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 1: HIGHVOLT Prüftechnik Dresden GmbH, Germany; 2: JDR Cable System Ltd.
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Cirujano, Pablo; Larracochea, Ibon; Del Río Etayo, Luis
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- 1031** *SF6-free World's first 36 kV dry-air GIS for Acciona's solar park in Spain*
Zache, Sebastian (1); Ramesh, Manjunath (1); Gallego Cobos, Alejandro (2)
 1: nuventura GmbH, Germany; 2: Acciona Energia
- 1041** *Cable Diagnostic Experiences in the German Distribution Grid*
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 1: Elektro Koopmann GmbH, Germany; 2: TH Köln, Germany
- 1045** *Recent superconducting cable installation in Chicago paves the way for a Resilient Electric Grid (REG) system*
Saugrain, Jean-Maxime (1); Allais, Arnaud (1); Lallouet, Nicolas (1); West, Beate (2); Marzahn, Erik (2); Ross, Mike (3); Frentzas, Frank (4)
 1: Nexans, France; 2: Nexans, Germany; 3: American Superconductor, USA; 4: COMED, USA
- 1050** *Requirements For Large Scale Battery Storages In Low Voltage Grids - Lessons Learned From A Smart Grid Project.*
Dult, Navreet; Petters, Benjamin
 Avacon Netz GmbH, Germany
- 1052** *Diagnostic Tools (DGA) for Resilient Transformers with Aramid-Based Insulation Systems*
Szewczyk, Radoslaw (1); Duarte, Jean-Claude (1); Wilhelm, Helena (2); Fernandes, Paulo (2)
 1: DuPont; 2: Vegoor Tecnologia Aplicada
- 1056** *A Simplified Tool For The Life Cycle Analysis Of A Medium Voltage Switchgear*
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 1: Ormazabal; 2: Iberdrola Distribucion Electrica; 3: Ihobe
- 1059** *Superconducting Systems, a New Tool for Railway Power Grids*
Saugrain, Jean-Maxime (1); Allais, Arnaud (1); Caron, Hervé (2)
 1: NEXANS, France; 2: SNCF, France

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- 1083** *Cyclic Loadability Of Entire HV/MV-Substations*
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 Alliander, The Netherlands
- 1091** *Life Cycle Assessment Comparison Of SF6 Insulated And AirPlus Insulated Medium-voltage Switchgear*
Nystad-Hansen, Magnus (1); Sahraro, Milad (2); Sørflaten Eikeland, Marianne (2); Fjeld, Elin (2)
 1: ABB Electrification Norway AS, Norway; 2: USN
- 1094** *Inrush-Currents of Series Combination of Transformer with in-phase Regulation and Phase Shifting Transformer at the Interface between Transmission and Distribution Networks*
Bai, Jiachen (1); Shewarega, Fekadu (1); Vennegeerts, Hendrik (1); Lechner, Roman (2); Etz, Günter (2); Unterholzer-Moser, Markus (3)
 1: University Duisburg-Essen, electrical Energy Systems (eES), Germany; 2: Netz Niederösterreich GmbH, Austria; 3: Austrian Power Grid (APG), Austria
- 1108** *Thermal Performance For Three-Windings Transformers With Axially Stacked Windings*
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 1: DOBLE ENGINEERING, United States of America; 2: IBERDROLA, Spain; 3: FARAMAX TRAFO, Spain
- 1112** *Transformer Retrofilling With Natural Esters*
Fernandez, Roberto; Ignacio, Roberto; Wang, Revin
 Cargill Bioindustrial, Spain
- 1116** *What Should DSOs Focus On For Reducing The Impacts On Climate Change When Developing And Operating Electricity Networks? A Case Study Of The Power Distribution Network In A Rural Area In Central Norway*
de Sadeleer, Irmeline; Skattenborg, Regina; Rønning, Anne
 NORSUS, Norway
- 1120** *Machine-Learning-Empowered Edge Computing Solution for Partial Discharge Monitoring*
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 SINTEF Energy Research, Norway
- 1126** *Non Intrusive Repair Of a Belgrade Fluid Filled Cable With a Self-healing Dielectric Fluid*
Rhodes, Rhys (1); Svensson, Maggie (1); Herman, Henryk (1); Stevens, Gary (1); Miners, Christopher (2); Uppal, Siddharth (3); Kretschmar, Christian (3); Ivetic, Pane (4); Dordevic, Branko (5); Borovic, Mirko (5); Mitic, Ivana (5)
 1: Kinectrics UK Ltd, United Kingdom; 2: Energi Cable Engineering, United Kingdom; 3: NKT, Denmark; 4: MINS Elektro, Serbia; 5: Elektromreza Srbije, Serbia
- 1140** *Deploying Intelligent PD Monitoring Solutions In Distribution Grid*
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 1: Ampacimon; 2: EDP Redes España; 3: Universidad Politécnica de Madrid; 4: FFII-LCOE

- 1145** *Hybrid Power Solution Modelling Based on Artificial Intelligence*
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 1: CE+T Power, Belgium; 2: ULiège; 3: Alpha Innovation
- 1164** *Virtualization and Management Technologies in IT & OT of Smart Substations*
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 OFFIS e.V., Germany
- 1167** *Lifetime Extension Options for Electrical Equipment*
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 1: KTH, Sweden; 2: HM Hochschule München University of Applied Sciences, Germany; 3: OMICRON electronics GmbH, Austria; 4: Maschinenfabrik Reinhausen, Germany; 5: Budapest University, Hungary; 6: Vorarlberger Energienetze, Austria; 7: EDP Distribuição Portugal; 8: G&W Electric, Italy; 9: Hitachi ABB Power Grids, Sweden; 10: Enedis, France; 11: Stromnetz Hamburg, Germany; 12: Elektro Gorenjska, Slovenia; 13: Nexans, France; 14: Vattenfall Sweden; 15: Ormazabal, Spain; 16: Schneider Electric, France
- 1171** *Smart Bushing PD Sensor Testing for Switchgear Application*
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 1: University of Bologna, Italy; 2: G&W Altea, Italy; 3: G&W Electric Co. USA; 4: Electrical Engineering Institute Nikola Tesla, Serbia
- 1175** *Improve Operator Safety and Protect Wildlife in Overhead Distribution Networks*
Landeta Zarate, Iban (1); Apraiz Alvarez, Iñaki (1); Pérez Quesada, Juan Carlos (1); Irizar Moyua, Mikel (2)
 1: Schneider Electric (MESA PLANT), Spain; 2: Iberdrola, Spain
- 1182** *Simulation Study and Field Experience from Switching of Transformer with Minimal Inrush Current*
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 1: ABB AB, Sweden; 2: ABB S.p.A., Italy
- 1187** *On Droop Control Techniques for Distributed Generation Sources in Islanded Microgrid Systems*
Bekele, Yared; Biru, Getachew; Bertling Tjernberg, Lina
 Addis Ababa University, United Arab Emirates
- 1215** *Implementation of Asset Condition Models at E-REDES: What Comes Next?*
Freitas, Miguel; Carvalho, Cristina; Moreira, Fernando; Moreira, Diogo; Delfino, Ana; Neves, André
 E-REDES, Portugal
- 1223** *Fast-tracking Licencing Of Temporary Lines And The Use Of Mobile Maintenance Kits With MV Aerial Bundled Cables*
Bandeirinha, Rui; Duarte, Carlos Manuel; Tomás, António; Antunes, Jorge Miguel
 E-REDES, Portugal

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- 1234** *Analysis Of The Exposure Of Workers To Electric And Magnetic Fields During Maintenance Works On Distribution Overhead Power Lines*
Grbić, Maja; Pavlović, Aleksandar
Electrical Engineering Institute Nikola Tesla, Serbia
- 1246** *Power Transformer Life Extension By An Optimized Mid-life Maintenance*
Cordonnier, Michel; Zouiti, Mohammed; Eric, Ortega
Enedis, France
- 1251** *Innovative Solutions for the Replacement of Underground Transformers*
Campbell, Alexandra; Kazerooni, Ali; Bebbington, Malcolm; Jones, Matthew; Cupples, David; Neilson, David
SP Energy Networks, United Kingdom
- 1254** *Tubular DC Breaker*
Mannekutla, James (1); Nohlert, Johan (1); Eriksson, Thomas (1); Bergamini, Alessio (2)
1: ABB AB, Corporate Research, Västerås, Sweden; 2: ABB S.p.A. SACE, Bergamo, Italy
- 1257** *Cyber Security Of An Industrial IoT Gateway Device – A Threat Model View And Security Aspects*
Tatavarthi, A Pavan Kumar (1); Panigrahi, Prof. Bijaya Ketan (2)
1: ABB, India; 2: IIT Delhi
- 1264** *Research Of Components For An Increase Of Transmission Capacity In Distribution Grids By Changing Existing AC Links Into DC Links*
Adam, Robert (1); Hildmann, Christian (1); Nilges, Matthias (1); Backhaus, Karsten (1); Rupp, Stephan (2)
1: Technische Universität Dresden IEEH, Germany; 2: Maschinenfabrik Reinhausen GmbH
- 1270** *Optimizing the Life-Span of (Smart) Transformers: A Review on Smart Services*
Azamat, Mana; Schütz, Johann
OFFIS, Germany
- 1272** *Synchronous Circuit Breaker For Transient Suppression In Distribution Network: VD4-CS Pilot*
Ferruccio, Andrea (1); Brandt, Andreas (2); Minuti, Matteo (1); Tadorelli, Carlo (1); Ragonese, Antonio (3); Pegoiani, Andrea (3); Forciniti, Samuele (3)
1: ABB S.p.A.; 2: ABB AG; 3: Unareti S.p.A.
- 1282** *Smart Meter Based Charging System for Public EV Charge Points*
Babu, Anish; Sims, Ryan
University of Strathclyde, United Kingdom
- 1289** *Realising the Benefit of Short-Term Post-Fault Ratings using Smart OHL Sensors for Increased DER Integration*
Jupe, Samuel (1); Troshka, Liza (2); Casallas, Samuel (1)
1: Nortech Management Limited, United Kingdom; 2: National Grid Electricity Distribution, United Kingdom
- 1291** *Capacitive Transfer System Cable for Efficient Power Delivery in a 33kV Distribution System*
Yanushkevich, Alexander; Salehi-Moghadam, Mansour; Hajiloo, Ashkan Daria; Johnson, Owen
Enertechnos, United Kingdom

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- 1301** *Life Enhancement of Shunt Reactors with Optimum Placement of Core Duct*
Rathore, Pawan; Jain, Apoorv
 CG POWER AND INDUSTRIAL SOLUTIONS LIMITED, India
- 1317** *Lessons from the Installation and Commissioning of Novel Power Electronics for Active Response*
Page, Brendan (1); Terry, Simon (1); Burton, Andrew (2)
 1: Ricardo Energy and Environment, United Kingdom; 2: UK Power Networks, United Kingdom
- 1331** *Partial Discharge Characterization Through Innovative Continuous Monitoring of Medium Voltage Substation*
El Khoury, Diana (1); Durand, Maxime (1); Gentils, François (1); Fabiani, Davide (2)
 1: Schneider Electric Industries SAS, France; 2: University of Bologna, Italy
- 1338** *Advanced Switchgear Diagnostics Through PD Monitoring Correlated With Environmental And Operating Parameters*
Alberto, Diego (1); El Khoury, Diana (1); Ferraro, Venanzio (1); Cavallini, Andrea (2)
 1: Schneider Electric Industries SAS, France; 2: University of Bologna, Italy
- 1341** *Standardization of Smart Distribution Substations in Cologne*
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 Rheinische NETZGesellschaft mbH, Germany
- 1350** *Polymeric Composite Crossarms as an Alternative to a Traditional Metallic Solution on E-REDES Medium Voltage Overhead Networks*
Sá Furtado, Pedro; Mendes Santos, Jorge; Lopes, Hilário; Capela, Filipa; Silva, Inês
 E-REDES, Portugal
- 1358** *Theoretical Investigation of C5F10O (Per Fluoro Ketones) Decomposition to Determine Reaction Pathways for Switchgear Design*
Singh, Shailendra (1); S. Thevar, Dukkaiappan (2)
 1: ABB Electrification Norway AS, Norway; 2: ABB AG, Germany
- 1366** *TNB Experience in The Use of Smart Meter For Real Time Monitoring on The Thermal Performance of In-Service Distribution Transformer*
Yang Ghazali, Young Zaidey (1); Abd Aziz, Mohd Azhar (2)
 1: Tenaga Nasional Berhad, Malaysia; 2: TNB Research Sdn. Bhd., Malaysia
- 1372** *20 Years Of Birdlife Protection At E-REDES*
Capela, Filipa (1); Cândido Silva, Inês (1); Batista, Vítor (2); Mendes Santos, Jorge (1); Sá Furtado, Pedro (1)
 1: E-REDES - Distribuição de Eletricidade S.A., Portugal; 2: EDP - Energias de Portugal S.A, Portugal
- 1397** *Monitoring of Gas Evolution of Power Transformers Integrating Nanotechnology and Intelligent Techniques*
Albertin, Camila (1); Neto, Floriano (2); Vasconcellos, Vagner (3); Carneiro, João (4)
 1: CPFL Paulista, Brazil; 2: CPFL Geração de Energia S.A; 3: CPFL Paulista, Brazil; 4: CPFL Piratininga, Brazil

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- 1407** *Core Vibration Modelling for Secondary Distribution Transformers*
Würde, Andre (1); Kahlen, Jannis Nikolas (2); Moser, Albert (1)
 1: IAEW, RWTH Aachen, Germany; 2: Umlaut SE, Germany
- 1433** *Gaining Insight In The MV-grid With Low Effort By Accurate RMU Retrofit Measurement To Accelerate Hosting Capacity And Energy Transition*
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 1: Alliander; 2: Eaton
- 1435** *Evaluation Of Novel Corrosion Protected Aluminium Earth Wire For Use In Underground Cable Networks*
Söderberg Erdal, David (1); Hagman, Ingvar (2); Andersson, Christian (2); Gleich, Dietmar (2); Persson, Anders (3)
 1: Vattenfall Eldistribution AB, Sweden; 2: NKT (Sweden) AB; 3: Dala Energi AB
- 1437** *Zero-Sequence Blocking Transformers For Use In MV Distribution Systems – Design Comparison Of Single-Core Vs Multi-Core Designs*
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 1: Vattenfall Eldistribution AB, Sweden; 2: KKM Power OY, Finland
- 1441** *Future Proof Grid Observability Through Super LV Project*
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 1: E-Redes, Portugal; 2: E-Redes, Spain
- 1444** *Recent Experiences with High Failure Rates of Medium-Voltage Switchgear Assemblies during Lightning Impulse Tests*
Ćurčić, Dejan
 KEMA Labs, Czech Republic
- 1469** *Distributed Smart Soft Open Point*
Ming, Wenlong (1); Chen, Jinlei (1); Wu, Jianzhong (1); Yu, James (2); Kazerooni, Ali (2); Edgar, Ranit (2); Ferguson, Alastair (3)
 1: Cardiff University, United Kingdom; 2: Scottish Power Energy Networks; 3: Polaris Diagnostics & Engineering Ltd
- 1470** *SF6 Free MV Switchgear - Different Designs for Different Applications*
Uzelac, Nenad (1); Hyrenbach, Maik (2); Smeets, Rene (3); Jacquier, Frank (4); Perez, Antoine (4); Laso, Andres (1)
 1: G&W Electric, United States of America; 2: ABB, Germany; 3: Kema Labs, Netherlands; 4: Super Grid Institute, France
- 1472** *Hardware of Aerial Distribution Networks, for Use on the Seashore, Corrosion Resistant, Corona Discharges and Leakage Current*
Dadam, Alessandro P (1); de Almeida, Geraldo R (2); Pinheiro, Walter (2); N Araujo, Simone C (2)
 1: Celesc Distribuição S.A., Brazil; 2: Tag Inovacao Tecnologica

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- 1483** *Life-Expectance Evaluation for SF6-free Switchgear using C4-FN Mixtures*
Laso Rubio, Andres; Mainwaring, Ian; Yeaton, Traci; Darko, Kennedy; Uzelac, Nenad
G&W electric, United States of America
- 1486** *Improved Condition Monitoring Using Internally Mounted PD Sensors Within Network Components And Switchgear Enclosures*
Morris, Jack; Smith, Colin; Mynampati, Sai J; Eastham, Carl
IPEC Ltd., United Kingdom
- 1504** *Battery Energy Storage System with Batteries of Second Life*
Omae, Camila (1); Arioli, Vitor (2); Padela, Fernando (2); Riboldi, Victor (1); Freitas, Nathalia (1); Ohashi, Ricieri (2)
1: CPFL ENERGIA, Brazil; 2: CPQD, Brazil
- 1510** *Industry State-of-Art and Opportunities for the Use of Drones in Power Grid Inspections*
Landas, Nathan; Rodrigues, Yuri
Seattle Pacific University, United States of America
- 1517** *Vibration-Based Extraction of Switching Times for Circuit Breaker Monitoring Using Machine Learning*
Boyaci, Aydin; Amihai, Ido; Penner, Simon; Migunov, Vadim; Loss, Theresa; Zajadatz, Maurizio; Suriyah, Michael; Leibfried, Thomas; Seidel, Nico
ABB AG Corporate Research Center Germany, Germany
- 1521** *Application of Diagnostic Criteria on Service Aged MV XLPE Cables Removed from Service*
Hvidsten, Sverre (1); Liland, Knut Brede (1); O'Shaughnessy, James (2); Looby, Tom (2)
1: SINTEF, Norway; 2: ESB, Ireland

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AMSC, United States of America
- 121** *Harmonics in the Transmission and Distribution Grid and their Relation to Geomagnetically Induced Currents*
Malfoy, Alexandre; de Oliveira, Roger; Ronnberg, Sarah; Bollen, Math
Luleå University of Technology, Sweden
- 130** *Case Studies of Estimation of Harmonics in partly monitored Residential Networks*
Rodríguez-Pajarón, Pablo (1); Hernández, Araceli (1); Zhao, Yuqi (2); Milanovic, Jovica (2)
1: Universidad Politécnica de Madrid, Spain; 2: The University of Manchester
- 131** *Measurement based Identification of harmonic currents Injected by Electric Vehicles*
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1: Universidad Politécnica de Madrid, Spain; 2: The University of Manchester
- 139** *The Impact of Electric Vehicles Charger on Harmonics*
Atia Ismail, Mohammad; Youssef, Kamelia
North Delta Electricity Distribution Company, Egypt
- 140** *The Impact of Biogas Production from Waste of Sewage Blended with Cow Dung On Power Quality Elements*
Atia Ismail, Mohammad; Ahmed Assel, Mohammad
North Delta Electricity Distribution Company, Egypt
- 141** *Smart Charging Experiment with 40 EVs on a Charging Plaza – Power Quality Analysis*
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1: Eindhoven University of Technology, Netherlands; 2: ElaadNL, Netherlands
- 142** *Transfer of Supraharmonics through a MV/LV Transformer*
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1: Eindhoven University of Technology, Netherlands; 2: KEMA Labs, Netherlands
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Wingenfelder, Manuel (1); Frank, Daniela (1); Reese, Constantin (2); Hofmann, Lutz (1)
1: Leibniz University Hannover, Institute of Electric Power Systems, Electric Power Engineering, Germany; 2: enercity AG, Stadtwerke Hannover

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- 160** *Testing Inverters And Their Response To Frequency And Voltage Changes In The Distribution Network*
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- 176** *Minimization Strategies Of Harmonics in Microgrid Connected Wind-Driven PMSG*
Nashed, Maged; Eskander, Mona
 Electronic Research Institute, Egypt
- 179** *Comparative Study On The Performance Of Unipolar And Bipolar Industrial DC Microgrids*
Vasquez Mayen, Eduardo; De Jaeger, Emmanuel
 UCLouvain, Belgium
- 181** *Advanced Techniques For Troubleshooting Solar Arrays And Generator Connections*
Weller, Robert (1); Edwards, Kate (2); Dalton, Duncan (2)
 1: Electrical Investigation Ltd, United Kingdom; 2: Outram Research, United Kingdom
- 196** *Power Quality Impact on Light Intensity and Flicker Sensitivity of LED Lamps*
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 1: Luleå University of Technology, Sweden; 2: Universidad de Córdoba, Spain
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 1: Fluvius, Belgium; 2: ENGIE Laborelec, Belgium
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 1: ENGIE Laborelec, Belgium; 2: Fluvius, Belgium
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Nashed, Maged; Eskander, Mona
 Electronic Research Institute, Egypt
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Grasel, Bernhard (1); Baptista, José (2); Tragner, Manfred (1)
 1: FH Technikum Wien, Austria; 2: University of Trás-os-Montes and Alto Douro
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Groiß, Christoph (1); Friedl, Katrin (2)
 1: Salzburg Netz GmbH, Austria; 2: TU Graz, Austria
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Nakhodchi, Naser; Bollen, Math H. J.
 Luleå University of Technology, Sweden

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- 229** *Requirements For Grid Supporting Inverter In Relation With Frequency And Voltage Restoration And Standardisation*
Lehmal, Carina; Zhang, Ziqian; Renner, Herwig; Schürhuber, Robert
 Graz University of Technology, Austria
- 246** *Unmanned Aerial inspection of distribution power lines in MEEDC; challenges and Lessons Learned*
Khalilzadeh Moghaddam, Farhad; Sekandari Shahri, Alireza
 Mashhad Electric Energy Distribution Company, Iran
- 269** *Assessment of Technical Feasibility of Non-Invasive Measurement of Grid-Side Harmonic Impedance on Low-Voltage Networks*
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 TU Dresden, Germany
- 270** *Continuous Non-invasive Resonance Detection in Residential Low-Voltage Networks*
Kannan, Shrinath; Meyer, Jan; Schegner, Peter
 TU Dresden, Germany
- 283** *Assessing the Bonding Distance of the HV Grounding System and Instrumentation to Reduce Electromagnetic Interferences Due to Lightning Strikes in the EMTP-RV Environment*
Eshagh Ahmadi, Mahmoud; Hoorzad, Mostafa; Shahabi, Mohammad
 Mashhad Electric Energy Distribution Company, Iran
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 1: ENGIE Laborelec, Belgium; 2: Ores, Belgium; 3: Resa, Belgium; 4: Sibelga, Belgium
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 1: ENGIE Laborelec, Belgium; 2: Fluvius, Belgium; 3: Ores, Belgium; 4: Sibelga, Belgium; 5: Resa, Belgium
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 1: ENGIE Laborelec, Belgium; 2: Fluvius, Belgium
- 318** *Explainable AI-based Intelligent Approaches for Power Quality Prediction in Distribution Networks Considering the Uncertainty of Renewable Energy*
Lee, Haesung; Lee, Hanmin; Lee, Byungsung
 KEPCO Research Institute
- 324** *Deep Learning Graphical Tool Inspired on Correlation Matrix for Reporting Long-term Power Quality Data at Multiple Locations*
de Oliveira, Roger; Nakhodchi, Naser; Bollen, Math
 Luleå University of Technology, Sweden

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- 334** *Influence Of Current Flowing On The Screens During The Standard Conditions And Preconditioning Of Hot Spots Of Joints*
D'Orazio, Luigi (1); Cerretti, Alberto (1); Fatica, Alessandro (2); Corsi, Niccolò (2)
 1: ENEL, Italy; 2: e-distribuzione, Italy
- 356** *The Benign Earthing System: A New Method to Classify the Earthing of Substations*
Ehlert, Christian (1); Schmoger, Christin (2)
 1: Avacon Netz GmbH, Germany; 2: E.DIS Netz GmbH, Germany
- 367** *Power Quality Benchmarking*
Galzina, Denisa
 HOPS, Croatia
- 368** *Application of Artificial Neural Networks for Overhead Distribution Lines Magnetic Flux Density Estimation*
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 University of Sarajevo - Faculty of Electrical Engineering, Bosnia and Herzegovina
- 374** *Determining Faults Cause Based On Disturbance Records From PQ Monitors*
Sagovac, Irena; Lukac, Marijan
 HEP ODS d.o.o. Elektra Zagreb, Croatia
- 402** *Extremely low Frequency Magnetic Field Emission from Electric Bus*
Karawia, Hanaa
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- 417** *Supervised and Unsupervised Machine Learning with Special Reference to Power-Quality Data*
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- 428** *Impedance Characteristics at Socket Outlets in Residential and Commercial Buildings in the Frequency Range 2-150 kHz*
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 1: Technische Universität Dresden, Germany; 2: National Physical Laboratory (NPL), United Kingdom; 3: University of the Basque Country (UPV/EHU), Spain
- 431** *Operation of Micro Sources and Impact of High Penetration on Low Voltage Distribution Grid*
Kaspirek, Martin; Kurfirt, Martin; Valta, Tomas; Kouba, Daniel; Maca, Zdenek
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 1: FGH e.V., Aachen, Germany; 2: IAEW RWTH Aachen University, Aachen, Germany
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 1: Reactive Technologies Ltd, UK; 2: Eaton, USA; 3: Reactive Technologies, Finland
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 1: Eindhoven University of Technology, The Netherlands; 2: TenneT TSO BV, The Netherlands
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 1: University of the Basque Country (UPV/EHU), Spain; 2: National Physical Laboratory (NPL), United Kingdom; 3: Technische Universität Dresden (TUD), Germany
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 1: SINTEF Energy Research, Norway; 2: REN AS; 3: PQA AS
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 1: KEPRI / KEPCO, South Korea; 2: KEPCO, South Korea
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 1: Tampere University; 2: Siemens Oy; 3: Lempäälän Lämpö Oy

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 1: BASF Antwerp NV, Belgium; 2: Universidad Autonoma de Nuevo Leon, Mexico
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 1: Public Electric Utility Elektroprivreda of Bosnia and Herzegovina d.d. - Sarajevo, Bosnia and Herzegovina; 2: Graz University of Technology, Austria; 3: Netz Oberösterreich GmbH, Austria; 4: Technische Universitaet Dresden, Germany
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 1: Alliander, The Netherlands; 2: TenneT TSO B.V., The Netherlands
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 1: National Chung Cheng University, Taiwan; 2: Univ. of Campania "Luigi Vanvitelli", Italy
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 1: the University of Manchester, United Kingdom; 2: Universidad Politécnica de Madrid, Spain

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1: Technische Universitaet Dresden, Germany; 2: State Key Laboratory of Advanced Power Transmission Technology, China; 3: Asia Power Quality Initiative, China
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1: Zittau/Görlitz University of Applied Sciences, Germany; 2: Dresden University of Technology, Germany
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1: EDP Labelec; 2: EDP SA; 3: E-REDES
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1: National Grid Electricity Distribution, United Kingdom; 2: Nortech Management Ltd

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 1: EDF, France; 2: ESTIA Institute of Technology, France; 3: Enedis, France
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 1: FGH e.V., Germany; 2: Technical University Brunswick; 3: RWTH Aachen University
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 1: Ingenieurbüro Kitzig, Germany; 2: Hochschule Ruhr West, University of Applied Sciences, Germany
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 1: Université du Québec à Trois-Rivières, Canada; 2: Les services Électrigénies
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 1: TECNALIA, Basque Research and Technology Alliance (BRTA), Spain; 2: University of the Basque Country, Spain; 3: Hubbell Inc., USA
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 1: Safearth, Australia; 2: BC2

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 1: Bill Carman Consulting, Australia; 2: Safeearth Consulting, Australia
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 1: Graz University of Technology, Austria; 2: EWZ, Switzerland
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 1: Institute of Electrical Power Systems, Graz University of Technology, Austria; 2: Institute of High Voltage Engineering and System Performance, Graz University of Technology, Austria; 3: ESC Engineering Service & Consulting, Graz, Austria; 4: Institute of Electrical Power Systems (Head of the institute), Graz University of Technology, Austria
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 1: RWTH Aachen University, Germany; 2: Westnetz GmbH, Germany
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 1: RINA, United Kingdom; 2: UK Power Networks, United Kingdom
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 1: TU Dresden, Germany; 2: Oesterreichs Energie, Austria; 3: Energie Steiermark, Austria

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1: RINA, United Kingdom; 2: UK Power Networks, United Kingdom
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1: ENEIDA.IO, Portugal; 2: Instituto Superior Técnico, Portugal
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1: TU Dresden, Germany; 2: SachsenEnergie AG, Germany
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1: Technische Universität Dresden, Germany; 2: Camille Bauer Metrawatt AG, Switzerland
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1: The University of Sannio, Italy; 2: The University of Campania, Italy
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1: University of Eastern Finland, Finland; 2: Tampere University, Finland
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1: UCLouvain, Belgium; 2: UGent, Belgium
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1: Technische Universität Dresden, Germany; 2: Amprion GmbH

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 1: University of Campania "Luigi Vanvitelli", Italy; 2: Brno University of Technology; 3: Auburn University; 4: Technische Universität Dresden; 5: EnerNex; 6: Southern Company Services; 7: University of Canterbury; 8: Duke Energy
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 1: Electric Power Research Institute, USA; 2: Technical University of Dresden, Germany; 3: Tennessee Valley Authority, USA; 4: Duke Energy, USA

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 1: Uppsala University, Sweden; 2: University of Federal de Juiz de Fora, Brazil
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 1: Division of Electricity, Department of Electrical Engineering, Uppsala University, Sweden; 2: Foundation STUNS Energi
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 1: Eindhoven University of Technology, The Netherlands; 2: TenneT TSO BV, The Netherlands
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 1: University of Strathclyde, United Kingdom; 2: University of Glasgow; 3: Soraytec
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 1: Volta S.p.a.; 2: Università degli Studi di Cagliari, Italy
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 1: Schneider Electric, United States of America; 2: Schneider Electric, United States of America
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 1: Luleå University of Technology, Sweden; 2: Umeå University, Sweden
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 1: Tampere University, Finland; 2: Lappeenranta-Lahti University of Technology LUT
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 1: Universidade Federal de Santa Maria, Brazil; 2: Grupo Equatorial Energia / CEEE-D

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 1: Istituto Nazionale di Ricerca Metrologica (INRIM), Italy; 2: Technische Universität Dresden, Germany; 3: Laboratoire National de métrologie et d'Essais (LNE), France; 4: Physikalisch-Technische Bundesanstalt (PTB), Germany; 5: VSL B.V. (VSL), The Netherlands; 6: Türkiye Bilimsel ve Teknolojik Araştırma Kurumu (TUBITAK), Turkey; 7: Ricerca sul Sistema Energetico - RSE S.p.A, Italy; 8: Dept. of Industrial and Information Engineering, Università della Campania, Italy; 9: Dept. of Electrical, Electronic and Information Engineering, University of Bologna, Italy
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 1: G&W Electric, United States of America; 2: Powerside, United States of America; 3: EPRI, United States of America; 4: Ameren Illinois, United States of America
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 1: Ghent University, Faculty of Engineering and Architecture, Department of Electromechanical, Systems, and Metal Engineering, Research Group EELab/Lemcko, Kortrijk, Belgium; 2: Department of Electrical Engineering, Faculty of Engineering, Menoufia University, 32511 Menoufia, Egypt
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1: Westnetz GmbH, Germany; 2: Beagle Systems GmbH, Germany
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1: Enedis, France; 2: Enedis, France; 3: Enedis, France
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1: University of Bologna, Italy; 2: Unareti S.p.A
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1: Itaipu Technological Park – PTI; 2: Itaipu Technological Park – PTI; 3: Itaipu Binacional, Paraguay
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1: EDP NEW R&D, Portugal; 2: EDA, Portugal; 3: INESC-ID/IST, Portugal
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1: ENEL, Italy; 2: Falck Renewables, Italy; 3: CESI, Italy; 4: e-distribuzione, Italy

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 1: Univ. Grenoble Alpes, CNRS, Grenoble INP*, G2Elab, F-38000 Grenoble, France; 2: Enedis, France; 3: Nanyang Technological University, Singapore 639798, Singapore
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 1: ENEA, Italy; 2: Eindhoven University of Technology; 3: SINTEF Energy Research; 4: EPRI Europe
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 1: Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab, Grenoble, France; 2: Wattmen, Saint-Priest-En-Jarez, France
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 1: EnergySemantic.com, France; 2: ENEDIS, France; 3: RTE, France; 4: GIMELEC, France; 5: EDF, France; 6: Schneider-Electric, France
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 1: EFACEC, Portugal; 2: ARMIS, Portugal; 3: INESC TEC, Portugal; 4: Faculty of Economics - University of Porto, Portugal; 5: PH Energia, Portugal
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 1: University of Stuttgart, Stuttgart, Germany; 2: Netze BW GmbH, Stuttgart, Germany
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 1: EDF Lab Paris Saclay; 2: Enedis
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 1: KU Leuven, ESAT - Electa, Kasteelpark Arenberg 10, 3001 Heverlee, Belgium; 2: EnergyVille, Thor Park 8310, 3600 Genk, Belgium; 3: VITO NV, Boeretang 200, 2400 Mol, Belgium
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 1: Sharif University of Technology, Iran; 2: Aalto University, Finland
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 1: Cardiff university, United Kingdom; 2: Schneider Electric, Spain
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 1: ABB, Germany; 2: Karlsruher Institut für Technologie (KIT), Germany; 3: SUEC Coburg, Germany
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 1: ABB, Germany; 2: Universität Paderborn, SICP

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 1: INESC-ID/IST, Portugal; 2: EDF R&D; 3: ENEDIS
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 1: Luxembourg Institute of Science and Technology, Luxembourg; 2: Hrvatska Elektroprivreda Operator Distribucijskog Sustava, Croatia; 3: Institute for Systems and Computer Engineering, Technology and Science, Portugal; 4: Institute for Research in Technology, Comillas Pontifical University, Spain
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 1: SATIE Lab, ENS Rennes, France; 2: Orange Labs, France; 3: SATIE Lab, ENS Rennes & CNRS, France; 4: IRIT Lab, UPS Toulouse, France
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 1: Siemens AG, Germany; 2: Coburg University of Applied Sciences and Arts
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 1: Univ. Grenoble Alpes, CNRS, Grenoble INP, G2ELab, 38000 Grenoble, France; 2: Nanyang Technological University, Singapore 639798, Singapore
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 1: Avacon Netz GmbH; 2: RWTH Aachen
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 1: Siemens AG, Technology, Germany; 2: TU Darmstadt, Technology and Economics of Multimodal Energy Systems, Germany
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 1: Elektrizitätswerk der Stadt Zürich, Switzerland; 2: Swissgrid AG, Switzerland; 3: Zürcher Hochschule für angewandte Wissenschaften (IEFE), Switzerland
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 1: E-REDES, Portugal; 2: R&D Nester, Portugal; 3: REN, Portugal; 4: INESC TEC, Portugal
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 1: Fraunhofer FIT, Germany; 2: RWTH Aachen, Germany
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 1: Graz University of Technology, Austria; 2: Netz Oberösterreich
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 1: Siemens AG, Germany; 2: TU Darmstadt, Germany
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 1: KEPCO, South Korea; 2: Gwangju Institute of Science and Technology
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 1: Zaphiro Technologies, Switzerland; 2: Netze BW GmbH
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 1: L2EP - Ecole Centrale de Lille, France; 2: INRIA Lille, INOCS; 3: GECAD - Instituto Superior de Engenharia do Porto, ISEP
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 1: E5, Technical University of Darmstadt, Germany; 2: elenia, Technical University of Braunschweig, Germany

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 1: Kathmandu University; 2: University of South-Eastern Norway
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 1: The University of Melbourne, Australia; 2: AusNet Services, Australia
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 1: Salzburg Research Forschungsgesellschaft mbH, Austria; 2: Salzburg AG, Austria; 3: Salzburg Netz GmbH, Austria
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 1: Centrais Elétricas de Santa Catarina, Brazil; 2: Federal University of Santa Catarina, Brazil
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 1: Politecnico di Milano, Italy; 2: Università degli Studi di Pavia, Italy; 3: Siemens, Italy; 4: Freelancer
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 1: Enel Grids, Italy; 2: ENEL IBERIA, S.R.L.U.; 3: Enel Global Services S.r.l.; 4: ENDESA MEDIOS Y SISTEMAS, S.L.U.

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 1: Technical University of Munich, Germany; 2: Augsburg University of Applied Sciences, Germany; 3: KIMA Automatisierung Gesellschaft für elektronische Steuerungstechnik und Konstruktion mbH, Germany; 4: LEW Wasserkraft GmbH, Kraftwerkstechnik, Germany; 5: LW Zweckverband Landeswasserversorgung, Germany
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 1: Brandenburg University of Technology Cottbus-Senftenberg; 2: Highvolt Prüftechnik Dresden GMBH; 3: Technische Universität Dresden
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 1: Newcastle University, United Kingdom; 2: KU Leuven, Belgium; 3: Keele University, United Kingdom
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 Stedin, The Netherlands
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 1: UiT Campus Narvik; 2: Smart Innovation Norway
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 1: Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab, France; 2: Beoga, France
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 1: ENERGA-OPERATOR SA, Poland; 2: Globema Sp. z o.o.

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 UFSM, Brazil
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 1: Smarter Grid Solutions, United States of America; 2: Hydro Quebec, Canada
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 1: Sharif University of Technology, Iran; 2: Geologian Tutkimuskeskus (GTK), Finland; 3: Aalto University, Finland
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 1: University of Glasgow, United Kingdom; 2: SP Energy Network
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 1: KEPCO ES, South Korea; 2: KEPCO ES, South Korea; 3: KEPCO ES, South Korea; 4: Merlot Laboratories Inc., South Korea
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 1: Gwangju Institute of Science and Technology, South Korea; 2: Dongguk university, Korea, Republic of(South Korea)
- 941** *Development of a Real-time Estimation for a Pv Generation In a Distribution Network of South Korea*
Weon, Jong-Nam; Jung, Won-Wook; Shim, Jae-Seong; Kim, Jeong-Hun; Cho, Sung-Min
 KEPCO Research Institute, South Korea
- 945** *Increased Electrical Transmission And Resilience Of Distribution Systems By The Use Of Optical Fibre Systems*
Gräf, Thomas
 Hochschule für Technik und Wirtschaft Berlin, Germany

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- 968** *Techno-economic Comparison Of Reactive Power Control Modes For Distributed Generators For Voltage Regulation In LV Grids*
Gisbert, Cyril (1); Fournel, Josselin (1); Rias, Géraud (2); Gondolo, Mathieu (2)
1: EDF R&D, France; 2: Enedis, France
- 983** *Data Analytics For Pruning Optimization Around Power Lines*
Demay, Charles; Achaichia, Pierre; Tuloup, Philippe
ENEDIS, France
- 986** *Advanced Concept of Efficient Use of Transformers Leveraging the Dynamic Thermal Rating Technology*
Souvent, Andrej (1); Spec, Andrej (2); Koprivc, Polona (2); Petrovič, Nejc (3); Omahen, Gregor (4); Gradnik, Tim (5); Rot, Miha (6); Kosec, Gregor (6)
1: Operato d.o.o., Slovenia; 2: SODO d.o.o., Slovenia; 3: Elektro Gorenjska, d.d., Slovenia; 4: ELES, d.o.o., Slovenia; 5: EIMV, Slovenia; 6: Jožef Stefan Institute, Slovenia
- 987** *Data Analytics Model For Enhanced Utilization Of Grid Capacity*
Simonsen, Stig (1); Øyvang, Thomas (2); Grindbakken, Ole Kristian (1)
1: Lede AS, Norway; 2: USN, Norway
- 992** *Operational Strategies for Maximising the Value of Customer Flexibility*
Pudjianto, Danny; Strbac, Goran
Imperial College London, United Kingdom
- 997** *Development of Support System for Restoration of Power Outage in Distribution Facilities*
Kimura, Taku; Takeuchi, Shunsuke; Fujimoto, Keiichi; Furuta, Kyojo; Morita, Keisuke; Kawachi, Yuki; Kano, Noriaki
KANSAI Transmission and Distribution, Inc., Japan
- 1003** *Distribution Network Reconfiguration Strategy with Soft Open Point using GA and PSO*
Kim, Hyun-Woo; Ahn, Seon-Ju; Yun, Sang-Yun; Choi, Joon-Ho
Chonnam National University, South Korea
- 1017** *Demonstrating Interactions of Distribution Network and Local Energy Communities Operating in Hierarchically Autonomous Control Architecture Paradigm*
Degefa, Merkebu Zenebe; Rana, Rubi; Taxt, Henning
SINTEF Energy Research, Norway
- 1018** *Alternative Low-Frequency Demand Disconnection (LFDD) Solutions for UK Distribution Network Operator Implementation*
Emhemed, Abdullah (1); Bryson, Nathan (2); Huxtable, Ryan (3); Li, Can (4)
1: WSP UK Limited, United Kingdom; 2: WSP UK Limited, United Kingdom; 3: National Grid; 4: National Grid ESO
- 1020** *The Use of a Probabilistic Forecasts to Manage Risk of Congestion or Voltage Violations in a Distribution Network*
Carstens, Herman; Artoisenet, Pierre
N-SIDE, Belgium

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- 1033** *Decentralized Management of Distributed Energy Resources for Frequency Support – Finnish Pilot*
Aro, Matti (1); Ferrari, Jerome (2); Opas, Mikael (1); Caire, Raphael (2)
 1: VTT Technical Research Centre of Finland, Finland; 2: Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab, Grenoble, France
- 1035** *Distribution Smart Transformer Pilot Experience for LV Grid Real Time Operation*
Del Río Etayo, Luis (1); Mulroy, Patrick (1); Garcia Ribote, Iker (1); Lumberras, Itziar (2); Layo, Luis (2)
 1: Ormazabal; 2: i-DE
- 1046** *An Impact of Electrical Distribution Networks on the Operation of AC 25 kV Railway System*
Pavlovsky, Vsevolod (1); Steliuk, Anton (2); Zakharov, Andriy (3); Makogonchuk, Vasyl (4)
 1: DMCC Europe, France; 2: DMCC Engineering, Ukraine; 3: DMCC Europe, France; 4: DMCC Engineering, Ukraine
- 1049** *DeepGrid: Bringing the Operational Awareness to the LV Grid*
Couto, Rui (1); Faria, Joana (1); Sampaio, Gil (2); Bessa, Ricardo (2); Rodrigues, Francisco (3); Santos, Ricardo (3)
 1: ENEIDA.IO, Portugal; 2: INESC TEC, Portugal; 3: E-Redes, Portugal
- 1060** *The Implementation of Linear Asset Management As A Framework Solution In Distribution Electricity Network in Indonesia*
Fernando, Very; Mulyodinoto, Kharisma Utomo; Pardiasnyah, Indratno; Aldrian, Revi; Noval, Yopi Ardian; Swastika, Akbar Reza
 PT PLN (Persero), Indonesia
- 1065** *A Platform For Real-time Monitoring And Detection Of Conductor Integrity Related Health Hazards In Distribution Networks*
Freire, Guilherme (1); Campos, João (1); Faria, Joana (1); Marsh, Philip (2)
 1: ENEIDA.IO, Portugal; 2: Powerco, New Zealand
- 1071** *Congestion Anticipation and Preemptive Resolution in Distribution Networks Using Grid Internal and Redispatch Measures*
Schmitt, Susanne (1); Harjunkoski, Iiro (1); Dalle-Ave, Giancarlo (2); Subasic, Milos (1); Noglik, Peter (1)
 1: Hitachi Energy, Germany; 2: Hitachi Energy, Canada
- 1073** *Assessing the Pros and Cons of Different Operating Envelope Implementations Across Australia*
Gonçalves Givisiez, Arthur; Ochoa, Luis F.; Liu, Michael Z.; Bassi, Vincenzo
 The University of Melbourne, Australia
- 1089** *Dynamic Operation of MV Grids Based on Losses Optimisation*
Nunes Carreira, João; Pedro Baptista, João; Carrilho, Diogo; Monteiro, Alexandre; Roca, Ines
 E-REDES, Portugal
- 1093** *High-level Resilience Strategizing Using Data-Driven Inputs*
Weiss, Xavier (1); Nordström, Lars (1); Berlin, Arne (2)
 1: KTH Royal Institute of Technology, Sweden; 2: Vattenfall Eldistribution AB

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- 1097** *Chance-Constrained Method for Reserve Provision in EV-based DC Microgrids*
Marasciuolo, Francesca; Dicorato, Maria; Forte, Giuseppe
 Politecnico di Bari, Italy
- 1103** *Essential Aspects of Operational Risk Assessment and its Application: Issues and Challenges*
Nazir, Zunaira; Bollen, Math
 Luleå Tekniska Universitet, Sweden
- 1105** *Management of the Distribution System Operation During the Crisis – Earthquakes in Republic of Croatia in 2020*
Cavlovic, Marina (1,2); Piric, Damir (2); Perisa, Ivan (2)
 1: SAG 3, Croatia; 2: HEP ODS Ltd, Croatia
- 1109** *Optimal Cross-Voltage Operation of Active Distribution Networks Considering Flexibility and Production Schedule of an Industrial Customer with Various Business Models*
Mohseni, Nasratullah
 University of Bremen, Germany
- 1118** *IoT enabled System for High Voltage Disconnecter Advanced Asset Management*
Beltrán Hernández, Mikel (1); Landeta Zarate, Iban (1); Pérez Quesada, Juan Carlos (1); Alonso Alfayate, José Enrique (2)
 1: Schneider Electric (MESA site), Spain; 2: Red Eléctrica de España, S.A.U., Spain
- 1124** *Building a Realistic Sampler to Emulate Communication Delays in PLC-Operated Low Voltage Networks*
Rashad Ahmed, Mahmoud; Cano, José Manuel; Arboleya, Pablo
 University of Oviedo, Spain
- 1127** *Performance Analysis of a State Estimator for Low Voltage Unbalanced Grids Using Different Advance Metering Infrastructure Technologies*
Rashad Ahmed, Mahmoud (1); Cano, José Manuel (1); Mohamed, Bassam (2); Arboleya, Pablo (1)
 1: University of Oviedo, Spain; 2: Plexigrid, Spain
- 1137** *Peak Rebound Estimation of Electric Vehicle Chargers due to Load Shifting Strategies*
Kwon, Minho; Kim, Jinho; Baek, Keon; Lee, Eunjung
 Gwangju Institute of Science and Technology, South Korea
- 1147** *Impact of Charging Stations on Voltage Quality - Island and Grid Operation of Real Installation*
Mastny, Petr; Moravek, Jan; Vojtek, Martin; Vrana, Michal; Vrtal, Matej
 Brno University of Technology, Czech Republic
- 1148** *Demonstration for New Type SVR Using Commercial Distribution System with DERs*
Takahashi, Naoyuki; Tachibana, Yuya; Uemura, Satoshi
 Central Research Institute of Electric Power Industry, Japan
- 1153** *Generating Additional Markets for Mature Access to Flexibility*
Lynch, Jacob; Mavrocostanti, Yiango
 National Grid, United Kingdom

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- 1170** *An Automation Approach Towards The Preparation Of Switching Orders Involved In The Planned Outages of Network Elements*
Bausier, Jérôme
N-SIDE, Belgium
- 1176** *Partial Discharge Diagnostics on Medium-Voltage Switchgears - Measurement Methods and Benefits*
Zajadatz, Maurizio; Suriyah, Michael; Leibfried, Thomas
Karlsruhe Institute of Technology (KIT), Germany
- 1177** *Optimal Scheduling of EVs Route Considering Integrated Power and Transportation System*
Chae, Myeongseok (1); Won, Dongjun (1); Cha, Hee June (2)
1: Inha University, South Korea; 2: Incheon International Airport Corporation
- 1179** *Performance Evaluation and Operational Logistics in Energy Distribution Utility Fleet Electrification*
Zamboni, Lucca (1); Dias, Bruno Martin de Alcântara (2); Silva, Cynthia Thamires da (2); Martini, José Sidnei Colombo (1); Rodrigues, Andre Polatschek (3); Freitas, Nathalia Rubo Nobre de (3)
1: GESEL - Grupo de Estudos do Setor Elétrico - Brazil; 2: USP - Universidade São Paulo - Brazil; 3: CPFL Energia
- 1184** *E-REDES Adopt New Monometallic Technology and Predictive Algorithm to Minimize and Predict LV Neutral Loss Failures Detection*
Marques, Carolina; Gaspar, Cláudia; Vieira Santos, Carlos; Mendes Santos, Jorge; Margarido Morgado, Susana; Nunes Carreira, João; Príncipe Santos, Ricardo; Gomes, Alcides; Alves Dias, Jorge; Lourenço, Frederico; Azar, Jad; Duarte, Patrícia; Fonseca, Luís; Veríssimo, Miguel; Louro, Miguel
E-REDES, Portugal
- 1190** *Challenges in Proactive Congestion Management in Distribution Grids - Practical Findings from the flexQgrid Project*
Frankenbach, Marc-Aurel (1); Schubert, Carolin (1); Exner, Carmen (1); Höck, Ariane (2)
1: Netze BW GmbH, Germany; 2: FZI Research Center for Information Technology
- 1224** *Vision For Smart Grid Interoperability: Standards Based Integration Of E-Mobility, Prosumer, And Grid*
Sharma, Mayank; Berry, Tom
Schneider Electric, France
- 1230** *Auto Transfer Of Source At Substation*
Sonule, Liladhar; Mattoo, Nittin; Paradkar, Tejaswita; Potdar, Ajay; Gokani, Hitesh
Tata Power Company Limited, India
- 1232** *Synthesizing Q(P)- And Q(U)-characteristics By Means Of Time-series Based Optimal Power Flow Calculations*
Schwenke, Manuel; Hanson, Jutta
Technical University Darmstadt, Germany
- 1253** *Mapping Maintenance Road on Iran Power Distribution Network*
Khayyamim, Tara; Khayyamim, Sara; Safaei, Arman; Gilvanejad, Mojtaba
Niroo Research Institute, Islamic Republic of Iran

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- 1259** *Modeling of Frequency Reserve Provision for energy Storage Systems*
Mohamed, Ahmed (1); Rigo-Mariani, Rémy (2); Debusschere, Vincent (1)
 1: Univ. Grenoble Alpes; 2: CNRS
- 1260** *Modeling Active Grid Operation In A Testbed For Cyber-Physical Systems*
Fatemi, Armin (1); Schmidtke, Florian (2); Ulbig, Andreas (1)
 1: IAEW at RWTH Aachen University, Germany; 2: Fraunhofer FIT, Germany
- 1261** *Use of Voltage Regulation on HV/MV Substations to Increase Hosting Capacity in the LV Grid*
Jargstorff, Johannes; Boeraeve, Ward; Lauwers, Piet
 Fluvius System Operator CV, Belgium
- 1263** *Solving AC Power Flow with Graph Neural Networks*
Böttcher, Luis (1); Wolf, Hinrikus (2); Jung, Bastian (1); Lutat, Philipp (1); Trageser, Marc (1); Pohl, Oliver (3); Ulbig, Andreas (1); Grohe, Martin (2)
 1: IAEW at RWTH Aachen University, Germany; 2: Computer Science at RWTH Aachen University, Germany; 3: Schleswig Holstein Netz AG, Germany
- 1267** *Day-Ahead Forecast Of Low Voltage Network State To Prevent Outages – Real-World Experimentation In Ouagadougou, Burkina Faso*
Grosjean, Benoit (1); Rigal, Bruno (1); Richaud, Luc (1); Bayanma, Camille (2)
 1: Odit-e, France; 2: SONABEL, Burkina Faso
- 1268** *Simulating Integration Of New Flexibilities And DER In A Low-Voltage Grid*
Forestier, Arthur; Lucas, Chloé
 Odit-e, France
- 1292** *C-HIL Environment for Parameter Optimization of Grid Friendly Charging Control*
Einfalt, Alfred; Frischenschlager, Albin; Schroer, Lukas; Schildorfer, Andreas
 Siemens AG OEsterreich, Austria
- 1314** *A Data-driven Flexibility Region Estimation Method for Virtual Power Plant*
Jeong, Hwanmin; Kim, Donghoon; Kim, Jinho
 Gwangju Institute of Science & Technology, South Korea
- 1327** *Virtual Reality in Electrical Distribution: Applications and Future Trends*
Nosrati, Komeil (1); Saleh Alsaleh, Saleh Ragheb (1); Onile, Abiodun Emmanuel (2); Belikov, Juri (2); Tepljakov, Aleksei (1); Petlenkov, Eduard (1)
 1: Department of Computer Systems, Tallinn University of Technology, Estonia; 2: Department of Software Science, Tallinn University of Technology, Estonia
- 1335** *Enhancing Power Transformer Maintenance Planning Through Data Analytics and Risk Based Maintenance for Improved Work Management and Cost Optimization*
Yang Ghazali, Young Zaidey
 Tenaga Nasional Berhad, Malaysia

- 1336** *Demand Response Using Remote Modification Of Smart-Meters' Subscribed Power To Protect Low-Voltage Feeders In Ouagadougou, Burkina Faso*
Grosjean, Benoît (1); Lassauce, Antoine (1); Richaud, Luc (1); Bayanma, Camille (2); Mouchel, Yann (3); Siarras, Sébastien (4); Mouad, Khalil (5)
 1: Odit-e, France; 2: SONABEL, Burkina Faso; 3: Smartside, France; 4: GridPocket, France; 5: Institut Smart Grid, France
- 1339** *Rethink Grid Management – Challenges, Use Cases And Design Principles For The Next Generation Of Grid Operation Systems*
Gemsjaeger, Ben (1); Wenz, Robert (1); Ebert, Dr. Michael (1); Kvistad, Sigurd (2); Holene, Jens Tore (2); Åsrud, Jørgen Sivertsen (2)
 1: Siemens AG, Germany; 2: Elvia AS
- 1342** *Investigation of Stacked Applications for Energy Storage Systems*
Schmidtke, Florian (1,2); Hacker, Immanuel (2,1); Ulbig, Andreas (1,2)
 1: IAEW at RWTH Aachen University, Germany; 2: Fraunhofer FIT, Germany
- 1344** *Enhanced Virtual Power Plant Design And Implementation Lessons*
Howorth, Gary (1); Kockar, Ivana (1); Tuohy, Paul (1); Flett, Graeme (1); Bingham, John (2)
 1: University of Strathclyde, United Kingdom; 2: Engineering Technology Centre Ltd (ETC), United Kingdom
- 1348** *An Integrated Approach for Energy Management Optimizations in Customer Premises*
Azamat, Mana; Schütz, Johann
 OFFIS, Germany
- 1351** *Economical Operation Strategy of Multi-Energy VPP on Distribution Network*
Lee, Jin-Wook; Son, Sung-Yong
 Gachon University, South Korea
- 1357** *How To Control The Vegetation In Overhead Lines? – Analytics4Vegetation*
Borges, Ricardo (1); Meneses, Maria Nela (2); Santos, Fátima (3); Lopes, Inês (4); Correia, Miguel (5); Costa, Gabriel (6)
 1: E-REDES, Portugal; 2: E-REDES, Portugal; 3: E-REDES, Portugal; 4: E-REDES, Portugal; 5: EY-Ernst & Young; 6: EY-Ernst & Young
- 1359** *Frequency Response Of An Autonomous Microgrid Under The Influence Of Enhanced Spatial And Orientational Smoothing Of Photovoltaic Output*
Riaz, Nida; Peltonen, Lasse; Hildén, Antti; Repo, Sami; Järventausta, Pertti
 Tampere University, Finland
- 1371** *Platform for Traceability and Inspection Management Through the Use of Artificial Intelligence Techniques*
Wellington Barboza, Felipe (1); Tiemi Takeuchi, Jéssica (1); Carrasco Baptista, Fabio (1); Pedro Klock Ferreira, João (2); Britto Bessa, Miguel (2); de Souza Rodrigues, Vitor (2)
 1: CPFL Energia S.A.; 2: Concert Technologies S.A.
- 1390** *Distributed Energy Resource Optimisation, Conflict Of Interests And Flexibility Markets*
Markkula, Joni; Järventausta, Pertti
 Tampere University, Finland

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- 1398** *Linear State Estimation in Distribution System Using Smart Meter Data*
Lopez-Ramirez, Izar (1); Piyasinghe, Lakshan P. (3); Zamora, Inmaculada (2); Rodriguez-Seco, Emilio (1)
1: TECNALIA, Basque Research and Technology Alliance (BRTA)., Spain; 2: Department of Electrical Engineering Engineering, University of the Basque Country (UPV/EHU); 3: Hubbell, Inc.
- 1401** *Demonstration of a Concept for the Data Management and Monitoring of Larger Scale DER Utilizing a Time-series Database*
Lu, Zhiyu; Chen, Shuo; Heilscher, Gerd
Ulm University of Applied Sciences, Germany
- 1408** *Black Start In Distribution Grids Through Solid-State Transformer*
Couto, Mário; Coccia, Alessio
Electric Power Research Institute, Ireland
- 1409** *“Energy Package” as a Tool to Reduce Environmental Footprint and Withhold Grid Capacity Limit at Harbour Areas*
Ilieva, Iliana (1); Wingstedt, Anja (1); Lundestad, Tore (2); Johnsen, Pål Erling (2)
1: Smart Innovation Norway, Norway; 2: BORG HAVN IKS
- 1420** *Vegetation Management Optimization At E-REDES Through Advanced Analytics Applied To Satellite Imagery*
Costa, Ruben (1); Santos, Ricardo (1); Cristino, Paulo (1); Borges, Ricardo (1); Silva, Frederico (1); Rodrigues, Bruno (1); Corrêa, Francisco (2); Charpentier, Remi (2)
1: E-REDES, Portugal; 2: Tesselo
- 1423** *Challenge of Integration BESS on Distribution Active Network Management Scheme*
Tejero Calvo Calvo, Gonzalo; Chen, Minjiang; Fox, Jonathan; Boyd, Gerard; Neilson, David
SP Energy Networks, United Kingdom
- 1429** *Near Real-Time Topology Estimation in LV Network with PLC Smart Meters*
Suarez-Ramon, Lucía (2); Arboleya, Pablo (1)
1: University of Oviedo, Spain; 2: EDP Redes España
- 1434** *Impact of Three-Phase Inverter-Based Generating Units With Asymmetrical Power Redistribution on the Low-Voltage Network Operation*
Vrana, Michal; Klusacek, Jan; Moravek, Jan; Drapela, Jiri; Mastny, Petr; Vrtal, Matej
Brno University of Technology, Czech Republic
- 1442** *GridDrone: Use of Drones to Perform Thermographic, Distance Measurement and Visual Inspection of the HV and MV Aerial Network*
Rodrigues, Francisco (1); Santos, Ricardo (1); Borges, Ricardo (1); Coelho, André (2); Vålja, Tom (3); Stern, Madis (3)
1: E-Redes, Portugal; 2: EDP Labelec; 3: Hepta Airborne
- 1447** *Architectural And Systems Approach To Sustainable Digital Transformation Of Distribution Utilities*
Sharma, Mayank (1); Narang, Nand Kishor (2); Berry, Tom (1)
1: Schneider Electric, France; 2: Narnix Technolabs

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- 1449** *Development of Probabilistic Model of Urban Distribution Network*
Vrtal, Matěj; Toman, Petr
 Brno University of Technology, Czech Republic
- 1451** *Operation of Electrical Vehicle Recharging Station with a Photovoltaic System to Reduce the Impact on the Distribution Network*
Vasconcelos, Samuel D.; Castro, José F.C.; Limongi, Leonardo; Azevedo, Gustavo M.S.; Marques, Davidson C.; Bradaschia, Fabricio; Rosas, Pedro A.
 Federal University of Pernambuco, Brazil
- 1453** *Flexibility Demand and Availability for Congestion Management in Low Voltage Grids Considering Future Load Scenarios*
Steinle, Sina; Werthmann, Lando; Suriyah, Michael R.; Leibfried, Thomas
 Karlsruhe Institute of Technology, Germany
- 1454** *A New Electrical Safety Risk Assessment Approach For Power Distribution Substation*
Raeisi Gahrooei, Yaser (1); Pavanello, Davide (1); Amrani, Jessye (1); Emery, Xavier (2)
 1: HES-SO Valais, Switzerland; 2: OIKEN, Switzerland
- 1455** *A Methodology for the Evaluation of Congestion Induced Costs in Distribution Grid Operation*
Cheilas, Damianos; Bindner, Henrik W.; Weckesser, Tilman
 Technical University of Denmark
- 1459** *Evaluation of Battery Energy Storage System Operating Modes in a Microgrid for Charging Electric Vehicles*
Martin, Maria C. D.; Castro, José F.C.; Marques, Davidson C.; Rosas, Pedro; Lima, Alexander B.; de Medeiros, Luiz H. A.; Azevedo, Gustavo M.S.; Brito, Marcio E.; Maia, Geraldo L.
 Federal University of Pernambuco, Brazil
- 1460** *Optimized Deployment of Online Partial Discharge Monitoring Solutions for Branched MV Networks*
Kafal, Moussa; Charrier, Dimitri; Griot, Samuel
 NEXANS, France
- 1463** *An Improved GA-based Approach for Reduced Non-discriminatory Renewable Energy Curtailment*
Amoura, Yahia (1); Pereira, Ana I. (1); Ferreira, Ângela (1); Lopes, Rui Pedro (1); Ângelos, Eduardo W. S (2); Vasconcelos, Fillipe M. de (2); Lemos, Manuel (2); Pino, Gabriel (2)
 1: Research Centre in Digitalization and Intelligent Robotics (CeDRI), Instituto Politécnico de Bragança, Portugal; 2: GML Transmission Line Solutions, S.A.
- 1473** *Boosting Local Energy Consumption via Optimal Operation of Local Energy Communities — Leveraging Electric Vehicle Flexibility*
Silva, Enielma (1); Sabillon, Carlos (2); Baquero, John Fredy (1)
 1: São Paulo State University (UNESP), Brazil; 2: Universidad Loyola Andalucía, Spain

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- 1478** *A Novel Method To Efficiently Reduce The Impact of Increasing Penetration Of Electric Bus Fleets on the Electric Grid*
Jiope, Herman
Renewable Energy, Germany
- 1503** *Electrifying East Nusa Tenggara with Smart Microgrid - Study Case on Semaue Subsystem*
Tampubolon, Daniel; Siahaan, Halomoan; Hendriyanto, Albertus
PT PLN INDONESIA, Indonesia
- 1508** *Novel Framework for Hybrid EV Charging Stations Placement Focused on Footprint Reduction in Power System Operation*
Rodrigues, Yuri; Sy, David
Seattle Pacific University, United States of America
- 1520** *Transactive-based Control of Electrical Distribution and Transportation Networks Considering Congestion Issue*
Fattaheian Dehkordi, Sajjad (1,2); Lehtonen, Matti (1)
1: Aalto University, Finland; 2: Sharif University of Technology

Session 4 : Protection, Control & Automation

- 104** *Generation of Synthetic Examples Using Generative Adversarial Networks (GAN) to Extend the Database of Fault Signals on Power Distribution Lines*
Granado Fornás, Javier (1); Herrero Jaraba, Elías (2); Llombart Estopiñan, Andrés (1)
1: Fundación Circe, Spain; 2: Universidad de Zaragoza
- 115** *Data hub based secure integration of DER Assets with Utilities, DSO and Retail*
Thaliyil, Nirmal
Kalki Communication Technologies Pvt Ltd, India
- 116** *Standard IEC 61850 based real-time DER interface for The Netherlands*
Troost, René (1); van der Heijden, Sjors (1); Fonteijn, Rik (2); Stuivenvolt, Alain (2); Mohammadi Sooran, Davood (4); Mulder, Bas (4); van Leeuwen, Joris (5); van Olst, Rob (3)
1: Stedin; 2: Enexis; 3: Alliander; 4: TenneT; 5: Holland Solar / NWEA / EnergieSamen
- 126** *An Operational Data-Driven Malfunction Detection Framework for Enhanced Power Distribution System Monitoring – The DeMaDs Approach*
Fellner, David (1); Strasser, Thomas (1,2); Kastner, Wolfgang (2)
1: AIT Austrian Institute of Technology, Austria; 2: Technische Universität Wien (TU Wien)
- 128** *Analysis of Application of 5G Control and Protection in Distribution Networks and Test of Slicing Schemes*
Xiaofeng, Zou (1,2); Xinchun, Cai (2); Chunjie, Li (2); Bing, Shen (2)
1: East China Electric Power Test and Research Institute, China, People's Republic of; 2: State Grid Shanghai Municipal Electric Power Company, China, People's Republic of
- 156** *Voltage Regulations Solutions for Low Voltage Distribution Network with Large PV Integration: Performance Analysis with A Real Swiss Case*
Guo, Baoling (1); Pignat, Ludovic (2); Pouget, Julien (1); Jordan, Nicolas (1); Baltter, Didier (1); Köppel, Guido (3)
1: HES-SO, 1950, Sion, Valais, Switzerland; 2: OIKEN, 1950, Sion, Valais, Switzerland; 3: Enbag group, 3900, Brig, Valais, Switzerland
- 166** *Analysis of Control Algorithms on Different Low-Voltage Grid Clusters*
Barta, Veronika (1); Baumgartner, Sonja (2); Uhrig, Stephanie (1); Witzmann, Rolf (3)
1: HM University of Applied Sciences Munich, Germany; 2: LEW Verteilnetz GmbH; 3: TUM Technical University of Munich
- 178** *Detection and Location of Single Phase Faults in New 10(20) kV Distribution Networks*
Gruhonjic Ferhatbegovic, Seila (1); Bajramovic, Zijad (1,2)
1: PE Elektroprivreda B&H, Bosnia and Herzegovina; 2: Faculty of Electrical Engineering, University of Sarajevo

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- 187** *Experience Sharing : Self Powered Relays - Simulated Over Current Phase & Earth Fault Testing*
Shah, Vijay; Bhamare, Yogesh; Leua, Arpita; Surati, Harshit
 ABB India Ltd, India
- 189** *Detection of Neutral Loss in Distribution Networks Using Smart Meters Records*
Vázquez, Tania
 E-redes (edp networks Spain), Spain
- 191** *Machine Learning Based Grid Optimization Algorithm for Real-time Applications*
Winter, Andreas (1,2); Igel, Michael (1); Schegner, Peter (2)
 1: Hochschule für Technik und Wirtschaft des Saarlandes, Germany; 2: Technische Universität Dresden, Germany
- 204** *Innovative 5G Transmission For Anti-islanding Protection In MV Distributive Network*
Toutain, Etienne (1); Coudray, Patrick (1); Villalta, Emmanuel (2); Renaldo, Pierre (3); Dauchy, Philippe (4); Bihannic, Nicolas (5); Bertazzon, Philippe (1)
 1: EDF, France; 2: ENEDIS, France; 3: Wavestone, France; 4: Nokia, France; 5: Orange, France
- 210** *A Study on Automatic Fault Isolation of Closed Loop System in Power Distribution System*
Lee, Chung min; Park, Sang hyun; Kang, Soon gu; Kim, Yung sam; Jeong, Un jung
 Distribution Business Department / KEPCO KDN, South Korea
- 226** *Modelling the Provision of Local Ancillary Services in Form of Flexibility by Prosumer Households with Sensitivity Factors*
Wegkamp, Carsten; Hadlak, Mattias; Wagner, Henrik; Kohlhepp, Julius; Engel, Bernd
 Technische Universität Braunschweig, Germany
- 238** *Evaluating State Estimation Performance On Distribution Circuits With High PV Penetration*
Schoene, Jens; Humayan, Muhammad
 EnerNex, United States of America
- 249** *Smart Meters for Grid State Identification with Use Case for Agent-based Local Energy and Flexibility Markets*
Koch, Markus (1); Asman, Martin (1); Zdrallek, Markus (1); Suriyamoorthy, Ghayathri (2); Korotkiewicz, Kamil (2)
 1: University of Wuppertal, Germany; 2: PSI Grid Connect GmbH, Germany
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 1: Upper Egypt Electricity Distribution Company, Egypt; 2: Aswan University, Faculty of Engineering, Egypt; 3: San Sebastian University, Chile

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 1: dephys, Switzerland; 2: Liechtensteinische Kraftwerke, Lichtenstein; 3: Ostschweizer Fachhochschule, Lichtenstein
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 1: ORES, Belgium; 2: ULIEGE
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1: Univ. Grenoble Alpes; 2: Grenoble INP
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 1: AIT Austrian Institute of Technology GmbH, Austria; 2: Energienetze Steiermark GmbH
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 1: AIT Austrian Institute of Technology GmbH, Austria; 2: Trialog, France
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 1: Zanjan electric distribution company, Iran; 2: PhD, Assistant Professor, Department of Electrical Engineering, University of Zanjan, Zanjan, Iran,
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 1: Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab, Grenoble, France; 2: Schneider Electric, France
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 1: Siemens Osaakeyhtiö; 2: Helen Sähköverkko Oy; 3: Siemens AG; 4: Helen Oy
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 1: Helen Electricity Network Ltd., Finland; 2: Aalto University, Finland
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1: ABB, Finland; 2: UK Power Networks
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1: Augsburg University of Applied Sciences, Germany; 2: Technical University of Munich, Germany; 3: Munich University of Applied Sciences, Germany; 4: LEW Verteilnetz GmbH, Germany; 5: AVS Aggregatebau GmbH, Germany
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 1: VTT Technical Research Centre of Finland, Finland; 2: ABB, Finland; 3: Aalto University, Finland
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 1: University Grenoble Alpes; 2: Enedis; 3: Nanyang Technological University
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 1: EDF R&D, France; 2: CentraleSupélec, GeePs, France
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 1: National Grid Electricity Distribution, United Kingdom; 2: Nortech Management Ltd
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 1: EDP Labelec, Portugal; 2: E-REDES, Portugal
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 1: Leibniz Universität Hannover, Germany; 2: Stadtwerke Bayreuth Energie und Wasser GmbH
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 1: MINES Paris PSL, France; 2: Sapienza University of Rome, Italy; 3: Compagnie Nationale du Rhône, France
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 1: Circe, Spain; 2: University of Zaragoza, Spain
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 1: University of Stuttgart, Germany; 2: Transnet BW, Germany
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 1: ABB Oy, Finland; 2: ABB Corporate Research, Switzerland; 3: Caruna Oy, Finland

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 1: Eneryield; 2: ABB; 3: Vaasan Sähköverkko
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 1: ENERGA-OPERATOR SA, Poland; 2: Institute of Power Engineering Poland
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 1: Kehui International Ltd., United Kingdom; 2: Kehui Power Automation Co. Ltd., China; 3: Shandong University of Technology, China
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 1: KIOS Research and Innovation Centre, University of Cyprus; 2: Transmission System Operator Cyprus
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 1: University of Applied Sciences, Germany; 2: Siemens AG
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 1: Chalmers University of Technology, Sweden; 2: Hitachi Energy

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 1: Merytronic; 2: Ariadna Grid; 3: Pronutec; 4: i-DE
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Luxenburger, Rainer (1); Policht, Gregor (2); Fischer, Florian (1); Albert, Michael (1)
 1: OMICRON, Germany; 2: Netze BW GmbH
- 988** *Hardware-In-The-Loop Investigation Of Distance Protection Algorithm In Grids With Dominant Decentralized Generation Units*
Galler, Manuel; Hackl, Philipp; Schürhuber, Robert
 University of Technology Graz, Austria
- 995** *Challenge: Frequency Measurement In Different Applications*
Albert, Michael; Luxenburger, Rainer
 OMICRON electronics Deutschland GmbH, Germany
- 999** *A 5G Communication-Based Wide Area Protection Concept for Enabling Resilient and Reliable Loss of Mains Protection*
Raipala, Ontrei (1); Kulmala, Anna (1); Hovila, Petri (1); Yazadzhiyan, Boris-Emanuel (2); Dantas, Rui (2); Scoble, Colin (2)
 1: ABB, Finland; 2: UK Power Networks, UK
- 1022** *Object Detection Algorithms Applied On Low Voltage Grid Equipment*
El Harras, Mohcine (1); Birkle, Christophe (2); Bruschi, Julien (1); Sallaud, Samuel (1)
 1: EDF R&D, France; 2: Enedis, France
- 1037** *Key Performance Indicators (KPI) For The Testing Process Of An IED*
Albert, Michael
 OMICRON electronics Deutschland GmbH, Germany
- 1038** *A New Adaptive Auto Reclosure Approach With Secondary Arc Detection*
Vogel, Angelika; Yelgin, Yilmaz
 Siemens AG, Germany
- 1040** *A Collaborative Engineering and Validation Framework for Smart Grid Automation Applications – The PowerTeams Approach*
Brandauer, Christof (1); Linecker, Stefan (1); Prästl Andrén, Filip (2); Gavriluta, Catalin (2); Strasser, Thomas (2); Veichtlbauer, Armin (3); Steinmaurer, Gerald (3); Resch, Jürgen (4); Schöndorfer, Sebastian (4)
 1: Salzburg Research, Austria; 2: AIT Austrian Institute of Technology, Austria; 3: FH Oberösterreich, Austria; 4: COPA-DATA, Austria

- 1042** *Validation Of MPLS-TP For Tele-Protection / Current Differential Protection Services Via Proof Of Concept*
Haegdorens, Davy (1); Abdul Wahib, Mohd Mokhlis (2); Nacatar Singh, Gurdial Singh (3); Zakaria, Mohd Nasim (3); Zarmani, Muzalifah Hanim (4); Mohd Perdaus, Ahmad Farid (3); Uzir, Rahimah (3)
 1: OTN Systems, Belgium; 2: Tele-Flow Corporation Sdn Bhd, Malaysia; 3: Tenaga Nasional Berhad, Malaysia; 4: TNB Researcher Sdn Bhd, Malaysia
- 1058** *Cognitive Data Fusion for Improving Flexibility in Smart Homes*
Redhu, Surender (1); Raja, Rameez (1); Ottesen, Stig Ødegaard (1); Bremdal, Bernt A. (1,2)
 1: Smart Innovation Norway, Norway; 2: University of Tromsø, Norway
- 1064** *HIL-validated Synchrophasor-based Adaptive Protection Scheme For Active Distribution Grids*
Pavanello, Davide (1); Zanni, Lorenzo (2); Paolone, Mario (3); Romano, Paolo (2); Pignati, Marco (2); Buchard, Adrien (4); Raeisi, Yaser (1)
 1: Hes-so Valais-Wallis, Switzerland; 2: Zaphiro Technologies SA, Switzerland; 3: EPFL, Switzerland; 4: Groupe SEIC-Télédis, Switzerland
- 1078** *Automated MV Switching Based On AMI Data*
Parreira, Rui Filipe; Sousa, José Eduardo; Nunes Carreira, João
 E-Redes, Portugal
- 1085** *Load Modelling for Volt-var Optimization Control in Limited Network Visibility – a Case Study in Malaysia*
Lo, Chin Kim (1); Calvin Ku, Shong Ching (2); Abdul Rahim, Azlan (1)
 1: TNB Research Sdn. Bhd., Malaysia; 2: Tenaga Nasional Berhad, Malaysia
- 1090** *Investigation of the Cyber-Resilience of Grid Supporting Control Strategies for Demand Side Management of Electric Vehicles*
Hacker, Immanuel (1); Schmidtke, Florian (2); van der Velde, Dennis (1); Ulbig, Andreas (2)
 1: Fraunhofer FIT, Germany; 2: IAEW at RWTH Aachen, Germany
- 1106** *Fault Calculation Procedure For Adaptive Relay Protection In Distribution Networks With Current Limiters And Electronically-Coupled DERs*
Stefani, Izabela (1); Bekut, Dusko (2); Strezoski, Luka (2)
 1: Schneider Electric, Serbia; 2: Faculty of Technical Science
- 1125** *Automatic System for Evaluation of Lightning Events in Power Grid*
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 1: EGU - HV Laboratory a.s., Czech Republic; 2: CEPS, a.s., Czech Republic
- 1128** *Optimized Low Voltage Power Fuses For Current Requirements In Low Voltage Power Grids*
Büttner, Lukas; Hildmann, Christian; Schlegel, Stephan
 TU Dresden, Germany
- 1134** *E-REDES is Testing a Pioneer SCADA Interconnection for DER [250kW; 1MW]*
Carreira, Pedro; Louro, Miguel; Simão, Tiago; Fortunato, Carlos; Fonseca, Pedro
 E-REDES, Portugal

- 1144** *PMU-Based State Estimation and Fault Analysis in Active Distribution Grids: A Case Study for Kythnos Island, Greece*
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 National Technical University of Athens, Greece, Greece
- 1156** *From blackouts to flexibility: case study from Burkina Faso*
Ursic, Sebastijan (1); Richaud, Luc (2); Cornelis, Marine (3)
 1: INEA d.o.o, Slovenia; 2: Odit-e, France; 3: Next Energy Consumer, Italy
- 1172** *Evaluation and Influences of the Harmonic Earth Fault Currents*
Nikander, Ari
 Tampere University, Finland
- 1173** *Development of Local Autonomous Method for Power Distribution System with Battery Storage System*
Takahashi, Naoyuki; Fukushima, Kentaro; Hatta, Hiroyuki
 Central Research Institute of Electric Power Industry, Japan
- 1180** *5G-Based Fault location, Isolation, and Service Recovery*
Nait Belaid, Mohand Ouamer (1,2); Audebert, Vincent (1); Deneuille, Boris (1); Langar, Rami (2)
 1: EDF SA, France; 2: Gustave Eiffel University, France
- 1181** *Operational Considerations for Substation Security*
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 GE, United Kingdom
- 1185** *A Cyber Threat Model, Impact Analysis and Mitigation to Enhance Cyber Security of Distribution Networks*
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 1: TU Delft, The Netherlands; 2: Siemens AG, Germany; 3: Stedin NV, The Netherlands
- 1189** *Equivalent DC Impedance of a Three-phase Impedance through an Inverter*
Delhay, Quentin (1); Bekemans, Marc (2); De Jaeger, Emmanuel (1)
 1: UCLouvain, Belgium; 2: Thales Alenia Space, Belgium
- 1197** *Interoperability Raises Two Challenges: Cybersecurity & Maintenance*
Salles, Mathieu; Bigeard, Hervé
 Schneider Electric, France
- 1200** *Interconnected Grid Protection Systems – Reference Grid For Testing An Adaptive Protection Scheme*
Lorz, Tobias (1); Jaeger, Johann (1); Lin, Guosong (2); Pletzer, Tobias (3); Jurkat, Florian (3); Erichsen, Gerrit (3); Ohlsen, Meike (3); Selimaj, Antigona (4); Hacker, Immanuel (4); Dahlmanns, Markus (5); Fink, Ina Berenice (5); Wehrle, Klaus (5); Heckel, Jan-Peter (6); Babazadeh, Davood (6); Becker, Christian (6); Schindler, Michael (7); Schlump, Markus (7); Luxenburger, Rainer (8); Fischer, Florian (8); Biller, Michael (8); Dauer, Maximilian (2); Hammer, Thomas (2)
 1: FAU Erlangen-Nuernberg, Germany; 2: Siemens AG; 3: Schleswig-Holstein Netz AG; 4: RWTH-Aachen - IAEW; 5: RWTH-Aachen - COMSYS; 6: TUHH- IEET; 7: LEW-Verteilnetz GmbH; 8: OMICRON electronics GmbH

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- 1201** *Wide Area Protection Scheme for an Active Distribution Network*
Al-Maitah, Khaled (1); Al- Odienat, Abdullah (2)
 1: Electricity Distribution Company (EDCo), Jordan, Hashemite Kingdom of; 2: Mutah University, Jordan
- 1207** *Four Problems for Digital Substations I wish to be solved*
Steinhauser, Fred
 OMICRON electronics, Austria
- 1209** *Fault Analysis of Grid Forming Inverter for Microgrid Application*
Al-Maitah, Khaled (1); Al- Odienat, Abdullah (2)
 1: Electricity Distribution Company (EDCo), Jordan, Hashemite Kingdom of; 2: Mutah University, Jordan
- 1214** *A secure Automation Solution to Provide Flexibility at Low-Level Grid – Middleware Services*
Ebrahimi, Razgar (1); Banaei, Mohsen (1); Peralta Escalante, Juan Jacobo (2); Rodríguez, Manuel Diaz (3); Piotrowski, Krzysztof (4); Gallardo, Jaime Chen (3); Madsen, Henrik (1)
 1: Technical University of Denmark; 2: Centro de Estudios de Materiales y Control de Obra, S.A. (CEMOSA); 3: Softcrits; 4: Innovations for High Performance Microelectronics (IHP)
- 1216** *Architecture of Advanced Distribution Grid Voltage Control Method Utilizing Edge Computing Solution*
Repo, Sami (1); Supponen, Antti (1); Ruuth, Kalle (1); Rosenørn, Kenneth (2); Møller, Michael (3)
 1: Tampere University, Finland; 2: Green power Denmark; 3: RAH A/S
- 1218** *Semi-Distributed Automatic Scheme for Self-Healing Implementation in Distribution System*
Wahyudi, Candra Agus Dwi
 PT PLN (Persero), Indonesia
- 1222** *Challenges and Considerations for the Design and Implementation of a Centralized Protection and Control Solution for MV Networks*
Aleixo, Ana Cristina (1); Dias Jorge, Rui (1); Antunes, Lourenço (1); Gomes, Fernando (1); Barraca, João Paulo (2); Carvalho, Ricardo (2); Antunes, Mário (2); Gomes, Diogo (2); Gouveia, Clara (3); Carrapatoso, António (3); Alves, Everton (3); Gonçalves, Luís (4); Falcão, Francisco (4); Querido, José (4); Pinho, Bruno (4); Pires, Luís (5)
 1: Efacec; 2: Instituto de Telecomunicações; 3: INESC TEC; 4: ARMIS; 5: E-REDES
- 1227** *Software Defined Substation Automation*
Hemmer, Peter; Melenhorst, Edwin
 Locamation, The Netherlands
- 1248** *Implementation Of An Advanced Remote Engineering Platform*
Künnappu, Indrek (1); Voog, Rene (2); Hamdon, Ameen (3)
 1: Elektrilevi OÜ; 2: Enefit Connect OÜ; 3: SUBNET Solutions Inc.
- 1274** *Secondary Wiring Checks by Combining Sawtooth Polarity Detection and Voltage Measurement*
Schmidbauer, Josef (1); Walker, Tim (2)
 1: OMICRON Electronics, Austria; 2: OMICRON Electronics, USA

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- 1276** *Edge Computing for Improving Energy Management in Smart Homes*
Redhu, Surender (1); Kushwaha, Deepali (2); Bremdal, Bernt A. (1,3)
1: Smart Innovation Norway, Norway; 2: Indian Institute of Technology Kanpur; 3: University of Tromsø, Norway
- 1280** *Functional Testing of Virtualized and Centralized Protection Systems*
Starck, Janne (1); Rintamäki, Olli (1); Valtari, Jani (1); Coggan, Robert (2); Pritchard, Christopher (3)
1: ABB, Finland; 2: Energy Queensland, Australia; 3: Omicron, Austria
- 1284** *First Practical Results Of Continuous Grid-Serving Power Control In Low-Voltage Network Via Novel Power Management Concept*
Suriyamoorthy, Ghayathri (1); Korotkiewicz, Kamil (1); Stiegler, Martin (1); Kellendonk, Peter (2); Zander, Wolfgang (3)
1: PSI GridConnect GmbH, Germany; 2: EEBus Initiative e.V., Germany; 3: BET GmbH, Germany
- 1285** *Demonstration On Optimal Voltage Control For Medium Voltage Distribution Network*
Supponen, Antti; Ruuth, Kalle; Repo, Sami
Tampere University, Finland
- 1293** *AI To Detect Anormal Switching Operations*
Achleitner, Georg (1); Schöffner, Werner (2); Plesch, Juergen (2); Huska, Wolfgang (1)
1: Austrian Power Grid AG, Austria; 2: ARTEMES, Austria
- 1296** *Research Line of Cyber Security Maintenance and Management in Operational Technology Environments*
Puente Torruella, Angel (1); Bru Bru, David (1); Zaballos, Agustin (2)
1: iGrid T&D, Spain; 2: La Salle Campus Barcelona - URL
- 1304** *High Impedance Fault Detection for MV Distribution Networks*
Cimadevilla, Roberto; Moreno, Alex
ZIV, Spain
- 1306** *An Edge-Fog Computing Approach For Advanced Distribution Management Systems For The Low-Voltage Network*
Kippke, Matias Ariel; Villalba, Leo Marcelo; Arboleya Arboleya, Pablo
Universidad de Oviedo - Laboratory for Electrical Energy Management Unified Research (LEMUR), Spain
- 1309** *State Estimation Algorithm for Optimal Voltage Control in Medium Voltage Network*
Ruuth, Kalle (1); Supponen, Antti (1); Repo, Sami (1); Mutanen, Antti (2)
1: Tampere University, Finland; 2: Elenia Oy
- 1311** *Protection System Analysis in Microgrids with DSO Static Generation*
Bianco, Gianpatrizio (1); Ceneri, Gianni (1); Ceresoli, Bruno (3); De Berardinis, Ettore (3); Mascolo, Luigi (1); Micillo, Chiara (2)
1: Gridspertise Srl, Italy; 2: e-distribuzione SpA, Italy; 3: CESI SpA, Italy

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- 1318** *Control Architecture and Algorithms for Isolated Microgrids*
Bianco, Gianpatrizio (1); Barbato, Lucio (1); Bruno, Sergio (2); Ceneri, Gianni (1); Iurlaro, Cosimo (2); La Scala, Massimo (2); Mascolo, Luigi (1); Menga, Marco (2); Micillo, Chiara (3); Renna, Francesco (1); Sapienza, Gianluca (1)
 1: Gridspertise Srl, Italy; 2: Politecnico di Bari, Italy; 3: e-distribuzione SpA, Italy
- 1322** *Cloud-Based Management of Grid Automation Devices*
García Zamora, Santitos (1); Hamdon, Ameen (2)
 1: ENEL Distribución Perú; 2: SUBNET Solutions inc., Canada
- 1326** *Centre of Angles based Remedial Action Scheme using Synchrophasor Measurements in SP Transmission Network*
Hussnain, Shafqat; Junaid, Muhammad
 SP Energy Networks, United Kingdom
- 1337** *Three-phase Two-wire Distribution System: Protection schemes in unconventional networks*
da Silva dos Santos, Leonardo Felipe (1); de Lima Oliveira, Aécio (1); Cardoso Junior, Ghendy (1); Marchesan, Gustavo (1); Kraulich, Leyla (1); de Freitas Silveira, Leonardo (1); Spagnolo Martins, Miguel (1); Matias Rêgo, Rogimar (2)
 1: UFSM, Brazil; 2: Grupo Equatorial / CEEE-D
- 1343** *Improvement Of Cable Fault Performance Using A Ground Resistor In Series With An Artificial Neutral*
Neves, Andre; Rosa, Luis; Soares, Jose; Bras, Paulo; Lopes, Paulo; Almeida, Ines; Melo, Hugo; Louro, Miguel
 E-REDES, Portugal
- 1368** *Grid-Forming Control Modelling and Validation for Distribution Systems with Networkable Microgrids*
Sawant, Jay Ramesh; Jain, Rishabh; Pratt, Annabelle
 National Renewable Energy Laboratory, United States of America
- 1369** *Smart Grid Management Units To Increase Resilience And Flexibility*
Hammal, Sami; Alifragis, Vagelis; Mavromatakis, Jason; Livanos, Nikolaos-Antonios
 EMTECH SPACE P.C., Greece
- 1370** *Intermittent Earth Fault Detection in Distribution Network based on the voting classification technique*
Pil Ramli, Suzana (1); Asadi, Arta (2); Pourdaryaei, Alireza (3); Karimi, Mazaher (4)
 1: Universiti Malaya, Malaysia; 2: Islamic Azad University, Iran; 3: University of Shiraz, Iran; 4: University of Vaasa, Finland
- 1373** *Concept and Implementation of a Grid Simulation Framework Utilizing Containerized IEC 61850 Compatible IED*
Chen, Shuo (1); Morris, Jeromie (2); Lu, Zhiyu (1); Heilscher, Gerd (1)
 1: Ulm University of Applied Sciences, Germany; 2: Netze BW GmbH, Germany
- 1374** *Voltage Control In Low-Voltage Distribution Grids Through Flexibility Services*
Petrovic, Nejc; Dobravec, Blaz; Kafol, Ciril
 Elektro Gorenjska, Slovenia

- 1379** *Dependency of Harmonics in the Residual Earth Fault Current – Study of Influencing Factors to Determine Risky Locations*
Frowein, Karla (1); K  chler, Benjamin (2); Schmidt, Uwe (2); Schegner, Peter (1)
 1: Technische Universit  t Dresden, Germany; 2: Zittau/G  rlitz University of Applied Sciences, Germany
- 1382** *Advancing the Capabilities of OpenDSS: A Directional Overcurrent Relay Feature for Modelling Modern Microprocessor Network Protector Operation Modes*
Rocha, Celso (1); Ovalle, Andres (1); Padmanabhan, Aadityaa (1); McGuinness, Sean (2)
 1: Electric Power Research Institute (EPRI), United States of America; 2: EPRI Europe DAC, Ireland
- 1383** *EPRI Distribution Protection Analysis Toolkit*
Ovalle, Andres (1); McGuinness, Sean (2); Padmanabhan, Aadityaa (1); Rocha, Celso (1)
 1: Electric Power Research Institute, United States of America; 2: EPRI Europe DAC, Ireland
- 1384** *Solving Issues Of The Distribution Network Of Harstad (Norway) In Real Time Using Machine Learning-Based Observability To Place Flexibility Orders*
Grosjean, Beno  t (1); Richaud, Luc (1); Pinho da Silva, Nuno (2);   erne, Gregor (3)
 1: Odit-e, France; 2: R&D Nester, Portugal; 3: INEA d.o.o, Slovenia
- 1389** *Low Voltage as the final frontier for Broadband over Power Line*
Berganza, Inigo; Sendin, Alberto; Ayala, Raquel; Gomez, Sebastian
 Iberdrola, Spain
- 1419** *Decentralized Grid Control Using Power Grid State Estimation*
Waffenschmidt, Eberhard; Hotz, Christian; Baum, Sergej; Stadler, Ingo
 TH-K  ln, Germany
- 1474** *Performance Evaluations For The Configuration Of IEC 62351 Cybersecurity Profiles In Energy Telecontrol Scenarios*
Todeschini, Mauro G.; Dondossola, Giovanna
 RSE S.p.A., Italy
- 1479** *Development of Photovoltaic Power Generation Output Estimation Method Using Distribution System Sensor Information*
Nagata, Kentaro; Takahashi, Naoyuki; Uemura, Satoshi
 Central Research Institute of Electric Power Industry, Japan
- 1480** *The Smart Grid Lab in Hesse – Active Maximization of Annual Usage Time of Electrical Grids Using Flexibilities while Ensuring Data Security and Resilience at the same time*
Birkner, Peter (1); Schaldach, Anja (2); Jeromin, Ingo (3); Krontiris, Athanasios (4); Pfeffer, Sophia (5); Neukamp, Till (6)
 1: House of Energy e.V., Germany; 2: House of Energy e.V., Germany; 3: Darmstadt University of Applied Sciences, Germany; 4: Darmstadt University of Applied Sciences, Germany; 5: Darmstadt University of Applied Sciences, Germany; 6: Darmstadt University of Applied Sciences, Germany
- 1495** *Framework For Data Pre-treatment, Clustering, Detection Of Outliers And Critical Operating Points Applied In A Power Utility Voltage Regulator*
Costa, Ricardo (1); Aranda, Jorge (1); Pereira, Paulo (1); Barbosa, Jorge (1); Silva, Eleandro (2); Vianna, Marcelo (3)
 1: University of Vale do Rio dos Sinos - UNISINOS, Brazil; 2: Certaja Energia; 3: CEEE Equatorial

1497 *Fault Detection Sensors – E-REDES Case Study*

Raposo, Davide (1); Romão, José (1); Almeida, Pedro (2); Venseth, Terje (3)

1: E-REDES, Portugal; 2: Sicame Group; 3: Nortroll

1506 *Real Time Digital Simulation and IEC 61850 Standard: Interoperability Test Between OPAL-RT and Typhoon HIL Simulators*

Morais, Adriano (1); Cassol, Jhonathan (1); Sartori, Ângelo Felipe (1); Bernardon, Daniel (1); Lima, Diomar (1); Hokama, Wagner (2); Conceição, Julia Beatriz (2); Marchesan, Tiago (1); Carloto, Filipe (3)

1: Universidade Federal de Santa Maria, Brazil; 2: CPFL Energia; 3: Fox IoT

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Losa, Ilaria (1); Petters, Benjamin Georg (2); Dult, Navreet (2)
1: RSE, Italy; 2: AVACON, Germany
- 107** *Large Scale Detection Of Voltage Level Violations In LV-grids Using Smart Meters*
Kers, Bart (1); Hoek, Marco (2)
1: Stedin, The Netherlands; 2: Technolution, The Netherlands
- 108** *A Risk-Based Approach for Development Planning of Radial Distribution Networks*
Popovic, Zeljko (1); Knezevic, Stanko (2); Radojcic, Dragana (2)
1: University of Novi Sad, Serbia; 2: Schneider Electric, Serbia
- 132** *Statistical Characterization of Residential Power Factor*
Rodríguez-Pajarón, Pablo; Hernández, Araceli
Universidad Politécnica de Madrid, Spain
- 144** *Co-simulation Framework for the Provision of Flexibility Services for Distribution System Operators Using Electric Heating Systems*
Naimi, Yassine; Chesnet, Valentin; Le Pivert, Xavier
CEA, France
- 159** *Enabling Distributed Energy Resources to Participate in Wholesale Energy Market and Provide Flexibility Services*
Wong, Peter K.C. (1); Theunissen, John (2)
1: Eagles Engineering Consultants Pty Ltd, Australia; 2: AusNet Services, Australia
- 161** *Development Of A Model To Optimize The Energy Efficiency Of Residential Building And Their Impact On The Low Voltage Grid*
Dahms, Michael; Sowa, Torsten
amperias GmbH, Germany
- 164** *Planning Tool Of LV Network Of A MicroGrid Using Geographic Information Systems*
Carneiro de Sousa, Humberto (1); Boates, Isaac (2); Nasr, Sarah (1); El Akoum, Ali (1); Lazzerini, Philippe (3); Tan, Victoria (4); Cosperec, Jean Philippe (4)
1: EDF R&D, France; 2: EIFER, Germany; 3: EDF International Division; 4: EDF International Networks, France

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- 174** *Hosting Capacity for Electric Vehicles in Urban Medium Voltage Grids with Different Building Structure and Charging Strategies*
Kreutmayr, Simon (1); Niederle, Simon (2); Steinhart, Christoph J. (3); Gutzmann, Christian (3); Finkel, Michael (1); Witzmann, Rolf (2)
1: Augsburg University of Applied Sciences, Germany; 2: Technical University of Munich; 3: SWM Infrastruktur GmbH & Co. KG
- 192** *Partitioning of Distribution System into Resilient Clustered Microgrids Using Complex Network Approach*
Dwivedi, Divyanshi (1,2); Yemula, Pradeep Kumar (2); Pal, Mayukha (1,3)
1: ABB Ability Innovation Center, Asea Brown Boveri Company, Hyderabad 500084, India; 2: Department of Electrical Engineering, Indian Institute of Technology Hyderabad, Kandi, Sangareddy, Telangana 502285, India; 3: Corresponding Author
- 193** *Causal Network Analysis To Study Evolution Of Distribution System With DER Integration*
Reddy, D. Maneesh (1,2); Dwivedi, Divyanshi (1,3); Yemula, Pradeep Kumar (3); Pal, Mayukha (1,4)
1: ABB Ability Innovation Center, Asea Brown Boveri Company, Hyderabad 500084, India.; 2: Department of Mechanical and Aerospace Engineering, Indian Institute of Technology Hyderabad, Kandi, Sangareddy, Telangana 502285, India.; 3: Department of Electrical Engineering, Indian Institute of Technology Hyderabad, Kandi, Sangareddy, Telangana 502285, India.; 4: Corresponding Author
- 209** *Quasi-Dynamic Line Rating Spatial and Temporal Analysis for Network Planning*
Hadiwidjaja, Stella (1); Michiorri, Andrea (2)
1: National University of Singapore (NUS); 2: MINES Paris - PSL
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Düsdieker, Saskia; Veith, Katrin; Jenau, Frank
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- 251** *Mitigating and Preventing Electricity Distribution Congestion and Constraints Through Energy System Integration: an Integrated Energy System Analysis at DSO level*
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- 255** *Investment Efficiency Assessment On The Electric Grid by Group Of Control*
Kevin, Guilaumé; Bertrand, Lacombe; Pierre, Sevault; Bastien, Lacroix; Odilon, Faivre
Enedis, France
- 272** *Flexibility as a Cost-effective Solution Applied to MV Lines Investment Deferral: Guidelines to Study and Pinpoint Opportunities*
Lucas, Julien; Moiziard, Jerome
Enedis, France
- 291** *QUEST - An Overarching System Control Solution*
Collins, Mark (1); Jajcanin, Milena (2); Bailey, Kieran (3); Stott, Stephen (3); Macharia, Elizabeth (4)
1: Smarter Grid Solutions, United Kingdom; 2: Schneider Electric, Serbia; 3: Electricity North West Ltd., United Kingdom; 4: Fundamentals Ltd., United Kingdom

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- 292** *Technical Benefit Assessment for Network Automation Plans*
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 Enel Grids, Italy
- 295** *Voltage Demand Relationship Modelling for Future Energy Scenarios*
Collins, Mark (1); Rafferty, Mark (1); MacKenzie, Colin (1); Bailey, Kieran (2); Lynch, Maurice (2)
 1: Smarter Grid Solutions, United Kingdom; 2: Electricity North West Ltd., United Kingdom
- 297** *Nested Energy Management System to Improve the Resilience of Remote Interconnected Microgrids*
Mthethwa, Fundiswa
 University of the Witwatersrand, South Africa
- 301** *Non-technical Losses Identification in Distribution Grids: A Hybrid Approach*
Jené-Vinuesa, Marc; Aragüés-Peñalba, Mònica; Sumper, Andreas
 Universitat Politècnica de Catalunya, Spain
- 306** *Six-Sigma Technique to Identify Resilience Events on Electrical Networks*
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 Enel Grids, Italy
- 315** *Correlation Analysis on the Application Potential of Voltage Regulating Distribution Transformers in Medium- and Low-Voltage Grids*
Wintzek, Patrick (1); Zdrallek, Markus (1); Wack, Julia (2); Pizzutto, Franco (2)
 1: University of Wuppertal, Germany; 2: Maschinenfabrik Reinhausen GmbH, Germany
- 327** *Use Of Linky Smart Meter Data To Increase The Assessment Of The Diversity Factor Variations In Real Networks*
Ramos Milis, Guilherme (1,2); Alvarez-Herault, Marie-Cécile (2); Caire, Raphaël (2); Gay, Christophe (1); Gourguechon, Bruno (1)
 1: Enedis, France; 2: Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab, Grenoble, France
- 337** *Possible New Criteria For Designing Of The Interconnected Earthing Systems To Increase The Expected Life Of Buried Components And Limiting The Current Flowing Through The Shields*
D'Orazio, Luigi (1); Cerretti, Alberto (1); Geri, Alberto (2); Gatta, Fabio Massimo (2)
 1: ENEL, Italy; 2: University of Rome "La Sapienza", Italy
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 1: KU Leuven, Belgium; 2: EnergyVille, Belgium; 3: VITO, Belgium
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 1: EVERGI, Vrije Universiteit Brussel, Belgium; 2: EELAB/Lemcko, Universiteit Gent, Belgium

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1: National Grid Electricity Distribution, United Kingdom; 2: Regen
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 1: Ricerca sul Sistema Energetico, Italy; 2: Unareti spa; 3: Politecnico di Milano
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 1: NEXANS, France; 2: EPI, France
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 1: Univ. Grenoble Alpes, CNRS, Grenoble INP*, G2ELab, F-38000 Grenoble, France; 2: CEA-INES, Le Bourget du Lac, France

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 1: Università Padova; 2: Enel grids srl; 3: e-distribuzione spa
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 1: Div. of Civil Engineering and Built Environment, Uppsala University, Sweden; 2: Vattenfall AB
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1: Univ. Lille, Arts et Métiers Institute of Technology, France; 2: Lille Catholic Institut (ICL), FGES, Faculty of Business, Economics, and Sciences , France; 3: Faculty of Management, Economics \& Sciences, Lille Catholic University, France
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 1: Los Alamos National Lab, United States of America; 2: National Renewable Energy Lab, United States of America; 3: National Rural Electric Cooperative Association, United States of America; 4: Sandia National Lab, United States of America
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 1: Forschungsstelle für Energiewirtschaft e.V.; 2: School of Engineering and Design, Technical University of Munich (TUM)
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 1: EDF, United States of America; 2: EDF, Paris Saclay
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 1: E-REDES, Portugal; 2: Banco de Portugal, Portugal
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 1: SINTEF Energy Research, Norway; 2: REN AS, Norway
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 1: Engie Impact, Belgium; 2: World Bank, USA
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 1: Mines Paris – PSL University; 2: ENEDIS
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 1: SINTEF Energy Research, Norway; 2: Elvia, Norway

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 1: FGH GmbH, Germany; 2: N-ERGIE Netz GmbH, Germany
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 1: University Grenoble Alpes, France; 2: NTU; 3: Enedis
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 1: ULB, Belgium; 2: VITO, Belgium
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 1: SINTEF Energy Research, Norway; 2: Statnett SF, Norway; 3: Energy Norway, Norway; 4: The Norwegian Energy Regulatory Authority, Norway; 5: Lede AS, Norway; 6: Elmea AS, Norway; 7: Nettselskapet AS, Norway
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Zhu, Jing; Nacmanson, William J.; Ochoa, Luis F.
The University of Melbourne, Australia

- 957** *Network Planning Under Uncertainty And Risk: Is There An Alternative For Using Voltage Boundaries To Upgrade Low Voltage Distribution Networks?*
Laize, Pierre (1,2); Alvarez-Hérault, Marie-Cecile (1); Caire, Raphael (1); Garry, Aurel (2); Caujolle, Mathieu (2)
 1: Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab, Grenoble, France; 2: EDF R&D, Palaiseau, France
- 959** *Future Of Thermal Plants On Microgrids With High Renewable Share*
Chiodetti, Matthieu (1); Lafont, Thibaut (1); Gevret, Hugo (1); Huet, Clément (2); Mocellin, Pierre (2)
 1: EDF R&D, France; 2: EDF SEI, France
- 961** *Selection of Representative Urban Low-Voltage Grids for Electric Vehicle Integration Studies*
Niederle, Simon (1); Kreutmayr, Simon (2); Steinhart, Christoph J. (3); Gutzmann, Christian (3); Witzmann, Rolf (1); Finkel, Michael (2)
 1: Technical University of Munich, Germany; 2: Augsburg University of Applied Science, Germany; 3: SWM Infrastruktur GmbH & Co. KG, Germany
- 966** *Integration Of Flexibility Solutions In The Multi-year Planning Of Distribution Grids With Large Amounts Of Renewable Energy Sources: Development Of A Decision-support Tool For The DSO*
El makhroubi, Amine (1); Baraffe, Héloïse (1); Morin, Juliette (1); Rainot, Mathieu (2); Chatel, Juliette (2)
 1: EDF R&D, France; 2: Enedis, France
- 967** *Restructured Active Distribution Network Planning Considering Agents' Investment Budget Uncertainty*
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 1: Aalto University, Finland; 2: Sharif University of Technology
- 975** *Digitized Complex Project Management*
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- 976** *A Surrogate Model of Distribution Networks to support Transmission Network Planning*
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Stone, Thomas (1); Bower, Andrew (1); Lindmark, Sebastian (1); Hunter, Laurence (2)
 1: EA Technology, United Kingdom; 2: National Grid, United Kingdom
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Pisano, Giuditta; Pilo, Fabrizio; Ruggeri, Simona
 University of Cagliari, Italy
- 1001** *MVDC Distribution System Application Scenarios and Economic Analysis*
Kim, Hongjoo; Cho, Jintae; Cho, Youngpyo; Ryu, Hosung; Kee, Jiwon; Kim, Juyong
 KEPCO/South Korea, South Korea

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- 1005** *Challenges and Needs for High Power Combined Charging of Ferries and Electric Vehicles – A Norwegian Scenario Case Study*
Mehammer, Eirill Bachmann (1); Lakshmanan, Venkatachalam (1); Klemets, Jonatan Ralf Axel (1); Gjørven, André (2); Torsæter, Bendik Nybakk (1)
1: SINTEF Energy Research, Norway; 2: Mellom AS, Norway
- 1006** *Hierarchical Large-Scale Distribution Grid Simulation Across Multiple Voltage Levels Using Smart Meter Data*
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- 1013** *Impact of Flexibility and User Behaviour on EV Charging Infrastructure Requirements*
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1: PNDC, University of Strathclyde, Scotland; 2: PNDC, University of Strathclyde, Scotland
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1: E-REDES, Portugal; 2: EDP S.A., Portugal
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- 1025** *A New Optimization Method Brings Distribution Grids Performance To The Next Level Thanks To Digital Transformation*
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- 1026** *A Study of Mid to Long-term Distribution Planning Based on PV Installation Forecasting*
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1: Universidad Politécnica de Cataluña, Spain; 2: Estabanell Distribució, Spain
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Swibki, Taheni (1); Ben salem, Ines (1); Kraiem, Youssef (2); El Amraoui, Lilia (1); Abbes, Dhaker (2)
1: Smart Electricity & ICT, SEICT, LR18ES44, National Engineering School of Carthage (ENICarthage), University of Carthage, TUNISIA; 2: Univ. Lille, Arts et Metiers Institute of Technology, Centrale Lille, Junia, ULR 2697 – L2EP, Lille, France

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 1: Maschinenfabrik Reinhausen; 2: Technical University Graz; 3: University of Strathclyde; 4: AIT Austrian Institute of Technology GmbH
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 1: SINTEF Energy Research, Norway; 2: Port of Oslo, Norway
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 1: Luleå University of Technology, Sweden; 2: Vattenfall R&D, Sweden
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 1: AIT Austrian Institute of Technology; 2: Netz Oberösterreich GmbH; 3: KNG Kärnten Netz GmbH; 4: TINETZ Tiroler Netze GmbH
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 1: University of Cyprus, Cyprus; 2: University of Manchester, UK; 3: E-REDES, Portugal; 4: INESC TEC, Portugal
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 1: Enedis, France; 2: EDF R&D, France

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- 1133** *Optimal Scheduling of Energy Storage System in Distribution Grids Using Service Stacking*
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 1: Uppsala University, Sweden; 2: Vattenfall R&D, Sweden; 3: Vattenfall BA Distribution, Sweden
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 1: Lappeenranta-Lahti University of Technology LUT, Finland; 2: Tampere University, Finland
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 Austrian Institute of Technology, Austria
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 Austrian Institute of Technology, Austria
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- 1188** *Forecasting For Electricity Grid Planning: Current Challenges And Future Improvements*
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 1: Duinn, The Netherlands; 2: Endre, Sweden; 3: F4STER, Hungary; 4: Budapest University of Technology and Economics, Hungary; 5: Enexis DSO, The Netherlands; 6: R&D NESTER, Portugal
- 1195** *Assessing Connection Requests and Hosting Capacity in LV Networks without Electrical Models: A Model-Free Future*
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 1: Department of Electrical and Electronic Engineering, The University of Melbourne, Australia; 2: School of Computing and Information Systems, The University of Melbourne, Australia

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 1: Augsburg University of Applied Sciences, Germany; 2: LEW Verteilnetz GmbH
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- 1226** *Local Fault Identification and Location using Collaborative Smart Metering*
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 1: ISPGAYA – Instituto Superior Politécnico Gaya; 2: INESC TEC - Instituto de Engenharia de Sistemas e Computadores; 3: Universidade Federal Fluminense; 4: Universidade Tecnológica Federal do Paraná
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 1: EDP NEW, Portugal; 2: INESC TEC, Portugal; 3: MINES Paris – PSL University, France
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 1: Bayernwerk Netz GmbH; 2: University of Applied Sciences Zittau/Goerlitz; 3: Bayernwerk Netz GmbH; 4: E.cons Energiesystems Consulting GmbH, Germany
- 1241** *Meteorological Benchmark Forecasts for Energy Management Systems*
Spiegel, Michael; Strasser, Thomas
 AIT Austrian Institute of Technology, Austria
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 1: RSE S.p.A., Italy; 2: University of Pisa; 3: Gestione Governativa Navigazione Laghi
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 1: Scottish Power Energy Networks, United Kingdom; 2: Octopus Energy, United Kingdom

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- 1279** *Identification of a Causal Weather-QoS Model for Analysis and Planning of Distribution Networks*
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Enel Grids, Italy
- 1288** *Assessment of the DSO's Maximum Allowable Flexibility Procurement Cost*
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1: Tampere University, Finland; 2: Lappeenranta-Lahti University of Technology LUT
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Richaud, Luc (1); Lucas, Chloé (1); Saincy, Nicolas (2); Richard, Lucas (3); Cornelis, Marine (4)
1: Odit-e, France; 2: Nanoé, Madagascar; 3: Nanoé, France; 4: Next Energy Consumer, Italy
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1: TNEI Services Ltd, United Kingdom; 2: Frazer-Nash Consultancy, United Kingdom; 3: Electricity Northwest Ltd, United Kingdom
- 1303** *Increasing the Resiliency of Distribution Systems with Probabilistic Planning*
Soma, Gian Giuseppe; Celli, Gianni; Pilo, Fabrizio; Pisano, Giuditta
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- 1305** *Enhancing Load Profiles and Network Topology Records using Smart Meter Data*
Urquhart, Andrew (1); Woodruff, Jenny (2); Psarra, Iro (3); Al-Hariri, Nadim (3); Thomson, Murray (1)
1: Loughborough University, United Kingdom; 2: National Grid Electricity Distribution; 3: CGI
- 1329** *Predicting Local Effects of Energy Transition Through Development of a Network Observation Tool*
Vandeburie, Julien; Wehenkel, Thomas; Gerard, Simon
RESA, Belgium
- 1345** *IANOS Project: Integrated Solutions to Decarbonise and Improve the Resilience of Electrical Power and Energy Systems in Geographical Islands*
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1: EDP; 2: EDA; 3: Cleanwatts

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 1: E-REDES, Portugal; 2: Elektro Ljubljana, Slovenia; 3: PG&E, USA; 4: Omicron, Austria; 5: Enedis, France; 6: Nexans, France
- 1363** *Optimal sizing and location of Battery storage system services for Distribution Network in Egypt*
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 1: Ministry of Electricity and Renewable Energy, Egypt; 2: Arab Academy for Science and Technology; 3: Arab Academy for Science and Technology
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 1: Uppsala University, Sweden; 2: Universidad Carlos III de Madrid
- 1380** *Application of Probabilistic Load Flow Methodologies for Capacity Assessment: A South African Case Study*
de Bruyn, Johannes; Dalton, Amaris; Bekker, Bernard
 Stellebosch University, South Africa
- 1391** *Contributions to Energy Management of Single-Phase AC Microgrids Used in Isolated Communities*
Bissiriou, Aziz Oloroun-Shola; Ribeiro, Ricardo L. of A.; Rocha, Thiago de O. A.; de Oliveira, Gabriel P.
 Universidade Federal do Rio Grande do Norte, Brazil
- 1393** *Forward Feedback Effects of Distributed Flexibility Resources on Hosting Capacity Assessment*
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 1: Luleå University of Technology, Sweden; 2: The University of Hong Kong
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 1: CPFL ENERGIA; 2: Luis M. Duarte GSI - Engenharia e Consultoria Ltda; 3: APPITEC; 4: UFPR; 5: Bree
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Böttcher, Luis (1); Schumann, Klemens (1); Ulbig, Andreas (1,2)
 1: IAEW at RWTH Aachen University, Germany; 2: Fraunhofer Center Digital Energy
- 1411** *Assessment of Potential Electrolyzer Locations Regarding Their Impact on Redispatch Demand and Hydrogen Network Operation*
Kisse, Jolando Marius
 University of Kassel, Germany

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- 1413** *Optimal Planning of University Campus Microgrid with High Penetration of Renewable Energy and Storage: UCCS Campus Case Study*
Masaud, Tarek; Michon, David; Nwaulu, Emmanuel
 University of Colorado at Colorado Springs, United States of America
- 1416** *Smart Grid-Evolvability: Towards Technical Debt-Management in Smart Grids*
Schütz, Johann (1); Marx Gómez, Jorge (2)
 1: OFFIS, Germany; 2: Carl von Ossietzky - Universität Oldenburg
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 1: University of Stuttgart, Germany; 2: Netze BW GmbH, Germany
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 1: Politecnico di Milano, Italy; 2: ABB, Italy; 3: St. Mary's Lacor Hospital, Uganda
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McGranaghan, Mark (1); Ravi Sahaya, Treisa (2); Peppanen, Jouni (3); McCormack, Eoin (1)
 1: EPRI Europe, Ireland; 2: University College Dublin, Ireland; 3: EPRI, USA
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Opas, Mikael; Baranauskas, Marius; Rauma, Kalle
 VTT Technical Research Centre of Finland, Finland
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Fürst, Kristoffer; Chen, Peiyuan
 Chalmers University of Technology
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Nygård, Heidi S.; Mørch, Ingrid Maria; Bergland, Olvar
 NMBU, Norway
- 1443** *Enel Grid+: the Advanced Platform for Network Analysis and Planning*
Licasale, Gabriele (1); Scarantino, Raffaele (1); Viapiana, Francesco (1); Vermigli, Andrea (1); Alloni, Massimiliano (2); Bianchi, Pierluigi (2); Ravarino, Giulia (1)
 1: Enel Grids; 2: Enel Grids, Italy
- 1445** *Coordinated Deployment Of Electric Taxi Minibuses To Enhance Solar Photovoltaic Hosting Capacity Of Residential Networks*
Waswa, Lewis; Chihota, Justice Munyaradzi; Bekker, Bernard
 Stellenbosch University
- 1446** *Quantification of the Impact of Load Flexibility on the Planning of MV Distribution Networks*
Esslinger, Peter; Taxeidis, Efstratios; Farhat, Yamshid
 BKW Energie AG, Switzerland

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- 1448** *Three-phase Two-wire Distribution System: Evaluation On Safety Of People On Ground Generated Voltages*
Martins, Miguel (1); Sebastiany, Pedro Henrique (1); Stefanello, Roberta (1); Ramos, Diego (1); Cardoso Jr., Ghendy (1); Rêgo, Rogimar (2)
1: Universidade Federal de Santa Maria, Brazil; 2: Grupo Equatorial / CEEE-D
- 1456** *Effects Of Demand Side Management Programs in Modern Distribution Planning – Challenges and Opportunities*
Montenegro, Davis; O'Connell, Alison; Taylor, Jason
EPRI, United States of America
- 1457** *Measuring the Power Grid Resilience: A Case Study Applied to Brazilian Distribution Companies*
Dutra, Joisa (1); Amaro, Lucas (2); Souza, Rafael (1); Ennes, Henrique (1); Albertin, Camila (2); Gomes, Rafael (2)
1: Fundação Getulio Vargas; 2: Grupo CPFL Energia
- 1461** *Optimal Power Distribution Systems Planning for Short-, Medium-, and long-Term Horizons, Integrating Evolutionary Algorithms and Reference Network Models: Development and Application for Power Distribution Systems of Real Dimensions in Colombia*
García Montoya, Carlos Andrés
EPM / UNAL Colombia, Colombia
- 1462** *Flexibility Market Integration in Electric Distribution System Planning*
Celli, Gianni; Galici, Marco; Pilo, Fabrizio
University of Cagliari, Italy
- 1476** *Optimal Integration of Electric Bus Charging Points Into the Paraguayan Electrical Distribution Network in a Context of New Distributed Energy Resources*
Cáceres Díaz, Juan José; Petit, Marc; Dessante, Philippe
GeePs Laboratoire de Génie Électrique et Électronique de Paris, France
- 1481** *The Impact Of Forecasting Accuracy On The Economic Performance of Flexibility Provision*
Howorth, Gary (1); Kockar, Ivana (1); Tuohy, Paul (1); Flett, Graeme (1); Bingham, John (2)
1: University of Strathclyde, United Kingdom; 2: Engineering Technology Centre Ltd (ETC), United Kingdom
- 1484** *Efficiency Comparison of Programmed SAID in Investments in the Distribution System*
Saldanha, Taric; Boff, Diogo
UNISINOS, Brazil
- 1490** *Challenges and Opportunities for Distributed Renewable Energy Expansion in the Gulf Region – A State of Kuwait Case Study*
Al-Na'ar, Mohammad; Rodrigues, Yuri
Seattle Pacific University, United States of America
- 1491** *Hosting Capacity Portal of All Voltages Levels*
Machado Sales, Renan (1); Sente Fonseca, Daniel (1); Aparecido Pelegrini, Marcelo (1); Travassos Aguiar da Silva, Gustavo (2); Antônio de Souza Brito, José (2)
1: Sinapsis Inovação em Energia, Brazil; 2: Neoenergia S.A.

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- 1493** *Model for Determining the Charging Time of Electric Vehicles in Fast Charging Stations*
Fucks Darui, Caroline Beatriz (1,2); da Rosa Abaide, Alzenira (1); Souza da Cruz, Matheus (1); Knak Neto, Nelson (1); Guterres Lucca, Tiago (1)
1: Universidade Federal de Santa Maria, Brazil; 2: Universidade Regional Integrada do Alto Uruguai e das Missões - URI campus Santo Ângelo, Brazil
- 1501** *Flexible Methodology for Battery Swapping Stations Planning Operation in Support of Distribution Grids*
Oliveira Farias, Hérciles Eduardo; Sepulveda Rangel, Camilo Alberto; Canha, Luciane Neves; Franciscatto, Bernardo Ziquinatti; Klein, Henrique
FEDERAL UNIVERSITY OF SANTA MARIA, Brazil
- 1522** *Feasibility Study of MVDC and LVDC Distribution Networks in a University Campus with Renewable DERs and Charging Stations for EVs*
Conti, Stefania (1); Soma, Gian Giuseppe (2); Filippino, Fabio (3); Pappalardo, Agatino (3)
1: D.I.E.E.I. - University of Catania, Italy; 2: Consorzio Cometa, Italy; 3: A.P.S.E.M.A. - University of Catania

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Slaifstein, Darío; Nicchi, Fernando
Universidad de Buenos Aires, Argentine Republic
- 113** *Incentive Regulation For Lower Losses And More Efficient Use Of The Grid When Random Photovoltaic DG Is Connected In Argentinian LV Networks*
Jurado, Alejandro; Vinson, Edgardo; Nicchi, Fernando
Universidad de Buenos Aires, Argentine Republic
- 117** *Pilot Project where a Battery Energy Storage System is used for Fast Frequency Reserve*
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1: SINTEF Energi AS, Norway; 2: Lede AS, Norway
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1: VTT Technical Research Centre of Finland, Finland; 2: MSc Electronics, Finland; 3: THT Control, Finland; 4: Caruna, Finland
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1: GridQube, Australia; 2: KU Leuven and Energyville, Belgium
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1: VTT Technical Research Centre of Finland, Finland; 2: University of California Berkeley, USA
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1: Aalto University, Finland; 2: Sharif University of Technology; 3: North China Electric Power University; 4: Geologian tutkimuskeskus
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 1: Enexis DSO; 2: Endre; 3: Westnetz DSO; 4: Budapest University of Technology and Economics; 5: Duinn; 6: HM University of Applied Sciences Munich; 7: R&D Nester
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 1: enel grids, Italy; 2: enel grids, Spain; 3: enel grids, Colombia; 4: enel, Italy
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 1: National Grid Electricity Distribution, United Kingdom; 2: Energy Systems Catapult
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 1: EA Technology, United Kingdom; 2: Northern Ireland Electricity Networks, United Kingdom
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 1: E.ON Hungary, Hungary; 2: Budapest University of Technology and Economics, Hungary
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 1: Siemens AG Osterreich, Austria; 2: Siemens AG, Germany; 3: ASCR, Austria; 4: Wiener Netze GmbH, Austria

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 1: Saxion University of Applied Sciences, University of Twente, The Netherlands; 2: University of Twente, the Netherlands
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 1: National Technical University of Athens, Greece; 2: University of Western Macedonia, Greece
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 1: University of Mons, Electrical Power Engineering Unit, Power Systems and Markets Research Group Belgium; 2: University of Mons, Dept of Effective Mathematics, Belgium; 3: ENGIE Laborelec, Belgium; 4: WeSmart, Belgium
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 1: KTH Royal Institute of Technology, Sweden; 2: Vattenfall Eldistribution AB
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 1: Smart Innovation Norway, Norway; 2: ASKO, Norway
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 1: LUT University; 2: EDP NEW

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1: Enedis, France; 2: EDF R&D, France
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1: Flemish Institute for Technological Research (VITO), Belgium; 2: EnergyVille, Belgium

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1: FGH e.V., Germany; 2: RWTH Aachen University, Germany
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1: University of Wuppertal, Germany; 2: Yncoris GmbH & Co. KG, Germany
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1: PNDC - University of Strathclyde, United Kingdom; 2: Energy Systems Catapult, United Kingdom
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1: E-REDES, Portugal; 2: ENEDIS, France
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1: Alliander, Netherlands; 2: Radboud University, Netherlands
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1: E-REDES, Portugal; 2: Assetsman, France; 3: Nexans, France
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1: Elektro Celje, Slovenia; 2: Troia, Slovenia
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1: Federal University of Pernambuco, Brazil; 2: Eldorado Research Institute, Brazil; 3: Paulista Power and Light Company, Brazil
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1: University of Strathclyde, United Kingdom; 2: Engineering Technology Centre Ltd (ETC), United Kingdom
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1: Tampere University, Finland; 2: LUT University, Finland

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 1: Eindhoven University of Technology, The Netherlands; 2: TNO, The Netherlands; 3: Delft University of Technology, The Netherlands
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 1: TNEI, United Kingdom; 2: SSEN, United Kingdom
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 1: Luleå University of Technology, Sweden; 2: The University of Hong Kong
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 1: Daimon Engenharia e Sistemas, Brazil; 2: Enel Brasil, Brazil
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 1: Clausthal University of Technology, Germany; 2: Xi'an Jiaotong University, China

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1: Cleanwatts; 2: LUT University
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