SC A1 ROTATING ELECTRICAL MACHINES

PS1: GENERATION MIX OF THE FUTURE

A1-101 **Is reliance on synchronous machines holding us back from evolving the power grid to facilitate renewables?**
D. VAUGHAN - *AU*

A1-102 **The benefits of implementing Synchronous Compensators in Grids with high penetration of renewables**
H BIELLMANN - *FR*

SC A1 ROTATING ELECTRICAL MACHINES

PS2: ASSET MANAGEMENT OF ELECTRICAL MACHINES

A1-201 **Experimental Study of Vibration Sparking Erosion on Stator Bars**
H. ZHU - *US*, Y. MENG - *CN*

A1-202 **Diagnosis and Prognosis of Wind Turbines using Machine Learning Algorithms on SCADA and Gearbox Vibration Datasets**
F. FREITAS - *BR*

A1-203 **Evaluation of the Behavior of Partial Discharges in Generator Heating and Operating Range Tests**
P. VILHENA - *BR*

A1-204 **Developments in maintenance processes increase operational availability and contribute to the operating efficiency of the hydroelectric plant of Itaipu.**
M. MAURO - *BR*

A1-205 **Partial discharge characterization of stator windings taken from a hydro generator after 50 years of service**
E. EBERG - *NO*

A1-206 **Features of the design and operating modes of the asynchronized turbogenerator T3FSU-320**
M. ROYTGARTS - *RU*

A1-207 **A Study on the Resonance problems and Anti-Vibration Design of Large Vertical Motor-Pump sets**
K.Y. KIM - *KR*, J.Y LEE - *KR*

A1-208 **Motor Maintenance Management for Power Plant Operation Reliability with Work Optimization by On-Line Condition Based Monitoring**
C. SUPHATTANA - *TH*

A1-209 **PD Measurement of Rotating Machine for Condition Monitoring**
SANJAY KUMAR PRASAD - *IN*

A1-210 **Optimization of turbogenerator's core suspension system reconstruction methods for life time extension in the power plant conditions.**
D. KUZNETSOV - *RU*

A1-211 **A study of the drop test to detect damper faults and sensitivity analysis in order to identify the parameters that have an impact on the test results**
K.L. ZAPPELLINI - *FR*

A1-212 **Potential of VLF PD measurements for diagnosis of stator insulation of large hydro generators**
T. BRUEGGER - *CH*

A1-213 Evaluation of High Voltage Isolation Systems - Electrodynamic Meaning of Typically Specified Tests

J. ROCHA - *BR*, M.A.S. MAURO - *BR*, E.C. BORTONI - *BR*, G. GUSMAO - *BR*

SC A1 ROTATING ELECTRICAL MACHINES

PS3: LATEST DEVELOPMENTS

A1-301 Thermal Optimization of a Radially Air-Cooled Rotor for a Pumped Storage Hydro Power Motor Generator, applying advanced 3D Conjugate Heat Transfer Simulations

T. HILDINGER - *BR*

A1-302 Static Eccentricity Fault Detection Method for Electrical Rotating Machines Based on The Magnetic Field Analysis in the Air Gap by Measuring Coils

S. TVORIC - *HR*

A1-303 Magnetic Balancing System for Synchronous Machines – A Full Scale Demonstration of Unbalanced Pull Mitigation

F EVESTEDT - *SE*

A1-304 Technical challenges and solutions for the new Terna's standardized synchronous condensers/flywheel systems

M. REBOLINI - *IT*, L. BUONO - *IT*, G. GEMELLI - *IT*, F. PALONE - *IT*, F.M. PEPE - *IT*, A. VALANT - *IT*, A. OLDRATI - *IT*, M. RACITI - *IT*, M. SCHENONE - *IT*, G. ROVETA - *IT*, A. STIGER - *SE*, L. CALLEGARI - *IT*, L. NEGRI - *IT*

A1-305 How To Choose Electric Drive According IEC 60034-1?

S. MIRCHEVSKI - *MK*, D. VIDANOVSKI - *MK*, M. DIGALOVSKI - *MK*, G. RAFAJLOVSKI - *MK*

A1-306 Considerations on IEEE 1310-2012, Numbers of Start-Stops and Life Time of Stator Windings in Hydro-Generators

T. HILDINGER - *DE*, M. JACOB - *BR*, F. PEREIRA - *BR*, J. F. CORDEIRO - *BR*, T. E. LAMAS - *BR*, C.G. SANTOS - *BR*, T.K. AOKI - *BR*, E.J. FARIA - *BR*

A1-307 CANCELLED - A-High-Accuracy Diagnostic Technology for Layer-Shorted Rotor Coil of Turbine Generators

A1-308 Development of Reliable Stator Coil End Design of Large Turbine Generator

S. MURAMATSU - *JP*

A1-309 Impact of the q-axis sub-transient reactance on the rotor oscillations of a hydro generator

L. ROUCO - *ES*, F. PERÁN - *ES*

A1-310 The Design and Application of New Fast-response, Large-scaled Rotary Condensers in UHV Power Grid

Y. JIN - *CN*, J. ZHANG - *CN*, Z. YU - *CN*, J. HE - *CN*

A1-311 Design, Implementation and Field Application of a New Generation Flexible Excitation System for High-Power Synchronous Generators

J. ZHANG - *CN*

A1-312 Failures of Large Turbo-Generators on Prolonged Site Storage - Case Studies of Indian Power Utility

HIRDESH GUPTA - *IN*

SC A2 POWER TRANSFORMERS AND REACTORS

PS1: TRANSFORMER TECHNOLOGIES TO ENABLE INTEGRATION OF DISTRIBUTED RENEWABLE ENERGY RESOURCES

A2-101 Distributed Energy Resources (DERs): Impact of Reverse Power Flow on Transformer

P. UPADHYAY - *US*, J. KERN - *US*, V. VADLAMANI - *US*

A2-102 Active power control with 400/130 kV transformers. Experience from two recent projects

P NORBERG - *SE*

A2-103 Dynamic thermal behaviour of wind power transformers

T LANERYD - *SE*

A2-104 Solar Farm Transformer Condition Monitoring and Automated Anomaly Detection Using Micro-Synchrophasors

C V SIMMONS - *GB*, M A FEDOSIUK - *GB*, M DEY - *GB*, R BROWN - *GB*, S DUDLEY - *GB*, S W MAHON - *GB*, R HEYWOOD - *GB*

A2-105 Smart dynamic shunt compensation - inductive and capacitive reactive power based on common transformer technology

R. FRITSCHE - *DE*, T. MANTHE - *DE*, M. KUESTERMANN - *DE*, F. TRAUTMANN - *DE*, K. LOPPACH - *DE*, G. PILZ - *DE*

A2-106 Effects of TVR application on various voltage changes caused by reverse power flow, distributed power supply and renewable energy

M. KAKIHARA - *JP*

A2-107 Enhanced cooling of dry-type transformers for wind applications

A. NOGUÉS - *ES*, R. MURILLO - *ES*, J.P. GRACIA - *ES*, P. GONZÁLEZ - *ES*, M. BERROGAIN - *ES*, M. CUESTO - *ES*, J. KERN - *US*

A2-108 Study on key technology and demonstration application of UHV AC controlled shunt reactor

X. WANG - *CN*

A2-109 System for on-line evaluation of power transformer dynamic thermal capability

TIM GRADNIK - *SI*

A2-110 Thermal design aspects of subsea transformers

E. VIRTANEN - *FI*, T. LANERYD - *SE*, H. LENDENMANN - *SE*, H. NORDMAN - *FI*

A2-111 Influence of harsh operation conditions present on offshore platforms to the design of power transformers and shunt reactors

S RAJAMANICKAM - *GB*, S MOSBACHER - *AT*, J FINDEISEN - *DE*

SC A2 POWER TRANSFORMERS AND REACTORS

PS2: ADVANCES IN DIELECTRIC DESIGN AND TESTING

A2-201 Simulations and tests based on dielectric studies to improve the power transformers technical specifications and their performances

M RYADI - *FR*

A2-202 CANCELLED - High Frequency Modelling of Air-Core Dry-Type Reactors

A2-203 Resonant overvoltages inside power transformer windings and the measures improving their ability to withstand high-frequency stresses

V. LARIN - *RU*

A2-204 Electric Field Analysis for Valve-side Lead-out Insulation Structure of UHVDC Converter Transformer

J. ZHENG - *CN*, K.C WEN - *CN*, L.J. KONG - *CN*, X.Y. FENG - *CN*

A2-205 Partial Discharge Localization Algorithm for Power Transformer using UHF Signals

B. W. MIN - *KR*, J. B. LEE - *KR*, K. H. LEE - *KR*, J. S. PARK - *KR*

A2-206 Advances of Dielectric Frequency Response testing for HV OIP bushings

R. ALVAREZ - *AR*

A2-207 Simulation and Measurements of Special Termination Lightning Impulse Test on Power Transformers

D. VIR - *US*, P. RAMASWAMY - *US*, Y. FRADKIN - *US*

A2-208 Verification of Withstand Capability for Very Fast Transients of a 200 MVA, 500 kV GSU-Transformer by Modelling and Testing

A. RABEL - *AT*, J. ZHOU - *AT*

SC A2 POWER TRANSFORMERS AND REACTORS

PS3: IMPROVING RELIABILITY FOR TRANSFORMERS

A2-301 Ten Years of Experience with Natural Ester in 245 kV: Shunt Reactor of Vilhena Substation

R. IGNACIO - *BR*

A2-302 Investigation on the Operating Conditions of MV/LV Transformers and Recommendations to Improve their Reliability

WAHIB CHABANE - *DZ*

A2-303 Continuous improvement of transformer specifications at a large utility

C. RAJOTTE - *CA*, S. PROULX - *CA*

A2-304 Power Transformers using Esters next generation - ready to cope with all grid operation challenges

R. FRITSCHE - *DE*, F. TRAUTMANN - *DE*, S. WITTEMANN - *DE*, J. CHRISTIAN - *DE*, G. ADAMIETZ - *DE*, D. WENGER - *DE*

A2-305 Compatibility tests between solid and liquid materials for reliable transformers

C PERRIER - *FR*

A2-306 Reliability Evaluation of Ester Oil Filled Onload Tap Changers through Critical Tests

R V TALEGAONKAR - *IN*

A2-307 Improving the reliability of key power transformers (GSU for Nuclear Power Plants) through specifications

P HURLET - *FR*

A2-308 GIC Magnetic and Thermal Assessment of a Large Fleet of Power Transformers - A Case Study

R. GIRGIS - *US*, G. BURDEN - *US*, M. BERNESJO - *US*, T. LINDSTEDT - *SE*, D. BONMANN - *DE*, I. GRANT - *US*, G. KOBET - *US*, A. COMMANDER - *US*, S. DAHMAN - *US*, Y. SEHGAL - *US*

A2-309 Health Index and Hierarchizing Scale Methodologies for Prioritizing On-line Monitoring of Power Transformers and Reactors in the Brazilian Transmission Grid

M. ALVES - *BR*

A2-310 Improving transformer reliability through operation, maintenance, repair and asset management for extended life

L. QUEIROZ - *BR*

A2-311 Transformer management by learning from condition, failure and scrapping data collected nation-wide

J. FOROS - *NO*

A2-312 Fleet Asset Management Opportunities Arising From Transient Monitoring of Power Transformers and Shunt Reactors

T. ZUPAN - *HR*

A2-313 Fleet screening of HVDC transformers

E ERMAKOV - *SE*

A2-314 Field experience of small quasi DC bias on power transformers A first classification of low-frequency current pattern and identification of sources

D. ALBERT - *AT*, P. SCHACHINGER - *AT*, H. RENNER - *AT*, P. HAMBERGER - *AT*, F. KLAMMER - *AT*, G. ACHLEITNER - *AT*

A2-315 Rationalization and high precision of transformer lifetime evaluation method

S. MIYAZAKI - *JP*

A2-316 Large Power Autotransformers filled with natural ester – Working parameters from the field and Maintenance notes

L. LOMBINI - *IT*, S. SACCO - *IT*, F. SCATIGGIO - *IT*, C. SERAFINO - *IT*, F.M. PEPE - *IT*, F. FERRARI - *IT*, D. ROGORA - *IT*

A2-317 Experiences in Transformer Onsite Refurbishment

Y. LI - *AU*

A2-318 Application of Conditional Probability assessment to optimise Transformer Design, Operation and Maintenance practices

C. BECKETT - *AU*, J. LAI - *AU*

A2-319 Development and Implementation of Intelligent Condition Monitoring System for Transformers and Reactors

SHALI RAJ - *IN*

A2-320 Increasing Reliability Tertiary Voltage Side of Power Transformer by Installing Relay Protection

S. LAOHANAN - *TH*, S. INRUN - *TH*

A2-321 An innovative solution to assess the Reliability of Transformers by Integrated Transformer Health Monitoring

RAJAG KOMMU - *IN*, R P SATANI - *IN*

A2-322 Advancements in Transformer Site Dryouts

E. TENYENHUIS - *CA*

A2-323 Power Transformer Life Extension Rebuilds

T. O'NEILL - *IE*, J. CARPENTER - *IE*, T. NOONAN - *IE*

SC A3 TRANSMISSION & DISTRIBUTION EQUIPMENT

PS1: FUTURE DEVELOPMENTS OF TRANSMISSION AND DISTRIBUTION EQUIPMENT

A3-101 EDISON: A New Generation DC Circuit Breaker

L. GRABER - *US*, T. DAMLE - *US*, C. XU - *US*, J. WEI - *US*, J. SUN - *US*, M. MEHRABAN - *US*, Z. ZHANG - *US*, M. SAEEDIFARD - *US*, S. GRIJALVA - *US*, J. GOLDMAN - *US*, Q. YANG - *US*, K. SCHODER - *US*, F. PENG - *US*, M. STEURER - *US*, C. PARK - *US*

A3-102 Environmental Performance of Dead-Tank Circuit Circuit Breakers with SF6 and Alternative Gases

V. HERMOSILLO - *US*, E. LARUELLE - *FR*, L. DARLES - *FR*, C. GREGOIRE - *FR*, Y. KIEFFEL - *FR*

A3-103 VARC DC Circuit Breaker – a Versatile Concept for Non-Zero Current Interruption

L ÄNGQUIST - *SE*

A3-104 Innovative T&D Switching Equipment and Development of its Testing Technology

R.P.P SMEETS - *NL*, A.B. HOFSTEE - *NL*, R.M. NIJMAN - *NL*, N.A. BELDA - *NL*, B. BAUM - *NL*

A3-105 Low loss DC circuit breakers and DC GIS equipment

M. KOSAKADA - *JP*

A3-106 First CO2-neutral 145 kV and up to 63 kA Dead Tank Circuit Breakers based on Vacuum Switching and Clean Air Insulation Technology

S. KOSSE - *DE*, TH. HEINZ - *DE*, S. GIERE - *DE*, J. TEICHMANN - *DE*, D. HELBIG - *DE*, C. WEEKS - *US*, T. RAK - *US*

A3-107 Fault current limiters for electrical grids 220 kV on the base of the fast-acting highvoltage explosive commutators

N. NOVIKOV - *RU*

A3-108 Studying the characteristics of non-traditional current and voltage converters for digital substations

A. YABLOKOV - *RU*

A3-109 Power plants Modernization by Smart integrated vacuum generator breaker switchgears

G. URQUIZA - *ES*, K. VENNA - *DE*, H. URBANEK - *DE*, J. ROMÁN - *ES*, F. RADEMACHER - *DE*, I. CÁRCAMO - *ES*

A3-110 Development and Electrical Performance Research of a 12kV C4F7N/CO2 Ring Main Unit

R. ZHANG - *CN*

A3-111 Experience of Capacitive Current Switching of EHV and UHV AC Circuit Breaker in Power System and Test

G. LI - *CN*

A3-112 Basic aspects of switching with series-connected vacuum interrupter units in high-voltage metal-enclosed and live tank arrangements

P. G. NICOLIC - *DE*, T. GOEBELS - *DE*, J. TEICHMANN - *DE*, J. WEISKER - *DE*, R. HUTH - *DE*

A3-113 Interrupting Performance Evaluation of High-Voltage Gas Circuit Breakers Using CFD Simulation and Data Analysis Technique

H. K KIM - *KR*, M. J. HA - *KR*, J. H. PARK - *KR*, K. B. SEO - *KR*, S. Y. WOO - *KR*

A3-114 The First Development of SF6-free 170kV 50kA 60Hz GIS with Fluoronitile (C4F7N) Mixtures

H.E. JUNG - *KR*, J.U. YEUN - *KR*, H.S AHN - *KR*, J. CHOI - *KR*, Y.G. KIM - *KR*, M. PERRET - *FR*, K. BOUSOLTANE - *FR*, J OZIL - *FR*, G PERNAUDAT - *FR*

A3-115 Case Study – Improving Reliability of Circuit Breaker by using Controlled Switching and removing Pre Insertion Resistor (PIR)

JIVESH KHANNA - *IN*

A3-116 Innovative SF6 Free Load Break Switch with Shunt Vacuum Interruption (SVI) Technology

C PREVE - *FR*

A3-117 Return of experience of the SF6-free solution by the use of fluoronitrile gas mixture and progress on coverage of full range of transmission equipment

J OZIL - *FR*

A3-118 C5 fluoroketone based gas mixtures as current interrupting media in high voltage switchgear

P. STOLLER - *CH*

A3-119 Theoretical and Practical Behaviour of Eco-friendly SF6 Alternatives in High Voltage Switchgear

J. MANTILLA - *CH*

SC A3 TRANSMISSION & DISTRIBUTION EQUIPMENT

PS2: LIFETIME MANAGEMENT OF TRANSMISSION & DISTRIBUTION EQUIPMENT

A3-201 CIGRE Reliability Survey on Equipment

H. ITO ON BEHALF OF CIGRE AG A3.01 - *JP*

A3-202 Operational Experience, Field Test and EMT Simulation for EHV Shunt-Reactor Switching

G. BLANCHET - *NO*

A3-203 CANCELLED - Ferroresonance in high voltage inductive voltage and combined transformers: Simulations and Laboratory tests

A3-204 In-service Diagnosis of Grading Capacitor Dielectric Deterioration

P MOORE - *GB*, K WILLIAMS - *GB*

A3-205 Circuit Breaker De-Rating Assessment under High DC Time Constant

Z EMIN - *GB*, T FAIREY - *GB*, M V ESCUDERO - *IE*, J KELLIHER - *IE*

A3-206 Actual use survey and maintenance practice of circuit breakers for frequent switching applications

J. KIDA - *JP*

A3-207 A campaign for the ageing evaluation of station hollow core composite insulators after a number of years of service

M. MARZINOTTO - *IT*, G. CAMPOPIANO - *IT*, G. PELLICCIONE - *IT*, E. MOAL - *DE*, G. ROCCHETTI - *DE*, J. SEIFERT - *DE*

A3-208 Overvoltages research in switching modes of cable and mixed overhead-cable lines, power transformers, shunt reactors and capacitor banks of 110-750 kV and development of a controlled switching device for the above electrical equipment

V. SMEKALOV - *RU*

A3-209 X-ray inspection of operating high-voltage oil-filled circuit breakers

L. DARIAN - *RU*

A3-210 On-line monitoring of paper-oil insulated current transformers

J.M. NOGUEIRAS - *ES*, I. HUERTA - *ES*, I. AYERDI - *ES*, J. MENDIZABAL - *ES*

A3-211 Influence of Contact Heating on Main Circuit Resistance Measurement and Dynamic Contact Resistance Measurement in High Voltage Circuit Breakers

T. CHENG - *CN*

A3-212 Research on Simulation Testing Method of System Level's Strong Electromagnetic Disturbance in Substations

L. CHENG - *CN*

A3-213 Operational Aged Switchgear With The Age Up To 50 Years - Investigations, Testing, Results - Considerations For The Design And Operation Of Old and New Switchgear

T. GRÄF - *DE*, R. SCHILLER - *DE*

A3-214 Investigation of ferroresonance oscillations in the systems with electromagnetic potential transformers by experimental and calculation methods

A. SIVKOV - *RU*

A3-215 Development of 362kV 63kA 60Hz Self-Blast Breaker without additional capacitors to prevent ferro-resonance by improving the SLF performance

J. H. YOON - *KR*, J. K. PARK - *KR*, H. S. AHN - *KR*, J. U. CHOI - *KR*, Y. G. KIM - *KR*

A3-216 Damping Performance of VFTO using Magnetic Rings in 800kV GIS

J. W. KIM - *KR*, J. K KIM - *KR*, K. R KWON - *KR*, J. K SEONG - *KR*, D. J SIM - *KR*

A3-217 Approach & Experience of IoT Based Predictive Maintenance Technologies in Power Distribution Network

HUKUM CHAND SHARMA - *IN*

A3-218 Technical-Economic Study on Spark Gaps Replacement by Surge Arresters on Pole-Mounted MV/LV Transformers

W. CHABANE - *DZ*, F. REBBOUH - *DZ*, S.M. EL AMINE - *DZ*

A3-219 Pollution and Humidity Effects on Air Insulated Switchgear (AIS) of MV/LV Substations

WAHIB CHABANE - *DZ*

A3-220 CANCELLED - The role of Failure Modes, Effects Analyses (FMEA) in the Asset Lifecycle Management process for T&D assets

A3-221 Digital Disconnector and smart sensors: example of integration in the condition base asset management cloud tool

T PEGOURET - *FR*

A3-222 External flashover of a 245kV live tank circuit breaker

D CHUN - *FR*

A3-223 Monitoring of asymmetric short circuit currents at a hydro power plant using electronic fibre optical current transformers

T. HEID - *CH*

A3-224 Accuracy study of a combined low-power instrument transformer in different climatic and pollution conditions

T. HEID - *CH*

A3-225 Development of Light Asset Models based on Data Mining

T MAUFFREY - *FR*

SC A3 TRANSMISSION & DISTRIBUTION EQUIPMENT

PS3: IMPACT OF DISTRIBUTED RENEWABLE GENERATION AND STORAGE ON TRANSMISSION AND DISTRIBUTION EQUIPMENT

A3-301 First 170 kV / 50 kA GIS with Clean Air and Vacuum Interrupter Technology as a Climate-neutral Alternative to SF6

K. KIM - *KR*, S. HEO - *KR*, B. CHOI - *KR*, M. KUSCHEL - *DE*, F. EHRLICH - *DE*, T. RANK - *DE*, K. POHLINK - *DE*

A3-302 Benchmarking the suitability of a Bi-Staple Disc Spring as Novel Ultra-Fast Actuation Principle

H. MENNE - *CH*

A3-303 Performance tests of circuit-breakers for controlled switching

J. KIEFER - *CH*

SC B1 INSULATED CABLES

PS1: CABLES FOR FUTURE POWER SYSTEMS

B1-101 Life-Cycle Experiences for 115kV Underground Pipe-Type Transmission Circuit Cooling System

E.C. BASCOM III - *US*, M. PASHA - *US*, T. ZHAO - *US*

B1-102 Development of a New High-Voltage Dry Type Cable Terminator with Optional Integrated Partial Discharge Monitoring

R. MIDDLETON - *US*, E. EUVRARD - *US*, H. WANG - *US*, D. SONG - *US*, Y. ZHAO - *CN*

B1-103 ALEGrO – Extended type testing of the HVDC XLPE cable system and additional tests for Transient Over Voltages (TOV)

B. MAMPAEY - *BE*

B1-104 Mechanical characterization of smooth welded copper sheaths for high voltage submarine cables

T. KOUTI - *FI*, E. KIVINEN - *FI*, O. OTTE - *IT*, G. POZZATI - *IT*, E. CONSONNI - *IT*, E. MECOZZI - *IT*, S. RISCIFULI - *IT*

B1-105 Extended Thermal Rating Calculations of 400 kV XLPE Cables for Urban Grid Applications based on Artificial Intelligence and Big Data

F.. AINHIRN - *AT*, R. WOSCHITZ - *AT*, A. BOLZER - *AT*, H. SCHORT - *AT*

B1-106 Online prognostic system for cable joints for Industry 4.0

S CHRISTOU - *GB*, P L LEWIN - *GB*, A STAVROU - *CY*

B1-107 Development HV External Gas Pressure Cable Systems Retrofit

J. VAN ROSSUM - *NL*, T. KOLTUNOWICZ - *NL*, A. TSEKMES - *NL*, R. BARTHOLOMEUS - *NL*, B. WEGBRANS - *NL*, J. SMIT - *NL*, R. ZUIJDERDUIN - *NL*

B1-108 Total System Development on Innovative and Large Scaled HVDC Cable System towards Expanded Installation of Large Offshore Wind Farms

K. KOYAMA - *JP*

B1-109 Machine Learning Based Temperature Forecast for Offshore Windfarm Export Cables

S. H. H. KAZMI - *DK*

B1-110 Comprehensive tests of the 1200 m HTS DC cable system for Saint-Petersburg

A. KASHCHEEV - *RU*

B1-111 A Novel Self-healing Intelligent Power Cable Sheathing Material

Y. QIAN - *CN*

B1-112 A Commercial Implementation of an Innovative Superconducting Cable System and Its Future Prospect in Korea

C. H. RYU - *KR*, H. C. SON - *KR*, K. S. LEE - *KR*, J. Y. KOO - *KR*

SC B1 INSULATED CABLES

PS2: RECENT EXPERIENCES WITH EXISTING CABLE SYSTEMS

B1-201 Application of Horizontal Directional Drilling and Other Trenchless Methods to Electric Power Cable Installations

E.C. BASCOM III - *US*, J. WILLIAMS - *US*

B1-202 230 kV Mixed Transmission Line: Submarine, Underground and Overhead

J. LOPES - *BR*

B1-203 Qualifying an extruded 420 kV cable system for installation in a 4 km long blasted tunnel

K. RØNNINGEN - *NO*

B1-204 System Analysis of Fiber Optic Cable Faults in Underground Cable Systems

R. STØLAN - *NO*

B1-205 CANCELLED - Internal Arc in HVDC Cable Termination - Phenomena and Testing

B1-206 Cable design for deep water applications and low losses transmission links: first project experience

M. CHATZIPANOS - *GR*, I. MARGARIS - *GR*, K. TSIREKIS - *GR*, S. KATEMLIADIS - *GR*, D. KOSTOPOULOS - *IT*, A. TROLLI - *IT*, E. CONSONNI - *IT*, D. PARRIS - *IT*

B1-207 Rigorous calculation of external thermal resistance in non-uniform soils

A. I. CHRYSOCHOS - *GR*, D. CHATZIPETROS - *GR*, D. N. KOSSYVAKIS - *GR*, V. L. KANAS - *GR*, K. PAVLOU - *GR*, K. TASTAVRIDIS - *GR*, G. GEORGALLIS - *GR*

B1-208 Evaluation of Degrees of Freedom for the Design of Metallic Screen Grounding Systems of Long HVDC Underground Cable Systems

A. WAGNER - *DE*, C. FREITAG - *DE*, P. TÜNNERHOFF - *DE*, H. KÖHLER - *DE*, M. BENDIG - *DE*

B1-209 Long Horizontal Directional Drill for 220 kV Subsea Cable Installation

T. RALPH - *IE*

B1-210 Statistics, experiences and learnings from failures in power cable systems during pq and type tests, tests after installation and service operation

P. VAN DER WIELEN - *NL*, H. VAN MAANEN - *NL*, E. PULTRUM - *NL*, E. STEENNIS - *NL*

B1-211 Induced voltages issues in relation with long export cables for large offshore wind farms

P CHRISTENSEN - *DK*

B1-212 Lessons learned from joint bay implementation

A. MARTÍN - *ES*, A. MUÑIZ - *ES*, R. COBO - *ES*, G. DENCHE - *ES*

B1-213 Study on Recognition and Location of Partial Discharge in XLPE Cable under Damped AC Voltage

L. ZHANG - *CN*

B1-214 Qualification process of ±400 kV HVDC extruded cable system

X. GU - *CN*

B1-215 3D-FEM modelling of losses in armoured submarine power cables and comparison with measurements

S. STURM - *DE*, A. KÜCHLER - *DE*, J. PAULUS - *DE*, R. STOLAN - *NO*, F. BERGER - *DE*

B1-216 Proposal for a non-destructive protocol for the Verification of Absence of Voltage of Insulated Cable Systems

P. MIREBEAU - *FR*

B1-217 Construction of underground conduits through structures with a depth of more than 25 meters under the canal

P. SRIWAN - *TH*

B1-218 Development of Self-healable Insulator Applicable to High Voltage Pre-molded Joint

D. H. SHIN - *KR*, K. S. KIM - *KR*, H. J. KIM - *KR*, Y.N. KIM - *KR*, S.H. AHN - *KR*, J.W KIM - *KR*, Y.C JUNG - *KR*

B1-219 Development of Wet Type AC 66kV TR-XLPE Insulated Cable

K.S KIM - *KR*, H.J JUNG - *KR*, Y.S YANG - *KR*, J.H NAM - *KR*, S.K LEE - *KR*, G.J NAM - *KR*

B1-220 A Numerical Study on DC Electric Field Distribution in HVDC MI-PPLP Cable Considering Parameters Related to Load Cycle Test

I. K. KWON - *KR*, S. J KIM - *KR*, B. W LEE - *KR*, J. Y KOO - *KR*, C.K. JUNG - *KR*, J.S. HWANG - *KR*

B1-221 Design and Development of Back-to-Back Gas-to-Cable Termination for 420kV Gas Insulated Switchgear

M. MOHANA RAO - *IN*

B1-222 Power Cables insulation & establishing relationship between insulation level selection and aging

ROBIN GIRI - *IN*

B1-223 Damage on the 110 kV cable during measurements on the earthing system

JURE STRMEC - *SI*

SC B1 INSULATED CABLES

PS3: ENVIRONMENTAL CHALLENGES, ASSET MANAGEMENT, AND RESILIENCE OF CABLE SYSTEMS

B1-301 Use of Augmented Reality (AR) for Asset Management of HV Devices and Training of Field Personnel

I. JOVANOVIC - *US*

B1-302 On line monitoring of partial discharge on an underground transmission line

E. INUCENCIO - *BR*

B1-303 Practical experience and challenges for DTS/RTTR systems

S. STUL - *BE*

B1-304 Deep Water 500 kV HVDC Mass Impregnated Cable Interconnection between Montenegro and Italy

L LERVIK - *NO*

B1-305 Dynamic Current Rating - Thermal Transient Response

E. OLSEN - *NO*

B1-306 Reducing the likelihood of power transmission cable failures by increasing the role of quality assurance and quality control

M JEROENSE - *SE*

B1-307 Implementation of an integrated monitoring system for real-time assessment of HV cable links in the Terna's Italian electrical grid

L. GUIZZO - *IT*, E. DI VITO - *IT*, F. ROMANO - *IT*, T. CAIZZI - *IT*, L. GARZELLI - *IT*, L. ZARETTI - *IT*, P. MANOCCHIO - *IT*, G. RICCI - *IT*, A. FRAIOLI - *IT*, F. PALONE - *IT*

B1-308 Failure Analysis and Asset Management of Cable Trifurcating Joints

S TEE - *GB*, M BEBBINGTON - *GB*, D NEILSON - *GB*, M JONES - *GB*, R BRYANS - *GB*, J FOX - *GB*

B1-309 CANCELLED - Towards Integrated Monitoring of the Burial Status of Subsea Cables using Distributed Fiber-Optic Sensing

B1-310 Enhanced Cable Security through Fibre Optic Monitoring

J. CAIRNS - *AU*

B1-311 Automated sheath current monitoring system for cable sheath diagnostics purposes

F. GARNACHO - *ES*, A. BURGOS - *ES*, M.A. SHOKRY - *ES*, A. KHAMLICHI - *ES*, J. VIDAL - *ES*, J. ROVIRA - *ES*

B1-312 Non-Electrical Multi-Sensor Solution for Partial Discharge Detection in HV Cable Accessories

K. VATERRODT - *DE*, R. SCHILLER - *DE*, G. HEIDMANN - *DE*, M. KÖLLING - *DE*, T. MEINL - *DE*, T. ZAMZOW - *DE*, T. GRÄF - *DE*, M. MENGE - *DE*

B1-313 Construction Products Regulation: HVAC and HVDC cable classification criteria and application

G CAPON - *FR*

B1-314 Complete offshore cable condition monitoring and load management using distributed fibre optic sensing

E. ROCHAT - *CH*

SC B2 OVERHEAD LINES

PS1: CONDITION BASED MAINTENANCE FOR INCREASED SUSTAINABILITY

B2-101 Monitoring of a New Transmission Line Design

M. FULK - *US*, T.D. PARRISH - *US*, A.J. PHILLIPS - *US*

B2-102 A structural reliability approach to transmission line engineering – a consistent way to make use of monitoring and inspection data

A. ISTAD LEM - *NO*

B2-103 Development of sensors for real-time monitoring of ice loads on overhead lines

B. E. NYGAARD - *NO*

B2-104 The THOR Hammer Tester – A Step Change in the Management of Wooden Utility Poles

R EYRE-WALKER - *GB*, R BRYANS - *GB*, C DOW - *GB*, B SRISKANTHARAJAH - *AU*

B2-105 An Approach to Determine Temperature Exceedance in Overhead Line Compression Fittings

T. KAVANAGH - *IE*

B2-106 Utilization of environmental factor maps and corrosion rate maps for advanced maintenance of overhead transmission towers

S. OHARA - *JP*

B2-107 CANCELLED - Application of Unmanned Aerial Vehicles (UAVs) for Patrol and Inspection of Overhead Transmission Lines

B2-108 Experimental Study and Mechanism Analysis of Abnormal Fever Composite Insulators in AC 500kV Overhead Line

M. LU - *CN*

B2-109 A Development of Compact Corrosion Detector to Diagnosis of Aged Overhead Conductor

Y.H. KIM - *KR*, G.M. KWON - *KR*, H.S. AN - *KR*

B2-110 Indian Experience of Refurbishment of Tower Foundation located in water bodies

CHAITANYA KUNTE - *IN*

B2-111 Creation of a geographical informational system of thunderstorm activity based on the existing complex of 6-110 kV distribution networks using the overhead lines fault identifying devices

A. KUCHERIAVENKOV - *RU*

B2-112 Practical Procedure to Define the Maintenance Priority of Transmission Line Cables

S. ASTO - *PE*

B2-113 Holistic Regulatory Framework of Resilience for Electrical Facilities against Wildfire

R. SERRANO - *CL*

B2-114 Overhead powerline LiDAR inspection with unmanned aerial vehicles

A. COELHO - *PT*

B2-115 Remote monitoring overhead lines using satellite images

N. PINHO DA SILVA - *PT*

B2-116 Condition Assessment Study of OHTL Steel Towers in Iceland

A. B. JONASSON - *IS*

B2-117 Artificial Intelligence (AI) Augmented Transmission Line Inspection

J. TOTH - *IS*

B2-118 Limits of vibration amplitude measurement based conductor fatigue design

K. SCHILLAI - *CH*

B2-119 Hydrophobicity Classification of Composite Insulators Using Convolutional Neural Networks

C. C. KOKALIS - *GR*, T. T. TASAKOS - *GR*, V. T. KONTARGYRI - *GR*, G. SIOLAS - *GR*, I. F. GONOS - *GR*, C. A. CHRISTODOULOU - *GR*, K. O. PAPAILIOU - *DE*

SC B2 OVERHEAD LINES

PS2: ENHANCING OVERHEAD LINE PERFORMANCE

B2-201 Flexible HTLS-High Temperature Low Sag Conductor

S. UEDA - *BR*

B2-202 Sensitivity Effects of High Temperature Overhead Conductors to Line Rating Variables

A. ABBOUD - *US*, J. GENTLE - *US*, J. COFFEY - *US*, K. PARIKH - *US*

B2-203 Mega High Strength steel core for HTLS conductor on 2nd Scheldt long span crossing of new 380 kV line in the port of Antwerp

J.F. GOFFINET - *BE*

B2-204 Electrical design and testing of composite towers for 420 kV

A. KVAMME BERSTAD - *NO*

B2-205 Optimization of losses in new 400 kV overhead lines

K LENARCZYK - *PL*

B2-206 RTV Coated OHL Insulators in Harsh Desert Environment Optimization of Coating Thickness & Assessment of Sand Blasting Impact

ENG. AHMAD ALTHAGFI - *SA*

B2-207 CANCELLED - Enhancing lightning, environmental and hardware performance of unshielded medium voltage distribution lines in South Africa

B2-208 Field experience and laboratory results on the application of RTV coating on HVDC lines

M. MARZINOTTO - *IT*, J.M. GEORGE - *FR*, G. PIROVANO - *IT*

B2-209 compactLine - Experience with a Pilot installation of an innovative overhead transmission line concept for 400kV

R. SCHLOSSER - *DE*, C. NEUMANN - *DE*, J. DOHR - *DE*, W KIEWITT - *DE*, U. ZIEBOLD - *DE*, F. GOLLETZ - *DE*

B2-210 Overhead Transmission Line Performance with Respect to Grounding Impedance on Alpine Terrain

S. PACK - *AT*, L. SCHWALT - *AT*, J. PLESCH - *AT*

B2-211 Design Validation of HTLS Conductor through a High Temperature Field Test

P. PORTER - *IE*

B2-212 Conception, Construction and Realisation of an innovative OHL Design

S. STEEVENS - *DE*, T. VOGT - *DE*, B. RUSEK - *DE*, K. KLEINEKORTE - *DE*, J.H. NIELSEN - *DK*

B2-213 Development and implementation of digital line-to-cable termination points for connecting 110 kV overhead and cable lines

M. ERMOSHINA - *RU*

B2-214 Advantage Analysis of Composite Insulated Crossarm in Uprating Voltage and Transmission Capacity of Transmission Lines

Y. LI - *CN*, B. QIAN - *CN*, Z. LI - *CN*, Q. WANG - *CN*, Z. LIU - *CN*, N. ZHOU - *CN*, L. ZHANG - *CN*

B2-215 Research on Design of Compact Transmission Line Tower Based on Composite Cross-arm

P. ZHAO - *CN*

B2-216 Transient Overvoltage by pole-to-ground fault on ±500kV 8GW HVDC Double Bi-pole System with Metallic Return Conductor in Korea

G.M. KWON - *KR*, K.Y. SHIN - *KR*, J.A. OH - *KR*, W.J. WOO - *KR*, S.H. SONG - *KR*, S.R. LEE - *KR*, J.Y. YOON - *KR*

B2-217 Experience of Live Line or Zero Shutdown Reconductoring in India

SHACHIDEVI T. K. - *IN*

B2-218 Assessment of performance of insulators through leakage current monitoring under contaminated conditions

J.M. GEORGE - *FR*

B2-219 Development and realization of a complex transmission line management system

BALINT NEMETH - *HU*

B2-220 Research of steel - aluminium plastically compacted conductors for overhead lines (OHL)
V. KURYANOV - *RU*

B2-221 Technical Demands to Improve Today's Composite Insulator Reliability
C. BAER - *CH*

B2-222 Comparing the Corona Performance of AC and DC Overhead Lines in both Indoor and Outdoor Experiments Using novel Techniques
P. BLEULER - *CH*

B2-223 An integral approach to ensuring the integrity of the tower and conductors
NENAD GUBELJAK - *SI*

B2-224 Case of Dynamic Line Rating (DLR) for Overhead Transmission in Context of Tropical Countries Like India
SMRUTI RANJAN MOHAPATRA - *IN*

SC B2 OVERHEAD LINES

PS3: RESOURCES AND DESIGN CONSIDERATIONS

B2-301 CANCELLED - Study of a live line maintenance routine and development of a device and special procedures for increased safety

B2-302 Development of an Overhead Transmission Line Portable Protective Arrester (PPA) for Live Work
A.J. PHILLIPS - *US*, R. FERRARO - *US*, J. KUFFEL - *US*, C.S. ENGELBRECHT - *US*

B2-303 Robotic installation of aircraft warning markers on transmission lines
L. M. DICKIE - *NO*

B2-304 Exposure of workers to electric and magnetic field during maintenance work on double-circuit overhead power lines
MAJA GRBIC - *RS*

B2-305 Audible Noise Management of Newly Reconductored Transmission Lines
J. RANIGA - *AU*, R. URBAN - *AU*, A. LAPTHORN - *AU*, S. HARDIE - *AU*

B2-307 Selecting Equipment for Construction of Overhead Lines Based on CO2 Emissions Calculation
F. GHELICHI - *IR*, M. SAYYAHI - *IR*, M. ABDOLHOSSEINPOUR - *IR*, R. GHORBANI - *IR*

B2-308 UAV (Unmanned Aerial Vehicle) Electromagnetic Fields (EMF) Compatibility and Tests requirements for use in OHL
C. ROZE - *FR*

B2-309 Development of Vertical Separated Tubular Steel Pole for OHL
W. K. LEE - *KR*, S. D MUN - *KR*, K.Y. SHIN - *KR*, J.W. KIM - *KR*, J.S. CHOI - *KR*, C.S. SEO - *KR*

B2-310 Optimal Placement of Anti--Cascading Structures in Overhead Line Design – A Probabilistic Framework
A. HALDAR - *CA*

B2-311 Peruvian Experience on Insulation Design for 500 kV Overhead Transmission Lines at Very High Altitude
A. MARAVI - *PE*

B2-312 New solution for reduction of the ground potential rise around construction of high voltage overhead lines
ROBERT MARUŠA - *SI*

SC B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS

PS1: DESIGN AND TECHNOLOGY

B3-101 Water-Oil Separation Device for Mitigating Environmental and Safety Risks in Substations
J. QUERIDO - *BR*

B3-102 New 420-kV GIS Substation Design in the Norwegian Transmission System – Up-to-date Technology, Design Optimisation and Connection Interface Issues

G. BLANCHET - *NO*

B3-103 Safety Aspects related to Electric Fields in Converter Stations

J HERNANDEZ - *SE*

B3-104 TenneT's giant leap to be able to replace 140 substations within next 10 year, while in service and coming from different lay-outs

A. LATHOUWERS - *NL*, P. JANSEN - *NL*, E. DE MEULEMEESTER - *NL*

B3-105 Arc flash hazard in high voltage substations: incident energy calculation and statistical risk evaluation

A. VALANT - *IT*, L. BUONO - *IT*, F. PALONE - *IT*, F.M. PEPE - *IT*, A. VALANT - *IT*

B3-106 Seismic Design Optimization of Substation Equipment in Japan

S. IWASAKI - *JP*

B3-107 First 145 kV / 40 kA gas-insulated switchgear with climate-neutral insulating gas and vacuum interrupter as an alternative to SF6 - Design, Manufacturing, Qualification and Operational Experience

M. KUSCHEL - *DE*, A. ALBERT - *DE*, F. EHRLICH - *DE*, N. NESHEIM - *NO*, K. POHLINK - *DE*, T. RANK - *DE*, J. SKÅR - *NO*, L. I. STADHEIM - *NO*

B3-108 Flexible integration of phase-shifting transformers in AIS substations - Comparison of approaches

H. KÖRNER - *DE*, C. HECK - *DE*, E. FASTANZ - *DE*, M. WOUTERS - *BE*

B3-109 Design Changes in GIS Substations after experience from i-DE

A. RICONDO - *ES*

B3-110 Operation Scheme of Modular Green Substation with BESS for Transmission and Distribution System

I. LIM - *KR*, T. HAN - *KR*, H.-S AHN - *KR*, J. CHOI - *KR*, Y.G. KIM - *KR*, S.R. OH - *KR*, I.Y. JUN - *KR*, K.S. HAN - *KR*, J.W. KANG - *KR*, T.K. KIM - *KR*, Y.T. YOO - *KR*, G. JANG - *KR*

B3-111 CANCELLED - Optimization of Grid Substation Design by Integrating Sustainability and Innovation

B3-112 Influence of power harmonics on the non-ionizing EMF exposure values in electrical installations

L. ROCHA - *PT*

B3-113 SF6 circuit breakers' monitoring system – development and implementation in Ukrainian power industry

B. STOGNII - *UA*

B3-114 Health and safety partnership approach to improve safety records

V GUIGNARD - *FR*

B3-115 Alternative to SF6: an on-site 145kV GIS pilot project from a TSO perspective

M INVERSIN - *FR*

B3-116 French Offshore Substation - Analysis of the HV equipment design and maintenance

V CHATEL - *FR*

B3-117 Impact assessment of optimization methods for the construction of high voltage air-insulated substations

M. MONTOYA - *CO*

B3-118 Specification, project planning and design of the World's first 420 kV SF6-free GIS substation

N. MAHDIZADEH - *CH*

B3-119 Bus-Node Substations – Lower Lightning Overvoltages and Easier Lightning Protection (Georg Koeppl, Thomas Aschwanden th.aschw@bluewin.ch)

G. KOEPPL - *CH*

B3-120 HVDC gas-insulated systems for compact substation design

U. RIECHERT - *CH*

B3-121 Prototype Installation Test of HVDC GIS for Meshed Offshore Grids

M. GATZSCHE - *CH*

SC B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS

PS2: OPTIMISED SUBSTATION MANAGEMENT

B3-201 Integration of Condition Monitoring into Substation Asset Risk Management

T. MCGRAIL - *US*, S. RHOADS - *US*, J. WHITE - *US*, M. FOSTER - *US*, M. ROWBOTTOM - *GB*, J. BEARDSALL - *GB*, P. BOREHAM - *GB*, I. MITICHE - *GB*

B3-202 Additive Manufacturing of spare parts for Power Equipment

A. PINHEL - *BR*

B3-203 Refurbishment and Replacement of a 132 kV Substation Coupled to Hydroelectric Power Plant with State-of-the-art Technologies with high level of Service Continuity

G. BLANCHET - *NO*

B3-204 Contractors as modern Master Builders: Virtual Design and Construction as an enabler of meaningful experiences to project teams for achieving optimized substation management

A. FOSKULO - *HR*

B3-205 Value Quantification for Digital Substations in HV Transmission Grids

L. ASGARIEH - *DE*, M. FLECKENSTEIN - *DE*, P. SKARBY - *CH*, C. ZEIDLER - *DE*

B3-206 Investigation on the dynamic rating of tubular busbars in substations

K. REICH - *AT*, R. WEISSNAR - *AT*, R. PUFFER - *AT*

B3-207 Evolution of skills and managing competency in high voltage substation engineering design

T. CONDON - *IE*

B3-208 A Novel Evaluation Method for the Integrity of Grounding Grids in High Voltage Substations Based on Magnetic Field Measurements

M. MISRA - *NL*, B. BHUYAN - *NL*, K. VELITSIKAKIS - *NL*, M. GHAFFARIAN NIASAR - *NL*, P. VAESSEN - *NL*

B3-209 Repair cost planning as a reliability factor

Y. ZHILKINA - *RU*

B3-210 Non-intrusive diagnostic methods for AIS & GIS HV equipment

J. TOURIGUINE - *FR*

B3-211 Optimization of Health Indices for Power Assets in Substation Using Machine Learning Method

J. R. JUNG - *KR*, H. D. SEO - *KR*, K. R. HWANG - *KR*, H. R. DO - *KR*, M. G. KWAK - *KR*, S. B. KIM - *KR*

B3-212 Aeolian vibration challenges at Renewable substation

NIHAR RAJ - *IN*

B3-213 Maintenance, Monitoring & Strengthening of Substation Grounding – Experience of GETCO

ASHA AGRAVATT - *IN*

B3-214 CANCELLED - Use of Continuous Leakage Current Monitoring for Improving Substation Insulator Contamination Mitigation

SC B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS

PS3: INTEGRATION OF INTELLIGENCE

B3-301 3D Design/BIM/Digital Twin for Electrical Substation - Exaggerated Expectations, Current Realities, and Future Opportunities

P. SOMBOONYANON - *US*, A.M. STEARNS - *US*, C.-H. CHEN - *CA*

B3-302 Data to Decisions: Future-proof Integration of Substation Intelligence

G. RAJAPPAN - *US*, P. JONES - *US*, D. EROL - *SE*, V. GLINIEWICZ - *SE*, Y. WU - *SE*

B3-303 A fleet of digital substations at Alliander, a blessing after an intense learning curve

M. VAN RIET - *NL*, F. BALDINGER - *NL*

B3-304 FITNESS: Performance Evaluation & Comparison Across Conventional, Non-Conventional, Analog & Digital Substation Measurement Chains

S W A CLARK - *GB*, V S N ARAVA - *GB*, P BALASUBRAMANI - *GB*, P NEWMAN - *GB*, P MOHAPATRA - *GB*, J K MACKENZIE - *GB*, F MACLEOD - *GB*

B3-305 Intelligent IoT-connected transmission equipment in substations

D. HELBIG - *DE*, R. FRITSCHE - *DE*, M. HEINECKE - *DE*, M. KUSCHEL - *DE*, P. SINGH - *DE*

B3-306 Implementation of Artificial Neural Networks in Design of Steel Cap Plates of Substation Support Structures

OMER BURAK YUCEL - *TR*

B3-307 Pre-Qualification Testing of Digital Substations

B. BAUM - *NL*, M. ACHTERKAMP - *NL*, T. HEID - *CH*, M. DUC VO - *CH*, S. MEIER - *CH*, C. ZEHNDER - *CH*, A. VUJANIC - *CH*, M. YANIN - *RU*, D. TESSIER - *US*, A. LATHOUWERS - *NL*

B3-308 Digitalization solutions for substation planning, design, construction, operation and maintenance

M. NAKAHATA - *JP*

B3-309 Innovation Practices of Substation Maintenance Operation Scheme based on VR Visualization

Y. ZHOU - *CN*, B. QIAN - *CN*, Z. LI - *CN*, Q. WANG - *CN*, Z. LIU - *CN*, N. ZHOU - *CN*, L. ZHANG - *CN*

B3-310 Experience with reconstruction of industrial SVC analogue controller

B3-311 Group Specification for Power Transformers Using Edge Computing Technology

T.Y. KIM - *KR*, Y.H. CHANG - *KR*, J.S. KIM - *KR*, S.M. SIM - *KR*, D.H. KIM - *KR*

B3-312 Green and Digital GIS Substation Substation 50 kV Middelharnis II

R TROOST - *FR*

B3-313 Interface of large offshore windturbines into the electrical grid at 66kV voltage level

L. TREIER - *CH*

SC B4 DC SYSTEMS AND POWER ELECTRONICS

PS1: HVDC SYSTEMS AND THEIR APPLICATIONS

B4-101 Brazilian Experience in Switching 800 kV LCC Converter Transformers

R. TENORIO - *BR*

B4-102 Principles for paralleling HVDC-LCC converters: point-to-point transmission, multi-terminal and HVDC grids

P. TOLEDO - *BR*

B4-103 The Measurement of HVDC Ground Electrodes Resistance

P. FREIRE - *BR*

B4-104 Large-capacity multi-infeed HVDC configuration Managing simultaneously scheduled line outages to ensure power system security

P. GOMES - *BR*

B4-105 Simulation and Development of HVDC Control Room with Advanced HMI, Interface Systems, Analytical Tools and Cybersecurity Infrastructure and Monitoring

S.P. ASHOK - *US*

B4-106 Compacting HVDC VSC and LCC Converter Stations for Land Use Minimization

R. ADAPA - *US*, D. WOODFORD - *CA*

B4-107 Towards a deployment plan for a future European offshore grid: development of topologies

O. ANTOINE - *BE*

B4-108 Black-start and system restoration utilizing the NEMO Modular Multilevel Converter – a practical test in the Belgian transmission system

J. RIMEZ - *BE*

B4-109 Commissioning of VSC HVDC converters for STATCOM operation

S. BØDAL - *NO*

B4-110 Open-Source HVDC Control - a High-Level Perspective

K. SHARIFABADI - *NO*

B4-111 European Experiences in HVDC System Reliability and Availability

P. LINDBLAD - *FI*, M. AGUADO - *FR*, M. SCHUDEL - *FR*, R. ROSSETTI - *FR*, A. VAN SCHIJNDEL - *DE*, R. ZHANG - *DE*, K. GEENS - *BE*

B4-112 Challenges of HVDC standardization in external insulation design of converter stations

L AREVALO - *SE*

B4-113 HVDC Lifecycle management – a Reliability & Availability perspective

U ELGQVIST - *SE*

B4-114 Improved VSC HVDC for over head line HVDC transmission

Y HÄFNER - *SE*

B4-115 System studies for the Baihetan-Jiangsu ±800 kV Hybrid UHVDC project

M ANDERSSON - *SE*

B4-116 Planning and implementation of an HVDC link embedded in a low fault level AC system with high penetration of wind generation

K LINDEN - *SE*

B4-117 Levelized Energy Cost Improvement through Concept Selection and Availability Optimization for the Norfolk Windfarms' Export Links

C.A. PLET - *NL*, M. HOFFMANN - *DE*, W. EL-KHATIB - *DK*, A. ALEFRAGKIS - *NL*, M. KURRAT - *DE*

B4-118 Dynamic stability issues of VSC-HVDC systems in AC Transmission Emulation Control: the Piossasco - Grande Ile case

C. PISANI - *IT*, L. MICHI - *IT*, E.M. CARLINI - *IT*, G.M. GIANNUZZI - *IT*, R. ZAOTTINI - *IT*, F. ALLELLA - *IT*, G. BRUNO - *IT*, R. GNUDI - *IT*, A. PASCUCCI - *IT*, G. PECORARO - *IT*

B4-119 Design and functional aspects of a new HVDC link of Crete Island with the mainland Transmission System of Greece

K. LEONTARITIS - *GR*, M. KARYSTIANOS - *GR*, K. TSIREKIS - *GR*, X. SHI - *GR*, D. MICHOS - *GR*, I. MARGARIS - *GR*

B4-120 Multi Terminal Extension of Embedded Point to Point VSC HVDC Schemes

O D ADEUYI - *GB*, M H RAHMAN - *GB*, I COWAN - *GB*, B PONNALAGAN - *GB*, B MARSHALL - *GB*, S MARSHALL - *GB*

B4-121 A new approach to operational type testing of HVDC valves

C C DAVIDSON - *GB*, J A VODDEN - *GB*, J J SNAZELL - *GB*

B4-122 Combined Bridge MMC as efficient solution for HVDC systems with DC fault ride through requirements

S. SEMMLER - *DE*, K. DALLMER-ZERBE - *DE*, D. ERGIN - *DE*, R. ALVAREZ - *DE*

B4-123 Towards a deployment plan for a future European offshore grid: cost-benefit analysis of topologies

J. MOORE - *NL*, J. VAN UDEN - *NL*, O. ANTOINE - *BE*, P. HENNEAUX - *BE*, K. KAROUI - *BE*, F. RUDOLPH - *DE*, H. VENNEGEERTS - *DE*, S. POULLAIN - *FR*, L. DE VRIES - *NL*

B4-124 Demonstration of Multi-terminal DC Grid Integration with an MMC Test Bench

F. LOKU - *DE*, P. RUFFING - *DE*, P. TÜNNERHOFF - *DE*, R. PUFFER - *DE*, J. RIVEST - *CA*, N. STANKOVIC - *CA*, C. BRAYET - *CA*, J. BÉLANGER - *CA*

B4-125 Improving synthetic inertia provision by power electronic interfaced power sources to support future system stability

W. GAWLIK - *AT*, C. ALACS - *AT*, J. MARCHGRABER - *AT*, Y. GUO - *AT*, A. ANTA - *AT*, J. KATHAN - *AT*, B. WEISS - *AT*, K. OBERHAUSER - *AT*, M. LENZ - *AT*, M. FROSCHAUER - *AT*, A. STIMMER - *AT*, M. LEONHARDT - *AT*

B4-126 The Celtic Interconnector – linking the electricity grids of Ireland and France

K. FRENCH - *IE*

B4-127 Functions and Commissioning test of New Hokkaido-Honshu HVDC Link

M. MORI - *JP*

B4-128 Experience in the HVDC equipment development for Vyborg converter complex upgrade at SS 400 Vyborg PJSC FGC UES

E. DAVYDOV - *RU*

B4-129 Method for detecting of faulted section in cable-overhead HVDC line

J. KAPITULA - *RU*

B4-130 Improvement of the oscillatory behaviour of the HVDC link between Spain and France

A. DÍAZ-GARCÍA - *ES*, G. TORRESAN - *ES*, A. CORDÓN - *ES*, L. CORONADO - *ES*, S. SANZ - *ES*, J. PEIRÓ - *ES*, A. HERNÁNDEZ - *ES*, J. PÉREZ - *ES*, F. XAVIER - *FR*, C. CARDOZO - *FR*, S. AKKARI - *FR*

B4-131 Optimization and Simulation for Network Performance of Back to Back VSC-HVDC Systems

L. LIU - *CN*

B4-132 Calculation method for peak short-circuit currents for the security of HVDC grids

A. SACIAK - *DE*, G. BALZER - *DE*, J. HANSON - *DE*

B4-133 System Design and Development of HYOSUNG 200MW BTB VSC-HVDC in a KEPCO System

H.H. YOO - *KR*, N. J. KOO - *KR*, J. C. LEE - *KR*, H.J. JUNG - *KR*, J.H. KIM - *KR*

B4-134 The Method of Components Critical Priority Assessment for HVDC Station Asset Management System

Y. M. KIM - *KR*, H. S. CHAI - *KR*, J. R. JUNG - *KR*, J. W. SHIN - *KR*, T.Y. NAM - *KR*, J.C. KIM - *KR*

B4-135 Seismic Design and Validation of the HVDC Valve Structure

S.M. KIM - *KR*, H.B. PARK - *KR*, Y.J. KIM - *KR*, J.W. KOH - *KR*, K.J. KIM - *KR*

B4-136 Fundamental Frequency Blocking Filters for Champa- Kurukshetra HVDC ±800kV, 6000MW HVDC Parallel Bipole Transmission System – Design Consideration

AAKAN DUGAR - *IN*

B4-137 Assessment of protection strategy options for future DC grids

A BERTINATO - *FR*

B4-138 Technical solutions to predict and mitigate inadvertent interaction of two parallel connected VSC-HVDC schemes feeding an islanded offshore Oil and Gas grid

S DENNETIERE - *FR*

B4-139 A Survey of the Reliability of HVDC Systems throughout World during 2017 – 2018

M.G. BENNETT - *CA*, L. CROWE - *CA*

SC B4 DC SYSTEMS AND POWER ELECTRONICS

PS2: DC AND POWER ELECTRONICS FOR DISTRIBUTION SYSTEMS

B4-201 Engineering Design and Control Method for Hangzhou's Flexible DC Distribution Network

J. LIAN - *CN*

B4-202 A New Method for Distinguishing DC Line Faults in Flexible DC Distribution System

J. YANG - *CN*

B4-203 Development of Multi-Terminal DC link in Distribution Network

C. HAN - *KR*, J. LEE - *KR*, G. JANG - *KR*, D RHO - *KR*, H. LEE - *KR*, S. JUNG - *KR*, J. KIM - *KR*

B4-204 The Flexible Power Link of Western Power Distribution: A Case Study

P. MAIBACH - *CH*

SC B4 DC SYSTEMS AND POWER ELECTRONICS

PS3: FACTS

B4-301 Advantages of M-SSSC Devices over Traditional Series Compensation

B. BOJORQUEZ - *US*, E.S. LOPEZ - *US*, M. LONGORIA - *US*, S. BABAEI - *US*

B4-302 Recent FACTS Applications in Chesf Power Grid: Aspects of Technological Development

M. LIMA - *BR*

B4-303 Phoenix: The World's First Hybrid Synchronous Condenser System

R RIVAS - *SE*

B4-304 Capability and Flexibility of Energy Storage Enhanced STATCOMs in Low Inertia Power Grids

L. BESSEGATO - *SE*

B4-305 CANCELLED - Enabling Traffic Growth in the Channel Tunnel – Overview of the Eurotunnel STATCOM Project

B4-306 Evaluating Modular Voltage Source Converter Based Technology in the GB Transmission System with EMT Studies

T R NUDELL - *GB*, R GUPTA - *GB*, M OSBORNE - *GB*, A HIORNS - *GB*, D STAMATIADIS - *GB*, D SCHWEER - *GB*, J YU - *GB*

B4-307 Development of active filter function for STATCOM

T. TATSUMI - *JP*

B4-308 CANCELLED - Experience of integrating FACTS based modular power flow control equipment into the Australian transmission network

B4-309 NSSS STATCOM – The Optimal Dynamic Reactive Support Solution for a Weak Network

J. HU - *CA*

B4-310 Study and Operational Experiences of STATCOM for Emerging Grid with Renewable Power Network

SANGI JANA - *IN*, KUMAR JEETESH - *IN*

B4-311 Ascutney SVC - Engineering, Testing and Commissioning

J. HU - *CA*

SC B5 PROTECTION AND AUTOMATION

PS1: HUMAN ASPECTS IN PROTECTION, AUTOMATION AND CONTROL SYSTEMS (PACS)

B5-101 Impact of Standardization of PACS on Reducing Human Errors in Engineering and Testing

A.P. APOSTOLOV - *US*

B5-102 Prevention of Human Errors in Transmission Line Protection and Fault Location Functions by Eliminating the Need for Settings

F.V. LOPES - *BR*

B5-103 Challenges and experiences of utilities in Brazil to new procedures and human resources management to reduce PAC systems risks in a new complex digital environment

P. FLORES - *BR*

B5-104 Formal Methods to Power-System Automation

L. LISBOA - *BR*

B5-105 Human Aspects in Protection, Automation and Control Systems (PACS)

S. CAMPOS - *BR*

B5-106 The challenge of tackling human errors in the PACS environment

A. PEREIRA - *BR*

B5-107 Human Errors related to PACS: Experience and Expectations of Elia, the Belgian TSO

C. MOORS - *BE*

B5-108 The central role of human resources in PACS Asset Management

M. PETRINI - *IT*, T. FABIO - *IT*, A. FRAIOLI - *IT*, E. CASALE - *IT*, J.W. WRIGHT - *GB*, P.H. FLORES - *BR*, M. MUNDELL - *NZ*, J.A.G VIOSCA - *ES*

B5-109 Process bus based Busbar Protection – Easier Installation and Life-Cycle Management for the Digital Substation

C TEOH - *GB*, R HUNT - *US*, A ABDULLA - *GB*, G LLOYDS - *GB*

B5-110 Engineering and Validation Support Framework for Power System Automation and Control Applications

J. RESCH - *AT*, B. SCHUIKI - *AT*, S. SCHÖNDORFER - *AT*, C. BRANDAUER - *AT*, G. PANHOLZER - *AT*, F. PRÖSTL ANDRÉN - *AT*, T.I. STRASSER - *AT*

B5-111 Common Errors and Traps in Design, Testing and Commissioning of Protection and Control Schemes

S. BHOLA - *AU*, R. BHARAT - *AU*

B5-112 Human aspects related to IEC 61850 testing: How to believe or don´t believe in testing

J. CARDENAS - *ES*, R. LØKEN - *NO*, J. RODRIGUEZ - *ES*, D. ARRIBAS - *ES*, D. RUIZ - *ES*, F.J. MARTIN - *ES*

B5-113 Benefits derived from the use of Digital Twins of Protection and Control Systems

J. ROMÁN - *ES*, C. HARISPURU - *DE*, D. LOPEZ - *ES*, J. FIGUERA - *ES*, C. RODRÍGUEZ - *ES*

B5-114 How to Improve Human Decisions with a PMU´S Automatic System for the Control of Stability of a HVDC Link in Red Eléctrica de España (REE)

J. MARTÍN - *ES*, M. SANCHEZ - *ES*, J.M. DELGADO - *ES*, J. PÉREZ - *ES*, J. SANCHEZ - *ES*, D. GARCIA - *ES*, L. CORONADO - *ES*, V. POVEDA - *ES*, D. CASTAÑEDA - *ES*, A. CASTAÑON - *ES*, E. LEON - *ES*, J. CARDENAS - *ES*, C. DEARRIBA - *ES*, J. RODRIGUEZ - *ES*

B5-115 The Decision Tree Forest for the Defects and Weak Points of Relay Protection Devices

Y. LIU - *CN*

B5-116 Human Errors in Maintenance and Modification of Protection System in Thailand

B. KONGKAEO - *TH*

B5-117 Human aspects in testing and commissioning of digital substations, based on experiences from real installations

S. MEIER - *CH*

SC B5 PROTECTION AND AUTOMATION

PS2: COMMUNICATIONS NETWORKS IN PROTECTION, AUTOMATION AND CONTROL SYSTEMS (PACS) : EXPERIENCE AND CHALLENGES

B5-201 Model-Based Systems Engineering Views of Software Defined Process Bus Networks

D.K. HOLSTEIN - *US*, I. PATRIOTA DE SIQUEIRA - *BR*

B5-202 Analyzing the Limits of Data Transmission in the Process Bus

P. JUNIOR - *BR*

B5-203 Digitalization at Eletrobras Eletrosul – Challenges on fully digital substation PACS communication network architecture specifications

M. ALEXANDRINO - *BR*

B5-204 Best practices and challenges on designing a LAN communication network for 61850 Digital Substations

M. ZAPELLA - *BR*

B5-205 Test Systems Consideration in the Design of Communications Networks for Digital Substations

A.P. APOSTOLOV - *US*

B5-206 Architecture of Communication Network in Statnett Digital Substation

N. HURZUK - *NO*

B5-207 Experience gained and Recommendations for Implementation of Process Bus in Protection, Automation and Control Systems (PACS)

R. LØKEN - *NO*

B5-208 FITNESS: Live comparison of reliability and availability of different communication and redundancy architectures for digital substations

P MOHAPATRA - *GB*, C POPESCU-CIRSTUCESCU - *GB*, A SHUKLA - *GB*, M WEHINGER - *GB*, A ABDULLA - *GB*, C. MCTAGGART - *GB*, P. NEWMAN - *GB*, P. BALASUBRAMANI - *GB*

B5-209 Development of Advanced Communication Unit for Ring Topology Network and Application to Special Protection Scheme

M. KUWABARA - *JP*

B5-210 Implementation of Overload Protection Relay System based on IEC 61850 for Simplification of communication network

K. NISHIZAWA - *JP*

B5-211 Data segregation and traffic anomaly detection within the transmission substations and the whole power system

E. CASALE - *IT*, M. MATTA - *IT*, M. MACINA - *IT*, P. MIGLIORE - *IT*, G. CECI - *IT*, N. MORELLI - *IT*

B5-212 Experience in organization of communication network PMU data transmission in protection, automation and control systems

D. DUBININ - *RU*

B5-213 IEC 61850 communications monitoring and diagnostics system implementation experience

D. ZHUKOV - *RU*

B5-214 Optimising LAN Architecture For Improved Reliability And Resilience

R. HUGHES - *AU*

B5-215 5G wireless communications for smart grid: a PACS case with network slice

Y. CAO - *CN*

B5-216 Design constraints and choices for the LAN in RTE's R#SPACE system

X. MICHAUT - *FR*

B5-217 Redundancy in the IEC 61850-Based Digital Substation System for KEPCO's 154kV Substations

S. Y. MOON - *KR*, H. G. KANG - *KR*, J. H. PARK - *KR*

B5-218 Engineering and Management of Communication Networks in Powergrid's Full Digital Substations

BARIN DE BHOWMICK - *IN*

B5-219 Assessment of Dynamic and Programmable Network Redundancy Management Method based on Software Defined Network Technology in A Fully Digital Substation

H LI - *GB*, L CHEN - *GB*, Z WU - *GB*, D T DANTAS - *GB*, T CHARTON - *GB*, R ZHANG - *GB*

B5-220 Experience in Communication Network Design for High Performance Requirements in IEC 61850 Process Bus based Substation

PRAVEEN A.N - *IN*

B5-221 Implementation of QOS in the process bus for Digital Substations

N. NELIS - *CL*

B5-222 The 'Protection over MPLS' project - Testing line differential protection and teleprotection over an IP/MPLS communication network

J. CASEIRO - *PT*

B5-223 Pilot Experience of IEC 61850 real-time communication between digital substations enabling new protection and automation concepts in Al-Dhafrah in Transco Power system

P. KREUTZER - *CH*

SC C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS

PS1: POWER SYSTEM RESILIENCE PLANNING

C1-101 Quantifying Extreme Events Impacts Using a Coupled Electricity Economy Model

V. KUMAR - *US*, M.F. VANDEN - *US*, M. WEBSTER - *US*, J. PERLA - *US*, R.B. LAMMERS - *US*

C1-102 Methodology for Defining the Configuration of Transmission Lines in Two Simple Circuits Instead of a Double Circuit – Approach under Electric and Environmental Aspects and Forced Shutdown Susceptibility

M. CURY - *BR*

C1-103 Brazil's Power Transmission Grid Geographic Database Regulation

S. FEITOSA - *BR*

C1-104 Development of a Resilient Master Plan For Dominica

F. SPARAVIER - *BE*

C1-105 Improving reliability and stability of supply industrial customer by grid reinforcement and installation of intra-factory generation

M PRZYGRODZKI - *PL*

C1-106 Multicriterial analyses and selection of the best option for revitalization and development of the southern part of Croatian 400 kV network and connection to the power system of Bosnia and Herzegovina

G. MAJSTROVIC - *HR*

C1-107 Planning Studies for Connection of 500 MW Photovoltaic Power Plant to Oman Grid at Ibri

ENG. HISHAM AL RIYAMI - *OM*

C1-108 OPEX benchmarking exercise amongst GCC Transmission Utilities

ENG. ABDULLAH HASSAN - *ZW*

C1-109 Sizing of the series and shunt compensation of the COA-WOA interconnection and impacts on the maximum transfer capacity

ENG. AL-ASERI - *ZW*

C1-110 Techno-Economic Evaluation of 1500MW Generation Connection to the Main Interconnected Transmission System in Oman

ENG. AL SIYABI - *ZW*

C1-111 A methodology to compute resilience indicators for the Italian Transmission System

E. CIAPESSONI - *IT*, D. CIRIO - *IT*, M. LACAVALLA - *IT*, P. MARCACCI - *IT*, G. PIROVANO - *IT*, A. PITTO - *IT*, F. MARZULLO - *IT*, F. FALORNI - *IT*, F. SCAVO - *IT*, C. VERGINE - *IT*, A. LAZZARINI - *IT*

C1-112 "Elicitation of Structured Expert Judgment to estimate the probability of a major power system unreliability event "

K BELL - *GB*, T BEDFORD - *GB*, A COLSON - *GB*, M BARONS - *GB*, S FRENCH - *GB*

C1-113 Planning for 100% Variable Renewable Energy (VRE) on an Island Power System

P. TUSON - *ZA*, C. KAUFMANN - *ZA*, D. MUSARURWA - *ZA*

C1-114 Development of Resilience Issues and Challenges in the SEERC Region (South East European Regional Council of CIGRE)

K. REICH - *AT*, M. POMPILI - *AT*, K. BAKIC - *AT*, Y. BONDARENKO - *AT*

C1-115 Bulk System Planning Aiming to Improve System Resilience

D. SEKIGUCHI - *JP*

C1-116 North Sea Wind Power Hub – System Configurations, Grid Implementationand Techno-economic Assessment

G. MISYRIS - *DK*

C1-117 Software and hardware complex for making decisions on the impact on power grid equipment, taking into account its technical condition and importance index using modern methods of diagnostics and data processing

A. GUSAROVA - *RU*

C1-118 Economic and social Contribution from Red Electrica Group Investments

R. DE LA FUENTE - *ES*, P. LABRA - *ES*, F. MARTINEZ - *ES*

C1-119 Research on Practical Method for Optimizing Energy Storage Capacity based on Large-Scale Offshore Wind Power

S. U - *CN*, B. ZHOU - *CN*, L. CHEN - *CN*, W. YAO - *CN*

C1-120 Theoretical Analysis and Operational Practice of Pure Renewable Energy Power Supply in Europe and China

J. PI - *CN*

C1-121 Fault Current Limiter Using Series Reactors in Indian Power System

SUBIR SEN - *IN*

C1-122 New Requirements for Grid Codes to Increase Resilience of Power Grids under Severe Natural Disasters

M. MOHAMMADI - *IR*, F. AMANI JONEGHANI - *IR*, M. FOTUHI - *IR*

C1-123 Major flooding resilience of a substation

G. SERNA - *FR*

C1-124 Development of Power Transmission System Interconnections in South-Asian Region

SUBIR SEN - *IN*

C1-125 A coordinated approach to transparency and harmonised criteria for TSOs reporting on power systems in Med-TSO

A. SAINZ - *ES*, J.F. ALONSO - *ES*, A. AMEYOUD - *DZ*, A. BENBELLIL - *DZ*

C1-126 Photovoltaic power plant design for high voltage substation utilities

B. FILIP - *RO*, M. DRAGOMIR - *RO*

C1-127 Mathematical model of power system's dynamic stiffness and used it for resilience planning at increasing renewable power mix

OLEG AGAMALOV - *UA*

C1-128 Reliability Assessment for Integration of Renewable Energy Projects In the National Electric System of Jordan

K. ALWALIDI - *JO*, L. GIUDICI - *IT*

C1-129 Transmission Expansion Planning for System Resilience Using Convex Relaxation

J.J. CHAVEZ - *PE*, E.F. ALVAREZ - *ES*, M.J. RIDER - *BR*

C1-130 Increase resilience through investment in transmission, replacing expansion in distribution

X. OVIEDO - *CL*

SC C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS

PS2: ENERGY SECTOR SYNERGIES FOR DECARBONISING EFFICIENTLY

C1-201 Economic and environmental benefits of electric vehicle smart charging in a large-scale EV integration scenario in France

A TEJEDA - *FR*

C1-202 Integration of Electric Vehicles in a High Penetrated Renewable Energy Market

J. ZHU - *US*, H. LI - *US*, D. BHATNAGAR - *US*, S. DAVIS - *US*, M. KINTNER-MEYER - *US*, N. SAMAAN - *US*, S. SRIDHAR - *US*

C1-203 Power Market Development in the Greater Mekong Sub-region

D.R. OSTOJIC - *US*, L. SEDOGO - *US*, S.R. THORNCRAFT - *AU*, P. WANG - *AU*, J.J. HEDGECOCK - *GB*

C1-204 Advances in probabilistic analyses addressing enhanced electrification of end-uses and the progressive decarbonisation of the generation fleet

T. BAFFA SCIROCCO - *IT*, D. CANEVER - *IT*, B. COVA - *IT*, L. GIORGI - *IT*, F. DEL PEDRO - *IT*, F. GENOESE - *IT*, P. CAPURSO - *IT*, F. VEDOVELLI - *IT*, B. ALUISIO - *IT*

C1-205 A Whole Energy Systems Study - The Glasgow Energy Operator

G S HAWKER - *GB*, G WATSON - *GB*, D MCMILLAN - *GB*, D NEILSON - *GB*

C1-206 Power Systems in the context of district heating and cooling networks as an integrated energy system approach - Regulations and Business Cases within the IEA DHC Annex TS3

T. KNEISKE - *DE*, A.M. KALLERT - *DE*, D. CRONBACH - *DE*, Y.J. YU - *DE*, D. SCHMIDT - *DE*, R.M. JOHANNSEN - *DK*, P. SORKNAES - *DK*, D. MUSCHICK - *AT*, A. IANAKIEV - *GB*, I.L. SVENSSON - *SE*, R.-R. SCHMIDT - *AT*, O. TERREROS - *AT*, E. WIDL - *AT*

C1-207 Dispatch of Multi-Energy Systems with District Heating Network Considering the Renewable Power Generation Uncertainties

Q. GAO - *CN*

C1-208 Optimising Energy Efficiency Business Model in industrial sector for electric utility in Thailand

J. KRIDSANANONT - *TH*

C1-209 Installation and Test Result of Regenerative Braking System in Electrified Railways

S.H PARK - *KR*, J.H. PARK - *KR*, J.J. KIM - *KR*, S.W. LEE - *KR*, D.H. CHOI - *KR*

C1-210 Impact of Decarbonization on Transmission Network Planning and Delivery: comparing the German and Chilean Experiences

J. ARANEDA - *CL*

C1-211 CANCELLED - Hydrogen the key to zero emission in Chilean Electrical Sector

SC C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS

PS3: DISTRIBUTED ENERGY RESOURCES IN TRANSMISSION PLANNING

C1-301 Software Tool for Automation of Transmission Margin Calculation of the Brazilian Interconnected Power System

F. ALVES - *BR*

C1-302 A security constrained planning methodology for HVDC interconnectors and grids

H. ERGUN - *BE*

C1-303 micro vs MEGA grid solutions for the future power system

E HILLBERG - *SE*

C1-304 Technical and Economic Feasibility Analysis of Aegean Island Interconnections to the Mainland Grid

J. KABOURIS - *GR*, S. NANOU - *GR*, M. PAPADOPOULOS - *GR*, S. PAPATHANASSIOU - *GR*, C. PITAS - *GR*

C1-305 Quantifying risk in low voltage network planning using smart meter data and probabilistic modelling

G EDWARDS - *GB*, G MCFADZEAN - *GB*, C HIGGINS - *GB*, M MCFARLANE - *GB*

C1-306 The Impact of Reduced System Inertia on System Planning and HVDC Interconnection

W A BUKHSH - *GB*, M NEDD - *GB*, C MACIVER - *GB*, K R W BELL - *GB*

C1-307 Potentials and systemic aspects for the integration of renewable energies in the North African and Middle East electricity system

U. BACHHIESL - *AT*, R. GAUGL - *AT*

C1-308 The Integrated Planning of Taiwan Transmission System in Coordination with the Development of Renewable Energy

P.-H. HO - *TW*, P. Y. LIU - *TW*

C1-309 Geospatial Analysis Techniques for Transmission System Needs Identification: A Case Study with High Shares of Distributed Energy Resources

P. DALY - *IE*

C1-310 Renewable energy interconnection acceleration scheme

K. YAMAKI - *JP*

C1-311 Secure operation of the Australian National Electricity Market with high levels of wind and solar in 2025

B. O'CONNELL - *AU*, A. PAVER - *AU*, J. YU - *AU*, E. TAYLOR - *AU*, Q. PATTERSON - *AU*, T. VEIJALAINEN - *AU*, R. GANGULI - *AU*, C. DAVIES - *AU*, C. SCHAEFER - *AU*

C1-312 Dimensioning of STATCOM for Grid Code Compliance of Renewable Energy Plants

E. OLEA-OREGI - *ES*, P. EGUIA-LÓPEZ - *ES*, J.C. PÉREZ-CAMPIÓN - *ES*, A. SANCHEZ-RUIZ - *ES*, M. ZUBIAGA-LAZKANO - *ES*

C1-313 A Security Constrained Optimal Power Flow for interconnected Meshed AC and DC Transmission Systems with a high proportion of Offshore Wind Generation

F. RUDOLPH - *DE*, H. VENNEGEERTS - *DE*, A. MOSER - *DE*

C1-314 First Swing Stability and SSR Mitigation in KEPCO Grid by Using TCSC

J.S. YOON - *KR*, H. LATORRE - *SE*, R. MANNERBRO - *SE*

C1-315 Reliability and Capacity Credit Evaluations of Jeju island Power System Including REG Combined with ESS

U.J. OH - *KR*, J.S CHOI - *KR*, J.M CHA - *KR*

C1-316 Whole System Coordination in Network Planning

C HIGGINS - *GB*, S HAY - *GB*, G MCFADZEAN - *GB*, X ZHANG - *GB*

C1-317 CANCELLED - Application of a Security Constrained Transmission Expansion Planning Tool with Energy Storage Systems based in a MILP AC Power Flow Formulation in a Zonal System in Chile

C1-318 Planning of transmission systems in Chile after the regulatory changes introduced in 2016

J. TORO - *CL*

C1-319 Combined Optimal Transmission and Distribution Expansion Planning

D.. ELSASSER - *CH*, A. OUDALOV - *CH*, D. KIRAN - *IN*, S. KARAGIANNOPOULOS - *CH*

C1-320 Technical and Economic Model of Distribution of Energy Resources with Integrated Power Grid Planning

S. GRASSI - *CH*

SC C2 POWER SYSTEM OPERATION AND CONTROL

PS1: CAPABILITIES REQUIRED FOR FUTURE SYSTEM OPERATION

C2-101 Mitigating Inter-Area Oscillations Using Adaptive Wide-Area Damping Controller Based on Measurement-Driven Model: Case Studies on Realistic Grid Models and Actual Events

L. ZHU - *US*, C. ZHANG - *US*, Y. ZHAO - *US*, H. XIAO - *US*, I. ALTARJAMI - *US*, Y. LIU - *US*, E. FARANTATOS - *US*, M. PATEL - *US*, C. PISANI - *IT*, G. GIANNUZZI - *IT*, R. ZAOTTINI - *IT*, L. MICHI - *IT*, E. CARLINI - *IT*

C2-102 Using Content Management to Improve Real Time Operation as Well as Preparing for Artificial Intelligence

A. OLIVEIRA - *BR*

C2-103 Analysis of Underfrequency Load Shedding During Taiwan's 8/15 Blackout Event

Y.-H. CHANG - *TW*, L.-T. TSAI - *TW*, L.-H. LO - *TW*, C.-Y. LEE - *TW*

C2-104 Contributions of the Geospatial Transmission Management System (GGT) to prevent environmental impacts caused by fires on transmission lines

S. FEITOSA - *BR*

C2-105 Using Synchrophasor Technology for Monitoring and Analysing January 11, 2019 North American Eastern Interconnection System Oscillations

I. SINGH - *US*, K. NARENDRA - *US*, B. BHARGAVA - *US*, D. SCHOOLEY - *US*, H. NOSAIR - *US*, T. FRITCH - *US*, S. MURPHY - *US*, C. PARKER - *US*

C2-106 CANCELLED - Using Mobile M-SSSCs to Manage Outage Windows for Major Construction and Maintenance Projects

C2-107 Real-time estimation of frequency stability using a dynamic model tuned based on real events

M. KUIVANIEMI - *FI*, N. MODIG - *SE*, R. ERIKSSON - *SE*

C2-108 Developing practices for power system restoration: The Finnish experience on restoration field-testing and training

A-J. NIKKILÄ - *FI*, A. KUUSELA - *FI*, T. RAUHALA - *FI*, A. PAHKIN - *FI*

C2-109 Reliability of the GCC Interconnector

DR. NASSER AL-SHAHRANI - *ZW*

C2-110 Optimal Placement of Phasor Measurement Units for Full Topological Observability in the Power System of South Eastern Europe

VLADIMIR BECEJAC - *RS*

C2-111 Method and Software Tool for Assessment of Seasonal Step-Up Transformer Optimal Tap Settings

JASNA DRAGOSAVAC - *RS*

C2-112 CANCELLED - Kriegers Flak Combined Grid Solution Commissioning of the master controller and the HVDC system

C2-113 The Assessment of the HVDC Frequency Control Methods in the Nordic Power System

D OBRADOVIC - *SE*

C2-114 Advanced and Rapid Tool in Control Room to Determine the Cause and Location of Events in Transmission Network

I. IVANKOVIC - *HR*, K. ŽUBRINIC-KOSTOVIC - *HR*, A. KEKELJ - *HR*, Z. BUNCEC - *HR*, P. ANDERSSON - *SE*, J.E. LARSSON - *SE*

C2-115 Inter-area oscillations in Continental European power system: events analysis and countermeasures

C. PISANI - *IT*, L. MICHI - *IT*, E.M. CARLINI - *IT*, G. GIANNUZZI - *IT*, R. ZAOTTINI - *IT*, W. SATTINGER - *CH*

C2-116 Application of Wide-Area and Monitoring and Control Techniques for Fast Frequency Control in Power Systems with Low Inertia

Q HONG - *GB*, S NORRIS - *GB*, M SUN - *GB*, O BAGLEYBTER - *GB*, D WILSON - *GB*, B MARSHALL - *GB*, V TERZIJA - *GB*, C BOOTH - *GB*

C2-117 Online Security Assessment and System Optimization for Close to Real-Time Decision Support: Recent Advances and Lessons Learned from a Joint Development Project

A. KUBIS - *DE*, M. ABEL - *DE*, J. HACHENBERGER - *DE*, M. THIELE - *DE*, M. HEINE - *DE*, H. WOITON - *DE*, J. EISELE - *DE*, R. FUCHS - *DE*, T. DONG - *DE*, A. GUMBEL - *DE*, T. RZYMEK - *DE*

C2-118 Enhancing Decision Support Tools in Ireland and Northern Ireland Control Centres to Facilitate Integration of Large Shares of Wind Generation

M. VAL ESCUDERO - *IE*

C2-119 Optimal Transmission Line Switching with Genetic Algorithm to Restrict Short Circuit Current in Istanbul Anatolian Side

E. DOGAN - *TR*, N. YÖRÜKEREN - *TR*

C2-120 Development of “Keystone Japanese Coordinating system for energy balancing”

T. OCHI - *JP*

C2-121 Study for apply Short term local weather forecast nationwide Photo Voltic (PV) solar farm in Jordan – Part I

AHMED ALDOHNI - *JO*

C2-122 Stability Margin Monitoring Systems: Instrument for Grid Transmission Capacity Increase

V. DYACHKOV - *RU*

C2-123 Prospects of application of synchrophasor technology for the development of monitoring and control systems for future power system

D. DUBININ - *RU*

C2-124 Operational manifestation of low system strength conditions - Australian Experience

B. BADRZADEH - *AU*, N. MODI - *AU*, A. HALLEY - *AU*, A. LOUIS - *AU*, A. JALALI - *AU*

C2-125 Evolution and improvements in REE renewable energy forecasting systems

J.J. ABELLÁN-PÉREZ - *ES*, M. GARCÍA-CASADO - *ES*, A. RODRÍGUEZ-APARICIO - *ES*

C2-126 Application of On-Line Dynamic Security Assessment Techniques in SGCC Dispatching System

C. MA - *CN*, C. FENG - *CN*, W. ZHUANG - *CN*, C. HU - *CN*

C2-127 Impact of large scale renewable energy on transient stability of sending end grid of ultra-high voltage DC transmission

Y. CHI - *CN*

C2-128 Research on Strategy Knowledge Base Construction Method for Intelligent Management and Control of Complex Power Grid

M. XIE - *CN*

C2-129 An Operator Assistant System for Fast and Reliable Decision Support based on a Dynamic Digital Mirror

C. BROSINSKY - *DE*, T. SENNEWALD - *DE*, R. KREBS - *DE*, D. WESTERMANN - *DE*

C2-130 New adaptive automata to minimize RES curtailment

O. HARP - *FR*

C2-131 Establishment of Variable Renewable Energy Forecast Center: Challenges for Thailand

C. AMORNVIPAS - *TH*

C2-132 Automatic Abnormal Incident Notification System at EGAT's Northeastern Dispatching Control Center (Alarm Summary)

N. EUA-ANANT - *TH*

C2-133 A Study on the Establishment of the Optimal Management of Fault Current by Voltage in Korea Power System

H.J. SON - *KR*, S.K. KIM - *KR*, H.J. KANG - *KR*, S.W HAN - *KR*

C2-134 Development of Transmission Operation Planning Assessment System (TOPAS)

T. G. KIM - *KR*, H.J. LEE - *KR*, K.H. KIM - *KR*, K.S KIM - *KR*, T.S. KIM - *KR*, J.Y JOO - *KR*

C2-135 Advance voltage control solutions for Romanian power system

C. CONSTANTIN - *RO*

C2-136 Use of Meteorological Radar image to improve Resiliency of Indian grid

ALOK KUMAR - *IN*

C2-137 Real Time Fault Level Monitoring For Network Capacity Management

M KHADDOUMI - *GB*, J OUTRAM - *GB*, R EYRE-WALKER - *GB*, V OUTRAM - *GB*, R BRYANS - *GB*, M BEBBINGTON - *GB*

C2-138 Capacity Building of Indian System Operators in the emerging environment

ADITYA P. DAS - *IN*

C2-139 Synchrophasor Technology Applications in Generating Substations

K. NARENDRA - *CA*

C2-140 A software-in-the-loop testbed platform implementation for new PMU-based wide area control strategies for future system operation

J. NOREÑA - *CO*

C2-141 Dynamic control of embedded HVDC to contribute to transient stability enhancement

J.C. GONZALEZ - *FR*

C2-142 Experience of fast-acting wide area control with geothermal governing to manage separation and island running

B. HEIMISSON - *IS*

C2-143 Use of Dynamic Line Rating System in System Operation and Planning

JANKO KOSMAC - *SI*

SC C2 POWER SYSTEM OPERATION AND CONTROL

PS2: SYSTEM OPERATION INTERFACES: IMPROVING OBSERVABILITY AND CONTROLLABILITY

C2-201 State of the Art Implementation of Linear State Estimator in Control Centers

A. BOSE - *US*, L. ZHANG - *US*, N. NAYAK - *US*, A. FARIS - *US*

C2-202 Egypt-Sudan Electricity Interconnection – Technology Concepts and Operational Experience

M KAMH - *EG*, M ELSISSI - *EG*, A AMIN - *EG*, A ATALLAH - *EG*, M SCHWAN - *DE*, J VERBOOMEN - *DE*, A ELMORSHEDY - *EG*

C2-203 New challenges in the evolving Transmission System Operator and Regional Security Coordinator business

DANNY KLAAR - *NL*, M. NEUBAUER - *DE*, U. ZIMMERMANN - *DE*, J.-F. GAHUNGU - *BE*, J. VAN ROOST - *BE*, J. MØLLER BIRKEBÆK - *DK*, T. KAPETANOVIC - *AT*, R. PAPROCKI - *PL*

C2-204 The role of load and distributed generation in bottom-up power system restoration

C. PISANI - *IT*, L. MICHI - *IT*, E.M. CARLINI - *IT*, G.M. GIANNUZZI - *IT*, R. ZAOTTINI - *IT*, M. SALVETTI - *IT*, D. MACALLI - *IT*

C2-205 TSO-DSO Co-Operation – Control Centre Tools Requirements

J. POLLOCK - *GB*, T. HEARNE - *IE*, J. REILLY - *US*, A. KUBIS - *DE*, H. MORAIS - *PT*, M. OSTERMANN - *DE*, M. POWER - *IE*

C2-206 ESO/DSO coordination for reactive power services from DERs in the UK's Power Potential innovation project: initial trial results

I MARTINEZ SANZ - *GB*, B STOJKOVSKA - *GB*, C GRANT - *GB*, R ANDREWS - *GB*, A AHMADI - *GB*, R SHAW - *GB*

C2-207 TSO / DSO Cooperation and Interactions in Systems with Very High Shares of Renewable Generation

W.H. WELLSSOW - *DE*, M. ZUGCK - *DE*, P. HINKEL - *DE*, M. KRANHOLD - *DE*, A.-K. MARTEN - *DE*, J. VANZETTA - *DE*, F. REYER - *DE*, C. SCHNEIDERS - *DE*, U. SCHREIER - *DE*, S. HILGERS - *DE*, D. KAMENSCHIKOW - *DE*, T. SCHLÜTER - *DE*, D. ENGELBRECHT - *DE*, U. SPANEL - *DE*, C. ROGGATZ - *DE*, T. AUNDRUP - *DE*, M. GOERGEN - *DE*

C2-208 TSO-DSO Cooperation in a System of Systems

G. DE JONG - *NL*, M. LALLEMAND - *BE*

C2-209 Co-ordinated Approach between TSO and DSO for the Utilisation of Voltage Control Resources using Distributed Wind Generation in Ireland

D. CORCORAN - *IE*

C2-210 Transformation of TSO-DSO interface and operation through digitalisation

A HAZI - *GB*, M PLECAS - *GB*, B STOJKOVSKA - *GB*, S CELIK - *GB*, K KARATHANASI - *GB*

C2-211 TSO-DSO data exchange : Integration of new data into RTE operational security analyses process

O ARNAUD - *FR*

C2-212 Numerical simulation and robustness analysis of TSO-DSO collaboration in activation of distributed renewable sources

NERMIN SULJANOVIC - *SI*

SC C2 POWER SYSTEM OPERATION AND CONTROL
SC C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES

PS3: JOINT PS C2 AND C6 SYSTEM OPERATION CHALLENGES WITH INCREASING USE OF DISTRIBUTED ENERGY RESOURCES

C2-C6-301 Demonstrated Capabilities of Flexible Demand Response for Enhancing System Reliability and Flexibility

A. CHUANG - *US*, A. TUOHY - *US*, D. LINDSEY - *US*

C2-C6-302 Brazilian Interconnected Power System - The Use of Wind Power Farm in the Restoration Process

A. GUARINI - *BR*

C2-C6-303 Challenges and Measures to Integrate Renewable Energy Sources, Distributed Energy Resources and Storage Means in the Brazilian Power System

S. CISNEIROS - *BR*

C2-C6-304 Integrating Distributed Energy Resources - A Wholesale Perspective

C. WANG - *US*, Y. CHEN - *US*, J. HARRISON - *US*, J. BLADEN - *US*

C2-C6-305 Coordination of Distributed Resources in the Provision of Essential Reliability Services for Active Power Management

M. RICHWINE - *US*, D. STENCLIK - *US*

C2-C6-306 Battery Energy Storage Systems for frequency grid stability in Senegal

A. NEVE - *BE*

C2-C6-307 Polish – Japanese partnership in the field of on-line Special Protection Scheme as a new solution for power system security

L SZCZEPANIAK - *PL*

C2-C6-308 Advance Dispatching and real time electric load forecasting featuring data mining techniques

C. MARTARELLI - *IT*, L. MICHI - *IT*, G.M. GIANNUZZI - *IT*, L. ORTOLANO - *IT*, E.M. CARLINI - *IT*

C2-C6-309 "Puglia Active Network" project: flexibility from Regional Smart Grid

G. SAPIENZA - *IT*, C. BALDI - *IT*, L. DELLI CARPINI - *IT*, G. DI LEMBO - *IT*, L. D'ORAZIO - *IT*, M. GIOVANNINI - *IT*, L. PIMIPINELLA - *IT*, E. RUGGERI - *IT*

C2-C6-310 Optimal Distribution System Preventive Scheduling for Enhancing Resilience Under Wildfire

N. D. HATZIARGYRIOU - *GR*, D. N. TRAKAS - *GR*

C2-C6-311 Objectives and setup of an aFRR-pilot in the Dutch electricity system

J. FRUNT - *NL*, J. DREWES - *NL*

C2-C6-312 Stability challenges and solutions for reducing inertia: PMU-based measurement and machine-learning forecasting

D H WILSON - *GB*, S NORRIS - *GB*, N AL-ASHWAL - *GB*, P MCNABB - *GB*, P M ASHTON - *GB*, J YU - *GB*

C2-C6-313 Restoration of Power Networks Utilising Distributed Energy Resources

P CHANDLER - *GB*, D AUTY - *GB*, S WATERS - *GB*, N MILLER - *GB*, C FOOTE - *GB*, S HAY - *GB*, D GUTSCHOW - *GB*

C2-C6-314 Methodology for considering underlying, decentralized flexibilities at frequency restoration reserves in Germany

D. LEHMANN - *DE*, L. KALISCH - *DE*, H. VENNEGEERTS - *DE*, A. MOSER - *DE*

C2-C6-315 Centralized and Decentralized Distribution Grid Control: Towards a New Intelligent Architecture

M. GIUNTOLI - *DE*, V. BIAGINI - *DE*, S. SCHMITT - *DE*, P. NOGLIK - *DE*, T. MUEHLPFORDT - *DE*, A. ENGELMANN - *DE*, V. HAGENMEYER - *DE*, A. KOROMPILI - *DE*, A. MONTI - *DE*

C2-C6-316 An advanced method for steady-state security assessment considering dynamic thermal capacities of grid assets

M. SCHRAMMEL - *AT*, I. LUPANDINA - *AT*, W. GAWLIK - *AT*, K. VIERECK - *AT*

C2-C6-317 Development of balancing control and grid stabilization services based on VPP

M. TSUNEMATSU - *JP*

C2-C6-318 Frequency adjustment with integrated control of distributed storage batteries

S. OKA - *JP*

C2-C6-319 Frequency Regulation in an Isolated Grid with a High Penetration of Renewables

H.M. TRÓNDHEIM - *DK*

C2-C6-320 Power System Restoration - Report on a Bottom-Up Restoration Test at the Amprion Transmission Grid

W. H. WELLSSOW - *DE*, D. HENSCHEL - *DE*, J. VANZETTA - *DE*, C. SCHNEIDERS - *DE*, F. REYER - *DE*, M. HEIDEMANN - *DE*, S. HILGERS - *DE*, A. MANNEBACH - *DE*, M. WALTER - *DE*, H. KUHN - *DE*, R. BADER - *DE*, L. REINIG - *LU*, C. HECK - *LU*, S. JACOBS - *LU*, P. HEINEN - *LU*

C2-C6-321 Flexibility and grid services from integrated electricity-hydrogen distributed energy systems

P. MANCARELLA - *AU*, S. RIAZ - *AU*, J. NAUGHTON - *AU*, H. WANG - *AU*

C2-C6-322 Grid Forming Energy Storage System addresses challenges of grids with high penetration of renewables (A case study)

S. CHEREVATSKIY - *AU*, S. SPROUL - *AU*, R. KORTE - *AU*, H. KLINGENBERG - *AU*, A. OUDALOV - *AU*

C2-C6-323 MPP awareness in Automatic Generation Control (AGC) with wind farm participation

K. DOENGES - *ES*, I. EGIDO - *ES*, L. SIGRIST - *ES*, E. LOBATO - *ES*, L. ROUCO - *ES*

C2-C6-324 Multi-self-verification and Multi-self-switching Based Adaptive Synchrophasor Estimator and its Application

Q. XU - *CN*, P. LI - *CN*, Z. YUAN - *CN*, L. YU - *CN*

C2-C6-325 Research on Ubiquitous Power Dispatch and Control Technologies of Renewable Energy Based on Cyber-Physical-Social Systems

H. XU - *CN*

C2-C6-326 Grid control centre extension platform for flexibility aggregation of DER in the EU-project "EU-SysFlex"

S. WENDE-VON BERG - *DE*, B. REQUARDT - *DE*, Z. WANG - *DE*, M. BRAUN - *DE*, S. STOCK - *DE*, L. LÖWER - *DE*, W. ALBERS - *DE*, C. CALPE - *DE*, M. STAUDT - *DE*, J. SCHWEDLER - *DE*

C2-C6-327 Identification and comparison of virtual power plants process models used in Futureflow project

D. ILISIU - *RO*

C2-C6-328 Lift Irrigation Projects for better System Operation under high Renewable Energy penetration

K.B.V. RAMKUMAR - *IN*

C2-C6-329 CANCELLED - System Operation Challenges for Distributed Wind Power Resources in India – A Case Study

C2-C6-330 System Operation Challenges with Large and Distributed Generators

PANKAJBHAI SUTHAR - *IN*

C2-C6-331 Virtual Power Plant – A multi service framework for coordination of centralised flexibilities

R. MARTINS - *PT*

SC C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE

PS1: SUSTAINABLE DEVELOPMENT GOALS (SDGs) OF THE UN

C3-101 Sustainable Development Goals and their importance in the relationship between First Nations and Energy Producer Companies

A. FONSECA - *BR*

C3-102 Building the R&DI business case for Sustainable Development in the Electricity Sector in Brazil

K. GARCIA - *BR*

C3-103 Methodology for the evaluation of a

J. KAYS - *DE*, G. KAENDLER - *DE*, A. CEGLARZ - *DE*, C. SIMIOLI - *DE*, A. BATTAGLINI - *DE*

C3-104 Opportunities and Challenges Related to SDGs in Electric Power Sector: Analysis of Companies in Japan and Worldwide

S. YOKOKAWA - *JP*

C3-105 Terna Envision path for Sustainable Electrical Infrastructure

F. GIARDINA - *IT*, A. GUARNERI - *IT*, A. BURRAI - *IT*, A.M. FIORELLA - *IT*, F. MASSARA - *IT*, M. D'ANGIO' - *IT*, N. VETRANO - *IT*, A. ZOCCALI - *IT*, A. MOTAWI - *IT*

C3-106 Fighting Against Haze via Generation Scheduling with Coal Reduction Constraints: Practice in Shaanxi China

B. WANG - *CN*

C3-107 Research and Empirical Analysis of Sustainability Management System of Power Grid Enterprises

S. QUAN - *CN*

C3-108 Research on the method to tap the potential of electricity substitution based on the digital characteristics of load curve

P. ZHENG - *CN*

SC C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE

PS2: ENVIRONMENTAL IMPACT OF ENERGY TRANSITION

C3-201 An Analysis of the Dye Sensitized Solar Cell

M. AUGUSTIN - *US*

C3-202 Limiting land degradation and carbon footprint when developing new transmission lines

E. T. TORSAETER - *NO*

C3-203 **CANCELLED - Integrating condensed Life Cycle Assessment in asset procurement for efficient sustainable tendering**

C3-204 **Integrating Natural Capital Assessment in the creation of substations Sustainable substation; from dream to reality Case description Substation de Laarberg**

J. DEN HARTOG - *NL*, P. OOSTERHOUT - *NL*, E. GERRITSE - *NL*, H. NOOTER - *NL*, J. VAN DER BEEK - *NL*

C3-205 **Environment, Health and Safety Aspects of Gas-Insulated Electric Power Equipment Containing Non-SF6 Gases and Gas Mixtures**

W. SHEN - *CN*, A. KLOOS - *DE*, J. MIAO - *CN*, Q. YU - *CN*, B. LUTZ - *CN*, F. GOLL - *CN*, A. KALTER - *DE*

C3-206 **The impact of distributed generation intensive development on ecological performance of remote power supply centers**

S. EROSHENKO - *RU*

C3-207 **How ecodesign helps to inform the digital transformation strategy of RTE?**

M. NUNES - *FR*

C3-208 **The environmental impact of the regasification process: case study for the first Floating Storage Regasification Unit (FSRU) project in Thailand**

P. BAIMAI - *TH*

C3-209 **Experience on Electric and Magnetic field induction under 765/400kV power transmission lines**

DHYEY SHAH - *IN*

C3-210 **Environmental impact of energy transition Lessons learned from a first experience on the French adequacy forecast study**

K NUSSBAUM - *FR*

SC C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE

PS3: RELATION OF WILDLIFE AND ELECTRICAL INFRASTRUCTURE

C3-301 **Avian Action Plan, a comprehensive strategy for bird protection**

L. MOIANA - *IT*

C3-302 **Video monitoring to study the behaviour of birds on a marked overhead line and to determine the risk of collision**

N. KUCHER - *DE*, S. ABERLE - *AT*, R. RAAB - *AT*, K. HORENK - *DE*

C3-303 **An overview of bird pest control in electric power transmission in Japan**

M. SHIRAI - *JP*

C3-304 **Development of Eco-friendly Electric Transmission Towers in KEPCO**

S. D. MUN - *KR*, W. K. LEE - *KR*, K.Y. SHIN - *KR*, J.W. KIM - *KR*, J.S. CHOI - *KR*, C.S. SEO - *KR*

C3-305 **Evaluation of monitoring practices related to the impacts of very high-tension power lines on birds in Portugal: Suggestions for improvement**

F. MOREIRA - *PT*

C3-306 **A nature-protection supervision in the construction of infrastructure objects as an example of good practice**

NUŠA VANIC - *SI*

C3-307 **TasNetworks' strategy to mitigate the impact of power lines on threatened birds**

M. FISH - *AU*

SC C4 POWER SYSTEM TECHNICAL PERFORMANCE

PS1: IMPROVING POWER SYSTEM TECHNICAL PERFORMANCE THROUGH THE USE OF ADVANCED METHODS, MODELS AND TOOLS

C4-101 **ADVANCED MODELLING OF COMPLEX NETWORKS TO REDUCE LOSSES**

R BRYANS - *GB*, M JONES - *GB*, M BEBBINGTON - *GB*, W MANTLE - *GB*, C HIGGINS - *GB*

C4-102 Fault Level Monitoring in Distribution Grids

D GHEORGHE - *GB*, B BERRY - *GB*

C4-103 Corona losses reduction of OHL 500 kV of Omsk electric power system based on signal processing of PMU

V. RYABCHENKO - *RU*

C4-104 Online risk assessment of power system transmission lines based on multivariate analysis of lightning and weather data

J. NOREÑA - *CO*

C4-105 Validation of primary frequency control simulation models based on field-tests of production units

E AGNEHOLM - *SE*

C4-106 Inertia Measurement Method to Address Declining System Resilience

B BERRY - *GB*, E HWANG - *GB*, N HOSAKA - *JP*, S MIYAZAKI - *JP*

C4-107 Analysis, Monitoring and Mitigation of Common Mode Oscillations on the Power System of Ireland and Northern Ireland

P. WALL - *IE*

C4-108 Synchronous condenser solution to replace synchronous generators for providing system strength in a large-scaler power system - South Australian experience

B. BADRZADEH - *AU*, F. SPESCHA - *AU*, E. FARAHANI - *AU*, N. MODI - *AU*, J. YU - *AU*, J. BAKER - *AU*, A. VAN EYK - *AU*, D. PERERA - *AU*, F. RAFI - *AU*

C4-109 Comparing the Linear and Square Models for Defining the Power System Frequency Static Response Slope based on Transient Synchrophasor Data

P. KOVALENKO - *RU*

C4-110 Frequency analysis in the Romanian power system under major grid disturbances

L. TOMA - *RO*

C4-111 Modelling of emergency automatics of Georgian power system

G. ARZIANI - *GE*

C4-112 Electromagnetic environment and electromagnetic compatibility study at power substations

R. BORISOV - *RU*

C4-113 Calculations leading to voltage stability and transformer assessment in the presence of geomagnetically induced currents

C.T. GAUNT - *ZA*

C4-114 Monitoring and Modelling of Geomagnetically Induced Currents Across the Australian National Electricity Market

G. HESSE - *AU*, C. ZHANG - *AU*, D. MIKKELSEN - *AU*, R. MARSHALL - *AU*, T. VAN DER WALT - *AU*, A. POWER - *AU*, L. WANG - *AU*, C. ONG - *AU*, C. TAYLOR - *AU*

C4-115 Geomagnetic Disturbances and evaluation of their impacts on Korean Power Systems

J.W. WOO - *KR*, J.H. LEE - *KR*, B.S. JOO - *KR*, K.Y. SHIN - *KR*, J.W. KANG - *KR*, S. KIM - *KR*

C4-116 Evaluation of Inverter Based Resources Transient Stability Performance in Weak Areas in Southwest Power Pool's System Footprint

D. RAMASUBRAMANIAN - *US*, W. WANG - *US*, E. FARANTATOS - *US*, A. GAIKWAD - *US*, D. BOWMAN - *US*, H. SCRIBNER - *US*, J. TANNER - *US*, C. CATHEY - *US*, C. CATES - *US*, J. CASPARY - *US*

C4-117 Full-frequency network equivalent models for inverter-based systems

F. CAMARA - *BR*

C4-118 Test Feeder System and Benchmark Demonstrating Feeder Hosting Capacity and Smart Inverter

T. KHANDELWAL - *US*, A.Y. SABER - *US*, K. KAMEDA - *JP*, J. HASHIMOTO - *JP*

C4-119 Generator fault current injection: Are system operators asking for the right thing?

A. MORTON - *AU*

C4-120 Implementation of Emerging Techniques and Tools for Reliability, Stability and Flexibility of RE Rich Modern Power Grid with Multidimensional Approach – Indian grid context

NILESH M SHETH - *IN*

C4-121 Planning for Resilience in High Renewable Power Systems

N.W. MILLER - *US*

C4-122 The operational risk management of UHVDC transmission system considered external meteorological environment

J. WANG - *CN*, W. ZHUANG - *CN*, Y. WANG - *CN*, X. LI - *CN*, C. FENG - *CN*, S. WANG - *CN*, D. LIU - *CN*

C4-123 Optimal Power Flow based security and risk considering voltage stability and overload

R. GARCIA - *CO*

C4-124 Load Validation and Forecasting on Systems with DER

M. MONDELLO - *US*, M. LIETHEN - *US*, M. MAHOOR - *US*

C4-125 ICT-tool for assessment of the performance and stability of frequency containment reserves in the Nordic synchronous area

H EKESTAM - *SE*

C4-126 CANCELLED - Holistic Approach to Modelling and Tuning of a Wind Farm in Conjunction with a Synchronous Condenser in a Low System Strength Grid

C4-127 Power system analysis tools for renewable generation connections

N. PAHALAWATHTHA - *AU*, Y. DONG - *AU*, A. JAYAWARDENA - *AU*, Y. LI - *AU*

C4-128 Stability Analysis of Grid-Connected Voltage Source Converters

J.C. PÉREZ-CAMPIÓN - *ES*, S. CEBALLOS - *ES*, A. GIL DE MURO - *ES*, S. D'ARCO - *NO*, I. AZPIRI - *ES*

C4-129 Design and Application of State-of-the-art Synchronous Condensers to Facilitate the Energy Transition

K. CHAN - *CH*

SC C4 POWER SYSTEM TECHNICAL PERFORMANCE

PS2: MODELLING OF THE FUTURE GRID BASED ON LESSONS LEARNED FROM SYSTEM EVENTS

C4-201 Model Verification for Inverter-Based Resources for Improved Bulk Power System Reliability

R. QUINT - *US*, D. RAMASUBRAMANIAN - *US*, A. ISAACS - *CA*, S. PANT - *US*, S. ZHU - *US*, D. PIPER - *US*, R. BAUER - *US*

C4-202 Benban PV Solar Park – Impact on the Operation of the Egyptian Power Transmission System –

M KAMH - *EG*, M FAWZI - *EG*, P AWATER - *DE*, A AMIN - *EG*, M SCHWAN - *DE*, J VERBOOMEN - *DE*, A ELMORSHEDY - *EG*

C4-203 Modern Grid Stability Aspects and Mitigation with Traditional and Innovative Solutions – Lessons learned from actual cases

S KARAMITSOS - *GB*, A CANELHAS - *GB*

C4-204 CANCELLED - Impact of Increased Inverter Interfaced Generation in Island Grids and Mitigation Measures

C4-205 CANCELLED - Technical Challenges Associated with Operating the Ireland and Northern Ireland Power System with 70% Renewables by 2030: Results from Work Package 2 of the EU-SYSFLEX Project

C4-206 Large-scale electromagnetic transient model validation based on measured system disturbances

B. BADRZADEH - *AU*, J. LU - *AU*, N. MODI - *AU*, C. NORONHA - *AU*, N. CROOKS - *AU*, F. SPESCHA - *AU*, A. JALALI - *AU*

C4-207 **Assessment of the dynamic frequency stability of the future continental Europe power system – Interconnected incidents and system splits**

J. FOURNEL - *FR*

C4-208 **System studies on the French network including HVDC stations and using real-time simulation**

A PETIT - *FR*

C4-209 **OSMOSE: Grid Forming performance assessment within multiservice storage system connected to the transmission grid**

C CARDOZO - *FR*

C4-210 **Sub synchronous Resonance of DFIG-based Wind Farms Connected to Series-Compensated Transmission Systems in North China: Field Data and Theoretical Analysis**

X. DONG - *CN*

C4-211 **Subsynchronous Resonance Study and Torsional Vibration Monitoring Program in the National Electric System of Chile**

V. VELAR - *CL*

SC C4 POWER SYSTEM TECHNICAL PERFORMANCE

PS3: METHODS, MODELS, AND TECHNIQUES FOR EVALUATING LIGHTNING, POWER QUALITY, AND INSULATION CO-ORDINATION TO ENHANCE THE PERFORMANCE OF THE EVOLVING GRID

C4-301 **Harmonic Modelling and Model Validation of DFIG Wind Turbines**

R. KAZEMI - *US*, M. LWIN - *US*, J. LEONARD - *US*, C. FOX - *US*, E. BOESSNECK - *US*

C4-302 **Impact of WTG converter impedance model on harmonic amplification factor of the Dutch 110 kV transmission network using a 383 MW wind farm case study**

D. VREE - *NL*, L. BELOQUI LARUMBE - *NL*, Z. QIN - *NL*, P. BRAUER - *NL*, B.C. UMMELS - *NL*

C4-303 **Proposition of the Superposition Method with Multiple Sources and Impedances in order to Attribute Responsibilities over Harmonic Distortions**

M. CARLI - *BR*

C4-304 **CANCELLED - Analysis of Calculating Harmonic Voltage Distortion Gain Calculation Methods on Transmission and Distribution Networks**

C4-305 **System-wide Amplification of Background Harmonics due to the Integration of High Voltage Power Cables**

J. B. KWON - *DK*

C4-306 **Resonance in ESS Operation in a Large Scale Plant System with Capacitor Bank**

J.S HUH - *KR*, Y.J. KWON - *KR*

C4-307 **High-order harmonic resonance phenomena in the frequency range from 2 kHz to 9 kHz of low voltage system in Japan**

J. YOSHINAGA - *JP*

C4-308 **Considerations on the frequency-dependent grid impedance in meshed HVAC grids - Parametric sensitivity analysis and impact of power electronic assets**

S. WENIG - *DE*, C. HIRSCHING - *DE*, C. JOHN - *DE*, T. LEIBFRIED - *DE*

C4-309 **Frequency and time domain field tests and cable model validation for the Italy – Montenegro 500 kV HVDC submarine cable link**

F. PALONE - *IT*, L. BUONO - *IT*, F. PALONE - *IT*, F.M. PEPE - *IT*, F. ROMANO - *IT*, B. CERESOLI - *IT*, F. OLDAZZI - *IT*, N. KULJACA - *ME*

C4-310 **Trends in Power Quality Disturbance Compatibility in Australia**

N. BROWNE - *AU*, S. ELPHICK - *AU*, T. BROWNE - *AU*

C4-311 **Power Quality Monitoring Of HVAC Solar Power Station Using Sequence Voltages From Synchrophasor – A Case Study**

C RETHI NAIR - *IN*

C4-312 Power Quality in Argentinian Electrified Railways: Comparison of Measurements in Two Different Traction Substations

F. ISSOURIBEHERE - *AR*

C4-313 CANCELLED - A Voltage Sag Severity Index Based on Combined Weighting

C4-314 Interaction between GIS and Power Transformers Simulation and Mitigation

P. MIGUEL - *BR*

C4-315 Insulation Coordination for Grid-Connected Power Electronic Apparatus

L. GRABER - *US*, C. XU - *US*, J. WEI - *US*, L. ZHENG - *US*, X. HAN - *US*, M. SAEEDIFARD - *US*, P. KANDULA - *US*, K. KANDASAMY - *US*, D. DIVAN - *US*

C4-316 CANCELLED - Switching surge and transient recovery voltage stress evaluation for an uprated 400 kV to 500 kV series compensated transmission line

C4-317 A Parametric Study Towards a Generic Mitigation Against Excessive Circuit Breaker TRVs in Series Reactor Applications in the Netherlands

K. VELITSIKAKIS - *NL*, J. VAN WAES - *NL*, I. TANNEMAAT - *NL*, C. ENGELBRECHT - *NL*, N. PAPAZACHAROPOULOS - *NL*

C4-318 The comparison of the different methods for the determination of the shielding failure rate of a transmission overhead line

I. TANNEMAAT - *NL*, K. VELITSIKAKIS - *NL*

C4-319 Lightning protection of wind turbines constructed in heavy lightning area

K. YAMAMOTO - *JP*

C4-320 Dynamic Lightning Protection of Smart Grid Power Load Centers

C. TONG - *CN*

C4-321 Lightning Analysis for ±500kV HVDC XLPE Cable System Combined with Overhead Transmission Lines

C. K. JUNG - *KR*, M.J. KIM - *KR*, J.S. HWANG - *KR*, K.Y. SHIN - *KR*, J.W. KANG - *KR*, J.W. WOO - *KR*

C4-322 Capacitors Banks for Reactive Power Compensation in Wind Power Plants: Aspects of Electromagnetic Transients and Components Specification

D. SENA - *BR*

C4-323 A Comprehensive Assessment of Concerns and Mitigation Measures for the Application of Inline Reactors to Reduce Short Circuit Levels

I. RAHIMI - *CA*

C4-324 Voltage and Current Inversion Impact on Distance and Differential Protection Relays in an Overcompensated Transmission System

H ERIKSSON - *SE*

C4-325 Post-mortem incident analysis on a hydro power plant main transformer by digital simulation – A Case Study of dielectric failure due to Transformer-GIS interaction

C. CARDOSO - *PT*

C4-326 Development of Desert-Dust and Sea-Salt Deposition Database Required for Outdoor Insulation Coordination in Israeli Power Grid

E. VOLPOV - *IL*

C4-327 Experimental Investigation of Ground Return Currents and Mutual Induction in Extruded Cables

S. NAUTA - *NL*, P. KROPMAN - *NL*, F. PROVOOST - *NL*, M. VAN RIET - *NL*

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PS1: THE CHANGING NATURE OF MARKETS AND ANCILLARY REQUIREMENTS

C5-101 Pricing Future Markets: How Alternative Pricing Can Impact Renewable Penetration Levels and the Resource Mix

R.B. HYTOWITZ - *US*

C5-102 Need of Improvements in the Brazilian Energy Market to Consider Separate Prices for Energy and Services
J. MELLO - *BR*

C5-103 Market Transformation to Value Energy, Reliability, and Flexibility Services
C. WANG - *US*, L. ZHAO - *US*, J. HARRISON - *US*, J. BLADEN - *US*

C5-104 From services to markets – system and market impacts of energy transition in European markets
R. HIRVONEN - *FI*, A. SIHVONEN-PUNKKA - *FI*, G. DOORMAN - *NO*

C5-105 Principles for allocation of cross-zonal capacities for the exchange of balancing capacity or sharing of reserves
R. BEUNE - *NL*, J. DE HAAN - *DE*, T. HENRI - *FR*, T. VEITH - *DE*

C5-106 System Operator Challenges in Spot Market
ENG.S AL-RAWAHI - *ZW*

C5-107 Incentivizing Generator Flexibility Investments: A Stochastic Analysis of Various Market Designs
J. FRASIER - *US*, M. WEBSTER - *US*, S. VARGHESE - *US*, T. MICHAUD - *US*, A. NARULA - *US*

C5-108 System Services for Power Systems with a High Level of Renewables
N. DELANEY - *IE*

C5-109 Integrating multi-period uncertainty management reserves into the Irish balancing market
J. GING - *IE*

C5-110 Evolutions of Japanese markets to secure appropriate ancillary service corresponding to a large amount of RES installation - Establishment of Capacity market and Balancing market
Y. TAKAMIZAWA - *JP*

C5-111 Market Integration of HVDC Lines: Cost Savings from Loss Allocation and Redispatching
A. TOSATTO - *DK*

C5-112 Identifying Emerging Ancillary Services changes in the Australian NEM
I. ROSE - *AU*, J. EGGLESTON - *AU*

C5-113 Research on Coordination Optimization Strategy of Peak Shaving and Frequency Modulation Auxiliary Service
W. ZHENG - *CN*

C5-114 A world-first: On the pooling of battery energy storage and pumped-hydro
A. SCHNEIDER - *DE*, L. BAHNER - *DE*, R. BUCHER - *DE*

C5-115 On lost profit calculations and pricing in liberalized power markets
V. BOROKHOV - *RU*

C5-116 Paradigm Shift in Thailand's Energy Sector: Effects from Increased REGs on Conventional Power Plant Operation and Power System Security
W. WONGLIMAMORNLERT - *TH*

C5-117 Transition From Administered To Market Linked Imbalance Handling Mechanism in Indian Power System
K.V.N. PAWAN KUMAR - *IN*

C5-118 The Economic and Environmental Value of the Demand Response Market in Korea
S. I. KIM - *KR*, H.N KIM - *KR*

C5-119 Experience of Implementation of Reserve Regulation Ancillary Services and Fast Response Ancillary Services in India
ANUPAM KUMAR - *IN*

C5-120 To socialise or not to socialise the cost of imbalances from non-programmable renewable generation
N. PINHO DA SILVA - *PT*

C5-121 Implementation of Security Constrained Economic Dispatch Pan India

PHANISANKAR CHILUKURI - *IN*

SC C5 ELECTRICITY MARKETS AND REGULATION

PS2: CHANGING ROLE OF REGULATORS AND STANDARDS

C5-201 A Holistic Framework for Electricity Market Design: The Benefits of Regulatory and Market Coordination

J. FRASIER - *US*, R. WOODFIELD - *US*, M. WEBSTER - *US*

C5-202 Evolution of Regulatory Framework on Reinforcements, Improvements and End of Useful Life of the Electric Power Transmission Assets in Brazil

E. NEVES - *BR*

C5-203 Assessing the Pricing Approach for Renewable Energy Reserve Auctions in Brazil: Do We Have Misleading Prices?

A. PERRELLI - *BR*

C5-204 Regulation of Economic Incentive for the Improvement of the Operational Performance of the HVDC Transmission System in Brazil

S. FEITOSA - *BR*

C5-205 Constrained-off energy events in wind farms on Brazilian Market

R. FERREIRA - *BR*

C5-206 CANCELLED - The Impacts of Carbon Pricing in PJM

C5-207 CANCELLED - Mexico ´s Bilateral Market-An Alternative for Renewable Energy Development?

C5-208 The transition to new dynamic market arrangements in Ireland and Northern Ireland in the context of high levels of variable renewable generation

A. M. DOWNEY - *IE*

C5-209 Renewable Energy Targets and Policies in Turkey and Development of Photovoltaic Solar Energy

HUSEYIN ALTUNTAS - *TR*

C5-210 Sensibility to Consumers' Outflow

V. BEREZOVSKY - *RU*

C5-211 Market tools for managing thermal generation fleet.

G. LABUTIN - *RU*

C5-212 Research of China's two tier spot market and its evolution path

L. MA - *CN*

C5-213 The realization of the fairness and efficiency goals in the electricity market and its application in the Guangdong power market

Z. JING - *CN*

C5-214 A Novel Demand Response Market Clearing Auction Model for Independent System Operators

M. AHMED - *CA*

C5-215 Financial Systemic Risk Level Model_C5-PS2

J. CARDONA - *CO*

C5-216 Assignment of transmission system installations after the regulatory changes approved in 2016 in Chile

J. TORO - *CL*

C5-217 From a system of shared payment between generators and customers to a regime of payment of final customers

J. TORO - *CL*

SC C5 ELECTRICITY MARKETS AND REGULATION

PS3: MARKET DESIGNS FOR CO-ORDINATION OF GENERATION AND NETWORK INVESTMENTS

C5-301 Latent Clustering Model for Co-optimization of Transmission and Generation Investments Under Uncertainty

J. BUKENBERGER - *US*, M. WEBSTER - *US*

C5-302 Competitive costs for flexibility-based alternatives to conventional Investments in distribution network capacity

E. GRAMME - *NO*

C5-303 Development and Impact of Flow-Based Methodology in Core Region

M. VAJDIC - *HR*

C5-304 Improving wholesale electricity market design for electric power systems with high shares of intermittent renewable energy sources

M. C. DALENA - *IT*, S. CIANCIO - *IT*, V. MORRI - *IT*

C5-305 The consideration of novel and flexible network usage in Japan - Attempts to minimize social cost by optimizing network investment considering generation curtailment -

K. FURUSAWA - *JP*

C5-306 Ancillary Services Market reform according to the new European Electricity Directive: open points for the design of the future TSO-DSO coordination and the DSO's procurement of flexibility services in the Italian context

G. LENAZ - *IT*, S. LIBRATTI - *IT*, M. MAURO - *IT*

C5-307 System strength, inertia and network loss factors - implications for power networks and renewable generation

S. HINCHLIFFE - *AU*, J. EGGLESTON - *AU*

C5-308 The Role of Price Signals in the Economically Efficient Integration of Demand Response and Distributed Energy Resources with the Central Electricity Supply System

L. HOCH - *AU*, D. BOWKER - *AU*

C5-309 Evaluating Various Battery Behaviours to Maximise Consumer Value Across the Electricity Supply Chain

E. MA - *AU*, J.C. DENNIS - *AU*

C5-310 Improved method for calculating ISKs based on node transmission contribution

X. LI - *CN*

C5-311 How to Give a Reasonable Economic Signals Through Transmission Service Cost: Analysis based on Game Theory with the Example of Korean Transmission System

H. CHANG - *KR*, Y. JUNG - *KR*, K. JEONG - *KR*, H. CHOI - *KR*, S. KIM - *KR*

C5-312 Markets and platforms to coordinate the procurement of system services from large-scale and small-scale assets connected to the electricity network

C. MADINA - *ES*, M. SANTOS-MUGICA - *ES*, I. GOMEZ-ARRIOLA - *ES*, J. JIMENO - *ES*

C5-313 Strategy for Northeast Asia Power System Interconnection Technical Assistance to Mongolia General Overview of a Northeast Asia Power Trade

P LIENHART - *FR*

SC C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES

PS1: ADVANCED DISTRIBUTION SYSTEM DESIGN INCORPORATING DISTRIBUTED ENERGY RESOURCES

C6-101 Analysis of Voltage Stability Index for a Distribution Grid with Photovoltaic and Battery Energy Storage Systems

T. BLASI - *BR*

C6-102 Analysis of Benefits After Installing Battery Energy Storage in Distribution Feeder with Presence of Photovoltaic Plants in Brazilian Electrical System

S. ROCHA - *BR*

C6-103 Impacts of a Power Storage Systems Based on Lead Carbon and Lithium Technologies in 13,8 kV Distribution Network - Technical, Economic and Regulatory Challenges

L. LEITE - *BR*

C6-104 Lessons learnt from the 800 MWh Utility Scale Battery Energy Storage Systems (BESS) Project in South Africa

K DEDEKIND - *ZA*

C6-105 CANCELLED - A Practical Application Case of Large Scale Energy Storage System for Energy Arbitrage at Steel Plant

C6-106 Contribution of energy storage to capacity adequacy – Application to island power systems

G. N. PSARROS - *GR*, A. G. PAPAKONSTANTINOU - *GR*, S. A. PAPATHANASSIOU - *GR*, J. S. ANAGNOSTOPOULOS - *GR*, N. G. BOULAXIS - *GR*

C6-107 Research on SOC balanced control of flexible group energy storage system with echelon used batteries

M. LUO - *CN*

C6-108 Distributed Resources Providing Ancillary Services: operating DSO owned storage without market interferences

M. ROSSI - *IT*, G. VIGANO' - *IT*, D. CLERICI - *IT*, D. MONETA - *IT*

C6-109 Implementation of Battery Energy Storage for Frequency and Power Profile Regulation, and Spinning Reserve Management

P. ZINCK - *CA*

C6-110 Energy storage application for improving transients performance of synchronous distributed generation

V. SAMOYLENKO - *RU*

C6-111 Assessment of distribution grid losses depending on storage location for residential PV systems in three grids in the region of Murcia

D. RUBIO-MIGUEL - *ES*, J. MERINO - *ES*, P. EGUÍA-LÓPEZ - *ES*, E. TORRES-IGLESIAS - *ES*

C6-112 Considerations for Energy Storage in Distribution Planning

J. PEPPANEN - *US*, J. TAYLOR - *US*, M. BELLO - *US*, A. MAITRA - *US*

C6-113 Accounting for the uncertainty associated with consumer-led demand side response

G MCFADZEAN - *GB*, G EDWARDS - *GB*, M MCFARLANE - *GB*, C HIGGINS - *GB*

C6-114 Modelling Considerations for Assessing Smart Inverter Functions - A Case Study from Northern California

J. PEPPANEN - *US*, M. HERNANDEZ - *US*, T. HUBERT - *US*, J. DEBOEVER - *US*, F. PETRENKO - *US*, M. MCCARTY - *US*, O. TRINKO - *US*

C6-115 Using advanced modular FACTS to increase flexibility of distribution networks and enable the connection of more distributed energy resources

C WINNING - *GB*, M FARIDI - *GB*, B KELLY - *IE*

C6-116 Optimization of the Effect of Electric Vehicle Charging Stations by Genetic Algorithm

H. CIFTCI - *TR*

C6-117 Effects of Electric Vehicles Charging on Power Distribution Systems "A Case Study in Aqaba-Jordan"

R. DAHOUD - *JO*

C6-118 Research on Ordered Charge Control System of Electric Vehicles Based on New Acquisition Communication and Control Equipment

L. JIANG - *CN*

C6-119 A Conceptual Framework for Sub-Transmission Expansion Planning of Active Distribution Systems, focused on South American Networks

M. SAMPER - *AR*

C6-120 Achievements, Experiences, and Lessons Learned from the European Research Infrastructure ERIGrid related to the Validation of Power and Energy Systems

T. STRASSER - *AT*, E.C.W DE JONG - *AT*, M. SOSNINA - *AT*, J.E. RODRIGUEZ-SECO - *AT*, P. KOTSAMPOPOULOS - *AT*, D. BABAZADEH - *AT*, K. MÄKI - *AT*, R. BHANDIA - *AT*, R. BRANDL - *AT*, C. SANDRONI - *AT*, K. HEUSSEN - *AT*, F. COFFELE - *AT*

C6-121 CANCELLED - Automated Target Grid Planning in Distribution Systems Considering Optimization of Grid Structures

C6-122 Installation of DER in Distribution Automation Schemes

M. MONDELLO - *US*, N. SELAK - *US*, B. HERNANDEZ - *US*

C6-123 Innovative Solutions for Smart Management of Power Grids

J.C. DÍAZ - *ES*, P. MULLOR - *ES*, N. PITARCH - *ES*, M. GARCÍA-PELICER - *ES*, A. QUIJANO-LÓPEZ - *ES*

C6-124 Voltage Control in the Active Networks, Oman Case Study

ENG. AHMED AL-NADABI - *ZW*

C6-125 CANCELLED - A Study on the System Architecture of Typical Energy Use Scenarios in Industrial Parks

C6-126 Smart Transformer Use in Net-Zero Energy Factories

P. LOMBARDI - *DE*, B. ARENDARSKI - *DE*, G. DE CARNE - *DE*, C. WENGE - *DE*, P. KOMARNICKI - *DE*, M. LISERRE - *DE*

C6-127 Reduction method for planning cross energy carrier networks in the cellular approach applicable for stability assessment in low-voltage networks

A. TRAUPMANN - *AT*, M. GREIML - *AT*, T. KIENBERGER - *AT*

SC C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES

PS2: ENABLING TECHNOLOGIES AND SOLUTIONS FOR DISTRIBUTION SYSTEMS

C6-201 Distributed Energy Resources aggregation platforms for the provision of flexibility services by Working Group C6.35

A. OUDALOV - *CH*

C6-202 Microgrid Control Platform to Provide Industrial Site in the USA with Efficient and Reliable Management of Distributed Resources and Energy Storage Systems

H. BITARAF - *US*, S. CRAY - *DE*, J. GLASSMIRE - *US*, J. BAUMGARTEN - *US*, A. LAKSHMINARAYANAN - *US*, T. DRAKE - *US*, K. HUTCHISON - *US*

C6-203 Optimal Energy Management and Control for Load Management in V2G EV-integrated Microgrid

G. BYEON - *KR*, S. LIM - *KR*, J. KIM - *KR*, H JO - *KR*, S. KIM - *KR*, H. SUN - *KR*, D. YOO - *KR*

C6-204 Cyber-Physical Resilient Interoperable Microgrid Networks

D. ISHCHENKO - *US*, A. KONDABATHINI - *US*, M. CINTUGLU - *US*, A. BRISSETTE - *US*, A. VALDES - *US*, R. MACWAN - *US*, H.J. LIU - *US*, H. CHOI - *US*, P. BUASON - *US*, S. LAVAL - *US*, D. LAWRENCE - *US*

C6-205 Using a Real Time Digital Simulator to Test a Microgrid Integrated Solar Storage Technology

S.R. KOTHANDARAMAN - *US*, N. GURUNG - *US*, C. ZHANG - *US*

C6-206 A Microgrid Validation Centre to enable Validation and Optimisation of the Design, Simulation, Intelligent Control and Asset Management of Microgrid

M OSBORN - *GB*, S CRAY - *DE*, S OBERHOFER - *DE*, S SCHNEIDER - *GB*

C6-207 Cellular approach and new grid edge solutions for distribution systems and industrial sites in Germany

B. BUCHHOLZ - *DE*, P. NOGLIK - *DE*, V. BUEHNER - *DE*

C6-208 Demonstrating a Virtual Power Plant on the Isles of Scilly

S C E JUPE - *GB*, D DALE - *GB*, F HOLDER - *GB*, S HODA - *GB*, S ROSSI-ASHTON - *GB*, J BEASLEY - *GB*, S J HODGSON - *NO*, M HISATOMI - *JP*

C6-209 Real-Time Control Algorithm for the Integration of a Battery Energy Storage System to Optimize the Power Generation on a real Island Microgrid System: Conceptualization and Validation

J. IGLESIAS - *ES*, C. GARCÍA - *ES*, R. PINTO - *PT*

C6-210 4-legs electronic active load for anti-islanding evaluation

J. BALLESTÍN-FUERTES - *ES*, J. MUÑOZ-CRUZADO-ALBA - *ES*, J.F. SANZ-OSORIO - *ES*

C6-211 Battery Energy Storage System based Voltage and Frequency Control of An Island Distribution Network

P PONNAGANTI - *DK*

C6-212 Enhancing flexibility, reliability, and resilience of isolated power systems via Variable Speed Diesel Integration

M. NEGNEVITSKY - *AU*, J. HAMILTON - *AU*, E. SEMSHCHIKOV - *AU*, X. WANG - *AU*

C6-213 CANCELLED - Smart Rural MicroGrid Solutions for Off-grid Applications

C6-214 ENEL experience in rural electrification in South America area

E. VALIGI - *IT*, L. COCCHI - *IT*, M. GARCIA BUSTOS - *BR*

C6-215 Conceptualising hybrid power system and microgrid design for a remote touristic village supply

ESMA MUSIC - *BA*

C6-216 Tapping of Power from Overhead Earthwire of EHV Transmission Line to Supply Remotely Located Load-Powergrid Experience

DHEERAJ SRIVASTAVA - *IN*

C6-217 A simple rule-based energy management system for off-grid system

L. SIGRIST - *ES*, L. ROUCO - *ES*, I. SABOYA - *ES*, L. DIEZ - *ES*

C6-218 Hardware in the loop microgrid controller testing

H.M. SANCHEZ - *CO*

C6-219 Novel Control of Multi-Level Inverter Based Microgrid with Hybrid Generation

BHAVESH R. BHALJA - *IN*

C6-220 Development of a state estimator based modular toolset – specialities of low-voltage operation

B. HARTMANN - *HU*, L. BARANCSUK - *HU*, D. KERTÉSZ - *HU*, B. SINKOVICS - *HU*, I. TÁCZI - *HU*, I. VOKONY - *HU*

C6-221 Active Distribution Test System for Typical New Zealand MV and LV Networks

N. K. C. NAIR - *NZ*, S. SHIRZADI - *NZ*

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PS1: TESTING, MONITORING AND DIAGNOSTICS

D1-101 Predictive maintenance based on continuous monitoring of OLTCs electrical signatures

A. BARBOSA - *BR*

D1-102 Development and implementation of partial discharges on-line monitoring module in GIS 110kV switchgears

W GIL - *PL*

D1-103 Identification and Improved Quantification of Inhibitors in Mineral Insulating Oils using FTIR Spectroscopy and Partial Least Squares Regression

P. ÅGREN - *FI*, T. LILLHONGA - *FI*, L. MELZER - *SE*

D1-104 Influence of temperature variation on transformer bushing monitoring

N ABEYWICKRAMA - *SE*

D1-105 A New Partial Discharge Measuring System in HVGIS Based on Magnetic Field Antennas

A. RODRIGO MOR - *NL*, F. MUÑOZ- MUÑOZ - *NL*, L.C. CASTRO-HEREDIA - *NL*, A. NAYAK - *NL*

D1-106 Challenges for space charge measurements with the PEA technique in the thick insulation of HVDC Cables

M. ALBERTINI - *IT*, S. FRANCHI BONONI - *IT*, D. PINI - *IT*, G. MAZZANTI - *IT*, P. ROMANO - *IT*, A. IMBURGIA - *IT*, E. RIVA SANSEVERINO - *IT*, G. RIZZO - *IT*, G. ALA - *IT*

D1-107 Cigré Prototype Installation Test for Gas-Insulated DC Systems - Testing a Gas-Insulated DC Transmission line (DC-GIL) for ±550 kV and 5000 A under Real Service Conditions

M. HALLAS - *DE*, V. HINRICHSEN - *DE*, C. NEUMANN - *DE*, M. TENZER - *DE*, B. HAUSMANN - *DE*, D. GROSS - *DE*, T. NEIDHART - *DE*, M. LERCH - *DE*, D. WIESINGER - *DE*

D1-108 Evaluation of dynamic loading capability for optimal loading strategies of power transformers

I. LUPANDINA - *AT*, W. GAWLIK - *AT*, M. SCHRAMMEL - *AT*, A. ILGEVICIUS - *AT*, M. KÜRTEN - *AT*, K. VIERECK - *AT*

D1-109 Partial Discharge Analysis in Gas-Insulated HVDC Systems Using Conventional and Non-Conventional Methods

T. GÖTZ - *DE*, P. WENGER - *DE*, M. BELTLE - *DE*, K. BACKHAUS - *DE*, S. TENBOHLEN - *DE*, U. RIECHERT - *CH*

D1-110 Spectral measurement of the precipitations composition in OIP insulation of the high-voltage bushings

M. LYUTIKOVA - *RU*

D1-111 A measurement system for insulator puncture test with short front impulse voltage

Y. LI - *AU*, W. YAN - *AU*

D1-112 Extended Frequency Range Testing of HV Cables

J. TUSEK - *AU*

D1-113 PD Testing Setup Composed by GIS, Cable and Power Transformer to Compare Different PD Monitoring Technologies

A. SÁNCHEZ - *ES*, F. GARNACHO - *ES*, P. SIMÓN - *ES*, T. GARCÍA - *ES*, J. ORTEGO - *ES*, J.J. GARCÍA - *ES*, S. MARTIN - *ES*

D1-114 On-Line Diagnosis Methods for Transformer Winding Deformation Based on Running Voltage and Current Correlation Mining

Y. ZHENG - *CN*, W. WANG - *CN*, H. YAO - *CN*, C. LI - *CN*, X. SUN - *CN*, L. LIU - *CN*, W. DU - *CN*, D. WEN - *CN*

D1-115 Development of a Multi-Parameter Online Monitoring Equipment for EHV Transformer Bushing

L. ZHANG - *CN*

D1-116 Proposal of a Calibration Methodology of UHF Partial Discharge Measurements for Power Transformers

S. COENEN - *DE*, M. SIEGEL - *DE*, M. BELTLE - *DE*, S. TENBOHLEN - *DE*, S. HOEK - *DE*, P. FEHLMAN - *CH*, R. SCHWARZ - *AT*, T. LINN - *CH*, U. KEMPF - *DE*, M. WEBER - *DE*, J. FUHR - *CH*

D1-117 A new method for evaluating the degree of polymerization of paper insulation of power transformers

A. SABITOV - *RU*

D1-118 Field Experience in Oil-filled Power Transformers Fault Diagnosis by Frequency Response of Stray Losses (FRSL)

P. SINGKHAWAT - *TH*

D1-119 Analysis of puncture breakdown characteristics according to inner defect types of GIS epoxy insulator

J.J. KIM - *KR*, S.J. HAN - *KR*, T.H. KIM - *KR*

D1-120 Oxidative degradation of mineral oils in power transformers over service time. Effect of the economic owner on maintenance strategies

A. ZAYA-JIMENEZ - *ES*, L. ARBELAEZ-OROZCO - *ES*

D1-121 Development of OF Cable Insulation Deterioration Diagnosis Technique Using Support Vector Machine

H.J. PARK - *KR*, B.S. KWAK - *KR*, T.H. JUN - *KR*, A.R. KIM - *KR*

D1-122 Monitoring of active part drying for instrument transformers by dielectric measurements

C PERRIER - *FR*

D1-123 Measurement and behavior of partial discharge for SF6 substitute gases in HVDC GIS/GIL

C TOIGO - *FR*

D1-124 CANCELLED - Composite Voltage Test for HVDC Equipment

SC D1 MATERIALS AND EMERGING TEST TECHNIQUES

PS2: FUNCTIONAL PROPERTIES AND DEGRADATION OF INSULATION MATERIALS

D1-201 CANCELLED - Recent Testing of Aramid Insulation for Liquid Immersed Power Transformers

D1-202 Proposal of test method for evaluating the induction time (IT) of natural ester insulating oils

A. MARTINS - *BR*

D1-203 LCA and Smoke Test of Dielectric Fluids based on Natural Esters

F. SCATIGGIO - *IT*, E. BREDA - *IT*, L. CALCARA - *IT*, G. CAMPI - *IT*, L. PARODI - *IT*, R. PEDRIALI - *IT*, M. POMPILI - *IT*

D1-204 Investigation into the effect of cold temperature on the physical properties of dielectric liquids

P M LIVESEY - *GB*, J MALDE - *US*

D1-205 CANCELLED - Mechanical and Electrical Performance of High-Stressed Composite Hollow Insulators for 800kV HVDC Wall and Transformer Bushings

D1-206 Characterization of pressboard mechanical properties for understanding the dynamic behaviour of transformer winding clamping pressure

T.K. SAHA - *AU*, C. EKANAYAKE - *AU*, L. NARANPANAWA - *AU*, H. MA - *AU*, G. RUSSELL - *AU*, M. PANNU - *AU*

D1-207 A new type of failure of composite insulators: service experience, degradation characteristics, root cause, experimental simulation and countermeasures

X. LIANG - *CN*, W. BAO - *CN*, Y. GAO - *CN*, S. LI - *CN*

D1-208 Investigations of long-term transition processes on solid-gas insulated HVDC bushings under high thermal and electrical stress

M. SCHELER - *DE*, M. ROSSNER - *DE*, F. BERGER - *DE*, U. PRUCKER - *DE*

D1-209 The Electrical Characteristics of Low Current Surface Discharges with Liquid Electrodes and the Adaption of Test Parameters for a DC Inclined-Plane-Test

S. KUEHNEL - *DE*, S. KORNHUBER - *DE*, C. BAER - *CH*, J. LAMBRECHT - *DE*

D1-210 Analysis of stray gas according to oil characteristics and vacuum process conditions of insulation oil in power transformer

J.H. SONG - *KR*, K.H LEE - *KR*, J.T KIM - *KR*, J.W LEE - *KR*, D.H KIM - *KR*

D1-211 Analysis Of 400 Kv Failed Silicone Rubber Insulators: Role Of Micro-Cracks In Glass Fiber Rod And Electric Field Distribution In Failure Mechanism-Case Study

NITIN R SHINGNE - *IN*

D1-212 Implementation of space charge measurement using the Pulsed Electro-Acoustic method during ageing of HVDC model cable

L BERQUEZ - *FR*

D1-213 Low temperature behaviour and dielectric performance of Fluoronitrile/CO2/O2 mixture

M. WALTER - *CH*

D1-214 Degradation of insulating gases with low environmental footprint in operation

P. STOLLER - *CH*

SC D1 MATERIALS AND EMERGING TEST TECHNIQUES

PS3: INSULATION SYSTEMS OF ADVANCED COMPONENTS

D1-301 CANCELLED - Byproduct-free curing of a highly insulating polyethylene copolymer blend: an alternative to peroxide crosslinking

D1-302 Replacement of area substation transformers with flexible units with reduced footprint and increased overload capability

R SZEWCZYK - *PL*

D1-303 New test procedure intended to evaluate adhesion of core/housing interface of composite insulators

I GUTMAN - *SE*

D1-304 Measurement and simulation of transient field stresses and impacts on advanced insulation design and new test procedures for HVDC components

I. WIRTH - *DE*, A. REUMANN - *DE*, M. H. ZINK - *DE*, A. KÜCHLER - *DE*, T. SCHNITZLER - *DE*, A. LANGENS - *DE*, B. HEIL - *DE*, F. BERGER - *DE*

D1-305 3D Printed Solid Insulator: Possibilities and Challenges

M. KURIMOTO - *JP*

D1-306 Features of the choosing insulation voltage of AC systems under increased frequency

T. SHADRIKOV - *RU*

D1-307 Electric Field Relaxation by Functionally Graded Insulating Materials in GIS

D. J. PARK - *KR*, J. Y. SHIM - *KR*, J. H. SON - *KR*, J. EITSCHUN - *DE*, V. ZOELLMER - *DE*

D1-308 Erosion Performance of Boron Nitride Filled Silicone Rubber Composite as an Outdoor Insulator Weathershed Material

M. JO THOMAS - *IN*, SINDH A V BABY - *IN*

D1-309 Dielectric stress on and design of GIS support insulators for HVDC-applications

U. STRAUMANN - *CH*

SC D2 INFORMATION SYSTEMS AND TELECOMMUNICATION

PS1: THE IMPACT OF EMERGING INFORMATION AND COMMUNICATION TECHNOLOGIES ON ELECTRIC POWER UTILITIES

D2-101 Big Data Analytics for Predictive Lightning Outage Management Using Spatially Aware Logistic Regression

M. KEZUNOVIC - *US*, T. DOKIC - *US*, Z. OBRADOVIC - *US*, M. PAVLOVSKI - *US*, R. SAID - *US*

D2-102 Artificial Intelligence Applications to Electric Power Systems Asset Management

A.P. APOSTOLOV - *US*

D2-103 Failure reduction and predictive replacement approach for overhead lines using big data and advanced analytics

A. FRAIOLI - *IT*, G. RICCI - *IT*, A. FOSSI - *IT*

D2-104 Incremental machine learning implementation for voltage forecasts and predicted violation alerts

A KULKARNI - *GB*, S KUMAR - *GB*, R BROWN - *GB*, S DUDLEY - *GB*

D2-105 Developing Enhanced Information and Data Exchange to Enable Scalable TSO-DSO Interoperability

G A TAYLOR - *GB*, E LAMBERT - *FR*, M USLAR - *DE*, F MARTEN - *DE*

D2-106 Improvement of operability and maintainability using new information and telecommunication technologies

Y. SAKAMOTO - *JP*

D2-107 Artificial Intelligence and Machine Learning Applications in the Distribution Network in Greece

M. CHAMPAKIS - *GR*, G. TSIROPOULOS - *GR*, D. STRATOGIANNIS - *GR*, D. PAPAKONSTANTINOU - *GR*, G. M. MESSINIS - *GR*, N. D. HATZIARGYRIOU - *GR*

D2-108 Adopting IIoT Technology to Realize Controllability of Existing Small-scale Distributed Energy Resources

S. LAI - *TW*, C. CHEN - *TW*, W-J. WU - *TW*, Z-X. XEI - *TW*, C-S. CHEN - *TW*

D2-109 Electric Power Utilities Disturbance analysis using Bayesian Networks of Events

G. ARROYO-FIGUEROA - *MX*

D2-110 Development of intelligent control systems for decentralized distributed energy resources based on a digital platform

S. KOVALYOV - *RU*

D2-111 Application of modern information and communication technologies for improving the effectiveness of power systems

A. RODIONOV - *RU*

D2-112 Machine learning as a tool to improve the efficiency of high-voltage power equipment lifecycle management

A. KHALYASMAA - *RU*

D2-113 Research and Application of Virtual Dispatchers in Intelligent Distribution Network Based on Artificial Intelligence

W. ZHENG - *CN*, W. LIU - *CN*, H. LIU - *CN*, J. FU - *CN*, Y. YANG - *CN*, L. CHEN - *CN*, Y. ZHU - *CN*

D2-114 Research on the Architecture for Smart Energy Service System Based on Industrial Internet

X. DONG - *CN*

D2-115 CANCELLED - The IoT solution architecture for Power Distribution and its application

D2-116 An Instance Segmentation and Depth Perception based Obstacle Detection and Distance Measurement Method for Substation Patrol Robot

H. XU - *CN*

D2-117 An intelligent power grid post-fault restoration support system based on knowledge graph

J. LU - *CN*

D2-118 Experience of development and implementation of automated system for monitoring and analysis of functioning of relay protection devices (IED's) and assessment of correct protection operation

O. FEDOROV - *RU*

D2-119 Development an AI Algorithm and Drone Operation System for Diagnosis of Transmission Facilities in KEPCO

N. JUNG - *KR*, M. CHOI - *KR*, C. CHAE - *KR*, J. PARK - *KR*

D2-120 Peer-to-Peer Energy Trading: A Case Study in Thailand

S. KAEWCHIRD - *TH*

D2-121 Facilitating Power Banking And Overarching Arrangement Through Smart Contracts Based On Block Chain Technology

SANTOSH KUMAR JAIN - *IN*

D2-122 MANINT Project: Digital Transformation of the Management of Transmission Grid Operating Assets

M. GARNACHO - *ES*

D2-123 A Multi-Agent System platform for State Estimation in power distribution grids in the context of distributed generation

A. COJOACA - *RO*

D2-124 Internet of Distributed Energy Architecture (IDEA): new approach on transactive energy

I. CHAUSOV - *RU*

D2-125 Impact of Big Data, Internet of Things and Analytics in Indian Power System - A Case Study

PRAVEEN KUMAR AGARWAL - *IN*

D2-126 CANCELLED - Smart Grid Developments in India

D2-127 CNDbot: A Robot for Operation Information Management in the Colombian Power Grid

S. JIMENEZ - *CO*

D2-128 On the Path to Autonomous Power System Management

M. SUBASIC - *CH*

D2-129 How to deploy Augmented Reality solutions into day to day DSO operations

T. MESTNIK - *SI*

D2-130 Management of data from smart measuring device for predictive maintenance

MAJA SAVINEK - *SI*

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PS2: NEW CYBERSECURITY CHALLENGES IN THE CHANGING ELECTRICITY INDUSTRY

D2-201 Assessing Blockchain Technology to Enable High DER Scenarios Using Hardware in the Loop Testing

N. GURUNG - *US*, S.R. KOTHANDARAMAN - *US*, N.M. ABDULLAH - *US*, M. MAHOOR - *US*

D2-202 THE ROLE OF SOFT CYBERSECURITY IN THE POWER SYSTEM OF THE FUTURE

G. AZEVEDO - *BR*

D2-203 Leveraging SOC-as-a-Service to Counter Some of the Cybersecurity Challenges of Combined IT and OT Operations

D.K. HOLSTEIN - *US*, T.W. CEASE - *US*, R.E. KING - *US*

D2-204 Applying Automated Cyber Risk Assessment for the Smart Grid

D. CAMPARA - *BA*

D2-205 CYber Resilience framework for ENErgy systems

G. DONDOSSOLA - *IT*, R. TERRUGGIA - *IT*, M.G. TODESCHINI - *IT*

D2-206 An Intrusion Detection System for the Smart Grid based on Computational Intelligence Algorithm

G. ARROYO-FIGUEROA - *MX*, I. ROJAS - *MX*, A. HERNANDEZ - *MX*

D2-207 Security threats and challenges in the transmission of condition and forecast data for determining the availability of substation equipment

T. BOEHM - *DE*, K. VIERECK - *DE*

D2-208 Collaborative Cybersecurity Solution for Substations

S. WANG - *TW*, S. SUDAKOV - *TW*, K. WU - *TW*

D2-209 Boosting Cybersecurity in Communication Gateways for Better Substation Protection and Control

J. LIN - *TW*, C. LIANG - *TW*

D2-210 Critical Infrastructure Cyber Security: Applications of Machine Learning and Artificial Intelligence in Detecting, Responding to and Containing Threats

L. WATTS - *AU*

D2-211 Cybersecurity challenges related to Distributed Energy Resources and Flexibility Providers

F. RAMÍREZ - *ES*, V. SAIZ - *ES*, D. ANDRES - *ES*

D2-212 Cybersecurity for EV charging infrastructures communications based on a tool developed to identify cyber-attacks and to restore security

J. ROMERO - *ES*, A. MOCHOLÍ - *ES*, J.C. DÍAZ - *ES*, A. QUIJANO-LOPEZ - *ES*

D2-213 Cyber Secured Grid Operations with Machine Learning Implementation- A Case Study

Y.S. KULKARNI - *IN*

D2-214 Duke Energy implements corporate wide standard for Secure Access & Device Management (SADM) to improve Grid Reliability and Operational Efficiencies

A. HAMDON - *CA*

D2-215 Assuring secure access for operation and maintenance to substation-based telecom devices

J DE GEVIGNEY - *FR*

SC D2 INFORMATION SYSTEMS AND TELECOMMUNICATION

PS3: INCREASING OPERATIONAL EFFICIENCY USING PACKET SWITCHED COMMUNICATION TECHNOLOGIES

D2-301 Challenges in the Migration to Packet Switched Networks for Teleprotection Service of Power Transmission Lines

L. LEITE - *BR*

D2-302 Time Distribution Applications in the Power Utility Environment

A. VIRO - *FI*, J. SUOMALAINEN - *FI*

D2-303 SIARA – Proving Suitability of R-Goose over a Packet Switched Wide Area Network for Future Wide Area Applications

P MOHAPATRA - *GB*, C MCTAGGART - *GB*, H GUO - *GB*, P BALASUBRAMANI - *GB*, K KULBHUSAN - *GB*, A WILSON - *GB*, M WEHINGER - *GB*

D2-304 Comprehensive Validation of Packet-Based Communications for Future Energy Systems

S M BLAIR - *GB*, H GUO - *GB*, C BOOTH - *GB*, N NAWACKI - *GB*, L HITE - *US*, D VERHULST - *BE*

D2-305 Measures to improve the reliability of IP networks for electric power systems aiming at operation efficiency and cost reduction

H. DOI - *JP*

D2-306 PACS challenges for Packet Switched Networks

J. RAMIREZ - *VE*, J. CARDENAS - *ES*, J. RODRIGUEZ - *ES*

D2-307 Application of MPLS-TP for Transporting PowerÂ System Protection Data

N. JOSHI - *AU*, S.M. BLAIR - *AU*, C.D. BOOTH - *AU*, J. MICHIELSEN - *AU*

D2-308 Telecommunications Network Modernisation in Utilities: Challenges of Migrating from Time Domain Multiplexing (TDM) Technology to Packet Switched Network (PSN)

P. TUAZON - *AU*, S. WITHANAGE - *AU*, V. TAN - *AU*

D2-309 Verification and Validation of MPLS-TP for Tele-protection (Current Differential) services with existing TDM (SDH & PDH), Radio & WDM technologies through Proof of Concept

K. KULBHUSHAN - *AU*, N. ZEINERT - *AU*, R. LIEBERT - *AU*, D. PERERA - *AU*, J. DORTMANS - *AU*

D2-310 A Unified Communication Architecture for Smart Grid WAN/FAN/NAN Services

Y. SHI - *CN*

D2-311 Migration to Packet Switched Networks in Iran National Grid Dispatching Center

V. VEYSI - *IR*

D2-312 Development of IoT Sensor System for Monitoring/Diagnosis of the Power Distribution System

C.M. SON - *KR*, M.J. JUN - *KR*, S.H. LEE - *KR*, M.S HAN - *KR*

D2-313 Migration to Hybrid MPLS-TP & SDH Communication System for a More Reliable Performance of the 500 kV System

C. DI PALMA - *AR*

D2-314 Strategies for implementing teleprotection function over packet-switched networks

S BULJORE - *FR*

D2-315 Using IEC 61850 differential protection over Multiprotocol Label Switching – Transport Profile (MPLS-TP) wide area networks

M. KRANICH - *CH*