2020 CIGRE SESSION TECHNICAL PROGRAMME

PROVISIONAL VERSION

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 BIIELLMANN - *FR*

SC A1 ROTATING ELECTRICAL MACHINES

PS2: ASSET MANAGEMENT OF ELECTRICAL MACHINES

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

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**
J.Y LEE - *KR*, K.Y. KIM - *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 cracks and sensitivity analysis in order to identify the parameters that have an effect 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*

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 implemented on a 11 MVA Hydropower generator to neutralize lateral forces**

F EVESTEDT - *SE*

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

M. REBOLINI - *IT*

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

MIHAIL DIGALOVSKI - *MK*

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

T. HILDINGER - *DE*

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

Y. TAKIZAWA - *JP*

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*

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

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

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

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

P NORBERG - *SE*

A2-103 **Dynamic thermal behavior of wind power transformers**

T LANERYD - *SE*

A2-104 **High Resolution Condition Monitoring of Transformers at five UK Solar Farms using micro-synchrophasors**

C SIMMONS - *GB*

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

R. FRITSCHE - *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*

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*

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

S RAJAMANICKAM - *GB*

SC A2 POWER TRANSFORMERS AND REACTORS

PS2: ADVANCES IN DIELECTRIC DESIGN AND TESTING

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

M RYADI - *FR*

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

A. GAUN - *AT*

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 on Valve-side Lead-out Insulation Structure of UHVDC Converter Transformer**

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

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

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

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

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 Power Transformer Specification at Hydro-Quebec

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*

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

G. BURDEN - *US*, T. LINDSTEDT - *SE*, I. GRANT - *US*, A. COMMANDER - *US*, Y. SEHGAL - *US*, M. BERNESJO - *US*, D. BONMANN - *DE*, G. KOBET - *US*, S. DAHMAN - *US*, R. GIRGIS - *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 asset management based on condition, aging, 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 DC pattern and identification of sources

D. ALBERT - *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*

A2-317 Experiences in Transformer Onsite RefurbishmentÂ

Y. LI - *AU*

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

C. BECKETT - *AU*

A2-319 POWERGRID's Leap Towards Intelligent Condition Monitoring Of Assets

SHALINI RAJ - *IN*

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

S. LAOHANAN - *TH*

A2-321 An innovative solution to assess the Reliability of Transformers by Integrated Transformer Health Monitoring – A Pilot Project in GETCO

RAJAGOPAL KOMMU - *IN*

A2-322 Advancements in Transformer Site Dryouts

E. TENYENHUIS - *CA*

A2-323 Power Transformer Life Extension Rebuilds

T. O'NEILL - *IE*

SC A3 TRANSMISSION & DISTRIBUTION EQUIPMENT

PS1: FUTURE DEVELOPMENTS OF TRANSMISSION AND DISTRIBUTION EQUIPMENT

A3-101 EDISON: A New Generation DC Circuit Breaker

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*, L. GRABER - *US*

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

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

A3-103 VARC DC circuit breaker – a versatile concept for non-zero current interruption

L ÄNGQUIST - *SE*

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

RENE SMEETS - *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*

A3-107 Fault current limiters for electrical grids 220 kV on the base of the fast-acting high-voltage explosive commutator

N. NOVIKOV - *RU*

A3-108 Investigation of non-conventional current and voltage converters characteristics for digital substations

A. YABLOKOV - *RU*

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

G. URQUIZA - *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*

A3-113 Development and Validation of Simulation Technology for SF6 and SF6-free Gas Circuit Breaker Design

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

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

H.E. JUNG - *KR*, H.S AHN - *KR*, Y.G. KIM - *KR*, E. DURHONE - *FR*, J OZIL - *FR*, J.U. YEUN - *KR*, J. CHOI - *KR*, M. PERRET - *FR*, K. BOUSOLTANE - *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 air/vacuum technology for AIS and GIS**

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 fourth reliability survey on equipment**

H. ITO ON BEHALF OF STUDY COMMITTEE A3 AND B3 - *JP*

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

R. OTTERSTEN - *NO*

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

D. KRAJTNER - *HR*

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

P MOORE - *GB*

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

Z EMIN - *GB*

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*

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*

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*

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 PASB Breaker without additional capacitors to prevent ferro-resonance by improving the SLF performance**

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

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

J. W. KIM - *KR*, J. K. KIM - *KR*, D.J. SIM - *KR*, J. G. SUNG - *KR*, Y.H. CHUNG - *KR*, K.R. KWON - *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 arrestees on roof-mounted MV/LV transformers**

WAHIB CHABANE - *DZ*

A3-219 **pollution and humidity effects on air insulated switchgear 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**

C. ROBILLARD - *CA*

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**

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

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

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

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

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*

B1-105 **Extended Thermal Rating Calculations of 400 kV XLPE Cables for Urban Grid Applications based on long-term Experimental Data**

A. AINHIRN - *AT*

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

S CHRISTOU - *GB*

B1-107 **Development HV External Gas Pressure Cable Systems Retrofit**

J. VAN ROSSUM - *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**

L. PENG - *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*, J. Y. KOO - *KR*, K. S. LEE - *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**

J. WILLIAMS - *US*, E.C. BASCOM III - *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 **Analysis of Fiber Optic Cable Faults in Land Cable Systems**

R. STØLAN - *NO*

B1-205 **Internal Arc in HVDC Cable Termination – Phenomena and Testi**

T KARMOKAR - *SE*

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

M. CHATZIPANOS - *GR*

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

A. I. CHRYSOCHOS - *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*

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*

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*

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*

B1-216 **Proposal for a non-destructive protocol for the Verification of Absence of Voltage of Land 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 of Pre-molded Joint**

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

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

K.S KIM - *KR*, Y.S YANG - *KR*, J.H NAM - *KR*, S.K LEE - *KR*, G.J NAM - *KR*, H.J JUNG - *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*, B.W. LEE - *KR*, J.S. HWANG - *KR*, J. Y. KOO - *KR*, S.J. KIM - *KR*, C.K. JUNG - *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 hvdc mass impregnated cable systems**

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*

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

S TEE - *GB*

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

M. ERDMANN - *DE*

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*

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

K. VATERRODT - *DE*

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

L BERNARD - *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**

T.D. PARRISH - *US*, A.J. PHILLIPS - *US*, M. FULK - *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 **THOR Hammer – UK DNO trials of a new wooden utility pole decay assessment device**

R EYRE-WALKER - *GB*

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 **Application of Unmanned Aerial Vehicles (UAVs) for Patrol and Inspection of Overhead Transmission Lines**

L. LI - *CN*

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**

G.M. KWON - *KR*, H.S. AN - *KR*, Y.S. LIM - *KR*, K.Y. SHIN - *KR*, Y.H. KIM - *KR*, S.B. KIM - *KR*, W.J. WOO - *KR*

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

CHAITANYA KUNTE - *IN*

B2-111 **Creation of a geographic information system of thunderstorm activity based on the existing complex of 6-110 kV distribution networks using the devices for identifying faults in overhead lines**

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. A. KOKALIS - *GR*

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 Line (OHL) Conductors to Line Rating Variables**

J. GENTLE - *US*, K. PARIKH - *US*, J. COFFEY - *US*, A. ABBOUD - *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 Insulators in Harsh Desert Environment. Part I Optimization of Coating Thickness & Assessment Of Sand Blasting Impact

ENG. AHMAD ALTHAGFI - *SA*

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

A. BEUTEL - *ZA*

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

M. MARZINOTTO - *IT*

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

R. SCHLOSSER - *DE*

B2-210 Overhead Transmission Line Performance with respect to grounding impedance on alpine terrain

S. PACK - *AT*

B2-211 Design Validation of HTLS Conductor through a High Temperature Field Test on a 220 kV Line in Ireland

P. PORTER - *IE*

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

S. STEEVENS - *DE*

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*, Q. WANG - *CN*, N. ZHOU - *CN*, Z. LI - *CN*, Z. LIU - *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*, S.H. SONG - *KR*, J.Y. YOON - *KR*, W.J. WOO - *KR*, S.R. LEE - *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 power lines

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 **Study of a live line maintenance routine and development of a device and special procedures for increased safety**

L. DOMINGUES - *BR*

B2-302 **Development of an Overhead Transmission Line Portable Protective Arrester (PPA) for Live Work**

J. KUFFEL - *US*, R. FERRARO - *US*, C.S. ENGELBRECHT - *US*, A.J. PHILLIPS - *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*

B2-307 **Selecting Equipment for Construction of Overhead Lines Based on CO2 Emissions Calculation**

F. GHELICHI - *IR*

B2-308 **UAV (Unmanned Aerial Vehicle) Electromagnetic Fields (EMF) Compatibility and Tests requirements**

C. ROZE - *FR*

B2-309 **Development of Vertical Separated Tubular Steel Pole**

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

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

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*

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

H. KÖRNER - *DE*

B3-109 Design changes in GIS Substations after experience from Iberdrola Distribución Eléctrica

A. RICONDO - *ES*

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

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

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

M SIDDIQUI - *GB*

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 Approach to Avoid Any Accident

V GUIGNARD - *FR*

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

R PETIT - *FR*

B3-116 French Offshore Substation

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

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

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 (VDC) 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*

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

K. REICH - *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*

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*, K. R. HWANG - *KR*, M. G. KWAK - *KR*, H. D. SEO - *KR*, H. R. DO - *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 Use of Continuous Leakage Current Monitoring for Improving Substation Insulator Contamination Mitigation

J. LEVINE - *CA*

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

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

B3-302 **Data to Decisions: Future-proof Integration of Substation Intelligence**
P. JONES - *US*, D. EROL - *SE*, V. GLINIEWICZ - *SE*, Y. WU - *SE*, G. RAJAPPAN - *US*

B3-303 **A fleet of digital substations at Alliander, a blessing after an intense learning curve**
M. VAN RIET - *NL*

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

B3-305 **Intelligent IoT-connected transmission equipment in substations**
D. HELBIG - *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*

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

B3-310 **Experience with reconstruction of industrial SVC analogue controller**

B3-311 **Group Specification for Power Transformers Using Edge Computing Technology**
J.S. KIM - *KR*, D.H. KIM - *KR*, T.Y. KIM - *KR*, Y.H. CHANG - *KR*, S.M. SIM - *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**

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

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 **A Proposal for Open-Source HVDC Control (Abstract)**

K. SHARIFABADI - *NO*

B4-111 **European HVDC System Reliability Experiences**

P LINDBLAD - *FI*

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 in a very weak 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*

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

C. PISANI - *IT*

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

K. LEONTARITIS - *GR*

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

O ADEUYI - *GB*

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

C DAVIDSON - *GB*

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

S. SEMMLER - *DE*

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

J. MOORE - *NL*

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

F. LOKU - *DE*

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

W. GAWLIK - *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 - *ES*

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**

G. BALZER - *DE*

B4-133 **System Design and Test of HYOSUNG 200MW BTB VSC-HVDC in KEPCO System**

J. H. KIM - *KR*, J. C. LEE - *KR*, H. J. JUNG - *KR*, J. K. JEONG, - *KR*, H. H. YOO - *KR*

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

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

B4-135 **The Study for the Seismic Qualification of the HVDC Valve Structure**

J.W. KOH - *KR*, S.M. KIM - *KR*, K.J. KIM - *KR*

B4-136 **Fundamental Frequency Blocking Filters in HVDC Schemes- Design Considerations and Practical Case Study**

AAKANKSHA DUGAR - *IN*

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

A BERTINATO - *FR*

B4-138 **Technical solutions to mitigate and predict 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 MVDC link in Distribution Network**

C. HAN - *KR*, G. JANG - *KR*, H. LEE - *KR*, D. RHO - *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 **A Case Study on the Advantages of SSSC Devices over Traditional Series Compensation on New Transmission Facilities**

W. BOJORQUEZ - *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**

A OWENS - *SE*

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

T SOONG - *SE*

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

P VUORENPÄÄ - *FI*

B4-306 **Evaluating Modular Voltage Source Converter Based Technology in National Grid Electricity Transmission System with EMT Studies**

R GUPTA - *GB*

B4-307 **Development of active filter function for STATCOM**

T. TATSUMI - *JP*

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

P. HARRINGTON - *AU*

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

J. HU - *CA*

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

SANGITA JANA - *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. 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 enviroment**

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*

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

C TEOH - *GB*

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

J. RESCH - *AT*

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

S. BHOLA - *AU*

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

J. CARDENAS - *ES*

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

J. ROMÁN - *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*

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**

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

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*

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*

B5-212 The experience of organization PMU data transmission networks in the 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 for Rte's R#SPACE project

X. MICHAUT - *FR*

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

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

B5-218 Engineering And Management Of Communication Networks In Powergrid's First Digital Substation

BARINDRA NARAYAN 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*

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*

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**

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

ENG. MALIK AL HAJJI - *SA*

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

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

E. CIAPESSONI - *IT*

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

K BELL - *GB*

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

P. TUSON - *ZA*

C1-114 **Development and Challenges in Energy Economics in the SEERC Region (South East European Regional Council of CIGRE)**

K. REICH - *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 REE's Investments**

R. DE LA FUENTE - *ES*

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

S. U - *CN*, L. CHEN - *CN*, B. ZHOU - *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 **The operation and planning requirements for fast restoration and hardening of power grids after extreme event**

M. MOHAMMADI - *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*

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

B. FILIP - *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**

KHALED ALWALIDI - *JO*

C1-129 **Transmission Expansion Planning for System Resilience Using Convex Relaxations**

J. CHAVEZ - *PE*

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 **The implications of electric mobility development by 2035 for the electrical system**

A TEJEDA - *FR*

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

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

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

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

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

C. VERGINE - *IT*

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

G HAWKER - *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*

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 energy Use for Li-ion Battery Application in Electrified Railways**

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

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

J. ARANEDA - *CL*

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

P. VALDIVIA - *CL*

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*

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

G MCFADZEAN - *GB*

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

W BUKHSH - *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*

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

PING-HENG HO - *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 Integration of Distributed Renewable Generation in the 2025 Australian Power System

B. O'CONNELL - *AU*

C1-312 Sizing of STATCOM for grid code compliance of renewable energy plants

E. OLEA - *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*

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

J.S. YOON - *KR*, A. 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*, JUN-M CHA - *KR*, J.S CHOI - *KR*

C1-316 Whole System Coordination in Network Planning

C HIGGINS - *GB*

C1-317 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

L. GACITUA - *CL*

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

J. TORO - *CL*

C1-319 Combined Transmission and Distribution Expansion Planning

A. OUDALOV - *CH*

C1-320 Integrated technical and economic model of distributed energy resources for 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

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

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

A. OLIVEIRA - *BR*

C2-103 Analysis of Under Frequency Load Shedding During Taiwan's 815 Blackout Event

YU-HSIEN CHANG - *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

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

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

C. HEIER - *US*

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

M KUIVANIEMI - *FI*

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

A-J NIKKILÄ - *FI*

C2-109 Reliability of the GCC Interconnector

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 Software Tool for Assessment of Seasonal Step-Up Transformer Optimal Tap Settings

JASNA DRAGOSAVAC - *RS*

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

J LINDGREN - *SE*

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 for Determine the Cause and Location of Events in Transmission Network

I. IVANKOVIC - *HR*

C2-115 Inter-area oscillations in Continental Europe: events analysis and countermeasures

C. PISANI - *IT*

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

Q HONG - *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*

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

ERDI DOGAN - *TR*

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

T. OCHI - *JP*

C2-121 Short term local weather forecast apply to nationwide Photo Voltic (PV) solar farm in Jordan

AHMED ALDOHNI - *JO*

C2-122 Stability margin monitoring systems – tool to increase grid capacity

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*

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

J.J. ABELLÁN - *ES*

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

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

C2-130 **New adaptive automates 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*, H.J. KANG - *KR*, S.K. KIM - *KR*, S.W HAN - *KR*

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

T. G. KIM - *KR*, H. S RYU - *KR*, E. S JEONG - *KR*, K. H KIM - *KR*, T. S. KIM - *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*

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**

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

C2-202 **Egypt-Sudan Electricity Interconnection – Technology Concepts and Operational Experiencej**
MOHAMED ZAKARIA - *EG*

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

C2-204 **The role of load and distributed generation in bottom-up power system restoration**
C. PISANI - *IT*

C2-205 **TSO-DSO Co-Operation – Control Centre Tools Requirements**
J. POLLOCK - *GB*

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

C2-207 **TSO / DSO Cooperation and Interactions in Systems with Very High Shares of Renewable Generation**
W.H. WELLSSOW - *DE*

C2-208 **TSO-DSO Cooperation in a System of Systems**
G. DE JONG - *NL*

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**
M PLECAŠ - *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

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. TUOHY - *US*, D. LINDSEY - *US*, A. CHUANG - *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 Distributed Energy Resources and Storage Means in the Brazilian Power System**
S. CISNEIROS - *BR*

C2-C6-304 **Integrating Distributed Energy Resources - A Wholesale Perspective**
Y. CHEN - *US*, J. BLADEN - *US*, J. HARRISON - *US*, C. WANG - *US*

C2-C6-305 **Coordination of Distributed Resources in the Provision of Essential Reliability Services for Active Power Management**
D. STENCLIK - *US*, M. RICHWINE - *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*

C2-C6-309 “Puglia Active Network” Project: flexibility from Regional Smart Grid

C. BALDI - *IT*

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

N. D. HATZIARGYRIOU - *GR*

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

J. FRUNT - *NL*

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

D WILSON - *GB*

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

P CHANDLER - *GB*

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

D. LEHMANN - *DE*

C2-C6-315 Central and Decentral Distribution Grid Control: towards a new intelligent architecture

V. BIAGINI - *DE*

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

M. SCHRAMMEL - *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*

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

P. MANCARELLA - *AU*

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

S. CHEREVATSKIY - *AU*

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

K. DOENGES - *ES*

C2-C6-324 Multi-self-verification and Multi-self-switching based Adaptive Synchrophasor Estimator and Its Application

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

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 System Operation Challenges for Distributed Wind Power Resources in India – A Case Study

VIVEKANAND SINDKAR - *IN*

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 "better grid project" implementation

J. KAYS - *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*

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 negative land use impact and carbon footprint when developing new energy transmission sites

E. T. HOFF - *NO*

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

W. HAANSTRA - *NL*

C3-204 Integrating Natural Capital Assessment in the creation of substations.

J. DEN HARTOG - *NL*

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

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

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 **Powergrid's Experience on Electric and Magnetic field induction under 765/400 kV power transmission lines**

DHYEYA R SHAH - *IN*

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

J.Y. BOURMAUD - *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*

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

M. SHIRAI - *JP*

C3-304 **Development of Eco-friendly Design Transmission Tower**

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

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 **Losses Reduction through Advanced Modelling of Complex Networks**

R BRYANS - *GB*

C4-102 **Fault Level Monitoring in Distribution Grids**

D GHEORGHE - *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*

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*

C4-109 Defining the power system load 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 Methods and technology for electromagnetic environment and electromagnetic compatibility study at power engineering objects

R. BORISOV - *RU*

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

C. GAUNT - *ZA*

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

G. HESSE - *AU*

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

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

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

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

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

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

A. MORTON - *AU*

C4-120 Implementation of Emerging Techniques & 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*, Y. WANG - *CN*, C. FENG - *CN*, D. LIU - *CN*, W. ZHUANG - *CN*, X. LI - *CN*, S. WANG - *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. MAHOOR - *US*, M. LIETHEN - *US*, M. MONDELLO - *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 **Holistic Approach to Modelling and Tuning of a Wind Farm in Conjunction with a Synchronous Condenser in a Low System Strength Grid**

L. KHALIL - *AU*

C4-127 **Power system analysis tools for supporting renewable generation connections**

N. PAHALAWATHTHA - *AU*

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

J.C. PÉREZ - *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**

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

C4-202 **Benban PV Solar Park – Impact on the Operation of the Egyptian Power Transmission System – M.Z. KAMH * M. FAWZY M. SCHWAN A.M.K. ELMO**

MOHAMED ZAKARIA - *EG*

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

S KARAMITSOS - *GB*

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

P. DATTARAY - *IE*

C4-205 **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**

S. NOLAN - *IE*

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

B. BADRZADEH - *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 the HVDC INELFE Link and Using the Real Simulation**

A PETIT - *FR*

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

T PREVOST - *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*

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*

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 **Analysis of Calculating Harmonic Voltage Distortion Gain Calculation Methods on Transmission and Distribution Networks**

D MILLS - *GB*

C4-305 **System-wide amplification of background harmonics due to the integration of high voltage power cables**

J. B. KWON - *DK*

C4-306 **Study on 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*

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*

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

N. 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 Argentinean Electrified Railways: Comparison of measurements in two different traction substations**

F. ISSOURIBEHERE - *AR*

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

K. DING - *CN*

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

P. MIGUEL - *BR*

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

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

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

P. SCHUTTE - *ZA*

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

K. VELITSIKAKIS - *NL*

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

I. TANNEMAAT - *NL*

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

K. YAMAMOTO - *JP*

C4-320 **Dynamic Lightning Protection of Smart Gird 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*, K.Y. SHIN - *KR*, J.W. WOO - *KR*, J.S. HWANG - *KR*, J.W. KANG - *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 and its Impact on Distance and Differential Protective Relaying 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 single core and three core extruded cables**

S. NAUTA - *NL*

SC C5 ELECTRICITY MARKETS AND REGULATION

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

J. HARRISON - *US*, L. ZHAO - *US*, J. BLADEN - *US*, C. WANG - *US*

C5-104 From services to markets – system and market impacts of energy transition in European markets

R HIRVONEN - *FI*

C5-105 Principles for allocation of cross-zonal capacities for the exchange of balancing capacity or sharing of reserves

R. BEUNE - *NL*

C5-106 System Operator Challenges in Spot Market

C5-107 Incentivizing Generator Flexibility Investments: A Stochastic Analysis of Various Market Designs

J. FRASIER - *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*

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

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 Electricity Market

K.V.N. PAWAN KUMAR - *IN*

C5-118 The Economic and Environmental Value of the Demand Response Market in Korea

S. I. 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 DESPATCH PAN INDIA

PHANISANKAR CHILUKURI - *IN*

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*

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 **Mexico ´s Bilateral Market-An Alternative for Renewable Energy Development?**

M.A. AVILA ROSALES - *MX*

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**

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**

M. WEBSTER - *US*, J. BUKENBERGER - *US*

C5-302 **The use of flexibility as an alternative to investments in grid capacity**

E. GRAMME - *NO*

C5-303 **Development and Impact of Flow-Based Methodology in Core Region**

M. VAJDIC - *HR*

C5-304 **Market design models for power systems with high RES shares**

M. C. DALENA - *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**

D. PUGLIESE - *IT*

C5-307 **System strength, inertia and network loss factors - implications for power networks and renewable generation**

S. HINCHLIFFE - *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*

C5-309 **Evaluating Various Battery Behaviours to Maximise Consumer Value Across the Electricity Supply Chain**

E. MA - *AU*

C5-310 **Improved method for calculating ISKs based on node transmission contribution**

X. LI - *CN*

C5-311 **A cooperative game theoretic approach in transmission service cost: Effects of Northeast Asia Supergrid to Korean electric power system**

H.-I. CHANG - *KR*, K.W. JEONG - *KR*, H.S SONG - *KR*, K.S. KANG - *KR*, H.J. KANG - *KR*

C5-312 **Markets and platforms to coordinate the procurement of energy services from large-scale and small-scale assets connected to the electricity network**

C. MADINA - *ES*

C5-313 **Strategy for Northeast Asia Power System Interconnection Technical Assistance to Mongolia General Overview**

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 A Practical Application Case of Large Scale Energy Storage System for Energy Arbitrage at Steel Plant

S.W. LEE - *KR*, D.H. CHOI - *KR*, B.G. JIN - *KR*, Y.J. CHOI - *KR*

C6-106 Contribution of energy storage to capacity adequacy – Application to island power systems

G. PSARROS - *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*

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 in three grids in the region of Murcia depending on storage location for residential PV systems

D. RUBIO-MIGUEL - *ES*

C6-112 Considerations for Energy Storage in Distribution Planning

J. TAYLOR - *US*, M. BELLO - *US*, A. MAITRA - *US*, J. PEPPANEN - *US*

C6-113 Accounting for the uncertainty associated with consumer-led demand side response

G MCFADZEAN - *GB*

C6-114 Modelling Considerations for Assessing Smart Inverter Functions - A Case Study from Northern California

T. HUBERT - *US*, F. PETRENKO - *US*, O. TRINKO - *US*, M. HERNANDEZ - *US*, J. DEBOEVER - *US*, M. MCCARTY - *US*, J. PEPPANEN - *US*

C6-115 Exploitation of advanced Modular FACTS to increase flexibility of Distribution Networks and enable the connection of Distributed Energy Resources

C WINNING - *GB*

C6-116 Optimization of the Effect of Electric Vehicle Charging Stations by Using Particle Swarm Optimization

HAZAL CIFTCI - *TR*

C6-117 Effects of Electric Vehicles Charging on Power Distribution Systems “A Case Study in Aqaba-Jordan”

RUIA 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*

C6-121 **Automated Target Grid Planning in Distribution Systems Considering Optimization of Grid Structures**

M. BRAUN - *DE*

C6-122 **Installation of DER in Distribution Automation Schemes**

B. HERNANDEZ - *US*, N. SELAK - *US*, M. MONDELLO - *US*

C6-123 **Innovative Solutions for Smart Management of Power Grids**

J.C. DÍAZ - *ES*

C6-124 **Voltage Control in the Active Distribution Networks, Oman Case Study**

C6-125 **A Study on the System Architecture of Typical Energy Use Scenarios in Industrial Parks**

K. SU - *CN*

C6-126 **Smart Transformer Use in Net-Zero Energy Factories**

P. LOMBARDI - *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*

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**

S. CRAY - *DE*, J. GLASSMIRE - *US*, J. BAUMGARTEN - *US*, A. LAKSHMINARAYANAN - *US*, T. DRAKE - *US*, K. HUTCHISON - *US*, H. BITARAF - *US*

C6-203 **Optimal Energy Management and Control for Load Management in V2G EV-integrated Microgrid**

J.W. KIM - *KR*, H.C. CHO - *KR*, G. S. BYEON - *KR*, S. H. LIM - *KR*, J.Y. KIM - *KR*, S.K. KIM - *KR*

C6-204 **Cyber-Physical Resilient Interoperable Microgrid Networks**

M. CINTUGLU - *US*, A. VALDES - *US*, H.J. LIU - *US*, P. BUASON - *US*, D. LAWRENCE - *US*, A. KONDABATHINI - *US*, A. BRISSETTE - *US*, R. MACWAN - *US*, H. CHOI - *US*, S. LAVAL - *US*, D. ISHCHENKO - *US*

C6-205 **Using a Real Time Digital Simulator to Test a Microgrid Integrated Solar Storage Technology**

C. ZHANG - *US*, N. GURUNG - *US*, S.R. KOTHANDARAMAN - *US*

C6-206 **A Microgrid Validation Centre to enable Validation and Optimisation of the Design, Simulation, Intelligent Control and Asset Management of Microgrids**

M OSBORN - *GB*

C6-207 **Cellular approach and new grid edge solutions for distribution systems and industrial sites in Germany**

B. BUCHHOLZ - *DE*

C6-208 **Demonstrating a Virtual Power Plant on the Isles of Scilly**

S JUPE - *GB*

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*

C6-210 **4-legs electronics active load for anti-islanding evaluation**

J. BALLESTÍN - *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*

C6-213 **Smart Rural MicroGrid Solutions for Off-grid Applic**
R. DE LANGE - *ZA*

C6-214 **ENEL experience in rural electrification in South America area**
E. VALIGI - *IT*

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*

C6-218 **Hardware in the loop microgrid controller testing**
D. VILLEGAS - *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**
BALINT HARTMANN - *HU*

C6-221 **Active Distribution Test System for Typical New Zealand MV and LV Networks**
N. K. C. NAIR - *NZ*

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 see page 28

SC D1 MATERIALS AND EMERGING TEST TECHNIQUES

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*

D1-104 **Influence of temperature variation on transformer bushing monitoring**
N ABEYWICKRAMA - *SE*

D1-105 **A new measuring approach for partial discharge measurements on GIS based on magnetic antennas.**
ARMANDO RODRIGO MOR - *NL*

D1-106 **Challenges for space charge measurements with the PEA technique in the thick insulation of HVDC Cables**
M. ALBERTINI - *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*

D1-108 **Evaluation of dynamic loading capability for optimal loading strategies of power transformers**

I. LUPANDINA - *AT*

D1-109 **Partial discharge analysis in gas-insulated HVDC systems using conventional and non-conventional methods**

T. GÖTZ - *DE*

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 the fast-rise impulse voltage**

Y. LI - *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*

D1-114 **On-Line Diagnosis Methods for Transformer Winding Deformation Based on Running Voltage and Current Correlation Mining**

Y. ZHENG - *CN*, W. WANG - *CN*, C. LI - *CN*, L. LIU - *CN*, D. WEN - *CN*, H. YAO - *CN*, X. SUN - *CN*, W. DU - *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*

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**

S.J. HAN - *KR*, T.H. KIM - *KR*, J.J. KIM - *KR*

D1-120 **Oxidative degradation of dielectric oils over time. A real case**

A. ZAYA - *ES*

D1-121 **Development of OF cable insulation deterioration diagnosis technique using Support Vector Machine**

B.S. KWAK - *KR*, A.R. KIM - *KR*, H.J. PARK - *KR*, T.H. JUN - *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 **Composite voltage test for HVDC equipment**

A. VOSS - *CH*

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*

D1-204 **Investigation into the effect of cold temperature on the physical properties of dielectric liquids**

P LIVESEY - *GB*

D1-205 **CANCELLED - Mechanical and Electrical Performance of High-Stressed Composite Hollow Insulators for 800kV HVDC Wall and Transformer Bushings**

J. SEIFERT - *DE*

D1-206 **Characterization of pressboard mechanical properties for understanding the dynamic behaviour of transformer winding clamping pressure**

T. SAHA - *AU*

D1-207 **A new type of failure of composite insulators: service experience, degradation characteristics, root cause, experimental simulation and countermeasures**

X. LIANG - *CN*, Y. GAO - *CN*, W. BAO - *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. ROSSNER - *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*

D1-210 **Analysis of stray gas according to characteristics and degassing conditions of insulation oil in power transformer**

J.W. LEE - *KR*, J.T. KIM - *KR*, J.H. SONG - *KR*, D.H KIM - *KR*, K.H. LEE - *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 **Byproduct-free curing of a highly insulating polyethylene copolymer blend: an alternative to peroxide crosslinking**

M. MAURI - *NO*

D1-302 **Replacement of area substation transformers with flexible units of reduced footprint and increased overloadability**

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*

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**

J. H. SON - *KR*, V. ZOELLMER - *DE*, D. J. PARK - *KR*, J. Y. SHIM - *KR*, J. EITSCHUN - *DE*

D1-308 **Erosion Performance of Boron Nitride Filled Silicone Rubber Composite as an Outdoor Insulator Weathershed Material**

M. JOY THOMAS - *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**

T. DOKIC - *US*, Z. OBRADOVIC - *US*, M. PAVLOVSKI - *US*, R. SAID - *US*, M. KEZUNOVIC - *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*

D2-104 **Machine learning implementation for improving grid operations**

A KULKARNI - *GB*

D2-105 **Developing Enhanced Information and Data Exchange to Enable Scalable TSO-DSO Interoperability**

G TAYLOR - *GB*

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*

D2-108 **Adopting IIoT technology to realize controllability of existing small-scale distributed energy resources**

D. LAI - *TW*

D2-109 **Electric Power Utilities Disturbance analysis using Bayesian Network 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 power systems**

A. RODIONOV - *RU*

D2-112 **Machine learning as an intelligent tool for long-term forecasting of power equipment technical state and 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 **The IoT solution architecture for Power Distribution and its application**

S. GUO - *CN*

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 and Issues of Drone Operation System for Diagnosis of Transmission Facilities in KEPCO**

M. H. CHOI - *KR*, N. J JUNG - *KR*, C. W. LIM - *KR*, J. Y. 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 **Smart Grid Developments in India**

REJI KUMAR PILLAI - *IN*

D2-127 **CNDbot: A Robot for Operation Information Management in the Colombian Power System**

A. DUQUE - *CO*

D2-128 **On the Path to Autonomous Power System Management**

A. OUDALOV - *CH*

D2-129 **How to deploy Augmented Reality solutions into day to day DSO operations**

MATJAŽ OSVALD - *SI*

D2-130 **Management of data from smart measuring device for predictive maintenance**

MAJA SAVINEK - *SI*

SC D2 INFORMATION SYSTEMS AND TELECOMMUNICATION

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.M. ABDULLAH - *US*, S.R. KOTHANDARAMAN - *US*, M. MAHOOR - *US*, N. GURUNG - *US*

D2-202 **Distributed Energy Resources and the Smart Grid: The Role of Soft Cybersecurity**

G. AZEVEDO - *BR*

D2-203 **Leveraging SOC-as-a-Service to Counter Some of the Cybersecurity Challenges of Combined IT and OT Operations**

T.W. CEASE - *US*, R.E. KING - *US*, D.K. HOLSTEIN - *US*

D2-204 **Applying Automated Cyber Risk Assessment for the Smart Grid**

DJENANA CAMPARA - *BA*

D2-205 **CYber Resilience framework for ENErgy systems**

G. DONDOSSOLA - *IT*

D2-206 **An Intrusion Detection System for the Smart Grid based on Computational Intelligence Algorithm**

G. ARROYO-FIGUEROA - *MX*

D2-207 **Security threats and challenges in the transmission of condition and forecast data for determining the availability of substation equipment**

K. VIERECK - *DE*

D2-208 **A collaborative cybersecurity solution between IDS and Ethernet switches, enables proactive, and seamless cyber protection in substation systems**

DEAN SUN - *TW*

D2-209 **Boosting Cybersecurity in Communication Gateways for Better Substation Protection and Control**

JOSHUA LIN - *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 interconnection of new flexibility providers**

F. RAMÍREZ - *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*

D2-213 **Cyber Secured Grid Operations With Machine Learning & Artificial Intelligence Implementation- A Case Study**

YASH KULKARNI - *IN*

D2-214 **Leading North American Electric Utility 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*

D2-303 SIARA – Proving suitability of R-GOOSE over Packet Switched Wide Area Networks for future wide area applications

P MOHAPATRA - *GB*

D2-304 Comprehensive Validation of Packet-Based Communications for Future Energy Systems

S BLAIR - *GB*

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

JOZTHDWING RAMIREZ - *VE*

D2-307 Application of MPLS-TP for Transporting PowerÂ System Protection Data

N. JOSHI - *AU*

D2-308 Telecommunications Network Modernisation in Utilities: Challenges of Migrating from Time Domain Multiplexing (TDM)Â Technology to Packet Switched Network (PSN)

P. TUAZON - *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*

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

S. KHALAJ - *IR*

D2-312 Development of IoT sensor system for monitoring/diagnosis of the power distribution system

C.-M. SON - *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 for distance and differential protection over WAN MPLS-TP networks

M. KRANICH - *CH*