

CIGRE Paris Session 2026

Provisional Technical Programme

See the list of Session Papers based on accepted synopses.

Kindly note that Session Papers selection is still under process. Therefore, the list may evolve. Final selection results will be on 11th May 2026.

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A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION

A1 PS1 - Rotating electrical machines and the energy transition

ID: 10139

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: Rotating electrical machine, turbogenerator, grid stability, kinetic inertia, Rate Of Change Of Frequency (RoCoF), Renewable Energy Integration, frequency variation, energy transition

Contribution of Large Synchronous Turbogenerators to RoCoF Mitigation in Low-Inertia Grids

H. BIELLMANN¹, E. BRONNER², V. DUBS³, V. FERNAGUT³, B. GUIDOUX³, E. MONNOT³

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ID: 10141

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: Inertia, Grid service, Grid stability, Frequency

Contributions to Stability through System Inertia: a fair reconciliation mechanism for the European electrical system

J. HIS, T. VINAS

EDF

ID: 10194

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: Synchronous, Compensators, STATCOM, HVDC

Synchronous Condenser Integration: A Green Grid Stabilisation Model for India's 500 GW Renewable Energy Vision

R. KUMAR*, K. K. GUPTA, V. BAGADIA, K K SARKAR

CTUIL

ID: 10200

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: CHEMICAL, CLEANING, IMPACT ON STATOR, WINDING

Comprehensive analysis of chemical cleaning impact on stator winding hollow conductors and generator cooling water system performance

A. PANDEY*, K NAGESH, N. KHANDELWAL

NTPC Ltd

ID: 10792

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: Hydropower modernization, digital systems, failure analysis, asset management

Performance Analysis of Electronic Components and Digital Systems in Modernized Hydroelectric Power Plants

R. T. SINISCALCHI¹, E. C. BORTONI², L. J. L. MENDES¹, C. C. VIEIRA¹, R. A. SOUZA¹

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ID: 10802

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: Turn-to-turn insulation, transient voltage, field winding, analytical calculation

Analytical Determination of the Maximum Induced Turn Voltage in the Field Winding of Hydro-Generators During Stator Faults – The Turn-to-Turn Test Voltage

T. HILDINGER

Voith Hydro Brazil

ID: 10819

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Enhanced Static Excitation System architecture for high-capacity Turbogenerators with improved current sharing and harmonic performance

K. SUBIR*, C. PARAG

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ID: 10820

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: Pumped Storage Plant, Inverter Based Resources, Low/High Voltage Ride Through, Point of Interconnection, Master Power Plant Controller, Electromagnetic Transient, Critical Clearing Time, Static VAR Generator

Recommendations for Technical Standards for Synchronous Machines Coloacted with Inverter Based Resources

H. HIMANSHI*, J. SHARMA, A. K. MEENA, D. N. ROZEKAR

Central Transmission Utility of India Limited, India

ID: 11244

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: turbogenerator, harmonization of standards, technical requirements

A Modern Russian Standard for Turbogenerators

E. KADI-OGLY*¹, N. KOROVKIN², A. LASHUKOV¹, V. KUZ'MICHEV³, M. ROYTGARTS*⁴, N. GRISHIN⁴, R. CHESTYUNIN⁵, A. GRIGOR'EV⁶, Y. SERGIEVSKIY⁷, N. SIZOV⁸, P. SOKUR⁹, Y. SMETANYUK¹⁰

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ID: 11339

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: Evaluation, Generator, Condenser Assets

Life Evaluation of Strategic Generator and Condenser Assets

R. SCOLLAY, V. BHANDARI

Machinemonitor, Australia

ID: 11447

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: Thermal power generation; Condenser; Retrofit; Flexible operation

Development and Application of Adding Synchronous Condenser Function to Turbo Generator

F. CHEN, X. XIE, K. CAI, Z. XIAN, C. LIU

Shanghai Electric Power Generation Equipment Co., Ltd. Generator Plant

ID: 11449

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: Hydro-generators; 1, 000 MW unit; High-voltage insulation; Air-cooled; Dynamic stability; Thrust bearing

Development and Engineering Application of Key Technologies for Baihetan 1000 MW Fully Air-Cooled Hydro-Generators

G. LI, G. QIN, B. ZHOU, Q. ZHANG, Z. WU, B. LAN

Harbin Electric Machinery Co., Ltd.

ID: 11451

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: Air-cooled generator; Boron nitride(BN); High thermal conductivity(HTC); Heat conduction model; Fluorescence optical fiber temperature measurement (FOFTM)

Development of a High Thermal Conductivity Air-Cooled Generator Fabricated by GVPI technology

S. YU, Y. ZHANG, G. ZHENG, Y. WEI, B. YANG

Shanghai Electric Power Generation Equipment Co., Ltd. Generator Plant

ID: 11452

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: Coordinated frequency-voltage support, flywheel energy storage condenser, brushless doubly-fed motor, power decoupling control, operating mode regulation

Research on the Application of High-Inertia Flywheel Energy Storage Condenser in High-Proportion Renewable Energy Power Systems

Y. LYU¹, Y. GAO¹, Z. LI², X. ZHA¹

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ID: 11790

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: predictive monitoring, early fault detection, machine learning, hydropower plant

Advanced Machine Learning-Based System for Predictive Monitoring and Early Fault Detection in Dubrovnik Hydropower Plant

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ID: 11802

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: Grid code, FRT, Two axis dynamic model, CCT, CCA, Inertia, Ceiling factor, Braking resistor, Fast valving

Parameter-driven strategies to analyze fault ride through capability of synchronous generator

P. BARUA

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ID: 11889

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Keywords: Energy Transition; Rotating Electrical Machines; Flexible Operation; Cycling; Induced Degradation; Combined Cycle Gas Turbine; Insulation Degradation; Operational Duty Shift; Reliability Analysis; Condition-Based Maintenance.

Impacts of the Energy Transition on the Reliability and Operational Flexibility of Rotating Electrical Machines: A Case Study of the Operational Cycling and Reliability from the Samra Combined Cycle Power Plant, Jordan

Y. MASHAGBEH

SEPCO-Samra Electric Power Generating Co

ID: 11952

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS1 - Rotating electrical machines and the energy transition

Underexcited saturation state in cylindrical rotor synchronous machines

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A1 PS2 - New machine developments

ID: 10142

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Keywords: Turbo generator, hydrogen-cooling, water-cooling, four-pole generator, design, development, nuclear, factory test

Type test of the largest commercial 4-pole generator and exciter for a EPR power plant

B. WAHDAME¹, D. DE-ROZARIO¹, V. FERNAGUT², S. FERRIS²

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ID: 10180

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Keywords: Circulating Currents - Harmonics - Nacelle - Reliability - Supra-Harmonics - Inter-Harmonics - Wind Turbines - DFIG

A Relative Harm Index Framework for Quantifying and Mitigating Circulating Currents, Harmonics and Supra-Harmonics in Wind Turbine Drive-Train Reliability

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ID: 10185

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Keywords: High-Voltage Rotating Machine (HVRM) - Partial Discharge (PD) - Outer Faraday Shield - Bleaching - Carbon Black - Conductive Coating - Epoxy Resin - Generator Maintenance - Insulation Degradation - Ripple Springs - Slot Coating - Stator Winding

Slot Conductive Coatings for Electrical Contact Control in High-Voltage Generator Stator Windings

A. KHAZANOV, A. GEGENAVA, A. NIKOLAEV

National Electric Coil, United States of America

ID: 10196

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Synchronous Condensers for India's Evolving Grid: Leveraging India's Retiring Generators for Reactive Power and Inertia Support

V. V YOM*, H. KUSHWAHA, R. SINGH
BHEL

ID: 10218

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Keywords: Thermal Cycling - Stator Winding - Form-Wound Bars - Insulation System - IEEE 1310 - IEC 60034-18-34 - Digital Twin - Finite Element Analysis - Delamination - Acceptance Criteria - Field Correlation

Thermal Cycling of High-Voltage Generator Stator Windings: A Comparative Study of IEEE 1310 and IEC 60034-18-34 Using Simulation and Testing Experience

A. NIKOLAEV, A. KHAZANOV, A. GEGENAVA
National Electric Coil, United States of America

ID: 10219

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Keywords: Accelerated Aging - Gradient Coating - Corona Discharge - Silicon Carbide (SiC) - Field Control - High Voltage Rotating Machine (HVRM) - Insulation Degradation - Partial Discharge (PD) - Outer Conductive Coating - Stator Winding - Stress Grading

The Gradient Coating Systems for Electrical Field Control in High-Voltage Generator Stator Windings

A. KHAZANOV, A. GEGENAVA, A. NIKOLAEV
National Electric Coil, United States of America

ID: 10782

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Keywords: Insulation systems, stator windings, specification guidelines, reliability

Insulation Systems for Motors, Generators and Synchronous Condensers – Contributions to Writing Stator Winding Design Specifications

F. R. SPEZIA, C. S. GONÇALVES, J. A. DORIGON
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ID: 10988

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Keywords: Synchronous condenser, oil system failure, lube oil, jacking oil, AC pumps, DC pumps, emergency system, control system, inspection, flywheel, rotor, stator, bearings

"Severe damage to synchronous condensers, caused by lube failure, demand stricter requirements for the oil system"

A. DEL GRACCO
TERNA, Italy

ID: 11253

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Keywords: Akkuyu NPP, turbogenerator's brushless exciter, factory tests

Features of Akkuyu NPP Turbogenerator's Brushless Exciter and Factory Test Results

E. KADI-OGLY¹, D. DE-ROZARIO², B. WAHDAME², P. MEYER², A. CHEREPANOV¹, A. ALEKSANDROV¹, A. REZNICHENKO¹
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ID: 11351

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Keywords: Hydro generator, Variable speed, Full-power converter, Grid code compliance, Model identification

Model Validation of Full-power Converter Variable Speed Hydro Generators

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ID: 11551

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Keywords: salient pole synchronous machines, vibration, magnetic balancing, rotor current control, unbalanced magnetic pull

Lessons learnt from actively balancing two units magnetically with rotor segmentation and dedicated power supplies which results in resolving vibration issues

U. LUNDIN

Magstrom Nordic

ID: 11953

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Keywords: Hydro-Generators; Motor-Generators; Pumped Storage; High-Speed; High-Output

Development and design of a 390 MVA / 600 rpm air-cooled motor-generator

T. HILDINGER¹, G. KLAUS², B. DIEBEL³, D. EMMRICH⁴, G. MORONIS⁵, M. ADAM⁶, M. GIESE⁷, S. ALLGEYER⁸

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ID: 11954

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Comparison of HV-Insulation system acc. IEC 60034-18-42 for a hydro-generator with different inverter technologies

T. HILDINGER¹, C. STAUBACH²

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ID: 12595

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Keywords: Hydro generators, integrated damper winding, pole-to-pole impedance, saturation effects, subtransient reactances

The integrated damper winding behaves like a continuous classic damper winding during sudden short circuits in large, saturated hydro generators

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ID: 12615

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Keywords: Capability curves, magnetic saturation, reactive power limits, synchronous generators, voltage control

Saturation effects on synchronous generator reactive power limits: comparison of constant reactances and precise methods

F. GEGÚNDEZ¹, L. ROUCO², I. EGIDO³, E. LOBATO⁴, Á. BENÍTEZ DOMÍNGUEZ⁵

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ID: 12630

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS2 - New machine developments

Keywords: Hydrogenerator, Cooling method, Operation and maintenance

An Analysis of Long-Term Operation and Maintenance Characteristics of Air-Cooled and Evaporative-Cooled Hydrogenerators at Liji Xia Hydropower Station

J. CHEN¹, Y. JIA², L. RUAN³, C. SUN⁴, B. BAO⁵, W. JIANG⁶, T. WEI⁷, X. ZHANG⁸

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A1 PS3 - Asset management and new challenges

ID: 10143

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Generator, Short Circuit, Electrical Arc, Overpressure, Model

Calculation of Overpressure in the Enclosure of a Hydroelectric Generator during a Phase-to-Phase short circuit with electric arc

P. SCHLUPP

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ID: 10198

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Hydro Generator, Stator Core, Mechanical Damage, EL CID, In-situ Repair

Mechanical degradation of hydro generator stator core: advanced diagnostics, on-site remediation, and engineering insights from a field case

S ADHIKARI*, I P RANJAN, S. K. MISHRA, J. PANI

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ID: 10754

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Circulating current loss, Roebel transposition, Series connection, Temperature, Turbine generator, Armature winding

Theoretical and Experimental Evaluation of Hot-spot Temperature at Series Connection of Turbine Generators

K. HATTORI¹, K. KOBASHI², K. NAKAMURA³

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ID: 10757

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Retaining ring, Turbine generator, Ultrasonic testing, Robotic system, Dry couplant, Non-destructive testing, Maintenance optimization

Development of an Ultrasonic Testing Robot for Retaining Rings in Turbine Generators

M. SAITO, F. SATO, S. MUKOYAMA, H. KATAYAMA

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ID: 10784

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Reverse engineering, Esson's identity, hydro generator modernization, utilization factor

Heterogeneous Air Gap and Its Consequences Modelling Residual Magnetic Attraction Force

M. UEMORI¹, J. ROCHA¹, E. C. BORTONI²

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ID: 10785

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Surge testing, turn insulation, field testing limitations, high-voltage stators

Theoretical Review and Precautions on Surge Testing Medium and High Voltage Stators in Fully Assembled Rotating Electrical Machines

R. FERREIRA¹, F. R. SPEZIA²

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ID: 10787

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Vibration sparking, spark erosion, slot coating resistance, electrical degradation

Methodology to Estimate the Risk of Vibration Sparking (Spark Erosion)

T. HILDINGER

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ID: 10789

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Stator insulation, partial discharge, SFRA, hydro generator diagnostics

Assessment of the Electrical Insulation of the Stator Windings of a Large Hydrogenerator

J. NASCIMENTO, F. BRASIL

Eletronorte Brazil

ID: 10796

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Condition monitoring, stator ovalization, vibration analysis, operational strategy

Condition-Based Operational Strategy for Life Extension of a Hydro Generator with Stator Ovalization

T. K. MATSUO, E. NASCIMENTO, R. MATOS, T. KLEIS, P. SILVA

AQTech Brazil

ID: 10797

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Bulb generators, partial discharge, long-term monitoring, predictive maintenance

Partial Discharge Monitoring Experience in Bulb Generators

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ID: 10801

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Dynamic eccentricity, unbalanced magnetic pull, vibration monitoring, diagnostic analysis

Case Study: Vibration Analysis for Detection of Unbalanced Magnetic Pull and Dynamic Eccentricity in a 200 MW Vertical Kaplan Turbine

E. NASCIMENTO, P. SILVA, T. KLEIS

AQTech Brazil

ID: 10821

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Hydro Generator Diagnostics; Insulation Condition Assessment; Partial Discharge Monitoring; Health Indexing; AI-Assisted Asset Management

AI-Augmented Multi-Test Diagnostic Framework for health indexing in Hydro Generator Fleets

S. ADHIKARI¹, N. K. SINGH^{*1}, C. KOLEY², B. BHATTACHARJEE³, A. TIWARY¹, J. PANI¹, P. KUMAR¹

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ID: 11352

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Applied use of AI for stator winding insulation diagnosis using online PD monitoring

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ID: 11536

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: motors, generators, rotating machines, resistive imbalance, electromagnetic imbalance, air gap eccentricity, open rotor bars, broken rotor bars, winding resistance, collapsed bearings

Detection of electromagnetic faults (air gap eccentricity, open rotor bars, connection issues) in induction rotating machines with off-line dual imbalance test through stator windings

D. PETSOV, S. ZUREK, J. JONES, T. RIVRON

Megger Instruments United Kingdom

ID: 11971

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: partial discharge, stator winding insulation, root cause identification, stator winding maintenance

New VHF Technology for Separating Partial Discharge Sources in Operating Stator Windings

M. SASIC¹, H. SEDDING¹, C. CHAN¹, G. STONE²

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A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: End Winding Vibration Sensor, Generator Maintenance, Water-cooled Generators, Stator Ground Fault

Mitigation and Prevention of Ground Faults in Water-Cooled Generators: A Case Study of Water Box Failures

K. THAMPANYASAKUL

Electricity Generating Authority of Thailand (EGAT)

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A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: generator, stator, winding, insulation, dielectric dissipation factor, tan d, power factor, tangens-delta, insulation ageing, diagnostic

Stator Insulation Performance: Six Decades of Experience

L. NILSSON¹, P. GENDRE¹, A. GENINI¹, M. ROHRBACH¹, D. RIESEN¹, O. KRONE¹, M. STOECKLI²

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A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: hydrogenerator, condition index, fleet management, maintenance strategy

Index-Based Fleet Management for Hydro Generators

L. NILSSON¹, P. GENDRE¹, A. GENINI¹, M. ROHRBACH¹, D. RIESEN¹, O. KRONE¹, M. STOECKLI²

¹BKW Energie AG; ²ELECTROSUISSE / CIGRE Switzerland NC Secretary

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A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Synchronous Generators, Maintenance, Intelligence System, Stress-Aware, Electro-thermal digital twin, Fuzzy logic decision-making, Operational stress tracking, Human observation integration, Machine learning extensions.

Stress-Aware Maintenance Intelligence System (SAMIS) of Synchronous Generators

J. DRAGOSAVAC¹, Ž. JANDA¹, I. KLASNIC¹, A. MIJAJLOVIC¹, N. LUKIĆ², A. LATINOVIC³, M. ĐORĐEVIĆ⁴

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A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Hydrogen-cooled generators, Oil contamination, Oil sampling and testing, Seal oil, Seal oil ingress, Wear metals

Seal oil ingress in large turbo generators: A South African utility perspective

A. N. SINGH

Eskom

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Siemens Energy Global GmbH & Co. KG

ID: 12598

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Vibration, Condition Monitoring, MEMS Accelerometers, Predictive Maintenance, Reliability Engineering

Vibration Severity Standards Development for MEMS-Enabled Condition Monitoring

M. NISHIOKA¹, E. CORAÇA², F. CARNEIRO³

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ID: 12610

A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers

Topics: A1 PS3 - Asset management and new challenges

Keywords: Interlaminar Short Circuit, Stator Core, Low Flux Loop Test, Generator, Magnetic Flux

Practical Detection Method of Stator Core Interlaminar Short Circuit for Turbine Generators

R. NAKANO¹, H. SAKO², S. HOSHI³

¹Mitsubishi Generator Co., LTD. Japan; ²Mitsubishi Generator Co., LTD. Japan; ³Hitachi Mitsubishi Hydro Corporation Japan

A2 POWER TRANSFORMERS AND REACTORS

A2 PS1 - Major challenges to the power transformer industry

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: LCA, copper, recycling, circular economy

Pilot project with recycled copper from a scrapped transformer

C. PERRIER¹, F. JACQUIER¹, S. LAURENT¹, A. TIMERA², V. MARCADON², A. LAFRAGETTE²

¹GE Vernova; ²RTE

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Power Transformers - Design - Standardization - Lead Time - Statistical Distribution - Economic Feasibility - Supply Chain - Labor - Throughput

Reimagining Power Transformer Design: Standardization Strategies to Reduce Lead Times, Mitigate Supply Chain and Labor Challenges

D. VIR, P. RAMASWAMY

Prolec-GE Waukesha, United States of America

ID: 10201

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Partial, discharge, risks, metallic, contamination

Review of High Voltage failure risks under expanding supply chains: Case of Directed oil flow Transformers

D. G. SRIVASTAVA*, R. PATIL

Siemens Energy India Ltd

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Powering the RE Push: A Strategic Procurement Framework for Transformers and Reactors in India's Energy Transition

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Topics: A2 PS1 - Major challenges to the power transformer industry

Comprehensive Life Cycle Assessment and Carbon Footprint Evaluation of EHV Transformers: A Case-Based Approach

D. N. JHA*, M. KALORIA, S. RAY, G. AGRAWAL, N. SRIVASTAVA

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Internal Arcing - Power Transformer - Tank Rupture - Peak Pressure - Depressurization Time - Pressure Relief Device

Performance of Various Pressure Relief Devices to Internal Arcing in Power Transformers

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¹Transformer Protector Corporation, United States of America; ²SERGI Transformer Protector, France

ID: 10253

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Strategic, Acquisition, Transformers, Reactors, Optimizing

Strategic Acquisition of Transformers and Reactors: Optimizing Delivery Timelines, Managing Supply Chain Risks, and Workforce Constraints

R. M. DAS*, A. SINGH, S. SONI, A. KUMAR

POWERGRID, India

ID: 10279

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Uprating power transformer, Load ability, Thermal Performance, Low viscosity oil, Bio-based Hydro Carbon Liquid

Uprating a Spare Transformer by Improving its Thermal Performance Using Bio-based Hydrocarbon Oils

R. LEICH¹, T. VAN DER HOEVEN¹, H. CAMPELO², M. TIRONI³

¹DEP/Alliander; ²Nynas AB; ³ELETTROMECCANICA TIRONI Srl

ID: 10493

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Temperature, Silver Sulphide

Redefining Transformer Operating Requirements: A Temperature Based Approach to Mitigate Silver Sulphide

A. SULEIMAN^{1,2}, D. SUSA³, C. EKANAYAKE²

¹Ausnet Services, Australia; ²University of Queensland, Australia; ³GMB-TX

ID: 10645

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Life Extension, Sustainability, Lifecycle Assessment, LCA, Transformer

Transformer Life Extension: GSU Transformers at Tucuruí Dam. Case Study Around Vital Role in Sustainability, Resilience and Reliability.

M. HARADA¹, W. CALIL¹, G. PAJARO²

¹Hitachi Energy Brazil; ²Hitachi Energy Spain

ID: 10658

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: circuit breaker, shunt reactor, transient, overvoltage

Dielectric Withstand Evaluation for Shunt Reactors due to Disconnect Switching Transients

J. MONTANHA¹, R. ANTUNES², A. ROCHA³, T. MANTHE⁴

¹Siemens Energy Brazil; ²ONS Brazil; ³ATG Brazil; ⁴Siemens Energy Germany

ID: 10661

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: High-frequency electromagnetic transients; white-box analytical model; controlled impulse testing in the laboratory

Analysis of High Frequency Electromagnetic Transients in Transformer Windings through White Box Modelling and Experimental Measurements

T. B. MARCHESAN¹, M. P. STOCHERO¹, V. C. BENDER¹, R. C. BELTRAME¹, M. C. C. VIEIRA¹, L. H. MEDEIROS¹, S. TENBOHLEN², F. L. PROBST²

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ID: 10750

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Power Transformer Protection - Grid Resilience - Physical Security - Loss of Oil - Autonomous Protection Scheme - Critical Infrastructure Reliability

Transformer Loss of Oil Lockout (LOL) Enhancing Grid Resiliency Against Physical Attacks

S. FITZGERALD, B. GUREVICH, T. LUTES

ComEd, United States of America

ID: 10758

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Advanced simulations and engineering, Site assembly, Transportation, Yoke-split structure

Innovative Technology of Site Assembly Transformer: Overcoming Transportation Challenges for Large Power Transformers

M. HABUKAWA¹, K. YAMAGUCHI¹, M. KADOWAKI¹, M. CUESTO², R. LLAMUZA², K. SETHI³

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ID: 10760

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Gas, insulated Transformer (GIT), Natural Origin Gas, SF6, free

66 kV-20 MVA Gas insulated Transformer Using Natural Origin Gas (N₂) with Reduced Environmental Load and Improved Maintainability

N. NOGUCHI¹, T. ISHIKAWA¹, S. TSUKAO², K. UCHIDA¹, T. CHIGIRI¹, K. TAKANO¹

¹Toshiba Energy Systems & Solutions Corporation Japan; ²TEPCO Power Grid, Inc. Japan

ID: 10761

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Insulation paper, Lifetime evaluation, Natural ester, Retrofill, Transformer

Evaluation of Temperature Rise and Insulating Paper Lifetime in Retrofilling Transformer with Natural Ester

T. HOMMA, S. MIYAZAKI, Y. MIZUTANI

Central Research Institute of Electric Power Industry Japan

ID: 10771

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Global Supply chain value, Optimization, Transformer procurement process

A South African case study on transformer procurement process optimization for a constrained global supply chain value

M. HLAKUDI, S. MTETWA

National Transmission Company South Africa (NTCSA)

ID: 11015

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: life cycle cost, dry-type air-core reactors, sustainable substations, environmental hazards, asset management

Real Case Study Assessment of Technical, Environmental, Social and Financial Benefits of Dry-Type Air Core Reactor Technology

L. d. N. PEREIRA¹, A. ASGEDOM², G. ZHOU²

¹TEEE Brazil; ²TEEE China

ID: 11052

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: transformer, load losses, finite element method, FEM, machine learning, ML

"Transformer Load Losses prediction by means of Finite Element Method Simulations and Machine Learning"

L. CANTINI

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ID: 11053

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: reliability, short circuit withstand test

Terna requirements for Short Circuit Withstand Test

S. SACCO

TERNA, Italy

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

275 MVA Power Transformer Noise Reduction, innovation, sustainability and asset performance

G. PAJARO¹, Z. A. AL SHAIBA², A. SERT³, A. JOSEPH⁴

¹Hitachi Energy, Spain; ²KAHRAMAA, Qatar; ³PECHOM, Turkey; ⁴Hitachi Energy, Qatar

ID: 11422

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Advanced Insulation System - Aramid Pressboard and Paper - Ester Liquid – Mobile Plug & Play Transformer - Grid Resilience - Fast Deployable Transformer - Rapid Response – Interchangeability - Reconnectable Multi-rated Transformer - Overload Capability

Advancements in Resiliency Transformers: Case of a 58/65/93 MVA Reconfigurable Area Station Transformer

R. SZEWCZYK¹, J.-C. DUART², A. O'MALLEY³, R. WIND⁴, E. SCHWEIGER⁵

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ID: 11453

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: 500 kV Substation, Assembled Transformer, Transformer Body Noise Level Measurement, Substation Boundary Noise Level Prediction, Sound Source Correction Coefficient

Establishment Method of Correction Factors for Noise Level Prediction about 500 kV Combined Transformers Based on Field Measurement Analysis

D. WANG¹, Z. ZHANG¹, Z. SUN², M. WANG³, F. WANG¹, S. JI⁴, L. YING⁵

¹State Grid Henan Electric Power Research Institute; ²State Grid Henan Electric Power Company; ³State Grid Corporation of China; ⁴Xi'an Jiaotong University; ⁵Wuhan University

ID: 11659

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Converter transformer, eddy loss, harmonic load, finite element method, IEC 61378-1:2011

Calculation of Winding Eddy Losses in Converter Transformers Based on IEC 61387:1-2011 Formulations and FEM

E. AKYÜZ¹, S. ÇÜRÜKOVA KALE¹, O. SÖNMEZ¹, B. ALBOYACI², Y. B. DEMİROL³

¹Sönmez Transformatör; ²Kocaeli Üniversitesi; ³Genetek Güç & Enerji

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

From Complexity to Efficiency: Standardized Transformer Procurement to Mitigate Supply Chain Disruptions

A. AGUADO, I. ARICETA, J. FRIAS, M. MARTÍNEZ

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ID: 11730

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Acoustic Modeling - Finite Element Optimization - Grain-oriented Electrical Steel - Modal Analysis - Shear Modulus - Transformer Noise

Optimization Study of the Shear Moduli of Magnetic Foil-Sheet and Its Implication into the Noise Simulation

L. MICHALSKI¹, V. MURGIDA², L. DE MERCATO²

¹Hitachi Energy Poland; ²Hitachi Energy Italy

ID: 11825

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Arctic temperatures - Cold start - ONAN - Transformer oil - Thermal response

Studying Cold-Start Thermal Response of Oil-Immersed Power Transformers at Low Ambient Temperatures

M. H. A. HASSAN¹, I. MADSHAVEN², K. NIAYESH¹, Ø. L. G. HESTAD¹, F. BACHINGER³, A. C. MERMIGKAS², H. CAMPELO⁴, U. PLAZNIK⁵

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ID: 11955

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Power transformer, shunt reactor, tap-changer, offshore substation (OSS), floating offshore substation (FOSS), maintenance guidelines, corrosion protection, condition monitoring

Maintenance Guidelines for Offshore Applications

T. STIRL¹, D. KOCH², P. WISCHTUKAT³, T. BOROOMAND⁴

¹GE Vernova, Germany; ²GE Vernova, Germany; ³Göbel; ⁴GE Vernova, UK

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Dynamic Load Analysis of Sealing Mechanisms in Floating Offshore Structures

G. A. MORLET¹, J.-J. RUIZ², S. BRODEUR³, T. NOVAK⁴

¹Hitachi Energy, Germany; ²Hitachi Energy, Spain; ³Hitachi Energy, Canada; ⁴Hitachi Energy, Poland

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

An improved risk management model for a fleet power transformer through reliability asset condition and probability of failure using weibull analysis

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Methodology for the Qualification of New Supplier Factories at Utility: A Strategic Response to the Challenges of the Energy Transition

A. HERREÑO¹, F. IBAÑEZ²

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ID: 12240

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: carbon footprint, transformer manufacturing, lifecycle assessment, LCA, energy consumption, waste management, data quality, environmental impact

Carbon Footprint of Transformer Manufacturing

B. BOSNJAK¹, E. PEREZ², C. PERRIER², S. MICHAUD², T. STIRL³, M. STOECKLI⁴

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ID: 12241

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: transformer, ambient temperature, CFD, numerical modelling, climate change, transformer loading

Impact of Climate Change on Power Transformer Lifetime

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: AI-DATACENTER, DISTRIBUTION TRANSFORMER, SKID- MOUNTED SUBSTATION

Advanced dry-type transformer design solution for hyperscale AI-datacenter application

M. SVOBODA¹, L. SPECKNER², D. BROCILO³

¹SGB Group, s.r.o.; ²SGB Germany; ³META

ID: 12412

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Chemical reaction, Insulation oil preservation, Moisture compensation, Oxygen reduction, Power transformer aging, Static oxygen absorber, Transformer maintenance, Transformer reliability

Experimental Investigation and Field Validation of a Chemical-Based Oxygen Reduction Method for Oil-Immersed Power Transformers

M. MOH'D¹, R. BARDEN², P. WERLE³, U. MAIER⁴

¹50Hertz Transmission GmbH, Germany; ²Albert Maier GmbH, Germany; ³Leibniz University Hannover, Germany; ⁴Albert Maier GmbH, Germany

ID: 12418

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Power transformer 765 kV, ester liquids, sustainability, innovation, fire safety.

World's largest 765 kV ester transformer for enhanced safety and environmental protection in electrical grids

D. VUKOVIĆ¹, M. CUESTO², K. SETHI¹, R. LIAMUZA²

¹Hitachi Energy, Germany; ²Hitachi Energy, Spain

ID: 12438

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Integrated on-load tap-changer – FEM simulation – dielectric strength – compact design – sustainability

Novel Method for dielectric Integration of Integrated Tap-Changer based on 3D-FEM Simulation for compact transformer design

S. REHKOPF, B. GLASER, M. BENGLER

Maschinenfabrik Reinhausen Germany

ID: 12494

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Sustainability, dry-type transformers, LCA, EPD, low carbon materials, environmental sensitivity analysis, cradle to gate, cradle to grave, CO2 footprint, alternative materials.

Assessing the impact of low carbon materials on a dry type transformer: Case study of a 1.6 MVA transformer

D. GONZÁLEZ¹, M. BERROGAIN², R. NIINA³

¹Hitachi Energy, Germany; ²Hitachi Energy, Spain; ³Tampere Raitiotie Oy, Finland

ID: 12499

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Ultra-high voltage (UHV) converter transformer, Pressure Relief Valve (PRV), DN400 Large Diameter, Arc Test

Investigation of a DN400 Large-Diameter Pressure Relief Valve: Design, Manufacturing, and Arc Performance

J. LI¹, L. LUO², Y. ZHAO², K. WANG², H. ZHANG³

¹China Electric Power Research Institute; ²Hefei University of Technology; ³China University of Mining & Technology

ID: 12607

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Medium-size transformers, No-load loss, Loss separation, Steinmetz equation, XGBoost, Optimization

Modelling No-Load Losses in Distribution Transformers: A Comparison Between Physical and Machine Learning Approaches

M. KIANI-OSHTORJANI¹, G. KALKAN², A. KIRCHNER³, F. DEHLAS⁴, R. FLURI⁵

¹Rauscher & Stoecklin AG Switzerland; ²R&S Group AG Ireland; ³R&S Group AG Switzerland; ⁴Rauscher & Stoecklin AG Switzerland; ⁵R&S Group AG Switzerland

ID: 12624

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS1 - Major challenges to the power transformer industry

Keywords: Design, EMTP, Reliability, Reactive Power Compensations, Thyristor-controlled Transformers

Electromagnetic design of a Thyristor-Controlled Transformer for Dynamic Reactive Power Control

A. SANTACROCE¹, G. TRESSO², P. VACANTE³, S. SACCO⁴, L. BUONO⁵, E. ROTOLO⁶, F. PALONE⁷

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ID: 10148

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Power transformer bushing, low power instrument transformer, measurement accuracy, monitoring

Power transformer dry type bushing embarking combined low power instrument transformers. Impact of the mutual influence on the accuracy

E. FAKHRI¹, C. ELLEAU¹, J. ZHUO², B. PAYA¹, L. BASUYAUX¹, E. EUVRARD²

¹EDF; ²RHM International

ID: 10149

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Power transformer, digitalization, Lifecycle management

Digitalization of transformer data for enhanced lifecycle management

R. DESQUIENS, D. BORTOLOTTI, S. FLET, L. PAULHIAC, A. LEFEVRE, C. ELLEAU

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ID: 10207

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Digital Mirror, Power Transformers, Reactors

Development of a Digital Mirror for Power Transformers and Reactors

D. N. JHA*, M. KALORIA, D. PAUL, R N GUPTA

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ID: 10209

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Artificial Intelligence, Machine Learning, Dissolved Gas Analysis, Fault Prediction, Health Assessment, Condition Monitoring, Residual Life Assessment, Transformer models.

Leveraging Artificial Intelligence for Transformer and Reactor Health Assessment and Aging Estimation Amandeep SINGH* Richik Manas DAS Gunjan AGRAWAL Abh

A. SINGH*, R. M. DAS, G. AGRAWAL, A. KUMAR

POWERGRID, India

ID: 10220

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Transformers - Condition Assessment - AI Boosted

AI Boosted Transformer Life Management

L. CHEIM

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ID: 10270

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Congestion, Dynamic Rating, IEC60076-7, Power Transformer, Thermal Modelling, Open source

Dynamic Transformer Rating (DTR) on large three winding power transformers in the transmission grid of the Netherlands

R. SCHELLEVIS¹, T. VAN DER HOEVEN², B. ROS¹, J. SLANGEN¹, P. SLOOTS³

¹TenneT TSO; ²DEP/ Alliander N.V.; ³Royal SMIT Transformers BV

ID: 10385

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Twin, Moisture, Sensing

Digital Twin for Transformer Moisture Management: Closing the Loop from Sensing to Action

O. ROIZMAN¹, P. GREY²

¹IntellPower, Australia; ²Powercor, Australia

ID: 10706

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: data templating, digitalisation, transformer nameplate, XML

A proposed data model for a standardised power transformer nameplate, design and parameter dataset

C. WOLMARANS¹, R. DESQUIENS², T. GRADNIK³, F. OSTERMAN⁴, Z. DRAPER⁵, M. SOTO⁶, G. LINORTER⁷, V. DURINA⁸

¹GE VERNOVA; ²EDF; ³EIMV; ⁴MR; ⁵DELTA X RESEARCH; ⁶HITACHI ENERGY; ⁷SIEMENS ENERGY; ⁸KONCAR INSTITUTE

ID: 10707

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: AI, ML, DATA, TRANSFORMER, ALARMS, DGA

Leveraging data and metadata for effective deployment of AI/ML in transformer monitoring and diagnostics

C. WOLMARANS, R. LUKE, A. DEY

GE VERNOVA

ID: 10762

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Dynamic Rating, Monitoring Device, Online DGA

Development of Transformer Monitoring Device using IoT technology for Condition Based Maintenance

T. KANAMORI¹, Y. ITOU¹, H. ISAJI¹, A. IWATA¹, J. KUSANO², S. ITO²

¹Chubu Electric Power Grid Co., Inc. Japan; ²AICHI ELECTRIC Co., Ltd. Japan

ID: 11054

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: digitalisation, BIM, data, asset, asset management

Power Transformer Digitalisation. Terna approach on BIM

E. ROTOLO

TERNA, Italy

ID: 11092

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Power Transformer, CFD, THNM, Natural Ester

Improving thermal-hydraulic modelling accuracy in CORE-Type transformers: a dynamic THNM approach.

B. OLIVEIRA, S. COUTO, R. CASTRO LOPES

EFACEC

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Phase-Shifting Transformers (PSTs), Shell Type, Digital Modelling, Grid Flexibility, Dissociated Phases Design

Addressing key design challenges through digital modelling of dissociated phases phase-shifting transformers

M. MAIA, A. SOTO, P. LIMA, R. CASTRO LOPES

EFACEC

ID: 11094

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Shell-type Transformer, Fluid Properties, Thermal Performance, Biodegradable Insulating Liquids

Modelling the thermal-hydraulic behaviour of shell-type power transformers: on the influence of fluid properties in OD and ON cooling modes

S. COUTO¹, M. CASTRO¹, H. CAMPELO², P. WEDIN³, A. SOTO¹, R. CASTRO LOPES¹

¹EFACEC; ²NYMAS AB (PORTUGAL); ³NYMAS AB (SWEDEN)

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Cooling Pattern Optimization for shell-type power transformers

P. QUINTANILLA¹, E. SANCHEZ¹, R. DESQUIENS², D. BORTOLOTTI²

¹Hitachi Energy, Spain; ²EDF, France

ID: 11489

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Transformer, Partial Discharge, Defect Location, Ultra-High Frequency

Development of a Digital Twin-Based Transformer Partial Discharge Diagnostic System

B.-W. MIN, D. LEE, K.-D. BAE, J.-B. LEE

HD Hyundai Electric

ID: 11494

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: UHV power transformer; Bushing turret; Internal arcing fault; Structure failure; Explicit dynamics

Improved arc containment of a bushing turret of UHV AC Transformers under a high-energy internal arcing fault

J. SUN¹, Y. ZHAO¹, L. LUO², W. XU², K. WANG¹, J. LI³

¹China Electric Power Research Institute; ²Hefei University of Technology; ³Xi'an Jiaotong University

ID: 11828

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Cellulose ageing, transformer lifetime, water content, digital twin, monitoring, capacitive humidity sensor, methanol, DP

Capacitive humidity sensors for transformer ageing monitoring

H. ENOKSEN¹, L. LUNDGAARD¹, K. LILAND¹, A. S. TØDENES², S. KYRKJEEIDE³, S. LEIVO⁴

¹SINTEF Energi; ²Hitachi Energy; ³Statnett; ⁴Vaisala

ID: 11862

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Power transformers, digital twin, digitalisation, monitoring, condition assessment, artificial intelligence

Development of Digital Twin Technologies for Power Transformers: A Multi-Disciplinary Initiative at a Large Utility

P. PICHER, M. KIROUAC, R. ZEMOURI, O. ARROYO, M. RODRIGUEZ, M. DUVAL, N. SENECHAL, M. CEA, A. SERVENTI, M. GAUVIN, S. PROULX, M. LALONDE, E. FRENETTE, G. BIZIER

Hydro-Québec

ID: 11865

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Smart, Transformers, Renewable, Energy

Smart Transformers: An Integrated Solution for Grid Visibility and Asset Management in Renewable Energy and Data Center Applications

L. F. SANCHEZ GOMEZ, F. SALDIVAR CERON, C. GAYTAN CAVAZOS, O. MENDEZ ZAMORA

Prolec-GE Internacional

ID: 11885

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: automation of measurement, digitalization, test bay

Transformer Test Bay Digitalization: Unified Platform for Workflow Automation

F. RAZUM¹, P. MIHOKOVIĆ², P. KRIŽIĆ¹, M. ŠTANFEL²

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ID: 11985

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: coil monitoring system, air-core reactor, predictive maintenance, field deployment, retrofit installation, wireless sensor node

Innovative Wireless Monitoring System for Air-Core Reactors – Experience from Field Deployment and Insights for Predictive Maintenance

C. KOHLBERGER¹, R. GRIVOT², A. ALHAFARI¹, I. RULYOV¹, A. AICHHORN¹

¹Trench Austria GmbH; ²RTE France

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Grid Load Optimization with Transformer Thermal Digital Twin

F. BELAVIĆ¹, J. RAITH², M. STOESSL²

¹Austrian Power Grid AG; ²Siemens Energy Austria GmbH

ID: 12378

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Evidence Theory - Machine Learning - Online Monitoring - Transformer Health Index

Transformer health index calculation using evidence theory and machine learning, with consideration of online monitoring data

O. RESING¹, J. FUESER¹, H. HIRSCH²

¹Westnetz GmbH; ²University of Duisburg-Essen

ID: 12405

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: OLTC, Vibroacoustic, VAM, Digitalization, Reference, Signature, Monitoring, Condition, Interpretation, Fingerprint

Digital Fingerprinting of OLTCs via Vibro-Acoustic Measurements During Factory Acceptance Testing

M. AUERHAMMER, A. SAVELIEV, M. FOATA, M. WOLFRAM, K. RÄDLINGER, S. CREEVY

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Transient Voltage Analysis of a Large 250 MVA Three-Winding Transformer with a Frequency-Dependent Modeling Approach

M. ESLAMIAN¹, E. RAHIMPOUR², K. SETHI¹

¹Hitachi Energy, Germany; ²Technical University of Applied Sciences Würzburg-Schweinfurt (THWS) Germany

ID: 12597

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Phase-shifting transformers, DC hysteresis, topological model

Measurement-Based Electromagnetic Modelling of Phase-Shifting Transformers with Limited Design Data

A. FRÖHLICH¹, D. ALBERT², G. LEBER³, H. RENNER⁴

¹Graz University of Technology Austria; ²OMICRON electronics GmbH Austria; ³Siemens Energy Austria GmbH Austria; ⁴Graz University of Technology Austria

ID: 12616

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS2 - Power transformer digitalisation journey

Keywords: Power transformer, Inrush current, circuit breaker, Machine Learning, Reinforcement Learning, Jiles-Atherton, Proximal Policy Optimization

Power Transformer Modelling and Advanced Intelligent Techniques for Inrush Current Minimization Studies

J. UGARTE-VALDIVIELSO¹, M. BARRENETXEA², J. I. AIZPURUA³

¹Electronics & Computing Science Department, Mondragon University Spain; ²Electronics & Computing Science Department, Mondragon University Spain; ³Department of Computer Science and Artificial Intelligence, University of the Basque Country (UPV/EHU)

A2 PS3 - Failure prevention, detection and investigation

ID: 10145

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Short-circuit, calculation, full scale test, on site failure

Short-circuit failure experience . Comparison of reliability depending on validation process

J.-C. RIBOUD, R. BLANC, A. TIMERA

RTE

ID: 10150

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Bushing, Leakage Current, Online Monitoring, Early Warning, Capacitive Layer Degradation, Transformer Fire Prevention, Signal Processing

Online monitoring of RIP Bushings for early failure detection

D. BORTOLOTTI, R. DESQUIENS, T. DELAGNES, L. PAULHIAC, A. LEFEVRE, J. SANCHEZ

EDF

ID: 10236

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: DFR, Diagnostics, Transformer, Bushings, Laboratory, Studies

DFR-Based Diagnostics of Transformer Bushings: Insights from Field and Laboratory Studies

G. NIKAM*, P. RAO

Yash HighVoltage Ltd, India

ID: 10238

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Diagnosis, Shunt, Reactor, attributed, Electrostatic, Shield

Diagnosis of fault in Shunt Reactor attributed to Core Electrostatic Shield: A Case Study Analysis

S. S H RAY*, R. SRIVASTAVA, G. AGRAWAL, K. RAO

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Abnormality and Failure Analysis and Remediation of Power Transformers and Reactors: Field Case Histories and Engineering Insights

D. D. CHAKRABORTY*, R. M. DAS

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Predictive failure forecast using Exponential Time-Series modelling of Dissolved gases in Converter Transformers

D. N. JHA*, D. PAUL, P R S YADAV, R. SRIVASTAVA

POWERGRID, India

ID: 10248

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Failure detection, investigation, 420KV Line, Reactor

Failure detection, investigation and root cause analysis of 420KV Line Reactor in POWERGRID

R. RANJAN*, R. K. JAIN, P. YADAV, R. MANAS

POWERGRID India

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Analysis of Shunt, Reactor, Failure, Switching, Operations, Line Faults

Failure Analysis of Shunt Reactor during Switching & Line Faults in POWERGRID

G. AGRAWAL *, S. S H RAY, A. K. TEWARI, R. M. DAS, A. SINGH

POWERGRID, India

ID: 10252

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Fatigue, Damage, Vulnerability, Shunt, Reactor

Predicting Fatigue Damage and Vulnerability of a Shunt Reactor Due to Structural Vibrations

D. P. SHARMA*, A. PATHAK

CG Power & Industrial Solutions Limited, India

ID: 10255

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Predictive, analysis, machine, learning, modelling

Predictive analysis using machine learning modelling of digital twin of a Power Transformer

R. R. ALAPATT*, R MEERAKRISHNA

Power Grid Corporation of India Ltd , India

ID: 10272

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Acoustic Emission, Applied Voltage, Dielectric Testing, Electromagnetic Interference Immune Sensor, Factory Acceptance Testing, Fiber Optic Acoustic Emission Sensing Technology, Lightning Impulse, Localization, Partial Discharge, Switching Impulse

Localization of Partial Discharges and Dielectric Disturbances During Factory Acceptance Testing of Power Transformers Using Fiber Optic Acoustic Emission Sensing

S. VOETEN¹, H. HASHEMI-DEZAKI², A. ZADEH²

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ID: 10345

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Failure Analysis, Teardown, Shunt Reactor, High Impedance

Failure Analysis and Teardown Inspection of Transmission Shunt Reactor in High Impedance Complex Transmission Network Power System

M. BHATTI¹, G. PAJARO²

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ID: 10386

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Demonstrating, Moisture, Failures, Elusive

Demonstrating Moisture as a Major Contributor to Transformer Failures: The Elusive Link Revealed Through Detailed Case Studies

P. GREY¹, O. ROIZMAN²

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ID: 10497

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Transformer, Impulse voltage, Surge distribution, Series reactor, Transferred surge, Insulation stress, Series capacitance

Impulse Voltage Distribution and Transferred Surge in Transformer Winding with Series Reactor – a Case Study

A. BOHRA, A. INDARTO, S. WAHYUDI, K. HARJO

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ID: 10660

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Thermal Performance Assessment of Power Transformer Winding; optical fiber measurement; computational fluid dynamics; thermal-hydraulic network model

Thermal Performance Assessment of Power Transformer Winding Through Experimental, Analytical and Numerical Analysis

T. B. MARCHESAN¹, L. H. MEDEIROS¹, M. M. OLIVEIRA², C. E. G. FALCÃO¹, V. C. BENDER¹

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ID: 10663

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: electromagnetic performance; modelling transformers and reactors; High-frequency transient studies

High-Frequency Transient Studies: Modelling Transformers and Reactors from Field Measurements and Design Data

O. IARONKA¹, D. SCHMITT¹, A. ROCHA²

¹Trinse Consulting Brazil; ²ATG Consulting Brazil

ID: 10685

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Transformer - Diagnostics - Offline Testing - Insulation Assessment - Electromechanical Integrity

Electromechanical Assessment of Power Transformers Based on Novel Offline Testing Techniques

D. M. ROBALINO¹, R. E. ALVAREZ²

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ID: 10763

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Dissolved Gas Analysis, Photovoltaic power generating systems, PCS, IBRs, Iron core loss, Load fluctuations, Oil-filled transformers

Influence of Harmonics and Load Fluctuations on Dissolved Gas Analysis for Oil-Filled Transformers Connected to Photovoltaic Power Generating Systems

H. YOSHIKAWA¹, G. SATO¹, Y. KONISHI¹, S. MATSUMOTO²

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Case Studies on Diagnostic Integration: Challenges and Findings in the Condition Assessment of 500 kV Transformers and Reactors

R. ALVAREZ, L. CATALANO, V. CARBAJAL

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Guidelines for Root Cause Analysis of Failures in Transformers Connected to Wind Turbines

R. ALVAREZ, L. CATALANO, V. CARBAJAL, V. TOMPKINS, P. MORCELLE DEL VALLE

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Artificial intelligence enhanced online condition monitoring of On-Load tap changers in power transformers based on electrical signature

G. ABRANTES, G. SANTOS, R. DUARTE, J. ESTIMA, M. FERREIRA

ENGING

ID: 11160

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Power transformers, windings, frequency response analysis, condition assessment

Approaches to the Interpretation of Frequency Response Analysis for Rapid Condition Assessment of Power Transformers

V. LARIN¹, D. MATVEEV², M. FROLOV², R. KURNYSHOV¹, B. LESIN³, D. GUREV³, A. KOZHEVIN³, V. ABRAMOV³

¹VEI – branch of RFNC-VNIITF; ²MPEI; ³SVEL – Power transformers

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Asset Health Index, Transformer Failures, Predictive Maintenance, Resilience Investment, Reliability Engineering, Condition Assessment, Risk-Based Planning

From Prediction to Reality: Assessing the Predictive Value of Transformer Asset Health Index Models

M. GRISARU^{2,1}, T. ATALLA¹, M. ELLENBOGEN¹

¹Israel Electric Company; ²Independent Consultant

ID: 11269

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Condition Monitoring, maintenance, power transformer, tap changer

Improvement of a tap changer condition-monitoring approach for predictive maintenance purposes

S. MTETWA, M. HLAKUDI, S. MIYA

National Transmission Company South Africa (NTCSA)

ID: 11279

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Transformer, Shunt Reactor, Failure, Investigation, Inspection, Testing

Experience with Transformer and Shunt Reactor Failure Investigation at a Large Transmission Network Operator

S. RYDER¹, A. BAJWA¹, R. HOOTON²

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Impact of switching transient overvoltages in dry-type transformers

V. M. GARCÍA¹, C. ROY¹, A. NOGUÉS¹, L. OLIVEIRA²

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ID: 11487

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Power Transformer, Short-circuit Withstand Capability, Dynamic Calculation Method, Cumulative Effect

Dynamic Calculation Method for Transformer Short-Circuit Considering Cumulative Effects

P. LI¹, Z. ZHANG², H. SUI², K. WANG², S. ZHANG²

¹SGCC Southwest Branch; ²China Electric Power Research Institute

ID: 11495

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Weakly-supervised, Faster RCNN, Infrared Image Recognition, Fault Detection

Weakly-supervised Infrared Image Recognition Method for Substation Equipment Fault Detection

Z. XIE, J. DENG, H. ZHOU, Z. PAN

China Southern Power Grid

ID: 11508

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: DGA, synthetic ester, wind energy generation

Analysis of DGA Data of Wind Farm Transformers Filled with Synthetic Ester

M. DAGHRAH¹, M. RAHMBEKSCH²

¹Shell U.K. Oil Products Ltd U.K.; ²ENERCON GmbH Germany

ID: 11544

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: copper sulphide, corrosive sulphur, DBDS, transformer oil, transformer failure, insulation degradation, oil analysis, CIGRÉ TB 625, condition monitoring, DGA, IEC 60296, asset management

Corrosive Sulphur in Transformer Oil: Root Cause Analysis, Risk Mitigation, and Field- Based Action Framework

S. ALLABAN, A. ALJOUF, A. ALAMEER, F. ALKHATER

SABIC

ID: 11627

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Power Transformers, Transformer Online Monitoring, TMS, Return of investment, ROI, CM, Condition Monitoring

Optimum Utilization of Transformer online Monitoring Systems in Electricity Transmission Network (Kahramaa approach)

Z. ALSHAIBA, M. ELSAHARTY

Qatar General Electricity &Water Corporation (KAHRAMAA)

ID: 11662

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Power Transformer, Reactors, DGA, Electrical Test, Partial Discharge

Case Studies of PD Measurement Experiences on Site Maintenance and in Workshop Fault Investigations of Oil-filled Power Transformers and Shunt Reactors

M. YANAN, T. GÜNEŞ, L. KAHTALI, İ. ÇALIŞKAN, M. TORUN

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ID: 11716

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Arc resistant design, design pressure equation, explicit dynamics simulation, finite-element analysis, high-energy arcing fault, liquid-immersed power transformer, pressure, tank rupture, transformer tank design

Update of a design pressure equation for power transformers under high-energy arcing faults

J.-B. DASTOUS, S. BÉLANGER

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ID: 11718

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Power Transformer, high-energy arcing fault, bushing turret, rupture prevention

Design and Manufacture of an Arc-resistant 250 MVA, 735 kV Transformer with Reinforced Side Turrets

S. BRODEUR¹, P. LAMOTHE¹, J.-B. DASTOUS²

¹Hitachi Energy Canada; ²Hydro-Québec, Canada

ID: 11719

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Transformer, Short Circuit Failure, Cases

Transformer Short Circuit Failure Case Histories

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Dynamic Analysis using FEM and SC-Withstand Test for Verification of Short Circuit Withstand Capability of a 600MVA, 405kV Auto-Transformer

D.-H. KWAK¹, M.-S. KANG², J.-C. RIBOUD³

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ID: 11893

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Deep-Reinforcement-Learning; Digital Twin; Fuel-Optimal Control

Advanced Diagnostics and Failure Prevention in Power Transformers: Dual Case Study Investigations of Magnetic Flux Leakage and Cellulose Insulation Degradation at Samra Electric Power Company (SEPCO), Jordan

Y. MASHAGBEH, S. ALBATTAT

SEPCO-Samra Electric Power Generating Co

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

A Diagnostic Approach Using SFRA: Comparative Analysis of Twin Distribution Transformers

R. ABWAINI, M. ALMOMANI, E. SHTAYAT

Irbid district Electricity Company (IDECO)

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Phase Shifting Transformer On-Site Testing – Best Practice

D. ALBERT¹, A. PIRKER², T. BEDNARCZYK¹, B. ENGSTLER¹

¹OMICRON electronics GmbH; ²VUM Verfahren Umwelt Management GmbH

ID: 11981

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: transformer short-circuits, axial winding forces, dynamic axial short-circuit force response, Spiraling effects in transformer windings, winding spiraling failure modes, dynamic axial winding models, lumped mass non-linear spring models

Avoiding Spiraling Effects on Helical Windings with Appropriate Dynamic Axial Short-Circuit-Force Calculation and Evaluation Methods

G. KOCZKA, G. LEBER

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ID: 11984

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Transformer Condition Assessment, Dissolved Gas Analysis (DGA), Classical Methods, Artificial Intelligence, Predictive Maintenance

Artificial Intelligence and Classical Methods in DGA Interpretation - Hybrid Approaches for Practical Transformer Condition Assessment

A. PIRKER¹, M. DARMANN¹, T. L. UDEH², F. BELAVIĆ³

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ID: 11990

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Transformer - Diagnostics - Online Monitoring Usability - Bushings - Failure - Fire Risk - Mitigation

Power Transformers Operational Safety Improvements

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ID: 11991

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Dry-type power transformer, partial discharge, condition assessment, on-site testing

Systematic Approach for Condition Assessment of Dry-Type Transformers based on Partial Discharge Measurements

B. ENGSTLER¹, C. ENGELEN¹, A. HERRERA¹, P. WISCHTUKAT²

¹OMICRON electronics GmbH; ²Hubert Göbel GmbH

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Optimization of reliability and safety in power transformers and reactors through advanced monitoring and data analytics

E. CANTOR¹, S. CARMONA², I. LOZADA³

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Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Dissolved Gas Analysis (DGA), Fault classification, Furanic compound analysis, Generator step-up unit transformer (GSUT), Thermal fault diagnosis

Case Study on Fault Detection in Generator Step-Up Unit Transformers of Mae Moh Coal-Fired Power Plant Unit 14 Using Dissolved Gas Analysis

J. LAOWANITWATTANA, A. KRITSADATAN, N. PROMSURIN

Electricity Generating Authority of Thailand (EGAT)

ID: 12093

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: VFTO, Shunt Reactor, GIS, Bushing

Evaluation on VFTO Phenomenon for Shunt Reactor and GIS Connected Transformer Bushing Applications

S. NANYAN¹, G. K. SUPRAMANIAM¹, H. KASIM²

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Forensic Analysis on Alligatoring Cracking Phenomenon on Transformer Bushings Polymeric Insulators in Malaysian Power Utility Environment

G. K. SUPRAMANIAM, S. NANYAN

Tenaga Nasional Berhad, TNB

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Silver corrosion, elemental sulphur, synthetic ester, power transformers, mitigation, treatment, S8 removal.

Synthetic ester silver corrosion testing and corrosive sulphur removal demonstrated on power transformer

J. LUKIC, J. JANKOVIC, D. KOLARSKI, V. IVANCEVIC

Nikola Tesla Institute, Serbia

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Methods for Direct and Indirect Condition Assessment of Insulating Paper in Transformers

T. MUENSTER¹, T. LAINCK¹, P. WERLE²

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ID: 12349

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: No-Load Loss Measurements, No-Load Conditions – Methodology, DGA, Diagnostic Application, Case Studies, FAT, Power Transformer Under Repair, On-Site No-Load Test, GSU Transformer.

DGA as a Diagnostic Tool During No-Load Tests

V. RADIN¹, B. DJURIC¹, D. JOVANOVIĆ¹, M. BRDAREVIC²

¹Nikola Tesla Institute, Serbia; ²JSC Elektroprivreda Srbije, Serbia

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Analysis of Resonant Characteristics of Transformers Using Natural Frequencies

I. WOYNAL, A. AL-ABADI, S. DI FRAIA

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Modern Condition Assessment Techniques for Power Transformers Connected to Renewable Energy Sources

S. TENBOHLEN¹, D. MARTIN², R. GÖTZ³, F. BELAVIĆ⁴

¹University of Stuttgart Germany; ²Essential Energy Australia; ³Maschinenfabrik Reinhausen Germany; ⁴Austrian Power Grid Austria

ID: 12432

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: A2 PS3 - Failure prevention, detection and investigation

Keywords: Power transformer, IEC 60076-5, Short-circuit forces, Electromagnetic forces, Dynamic forces, Short-circuit failure, Helical shaped winding, Winding pitch, Core saturation.

Improved Reliability Through Advanced Short-Circuit Force Analysis in Transformer Windings: 3D magnetic field boundary conditions and dynamic effects

K. SETHI¹, M. MUÑOZ², J. FORSLIN³, M. ULIANA⁴

¹Hitachi Energy, Germany; ²Hitachi Energy, Spain; ³Hitachi Energy, Sweden; ⁴Hitachi Energy, Italy

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT

A3 PS1 - Transformation of T&D assets for evolving grid conditions

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Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: current limitation, DC grid, power testing, protection, superconductivity

Resistive Superconductive fault current limiters for the protection of MTDC grids

C. CREUSOT, D. BRASILIANO, Y. ABDUL-SAMAD-EL-SKAFF, A. BERTINATO, N. DEVEAUX

SuperGrid Institute

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Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: Composite Insulators, Seismic Performance, High-Voltage Substations, Shake Table Testing, Dynamic Load Resilience, Electrical Grid Reliability

Advanced seismic resilience of composite insulators for High Voltage substations

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Jackson & Frank

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ELECTRIC AND THERMAL ANALYSIS OF 33kV DC VACUUM CIRCUIT BREAKERS USING 3D MODEL

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¹Cairo University, Egypt; ²Engineering for Petroleum and Process Industries (ENPPI) Company, Egypt

ID: 10259

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: Evaluation of Dielectric, Deterioration, Grading, Capacitor, diagnosis

Evaluation of Dielectric Deterioration of Grading Capacitor through supplementary diagnosis techniques

S. S H RAY*, P R S YADAV, R P S RANA, A. LAHIRI, B. LAKPATHI

POWERGRID, India

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

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Keywords: Operational, experience, reactors, conventional, substation, Indian grid

Operational experience with current-limiting series reactors in conventional substation within the Indian grid

R. BHAKAL*, P. K. JHA, V. K. SINGH, K. SAHU

POWERGRID, India

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: Installation of Current, 400kV, Transmission, substation

Installation of Current Limiting Reactor for controlling high fault level condition in 400kV Transmission substation

S. K. BADERIA*, G. SHARMA

POWERGRID CORPORATION OF INDIA LTD, India

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: Transmission, Distribution, T&D, flexibility, Resilience, Stability, Connectivity

Power System Experiences- 765 Circuit Breaker failure analysis.

N. RAJ*, S. RAVAL

Adani Energy Solution Ltd, India

ID: 10653

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: AIS- Air Insulated Switchyard, SS- Sub station, DAC-double arc chamber, CB-circuit breaker, PIR-Pre Insertion Resistance, ISO- Isolator or Disconnecter, LBB-Local Breaker Backup protection, Yph- Y phase, Gnd-ground, mS - millisecond, DR- disturbance record

Failure of 800 KV Circuit Breaker due to Lightning

J K PRAJAPATI¹, J K GAVEL²

¹POWERGRID INDIA; ²POWERGRID INDIA

ID: 10687

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: Metal-Oxide Surge Arrester (MOSA) - Zinc Oxide (ZnO) Arrester - Surge Arrester Selection - 765 kV EHV System - Insulation Coordination - Switching Overvoltage (SOV) - Temporary Overvoltage (TOV) - Substation Protection - Grid Resiliency

Surge Arrester Application in 765 kV Systems: Current Practices and Future Trends in the U.S. Transmission Grid

J. L. DE FRANCO, C. GALVEZ

Hitachi Energy, United States of America

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: Vacuum circuit breaker (VCB), hydro power plant, overvoltages, EMTP, surge arresters

Evaluation of high-voltage Vacuum Circuit Breaker installation: laboratory tests, simulations and on-site measurements

I. DIA, J. BOUVIER

ID: 10747**A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers**

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: Shunt Reactor Switching; transient recovery voltage;

Shunt Reactor Switching in Brazilian Grid: A Critical Analysis of Circuit-Breaker Standard Requirements and the Actual Stresses in the Network

A. C. CARVALHO

ATIVA Engenharia Brazil

ID: 10765**A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers**

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: High voltage, DC, Circuit breaker, Residual Current, Testing

Development of an HVDC Circuit-Breaker and the Study of Testing Methods

T. INAGAKI¹, T. AKAHOSHI¹, R. MANOHAR¹, S. NEE², T. MODEER², S. NORRGA²

¹Mitsubishi Electric Corporation Japan; ²Scibreak AB Sweden Sweden

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Optimum Fault Current Limiter Placement And Its Parameter Calculation

S. K. SINGH*, H. PRASAD, A. PARHI, A. K. PANDEY

POWERGRID, INDIA

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S. SINGH, B. K. SAHU, N. JANGID, A. K. DATTA, A. PANDEY

Central Power Research Institute, INDIA

ID: 11149**A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers**

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: Corrosion, Corrosion Protection, Gas Insulated Switchgear, Air Insulated Switchgear, Salt-Spray Testing, Non-Destructive Testing, Corrosion Mapping

Corrosion in Gas-Insulated Switchgear and Circuit Breakers with Respect to Gas Leakage: Causes, Prevention, Lifecycle Impact, Field Experience, Laboratory Studies, and Recommendations

T. WANKHEDE¹, M. BARNETT¹, A. JONES¹, R. SLAUGHTER¹, G. WAKTARE¹, M. KITCHEN², D. ARMIT³, G. SAFIAN¹, S. MANN¹

¹SSN Transmission UK; ²Sheffield Hallam University UK; ³Caledonia Inspection Services

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Application of controlled switching to (re-)energization of transmission lines in dynamically changing grid conditions

U. PARKH

Hitachi Energy

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Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: Fault Current Limiter, High-Voltage Power System, Grid Expansion, Protection

Application and Optimization of Fast Fault Current Limiters in Regional Grid Expansion

S. ZHONG, L. NIU, T. WANG

NR Electric Co., Ltd.

ID: 11497**A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers**

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: On-site calibration, Current transformer, Current modulation, Ratio error, Phase error

On-site Calibration Technology of Current Transformer Based on Background Current Modulation

X. QI, Q. ZHAO, F. ZHOU, X. YIN, J. ZHANG, Q. WANG

China Electric Power Research Institute

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: Disconnecting circuit-breaker, operational experience, switchgear configuration, major failure MaF, minor failure MiF, availability, reliability, disconnectors

Twenty-five years using Disconnecting Circuit Breakers: Return of operational experiences from Nordic European utilities

A. SANDOVAL

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Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: Vacuum Circuit-Breaker, Field Tests, Transformer Inrush, Switching Transient

Investigations of Switching Tests during Transformer Inrush with a 145-kV Vacuum Circuit Breaker

M. H. BRESTAN¹, P. HACKL¹, L. SCHWALT², F. BELAVIĆ², J. WEISKAR³, R. SCHAEFER³, R. SCHUERHUBER¹

¹Graz University of Technology; ²Austrian Power Grid AG; ³Siemens Energy

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: low-power instrument transformer, power quality, SFRA, frequency response analysis, test voltage level

On-site SFRA at MV LPVTs and VTs for Metering Application - Investigation of Test Voltage Dependency

T. BISCHOF¹, F. FEUSTEL¹, R. SCHULZE¹, E. SPERLING¹, L. CESKY², B. SEVCIK²

¹OMICRON electronics GmbH; ²ABB s.r.o.

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: Gas-Insulated Switchgear (GIS), SF₆ Diagnostics, Reliability Analysis, Circuit Breaker Lifetime, Condition-Based Maintenance

Failure Investigation of Gas-Insulated Switchgear at 110-500 kV Substation, Maintenance and Repair

A. EPIFANOV, A. KHRENNIKOV*, I. GALIASKAROV

S&T Centre of Rosseti FGC UES

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Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Impact Of Digital Substations On The Specification And Connection Of Instrument Transformers

J. D. PALENCIA¹, J. TORO², J. SANCHEZ³

¹ISA; ²ISA; ³ISA

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Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Operational Excellence Applied To High-Voltage Circuit Breaker Failures At ISA INTERCOLOMBIA

C. URREA AGUIRRE¹, A. RUA MONCADA², A. CASTRO LOPEZ³

¹Intercolombia; ²intercolombia; ³ISA

ID: 12244

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: High voltage circuit breaker, SF₆ alternatives, dielectrics, rise of dielectric withstand, controlled switching

Characterization of controlled Switching of SF₆ free 420 kV Live Tank Circuit-Breaker

R. KARRER¹, T. ROININEN², V. PATEL², M. DHOTRE¹, B. RADISAVLJEVIC¹, U. PARIKH², M. STOECKLI³

¹Hitachi Energy Switzerland; ²Hitachi Energy Sweden; ³ELECTROSUISSE / CIGRE Switzerland NC Secretary

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: Gas Insulated Line, Pressurized Air Cable, High Voltage, SF6 free, shaped conductor, high current busbar, GIL, GIB

3-phase encapsulated Pressurized Air Cables for 420 kV: Design, Optimization and Application

W. HOLAUS¹, Z. TANASIC¹, E. EMELIYANOV¹, E. MULLER¹, J. SMAJIC², M. STOECKLI³

¹HIVODUCT Switzerland; ²ETH Zurich Switzerland; ³ELECTROSUISSE / CIGRE Switzerland NC Secretary

ID: 12462

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions

Keywords: SF6-free, vacuum circuit breaker, shunt reactor switching, capacitive current switching, single capacitor bank, back-to-back, RC-filter circuit

Switching of Reactive Loads with High Voltage Vacuum Circuit Breaker

R. CERNAT, S. GIERE, T. HEINZ, J. TEICHMANN, J. WEISKER, P. WEHLAN, S. WETHEKAM

Siemens Energy Global GmbH&Co KG Germany

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A3 PS2 - Sustainability and circular economy of T&D equipment

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: 420 kV, LT, CO₂/O₂, Decarbonization, Double break, EU LIFE program, HVCB, LCA, Outdoor application, SF6 alternatives, ADEME FRANCE 2030, very low temperature.

Live tank CO₂/O₂ range update from 72 kV up to 420 kV

D. BERARD, M. BORREL, T. PISSARGIBOLLET, A. BOBEAU

GE Vernova

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: Gas Insulated switchgear, Metal enclosed, SF6-free, 245 kV, 420 kV, Circuit breaker, GIS Bay, C4FN / O₂ / CO₂

Update on C4FN mixture 245 kV and 420 kV metal enclosed switchgear

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: LCA, Aluminium, Recycling, Carbon-footprint, GIS

Use of recycled aluminium: challenges for metal enclosed parts in switchgears

S. LAURENT¹, C. DUMOULIN¹, E. MANGE¹, M. PERRET¹, L. TREIER¹, M. KWIECIEN², H. PUTO²

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: LPIT, GIS, Digital Substation, Compactness, Lightweight

Key lessons from long-term LPIT experimentation to support digital and environmental transition

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¹RTE; ²GE Vernova

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: SF₆, greenhouse gas, electrical industry, alternative technology, climate change mitigation, GIS, GIL, existing assets, high voltage

Retrofill application of 420 kV Gas Insulated lines with fluoronitrile based gas mixture

S. FIFI, H. DOLIGEZ, C. CABRERA, K. SCHANG, E. GROB

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: Retrofit - Conversion - Sustainability - Life Extension - Standards

Power Switchgear Retrofitting: Lessons from ANSI Standards Built on Four Decades of American Experience

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: Sensor, Integration, Process Bus, Efficiency, Reliability, Data, Communication

Revolutionizing Power Grid Modernization : The Impact of LPIT and Sensor Integration via Process Bus on Efficiency, Reliability, and Data Communication

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Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Asset management strategies including optimised maintenance, SF6 transitions and improve resiliency & ISO 55001 implementation journey

R. S. CHAUDHARY*, D. PAUL, M. KALORIA, D. N. JHA, R. SRIVASTAVA

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: Dry Air, Residual Current, Switch, Insulation, Firefly, Partial Discharge, Superimposed Impulse Voltage, Test

Dielectric Properties of highly - pressurized Dry Air and their Application to 550 kV DC Residual Current Switch

M. MIYASHITA, S. SASAKI, T. ASHIKAGA, Y. SAKATA, K. MATSUYAMA, T. INAGAKI

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: Synthetic Air, Bus Transfer Current, Electromagnetically Induced Current, Switching

Evaluation of Current Switching Performance with Synthetic-Air Disconnecter and Earthing Switch

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: Extra High Voltage (EHV), Gas Insulated Switchgear (GIS), SF6 Alternative, Natural-Origin Gas, CO2/O2 Gas Mixture, Gas Insulated Bus (GIB), Metal Oxide Surge Arrester (MOSA), Circuit Breaker (CB), Breakdown

Development of SF6-Free EHV Gas-Insulated Switchgear Employing a CO2/O2 Natural-Origin Gas Mixture

Y. SHO, T. SUSUKI, K. KUBO, T. MATSUMOTO, T. KOIKE, T. IJIMA, A. MUKAIDA

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: Dry Air, Insulation, Synthetic Air, Clean Air, SF6, Vacuum Circuit Breaker, Gas Handling, GWP

Dry Air-insulated 245 kV Dead-Tank Vacuum Circuit-Breaker - Insulation Design and its Verification

D. YAMADA¹, S. ISHITANI¹, M. SATO¹, H. HAMA¹, A. POETZSCH², T. HEINZ², K. JUHRE², D. CORTESE³, K. MIANZO³

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Decarbonization of Power Systems - Green Equipments (SF₆ Free)

P. PANDEY*, H. MITTAL, S. JAIN, A. K. SINGH

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: Condition-based Maintenance, Condition Monitoring, Digital Substation, IEC 61850, LPIT, Merging Unit, MMS, Optical Current Transformers

Reliable Power Grid Operation with Self-Monitoring Optical Current Transformers

C. DUTRA¹, L. TOMINAGA¹, J. OLIVEIRA¹, T. MATSUO², S. ZIMATH², V. WOYAKEWICZ², M. OLIVEIRA³, R. LIMA³, L. FREITAS³

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Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: pressurized tank, mechanical stress, GIS

Mechanical Stresses in GIS Grid components

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SF6 free RC Divider for DC Measurement on AIS HVDC Systems

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Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Sizing Vacuum Generator Circuit Breaker with Modern and User-Friendly EMT Model - Field Experience Applications

L. CASADO FULGUEIRAS¹, K. GREBENNIKOV², P. LA SETA², H. URBANEK²

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

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Testing of Biodegradable Fluids in High Voltage Current Transformers

J. M. NOGUEIRAS¹, M. HERNAIZ²

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Breakthrough for Rogowski coils (LPCTs) in medium voltage switchgear: benefits, standardization, and challenges in protection and testing applications

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Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Technology innovation of VI(Vacuum Interrupter) and challenges for the Eco-friendly power equipment industry in Korea

Y. S. YEO, H.-J. JU, C.-W. GU, J.-B. KIM

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ID: 11501

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: C4-FN mixtures, circuit breakers, CO₂/O₂/C4-FN, DTB, eco gas mixture, GIS, high voltage, SF6-free, switchgear, pre-insertion resistor

Development of 550 kV SF6-free Circuit Breaker for Dead Tank Breaker and Gas-Insulated Switchgear

F. KONG, X. LIU, Y. YANG, M. ZHENG, V. TEPPATI, C. YANG, S. KOTILAINEN, R. VOSS, M. BUJOTZEK

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ID: 11502

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: Curbing the global warming trend, 550kV current transformers, Air insulation properties, Improve the insulation strength, Installable and operable with security features

Development and Maintenance of 550kV UHV Clean Air CT

F. XUE, K. ZHAO, H. ZHANG, Y. LV

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ID: 11504

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: VIs, AMF, NSGA-II, GABP, 1/2 turn coil contact

Design optimization of a 1/2-coil type contact based on NSGA-II optimization algorithm and GABP neural network optimal

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Key Laboratory of Pulsed Power Technology (Huazhong University of Science and Technology), Ministry of Education

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: CO₂/O₂/C₄-FN mixture, thermal interruption, dielectric strength recovery, SF₆ alternative, HVCB

Study on Thermal Interruption and Dielectric Recovery Performance of CO₂/O₂/C₄-FN Mixture in HVCB

P. LU, Q. WU, R. SUN, Z. YUAN, N. LI

CHINT Electric Co., Ltd.

ID: 11509

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

A flash method for recycling insulator core rods into silicon carbide

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ID: 11510

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: SF₆-free, C₄F₇N/CO₂, circuit breaker, CFD, dielectric recovery, current interruption

Gas Blast of C₄F₇N/CO₂ Circuit Breaker under Various Current Levels

W. GU, X. WANG, Y. LI, W. SANG

Sieyuan Electric Co., Ltd.

ID: 11664

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: High Voltage Circuit Breaker, Correct Maintenance, Test Graphic, Dynamic Contact Resistance(DRM)

Troubleshooting HV Circuit Breaker Problems in the Field with Advanced Testing Techniques

E. KILIÇ, A. H. SERT, F. TAŞDEMİR AYDIN, Y. BİLGE, B. N. TOKER

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Application of PMVE Mixture in 145kV Gas Circuit Breaker

Y. H. OH, H. J. JANG, K. D. SONG

KERI

ID: 11829

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: .420 kV, GIS, SF₆-free, Dry-type cable termination, Interface testing, Standardization, Substation design, 420 kV, XLPE cable, Dry type technology, SF₆ reduction, C4-FN, Fluoronitrile, Connection system, Qualification tests.

420kV SF6-free GIS Substation Design, pioneering in new SF6-free Dry type Cable technology interface testing method standardization, implementation and recommendation for substation design

G. BLANCHET¹, J. MATALLANA¹, P. BOFFI², A. FERTI², J. A. BREIMO¹, A. FICHEUX³

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ID: 11831

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: SF6-free, switchgear, High-voltage AC and DC grids, HVAC, Vacuum circuit breaker, Partial discharge detection, Pilot installations, Offshore HVDC system, MVDC ultrafast circuit breaker, EU F-gas regulation

SF6-free switchgear for the future resilient European grid

A. PEDERSEN¹, N. STØA-AANONSEN¹, M. GAMMELSÆTER¹, L. AMARAL², M. LESSER³, M. NGUYEN⁴, G. BLANCHET⁵, M. MAGLIO⁶, V. BERGMANN³, R. MARSKAR¹, T. TREIDER¹, I. B. SPERSTAD¹

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ID: 11975

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: LPIT, SPACER, GIS, Reliability, Sustainability

A Study on the Long-term Reliability of Spacer Type Low Power Instrument Transformers

J.-K. KIM, J.-G. LEE, J.-H. KIM, D.-H. JEONG

HYOSUNG

ID: 12000

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: SF6-free GIS

The Development of a SF6-free high voltage 170kV 50kA GIS including Environment test

S. LEE

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ID: 12002

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: Sustainability, Transmission, AIS, SF6-free, F-gas-free, Vacuum, GHG emission

Emission-free 245 kV and 420 kV life-tank vacuum circuit-breaker

M. KUSCHEL, L. BINNER, J. TEICHMANN, T. HEINZ, P. GRONBACH, M. LESSER, R.-M. CERNAT, M. ROLF

Siemens Energy Global GmbH&Co KG

ID: 12091

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: Circuit breaker, Gas-insulated switchgear (GIS), Greenhouse gas (GHG) emissions, Maintenance, Explosion of SF6 circuit breaker, Alternative gas

Experiences from the Exploitation of High-Voltage SF6 Circuit Breakers and SF6 Gas-Insulated Switchgear (GIS) in the Power Utilities of Croatia and Serbia

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ID: 12245

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: High-Voltage Switchgear, SF6-free, Type Testing, Short-Circuit Testing

Type Testing of SF6-Free High-Voltage Switchgear at Highest Ratings - Key Experiences and Technical Aspects

D. BAECKER¹, G. HOFFMANN¹, M. HEDDERGOTT¹, J. KIEFER¹, M. STOECKLI²

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ID: 12248

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: HVCB, High-Voltage Circuit Breaker, C4F7N, extended electrical endurance, shunt reactor switching, back-to-back, transient recovery voltage, TVR, inductive load switching, inrush current and frequency

Back-to-back switching, inductive switching and extended electrical endurance E2 performance of a CO₂+C₄F₇N-based 145kV HVCB

M. GOTTI¹, J. MANTILLA¹, X. YE¹, J. KIM², S. KIM², S. KIM², M. STOECKLI³

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ID: 12249

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: power quality metering, low-power instrument transformer, LPIT, standardization, IEC 61869

Low-power instrument transformers for power quality metering

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ID: 12250

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: High Voltage Circuit-Breaker, SF₆ alternatives, puffer technology, computational fluid dynamic simulation, dielectrics, short line fault, terminal fault

Development and Testing of the World's first 420 kV SF₆ free Live Tank Circuit-Breaker

R. KARRER¹, T. ROININEN², V. PATEL², M. DHOTRE¹, B. RADISLAVLJEVIC¹, M. STOECKLI³

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ID: 12251

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: bio-based, bushing, epoxy, high-voltage, insulation

Bio-based Epoxy Resin for High-Voltage Bushings: Insight into more sustainable Materials with improved Insulation Performance

V. LUTZ¹, Z. LUO¹, E. FERDJALLAH¹, M. STOECKLI²

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ID: 12252

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: gas insulated switchgear, live tank circuit breaker, puffer technology, SF₆ alternatives, short circuit current, transmission grid

420 kV SF₆-free Live Tank Circuit Breakers and Gas-Insulated Switchgear for 80 kA Applications

M. PALAZZO¹, D. TEHLAR¹, M. BUJOTZEK¹, K. CHAUHAN², M. REFAEY¹, T. RODLER³, M. TUCZEK³, M. STOECKLI⁴

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ID: 12253

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: data analysis, decarbonization, energy transition, fluoronitriles, gas insulated switchgear, HVCB, machine learning, neuronal networks, SF₆-free, simulation, testing

Application of Machine Learning Models to the Development of SF₆-free High Voltage Gas Insulated Switchgear

K. PANDYA¹, H. SOHN², A. REYES¹, M. GOTTI¹, J. KIM², J. MANTILLA¹, M. STOECKLI³

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ID: 12255

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: GIS, C₄-FN mixtures, long-term return of experience, site measurements, gas quality

Return on Experience on the C₄-FN/O₂/CO₂ Technology based on a GIS after 7 years in Operation

M. PERRET¹, M. INVERSEN², M. LACUVE³, D. LEGUIZAMON-CABRA³, M. STOECKLI⁴

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ID: 12257

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: HVCB, SF₆-free, SF₆ alternatives, CO₂/O₂/C₄-FN, C₄-fluoronitrile, sub-transmission, type testing

Type-testing of a new metal-enclosed 145 kV CO₂/O₂/C₄-FN Circuit Breaker with a cross-platform Design

P. STOLLER¹, B. SPREEN¹, M. NUREDINI¹, R. KARRER¹, F. LUNDQVIST¹, M. STOECKLI²

¹Hitachi Energy Switzerland; ²ELECTROSUISSE / CIGRE Switzerland NC Secretary

ID: 12259

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: C4F7N, double-chamber, HVCB, high voltage circuit breakers, grading capacitors

Development Experience of C4F7N-based 420 kV HVCB, double chamber and single chamber Prospects

T. SUTHERLAND¹, M. GOTTI¹, K. PANDYA¹, J. MANTILLA¹, M. STOECKLI²

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ID: 12260

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: C4-FN mixtures, circuit breaker, current interruption, dielectric optimization, dielectric tests, eco gas mixture, high voltage, SF6 alternatives, SF6-free, short line fault, terminal fault, voltage withstand

Advanced optimisation Techniques for eco-efficient Circuit Breaker Design - Applications to a newly developed 245 / 300 kV SF6-free High Voltage Circuit Breaker

V. TEPPATI¹, W. THUNBERG¹, Y. LU¹, P. FREI¹, S. KOTILAINEN¹, M. STOECKLI²

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ID: 12261

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: C4-FN mixture, circuit breaker, controlled closing, current interruption, dielectric, dead-tank breaker, gas insulated switchgear, high voltage, SF6 alternatives, SF6-free, short line fault, shunt reactor switching, terminal fault, voltage withstand

Developing and standard testing of a 245 kV / 300 kV eco-efficient High-Voltage Circuit Breaker and Switchgear

V. TEPPATI¹, F. COSTANTINO¹, M. NUREDINI¹, P. FREI¹, M. DHOTRE¹, V. TILLIETTE¹, M. STOECKLI²

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ID: 12262

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: HVCB, High-Voltage Circuit Breaker, C4F7N, CFD, machine learning, MOO, dielectric recovery, thermal interruption, neuronal networks, pareto front

Machine learning-driven Component optimization for eco-friendly High-Voltage Circuit Breaker design

X. YE¹, S. BRYNDA¹, O. COSSALTER¹, M. GOTTI¹, J. MANTILLA¹, M. STOECKLI²

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ID: 12369

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: Sustainability, Transmission, Circuit-Breaker, AIS, SF6-free, F-gas-free, Vacuum, GHG emission, Clean Air, Non-linear resistor, 420 kV

Analysis of behaviour of an emission-free 420 kV live-tank vacuum circuit-breaker

R.-M. CERNAT¹, S. WETHEKRAM¹, L. BINNER¹, M. LESSER¹, P. WERDELMANN², D. ALFES², S. HANS², D. E.²

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ID: 12372

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: Low-power instrument transformers (LPITs); Medium Voltage Gas-insulated Switchgear (MV GIS); Life Cycle Assessment (LCA); CO₂ emissions; IEC 61850; Sampled Measured Values (SMV); Process Bus; accuracy class 0.2(S); MID-certified revenue metering; medium-v

Impact of Low Power Instrument Transformers on Medium Voltage Gas Insulated Switchgear Sustainability

T. BAJANEK, V. PROKOP, L. CESKY, R. PERNICA, N. VYBIRALOVA, P. VANO

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ID: 12375

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: SMART MV SWITCHGEAR, LOW POWER INSTRUMENT TRANSFORMERS, MV SENSORS, IEC 61850 COMMUNICATION, OPERATION EFFICIENCY, SUSTAINABLE POWER DISTRIBUTION, REVENUE METERING, BUSBAR DIFFERENTIAL PROTECTION

A Decade of Smart Medium Voltage Switchgear: LPITs and IEC 61850 Advancements

K. MAJER, V. PROKOP, M. CELKO

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ID: 12485

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Keywords: Vacuum Interrupter, Vacuum Circuit Breaker, Low Frequency, AMF, TMF, Butt Contacts

Vacuum Current Interruption for Low Frequency Applications

D. GENTSCH¹, S. GORTSCHAKOW², A. LAWALL³, F. GRASKOWSKI³, N. DORRAKI³

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS2 - Sustainability and circular economy of T&D equipment

Environmental friendly high voltage testing equipment with synthetic air

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A3 PS3 - Asset management strategies for T&D equipment

ID: 10179

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Seismic Design - High Voltage Equipment - Artificial Intelligence (AI) - Digital Twin Technology - Instrument Transformer - Circuit Breaker

Seismic Design of High Voltage Equipment through AI-Driven Engineering

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ID: 10266

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Robotic, Automation, Transmission, O&M

Robotic Process Automation for Transmission O&M

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ID: 10267

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Assessment, Healthiness, EHV, Lightning, Arrestors

Novel Method of Assessment of Healthiness of EHV Lightning Arrestors using Total Harmonic Distortion analysis of Leakage Current

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ID: 10268

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Interrupter, Replacement, 765 kV, Circuit, Breaker

Minimizing Grid Downtime Through On-Site Interrupter Replacement of 765 kV Circuit Breaker at Ballia Pooling Station

A. KUMAR*, T P VERMA, P. SHARMA, Y. K. DIXIT

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Current, Transformer, Health, Assessment, Condition Monitoring

Development of a Real-Time Online Condition Monitoring System using Tan delta leakage current for Current Transformer Health Assessment

V. PARGANIHA*, R. VUSALA, R. P. SINGH, V. C. MEHATA

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ID: 10271

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment
Keywords: Digital, Twin, Predictive, Asset, Management, Distribution, Grids

Digital Twin and Predictive Asset Management for Distribution Grids in Delhi: A BRPL Case Study

A. KUMAR*, A. NAGARAJAN, S. WADHERA, S. KHETARPAUL, A. RANJAN
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ID: 10273

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment
Keywords: switchgear, monitoring

MV Switchgear monitoring & analysis using Panel Health Monitoring System

S. JOSHI*, V. BHOSALE, A. BHUTKAR, A. CHAUHAN
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ID: 10274

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment
Keywords: Challenges, AIS, GIS, Substation, Transformation

Future-Ready T&D Assets: Overcoming Challenges in AIS and GIS Substation Transformation

B. SINGH*, S. KUMAR, S. KUMAR, L. SARKAR
BHEL, India

ID: 10275

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment
Keywords: Installation, Commissioning, Operation

From Dormancy to Operation: Successful Restoration, Installation and Commissioning of a 420kV Gas Insulated Switchgear (GIS) After Prolonged and Adverse Storage

M G GOKHALE*, S ADHIKARI, I P RANJAN, M. SRIVASTAVA, N. K. SINGH, A TIWARY, J. K, R. KUMAR
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ID: 10328

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment
Keywords: 400 kV, GIS, SF₆, restoration, strategy

Case Study on Flashover in a 400 kV GIS Compartment due to undetected SF₆ pressure drop and restoration strategy

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ID: 10329

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment
Keywords: Conceptualization, development, Asset, Performance, Management

Conceptualization & development of unified Asset Performance Management (APM) framework in POWERGRID.

M. K. KALORIA*, D. N. JHA, D. PAUL, R. SRIVASTAVA, N. SRIVASTAVA
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ID: 10354

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment
Keywords: Implementation of SF₆ Online Monitoring, HV Circuit Breakers

Innovative Implementation of SF₆ Online Monitoring for HV Circuit Breakers

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ID: 10770

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment
Keywords: Life Assessment, MTS, Gas Circuit Breaker, Grease, Oil Content, Deterioration, Silver Plating, Wear, Rotary Sliding, Sliding Limit

Criteria for renovating Circuit-Breakers of 500 kV MTS

K. SASAMORI¹, M. SATO¹, N. IGURA¹, A. HATSUZAKI², Y. YAMAMOTO², A. SUGAWARA²
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ID: 10816

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

A Data-Driven Paradigm: Digital Twins, IoT and AI for Predictive Management of High-Voltage T&D Assets

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ID: 10817

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Industrial Internet of Things (IIoT), Substation Asset Monitoring, Predictive Maintenance, Thermal Imaging, SF₆ Monitoring, Reliability-Centered Maintenance (RCM), Smart Sensors, Digital Substation, Asset Health Index, Real-Time Monitoring, Cybersecurity

Integration of smart IIoT sensors in T&D for enhanced monitoring

R. S. CHAUDHARY*, D. PAUL, A. DUBEY, R. SRIVASTAVA, J. G. JOSE

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ID: 10860

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: series capacitor, smart sensor, energy harvesting, artificial intelligence, diagnostics, maintenance prescription

Research and Application of Innovative Smart Sensors and AI-based Diagnostic, Prognostic and Prescription Software for Series Capacitors

M. ALVES¹, M. SANTOS², C. CHANGWEI², W. FERREIRA², J. B. SILVA³, R. SANTOS³, R. ANDRADE³, F. HÖPKER⁴, J. SILVA⁴, J. DUQUE⁴, D. PEDROSA¹, M. PINTO¹, C. HARISSIS¹, A. CABRINO¹, G. MOURA¹, D. PIVOTO¹, C. PEDROSA¹, H. SANTOS¹, B. SARDINHA¹, D. MENDES¹

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ID: 10861

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Asset Management, Finite Volume Method, Infrared Thermography, Multiphysic Simulation, Predictive Maintenance, Surge Arrester

Electro-Thermal Modeling of ZnO Surge Arresters for Predictive Maintenance Support through Infrared Thermography Considering Porcelain and Polymeric Housings

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ID: 10869

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: frequent-operation circuit breakers, on-line monitoring, signal processing, artificial intelligence, diagnostics, Intelligent Electronic Device

Research and Development of an On-line Monitoring System for Circuit Breakers under Frequent-Operation Regime

M. ALVES¹, L. SOUZA², B. REIS², F. PIOTO², D. PEDROSA¹, M. PINTO¹, C. HARISSIS¹, A. CABRINO¹, G. MOURA¹, B. SARDINHA¹, I. MODA¹, D. PIVOTO¹, C. PEDROSA¹, H. SANTOS¹, R. FERREIRA¹, D. MENDES¹

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Asset Management - Natural Language Processing - Underground Transmission

Applying Natural Language Processing and Machine Learning to Support Underground Transmission Asset Management by Analysis of Maintenance Records

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ID: 10989

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: PQ; SAMU; IT

Towards Intelligent Digital Substations: SAMU-NG with Digital Twin for Inductive Instrument Transformer Compensation

D. PALLADINI

RSE

ID: 11155

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Frequency domain, frequency response analysis, perturbation signals, time domain, voltage measurement systems, wideband classes

Evaluation and characterisation of test signals in the time and frequency domain for the frequency response analysis of voltage measurement systems

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ID: 11246

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Digitally enabled substation service: a structured framework to establish a collaborative asset management environment. The ERG use case in wind power generation

Digitally enabled substation service: a structured framework to establish a collaborative asset management environment. The ERG use case in wind power generation

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ID: 11626

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Asset management, Condition-based maintenance, Damped AC, Distribution networks, IEC 60270, IEEE 400, Insulation diagnostics, Medium-voltage cables, Partial discharge, Predictive maintenance, Utility networks

Enhancing Predictive Maintenance of 11kV Distribution Networks-offline Partial Discharge Testing Using Damped AC Signals

M. ALHAYKI

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ID: 11720

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Version control, Shell scripting, Automation, Circuit breaker maintenance test record

Applying IT Version Control to Circuit Breaker Maintenance Test Records

J. SCHWARTZ, E. KELEMEN, C. WERNER

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ID: 11832

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Asset Monitoring – Dashboard – User Journey – Key Learnings – SF6 – Data – Sustainability Reporting – Trend

Beyond Go-Live: Key learnings from the data journey of dashboard solutions for enhanced SF6 monitoring

K. LEE, K. S. OFTEBRO, G. BLANCHET

Statnett

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: optimization of maintenance strategy, switching equipment, substation, machine learning model, condition-based maintenance, asset health index, explainable AI

A methodology for real-time health monitoring and management optimization of Substation switching equipment using interpretable machine learning

E. CORONEL¹, P. GARDEL², M. CAETANO³

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ID: 11992

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Circuit Breaker Monitoring, Condition Monitoring, Machine Learning Applications, Phase De-tection, Solenoid Action

Data-Driven Condition Monitoring of AC-supplied Trip Coils of Circuit Breakers

P. KRONEGGER¹, M. STIFTER¹, T. I. STRASSER^{2,3}, I. A. OGREZEANU^{4,1}

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ID: 11999

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Current Transformer, Control-Oriented Modelling, Model Identification, Ferromagnetic -Core Material, Jiles-Atherton Model

Parameter Identification and Application Guide of a Computational Efficient Control-Oriented Ferromagnetic Transformer Core Model

N. SCHWARTZE¹, D. ALBERT¹, S. MOSCHIK¹, M. REICHHARTINGER²

¹OMICRON electronics GmbH; ²Graz University of Technology

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Predictive Diagnostic Model with Artificial Intelligence for High-Voltage Switchgear Failures

A. C. GALINDO VARGAS¹, G. FANDIÑO OLAYA²

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ID: 12074

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Insulators, Flashover events, Leakage Current, Contamination

Effect of Form factor, Non-Uniform Contamination, and UV Radiation on Leakage Current in High-Voltage Insulators

R. VILLALOBOS, M. ARACENA, E. RICHARD

Universidad de La Frontera

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Intelligent Failure Prediction System: Transforming Traditional Maintenance Strategy through Advanced Predictive Analytics and Organizational Change Management

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: SF6 Leak Detection, Gas-Insulated Substations, Predictive Maintenance, Sensor Technology, Machine Learning Models

Predictive Monitoring of SF6 Gas Leaks in GIS Substations Using Sensor Technology and Machine Learning Models

A. HUAMAN, P. CASABONA, A. GIBU, J. DAVILA

ISA ENERGÍA PERÚ

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Development of a Digitalized Circuit Breaker Continuous Online Monitoring System and Intelligent Dashboard for Smart Asset Management

S. MUTHUKARUPPAN¹, A. A. R. RAJA GOPAL², N. S. ABDUL BAHARI²

¹Tenaga Nasional Berhad, TNB; ²TNB Research Sdn. Bhd

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

From Silo to Synergy: Achieving Interoperability in Asset Performance Management

E. AUMANN¹, J. SKIERSZKAN¹, B. FISCHER², L. LINK²

¹Siemens AG; ²Maschinenfabrik Reinhausen GmbH

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Efficient Condition Assessment System for Circuit Breaker Fleets addressing both Reliability and Sustainability

K. MAURER¹, P. BOLZ², M. ZDRALLEK², T. BROCK³

¹Maschinenfabrik Reinhausen; ²University of Wuppertal; ³Netze Duisburg

ID: 12421

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: High-voltage circuit breaker, Digitalization, Vibro-acoustic, Condition Assessment

Benefits of a vibro-acoustics-enhanced method for assessing the condition of high-voltage circuit breakers

A. KURZ¹, J. KRELING³, P. MASMEIER¹, M. KOCH², R. GÖTZ³

¹Messko GmbH Germany; ²Technische Universität Darmstadt Germany; ³Maschinenfabrik Reinhausen GmbH Germany

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Online monitoring and state-of-health estimation of circuit breakers using data analysis and AI

T. GRÄF¹, S. BORCHERS-TIGASSON¹, S. SCHWANCK²

¹Hochschule für Technik und Wirtschaft Berlin; ²KEMA Labs, CESI Group, IPH Berlin

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

A recommendation for T&D industry on how to digitalize the Value Chain

T. DÜRR¹, F. RICHTER², U. KALTENBORN³

¹Siemens AG Germany; ²50Hertz Transmission GmbH Germany; ³HIGHVOLT Dresden GmbH Germany

ID: 12640

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Floating DC Battery Systems, DC Battery Grounds, Monitoring, Critical Ground Resistance Values

Advanced DC Battery Ground Monitoring

D. MARTINO¹, R. JIMENEZ², T. SAUERS³, R. SCHILLER⁴

¹ComEd U.S.A.; ²ComEd U.S.A.; ³ComEd U.S.A.; ⁴ComEd U.S.A.

ID: 12641

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: A3 PS3 - Asset management strategies for T&D equipment

Keywords: Artificial Intelligence, Asset Management, Defect Detection, Distribution Inspection

Enhancing Power Distribution Defect Identification with Video- Based Computer Vision: A Two-Step Defect Detection Method

Z. TANG¹, J. WANG², J. ZHAO³, A. FAZLAGIC⁴

¹Eversource Energy USA; ²Eversource Energy USA; ³Eversource Energy USA; ⁴Eversource Energy USA

B1 INSULATED CABLES

B1 PS1 - Future cable systems and innovative cable applications

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Universal Transition Joint 150kV for XLPE cable on the Belgian Grid

B. MAMPAEY¹, P. LEEMANS¹, J.-B. ZIMER¹, T. CAPELLE², D. LEEMANS², A. AIT AMAR²

¹Elia, Belgium; ²Nexans, Belgium

ID: 10281

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Superconducting Cable, Resistive Cable, Grid Hierarchy, Right of Way, Transmission power capacity, Urban Grid, On-shore, Off-shore, Grid Congestion, CableGnosis

Requirements for Feasibility of Superconducting Cables as studied in the CableGnosis Project

R. ROSS¹, A.-J. DE GRAAF¹, R. ZUIJDERDIJN², C.-E. BRUZEK³, M. YAZDANI-ASRAMI⁴, T. SPINA³, W. SONG⁴

¹IWO; ²TenneT TSO; ³ASG Superconductors S.p.A.; ⁴University of Glasgow

ID: 10282

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications
Keywords: Experiments, MVAC cable systems, thermal monitoring, time-domain reflectometry

Time-domain reflectometry based temperature monitoring on MVAC cables: experience from field and laboratory experiments

A. JIMÉNEZ-ROSALES¹, D. WOLDENDORP¹, A. KOLMUS¹, N. DE VISSER¹, J. DE LANGE¹, S. RIEKEN^{1,2}

¹Alliander N.V.; ²IMAPP, Radboud University

ID: 10320

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Aluminium conductor; underground cables; high voltage transmission; total cost of ownership; cable accessories; environmental impact; 150 kV cable system

Introduction of 4000 mm² AlMil conductor in HV cable systems

R. ZUIJDERDUIN¹, J. SMIT¹, A. KARAMEKIOS¹, M. FARAGALLA¹, A. TSEKMES², F. MIDDEL², T. KOLTUNOWICZ², R. BODEGA²

¹TenneT TSO; ²Prysmian

ID: 10325

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Submarine, immersed in water, buried, seabed

An Analytical Current Rating Calculation Method for Submarine Cables Completely Immersed in Water or Partially Buried in the Seabed

X. JIAO, E. FERNANDEZ, J. PATRICK

ELEK Software

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Insulated Cables Statistics 2023

R. WHEATLAND¹, F. WAITE², K. O. ASKLUND³, J. FUJIHARA⁴, P. VAN DER WIELEN⁵, S. D. MIKKELSEN⁶, N. HAMPTON⁷, A. WOOLLES⁸

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ID: 10678

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Construction - Design Coordination - Cable Systems - Transmission - Civil Engineering - Electrical Design - Urban

Electrical and Civil Engineering Challenges for Underground Cable Installations in Urban Settings

E. Ç. C. BASCOM III¹, C. PETROCELLI², D. L. TAYLOR JR², R. ADAMS²

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ID: 10679

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Transmission - XLPE - Retrofit - Pipe-Type - HPFF - Replacement - Life Cycle

XLPE Cable Retrofit for Pipe-Type Presents Engineering Challenges

E. Ç. C. BASCOM III¹, A. SMITH², S. ASHKOURI², P. WALL², E. AL-SIBAI²

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ID: 10699

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Superconducting cables, MVDC, high-temperature superconductors (HTS), offshore cables, Resistive Fault Current Limiter

High-power medium-voltage superconducting cables for Europe's energy transition

A. ALLAIS¹, B. WEST¹, N. LALLOUET¹, K. ALLWEINS¹, M. GAMMELSAETER², A. MORANDI³, M. SIMONAZZI³, E. GUERRA³, J. CANDIDO⁴, D. O DONOVAN⁵, F. GOMORY⁶, E. SEILER⁶

¹NEXANS; ²SINTEF; ³University of Bologna - Italy; ⁴WAVEC; ⁵SUPERNODE; ⁶IEE Bratislava - Slovakia

ID: 10701

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Dynamic cable – Floating offshore wind, Distributed fibre optic sensing, DAS, DSS, Subsea cable, Condition monitoring, Dynamic loading, Lazy wave, Offshore instrumentation

Dynamic cable monitoring using Distributed Fiber Optic Sensing

S. RAKOTOARIVONY¹, P. CLEMENT¹, M. ROULET², A. MAISON²

ID: 10720

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Superconducting - Electromagnetic Transient - Data Center - Simulation - Modeling - Experimental Model Validation

EMT Modeling and Analysis of HTS Power Cables in Data Center Interconnection

J. ZHAO¹, F. MORICONI², K. THOMAS¹, S. ASHWORTH², E. GARCIA², E. KARACA², S. CHRISTO²

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ID: 10728

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: HVDC, HVAC, Qualification Tests, HV Cable Systems, Cable specification, TOV, Short Circuit current, Submarine, Underground

Towards a Coordinated HV Cable Approach: A TSO-Led Response to the Grid Action Plan - Six European TSOs Launch Collaborative Effort to Support HV Cable Supply Chain

W. BELE¹, R. BONDO¹, F. ESTERL², Y. LEROY³, H. RAJADO⁴, G. GENDRE⁵, B. LEEMANS³, Y. BREMART¹, G. DENCHE⁴, K. SCHMIDLIN⁵, P. MEYER¹, S. GROEGER⁶

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ID: 10822

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Aluminum conductor, connector, OF cable replacement

Development of 275kV Aluminum Conductor XLPE Cable and Connectors

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ID: 10823

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: HVDC, Cross-linked Polyethylene (XLPE), Submarine cable, Deep water, Armour

Development of DC deep water submarine cables that enable installation along optimal routes

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Furukawa Electric Co., Ltd Japan

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Distributed Acoustic Sensing (DAS), Fault Detection, Remote Optically Pumped Amplification (ROPA), Optical Time Domain Reflectometry (OTDR), High Voltage Direct Current (HVDC) submarine cable, Anchor drop detection, Vessel movement identification

Early Detection of External Damage Incidents in Long-Distance Direct Current Submarine Cables

S. YAMAMOTO¹, S. TAKEDA¹, T. SHIMOOGUCHI¹, D. BOLOTOV², R. ALBRECHT²

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ID: 10991

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: 245 kV HVAC; Dynamic Cable Systems; Floating Offshore Wind; Mechanical Fatigue Resistance; Offshore Wind Innovation; Subsea Power Transmission

Industry-First Dynamic Cable System Solution at 245 kV

A. VERRILLO

PRISMIAN ITALY

ID: 11146

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: outdoor cable termination, composite housing, dry type, plug-in, energy transition, gas-free, qualification tests

"Development and Qualification of a 420 kV Dry-Type Outdoor Termination"

P. BOFFI

PRYSMIAN

ID: 11167

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications
Keywords: HPFF-cable, transition joint, high-voltage cable, accessory, oil-impregnated insulation, testing

220 kV Transition Joint for Connecting High-Pressure Fluid-Filled (HPFF) Cable and Cross-Linked Polyethylene (XLPE) Insulated Cable

A. FILIPPOV¹, A. SLAVINSKY¹, V. PSHENNOV², D. GVOZDEV³, V. BOLONOV³, A. KOROLEV⁴

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: controlled switching device, offshore wind farm cable export system, shunt reactor compensation, zero-miss phenomenon

Investigation on Zero-miss Phenomenon in Shunt Reactor Compensated Long HVAC Cable for Offshore Wind Farm

Z. WANG^{*1}, P. WANG², R. ZHANG¹, J. KOTINIITY³

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ID: 11341

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: polypropylene, Insulated cable, thermoplastics, catalyst, residues

AC Electrical Characteristics of Polypropylene for Eco-friendly Thermoplastic Power cable

H. LEE, H. JUNG, J. S. SHIN, E. LEE, J. PARK

Hanwha TotalEnergies

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Subsea reactive power compensation for offshore wind

T. LANERYD

Hitachi Energy

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Stresses on crossing third-party assets due to lightning strikes along underground HVDC cable route

P. SIDENVALL

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ID: 11380

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Partial Discharge, Fibre Optic, Passive Sensors, Very Long Distance, High Voltage Cables

Nobel passive signal acquisition system for PD monitoring of very long cables based on optical fibre

J. ORTEGO¹, I. JARA¹, W. DOMINGOS DE MEDEIROS², L. MERINO², P. CHAMORRO-POSADA³

¹Ampacimon, Spain; ²RDT Lumiker, Spain; ³Universidad de Valladolid, Spain

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Evaluation of modified XLPE for 320 kV HVDC Cable use at elevated Conductor Temperatures

S. KIM, T. LEE, C. KIM, Y. LEE

Hanwha Solutions

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

First results from curvature sensor installed in dynamic cable on floating platform

V. RYDÉN

NKT

ID: 11513

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: 110kV; Offshore wind power, Torsion-resistant cable, Ethylene Propylene Rubber, Intelligent Monitoring, service life assessment
Introduction

Research on 110kV Torsion-Resistant Cable for Offshore Wind Power

J. CHEN¹, C. TIAN¹, J. GAO², M. WU²

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ID: 11666

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Condition Monitoring, Digital Twin, High Voltage Cable Systems, High Voltage Intelligent Solutions, LoRaWAN Communication, Predictive Maintenance

Enhancing the Reliability of HV Cable Systems Through Intelligent Monitoring and Digital Integration Solutions

S. ERDENİZ, Y. HIZAL

Em Elektrik

ID: 11705

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: BIM, Cable, Flexible, High Voltage, Point Cloud Data, TMF, Tunnel, 3D Modelling.

Design of Flexible Cable Installations within Congested Tunnel Systems

D. CAVE, J. SULLIVAN, J. URDANETA, J. OLIVER

BakerHicks Ltd. United Kingdom

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Study on Mechanical Fatigue Loads on Insulation in a Dynamic HVDC Cable

A. TYRBERG

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Power Cable, Current Rating, Ampacity

Ampacity Calculations of Complex Underground Cables Arrangements

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: arcing models, type tests, cable components

A piecewise approximation methodology to analyse cable arcing fault behaviour and characteristic

A. CUPPEN¹, J. J. M. CUPPEN², N.-K.C NAIR¹

¹University Of Auckland, New Zealand; ²Neiding B.V., The Netherlands

ID: 11812

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Distributed Electrical Sensing (DES), Distributed Temperature Sensing (DTS), Fibre Bragg Grating (FBG), Passive Sensing, Real-Time Thermal Rating (RTTR).

Improved cable RTTR and early failure detection by combining DTS monitoring with distributed point sensing

S. BLAIR¹, L. GEORGE¹, M. KELLY¹, M. HOSSEINI¹, P. VERNON¹, R. OU¹, N. KROPF²

¹Synaptec UK; ²Vattenfall Germany

ID: 11824

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: HVDC Mass Impregnated Cable System, Deep water, Type testing

525 kV HVDC Mass Impregnated Cables for 3000 m water depth

L. LERVIK, P. V. LAENGEN, A. SUTHER, B. K. JOHANSEN

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ID: 11827

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Submarine Cable Installation, Offshore Wind, J-Tubeless, Fatigue Test, System Reliability

Development and Reliability Validation of J-Tubeless Installation Method for Submarine Cables in Offshore Wind Farms

J. CHOE¹, J. LIM¹, Y. JUNG², K. AHN³

¹KERI; ²Taihan Cable&Solution; ³Hwaseung Corporation

ID: 11834

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: offshore wind, floating wind, dynamic cables, extruded cables, high voltage cable, wet design, high voltage wet design

Qualification of 132 kV wet design XLPE cables

M. BENGTSSON¹, E. OLSEN¹, D. NILSSON², R. HUUV², S. HVIDSTEN³, H. H. SÆTERNES³, F. MAUSETH⁴

¹Nexans Norway; ²Borealis; ³SINTEF Energy Research; ⁴NTNU

ID: 11836

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Monitoring, Modelling, Cable Aging, Edge Integration, DTS, DAS, Vibration, PD

Predictive Modelling of XLPE Cable Systems Using Real-Time Monitoring via Distributed Sensing and Edge Integration in the EASY-DC framework

C. DIKAIKOS¹, T. LUCIGNANO¹, J. NIEMANN-LARSEN², S. V. KJÆR², G. MERINO³, L. MERINO³

¹Statnett; ²Energinet; ³Lumiker

ID: 11837

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: HVDC, Cable, Joint, Accessory, Surface Inspection, Quality Control, Algorithm, Database, Installation

Field Experiences with Surface Inspection and Control Algorithms Employed on Extruded HVDC Cable Accessory Installations

E. DOEDENS, S. KJØNIGSEN, T. DRAGESET

Nexans Norway

ID: 11838

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Dynamic cables, technology qualification, testing, numerical methods

Mechanical design of dynamic cables for floating wind – Technology Qualification combining testing and cross section modelling

P. A. EIKREM, G. SKEIE

DNV

ID: 11844

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Superconducting cables, MVDC, MgB₂, dual / bi-energy power transmission, liquid hydrogen

Hydrogen-cooled superconducting power link

M. GAMMELSÆTER¹, C.-E. BRUZEC², A. MARIAN³, S. HOLE⁴, N. LALLOUET⁵, A. MORANDI⁶, W. REISER⁷

¹SINTEF; ²ASG; ³RIFS Potsdam; ⁴ESPCI; ⁵Nexans; ⁶University of Bologna; ⁷VESC

ID: 11845

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Inter Array Cable Rating – Considerations Beyond IEC standards

XLPE cable cores with a new aluminium alloy conductor subjected to ageing in water at high constant temperatures and temperature cycling

J. HØLTO¹, T. A. VE¹, E. H. SWENSEN¹, S. HVIDSTEN¹, E. OLSEN², J. SKAGMEØ², K. M. BENGTSSON²

¹SINTEF Energy; ²Nexans Norway

ID: 11846

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: RTTR, DTS, Dynamic Rating, Optimisation, Thermal Modelling, Temperature monitoring, HVAC Submarine cable system

A Practical Approach to Dynamic Operation of the HVAC Submarine Cable System 'Fensfjorden' in Norway

T. LUCIGNANO, J. MATA LLANA, H. LUND, D. S. AMUNDSEN, V. MARKHUS

Statnett

ID: 11848

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: 3-core submarine cables, thermal bottleneck, low-loss cable system, single-point bonding, improved cable ratings.

Single End Bonding of submarine 3-core cables – Qualification Testing

E. OLSEN, H. TØMMERBAKKE, M. HOVDE, K. M. BENGTSSON

Nexans

ID: 11849

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Cross-linked Polyethylene – Dielectric Strength – HVDC – Temporary Overvoltage

Dielectric Strength of XLPE Subjected to Temporary Overvoltages of Different Durations

M. RUNDE¹, D. LINHJELL¹, Ø. HESTAD², A. MERMIGKAS¹, C. LESAINT¹, K. S. THINN¹, H. H. SÆTERNÆS¹, E. DOEDENS³, J. I. JUVIK⁴

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ID: 11902

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Polypropylene insulated cable, 154kV pilot project, Higher admissible current, Eco-friendly

Application Case of Field Experience through Mechanical Constant Test of 154kV Eco-friendly Polypropylene Insulated Power Cables

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ID: 12007

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: XLPE, HVDC Cables, LCC, VSC, Polarity Reversal, Lifetime, Breakdown, Insulation

Influence of Polarity Reversal on the dielectric strength of extruded HVDC Cables

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ID: 12231

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Cable, lightning, protection, shield wire, simulation, soil, testing

Protective Measures for Medium-Voltage Cable Systems against Nearby Lightning Strikes to Ground

S. PODKORITNIK¹, R. AHLIN¹, I. KOBAL¹, D. HUC¹, G. MILEV¹, M. SIMON¹, V. DJURICA¹, V. BONČA², J. SERDINŠEK³

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Transient Performance and Operational Insights of Hybrid 380 kV AC Transmission Systems

M. BOZEK, S. MUELLER- SCHUETZE, W. KRAUSE

TenneT Germany

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Defining Operational Voltage Bands for HVDC Cable Systems in Multiterminal DC Grids: Rationale for Increasing Type Test Base Voltage from 525 kV to 550 kV

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ID: 12501

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: 750 kV extra-high voltage AC cable, cross-linked polyethylene insulation, smooth aluminum sheath, corrugated aluminum sheath, type test, pre-qualification test

Development and Standardization of 750 kV Extra-High-Voltage AC Cable System for Large Capacity Renewable Energy Transmission

P. GAO¹, Y. ZHAO¹, F. GAI¹, Y. WANG², B. TANG¹, W. LIU¹, T. ZHANG², Y. ZHANG², J. HOU³, H. GONG³, J. GAO⁴, L. JIANG⁴, L. ZHONG⁴

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Current rating in dynamic cables with corrugated sheath and double wire armour

D. CHATZIPETROS, K. BITSIS, D. GKITSOS, P. PARISSIS, A. NEGINHAL, N. P. SAKKAS, V. KANAS, A. I. CHRYSOCHOS

Hellenic Cables Greece

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Thermoelectric performance of a 66 kV Submarine Umbilical Cable Integrating Hydrogen Transmission for Offshore Renewable Systems

P. ZAIRIS, K. BITSIS, I. CHALEPLIDIS, K. KOUTRAS, A. NEGINHAL, D. GKITSOS, D. CHATZIPETROS, E. KYRIAKOPOULOU, G. GEORGALLIS

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Real Time Monitoring of Submarine Power Cable Installation Parameters During Free Lay

P. DELIZIS, G. GEORGOPOULOS, A. PYTHAROULIOU

ASSO.Submarine Greece

ID: 12618

B1 INSULATED CABLES - Full Papers

Topics: B1 PS1 - Future cable systems and innovative cable applications

Keywords: Submarine, dynamic, cable, insulation, wet design, offshore, water tree, degradation, lifetime

Assessment of Water Tree Formation in XLPE Insulation Variants to Validate Design of 132 kV Wet-Type Dynamic Cables

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B1 PS2 - Recent experience with AC and DC cables, both land and submarine

ID: 10157

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Ampacity - Finite Element Method (FEM) - Pinch Points - Thermal Modeling - Cable

Advanced 3D FEM Modeling for Thermal Management of Underground Cable Systems and Crossings

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ID: 10177

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: TR-XLPE - EPR - Reliability - Expected Life - Remaining Lifetime

Performance Assessment of 35 kV TR-XLPE and EPR Cables Removed from the Same Installation Prior to Failure throughout 40 Years of Service Life

P. BRIGANDI¹, T. PERSON¹, R. AARONS², B. RICHARDSON³, S. WOLBACH⁴, D. RAMIREZ-WONG⁵

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ID: 10257

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: HVAC, 3-core Submarine Cable, Sequence Impedance, Analytical Calculation

Unlocking Accuracy: Improving Analytical Model for Submarine Cable Impedance from 50 Hz to 10 kHz

N. ESCOLANO¹, S. ANILD²

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: EHVDC cables, Thermal runaway, Modelling, Insulation materials, design criteria

Empirical criteria for avoiding thermal runaway and predicting steady state conductor temperature in EHVDC cables

P. BORMAN, M. BECHIS

Prysmian

ID: 10315

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Defect Notification - End-of-Warranty - Integrated Assessment – Monitoring - Offshore - Export Cables

Integrated End-of-Warranty Assessment of the Borssele 220 kV Offshore Export Cables

N. ZEBOUCHI¹, M. KAVIAN¹, J. FERNANDEZ PAREDES¹, V. OP DE BEEK², S. WEERSTAND²

¹DNV; ²TenneT

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Transient measurements, switching overvoltages, underground cable, sheath bonding system, sheath voltage limiter (SVL)

Technology & analysis of transient overvoltage measurements for a 420 kV sectionalized cross-bonded underground cable system in a Siphon circuit of the Dutch EHV transmission grid

K. VELITSIKAKIS¹, M. FARAGALLA¹, A. KUMAR¹, R. ZUIJDERDUIN¹, S. DE CLIPPELAAR²

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Congestion Management, Distribution Network Planning, Dynamic Cable Rating, Medium Voltage Cables, Thermal Ageing, Remaining Lifetime

Unlocking thermal and ampacity headroom of medium-voltage cables: towards a component-aware distribution planning framework

Y. ZHANG^{1,2}, N. BREKELMANS², G. ROUWHORST¹, A. VAN DER MOLEN^{2,3}, P. NGUYEN², P. VAN DER WIELEN^{1,2}

¹DNV; ²Eindhoven University of Technology; ³Stedin

ID: 10323

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: tunnel, flooding, XLPE

Recent experience with the consequences of cable tunnel flooding on 132kV XLPE cables and joints

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ID: 10332

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Challenges resolved in Laying of 220kV Underground Cables and Installation of Termination Towers in the High Altitude Steep Terrains of Zojila Pass

A. CHAKRABORTY*, A. AMIN

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Operational, insights, 320 kV, VSC, HVDC, Cable System, Metallic, Pipeline, crossing

Operational insights from the ± 320 kV VSC HVDC Cable System: Metallic Pipeline crossing challenges and Thermal Performance Assessment

A. K MATHEW^{*1}, D. P. TYAGI¹, J. I², A. B. BALAKRISHNAN¹

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ID: 10357

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Design, Challenges, Mitigation, HVDC, Cable, Installation

Design Challenges and Mitigation for HVDC Cable Installation in Metropolitan Cities of India

A. PHADNIS*, V. PATLE, Y. GIRI, P. PAWAR, C. KUNTE, K. JAIN, S. KAREKAR, M. AMBARDEKAR
Adani Electricity , India

ID: 10803

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Trends, High-Reliability, Submarine, Transmission, Zero-Fault

Technological Trends in High-Reliability Zero-Fault Underground and Submarine Transmission Systems in Mexico

P. REALPOZO DEL CASTILLO, R. RAMIREZ RIOS, V. SIERRA MADRIGAL

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ID: 10825

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Cable Termination, Partial Discharge, Monitoring, Online PD Measurement, Machine learning, GBDT, NM

Development of High-Precision Partial Discharge Monitoring System for Cable Termination

T. YOKOYAMA¹, T. SHIMOYUCHI¹, T. GOTO¹, H. SUZUKI², Y. IKEDA², K. IWASAKI²

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ID: 10992

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Offshore Installation, Submarine Cables, Hang Off

Retention System for Submarine Cable without Armour Wires

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Bentonite, Distributed temperature sensing (DTS), High-voltage cable systems, Thermal conductivity, Underground applications

Non-Invasive Method for Evaluating and Detecting Failures in Bentonite Filling in High-Voltage Cable Ducts during Project Execution

T. BRAGAGNOLLE, K. CALIANI, G. BODO, W. LEE

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: 525 kV insulated cable, power substation, innovation, 525 kV insulated cables installed in cable trays, reliability system, pioneering, sustainable solution

Installation of the 1st 525 kV Insulated Cable in Brazil

J. E. V. FASSARELA¹, R. d. C. FRANÇA¹, T. d. S. d. SILVA¹, E. P. MORAES¹, D. O. SILVEIRA¹, G. T. LOPES²

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: DTS; Temperature Monitoring System; Operation Analysis; Ampacity Validation; Power System Reliability

Experiences with DTS in Brazil and Ampacity Validation Using a Power Cable Ampacity Software

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ID: 11024

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Insulated high voltage cables, partial discharges and online monitoring

Online Diagnosis of 138kV Insulated Underground Cables by Measuring Partial Discharges by Grounding Cable – Case Study in More than 300 Light SESA Cables

H. P. AMORIM JUNIOR¹, T. B. RODRIGUES¹, D. L. ARGÔLO¹, T. P. VIÚLA², F. R. d. SILVA²

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ID: 11025

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine
Keywords: Overhead Lines, Underground Lines, Comparative Analysis, Challenges, Brazilian Scenario

Overhead & Insulated Cables Transmission Lines - Brazilian Scenario

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Low voltage grid, medium voltage grid, hourly distribution, seasonal distribution, Distribution System Operator (DSO)

Analysis of hourly interruption distribution: the case of the Milan's medium and low voltage grid

V. PICCO^{1,2}, A. MAZZA¹, A. PEGOIANI², I. MARINI², R. SIRNA³

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Cable rating, coupled model, dynamic load, sheath current

"Electrical-Thermal Rating of High-Voltage Cables via EMTP Coupled Modelling"

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Current rating, steady state, thermal rating, unfilled duct

"HV Cables Thermal Rating under Steady-State Conditions in Unfilled Ducts"

L. GUIZZO

TERNA

ID: 11064

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Cable monitoring, Partial Discharges, Transmission line model

Capacitive PD Sensing and Transmission Line Modeling for Long-Range Cable Defect Detection

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ID: 11065

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: HVDC, MIND cables, slow polarity reversal, LCC technology, power flow reversal

Qualification and reliability assessment of slow polarity reversal endurance in HVDC MIND cables for enhanced grid flexibility

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: HVDC, Cable monitoring, Partial Discharges, Ageing monitoring, Space Charges

Towards predictive monitoring of HVDC Cables: An integrated system for stress, partial discharges and ageing assessment

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Energy Transition, cable joints, market players

Performance of MV Underground Cable Joints

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Bonding leads impedance, cable systems, high frequency, very fast transients

Calculation and experimental validation of impedance of buried single-core bonding leads

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Improving the efficiency of renewable energy cable networks

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Damped AC Voltage - Export - Inter-array - Cable - Failure Rate - Repair Cost – Offshore - Wind Energy - Partial Discharge - Resonant AC Voltage - Site-acceptance Test - Quality Control

Quality Assurance of Offshore Wind Farm Power Cables

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Asset management, Cable terminations, Condition assessment, Health Index, Lifecycle, Weighted aggregation, Oil filled, XLPE.

Condition Assessment of Underground Power Cable Terminations

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Safety, Faults, Protection, Fire risk, Inspection, Monitoring, High Voltage Cables Maintenance

Safety in Underground High-Voltage Cable: Effective Solutions for People and Infrastructure Protection

R. GÓMEZ RIVERA, R. REINOSO DELGADO, G. DONOSO CONEJO, E. NOGUEROLES LAGUIA, V. BONET DIAZ

Red Eléctrica, Spain

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Fault events analysis in underground high-voltage cables

R. GÓMEZ RIVERA, R. REINOSO DELGADO, G. DONOSO CONEJO, E. NOGUEROLES LAGUIA

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Breakdown, Fault, Location, High Voltage Cables, Maintenance, TDR, Murray Bridge, Glasser Bridge

Lessons learned from fault location in underground high-voltage cables and use cases

R. GÓMEZ RIVERA¹, U. RUIZ DE AZÚA FERNÁNDEZ², G. DONOSO CONEJO¹, R. REINOSO DELGADO¹, E. NOGUEROLES LAGUIA¹, D. BLANCO SACEDO¹, V. BONET DIAZ¹

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: High Voltage Cables, Monitoring, Partial Discharges, Predictive Maintenance, Sensors

Sensitivity analysis for the different types of Partial Discharge sensors related to the measured installation

R. GÓMEZ RIVERA¹, J. ORTEGO³, G. DONOSO CONEJO¹, R. REINOSO DELGADO¹, E. NOGUEROLES LAGUIA¹, V. BONET DIAZ¹, F. GARNACHO⁴, A. KHAMLI²

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ID: 11389

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

How does a HVDC cable system react on TOVs?

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Water Treeing Behaviour in XLPE Insulation under the Influence of SAP and Development of Evaluation Method

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Study of frequency-dependent properties in HVDC links

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: HVDC XLPE cables, crosslinking byproduct, extra low frequency, dielectric relaxation

Extra-low Frequency Dielectric Relaxation: Characterization of Crosslinking Byproducts in XLPE HVDC Cable Insulation

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: High-voltage cable circuits, Grounding system, Loop resistance, Live detection

Live Detection Methods and Applications of Loop Resistance in High Voltage Cable Grounding Systems

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: SCFF submarine cables, Insulating oil leakage, Underwater fluorescent detector, Leakage point location, Underwater sealing repair device, Leakage point sealing

Research on UV fluorescence-based localization for insulating fluid leakage and underwater sealing repair method for SCFF submarine cable

B. HUI¹, L. FAN², L. ZHAO¹, J. LIU¹, Y. ZHAN¹, W. ZHU¹, S. HOU¹

¹CSG Electric Power Research Institute Co., Ltd.; ²China Southern Power Grid Co., LTD

ID: 11517

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Offshore wind farm, ± 500 kV EHVDC submarine cable, Extra-high voltage, XLPE

Asia's First 2 GW 500 kV EHVDC XLPE Submarine Cable Project: Engineering and Execution

M. AWAIS, Y. ZHAO, F. XIA, J. YANG, G. YU, P. KOSTAS

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Enhanced Single-Ended Fault Location in Hybrid Transmission Corridors with Underground Cable Sections Using a Dynamic Sequence Impedance Factor

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Harmonized Long term ageing test, ageing, water tree retardant, MV cables, insulation material

Atasehir GIS TM - Pasakoy TM - Umraniye TM 400 kV, 1x2500 mm² Cu/XLPE/Smooth Al Sheath/HDPE + 4T4FO Construction of XLPE Insulated Underground Power Cable Connection Works

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¹Demirer Kablo Tesisleri Sanayi ve Ticaret A.Ş.; ²Jiangsu Zhongtian Technology Co., Ltd

ID: 11671

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Underground cable system, 400kV, DTS, RTTR, urban infrastructure

End To End Implementation of a 400kV 1x2500 mm² XLPE Cable System With DTS Monitoring

E. ELVANOGLU, U. ÇUBUK

Demirer Kablo Tesisleri Sanayi ve Ticaret A.Ş

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Simplified Versus Realistic Geometries in Thermal Modelling of Cables Installed in HDD

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ID: 11709

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Ampacity, Post-Installation Effects, Thermal Resistivity, Trenching Installation, Subsea Cables

State-of-the-art review of post-installation effects on subsea cable thermal properties for rating calculations

F. GARCIA, F. ALBUQUERQUE, L. CROSS, J. REYNA

Ørsted Wind Power

ID: 11712

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Sequence impedance of submarine cables: Part II

A. GAROLERA¹, T. KVARTS¹, Z. HUANG¹, G. CALLENDER², K. GODDARD², J. PENG¹, C. COJOCARU¹

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ID: 11728

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Dynamic cable, Armor wire type, Fatigue performance, UFLEX2D

Comparative analysis on mechanical behavior according to Armor-types of dynamic cable: A FEM-based design perspective

K. CHAE, W. NAM, C. KIM

LS Cable & System

ID: 11729

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Study on the Behavior of Power Cable under External Forces in Duct : A Case Study from a HVDC System in South Korea

H.-d. HEO, M.-h. SHIN, K.-j. SUNG, S.-h. SEO

LS Cable & System

ID: 11737

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Cables in air-filled ducts – comparison between IEC60287 and FEM

O. THYRVIN

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Strain-life characterization of lead sheath for submarine cables using small-scale and full-scale bending fatigue tests

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ID: 11866

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Ampacity, Convective cooling, Cable rating, Cable trough, Forced ventilation.

Cables in ventilated conduits: experimental and numerical study of heat transfer and cable ratings

S. M. HELLESØ, K. S. THINN, E. EBERG, R. F. MELLERUD

SINTEF Energy Research

ID: 11868

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: KEYWORDS Current Rating Calculations, Empirical Correlation, Finite Element Method, Trough.

Development and Validation of an Improved Cable Thermal Rating Model for Unfilled Trough Installations

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ID: 11869

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Inter Array Cable Rating – Considerations Beyond IEC standards

Inter Array Cable Rating – Considerations Beyond IEC standards

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Unitech Power Systems

ID: 11923

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Commissioning Tests, Offshore Wind Farm, Load Cycle, EHV Export Cable, HVDC Export Cable

Offshore Windfarm Export Cable System Commissioning, is it fit for purpose?

R. SVOMA¹, L. WILLIAMS¹, C. HIGGINS², J. THEOBALD²

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ID: 12003

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Field Trials of DAS-Based TPID Systems for the Monitoring of Urban Extra High Voltage Cable Systems

F. AINHORN

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ID: 12005

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Arc Pre-location - APL - Cable Fault Location - Very Low Frequency - Medium Voltage, Long Cables, Synergetic Workflow, Intermittent Faults, Transient Analysis

Arc Pre-Location in Medium Voltage VLF Cable Testing: Performance Assessment on various Cable Insulation Faults, and Workflow Variation depending on used Equipment

J. KRUIJEN, S. DAS MERCES JOAO, L. GAJDOSOVA

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ID: 12058

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Cable systems, Electromagnetic fields, Fault analysis, Inductive interference, Submarine transmission

Inductive Interference Assessment from 230 kV Submarine and Underground Cable Systems: A Case Study in Southern Thailand

P. TOSRIGAW, A. JIRACHAWALWISOOT, W. APICHATO, C. CHOOPUM

Electricity Generating Authority of Thailand (EGAT)

ID: 12092

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Topside circulating current and lead sheath grounding of export cables for offshore wind

T. KVARTS¹, X. GIAGKOU¹, J. PILGRIM², O. N. CWIKOWSKI², A. BINNIAN²

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

A new model for condition assessment of medium voltage XLPE underground cables using statistical failures and testing insulation reports

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Underground Cable, Pipe Type Cable, Gas Compression Cable, Retrofitting, Oil Filled Cable, Cable Removal.

Retrofitting of an External Gas Compression Cable System

G. MAMATELASHVILI, K. KELLY, R. ABDUL BARI, M. WALSH

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: depth of cover, cable-seabed interaction, DTS, RTTR

Depth of cover Algorithm Validation in the Baltic Sea using time-lapse geophysical Surveys

E. ROCHAT¹, G. RIZZO², J. DIX³, N. KROPF⁴, M. STOECKLI⁵

¹EOSS Switzerland; ²EOSS Italy; ³Southampton University UK; ⁴Vattenfall Germany; ⁵ELECTROSUISSE / CIGRE Switzerland NC Secretary

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: power cable, fault finding, DAS, fibre sensing

Field Evidence and Lesson Learned from offshore Power Cable Fault finding using distributed acoustic Sensing

E. ROCHAT¹, E. NIGRO², M. D'AMBROSIO¹, F. BUCCHERI³, M. STOECKLI⁴

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ID: 12352

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Sheath Voltage Limiters (SVLs), Specially Bonded Cable Systems, Cross-Bonding / Single-Point Bonding, Induced Sheath Voltage, Overvoltage Protection.

Criteria and Methodologies for Selecting Sheath Voltage Limiters (SVLs)

I. MITIC¹, P. FLETCHER², E. SALOMONE², S. KNEZEVIC³, M. STOKIC¹, M. MANDARIC¹

¹Mott MacDonald, Serbia; ²Mott MacDonald, UK; ³Mott MacDonald/University of Belgrade, Serbia

ID: 12377

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

New methods for the selection of the bonding cable and SVL

C. FERREIRA, P. REBELO, M. DMITRIEV

CABELTE

ID: 12404

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Acoustic Wave Propagation, Cable Fault Localization, Distributed Acoustic Sensing, Power Cable Monitoring, Real-Time Signal Processing, V-Moveout Detector

Field-Proven V-Moveout Detector for Real-Time Power Cable Fault Detection using Distributed Acoustic Sensing

W. SFAR ZAOU¹, D. DAMM¹, S. BOHR¹, C. CANTINI², A. RIDGE², M. STROHBACH¹

¹AP Sensing GmbH, Germany; ²AP Sensing GmbH, United Kingdom

ID: 12436

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Comparison of an autoencoder and an insulation forest model for the condition assessment of low voltage cables based on powerline communication data

M. K. H. KREISKÖTHER, J. PLENER

amperias GmbH Germany

ID: 12445

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Artificial Intelligence – Cable Threat Detection – Deep Neural Network – Distributed Acoustic Sensing – Distributed Fiber Optic Sensing – Power Cable Monitoring – Third-Party Intrusion – Critical Infrastructure – CRITIS – NIS2

Inbuilt HV Cable Fiber Optics for AI-based Cable Threat Detection in urban Environments - a Case Study

W. SFAR ZAOUÏ¹, N. AGHANOURIAN¹, B. DRAPP¹, D. MOCKENHAUPT¹, M. STROHBACH¹, S. SYED¹, F. AINHORN²

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Sequence Impedance Calculation in Three-Core, Double-Layer Armored Power Cables: Accurate and Efficient Modeling Approaches

K. BITSIS, I. CHALEPLIDIS, D. GKITSOS, D. CHATZIPETROS, V. L. KANAS, A. I. CHRYSOCHOS

Hellenic Cables Greece

ID: 12572

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Current Rating Improvement via CFD Modeling of Underground HVAC Cables in Natural Ventilated Troughs

A. NEGINHAL, D. CHATZIPETROS, C. BOIKOS, P. PARISSIS

Hellenic Cables Greece

ID: 12573

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Water diffusion modeling in power cables: Addressing 1D to 3D geometries using FEM

A. I. CHRYSOCHOS, L. V. TARANU

Hellenic Cables Greece

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B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Accurate modelling of induced voltages on cables with single-point bonded sheaths installed in HV substations

S. PAPADAKIS, D. CHATZIPETROS, I. CHALEPLIDIS, K. KOUTRAS, V. KARAKONSTANTI, M. BETSI, V. L. KANAS, A. I. CHRYSOCHOS

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ID: 12613

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Ampacity, Submarine cable, IEC 60287, Finite element analysis, FEA, FEM, Thermal modelling, Open Source

Thermal Modeling and Ampacity of Submarine Three Phase AC Cables with Lead Sheath: IEC 60287 versus Hybrid Analytical-FEA Approach

P. VRACHAMIS¹, B. GIANELLI²

¹DEME Group Netherlands; ²DEME Group Netherlands

ID: 12634

B1 INSULATED CABLES - Full Papers

Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine

Keywords: Cable, Monitoring, Temperature, Diagnostics, Fiber Optic, Sensor, Raman Scattering, Hotspot, Damage, Fault, Reliability

Indirect Fault Location in Cable Lines Using Distributed Temperature Sensing

M. IVANOV

PJSC «Rosseti Lenenergo» Cable Line Service 35-220 kV Russia

B1 PS3 - Environmental impact and cable lifecycle

ID: 10284

B1 INSULATED CABLES - Full Papers

Topics: B1 PS3 - Environmental impact and cable lifecycle

Keywords: Circadian rhythm, electromagnetic fields, European flounder, *Platichthys flesus*, European plaice *Pleuronectes platessa*, subsea power cables

Advancing knowledge on electromagnetic field impacts on flatfish combining in- and ex-situ technical and ecological research

G. SWINKELS¹, E. CHAPMAN², C. ROCHAS¹, Z. BURNS², P. HARSANYI², A. HERMANS³, K. SCOTT²

¹TSO TenneT; ²St Abbs Marine Station; ³Wageningen University & TenneT TSO

ID: 10356

B1 INSULATED CABLES - Full Papers

Topics: B1 PS3 - Environmental impact and cable lifecycle

Keywords: Routing, Installing, EHV, AC, XLPE, Land, Cables, Geotechnically, Challenging, Terrain

Routing and Installing EHV AC XLPE Land Cables in Geotechnically Challenging Terrain: Experience from the Himalayas

A. KUMAR *, D. SHUKLA, V. KAPIL

BHEL, India

ID: 10827

B1 INSULATED CABLES - Full Papers

Topics: B1 PS3 - Environmental impact and cable lifecycle

Keywords: Overhead Cable Laying, Shorter Construction Period, Reduction of the Environmental Impact

Application of 77 kV Overhead Insulated Cables

T. ISHIDA, T. ENOMOTO, S. SUZUKI, A. YAMAGUCHI, A. NAKAZAWA

Kansai Transmission and Distribution, Inc Japan

ID: 11147

B1 INSULATED CABLES - Full Papers

Topics: B1 PS3 - Environmental impact and cable lifecycle

Keywords: Cable termination, 420 kV, XLPE cable, dry type technology, GIS, green gases, SF6 reduction, connection system

"Assessment and Qualification of a 420 kV SF6-free and Dry-Type GIS Cable Termination"

P. BOFFI

PRYSMIAN

ID: 11266

B1 INSULATED CABLES - Full Papers

Topics: B1 PS3 - Environmental impact and cable lifecycle

Keywords: GIS, standard interface, HVAC cable termination, alternative gas, pluggable solution, offshore application

A Sustainable Approach to High-Voltage Grid Expansion: A Standardized 145 kV GIS Cable Termination Developed for SF6 Free Application

S. POGLIANI

PRYSMIAN

ID: 11793

B1 INSULATED CABLES - Full Papers

Topics: B1 PS3 - Environmental impact and cable lifecycle

Keywords: Submarine cables, Free span, Scouring, Vortex-induced vibration, Fatigue life

Research on the Development Mechanism of Submarine Cable Suspension and Fatigue Life Assessment under the Action of Ocean Currents

B. FENG¹, M. FU¹, L. JIA¹, L. FAN², Y. LI², Q. LU³, J. YAN¹, S. HOU²

¹CSG Electric Power Research Institute Co., Ltd. China; ²China Southern Power Grid Co., LTD China; ³Dalian University of Technology China

ID: 11870

B1 INSULATED CABLES - Full Papers

Topics: B1 PS3 - Environmental impact and cable lifecycle

Keywords: LCA, Submarine power cables, Environmental impact, Climate change

Life cycle assessment of submarine power cables for distribution of offshore wind power to land

H. R. BJØRLO^{1,2}, E. DRØIVOLDSMO²

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ID: 12273

B1 INSULATED CABLES - Full Papers

Topics: B1 PS3 - Environmental impact and cable lifecycle
Keywords: process capability, high-volume manufacturing, defect rate, sigma level

Scalable and efficient production Strategies for HVDC Cables and Accessories: Enabling the Next Generation of Energy Infrastructure

R. GUENDUEZ¹, J. KRAUS¹, M. STOECKLI²

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B2 OVERHEAD LINES

B2 PS1 - OHL modernization and emerging technologies

ID: 10110

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: 3D model, BIM, Building Information Modelling, CDE, Common Data Environment, construction, design, digitalization, facility management, Geographic Information System, GIS, information management, Overhead Transmission Line

OTL BIM in Practice: From Design and Construction Towards Future Integration into Operation and Maintenance Processes

M. BECAN¹, N. ZIMA¹, R. FILIPIC¹, D. MARIC¹, A. STARC², M. STARASINIC²

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ID: 10118

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

High tensile steel wire cores for High Temperature Low Sag conductors: A case study for Elia Belgium

H. DEPAMELAERE¹, P. COUNESON², M. JAVORSKY¹

¹Bekaert, Belgium; ²Decube Consult, Belgium

ID: 10119

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Next generation of hinge mounted insulating crossarms

J. MAESSCHALCK, P. SMET

ELIA, Belgium

ID: 10135

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: ACSS - Manufacturing - Batch - Bobbin - Anneal - Sag - Conductivity

An Industry Summary of Batch versus Bobbin Annealed Conductors

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ID: 10184

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Dynamic Line Rating - Computational Fluid Dynamics - Wind Speed - Meteorology - Conductor

Hyperlocal Forecasting with Sensor Feedback for Reduced Uncertainty in Dynamic Line Rating

I. BARLET, K. ENGEL, J. MARMILLO

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ID: 10285

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Overhead lines, 380 kV, Standardization, Towers

Standard 380kV lattice steel tower within the Netherlands

P. VAN DER HORST, W. DEN HAAS, E. PLATENKAMP

TenneT TSO

ID: 10286

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: LiDAR, Clearance, Conductor Modelling, Overhead Line, Climate Data, Thermal Rating, Finite Element Analysis, PLS-CADD, Capacity Increase

Refined Clearance Assessment of Overhead Lines Combining LiDAR, Climate Data, and PLS-CADD Finite Element Analysis

R. LOMMERS¹, J. FRANCO¹, T. BÖRGER¹, E. PLATENKAMP²

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ID: 10288

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Overhead lines, external clearance, insulation coordination, lightning performance, European standards

Improved calculations for external clearances on overhead lines

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ID: 10289

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Historical weather data, Seasonal Line Rating, Static Line Rating (SLR), Overhead lines

Development and Application of Hourly Values for the Static Rating of High-Voltage Overhead Lines

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ID: 10324

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: self-alignment, erection, suspended load

Aim-Guide-Lock self-alignment system for tower erection avoids work under suspended load

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ID: 10361

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Strain, Gauge-Based, Quantitative, Monitoring, During, Prototype, Testing, Transmission, Towers

Strain Gauge-Based Quantitative Monitoring During Prototype Testing of Transmission Towers

P. PAUL^{*}, P. PIRTA

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ID: 10371

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Smart Greener Grid Expansion: Re-engineering 66 kV Infrastructure for 220 kV Operation – BBMB Case Study.

Smart Greener Grid Expansion: Re-engineering 66 kV Infrastructure for 220 kV Operation – BBMB Case Study.

R. SHEOKAND^{*}, M. TRIPATHI

BHAKRA BEAS MANAGEMENT BOARD (BBMB), India

ID: 10372

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: aerial, stringing, solutions

Use of aerial stringing solutions in vegetated & rough terrain of GTTPL Project.

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ID: 10373

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Advanced, Finite, Element, Simulation, Transmission, Towers

Advanced Finite Element Simulation of Transmission Towers

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ID: 10672

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: construction acceleration, design standardisation, project scalability, transmission line

Designing for delivery: tower spotting strategies to accelerate transmission line design and construction under South Africa's TDP2024

J. CHETTY, G. PILLAY, L. PUZA

National Transmission Company South Africa (NTCSA)

ID: 10690

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Line Thermal, Critical Spans/Sections

Line Thermal Upgrading of Overhead Conductors Using Real Time Rating Technology by Identification of Critical Spans/Sections

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ID: 10693

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Braced post insulator, combined load curve, combined working load curve, combined ultimate load curve, capacity curve

Composite Braced Post Insulators: Optimal installation angle and a theoretical way forward

A. MUIR, R. MACEY

Mace Technologies

ID: 10703

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: HTLS conductor, Composite core, Non-Destructive Testing (NDT), Asset management, Field experience

Dielectric assessment of composite core conductors: impact and return of experience from a field deployment

L. RICHARD¹, C. DUTRIEZ¹, M. DELBOVE², E. PLATENKAMP³

¹Epsilon Cable France; ²NEXANS; ³TenneT

ID: 10727

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Audible noise, corona discharge, electric field intensity, IEC 315 conductor, Surge Impedance Loading (SIL)

Addressing audible noise challenges in the integration of the 6 x IEC 315 conductor on South Africa's 765 kV transmission network

R. KHAN, A. BURGER, R. SINGH

National Transmission Company South Africa (NTCSA)

ID: 10737

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Grillage Foundation - Finite Element Method - Beam Elements - Shell Elements - Solid Elements - Soil-Structure Interaction (SSI)

Comparative Analysis of Grillage Foundation Modeling for Lattice Transmission Towers: A Detailed Assessment of Beam Element, Shell Element and Solid Element Approaches Incorporating Soil-Structure Interaction

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ID: 10828

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Angle steel tower, Dismantling transmission towers, Steel pipe tower, Helicopter, Jig Labour-saving

Development of a Helicopter-assisted Method for Dismantling Steel Pipe Towers

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¹Kansai Transmission and Distribution, Inc. Japan; ²AERO ASAHI CORPORATION Japan; ³F TECH, Inc. Japan

ID: 10829

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Augmented Reality, Compression Inspection, Sag Measurement, Smartphone

Development of AR-Based Inspection Technology for Transmission Line Construction

F. KONDO¹, R. YUZAWA¹, S. ISHIDA¹, K. YAO¹, T. MASUDA², M. OGAWA²

¹Chubu Electric Power Grid Co., Inc. Japan; ²SENSYN ROBOTICS, Inc. Japan

ID: 10830

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: OHL foundation, Bearing capacity, Overhead line, FE analysis, Centrifuge test, Liquefaction, Countermeasure, Top-shaped concrete block

Modernising OHL Foundation Design: 3D Bearing Capacity Evaluation and Cost-Effective Liquefaction Protection

T. OZAKI, Y. INOUE, Y. TOMINAGA, Y. YASUKOCHI, F. KUHARA, S. HORIMOTO, H. YONEMORI

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ID: 10832

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Advanced Conductor, Arc test, Galloping, HTLS, Swinging

Verification for Expanding the Application of Composite Conductor “ACFR”

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¹Kitanihon electric cable Japan; ²Tohoku Electric Power Network Japan; ³TEPCO Power Grid Japan; ⁴Tokyo Rope International Japan

ID: 10871

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Composite materials; CICA Cross-Rope; Structural design; High Surge Impedance Level; Compaction

Structural analysis of the CICA Cross-Rope tower

R. LOPES¹, P. CAMPOS¹, M. RECHTMAN¹, X. WANG², C. LIU², Q. HUANG², L. ROSA¹, Y. LIU², M. FERNANDES¹

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ID: 10873

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Helical foundations, foundation reinforcement, overhead lines

Innovative Foundation Reinforcement Solution for Guyed Transmission Line Structures Using Helical Piles

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ID: 10875

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: HVDC Transmission - Silicone Rubber - Polymer Insulators - Composites - Project Optimization

Consideration of Composite Insulator Assemblies for UHV DC Transmission Line Projects in the USA

J. BUTLER¹, C. MILITARU²

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ID: 11019

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Geotechnical investigation, Transmission line foundations, Site characterization, Soil-structure interaction, Line routing assessment, Foundation design, Standard Penetration Test (SPT), Geophysical methods

Poorly Executed Surveys: Hidden Risks in Energy Transmission Projects

P. R. MORENO, R. F. MENDES, F. A. ARAI, N. C. FARIA

ISA ENERGIA Brazil

ID: 11067

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: phases, Overhead line, Loadability, Magnetic field induction

Loadability and Magnetic Field Characteristics of Advanced 7-Phase Overhead Conductors

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ID: 11069

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Overhead lines 5-phases towers, EMF, OHL reconstruction, ampacity increase

The '5 Phases' OHL Towers for Refurbishing Existing Lines: First Installations and Experiences on 150 kV and 230 kV Backbones in Italy

F. PALONE

TERNA

ID: 11070

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Overhead transmission lines, stringing job site, IoT, jobsite connection, mainpower reduction, efficiency

Connection of the overhead stringing job site

A. GALLI

TESMEC

ID: 11152

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: crossings, tower modifications, transmission towers, underpass

Underpass structure options for 400 kV line crossings in South Africa

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National Transmission Company South Africa (NTCSA)

ID: 11157

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Climatic loads, deterministic design, probabilistic design, safety loading, security loading, transmission towers

The evolution of design criteria in tower designs in NTCSA

S. NATESAN¹, J. D. SERRANO², S. DUBAZANA²

¹National Transmission Company South Africa; ²Consultant

ID: 11173

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: remote monitoring, transmission line capacity, conductor condition

Study of the Feasibility of Increasing the Capacity of Overhead Transmission Lines using Real-Time Remote Monitoring Data of Conductors

M. PANARIN, V. TOKAREV

ServiceEnergy Ltd

ID: 11313

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

The Investigation and Modelling of Vertically Installed Inter-Phase Spacers for the Enhancement of Clearance in Overhead Transmission Lines

M. NEGARPOUR, F. GHELICHI

Monenco Iran

ID: 11362

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Accelerated thermal aging, Arrhenius aging, Carbon fiber composites, Composite core, Conductors for overhead lines, IEC TS 62818, Polymer matrix, Reinforcements, Resin, Tensile strength

Overhead Conductor with stranded Multiwire Composite Core in Aluminium Sheath – IEC TS 62818 Arrhenius testing of Resins

A. HASSINEN¹, R. BIGIARINI², S. PIRINEN¹, D. GABELLI²

¹Exel Composites; ²Tratos Group

ID: 11439

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Mechanical testing of a new “node-and-bolt-based” assembly system using a full-scale tubular lattice tower module

J. R. LÓPEZ-BLANCO¹, P. RODRÍGUEZ-HERRERÍAS², C. GARCÍA-BARRIOS²

¹Anisopter Insightful Research, S.L., Spain; ²Red Eléctrica, Spain

ID: 11498

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: RF433; WiFi; Power Consumption; Icing; Sens

Research on a New Transmission Line Icing Online Monitoring System Based on RF433 Technology

Z. WANG, Q. HUANG, X. MENG, J. HU

Guiyang Bureau of China Southern Power Grid Ultra High Voltage Transmission Company

ID: 11615

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Direct Ambient Adjusted Ratings - Embedded Distributed Sensing - Transmission Capacity Optimization - Predictive Maintenance - Wildfire Risk Mitigation

Monitoring of Overhead Lines Using Embedded Optical Fibers for Capacity Optimization, Line Awareness, and Determining Maintenance Schedules

D. GOEKJIAN, C. WONG

CTC Global, United States of America

ID: 11620

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: DLR, Ampacity, Conductor Temperature, Asset Resiliency, Spectrally Selective Coatings

Static Line Uprating: In-situ Modification of Overhead Conductor Properties for Continuous Capacity Enhancements and Synergy with Dynamic Line Ratings

O. HIGBEE, E. KHONG, N. COOGAN

AssetCool United Kingdom

ID: 11629

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Maintaining The Power Network Integrity Through Dynamic Line Rating Technologies

H. ALMAKRAMI

Saudi Electricity Company

ID: 11762

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Artificial Intelligence, Transmission Tower Design, AI Augmented Design, Generative Design, Ground Structure Method, Machine Learning Surrogates, Reinforcement Learning, Multi-Agent System, Structural Optimization, Institutional Knowledge Retention, CAPEX

Artificial Intelligence Augmented Design for Electrical Transmission Line Towers

J. TOTH

RecognAlse Technologies Inc., Canada

ID: 11788

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

A Study on New Compact Modular New Tensioning Equipment for Overhead Transmission Lines

S.-d. ROH, B.-K. KIM, J.-C. KIM

KEPCO(Korea Electric Power Corporation)

ID: 11901

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Autonomous UAV-Based Thermal Inspection and AI-Powered Fault Detection for Overhead Power Lines

A. IBRAHIM, S. ABDELAL, B. ABABNEH, D. ALEIDEH

Irbid district Electricity Company (IDECO)

ID: 11904

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Earthing switches, Electromagnetic coupling, Electrostatic coupling, Frequency domain, High-speed switching, Induced Currents.

EHV AC Earth Switch Induced Current Capability Using Frequency Domain Approach

H. NEGI, M. I. KHAN, I. A. JATOI, T. EATON

Arcadis United Kingdom

ID: 12037

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Leveraging Artificial Intelligence and Genetic Algorithms for Enhanced Techno-Economic Conductor Selection in Power Transmission Systems

C. MARTINEZ¹, V. JIMENEZ², J. PULGARIN RIVERA³

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ID: 12042

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Predictive Analytics for Vegetation Management within Power Derived from Data Collected during Pruning Activities: A Strategy Approach to Enhancing Sustainability and Operational Efficiency in the Energy Sector

L. H. BERRIO¹, D. L. ARANGO CAÑAS², R. LUNA URIBE³

¹EPM; ²EPM; ³EPM

ID: 12044

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

HVDC-HVAC Hybrid Lines: A Feasible Solution for Transmission Expansion in Colombia

V. JIMENEZ¹, C. MARTINEZ², D. TAUTA³, J. OSORIO⁴, A. PEDRAZA⁵, H. RESTREPO⁶, J. PULGARIN⁷

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ID: 12045

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Evaluation of HVDC transmission lines electrical insulation performance under environmental conditions in Colombia

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ID: 12052

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Development of Insulation Gurad to Prevent Flashover Caused by Jumper Wire Swing

S.-h. KWON

KEPCO

ID: 12157

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Solution to OPGW Cable Breakage Due to Lightning Strikes in Transmission Lines: Technical and Economic Evaluation of Alternatives

J. C. MEJIA¹, Á. MAZO², B. OSORIO³, M. ESCOBAR⁴, Y. D. PEREZ⁵, S. ESTEVEZ⁶, A. PEDRAZA⁷

¹Intercolombia; ²Intercolombia; ³ISA; ⁴Intercolombia; ⁵Intercolombia; ⁶ISA; ⁷ISA

ID: 12203

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Load Transfer and Weight Analysis of Angular and Tubular Profile Towers in Transmission Lines for Large-Span Crossings

J. S. VARGAS¹, A. GOMEZ², J. M. VARILLA³, S. CASTILLO⁴

¹HVM; ²HVM; ³HVM; ⁴HVM

ID: 12229

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Transmission line design, Artificial Intelligence, AI, AI-Augmented Design (AAD), Generative Grid

Artificial Intelligence Augmented Transmission Line Design

J. TOTH¹, L. RACZ², B. NEMETH²

¹RecognAlse Technologies Inc.; ²Budapest University of Technology and Economics

ID: 12232

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Kosovo, Distribution Network, Overhead Line, Technology, Modernization

Modernization of Overhead Lines in Kosovo: Challenges, Technologies and Future Directions

T. KOCABAYRAKTAR, D. GASHI, A. ALIDEMAJ

Kosovo Electricity Distribution Company

ID: 12338

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Upgrading of 400 kV overhead lines using conductor temperature sensors and ambient weather stations

R. PUFFER¹, G. MOLINAR², C. KANDBINDER-PARET²

¹RWTH Aachen University; ²TenneT TSO GmbH

ID: 12426

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

FlexiBL A new temporary tower solution for use in the 110-kV grid of Deutsche Bahn

J. RÖHM¹, J. MOSCHALL²

¹Omexom Hochspannung GmbH; ²DB Energie GmbH

ID: 12444

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

A new catenary system for safe and efficient crossing protection

M. ERSPAMER¹, C. WINTER², H. KETTERER³, A. PFLAUM⁴

¹Omexom Hochspannung GmbH Germany; ²Tennet TSO GmbH Germany; ³Sepa-Tech GmbH Germany; ⁴Seilflechter Tauwerk GmbH Germany

ID: 12490

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Dynamic Line Rating (DLR), Numerical Weather Prediction (NWP), Neural Networks (NN), Thermal rating, EMS/SCADA integration, congestion management, Real-time and planning horizons (IDCF, DACF, D2CF and WAPP)

Enhancing Grid Performance: Implementing Dynamic Line Rating on Transmission Systems

T. BUTSCHEN¹, B. RUSEK¹, M. RASCHKOWSKI¹, R. SCHADEN¹, F. BERSTER¹, B. KIRBUS², A. WESSEL², M. POSAUTZ²

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ID: 12503

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Lightning; monitoring; localization; distribution network

Application of Lightning Monitoring System in Beijing Distribution Network

P. ZHANG, L. ZHAO, C. LI, K. ZHOU, W. QI, R. ZHANG, X. LAI

State Grid Beijing Electric Power Research Institute

ID: 12611

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Field test, Multi-function conductors, Snow accretion, Wind pressure

Characteristics and Application of Multi-Function Conductors

S. TAKAHASHI¹, N. TAKADA², T. SHIRAIISHI³, N. SUGA⁴, T. TAKAHASHI⁵, T. ENAKA⁶

¹TEPCO Power Grid, Inc. Japan; ²TEPCO Power Grid, Inc. Japan; ³TEPCO Power Grid, Inc. Japan; ⁴Sumitomo Electric Industries, Ltd Japan; ⁵Sumitomo Electric Industries, Ltd Japan; ⁶Sumitomo Electric Industries, Ltd Japan

ID: 12619

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS1 - OHL modernization and emerging technologies

Keywords: Insulated Cross-arm (ICA), Horizontal Vee insulator (HV Insulator), Axis of Rotation (AoR), Steel Pole, Span geometry

Feasibility of Horizontal-Vee Insulator Configurations for Application in Undulating Terrain

O. O. IGENEWARI

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B2 PS2 - Health assessment and refurbishment of OHL

ID: 10120

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Use of Fiber Reinforced Polymer (FRP) membranes for reinforcement and structural restoration of 70kV concrete poles

E. DE BOE¹, T. ZARGAR², R. K. DOWELL³

¹ELIA, Belgium; ²GridWrap, United States of America; ³San Diego State University, United States of America

ID: 10136

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Artificial Intelligence - Asset Management - Point Clouds - Semantic Segmentation - Vegetation Management

AI-Powered 3D Data Fusion System for Vegetation Risk Assessment in Distribution Networks

B. HUANG, J. ZHAO, A. FAZLAGIC, S. REDDING

Eversource Energy, United States of America

ID: 10229

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Carbon Fiber Composite Core (CFC) - Arrhenius Thermal Testing - IEC TS62818-1 - ASTM B987 - Arrhenius Equation

Evaluation, Analysis, and Recommendation of Acceptance Criteria to Determine Ageing on Composite Core Conductors Utilizing the Arrhenius Method

E. BOSZE, C. WONG

CTC Global, United States of America

ID: 10290

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Distributed Acoustic Sensing (DAS), Dynamic Line Rating (DLR), Optic Ground Wire (OPGW), Overhead Line Monitoring

Monitoring of overhead lines using the optical fiber in OPGW

I. TANNEMAAT¹, B. GODARD², X. PAQUEZ², F. ZAIDI³, R. GHENO¹, M. BUISMAN¹

¹TenneT TSO; ²Ampacimon; ³AP Sensing

ID: 10376

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Ground-Based, Mechanized, Stringing, High-Voltage, Transmission

Innovative Mechanized Stringing Method for Manual Sections in Transmission Lines Reducing Manpower, Enhancing Safety, and Improving Efficiency

P. K. RAI*, A. ABHISHEK, R. GUPTA

POWERGRID, India

ID: 10379

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Risk, Mitigation, Condition, Assessment, Tower, Footing, Corrosion, High, Voltage, Transmission Lines

Risk Mitigation and Condition Assessment of Tower Footing Corrosion in High Voltage Transmission Lines

N. SRIVASTAVA*, G. AGRAWAL, D. PAUL

POWERGRID, India

ID: 10381

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Innovative, Non-Invasive, Method, Insulator, Detection, Transmission Lines

Innovative Non-Invasive Method for Faulty Insulator Detection on Live Transmission Lines

M. RAVINARAYAN*, S. M R, K. PANDEY

TAURUS POWERTRONICS PRIVATE LIMITED, India

ID: 10382

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Proactive, Overhead, Line, Management, Monitoring, Predictive Maintenance, Digital Twins

Enabling Proactive Overhead Line Management Through Monitoring, Predictive Maintenance, and Digital Twins

A. D. DARODE*

POWERGRID, India

ID: 10383

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Strategic, Enhancing, Transmission, Line, Performance, Grid, Reliability

Reliability-Centred Maintenance in POWERGRID: A Strategic Approach for Enhancing Transmission Line Performance and Grid Reliability

D. PAUL*, J. G. JOSE, D. N. JHA, M. K. KALORIA, K. SAHU, N. SRIVASTAVA

POWERGRID, India

ID: 10704

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Aged foundations, concrete deterioration, aggressive environments, concrete core sampling survey, foundation reinforcement solutions, foundation casualty rates.

Range of studies – asset management for aged foundations

B. GIUDICELLI, D. PEREIRA, J. DUCROS

RTE France

ID: 10708

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Artificial Intelligence, Computer Vision, Machine Learning, Network Inspection, Convolutional Neural Networks (CNNs), Data acquisition, European tender, GDPR

Optimizing surveillance activities with AI solutions

M. TALEB, S. GUDMUNDSSON, M. GUECEM, G. JARDON, E. LAMBIN, J. BOVERO, A. MARGELY, F. BOULESTEIX, P. BERNON

RTE France

ID: 10711

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Overhead conductors, fatigue damage, experimental data, reliability function

Estimating reliability functions of overhead conductors based on experimental fatigue data

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¹RTE France; ²Mews Labs

ID: 10809

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Artificial Intelligence - Distribution Inspection - Health Assessment - Video Detection

Leveraging AI, Video, and GPS for Distribution Inspections

Z. TANG, J. ZHAO, A. FAZLAGIC, N. HAGHNAZARIAN

Eversource Energy, United States of America

ID: 10831

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: AI, Drone, Visual Inspection

Developing Drone-Based AI for Defect Detection in Transmission Tower Bolts-and-Nuts

S. TERUI¹, M. KATO¹, K. FUJII¹, T. OOTAKI², K. YAMAGUCHI³

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ID: 11017

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Digital Twin, Transmission Towers, BIM, Lean Construction, Field Data Integration, Construction Logistics, Asset Lifecycle Management

Digital Twin Implementation for Data-Driven Planning and Assembly of 525 kV Transmission Towers in Brazil

D. BRAGA¹, P. LIBERATO², P. ROCHA², R. PERUCCI², T. CORRADI²

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ID: 11020

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Preformed splices, overhead conductors, failure analysis, transmission lines, wear, rupture

Evaluation of Failures Due to Slippage of Preformed Splices

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ID: 11071

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Composite core conductors, Monitoring, HTLS, Distributed sensing, Maintenance of line, Optical fiber sensor, Real-time detection, Thermal aging, Vibrations.

Monitoring of Advanced Composite Core HTLS Conductors with distributed sensing

D. PERONI

DE ANGELI PRODOTTI

ID: 11096

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Automating electrical grid asset inspections: improving insulators health assessment with Region-Level annotations

P. D. ROCHA¹, A. COELHO², R. SANTOS², R. MARTINS², L. SILVA CRUZ¹, F. LOPES³

¹UNIVERSIDADE DE COIMBRA; ²LABELEC; ³INSTITUTO POLITÉCNICO DE COIMBRA

ID: 11214

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Overhead Line - Line Rating - Clearance - Renewable Energy - Asset Management - Ageing - Probabilistic Assessment

DLR-Based Reassessment of Continuous Current-Carrying Capacity for Improved RES Integration in Legacy HV Networks

A. BABBS, T. SAMOTYJAK

Institute of Power Engineering Poland

ID: 11371

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Service experience with composite insulators in Danish OHL

P. SIDENVALL

I2G

ID: 11440

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Condition Monitoring of Composite Insulators: A Machine Learning Based Investigation at EDF's Martigues Test Station

H. DE SANTOS¹, E. MOAL², C. PONS³

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ID: 11552

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Corrective maintenance of OHL equipped by composite insulators

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ID: 11566

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Transmission tower; Mechanical characteristics; Wind loads; Fluctuating wind; Failure behavior

Research on Wind-Induced Vibration Response and Failure Behavior of Transmission Towers under Pulsating Wind Action

H. LIU¹, M. LEI¹, L. GONG^{2,3}, Y. XING¹

¹Hebei University of Technology; ²State Grid Tianjin Electric Power Company; ³Chengdong Power Supply Company

ID: 11583

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Strain clamps; damage identification; acoustic emission; parametric analysis; BP neural network

Experimental Study and Signal Analysis of Acoustic Emission from Typical Damages of Strain Clamps for Transmission Lines

G. ZHANG, D. LI, B. LIU, J. WANG

State Grid Electric Power Engineering Research Institute

ID: 11586

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Composite insulator, decay-like fracture, degradation, unmanned aerial vehicle, infrared thermography

On-Site Infrared Detection Methodology for Abnormal Temperature Rise in Composite Insulators of High-Voltage Transmission Lines

T. LI¹, Z. ZUO², X. LIANG², R. TAO¹, C. WU², S. LIU², R. ZHANG³, S. WANG¹

¹State Grid Zhejiang Electric Power Co Electric Power Research Institute; ²Tsinghua University; ³China Electric Power Research Institute

ID: 11628

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: OHL Lightning, Fault Protection

Footing Resistance Design for Reliable OHL Lightning and Fault Protection

S. ALMUBARAK, G. FOTIOU

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ID: 11673

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Induced voltage, transmission line interference, overhead transmission line, pipeline

Investigation of Inductive Electromagnetic Effect of 400 kV OHL on 3 Buried Oil Pipelines: Nurdag-Gaziantep Region, Türkiye

Ö. ÇETİN

Turkish Electricity Transmission Corporation

ID: 11872

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Health Assessment, Refurbishment, Maintenance, Aeolian Vibration, Damping, Conductor Motion, Crossing, Fjord, Monitoring, Wind, Enhancing Lifespan.

Vibration monitoring of all phases on Hjørundfjorden fjord crossing – measured differences between phases

B. ADUM¹, P. F. DUARTE DE OLIVEIRA², E. MATENE², J.-P. PARADIS²

¹Statnett SF; ²PLP

ID: 12030

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Insulator, Health Index, Aging, Acoustic Analysis

Aging and Reliability of Porcelain Longrod Insulators: Insights from Statistical Modeling and Acoustic Analysis

F. LEHRETZ², A. ZEITLER³, S. REICH⁶, C. PURUCKER¹, T. RODLER⁵, U. STRACKE⁴

¹Lapp Insulators GmbH; ²TenneT TSO GmbH; ³TenneT TSO GmbH; ⁴TenneT TSO GmbH; ⁵TenneT TSO GmbH; ⁶Grindo- Sonic BV

ID: 12075

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Insulator Flashover, Leakage Current, Insulator Washing, Condition-based Maintenance

Field Monitoring of Leakage Currents in Overhead Transmission Lines for Condition-Based Insulator Maintenance

R. VILLALOBOS, E. RICHARD, C. MAURY

Universidad de La Frontera

ID: 12118
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Health assessment and refurbishment of OHL
Health Index Model for 230 kV Transmission Line Insulation and Its Evaluation Using Satellite Sensor and Antenna Data (2015-2023)
F. ROJAS¹, G. GUERRA²
¹ENLAZA; ²ENLAZA

ID: 12125
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Health assessment and refurbishment of OHL
Performance Analysis of 500 kV Transmission Lines Under Lightning Strokes Considering the Influence of Various Environmental Conditions and the Effect of Terrain Slopes in Colombia
H. RESTREPO¹, A. PEDRAZA², A. CAMELO³, Y. PEREZ⁴, J. GOMEZ⁵, D. ARANGUREN⁶, E. PEREZ⁷
¹ISA; ²ISA; ³ISA; ⁴Intercolombia; ⁵ISA; ⁶KERAUNOS; ⁷UNAL

ID: 12186
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Health assessment and refurbishment of OHL
Circular Economy Applied to Power Grid Rerouting Projects: Maximizing Financial and Environmental Value at ISA INTERCOLOMBIA
A. BEDOYA¹, N. RESTREPO²
¹Intercolombia; ²intercolombia

ID: 12276
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Health assessment and refurbishment of OHL
Keywords: composite, insulator, condition, evaluation, lifetime, maintenance
Modern Approach to Condition Evaluation of Composite Insulator in Service
J. STRUMBELJ¹, K. VARLI², M. STOECKLI³
¹PFISTERER Switzerland; ²Amprion Germany; ³ELECTROSUISSE / CIGRE Switzerland NC Secretary

ID: 12312
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Health assessment and refurbishment of OHL
Keywords: Automated, Fault, Analysis, Asset, Information
In-House Developed Automated Fault Analysis with Multi-Collaboration of Asset Information System
Y. W. CHUNG
 Tenaga Nasional Berhad, TNB

ID: 12324
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Health assessment and refurbishment of OHL
Improved Technical Requirements for Potential Refurbishment on Tower Earthing Systems for Inundated-prone Areas
N. HUDI¹, N. HATTA², N. YAAKOB³
¹Tenaga Nasional Berhad, TNB; ²TNB Research Sdn. Bhd; ³University Teknologi MARA Malaysia

ID: 12348
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Health assessment and refurbishment of OHL
Keywords: Load transposition - Composite long rod insulators – Damage limit load - Dynamic tensile loading – Drop-weight impact testing
New Experiences with Load Transposition Tests on Composite Long Rod Insulators in Multiple Insulator Sets
J. SEIFERT¹, M. BORNOWSKI⁴, C. BÄR², U. SCHÄFER⁵, U. KREIG⁶, M. DOERR⁷, K. VARLI⁸, M. MEISSNER⁹, H. WEKENBORG¹⁰, F. LEHRETZ⁷, F. BECKER³, O. HERZ⁹, F. SEFFRIN¹⁰, F. SCHMUCK¹¹, B. ROBBEN¹², H. KRISPIN¹³, A. STOCKHAUSEN¹⁴
¹TKE GmbH; ²Wacker Chemie AG; ³Amprion GmbH; ⁴TransNet BW GmbH; ⁵E.DIS Netz GmbH; ⁶SSB AG Switzerland; ⁷TenneT TSO GmbH; ⁸Amprion GmbH; ⁹Westnetz GmbH; ¹⁰SPIE SAG GmbH; ¹¹Schmuck HV Insulating Consulting GmbH Switzerland; ¹²Siemens Energy Global GmbH & Co. KG; ¹³RIBE Elektroarmaturen GmbH; ¹⁴PFISTERER Insulators Wunsiedel GmbH

ID: 12368
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Health assessment and refurbishment of OHL
Keywords: In-Cloud Icing, climate wind tunnel, collision efficiency, conductor temperature, conductor inclination
Effects of Conductor Temperature and Conductor Angle on Icing of Overhead Power Line Conductors During Atmospheric Icing Events
E. ULLOA JIMENEZ, S. STEEVENS, S. PETERS

ID: 12370

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Earthing, Grounding, Touch voltage, Tower footing resistance, Soil resistivity, Quantified Risk Assessment, Asset management, Transmission line tower, Electricity pylon, Regression analysis

Systematic Comprehensive Diagnostics of Transmission Line Tower Earthing in Czech Republic

M. KENICKY¹, M. SVANCAR¹, J. BREJCHA², P. SPURNY²

¹EGU – HV Laboratory a.s.; ²CEPS, a.s.

ID: 12477

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: AC Voltage, Dielectric Behaviour, Insulator, Pollution

Comparison of the dielectric performance of polluted composite insulators under AC and DC stress using the rapid flash over method

F. GEBHARDT¹, S. KÜHNEL², S. KORNUBER², P. WERLE³

¹50 Hertz Transmission GmbH Germany; ²Zittau/Görlitz University of Applied Sciences Germany; ³Leibniz University Hannover Germany

ID: 12504

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: OHL, Maintenance, Satellite, UAV, Camera, Image

Satellite-based Transmission Line Operation and Maintenance Method: A Novel Practice in China

G. QIU, X. TAN, J. CHEN, N. ZHANG

Electric Power Research Institute of State Grid Jiangsu Electric Power Co., Ltd.

ID: 12505

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Transmission line; LiDAR point cloud; PointNet++; Point cloud classification; 3D modeling; Intelligent inspection

Research on 3D Point Cloud Modeling and Evaluation Technology for Transmission Lines and Corridor Environments

X. LAI, W. QI, R. ZHANG, K. ZHOU, L. ZHAO, P. ZHANG

State Grid Beijing Electric Power Research Institute

ID: 12558

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Non-destructive condition assessment of utility wood pole assets, with severity of decay measurement capability, a more reliable enabler for life extension and refurbishment optimisation

B. MCGOWAN

Scientias Energy

ID: 12606

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS2 - Health assessment and refurbishment of OHL

Keywords: Reinforced Concrete, Foundations, Non-Destructive Testing, Ultrasonic Pulse Velocity, Rebound Hammer, Ground-Penetrating Radar, Half-Cell Potential, SONREB

Non-Destructive Testing Techniques for Condition Assessment of Reinforced Concrete Overhead Transmission Foundations

T. T. LUDERE

NTCSA - National Transmission South Africa

B2 PS3 - Sustainability and climate change impacts (with C3)

D: 10291

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Downburst, Overhead lines, Climate change, European standards, Design loads, Climate resilience

Study on impact downburst events on Overhead Lines (OHLs) in the Netherlands in relation to climate change

E. PLATENKAMP¹, G. LENDERINK², L. STOOP¹, T. BÖRGER³

¹TenneT TSO; ²KNMI; ³DNV

ID: 10292

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Study Impact Downburst Events on Overhead Lines (OHLs) in the Netherlands in Relation to Climate Change

E. PLATENKAMP¹, L. STOOP¹, G. LENDERINK², T. BÖRGER³

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ID: 10346

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Environmental, Metallurgical

Environmental life cycle analysis of overhead transmission lines: Metallurgical considerations and sustainability impacts

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mjlee Consult, Australia

ID: 10405

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Climate, Change, Extreme, Weather, Events, EHV, Transmission Lines

Impact and Strategies in Response to Climate Change and Extreme Weather Events on EHV Transmission Lines

H. S. BEDI*, M. J. JADWANI, A. D. DUBEY, S. K. SINGH

Power Grid Corporation of India Limited, INDIA

ID: 10406

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Poles, Planet, Life Cycle, Carbon, Footprint, OHL

From Poles to Planet: Life Cycle and Carbon Footprint of OHL Infrastructure with Environmental and Social Compliance

H. S. BEDI*, M. JADWANI, A. DUBEY, S. K. SINGH

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ID: 10412

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Overhead, Infrastructure, Transmission, Sustainable

Sustainable Transmission Expansion in India: Innovative Approaches to Environmental and Social Compliance in Overhead Infrastructure Development

P. PANDEY, K. KISHOR, P. SALUJA, P. RAMPRASAD*, V. KARRI

POWERGRID CORPORATION OF INDIA LTD

ID: 10413

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Towers, River, Spatial

Spatial Model for Prediction of the Vulnerable Towers Affected by River Meandering

P. S. CHAUHAN*, P. SEERVI, A. SHANKAR

Power Grid Corporation of India Ltd. INDIA

ID: 10773

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Corrosion, extreme weather, full scale testing, guyed V-suspension, guy wire

Extreme weather incident experienced on 765 kV line in South Africa

B. JACOBS, F. MOKHONOANA

National Transmission Company South Africa (NTCSA)

ID: 10833

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Preventive measure, Transmission line insulator, Volcanic ash

Preventive measures and post-event responses for volcanic ash deposition on transmission line insulators

Y. AOKI¹, N. TAKADA¹, T. OSONO¹, T. SHIRAIISHI¹, H. HOMMA², M. MIYOSHI², N. KITA²

ID: 10872

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: climate change, extreme events, power transmission, infrastructure resilience, lightning, wildfires, Brazil

Climate Challenges in Power Transmission: A case study of the 500 kV Line in Brazil

L. L. N. MARTINS¹, J. B. G. F. DA SILVA¹, C. CHEN²

¹Paranaíba Brazil; ²State Grid Brazil

ID: 10929

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Avian Electrocution - Electrocution - Potential Ignition Source - Risk Assessment

Quantifying the Probability of Avian Electrocution on Overhead Transmission and Distribution Structures

G. BHATTACHARJEE, E. JAMPOLE

Exponent, Inc., United States of America

ID: 11363

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Composite core conductors, Sustainability, Carbon fiber (CF), Recycling, Lifecycle management, Energy transition, Advanced conductors, End-of-life (EOL) processes

Sustainable End-of-life for Advanced Composite Core Conductors

A. HASSINEN¹, G. DORIGATTI², H. KLOSTER¹

¹Exel Composites; ²De Angeli Prodotti S.r.l.

ID: 11588

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Galloping, UHV, Transmission Lines, Aerodynamic Coefficients, Inter-phase Spacers, Verification, Suppression Effectiveness, 4-DOF

Galloping Mechanism and Anti-Galloping Design of UHV Transmission Lines in Extreme Meteorological Environments

L. WANG, B. CAO, L. WANG

Tsinghua Shenzhen International Graduate School

ID: 11590

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Power Grid Engineering; Geological Hazards; Risk Assessment; Random Forest Model

Research on Susceptibility Risk Assessment and Application of Geological Hazards in Power Grid

Z. ZHANG, B. GONG, L. FAN, D. ZHU, H. LI, H. ZHONG

China Southern Power Grid Co.,Ltd.

ID: 11630

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: RTV silicone rubber, high-voltage overhead transmission lines (OHTL), hydrophobicity transfer mechanism (HTM), hydrophobicity loss and recovery, natural ageing, critical leakage current, flashover voltage, operating life of coating, tangent delta ($\tan \delta$)

Naturally Aged RTV Sir Coatings in Harsh Desert Environment: Technical Approach & Estimation Procedure

R. ZNAIDI¹, A. ALTHAGAFI², A. ELDEEB³, K. ALKHALID⁴

¹Expert Consultant; ²GCCIA; ³IMCO; ⁴KSU

ID: 11754

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Brillouin Optical Time, Domain Reflectometry, Distributed Fibre Optic Sensing, Overhead Lines, Temperature

A Novel Approach to Ice Detection on Power Lines Using Distributed Strain and Temperature Sensing (DSTS) with Field Test Validation

H. OĞUZ¹, V. TÜRKER¹, T. KARTALOĞLU¹, E. ÖZBAY¹, Ü. ÇETİNKAYA², M. UZAR²

¹Bilkent University; ²Turkish Electricity Transmission Corporation

ID: 11757

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)
Keywords: Overhead Lines, Climate change, Heatwaves, Windstorms, Resilience.

Failure modelling of overhead lines exposed to worsening gradual and instantaneous weather hazards due to climate change

G. EDWARDS¹, O. HLUSTIK¹, M. GALEELA¹, G. MCFADZEAN¹, G. WILSON¹, A. ALI², D. ARMIT²

¹TNEI Services UK; ²National Grid

ID: 11810

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)
Keywords: Climate resilience, overhead lines, heat, thermal annealing, climate model, visualisation

Climate Data for Overhead Line Resilience to extreme Events

C. DENT¹, J. MOLLARD¹, G. HEGERL¹, G. WILSON², G. EDWARDS³, C. TURLE⁴, A. BHATTACHARYA¹

¹University of Edinburgh UK; ²National Grid Electricity Transmission UK; ³TNEI; ⁴Frazer-Nash Consultancy

ID: 11873

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)
Keywords: Icing, Design loads, Load cases, Icing sensors, Real-time monitoring, Galloping, Weather modelling, Climatology

A novel approach to the assessment of extreme weather events related to icing

B. E. NYGAARD¹, K. INGVALDSEN¹, B. ADUM², P. A. HAGEN²

¹Norconsult; ²Statnett

ID: 11903

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)
Keywords: Duck-under scenarios, Electric field, Electromagnetic field, Environmental impact, Exposure Limit Values, Ground-level exposure, Line voltage, Magnetic field, Maxwell theory

Electromagnetic Field Compliance Study for New Overhead Line Design

H. NEGI¹, K. MANGLAM¹, N. SILVA¹, C. THOMPSON²

¹Arcadis United Kingdom; ²SSN Transmission United Kingdom

ID: 12009

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)
Keywords: Alpine Region, Climate Change, Climate Projections, Ice Load, Icing Events

Investigation of the future Development of Icing Events in relation to Climate Change in the Alpine Region of Austria

K. WEINDL¹, O. OBERZAUCHER¹, P. MÜLLER², M. NUTZ²

¹Austrian Power Grid AG; ²GeoSphere Austria

ID: 12124

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Alpine Region, Climate Change, Climate Projections, Ice Load, Icing Events

Implementation of Digital Tools for the Application of the Technical-Environmental Methodology for Sustainability in Transmission Line Projects

H. RESTREPO¹, A. OVIEDO², M. CARDENAS³, F. DUARTE⁴, J. GOMEZ⁵

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ID: 12230

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)
Keywords: Power Line, Ampacity, Climate Change, ACSR, Conductor

Climate-Driven Ampacity Analysis of High-Voltage Power Lines

L. RACZ, D. SZABO, G. FOLDI, G. GOCSEI, B. NEMETH

Budapest University of Technology and Economics

ID: 12246

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)
Keywords: life cycle assessment, product carbon footprint, power grid, climate impact mitigation

Live cycle assessment of 110 kV power lines equipment

D. BUGMANN¹, C. LINDNER¹, A. SPOERRI², L. SUBAL², M. STOECKLI³

¹Xpo Grid AG Switzerland; ²EBP AG Switzerland; ³ELECTROSUISSE / CIGRE Switzerland NC Secretary

ID: 12327

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Experience in Assessing HTLS Carbon Composite Core Conductor on Field Trial While Adhering to Sustainability and Strategies to Response Climate Change Issues in Malaysia

M. I. SHAMSUDIN, M. J. ABD JAWAS

Tenaga Nasional Berhad, TNB

ID: 12364

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: Audible Noise, Corona Effect, Noise Mapping, Noise Modelling, OHL

Advances in Acoustic Modelling of Overhead Transmission Lines

D. TODOROVIĆ¹, I. SALOM², N. PETROVIĆ³, V. ČELEBIĆ², M. KABOVIĆ², N. CUROVIĆ⁴

¹Dirigent Acoustics LLC, Serbia; ²Institute Mihajlo Pupin, University of Belgrade, Serbia; ³Energy Agency of the Republic of Serbia, Serbia; ⁴Elektromreža Srbije JSC, Serbia

ID: 12424

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Sustainable lattice towers for 380kV transmission lines

K. GÜNTHER-PAPADOPOULOU¹, J. GLÖGGLER¹, R. JACOB²

¹TENNET TSO GmbH; ²WIEGEL Parey GmbH

ID: 12491

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: audible noise, corona discharges, overhead line conductors, surface analysis

The Effect of Ageing on Corona Discharge induced Audible Noise of Overhead Line Conductors

B. SCHRÖDER¹, S. MÖLLENBECK¹, P. GIT², K. SCHILLAI³, P. GIT⁵, H. KIRCHNER⁶, O. PISCHLER⁴

¹Amprion GmbH Germany; ²TH Deggendorf Germany; ³Swissgrid Switzerland; ⁴TU Graz Austria; ⁵TH Deggendorf; ⁶Hitachi Energy Ltd Switzerland

ID: 12599

B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Keywords: High Intensity Localized Winds, Downburst, Transmission lines, Semi-analytical methodology, Finite Element Analysis, CFD, Newton-Raphson, Conductor swing, Structural assessment

Evaluation of Downburst Impact in the Electric Reliability of Transmission Line Spans Through Numerical Analysis

I. SOUZA¹, C. ARRUDA²

¹CEPEL, Asset Management Department Brazil; ²CEPEL, Asset Management Department Brazil

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS

B3 PS1 - Innovative substation concepts, designs and operation experience

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Soil Ionization Impact on the Grounding Grid Performance of High Voltage Substations Exposed to Lightning Strokes

O. GOUDA¹, A. ELDEIN², S. YASSIN³, A. ELMORSHEDY¹

¹Cairo University; ²Aswan University; ³Upper Egypt Electricity Company

ID: 10389

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: AI-Driven, Designs, Brownfield

AI-Driven Solutions for Efficient Generation and Optimisation of Substation Designs in Brownfield Context.

M. SURACE, M. RICHARD

APD Global, Australia

ID: 10436

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Battery Energy Storage System (BESS), Receiving substation (RSS), Energy Management system (EMS), Battery Management system (BMS), State of Charge (SOC)

DG Set Replacement With Bess

R. SAHU*, R. KOPEWAR, S. MALI, M. SHINDE

Tata Power Co. Ltd , INDIA

ID: 10438

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Structural Simulation of Gas Insulated Line Support Structures in GIS Substations

M. SUDAN*, V. K, G. k. A

GERETPL, INDIA

ID: 10443

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: gantry, architecture, space, constrained, Voltage, Substation

Innovative Multi-Tier gantry architecture enabling compact twin line exit in space constrained Multiple Voltage Substation using Intelligent Modelling

G. VIG*, J. KUMAR, V. KAPIL, A. SINHA

BHEL , INDIA

ID: 10445

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Digitalization, Substation, Engineering

Digitalization in Substation Engineering

B. MINOCHA*, G. HARIHARAN

L&T Construction, INDIA

ID: 10450

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: VFTO, voltages, TGPR, EHV/UHV, GIS, switching, earthing.

Minimising VFTO voltages & TGPR rise in EHV/UHV GIS station by adopting alternate switching sequence & additional earthing.

A H. V. KUMAR*, T H. PRASAD, M P. KUMAR

POWERGRID, INDIA

ID: 10684

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Substation Resilience - Digital Twin - Data Fusion - Impact Assessment - Sustainability - Predictive Asset Health - Utility Investment - Big Data

An AI-Driven Framework for Substation Physical Resilience Indexing: Leveraging Big Data for Predictive Asset Health and Investment

C. LI

Burns & McDonnell, United States of America

ID: 10686

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Dead Tank Circuit Breaker - Installation and Commissioning - Installed Base - Gas Analysis - Operational Experience - SF6-free Circuit Breaker

Return of Experience from Installation, Commissioning and Operation of the World's First Modern SF6-free 420 kV Dead Tank Circuit Breaker

J. GRORI¹, P. MELZEN¹, M. CUPPETT², M. SCHMITT², D. PERSAD², A. HOSSAIN², T. SCHULZ², M. GATZSCHE³

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ID: 10691

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Floating Offshore Substation - HVDC - Floater Design - Tension Leg Platform (TLP) - Finite Element Analysis (FEA) - Global Performance - Qualification Tests - Wave Basin Model Test

Conceptual Design of an HVDC Tension Leg Platform (TLP) Floating Offshore Substation Solution

H. SONG¹, Z. TANG², N. MOLINIER³, C. PLET⁴

¹GE Vernova, United States of America; ²Genesis Energies, United States of America; ³GE Vernova, United Kingdom; ⁴GE Vernova, France

ID: 10692

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Substation - 3D Models - Intelligent Symbols - Digital Twin - LiDAR - Photogrammetry - Resilience

Implementing Intelligent Substation 3D Design with Data Capture Technology

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Bentley Systems, United States of America

ID: 10748

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Substation Earthing - Touch and Step Voltages - Soil Freezing - Seasonal Earthing Performance

Analysis of Seasonal Effects on Substation Earthing Systems

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ID: 10808

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Building Information Modeling - BIM - Asset Information Model - AIM - Information Management Initiative - IMI - GeoBIM - IEC 61850

BIM 2.0 for Substations: Unlocking the Potential of Data to Improve Electrical Grid Operation and Maintenance

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ID: 10834

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Artificial Intelligence, Generative AI, Knowledge Management, SECI Model, Substation Lifecycle, Virtual Mentor

Leveraging generative AI to facilitate Knowledge Management across Substation Lifecycle

S. NOGUCHI

Chubu Electric Power Grid Co., Inc. Japan

ID: 10835

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Foundation Construction, High Skilled Engineer, Precast RC Foundations

Reduction of Construction Period by Applying Precast RC Foundations to Substation Equipment

K. MURAKITA, S. TSUKAO, M. YOSHIMOTO, K. ENDO, D. SAITO, C. SASAKI

TEPCO Power Grid, Inc. Japan

ID: 10877

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Generative Design - Computational Design - BIM - Sustainability - Embodied Carbon

Greening the Grid - More Sustainable Design of Electrical Substations using a 3D BIM Model Integrated with Generative Design Approach

P. SOMBOONYANON¹, R. DALE², B. PALMER³

¹AEC Lionstech, United States of America; ²Burns & McDonnell, United States of America; ³Burns & McDonnell, United Kingdom

ID: 11030

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Atacama Desert, resistivity surveys, 1D geoelectric modeling, geophysical surveys

The Kimal Converter Substation - The Challenges of Geoelectric Modeling in a Desert Environment

P. E. FREIRE¹, N. MEQBEL², S. BITTENCOURT³, T. WEI⁴, W. JIANZHONG⁵, B. ABARCA⁶, J. CALDERON⁶

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ID: 11300

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Substation; Power Generation; GEOBIM; Reality Capture; GIS; Point Cloud; Digital Twin; BIM; EletroBIM Project

GeoBIM Implementation for the Development of Transmission Projects and Digital Twins for the Optimization of Substation Management in Operation

A. MAROTTI¹, P. BRITO¹, F. SILVA¹, V. CARAZZAI¹, C. XAVIER¹, D. ARAÚJO², R. AGUIAR³

¹ELETROBRAS Brazil; ²BIM Start Brazil; ³EnergiaBIM Brazil

ID: 11302

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: BIM, FITradeoff, substations, multicriteria analysis, sustainability

Application of the FITradeoff Method in Substation BIM Projects: Multicriteria Optimization for Decision Making

H. VILELA¹, L. VASCONCELOS²

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ID: 11616

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Substation, mobile, modular, temporary, standardisation, sustainability, efficiency, NetZero

Mobile and modular Substations for the provision of more sustainable and efficient Grid Connection of renewable Generation

P. CURTIS, B. JAVAID, T. WANKHEDE, J. THOMAS, H. MORTON, M. BARNETT, M. MORREY, A. CHAUDHR

SSEN Transmission United Kingdom

ID: 11813

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Prefabricated modular substations: Findings from ongoing pilot project

T. JOHANSSON

Vattenfall Eldistribution

ID: 11997

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Sustainability, Transmission, GIS, SF6-free, F-gas-free, Vacuum, GHG emission

F-gas-free 420 kV GIS based on clean air and vacuum switching technology

M. KUSCHEL¹, B. LEEMANS², V. AELBRECHT³, K. POHLINK⁴, C. BÜTÜNER⁵, F. KELCH⁶, A. NIJHUIS⁷, M. ROLF⁸

¹Siemens Energy Global GmbH&Co KG; ²Elia; ³Elia; ⁴Siemens Energy Global GmbH&Co KG; ⁵Siemens Energy Global GmbH&Co KG; ⁶Siemens Energy Global GmbH&Co KG; ⁷Siemens Energy Global GmbH&Co KG; ⁸Siemens Energy Global GmbH&Co KG

ID: 12004

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Sustainability, Mobile substation, Compact, GIS, SF6-free, F-gas-free, Vacuum, GHG emission, LPIT, Low Power Instrument Transformers

Innovative greenhouse gas free mobile substation

A. ALBERT¹, M. WEIHKOPF², M. KUSCHEL³, P. MENKE⁴, L. E. DAHL⁵, L. I. STADHEIM⁶

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ID: 12057

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Anomaly detection, Condition-based maintenance, High voltage substation, Inspection robot, Thermal imaging

Experience from Pilot Implementation of Substation Inspection Robots in Thailand's High Voltage Substations

S. ARIDEJ, S. LAOHANAN

Electricity Generating Authority of Thailand (EGAT)

ID: 12059

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience
Keywords: BEP, BIM, Data Standardization, Interoperability, Substation Design

BIM in High Voltage Substations: Implementation, Data Gaps, and Readiness for Integration

K. DHANAVARAVIBUL, N. TANTASANEE, N. SRIPRASERT

Electricity Generating Authority of Thailand (EGAT)

ID: 12201

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Formulation of advanced design standards for HV/MV Substations to optimize and utilize renewable resources in construction, operation and maintenance: Technical challenges and lessons learned

M. S. RINCON¹, J. A. BETANCOURT², C. J. SEPULVEDA³, J. CASTRO⁴

¹CELSIA; ²CELSIA; ³CELSIA; ⁴CELSIA

ID: 12207

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Digital Twin for Operational Optimization of High Voltage Electrical Substations

L. MONSALVE¹, M. PALACIO²

¹HMV; ²HMV

ID: 12209

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Grounding protection studying Substations in Industrial Zones – Insights, Innovations, and Challenges

F. GIRALDO¹, E. OSPINA², M. PALACIO³

¹HMV; ²HMV; ³HMV

ID: 12272

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Automated Generation of Substation 3D Model via Python and 3D CAD Integration

N. ANAYA¹, E. CEBALLOS², A. LARIOS², J. ARCILA²

¹ISA; ²HMV

ID: 12279

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: availability, resilience, feeder, circuit breaker, substation, moebius-strip

A Comparison of three resilient HVAC Switchyards: Moebius-Strip, Crossed-Ring and Breaker-and-a-Half

G. KOEPL¹, K.-P. BRAND², M. STOECKLI³

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Implementation of Modular Substations to Address the Challenges of Traditional Substations in Tenaga Nasional Berhad Grid System

S. MUTHUKARUPPAN, M. Z. ZAINAL ARIFFIN

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ID: 12603

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience

Keywords: Modular electrical substations, Architectural design optimization, Construction time reduction, Industrial projects, Energy infrastructure

Innovative Design of Modular and Prefabricated Electrical Substations with an Approach to Reduce Execution Time and Increase Productivity in Industrial and Energy Projects

H. ABEDI

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ID: 12635

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS1 - Innovative substation concepts, designs and operation experience
Keywords: Emergency training, neural network, substation

Intelligent Emergency Training System for Substation Operating Personnel Based on Digital Simulation and Neural Network Technologies

R. PASHKOV

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B3 PS2 - Life cycle & asset management

ID: 10158

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Asset Management - Technical Drivers - Business Context - Bushings - Spares

Challenges in Asset Management: Data, Decisions and Uncertainty

T. MCGRAIL¹, R. DHIRR⁴, L. PAULHIAC⁵, J. BEARDSALL⁶, C. JOHNSTONE⁷, S. SUTTON², G. WILSON³, M. KHALIL²

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ID: 10278

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Sulphur Hexafluoride – emission – reducing – sealing

Mitigating SF₆-emissions: Performance evaluation of external adhesives as leakage mitigation in simulated and field conditions

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ID: 10344

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Substation SCADA, Circuit Breaker, Network Reliability

Application of Substation SCADA Data for Circuit Breaker Maintenance Optimisation and Network Reliability

J. KHOR, L. NARANPANAWA

Energy Queensland, Australia

ID: 10351

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Sulphur Hexafluoride (SF₆), HV, Transmission

Sulphur Hexafluoride (SF₆) Management Strategy in Transgrid's HV Transmission Network

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Transgrid, Australia

ID: 10461

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: SF₆

SF₆ Life Cycle Management strategy by GETCO

K. RATHOD, A. PIPARIA, P. PATEL, U. VANK*

Gujarat Energy Transmission Co. Ltd, INDIA

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Cumulative Impact of Frequent Through Faults on Conventional Substation Switchyard Equipment: Diagnostics and Long-Term Mitigation Strategies

R. BHAKAL*, P. K. JHA, K. SAHU

POWERGRID, INDIA

ID: 10469

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: AIS, substations, Hybrid, Grid

Hybrid Grid for enhancing capacity of AIS substations with space limitation with use of GIS switchgear

A. KUMAR*, S. GOSWAMI, K. BHATT, A. GARG, N. KAUSHIK
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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Substation, Extension, Upgrading

Substation Extension & Upgrading Experience

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ID: 10477

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: GIS, AIS, Ageing, Operational, Challenges

“POWERGRID’s Experience in Revamping Ageing AIS Infrastructure: GIS Upgradation Strategies Under Site-Specific and Operational Challenges”

A. CHAKRABORTY, A. VAISH, M. K. TIWARI, R. GUPTA

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: AIS, GIS, Gas, Refinery, 66kV

Replacement and Upgrade of a 66kV AIS to GIS at a Major Gas Refinery in India: A Phased Execution Strategy

V S MEENA*, D. SENGUPTA, M. S MEHTA, V. KAPIL

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: EHV, Failure, Risk

Risk Based Inventory Management of EHV Equipment Through Failure Modes and Effects Analysis

D. PAUL*, M. K. KALORIA, G. AGRAWAL, R. SRIVASTAVA, N. SRIVASTAVA

POWERGRID, India

ID: 10512

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Augmented, Substation

Enhancing Substation Asset Management with Intelligent Inspection and Augmented Reality in POWERGRID

D. PAUL*, D. N. JHA, M. K. KALORIA, K. SAHU, N. SRIVASTAVA

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ID: 10518

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Substation, Hydro Plant, Up-Rating

Substation Up-Rating Challenges and Solutions in a Live Hydro Plant Environment

P. CHAWLA *, D. MANDAL, D. K SHUKLA, V. KAPIL

BHEL INDIA

ID: 10537

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Ageing, Bus Reactor, Foundation modification, Reactor replacement.

Replacement of 400kV, 63 MVAR Aged Reactor with 400kV, 125 MVAR Reactor on the Same Foundation: Challenges, Modifications, and Lessons Learnt

T. SUDHIR*¹, V. S. RAMESH², C GOBINATH³, P. MURTHY⁴

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Powering the Northeast India: “A Case study on the timely completion of 220KV Transmission Project in adverse climatic conditions and various logistical challenges”

M. MAJUMDER*, A. DAS*, D. BHOWMICK*

POWERGRID, INDIA

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Role of Online PD Monitoring of GIS in Enhancing Reliability & Avoiding Catastrophic Damage: A Utility Experience and Perspectiv

M. G. GOKHALE¹, S. ADHIKARI², N. K. SINGH^{*2}, A. TIWARY², J. PANI², P. KUMAR²

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Smart meter, real-time, alarm, edge, LV Network

Substation Metering Equipment to improve Real-time Monitoring of the LV Network

D. DAVIDOVIĆ, D. CRNOJA, D. MAKSIMOVIĆ

Elektro Ljubljana d.d., Slovenia

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Gas-insulated substation, GIS, SF6-free, C4FN, C4F7N, fluoronitrile, extension, upgrading, retrofitting, retrofilling

Extension and upgrading of 420 kV GIS with SF6-free C4FN GIS solution

A. FICHEUX¹, T. BARBE¹, A. HOLTON², C. EDGAR²

¹GE Vernova; ²SP Energy Networks

ID: 10740

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Asset Performance Management, Circuit Breaker, Condition-based Maintenance, Controlled Switching, IEC 61850, IED, Monitoring

How combining controlled switching functions with extensive monitoring improves operation of circuit breakers

N. GADACZ, F. AIT-ABDELMALEK

GE Vernova

ID: 10836

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Switchgear, Monitoring, Anomaly Sign, Dry Air, Partial Discharge

Anomaly Detection Technology for Gas-Insulated Switchgear

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ID: 10837

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: SF6 Free, Natural Origin Gas (NOG), Gas Insulated Switchgear (GIS), Dry Air, Vacuum Circuit Breaker (VCB), Cubicle Type GIS

Current Status of Application and Operational Experience of Alternative Switchgears using Natural-Origin Gases in Japan

K. SASAMORI¹, T. MORI¹, T. SAIDA², N. KIKUCHI³, A. HATSUZAKI⁴, S. TSUKAO⁵, K. MURAKITA⁵

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ID: 10839

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Life Cycle Assessment, Carbon Footprint, Carbon Dioxide Equivalent, Emission, Sulphur Hexafluoride, Alternative Gas, Substation, Service Life

Life-Cycle Based Carbon Footprint Assessment and Evaluation of Reduction Measures for AIS and GIS Substations

S. AICHI¹, S. NOGUCHI¹, S. TSUKAO², M. HORIGOME³, T. UCHII⁴, R. TAKAHASHI⁴

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ID: 10840

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Ageing Equipment, Maintenance, Collaboration, Renewal Simulation, Asset Management, Failure Response

Collaboration between Utilities and Manufacturers for Sustainable Operation and Maintenance of Ageing Substation Equipment

K. MIKUNI¹, T. KAWAMURA¹, Y. ITO¹, S. MATSUDA², M. YAEHASHI²

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: circular economy, data collection, digitalization, disposal minimization, emission reduction, greenhouse gas mitigation, monitoring, regeneration, recycling, SF₆, SF₆ lifecycle, sustainability

SF₆ Monitoring, Recycling and Regeneration: Circular Solutions for the Energy Sector

S. PIROLA

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ID: 11170

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: asset life extension, equipment uprating, lifecycle assessment, retrofit design, structural reuse, substation refurbishment, sustainable engineering

Optimising substation refurbishment through reuse and modification of existing steel support structures: A case study at a 132 kV substation

B. HAJEE, A. MAYET, M. PEFFER

National Transmission Company South Africa (NTCSA)

ID: 11171

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: coupled electromagnetic-structural analysis, electrical fault loading, electromagnetic loading, short-circuit forces, substation structures, voltage uprating

Structural engineering challenges in short-circuit loading: Toward a unified methodology

A. MAYET, B. HAJEE, M. PEFFER

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ID: 11175

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Asset Management, Power Grid Companies, Power Supply Reliability, Production Asset Management System, Production Asset Management Model, automated system of technical survey facilities

Digital Technology Enabled Technical Survey

D. VODENNIKOV, Y. ZHILKINA, S. ZAKIROVA

PJSC ROSSETI

ID: 11301

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Availability, Substations, Shunt Reactors, Spare-Reactor Switching, Life-Cycle Asset

Life-Cycle Asset Management of Non-Switchable Line Reactors: Rapid Reserve Switching in Brazil's Interconnected Power System

F. FRAGA¹, E. PINTO¹, A. LACERDA²

¹Eletrobras Brazil; ²INTEREST Engenharia Brazil

ID: 11303

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Transformers ; energy transition ; uprating ; transmission margin; hybridization

Challenges in substation uprating to support Brazilian wind complex expansion

C. XAVIER, M. M. DELLABIANCA, S. PINHEIRO, L. BRAGA, R. RAMOS

ELETROBRAS Brazil

ID: 11315

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Building Information Modeling; Extra High Voltage Substation; Digital Twin Models; Current Transformers; Non-invasive Monitoring; Partial Discharges; HFCT; Extra High Voltage Substation; Digital Twin Models; Artificial Intelligence (AI); IoT; GeoBIM

Using GeoBIM, IoT and IA for Predictive Diagnose on High- Voltage Substations

A. MAROTTI¹, F. SALLES¹, G. LIMA², F. MACHADO³

¹ELETRONBRAS Brazil; ²CGW Brazil; ³Autodesk Brazil

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Assessing Risk Factors for PD-Activity in 24 kV Secondary Substations Using Machine Learning

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RISE

ID: 11734

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Asset Management, Maintenance Strategies, Risk Assessment, Health Index, Decision Making, Substation

Application of Substation Asset Management Solution for a Utility in Malaysia under the Korea's KSP Initiative

S. J. KIM¹, H. W. CHA¹, H. D. SEO¹, T. W. AHN², J. H. BAN², J. S. KIM³, J. W. KIM³, W. S. LEE³, R. LIM⁴

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Case study: Stock-up strategy for equipment with High-Lead-Time spares in offshore substations

E. J. QUINTANA SANTOS, S. JONSSON

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ID: 12076

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Seismic requirements, seismic interaction, subduction earthquakes, seismic shear waves

Similarities and Differences of Chilean Seismic Requirements with IEEE 693-2018

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Assembly of GIS Substations: The critical link to ensure performance, reliability and longevity

M. M. MEZA¹, J. S. SANCHEZ²

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Reliability and Cost Strategies in Operations and Maintenance: Agile Framework for Operational Excellence

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Transforming Data into Decisions: A Model to Maximize Asset Reliability

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Topics: B3 PS2 - Life cycle & asset management

Revitalization of the power grid: Improvement, renovation and increase of short-circuit capacity in substations

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: SF6 alternatives, GIS, GIL, transmission, disconnecter, earthing switch, C4-FN, fluoronitrile, gas handling, retrofill, installed base, gas-insulated switchgear, gas-insulated line

Retrofill of 420 kV and 550 kV gas-insulated Switchgear and Lines: Another Step towards the Decarbonisation of High-Voltage Switchgear installed Base

P. BERNER¹, D. CHRISTEN¹, T. JORGE¹, S. PACHLATKO¹, K. STEINEMANN¹, M. STOECKLI²

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Smart Spares Consulting' - Maximizing GIS asset resiliency and availability through a cost-, risk-, and utilization-optimized strategic spares approach leveraging existing inventory

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Topics: B3 PS2 - Life cycle & asset management

Investigations on detection sensitivity of partial discharge defects in various high-voltage GIS configurations with synthetic air and SF6 insulation

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: Voltage-Stability, STATCOM, Interface-Flow, Reactive-Power, Master-Controller, Operation-Maintenance

The largest 1 Gvar STATCOM Deployment in the Korean Power System: Architecture, Control, and Operational Approach

J. AHN

Hyosung Heavy Industries Republic of KOREA

ID: 12643

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS2 - Life cycle & asset management

Keywords: BESS planning, substations, Li-ion technology, self-consumption

Optimized Planning of Battery Storage for Substation Auxiliary Power

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B3 PS3 - Grid transformation and new reliability threats

ID: 10339

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Keywords: Substation, Storage, Optimisation

Substation Battery Energy Storage as an Optimisation Application in Power Systems

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ID: 10513

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Keywords: Condition, Monitoring, Substation, Assets, Twin

Digital Twin Enabled Advanced Condition Monitoring of Substation Assets

D. PAUL*, D. N. JHA, M. K. KALORIA, K. SAHU, N. SRIVASTAVA

POWERGRID India

ID: 10514

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats
Keywords: GIS, Substation, Design, Hydroelectric

Innovative GIS Substation Design Solutions for Overcoming Engineering Challenges in Hydroelectric Project

B. YADAV*, D. SHUKLA, V. KAPIL
BHEL, INDIA

ID: 10540

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats
Keywords: Grid, SC, test, Laboratory, substation, bus-bar

Reliable & safe Grid connectivity of SC test Laboratory, innovatively using substation bus-bar design

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Assessment of Very Fast Transient Over voltage in GIS Substation through Physical Measurements and System Studies

A. D MISHRA*, G. AGARWAL, P. SHRAMA, Y. DIXIT
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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Offshore Substation in India : A case study on planning of associated transformation capacity and Reactive compensation schemes for evacuation of power generated through off shore wind system-Gujrat

D. D. CHAKRABORTY*, S. PAUL, A. KUMAR, S. RAY
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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats
Keywords: Grid, Reinforcement

Grid Expansion and Reinforcement of existing National Grid of Uganda

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ID: 10741

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats
Keywords: climate change, offsite power supply, reliability, severe heat, substation control house, switchyard

Design and Operational Considerations for EHV Substation in Nuclear Power Plants in a Changing Climate

D. JOUAN, R. CLERT
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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats
Keywords: Mobile Substation - Gas Insulated Switchgear (GIS) - Temporary Mobile Substation (TMS) - Equipotential Zone Grounding (EPZ) - Power Line Carrier (PLC) - LTE Communication

Temporary Mobile Substations: A Solution for Modern Grid Expansion Challenges

B. GUREVICH, S. FITZGERALD
ComEd, United States of America

ID: 10882

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats
Keywords: Substation Seismic Designs - Equipment Seismic Qualification - IEEE 693 - IEC 62271 - ETG-A.0.20 - GB 50260

Evaluating Current Standards of Seismic Qualifications of Substation Equipment and Applying to Other Regions of the World

P. SOMBOONYANON¹, C. BOWEN²
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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Keywords: Resilience, Seismicity, Seismic Qualification, Overturning, Earthquake, Transformers, Reactors

Innovative Solutions for Enhancing the National Transmission Grid Seismic Resilience

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Mobile Substations: Rapid Response Solutions for Reliability Threats

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Keywords: HVDC, composite insulators, creepage distance, seismic demand, finite element method.

Use of composite insulators for HVDC disconnectors in seismic areas

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Keywords: Climate Change, Conductors, Extreme Events, Forces, Insulator strings, Wind

Technical Evaluation of Wind Load Design Criteria for Bus Structures in High-Voltage Substations Based on Technical Standards

E. PINTO¹, F. FRAGA¹, F. ALVARES¹, L. PESSOA¹, A. MACEDO², M. SILVA³

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Secondary Seismic Response Method for HV Equipment on Offshore Platform

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Smart Access Control to Substations

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Keywords: Wildfire, Wind Turbine, Battery Energy Storage Sites (BESS)

Resilience of Substations to External Hazards

A. ALOK, N. THOMSON, R. SLAUGHTER

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Designing Structural Supports for High-Voltage Electrical Equipment Using Dynamic Equivalency Models

L. H. MUÑOZ

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Keywords: gas insulated switchgear, GIS, standardisation, product quality, alternative gas

Modular and prefabricated GIS Product Platform

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¹GE Vernova Switzerland; ²ELECTROSUISSE / CIGRE Switzerland NC Secretary

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Analysis and Design of Grounding Systems in High-Resistivity Soils for Large Electrical Installations

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: B3 PS3 - Grid transformation and new reliability threats

Electric Field Stabilisation Technology in the Protection Against Lightning Strikes

S. HORSLEY

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B4 DC SYSTEMS AND POWER ELECTRONICS

B4 PS1 - DC equipment and systems

ID: 10121

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Cable, Direct Current, Fault, High Voltage, Measurement, Protection, Simulation

Trade-offs in HVDC Protection System Design – Investigation into Protection Margin and Threshold Setting for Future DC Grids

P. M. BAENA GARCIA, G. CHAFFEY, D. VAN HERTEM

KU Leuven, Belgium

ID: 10122

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Design methods, Electrical Energy Hubs, Multiterminal, HVDC, Protection

Protection system design for HVDC switching stations and electrical energy hubs

M. VAN DEYCK, G. CHAFFEY, D. VAN HERTEM

KU Leuven & Etch-EnergyVille, Belgium

ID: 10123

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC, Robotic Inspection, Thermal Anomaly Detection, Preventive Maintenance

Development of an analysis tool utilizing robotic image acquisition for early detection of thermal anomalies in HVDC converter equipment

P. VIALON¹, G. FRÜBING¹, R. LOLLIER², R. KOMOROWSKI¹

¹50Hertz Transmission GmbH, Germany; ²Elia System Operator S.A., Belgium

ID: 10310

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: KEYWORDS Bipole, Power Electronics Module, Offshore Interconnections, VSC HVDC, Wind Farms, MTDC, Harmonics, Transient Recovery Voltage

±525kV 2GW Bipole VSC-HVDC Offshore Transmission Projects – Critical Review and Status Updates

S. KABUL¹, A. KUMAR¹, B. KOX², K. DYKE¹, B. HOUSTEN¹, R. WINZENBURG²

¹GE Vernova; ²TenneT TSO

ID: 10552

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC, VSC, CROSS-BORDER, RESILIENT, POWER, GRID

Cross-Border And Mainland - Island Connectivity: Vsc Based HvdC Under Sea Links For A Resilient Power Grid

D. M ROY*, A. SUNDARAN, D. P. TYAGI, S. KUMAR

POWERGRID INDIA

ID: 10555

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Switchyard, HVDC, Circuit Breakers

Analysis of DC Switchyard Schemes for Multi-Terminal HVDC Systems with DC Circuit Breakers

V. K*¹, S. MATURU¹, Y.-J. HAFNER²

¹Hitachi Energy, India; ²Hitachi Energy, Sweden

ID: 10556

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Operational Experience of HVDC Insulators under Climatic Variations & pollution deposit conditions in ± 800 KV indoor DC Yard at Agra Terminal of NEA800 HVDC link and mitigations thereof

A. BANSAL*, L K PANDEY, S. SUROJ, P. SHARMA

Power Grid Corporation of India Limited , INDIA

ID: 10557

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC Control Strategy Parallel Bi-pole, ± 800 kV UHVDC Current Balancing, DMR, NBGS Multi-terminal HVDC Pole Outage Mitigation, DC Line Fault.

Control Strategy for Current Balancing in parallel Bi-pole for ± 800 kV HVDC System with Dedicated Metallic Return (DMR) - Users Perspective

D. KUMAR*, N V. RAO, D. P. TYAGI, K. PV, P P N. THALIB, S. KUMAR

POWERGRID, INDIA

ID: 10558

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: 800kV, HVDC, power flow

Design and system studies consideration for enhancement of reverse power flow capacity of ± 800 kV HVDC system.

D. KUMAR*, N. ADARI, S. K. CHOUDHARY, D. P. TYAGI, D. S. SEN

POWERGRID, INDIA

ID: 10559

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Operational, VSC-HVDC, Reactive Power

Operational Experience of Steady-State and Dynamic Reactive Power Capabilities of the Pugalur–Thrissur VSC-HVDC System

A. K MATHEW*, N. T. PP, S. P SANTOSH, A. RAJU

POWERGRID INDIA

ID: 10560

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: ± 320 kV/1000, VSC-HVDC

Planning and Design of a ± 320 kV/1000 MW Hybrid City-Infeed VSC-HVDC Link

A. THORAT *, J. KHAN*, M. AMBARDEKAR, S. KAREKAR

Adani Electricity, INDIA

ID: 10561

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Neutral, Rigid, Bipole, VSC-HVDC

Impact Assessment of Converter Neutral Grounding on Transient Performance in Rigid Bipole VSC-HVDC Systems

A. SINGH^{*1}, N. SHARMA¹, J. CAWTHORNE², A. PASHAEI³, J. A. MORALES³

¹GE Vernova, INDIA; ²GE Vernova, United Kingdom; ³National Grid, United Kingdom

ID: 10563

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: ± 320 kV, VSC, HVDC, DC, Line, Fault

DC Line Fault Recovery Performance of the India's first ± 320 kV VSC HVDC Pugalur-Thrissur Link

N. KUMAR*, A. B CHANDRAN, P. TYAG

POWERGRID INDIA

ID: 10565

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: VSC, LCC, Renewable Energy, Grid-forming

Design Considerations for LCC & VSC HVDC for integration with Large-Scale Renewable Energy (RE) - User's Perspective

N. KUMAR*, S. B. C, P. TYAGI, S. BARIK

POWERGRID, INDIA

ID: 10567

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Transient, Overvoltage, IBR, 800kV, HVDC

Transient Over-voltage Studies of ± 800 kV, 6000 MW LCC HVDC connected with RE source of Solar and Wind

N. KUMAR, A. B CHANDRAN*, P. TYAGI, A. BANSAL

POWERGRID INDIA

ID: 10570

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: OLTC Hunting, Gamma Control, kC-Factor

Operational experience and analysis of Hunting interaction between OLTCs of converter transformers due to Current sharing (Kc) factor influence and AC grid Voltage differences of parallel inverters in Multi terminal HVDC systems.

Y. MISAL*, A. SWAIN, M. K. KUMAR, S. MEENA, N. B ADARI

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ID: 10572

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Life assessment and refurbishment of ± 500 kV, 2500 MW Talcher-Kolar HVDC Converter Stations

S. .. S. SANTOSH, K. P.V, N. KUMAR, V DIWAKAR*

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Analysis of Higher 5th Order Harmonics & tripping of Type 3 filters (5/27) at HVDC Rihand & Dadri terminals

S. K. CHOUBEY*, N. BABU, P. SHARMA, Y. D. DIXIT

POWERGRID, INDIA

ID: 10774

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Equivalent Network Model, Jacobian Transfer Matrix, Grid Forming performance

Dynamic Equivalent Network Methods for Grid Forming Performance Test

H. SAAD¹, V. COSTAN², J. MICHEL³, D. PIERSON⁴, A. NICHOLS⁴, R. MAJUMDER⁴, M. VOR DEM BERGE³

¹ACDC Transient; ²RTE France; ³RTE-I; ⁴Invenenergy

ID: 10775

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC, MTDC, HVDC Planning, HVDC Control, HVDC Protection, reliability, resilience

Integrating protection and control in the reliability and resilience-informed planning of future MTDC grids

J. C. GONZALEZ-TORRES¹, F. PEREZ¹, E. WITZ¹, A. BENCHAI¹, N. BARLA¹, B. PERREYON¹, M. PANTELI², S. HASHEMI², S. JANKOVIC³, C. FOOTE⁴, C. MACIVER⁵

¹SuperGrid Institute; ²University of Cyprus; ³TenneT; ⁴The National HVDC Centre; ⁵University of Strathclyde

ID: 10780

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC, offshore wind, converter transformer, technical-economic, risk assessment

Converter transformer in HVDC offshore projects: an approach for risk assessment

T. VU-CONG, J.-C. RIBOUD, M. SCHUDEL

RTE France

ID: 10783

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: EMT-type simulation, Bipolar HVDC transmission system, Modular Multilevel Converter (MMC), Voltage source converter (VSC), Real-Time Simulation, Hardware-in-the-loop (HIL), sparse matrix solver, Parallel simulation, Compensation method, Factorization

Optimized Real-time simulation for VSC-HVDC bipolar scheme with physical control replica in the loop

B. BRUNED, B. DE FOUCAUD, S. DENNETIERE

RTE France

ID: 10786

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC, PQU diagram, HVDC connected offshore wind farms.

PQU diagram capabilities and operational needs for offshore HVDC converter stations

K. VERSHININ, T. VU, M. SCHUDEL, T. PREVOST, L. GARBAY

RTE France

ID: 10788

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Commissioning, offshore, transmission tests, heat-run

Risk analysis of offshore commissioning during power transmission tests

M. SCHUDEL¹, M. HORSNELL², S. JAPOKIC¹

¹RTE France; ²IMES Group

ID: 10815

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: RoCoF (Rate of Change of frequency), SC: Synchronous condensers, BESS: Battery Energy Storage Systems, PSP: Pump Storage Plants, VRE: Variable Renewable Energy, IBR: Inverter Based Sources, FRT: Fault Ride Through.

Enhancing Grid Stability in High Renewable Penetration Environments: Field implementation of STATCOMs in the Indian Power System

R. S. CHAUDHARY, R. GUPTA, P. PANDEY, A. LAHIRI*, R. SRIVASTAVA, A. DUBEY

POWEGRID INDIA

ID: 10939

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Aging, Asset Management, C&P (Control and Protection), Multivendor, Thyristor Module, Update

Confirmation test in refurbishment of the control and protection system devices and thyristor valve modules in the 300 MW Shin-Shinano No.2 frequency converter

Y. AIHARA¹, M. TAKECHI¹, K. AOKI¹, T. SATO², Y. NAKAIDE³

¹TEPCO Power Grid, Inc. Japan; ²Toshiba Energy Systems & Solutions Co. Japan; ³Hitachi, Ltd. Japan

ID: 10940

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Black Start, Grid Forming, LCC, VSC

The construction and system study of the Higashi-Shimizu frequency converter station (VSC BTB link)

S. IMAI¹, R. HAJIRI¹, T. MATSUNAGA¹, S. INOUE², K. KAMIYAMA², T. ASAO²

¹Chubu Electric Power Grid Co., Inc. Japan; ²Hitachi Energy Japan, Ltd. Japan

ID: 10942

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Floating, Offshore, Converter Station, HVDC, Valve, Tower, Station Post Insulator (SPI), Mechanical Design, Fatigue

Study on mechanical design requirements for HVDC valve tower in floating offshore converter stations

N. SHINOHARA, T. KITAMURA, M. HIRAYAMA, T. YOSHIDA

Mitsubishi Electric Corporation Japan

ID: 11013

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: integrating new HVDC Bipole with existing +/- 800kV HVDC Bipole

Operational and Commissioning Challenges and mitigation measures while integrating new HVDC Bipole with existing +/- 800kV HVDC Bipole with DMR system

A. B*, S. KIRAN K, D. P. TYAGI

POWERGRID INDIA

ID: 11079

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC, transmission, synchronous grid forming, MCC (MMC), rating.

The Impact of Synchronous Grid Forming on the Rating of HVDC Transmission Links

C. BARKER¹, T. QORIA², A. WILLIAMS-KELLY¹

¹GE Vernova UK; ²GE Vernova Germany

ID: 11103

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC Electrode Lines, Cable Faults, HVDC protections

On the analysis of faults along HVDC land electrode lines

S. DE MARIA

TERNA

ID: 11104

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: flashover, high-voltage insulators, insulation performance, pollution stress, salt-fog tests

Insights from salt-fog testing on high-voltage insulators used in HVDC converter stations

A. IOANNIDIS

TERNA

ID: 11130

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC fast-front transients, HVDC switchgear, DCSS, Multi-terminal HVDC, HVDC Commissioning.

Investigation of Fast-Front Transients in HVDC Switchgear for CMS Multiterminal HVDC System

S. GANESAN¹, P. HOFBAUER¹, K. LINDEN²

¹SSEN Transmission UK; ²Hitachi Energy Sweden

ID: 11285

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Automatic Transfer Scheme (ATS), Intelligent Electronic Devices (IEDs), Zone-Selective Interlocking (ZSI), Highly redundant Auxiliary Systems, GOOSE messaging.

Enhancing Electrical Protection and Automated Control Systems for HVDC Auxiliary Services: A Comprehensive Study Case

T. STOTT¹, J. JARAMILLO², M. CORREA³, C. SMITH⁴, A. GARCIA⁵

¹GE Vernova UK; ²IEB Colombia; ³GE Vernova France; ⁴RWE UK; ⁵GE Vernova Germany

ID: 11305

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC, Synchronous Grid-forming, Inertia, RoCoF.

True Inertia Constant of Synchronous Grid-Forming Control Strategies

C. BARKER¹, T. QORIA²

¹GE Vernova UK; ²GE Vernova Germany

ID: 11342

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Bipolar MMC–HVDC, Grid-forming control, Reactive power sharing, Asymmetric grid impedance, Impedance compensation, Decentralized control

Grid-Forming Control for Reactive Power Sharing in Bipolar MMC–HVDC Systems Under Asymmetric Grid Conditions

J. KIM¹, J. LEE¹, J. HONG¹, H. JUNG¹, H. KIM²

¹HYOSUNG CORPORATION; ²Zeta Elec

ID: 11345

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Electromagnetic transient modeling, Multi-terminal HVDC, Network-HILS, DC power transmission

Integrated EMT Modeling and Network-HILS Verification for HVDC Interconnection of the Southwest Offshore Wind Farm in South Korea

S.-S. PARK¹, C.-Y. LEE², S.-H. KIM³, R.-Y. KIM²

¹Korea Electrotechnology Research Institute; ²Energy Power Electronics Control System Lab, Hanyang University; ³Korea Electric Power Corporation

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Effect of Temporary VSC-HVDC converter blocking on Multiterminal HVDC and offshore windfarm performance

A. ABDALRAHMAN

Hitachi Energy

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Hierarchical Primary–Secondary Control of HVDC Grids: Challenges of Droop Control Schemes in Ensuring Safe Operation under Large-Scale Renewable Integration

F. Z. DEJENE

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Addressing specific challenges for harsh environmental conditions and integration with large solar park for Khavda – Nagpur HVDC transmission

A. KUMAR

Hitachi Energy

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC, control, protection, replica, maintenance, testing, HIL, real-time

Unlock Capacity through HVDC C&P Replica-as-a-Service Business Model

M. HAGSTRÖM

Hitachi Energy

ID: 11532

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: VSC-HVDC, Micro-sectors, Harmonic stability, Impedance loci, frequency-domain analysis

Micro-sector Analysis of Harmonic Instability for HVDC Systems Interconnected to Weak Grids

H. HUANG, J. MONTEIRO, E. LAVOPA, O. JASIM

GE Vernova United Kingdom

ID: 11547

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC system

Planning and Specification Challenges for Bipole Multiterminal HVDC Systems

P. LI¹, M. HABIBURRAHMAN¹, Z. TALIB¹, L. BAJAJ¹, N. SINGH¹, S. JOSH¹, M. JAVID¹, B. BAUDRY¹, G. ADAM¹, V. MURUGESAN², P. BARUPATI², P. KUMAR²

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ID: 11594

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Offshore wind power; offshore-onshore integrated grid; onshore DC hub; DC fault ride-through; distributed energy consumption

Multi-terminal HVDC Transmission Technology for Offshore Wind Power Adopting Hybrid Cable-OHL and Its Applications

C. ZOU, T. HOU, Y. LU, Y. HUANG

Electric Power Research Institute, CSG

ID: 11595

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: DC transformer; multilevel current-source converter; two-degree-of-freedom modulation; MMC; DC grid; renewable energy development

Topology and Control of High Transformation Ratio and Large Capacity DC Transformer Based on Multi level Current Source

C. WEI, C. GAO, Z. LIN, K. CHEN

China Electric Power Research Institute

ID: 11597

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: DC circuit breaker, Vacuum interrupter, Artificial current zero, Sub-millisecond interruption time

Sub-Millisecond Artificial Current Zero Interruption of DC Fault Current Using a 40kV Ultra-Fast Vacuum Interrupter

S. LIU, J. CHEN, Z. YUAN, Z. LIU, Y. GENG

Xi'an Jiaotong University

ID: 11598

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Digital transformation; UHVDC transmission project; Quality control; Transient instability of the system; Cross across

Transmission Project of Electric Power Engineering Based on Digital Transformation

W. ZHANG¹, B. CHENG¹, X. LENG², S. CHE³, Y. DONG², R. HU⁴, Z. ZHENG⁵, W. WANG³

¹China Southern Power Grid Co., Ltd.; ²China Southern Power Grid Energy Development Research Institute; ³China Southern Power Grid EHV transmission company; ⁴China Southern Power Grid Internet Service Co., Ltd.; ⁵South China University of Technology

ID: 11599

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Bipolar end-to-end VSC-HVDC, DC overhead line, fault ride through, full-bridge sub-module, half-bridge sub-module, hard-ware-in-the-loop

DC Overhead Line Fault Ride-through Schemes Comparison in End-to-end VSC-HVDC System

X. MA, C. ZHAN, Y. LU, C. JIANG, N. WANG

NR Electric Co., Ltd.

ID: 11600

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: VSC UHVDC, Renewable integration, Fault handling, Fault ride through, EMT simulation

8 GW VSC UHVDC transmission -- Fault handling in the Gansu-Zhejiang ± 800 kV project

Z. ZHAO^{1,2}, Y. XU^{1,2}, T. LI^{1,2}, L. FAN^{1,2}, T. ZOU^{1,2}, M. ANDERSSON³, G. WANG³, J. LU³

¹SGCC; ²SPERI; ³Hitachi energy

ID: 11621

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Modular Multi-level Converter, Voltage Sourced Converters, Valve Terminal AC-DC Dielectric Test, Rapid Discharge Circuit, Hybrid Method 1 - Method 2 Test Method

A Review of Practical Approaches to Dielectric Valve Terminal AC-DC Tests for Modular Multi-level Voltage Sourced Converters

F. GUO, J. VODDEN, A. KUMAR, F. ZHOU, R. PREEDY, C. DAVIDSON, S. MOULSON, H. CALDER

GE Vernova Stafford UK

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

A Strategy for Enhanced Resilience of the NEOM Grid U-shape HVDC

P. LI, M. HABIBURRAHMAN, G. ADAM, N. SINGH

ENOWA.NEOM

ID: 11724

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC, LCC, Bipole Upgrade, Commissioning Strategy, On-Site Experience

Upgrade of Monopole to Bipole in ± 500 kV, 3000 MW Bukdangjin-Godeok LCC HVDC Link - Strategy and Commissioning Experience

W. YANG¹, I. PARK¹, K. SONG¹, U. LEE¹, Y. KIM¹, Y. JANG¹, N. BHOWMIK², H. IM³

¹KAPES; ²GE Vernova; ³KEPCO

ID: 11727

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: bipolar, distribution, fault, MVDC, restoration

Restoration Strategy for Bipolar MVDC Systems Following Fault Events

G. C. CHO^{1,2}, S.-K. KIM¹, J. JEON¹, J. HWANG¹

¹Korea Electrotechnology Research Institute; ²National Research University 'Moscow Power Engineering Institute'

ID: 11765

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Survey, Reliability, HVDC Systems, LCC, VSC, Forced Outages, Unavailability, Availability

Survey of the Reliability of HVDC Systems Throughout World during 2023-2024

P. TAIAROL¹, J. BURROUGHS²

¹Stantec, Canada; ²Velco, USA

ID: 11771

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Design of generation runback scheme for a HVDC-connected wind farm

L. ZENI¹, A. COKIC¹, A. TSYLIN¹, P. MCGARLEY¹, M. PARADIS²

¹Ørsted; ²ATCO

ID: 11817

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Multi-terminal HVDC; Grid-forming converters; Offshore wind farms; Frequency regulation; Coordinated control; Power sharing.

Coordinated Frequency Support in Multi-Terminal HVDC Network Via Grid-Forming Converter with Dynamic Power Allocation

M. FAWAD¹, A. GARG¹, M. GALEELA¹, Y. WU¹, I. WONG¹, J. LIANG²

¹TNEI Services Ltd United Kingdom; ²Cardiff University United Kingdom

ID: 11823

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: DC Fault, Fault Isolation and Recovery, Full-Bridge MMC, Half-Bridge MMC, Overhead Line

Control and Recovery of DC Faults in Overhead Line UHVDC Systems: A Comparison of Full-Bridge and Half-Bridge MMCs

D. LIU¹, Q. HONG¹, L. XU¹, A. DYSKO¹, C. BOOTH¹, X. DING²

¹University of Strathclyde United Kingdom; ²National Grid United Kingdom

ID: 11851

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: O&M, HVDC Service, Reliability, Availability, Contracting, Costs, Knowledge Sharing

Transitional HVDC Systems Operation and Maintenance Strategy

J.-M. DUBOIS¹, R. MACNEILL²

¹WSP; ²Emera

ID: 11853

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC, Digital Twin, Digitalization, Grid Forming, Simulation, Modelling

HVDC Digital Twin – Maturity Level and Use Cases

J.-M. DUBOIS¹, H. SPAIN², A. BUREK³, S. CHRISTOU⁴

¹WSP; ²Ergrid, Ireland; ³Hitachi Energy, Sweden; ⁴EDF Renewables, UK

ID: 11874

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Multi-purpose, multi-terminal HVDC interconnector for offshore wind, RAM study.

RAM Analysis of an HVDC Multi-purpose Interconnector for Offshore Wind Integration

M. MEISINGSET¹, I. VETVIK¹, G. EVENSET¹, C. E. HILLESUND¹, E. KJØSNES², Ø. SAGØSEN², J. RIVIERE², A. ELMENSHAWY², M. V. D. BERGE³, S. AKKARI³

¹Statnett; ²Aker Solutions; ³RTE International

ID: 11875

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Reliability – Availability – Nordic HVDC – LCC – VSC – Interconnectors

Analysis of reliability of Nordic HVDC interconnectors based on DISTAC data from 2016-2022

M. EIE¹, H. RØRVIK¹, O. HEADLEY², S. SØRENSEN², H. NURMINEN³, P. LINDBLAD³, D. INGEMANSSON⁴, G.-O. PERSSON⁴, P. PETERSSON⁴

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ID: 11979

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: STATCOM, Container, Modular

Introduction of Containerized STATCOM up to 200Mvar Rating

M. LEE

Hyosung Heavy Industries

ID: 12012

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Composite Insulators, HVDC, Air-Core Dry-Type Reactors, Electrical Stress, Creepage Distance

Operational Experience with Composite Insulators for HVDC Air Core Reactors in Outdoor Polluted Environments

A. GAUN¹, Y. SOLOVYEV², L. AREVALO², S. WIRTH², J. KATZENSTEINER¹

¹Coil Innovation GmbH; ²Hitachi Energy

ID: 12031

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC transmission, DC networks, short-circuit current, standardisation.

Discussion of simplified methods for short-circuit current calculation in HVDC networks

J. HANSON¹, J. LEIDE², A. SIMAKU⁴, A. SACIAK³, T. FRIEß⁵, G. BALZER⁶

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ID: 12050

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Commissioning, Control and Protection System, Converter Station Design, Expandability, HVDC

Key facilitators of HVDC systems for advanced electrical infrastructures

A.-S. BONDE MORTENSEN, V. HUSSENNETHER, T. HAMMER, C. SUSAI
Siemens Energy

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Commutation Failure Prediction in LCC-HVDC under Severe Voltage Distortion

C. SEO, H. LEE, J. CHA, G. JANG

Korea University

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: AC/DC interaction, AC filters, Compound resonance, EMT simulation, Low-order harmonics

Interaction of Low-order Harmonics between the Chilean weak-AC system and the HVDC Kimal-Lo Aguirre project

J. CALDERON

Conexion Kimal-Lo Aguirre

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: TRV, Weak AC system, Large Firing/Extinctions angles, DMR, Background harmonics

Relevant Challenges and Lessons Learned from the Kimal-Lo Aguirre HVDC Project in Chile

J. CALDERON, R. ARIAS

Conexion Kimal-Lo Aguirre

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Dedicated Metallic Return, fault location, high-impedance fault, impedance method, real-time monitoring

Real-Time Fault Monitoring and Location in the Dedicated Metallic Return of the HVDC Kimal-Lo Aguirre System

M. FERNANDEZ, J. CALDERON, P. OLIVEIRA-SILVA

Conexion Kimal-Lo Aguirre

ID: 12289

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: high voltage direct current, HVDC, hybrid HVDC breaker, HHB, DC circuit breaker, DCCB, multi-terminal HVDC, MTDC, DC switching station, DCSS, DC grid controller, DCGC

A hybrid HVDC Breaker for 525 kV DC Switching Station Applications

D. COTTET¹, K. GAJJAR², V. K², A. SENGUPTA², J. LILJEKVIST³, M. STOECKLI⁴

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ID: 12292

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: digital substation, HVDC system, protection, DC current transformer, process bus architecture, IEC 61850

Digital Wideband DCCT with advanced Signal Processing and IEC 61850 Communication Services

M. WINKELNKEMPER¹, R. IBANEZ CATALA², C. KRIGER³, A. M. NCUBE⁴, M. STOECKLI⁵

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Design Implications of DC Grounding in Bipolar VSC-HVDC Systems

M. MOHAMMADI, H. YING-JIANG, A.-K. SKYTT

Hitachi Energy

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Impact of DC Circuit Breakers on Transient Stresses within Modular Multilevel Converters in Bipolar HVDC Systems

M. KUHN¹, L. OSTERKAMP¹, W. LETERME¹, G. OGORODNIKS², M. QUESTER²

¹IAEW of RWTH Aachen University; ²Siemens Energy Global GmbH & Co KG

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Towards Resilient HVDC Networks: DC Switching Stations and Multi-Vendor Interoperability

T. WESTERWELLER¹, X. LIE², N. VAN DER LAAG¹, R. MANOHAR², M. FOEHR¹, A. YU³

¹Siemens Energy Global GmbH & Co. KG; ²Mitsubishi Electric Cooperation Europe; ³Mitsubishi Electric Cooperation, Japan

ID: 12407

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC – Condition Monitoring – Pilot installation – Wireless Sensor Networks – Cybersecurity

Piloting Wireless Communication-based Condition Monitoring in an HVDC Station

K. SCHOENLEBER¹, R. GORE³, J. CASTELLANOS¹, B. DECK², A. FAIRBROTHER², H. ELHUSSINI⁴, N. ENGLUND³, J. JUNG⁵, M. GRATZA⁵

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

On Transient Electrical Cable Stresses in Next Generation Multiterminal HVDC Systems

M. GOERTZ¹, S. WENIG¹, P. PINTER¹, T. SCHAUPP², M. SANAEE², A. SACIAK³, I. NETT⁴, V. SCHNELL⁴

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Optimizing of VSC HVDC-Systems with the use of an On-Load Tap Changer Transformer

J. KAYSER¹, S. SCHLEGEL¹, D. WESTERMANN¹, M. BENGLER², S. REHKOPF²

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ID: 12510

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: HVDC - Dynamic phasor - Fourier transform - Switching function

Optimization of Dynamic Phasor Modeling for LCC-HVDC Systems Based on Fourier Transform

K. ZHANG¹, Y. XUE², P. LI³, D. ZHANG³, J. LEI³, S. CHEN³

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ID: 12511

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: Bidirectional, DC system, DC circuit breaker, low-loss, self-charging

Low-loss Bidirectional DC Circuit Breaker with Capacitance Self-charging Ability

Y. TAO, S. LIU, Z. LIU, Y. GENG

Xi'an Jiaotong University

ID: 12512

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Keywords: DC current limiter, Three winding coupled inductance, Dynamic performance of DC system

A novel low-impedance bidirectional voltage-clamped fault current limiter based on a coupled inductor

Z. YUAN, S. LIU, J. CHEN, Z. LIU

Xi'an Jiaotong University

ID: 12587

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS1 - DC equipment and systems

Assessment of Station & System Tests of the Attica - Crete HVDC Interconnection

M. KARYSTIANOS¹, P. MANDOULIDIS¹, Y. TSOURAKIS¹, G. FOTOPOULOS¹, A. GIOTIS¹, D. BROUSOVANAS¹, N. GINIS¹, E. BELIVANIS¹, K. ROGDAKIS¹, C. GEORGIOU¹, P. SIDERIS¹, N. KATSARAS¹, M. VOUMVOULAKI¹, C. KARATZAS¹, I. VENETIDIS¹, S. RIGA¹, C. APOSTOLOPOULOS², K. KAVOURIDIS², K. SPETSIOTIS², C. MOULOS², D. PEPPAS², I. NIKOLAKAKIS², I. KOLLIPOULOS², D. KARAKATSANIS²

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B4 PS2 - FACTS and power electronics (PE)

ID: 10277

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: Multi-terminal DC, harmonic stability analysis, optimal power flow, open source

Advanced simulation framework for AC/MTDC power systems

A. LEKIĆ¹, A. KERMANSARAVI², H. LI¹, Y. Q. LARES¹, S. ALSARAYREH¹, R. DIMITROVSKI³

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Experience Of Statcom For Improvement Of Voltage Stability & Assistance In Avoiding Loss Of Generation Of Renewable Energy (Inverter Based Solar Power) In Western India

Y. CHOUDHARY*

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Operational Experience of STATCOM in POWERGRID- challenges and mitigation

S. K. CHAURASIA*, K. SINGH*, P. SHARMA, Y K DIXIT

POWERGRID, INDIA

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Enhancing Grid Resilience of RE dominant Power System's through STATCOM's – A Practical Illustration

S. C S. M*

Power Grid Corporation of India Limited

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: coupling transformer, contingency study, grid stability, MMC-VSC, MSC, MSR, renewable, Reactive power control, STATCOM, VI curve, voltage control

Fatehagrh III STATCOM-Requirements and Practical challenges

R. K. NAYAK*, J. BENDI

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Optimisation of MSR & MSC switching instances during Auto mode operation of STATCOM to enhance the life of the equipment

S. BEHARA*, N. KUMAR, C. M. RAO

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ID: 11105

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: Stabilizing Devices; Oscillation Damping; Active and Reactive Power Control

"Commissioning and Field Testing of 40 MW Stabilizing Devices in the Italian Transmission Grid"

P. VACANTE

TERNA

ID: 11106

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: STATCOM, Steinmetz Method, Railway Traction Systems, Voltage Unbalance, Negative-Sequence Voltage Mitigation, ATP-EMTP, Reactive Power Control

"Mitigation of Voltage Unbalances in Railway Traction Systems Connected to 150 kV Grids Through STATCOM-Based Reactive Power Control"

L. PAPI

TERNA

ID: 11150

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: High Voltage Direct Current (HVDC) - Sub-Synchronous Torsional Interaction (SSTI) - Multi-Infeed Interaction Factor (MIIF)

Pre-FEED Study Approach in HVDC Projects with Perspective on Using Grid-Forming/Grid-Following Controls for Point-to-Point HVDCs

S. PARMAR¹, I. HUQ², O. AMAYA-ZEPEDA³

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ID: 11365

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: STATCOM, Grid-forming

Synchronous Grid-forming STATCOM Supercapacitor Energy Storage - Control During Active-Power Involving Events

M. BERG, L. AMBEGODA, A. MÄKINEN, T. QORIA, O. JASIM, C. BARKER, S. ZANDRAZAVI

GE Vernova

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

How FACTS plays a key role in the Grid of the Future

A. MÄKINEN, S. SUBRAMANIAN

GE Vernova

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: Power conversion system, Modeling, Grid-following, Grid-forming, Characteristics analysis

Grid-Connected Characteristics Analysis of GFL PCS and GFM PCS under Dynamics Perspective

X. GONG, M. CHEN, P. PENG, J. DOE

CSG PGC Energy Storage Research Institute

ID: 11601

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: High-frequency resonance, STATCOM, impedance reshaping, negative damping

Active Impedance Reshaping for High-frequency Resonance Suppression of Renewable Energy Power Stations with STATCOM

H. YU, C. WANG, X. WU, X. WEI, P. WANG

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: 100%IBRs, Dual-layer Optimization Method, Levelized Cost of Energy, Time-Averaged Power Ratio, Net Present Value, Grid-forming Battery Energy Storage System

Control Strategies for Stable Operation and Optimal Capacity Configuration of 100% Inverter-Based Systems with GFM-BESS

L. ZHANG, X. MENG, L. HUANG, X. ZHANG

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Technical Evaluation and Practical Solutions for Grounding Grid Design Performance in FACTS Projects

B. ALSUHAIBANI, A. IBRAHIM
Saudi Electricity Company

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: Unified Power-Flow Controller (UPFC), Flexible Alternating Current Transmission Systems (FACTS), Genetic Algorithm (GA), System Stability, optimal allocation of the UPFC

Optimal Placement and Comparative Analysis of a High-Power Multi-Level Unified Power Flow Controller (UPFC) for Voltage Stability and Power Loss Reduction in the Power System Network

H. F. CARLAK¹, E. KAYAR²

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Experiences and recommendations for parallel operation of SSSC devices, Candelaria – Ternera 220 kV circuits case

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ID: 12450

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: distribution grids, grid protection, high-frequency current injection, low-voltage grids, power-flow control, short-circuit, soft open points, universal power-flow and quality controller

Rapid tripping of a NH fuse using a power-flow controller with high-frequency current injection

A. KOEHLER, D. KESHAVARZI, N. TASHAKOR, W. H. WELLSSOW, S. M. GOETZ

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ID: 12454

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: EMC filter design – EMC filter testing – low-voltage grids – power flow controller

Design and Testing of Filters to Reduce EMC Interference in a Power-Flow Controller Based on Power electronics

G. SHOBAIRIAN, A. KOEHLER, D. KESHAVARZI, S. M. GOETZ

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ID: 12513

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: Switching losses (SL), electromagnetic interference (EMI), the basic commutation unit, the equivalent waveform, NSGA-II

Tradeoff for Power Loss and Electromagnetic Interference of IGBT Devices in Converter

B. HAO, J. XIONG, K. LIU, J. YANG, Y. WANG

CSG Guangdong Guangzhou Power Supply Bureau

ID: 12514

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: Harmonic current; active power filter; neural network; predictive control

Research on Neural Network Predictive Control Based Active Power Filter

J. LI, Y. HUANG, L. ZHAO

State Grid Changsha Power Supply Company

ID: 12627

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS2 - FACTS and power electronics (PE)

Keywords: Modular Multilevel Converter, Nearest-level modulation, Small-signal stability, Frequency scanning

Impact of Nearest-Level Modulation harmonics on the Small- Signal Dynamics of the Modular Multilevel Converter

R. VANDEREECKT¹, J. TANT², J. BEERTEN³

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B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

ID: 10104

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: HVDC - Large Renewable Generation Hubs - Grid-Forming

New Concepts in Overall Control of Large Renewable Generation Hubs Connected to Load Centers through Grid-Forming Multi-Terminal HVDC Technology

P. POURBEIK¹, A. NICHOLS², D. PIERSON³, H. ABRAMS⁴, R. MAJUMDER²

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ID: 10562

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Power Oscillation, Modulation control, High level controls, LCC HVDC, VSC HVDC, sinusoidal PWM, Space Vector PWM

Application of Space Vector Pulse Width Modulation in VSC HVDC converter to damp inter-area oscillations in Active power in a part of Indian grid

P. MISHRA*, B. MAZUMDAR, P. TYAGI

Power Grid Corporation of India Limited, India

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Concept of Integrated Reactive Power Management in a National Renewable Energy Hub

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ID: 10779

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: HVDC, protection, multi-terminal, multi-vendor, interoperability

Protection-related functional requirements for multi-terminal, multi-vendor HVDC grids

D. GOMEZ, P. TORWELL, A. BERTINATO, K. SHINODA, S. SILVANT

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ID: 10790

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Multi-terminal HVDC grids, Bipolar HVDC, Insulation coordination, DC circuit breakers.

Insulation Coordination in Bipolar Multi-Terminal HVDC Grids

B. DE FOUCAUD, J. POUGET, A. PETIT, P. RAULT, C. CARDOZO, S. DENNETIERE

RTE France

ID: 10793

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Superconducting Cables, MVDC, DC Circuit Breaker, Converter, Resistive Fault Current Limiter

Superconducting Medium Voltage DC Transmission: Architecture, Protection, and Simulation Insights

C. CREUSOT¹, A. BERTINATO¹, P.-B. STECKLER¹, D. BRASILIANO¹, N. DEVEAUX¹, A. MORANDI², E. GUERRA², M. SIMONAZZI², M. FABBRI², G. ANGELI³, A. MUSSO³, M. BOCCHI³

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ID: 10794

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Models, Replicas, Dynamic Link Library (DLL), Electromagnetic Transient (EMT) study, Integration tests.

Testing models and physical C&P replicas prior to interaction studies in a MV and MT context

A. BONNET¹, R. BAKHSHI-JAFARABADI², J. POUGET¹, F. DEGHAN MARVASTI², B. DE FOUCAUD¹, A. SHETGAONKAR², H. CLEMOT¹, R. KAMAT TARCAR², A. PETIT¹, R. KOORNNEEF², C. MARTIN¹, A. LEKIĆ², S. DENNETIERE¹, M. POPOV²

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ID: 10810

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: VSC HVDC - STATCOM - Grid-Forming Control (GFM) - Grid-following Control (GFL) - Control and Protection - Technical Specification - Performance Requirements - Dynamic Performance Studies (DPS) - Front End Engineering and Design (FEED)

An Owner's Perspective on the Implementation of Grid-Forming Controls for VSC HVDC and STATCOM Projects

C. WINTER¹, P. SCHOMMER¹, J. HU², J. MARSHIK¹, R. PALLAPATI¹, B. BISEWSKI²

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ID: 10876

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: HVDC Converter Stations - Autonomous Inspection Robots - Functional Specifications - Electromagnetic Compatibility (EMC) - Valve Hall Inspection - Substation Robotics - Asset Condition Monitoring - Energy Transition

Deployment Considerations of Autonomous Robots in HVDC Converter Stations

R. ADAPA, S. A. S. BELLARY

EPRI, United States of America

ID: 10943

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Hardware in the Loop, Simulation, HVDC, System, Multivendor Interoperability, Multi Terminal

Development of guidelines and HIL simulation on the control and protection scheme for multivendor multi-terminal HVDC systems

M. KASUGA¹, T. YAMADA², Y. AKIYAMA³, T. YOSHIHARA⁴, S. TOMINAGA⁵, T. NAKAJIMA⁶

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ID: 10944

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: DC Circuit Breaker (DC-CB), HVDC, MTDC, VARC, Switching Station, Energy, Absorption

Analysis of DC circuit breaker performance in multi-terminal HVDC grids considering fault dynamics and reclosing behaviour

R. MANOHAR¹, K. TAHATA¹, Y. TERADA¹, S. NEE², T. MODEER², L. XU³

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ID: 10945

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: DC Circuit Breaker (DC-CB), HVDC, Multi terminal

Operation of modular VARC DC-CB under load and fault current and the impact on system dynamics

F. PAGE¹, T. INAGAKI¹, K. TAHATA¹, S. NORRGA², T. MODEER², L. XU³

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ID: 11107

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: AC/DC conversion, Converter-Transformer, DC fault interruption, DC/DC conversion, Experimental validation, HVDC, MMC, Prototype testing, Scalable design, Solid-state protection

"Experimental Validation of a Low-Voltage Prototype of a Converter- Transformer for HVDC Applications"

M. AMATRUDA

TERNA

ID: 11109

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Meshed-HVDC; HVDC circuit breaker; voltage polarity reversals

Development of a Novel Polarity Reversal Inhibitor for Future MT-HVDC

P. VACANTE

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ID: 11267

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Multiterminal HVDC (MTDC), grid-forming, Brazilian power system, renewable energy integration, transmission planning, hybrid AC/DC grids

Assessment of Multiterminal HVDC Systems with Grid-Forming Converters in the Brazilian Power System

R. DIAS¹, P. M. PORTUGAL¹, M. C. SABOIA¹, P. H. L. d. SANTOS¹, M. A. AREDES¹, C. M. FREITAS²

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: GFM, Offshore Interconnections, SGFM, VSC-HVDC, Wind Farms, Phase-jump functionality.

Expanded Grid-Forming Solution and SGFM Control in HVDC System to Harvest Additional Energy from Offshore Wind Farms

O. JASIM¹, C. BARKER¹, T. QORIA²

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ID: 11282

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Bipole, SGFM, DMR, Power Electronics Module, Offshore Interconnections, VSC-HVDC, Wind Farms.

TenneT 2GW Bipole Offshore HVDC Transmission Schemes – Key Advanced Control Features

O. JASIM¹, M. KUMAR¹, A. KUMAR¹, S. KABUL², A. DEY³, Z. AHMED⁴, R. WINSBERG⁵, B. KOX⁴

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Asymmetrical monopole, DC-PIR, MPI, Multi-terminal HVDC network, Rigid bipole.

HansaLink: Multiterminal HVDC Rigid Bipole Offshore MPI

M. ELGENEDY¹, A. KHAN¹, N. SHARMA¹, C. FOOTE¹, B. MARSHALL¹, G. FINTZOS², E. SPAHIC³

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Converter design, dc-dc converter, grid infrastructure, LVDC, MVDC, railway load

Medium voltage railway dc-dc converter design and performance

M. S. ANSARI

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Virtual Control and Protection System in Real Time Software in the Loop

J. HERNANDEZ

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Reverse Blocking IGCT (RB-IGCT), Hybrid Commutated Converter (HCC), UHVDC, Commutation Failure

Key Technologies and Research Applications of UHVDC Current Source Converters Based on RB-IGCT

R. ZENG³, X. WEI^{1,2}, Z. YU^{3,1}, G. TANG¹, H. RAO⁴, Y. SHAN¹, S. LI¹, W. CAI⁴, T. JIANG¹

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Offshore wind power, low-frequency AC transmission, multi-terminal LFAC systems, AC/AC converter, fault ride-through, modular multilevel converter

Low-Frequency AC Transmission for Offshore Wind Power: Key Technologies and Grid Integration Challenges

Y. LU, Z. LI, X. NI, P. QIU, C. DING, W. YE

State Grid Zhejiang Electric Power Research Institute

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: VSC-HVDC system, MMC, AC/DC fault ride-through, DECF-MMC, distributed energy consumption function

Feasibility Study on Cancelling the DC Choppers in VSC-HVDCs for Renewable Energy Integration

Y. ZHOU, W. CAO, Y. XU, Y. CHEN

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: DCCB, DCSS, Multi-terminal HVDC

Performance Study and Specification Framework for DC Circuit Breakers in Multi-Terminal HVDC Networks

S. RANGASAMY¹, C. FOOTE¹, B. MARSHALL¹, A. KHAN¹, A. JANA¹, W. AHMAD¹, X. HUANG¹, H. BEKKOURI², S. S. H. YAZDI³

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Digital Twin, HVDC Interconnector, Black Start, Network Restoration, Real-Time Simulation, Grid Forming, Adaptive Protection and Control.

Digital Twin-Enabled Support for Network Restoration: A Case Study on Grid-Forming Controlled HVDC Interconnectors

Y. LI¹, Y. FAN², C. WU², X.-P. ZHANG², N. CHEN², X. DING³, R. ZHANG⁴

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: AC-AC converter, Electrification, Modular Multilevel converter, Offshore system, Power from Shore, Static Frequency Converter.

Electrification of offshore platforms using Static Frequency Converters - Concept analysis for the Norwegian grid

A. DUQUE

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Grid Forming STATCOM Dynamic Performance: A Technical Study

Y. KHAYAT

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Grid forming inverter, DC dynamics, Synchronous machine, Current control, Fault ride-through capability

A Novel Grid-Forming Controller Based Upon DC-Side Dynamics

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Solid State Transformer, Data Centers, electromagnetic transient simulation (EMT), Real Time simulation

FPGA-Based Modelling of Modular Power Converters for Data Centres System Interconnection and Integration Studies

J. PAEZ ALVAREZ, S. K. ANCHA, L. J. LEWIS, M. HOSEINIZADEH

Opal-RT Technologies, Canada

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Multi-terminal DC (MTDC), high-voltage DC (HVDC), DC circuit breaker (DCCB), DC power flow controller (DCPFC), multiport, interline

An Interline Multiport DC Circuit Breaker with Power Flow Controller

Z. J. ZHANG¹, M. FERDOUS¹, Q. YANG², M. SAEEDIFARD³

¹The University of British Columbia, Canada; ²University of Central Florida, USA; ³Georgia Institute of Technology, USA

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Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Comparative Analysis of AI-Based DVR Control Strategies for Hybrid Renewable Energy Systems: LSTM vs. PSO-Tuned Fuzzy Logic Controller

M. TBAISHAT, Y. MASHAGBEH
Samra Electric Power Co.

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Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: DC FRT, GFM, MTDC systems, DC protection, Partially selective protection, EMT studies

DC FRT Analysis and Disturbance Propagation of Grid-Forming HVDC Converters in Future MTDC Systems

J. CASTELLANOS¹, L. XU², F. PEREZ³, A. ZAMA³, A. BENCHAI³

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Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Innovation and Challenges in the Implementation of Series FACTS in 500kV Transmission Lines of the Peruvian System

M. P. PASTRANA¹, A. C. CASTRO², A. H. HUACCHO³, C. S. SANCHEZ⁴, H. M. MANTILLA⁵

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: solid-state transformer, economic analysis, MVDC

Economic Analysis of Solid-State Transformers for Modern Power Systems

T. GRADINGER¹, J. BENKE⁵, E. GARCIA MARTINEZ⁴, J. MUNOZ-CRUZADO ALBA³, F. WALD², M. MOGOROVIC¹, M. STOECKLI⁶

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: distribution grid, transformer, control, power quality, reactive power, PQ

Advanced Management and Power Quality Performance of Hybrid Transformers in modern Distribution Networks

M. MOGOROVIC¹, R. ALVES², A. Z. KHAN³, L. PETRIANNI⁴, M. BARTOLUCCI⁴, S. GIOVANETTI⁴, R. SANCHEZ⁵, G. ANDREELLA⁵, M. STOECKLI⁶

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: Congestion Management; Multi-terminal HVDC System; Protection Scheme

Modelling Protection Concepts for Multi-terminal HVDC Systems for Congestion Management

M. KRUEGER¹, C. GERDON¹, J. DILCHERT¹, M. KAHL², C. DETERS², A. MOSER¹

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition

Keywords: HVDC Circuit Breaker, High Voltage Direct Current, HVDC Grid, Multiterminal HVDC Systems, Power Electronics, High Performance

Ultra-fast Power Electronics based HVDC Circuit Breaker: A Paradigm Shift towards System Flexibility and advanced Control Features

S. SEMMLER¹, J. DORN¹, R. ALVAREZ¹, A. VAN SCHIJNDEL², D. SOUBRIER³, W. KRUSCHEL⁴, M. SANAEI⁵

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E-STATCOM, the first of its kind: Design and performance of a supercapacitor energy storage integrated into a STATCOM

F. PRÖBSTL¹, T. ENGELBRECHT¹, G. KUHN²

¹TenneT TSO GmbH; ²Siemens Energy Global GmbH & Co. KG

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition
Keywords: VSC-UHVDC, overvoltage, fault ride-through, converter valve

System Design for the World's First ± 800 kV 8 GW VSC-UHVDC Transmission Project

Y. XU, Z. GAO, L. WANG, Y. ZHAO, T. LEI, Y. ZHANG, F. ZHANG
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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: B4 PS3 - New technologies and concepts of DC and FACTS enabling energy transition
Keywords: Power-electronic converter, power system stability, Nyquist criterion, power grids, renewable sources

Effect of Power Electronic Converter Parameters on Converter- driven Stability in Transmission Grids with High Converter- interfaced Device Penetration

J. LOKAR¹, B. BLAŽIČ², L. HERMAN³

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring
Keywords: Generative AI - Knowledge Management - Digital Substations

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring
Keywords: Knowledge Management, DSO, TSO, Skills, Asset Specificity, Asset Lifecycle, Survey, Legacy PAC, IEC 61850-based PAC, Discontinuity, Strategic Resources, IAM

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring
Keywords: IEC 61850-9-2LE-Based, Bus, Demonstration, Testing

Development of an IEC 61850-9-2LE-Based Process Bus Demonstration, Testing and Training Environment

R. SUSANTO-LEE, N. NAGOORSAMY, D. LANGE, J. MENZIES, M. SURACE
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Keywords: Communication, Competencies, PAC Engineering

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring
Keywords: ANALYSIS OF DISTANCE RELAY

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Keywords: 3T Framework: GETCO's Protection System

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring
Keywords: Mis-operation of PLCC

Case studies and lesson learnt on Mis-operation of Power Line Carrier Communication (PLCC) & Digital Protection Coupler (DTPC) in EHV transmission lines.

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring
Keywords: STRATEGIC KNOWLEDGE MANAGEMENT FRAMEWORK PACM

Strategic knowledge management framework for pacm systems in indian power utilities: enabling a future-ready grid

S. K. MISHRA *, N. K. SINGH, A. TIWARY, J. PANI

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring
Keywords: Protection System Experiences. Case Studies

Protection System Experiences. Case Studies, Analysis and Learnings in Project Commissioning and O&M.

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring
Keywords: Tool for SAS Configuration Error

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A. CHOUDHARY*, V. C REDDY, A. NAYAN, S. K. SINGH, M. KUMAR, M T. REDDY

Power Grid Corporation of India Limited India

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring
Keywords: Auto-Recloser Simulator Kit Enhanced Grid Reliability

Development and Implementation of Auto-Recloser Simulator Kit for Enhanced Grid Reliability and Offline Relay Testing

M. M. ALAM*, J. AHAMAD, V. P. SRIVASTAVA, P. KUMAR

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Education - Knowledge Management - Knowledge Transfer - Post-graduate - Undergraduate - Quality Assessment - Training - Workforce Demographic - Workforce Profiles

Impact of Evolving Knowledge on Professional Development of Protection, Automation, and Control Engineers

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Product Lifecycle Management (PLM), Model-Based Systems Engineering (MBSE), Common Requirement Modeling Language (CRML), Protection Automation and Control Systems (PACS), IEC 61850

Product Lifecycle Management applied to Substation Automation System specification documentation and visualization tool

E. YANG, J. CANTENOT, C. EFFANTIN, A. JARDIN, A. PAM, T. COSTE

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Training, integrated approach, technological changes, systemic changes

Transforming Skills and Training at RTE in the Face of Energy Transition

M. DARRIGRAND, S. CHARTOIRE, N. APPLETON

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Sustainable Design - Protection Philosophy - Knowledge Transfer

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Training - Education - Protective Relaying - Proprietary Point-to-Point Digital Secondary Systems - Artificial Intelligence

In-house Training Development for Relay and Protection Engineers

K. MALPEDE, A. FISHBECK, R. CARRERA, A. FRANKS

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Digital Substation, Gateway, Intelligent Electronic Devices (IEDs), IEC 61850, SCADA

Development of a Portable SCADA System for Substations complying with International Standards and Logical Node Assignment Organization

D. JOZEN, S. NISHI, K. NIKI, Y. NAGATANI, Y. TAKESHITA, A. OKAHISA

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: IED, International standard, Logical node, Proxy/gateway, Substation

Development and Management of IEC 61850-based Common Functional Specifications for Telecontrol Systems in Japan

K. RYONO¹, H. YAMASHITA¹, T. OTANI¹, T. MIZUKAMI², T. OGIYAMA³, M. ONO⁴

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Digital Substation, IEC61850, System Construction

Regarding the Management of Knowledge and Skills Required for the Construction of Digital Substations in Transmission and Distribution Companies

Y. TAKEUCHI, Y. SANO, T. OHMORI, Y. ICHIKAWA, M. SHINOZAKI

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Certification Programs, Lifelong Learning, Knowledge management, Operational Technology, Virtualization & Testbeds.

Enhancing knowledge management and skills retention in OT protection and control environments

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Education, IEC 61850, Intent-Based Networking, Network Engineering, Time Synchronization

A Syllabus for Network Engineering in IEC 61850-Based PACS Systems

G. LISBOA, G. NORMANTON, J. R. CASTRO, A. VASQUEZ

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: PACS, university, industry, training

Challenges in Developing a Training Program through a University–Industry Partnership for Preparing Recent Graduates to Work in the Field of PACS

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Digital Twin, Engineering Education, Knowledge Management, PAC Systems, Training

A Pedagogical Framework Proposal for Next-Generation Power System Protection Education: A Case Study on Digital Twin integration at the Federal University of Itajubá in Brazil

G. C. SANZ PIRES¹, C. A. VILLEGAS GUERRERO², F. O. PASSOS², P. M. SILVEIRA²

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Updating Engineering Teaching Through Active Learning: Applying Flipped Classroom in Under-Graduation

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From Documents to Knowledge: Object-Oriented, Data-Centric Approaches Transforming Knowledge Management for PAC Systems

R. FERNANDES, J. MAGALHÃES, A. FARIA, P. ANDRADE, A. BELO

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: protection, automation, communication, control, knowledge, management, reliability, training, digitalization, PAC systems

The Challenges Faced and the Potential Solutions at the Knowledge Management in Protection Automation and Control Systems in Brazil

J. B. MOTA JUNIOR¹, J. C. M. d. LIMA², D. B. d. OLIVEIRA³, T. M. T. d. S. ALVES³, J. R. PESENTE⁴

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Disturbance analysis, Fault location, IED testing, Short circuit, Team formation

The Importance of Knowledge in Disturbance Analysis and Fault Location Techniques for the Development of Protection Teams

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: PAC systems, IEC 61850, Full Digital Substation, knowledge, management, training

Team Qualification Strategies in the Digital Substations Scenario at Eletrobras

P. H FLORES, M. H. WANDERLEY

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: continuous professional development, multidisciplinary skill sets, PACS training customization.

Knowledge management and training approaches for PACS in the era of the energy and digital transition: Terna's experience

E. CASALE

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ID: 11180

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: PLC teleprotection devices, DSP, modernization, personnel training, digital twin, immunity to interference

Digital Twin of PLC Teleprotection Devices as a Modern Technology for their Modernization and Personnel Training

S. KIREEV¹, A. CHIRKOV¹, Y. CHIRKOV¹, A. CHIRKOVA¹, D. YASKO²

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Digital Substation, IEC 61850, Power Engineering Education, Engineering Training, Workforce Development, Practice Oriented Learning, Online Education

Training in Digital Energy: Insights, Methodologies and Solutions

A. ANOSHIN, A. GOLOVIN, N. MARARAKINA

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: knowledge management, professional knowledge and skills, research and development, protection relay, synchronized phasor measurements, digital current and voltage instrument transformers

Applying Knowledge Management to Accelerate the Development of Protection, Automation, Measurement, and Monitoring Devices

D. ULYANOV¹, A. MOKEEV², P. SEITOV¹, S. PISKUNOV²

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Operational personnel, Dispatch personnel, Three-stage training program, Theoretical base, Theoretical tasks, Practical exercises

Training Program for Operational and Dispatching Personnel of a Grid Company in the Field of Relay Protection and Automation

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PJSC "ROSSETI" Leningradskoye PMES Branch

ID: 11242

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Electric power industry, operational dispatch control, higher education, professional retraining programs in the electric power industry

Staffing of the Electric Power Industry: Model of Cooperation between Universities and JSC «System Operator of the United Power System» in the Field of Young Professionals Training

Y. KUTUMOV, A. OSTANIN, A. RASSHCHEPLYAEV, E. SATSUK

«SO UPS», JSC

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: relay protection and automation, advanced training, relay protection and automation specialists

Professional Development of Relay Protection and Automation Specialists at JSC «SO UPS»

A. RASSHCHEPLYAEV, A. KOZYREV, E. SATSUK

«SO UPS», JSC

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: IEC 61850; Digital Substation; Substation Monitoring; GOOSE; SCD

Preserving and Transferring Expertise through IEC 61850 Digital Substation Monitoring Tools

C. ALBERO¹, Y. GALVE¹, M. GUTIÉRREZ¹, E. VILLAREAL², J. MARTÍN³

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ID: 11750

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Event classification, transmission system, inrush currents, fault detection, PMU data

Data-Driven Algorithm for Disturbance Classification in Transmission Systems: Design, Implementation, and Experimental Evaluation

A. MEMIĆ, M. MUFTIĆ DEDOVIĆ, N. DAUTBAŠIĆ, A. MUJEZINOVIĆ, A. ALIHODŽIĆ, Z. BAJRAMOVIĆ

University of Sarajevo - Faculty of Electrical Engineering, Bosnia and Herzegovina

ID: 11778

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: IEC 61850-9-2, IEC 61869-9, Process Bus, Sampled Values.

ITAIPU Digital Substation Innovation Laboratory for Testing, Validation, and Education

G. MERELES¹, C. VILLASANTI², A. ORTIZ³, P. LINDSTROM⁴, D. GAMARRA⁵

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ID: 11847

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Merging unit, Peripheral Interface Unit, Digital substation, Process bus, IEC 61850, P&C in MU/PIU

The Hidden Regression: Risks of Embedding Protection and Control Functions in IEC 61850 Merging Units

C.-P. TEOH¹, J. WRIGHT¹, P. BRUN², H. HOANG³, D.-T. VO³

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B5 PROTECTION AND AUTOMATION - Full Papers

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Expertise Development in Innovative Technologies for Next-Generation Substations

E. WEJANDER

Svenska kraftnät

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: OT Asset Transparency, Substation Automation, Cybersecurity, Asset Management, Knowledge Management, Digitalization, Patch Management, Vulnerability Management

Extending classic substation automation and control solutions modularly with substation management applications is key to ensure reliable operation, fast expansions and targeted investments

C. SPITZ, M. SCHACHINGER, N. FUCHS, M. BÖHM

Siemens AG

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: IEC 61850, IEC 61499, Power Utility Automation, Open-Source Tools, Education

Experiences with IEC 61850/61499 in Distributed Energy Resources and Substations Automation: A Standards-Driven, Open-Source Approach

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Experience, Knowledge management, Protection, Training, Transmission system

Experience in Knowledge Management and Training of Power System Protection for New Employees in Thailand's Power Utility

A. LADLOI, S. CHAIPUNHA, B. KONGKAEAO

Electricity Generating Authority of Thailand (EGAT)

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Expert Systems for Automated Relay Setting and Coordination in Transmission Lines and Power Transformers.

G. GUTIERREZ¹, C. MENDEZ²

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Support tool for establishing the technical analysis methodology for protection relay certification testing over time.

C. MENDEZ¹, G. GUTIERREZ², J. YEPES³

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Cable insulation degradation, progressive faults, fault modelling, intermittent fault, fault early warning, distribution system

Broadband fault perception and knowledge automatic mining technology for power cables in new distribution system

B. WANG, Y. SHENG, Y. LIAO, X. DONG

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Smart grid technology, Knowledge transfer, Synergy of sectors, Pedagogical methodologies, Learning by doing, Simulation-based training, Test scenarios, Performance metrics, Educational modules, Practical competencies, Real-time applications, Process Bus t

Model of the practical knowledge collection and transfer on Smart Grid technologies through collaboration between the academic, industrial, and utility sectors in the Republic of Serbia

T. DAMLJANOVIĆ¹, M. JOVIČIĆ¹, M. ISAILOVIĆ¹, D. TRIJIĆ², V. MILANOVIĆ², M. PEJČEV², Z. STOJANOVIĆ³, V. CVEJIĆ⁴

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: IEC61850, Automation, Vendor-agnostic, Guided-engineering, Open-source, OpenSCD

Enhancing IEC61850 Substation Engineering: The OpenSCD guided Engineering Wizard

R. DASTPAK¹, C. RUOPP¹, I. KRYBUS², S. BAUMGARTNER²

¹TransnetBW Germany; ²BearingPoint GmbH Germany

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Leveraging Digital Twins and AI Chatbots for Knowledge Management and Workforce Development

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Keywords: Digital substation, IEC 61850, Precision Time Protocol, Time synchronization, End to end, Peer to peer, Redundancy, Network latency

Challenges of Implementing the Precision Time Protocol in Digital Substations

J. TOHOLJ¹, K. ĐURIĆ²

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B5 PS2 - Protection and control in networks with unconventional sources

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Evaluating Grid-Following and Grid-Forming MMC Impact on AC Fault Current Injection and Distance Protection

X. LIU¹, G. CHAFFEY¹, P. JUDGE², D. VAN HERTEM¹

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A Resilient Protection Scheme for Active Distribution with Renewables

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Virtual Substation - Adaptive Protection - Solar Generation - Voltage Protection - IEC 61850

From Digital to Virtual: Adaptive Voltage Protection for Solar Generation Through Virtual Substation Architecture

J. ANDERSON

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ID: 10193

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Inverter-Based Resources (IBR) - Negative Sequence Current - Directional Polarization - Distance Protection - IEEE Std 2800 - Misoperations - Failure to Trip

Mitigating Directional Protection Challenges in Transmission Systems with Inverter-Based Resources: Modeling Negative Sequence Current Injection in Compliance with IEEE Std 2800-2022

C. CULPEPPER¹, Y. ALKRAIMEEN¹, M. R. RIVERA³, S. GUPTA²

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ID: 10226

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: IEC 61850 - Routable GOOSE (R-GOOSE) - Unconventional Sources - Protection

R-GOOSE and its Impact on Meeting the Performance Requirements for Protection and Control in Networks Dominated by Unconventional Sources

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ID: 10295

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: HYBRID MEASUREMENT, IEC 61850, HSR, PRP, DIGITAL SUBSTATION, TIME SYNCHRONISATION

Hybrid measurement solutions in digital substations

B. KLOPPENBURG¹, R. KOENDERMAN¹, D. VOORTMAN¹, H. BRINKERS¹, P. HEMMER²

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ID: 10392

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: EMT, Simulation, Distance

Using EMT Simulation in Reviewing Distance Protection with Inverter Based Resources

N. NAGOORSAMY¹, M. SURACE¹, M. MARQUEZ¹, V. PILLAY²

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ID: 10395

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: 100 MW BESS, 220 kV, Australian grid

A case study on the integration of a 100 MW BESS into a 220 kV Australian grid using conventional Protection and Control schemes

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ID: 10448

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Neutral, Grounding, Reactor, arc, protection, transmission line

Importance of Neutral Grounding Reactor size in secondary arc extinction and its protection challenges in over compensated transmission line

A. PRAKASH*, P. JAIN, S. GHOSH, S. GHOSAL, M. R. CHAND, P. MEENA, V. PANDEY, S. USHA

Grid-India, India

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Impact of Zero-Sequence Impedance errors

Impact of Zero-Sequence Impedance errors on ground fault detection and line parameter estimation using phasor measurements

M P. KUMAR*, A H. V. KUMAR, D. REDDY

Power Grid Corporation of India Limited India

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Presence of DFIG- Wind Integration ETAP

Analysis of Distance Relay Performance in the Presence of DFIG-based Wind Integration using ETAP

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: SCADA-Compatible (NPPDFD)

SCADA-Compatible Normalized Power Deviation Fault Detection (NPPDFD) for Unequal-Rated PV Strings with Irradiance-Based Transient Filtering

J. J.*¹, J. S. M., A. K. M, P. S. P, S. L, K. N. K.P

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ID: 10628

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Distance Protection for Networks Connected with Inverter Based Unconventional Sources

A New Time Domain Based Distance Protection for Networks Connected with Inverter Based Unconventional Sources

O. NAIDU*, N. GEORGE, M. KRAKOWSKI

Hitachi Energy Research India

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Renewable Energy Integration and Protection

Renewable Energy Integration and Protection : Insights and Solutions from the Southern Regional Grid of India

A. S. RONES V*, C J NIKHITHA, M K RAMESH, V BALAJI

SRLDC GRID -INDIA INDIA

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Protection Challenges Bulk Penetration Unconventional Sources -

Protection Challenges Under Bulk Penetration of Unconventional Sources - Detailed Study, Analysis and Implementation of Upgradation in Protection Philosophy to Suit New Power System Dynamics

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Gujarat Energy Transmission Co. Ltd India

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Intelligent Fault Classification Solution

Intelligent Fault Classification Solution for Networks Connected with Unconventional Sources

O. NAIDU*, K. LIKHITHA, A. V, M. KRAKOWSKI

Hitachi Energy India

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Lessons learned and field experience with protection

Challenges, Operational experience and key learnings of Protection and Control of networks, integrating renewable generation sources with large grid

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Adani Green Energy Ltd. INDIA

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Fault Localisation in Tree-Topology Wind Farm

Smart Fault Localisation in Tree-Topology Wind Farm Networks Using FPI and Machine Learning.

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Performance Assessment of Single Ended Fault Locator f

Performance Assessment of Single Ended Fault Locator for Lines Connected with Inverter Based Renewable Resources: Problems and Practical Solutions

O. NAIDU*, A v. SAI, S. KARMAKAR*

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: reverse blocking protection scheme Solar

Integration of reverse blocking protection scheme with SCADA systems in solar power installations

C. PARAG*, K. SUBIR

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Adaptive Protection and Auto-Reclosure in Indian Power Networks

Operational Experience with Adaptive Protection and Auto-Reclosure in Indian Power Networks with High Renewable Penetration

A. SHARMA*, A. DUBEY, S. K. SINGH

Power Grid Corporation of India Limited

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: RE Integration in India- Challenges

Protection Challenges in Renewable Energy Integrated Networks: Indian Experience and Solutions

A. K. RAI*, K. K. SARKAR, V. BAGADIA, D. N. ROZEKAR

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Distance Protection for Transmission Lines

Assessment of Distance Protection for Transmission Lines Connected with Type III Wind FarmsConnected with Type III Wind Farms

O. NAIDU*, V. PRADHAN*, N. GEORGE

Hitachi Energy Research India

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Protection of Export Cables Connecting Off-shore Wind Farms

Protection of Export Cables Connecting Off-shore Wind Farms to the Grid using Model-based State Estimation

V. PRADHAN*, O. NAIDU, V. S. ATS

Hitachi Energy Research India

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Advanced Protection and Controls for RE Power Networks:

Advanced Protection and Control Strategies for Renewable-Rich Power Networks: Insights from DIGSILENT Simulations and Case Studies

A. K. MAJUMDAR*, D. S. YADAV, K. V. SINGH, P. SHARMA
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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Digital Twin - Relay Protection - Closed Loop Co-Simulation - IEC 61850 - Inverter-Based Networks - Renewable Integration

Digital Twin in Relay Protection for Converter-Based Networks: From Foundational Vision to Closed Loop Co-Simulation and Lifecycle Integration

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Hardware-in-the-Loop (HIL) - Inverter-Based Resources (IBR) - Machine Learning (ML) - Line Protection - Three-Terminal Line - IEC 61850 GOOSE

Hardware-in-Loop Validation of a Machine Learning Algorithm with IEC 61850 GOOSE Communication to Protect a Three-Terminal Transmission Line Integrated with Inverter-Based Resources

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: GAN - Transmission Line Faults - Probabilistic Forecasting - Deep Learning - PMU Monitoring - Inverter-Based Resources - System Stability - Data Augmentation

Real-Time Fault Risk Forecasting on Transmission Lines Using Hybrid Deep-Learning Models and Generative Data Augmentation

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Distance Relay, Inverter-Based Resources, Wind Power Plant, Power Transmission Line

Wind Power Plant Impacts on Distance Protections-Real Time Relays Testing

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Inverter - Grid-Forming - Transmission System - Protection - Fault Ride-Through - Hardware-in-the-Loop

Protection of Inverter-Dominated Transmission Systems: First Experiences from Hawaii Island

U. MUENZ¹, S. BHELA¹, A. BANERJEE¹, S. ELPELT¹, A. STINSKIY¹, S. DAS², A. HADDADI², E. FARANTATOS², D. KELLY³, M. RENO³, Z. DONG⁴, A. ASHOK⁴

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Distance Protection - Directional Protection - Grid-Forming - IBR - IEEE 2800-2022

Impact of IEEE 2800-2022 Fault-Ride Through Requirements on the Protection of Network Dominated by IBRs

J. KAR, R. NUQUI

Hitachi Energy Research, United States of America

ID: 10931

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Multiterminal Direct Current Transmission System - Fault Detection - Transmission Line - Ensemble Learning

A Hybrid Protection Method for DC Line Faults in MTDC Grids Based on Ensemble Learning Algorithm

Y. NIE¹, Q. YANG², Z. J. ZHANG³, Q. XIA⁴, S. DEBNATH⁴, M. SAEEDIFARD¹

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: R-GOOSE, R-SV, IEC 62351, Grid-Forming, PKI, KDC

Unconventional Interfaces for Protection, Measurement and Control of Unconventional Sources

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ID: 11032

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Communication-assisted protection, EMT simulations, inverter-dominated grids, inverter-based resources, line protection, MMC-HVDC, offshore wind farms

Protecting Collector Lines of MMC-HVDC-Connected Offshore Wind Farms: Insights on Communication-Assisted Schemes for Inverter-Dominated Grids

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ID: 11033

B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Distance Protection, Overreach Zones, Inverter-Based Resources, Power System Protection, Impedance Nonlinearity, Protection Selectivity, Renewable Integration

Analysis of Criteria for Overreaching Zone Settings in Distance Protection for Dense Systems with High Penetration of Inverter-Based Resources

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: IBR transient behaviour, IEEE 2800-2022, inverter-based resources, phasor-based protection, transient-based protection, transmission line

Lessons Learned About Transient Behaviours of Inverter-Based Resources and Identification of Best Practices for Interconnection Line Protections

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Adaptive Protection, DER, Distributed Generation, Relay Coordination, smart grids, renewable energy sources

Methodology for a Dynamic Adaptive Protection System in a Distribution Smart Grid with Penetration of Distributed Generators (DG)

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Inverter-Based Resources, Protection, Traveling Waves, Blackout

Impacts of IBRs on Conventional Protection Functions and Emerging Alternatives

P. S. P. JUNIOR, R. C. BERNARDINO, G. S. SALGE, C. M. MARTINS, P. S. PEREIRA, G. E. LOURENÇO

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Inverter-Based Resources, Grid-Code, Regulatory Process, GFL, GFM, Disturbance, Protection and Control Systems

Technical Aspects of Protection and Control Systems for Inverter-Based Resources in Compliance with Grid Codes and Regulatory Frameworks

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: PAC systems, Renewable sources, inverters, knowledge

Impact of the Penetration of Renewable Energy Sources with Inverters in the Electrical Power System

D. B. OLIVEIRA¹, T. M. T. S. ALVES¹, J. C. d. LIMA², P. H. FLORES³

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: adaptive protection, CPC, DER, digital substation, directional overcurrent, HIL, IEC 61850, real-time validation, virtualization

Validation of adaptive protection framework in virtualized centralized protection architectures using Hardware-in-the-Loop methodology

E. ALVES¹, C. REIZ¹, A. MELIM¹, T. HEKKERT¹, A. CARRAPATOSO¹, C. GOUVEIA¹, A. ALEIXO², R. JORGE², J. PERES²

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Advanced Monitoring System; Black Start; Oscillation detection; Situational Awareness

Enhanced Monitoring System for Black Start Tests Using High Frequency Data Acquisition and Processing to Real Case in the Italian Transmission System

S. CASULLI

TERNA

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Inverter-Based Resources (IBRs), photovoltaic systems, protection systems, simulation-based fault analysis, adaptive protection

Analyzing protection system performance in networks with high PV penetration: insights from simulation-based fault studies

S. GRILLO

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Protection, Inverter, Wind Power Station, Solar Power Station, Transmission Line, Double Fed Induction Generator, Permanent Magnet Synchronous Generator

The Results of the Study on Relay Protection of Power Transmission Lines from Wind and Solar Power Plants

A. KOZYREV², A. RASSHCHEPLYAEV², A. VOLOSHIN¹, D. SEROV¹, R. MAXIMOV¹, O. DOBRIAGINA¹, D. ROMANOV¹, I. POLYGALIN¹

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Short-Circuit, Protection, Relay-Automation, Inverter, Wind Turbine, Photovoltaic, Transient, Renewable-Energy

Analysis of Inverter Generators Behavior during Faults on Protected Elements

A. KOZYREV², A. RASSHCHEPLYAEV², A. VOLOSHIN¹, D. SEROV¹, R. MAXIMOV¹, O. DOBRIAGINA¹, D. ROMANOV¹, I. POLYGALIN¹

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Impact of increased renewable integration on power swing detection: a case study from the Portuguese DSO

L. NUNES¹, F. MENDES¹, J. SILVA¹, M. SILVA¹, A. LEIRIA¹, A. NEVES², J. GOMES², M. LOURO²

¹LABELC; ²E-REDES

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: fault location, fault indicators, travelling wave method, overhead-cable lines, fault oscillograms

Application of Traveling-Wave Fault Location in Networks with Complex Topology and Distributed Generation

A. KUCHERIAVENKOV, A. FEOKTISTOV

ID: 11190**B5 PROTECTION AND AUTOMATION - Full Papers**

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Control System, Modelling, PMU, Excitation Regulation, Static Stability, Identification, DPartition, Renewable Energy Sources, Adaptive Algorithm

Automatic Adjustment of AVR Settings Based on PMU Data in Power Grids with RES

E. SATSUK¹, D. DUBININ¹, T. KLIMOVA², J. IVANOV², A. DMITRIEVA², M. POROZKOV²

¹«SO UPS», JSC; ²LLC «RC «Prosoft-Systems»

ID: 11192**B5 PROTECTION AND AUTOMATION - Full Papers**

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Relay protection and automation algorithms, protections with absolute and relative selectivity, renewable energy sources, inverter converters, relay protection information parameters, symmetrical and fault components

Relay Protection Algorithms for Facilities with Renewable Energy Sources

V. EFREMOV¹, A. EFREMOV¹, M. PETRUSHKOV¹, S. SMIRNOV²

¹«Relematika», LLC; ²JSC «VNIIR»

ID: 11255**B5 PROTECTION AND AUTOMATION - Full Papers**

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Power Supply Restoration, Renewable Energy Sources (RES), Dynamic Programming, Graph Theory, Fault Location, Network Reconfiguration, Power System Resilience, Optimization Algorithm, Automated Control

Automatic Dynamic Graph Calculation for the Fault Location System in a Grid with a Large Number of Unreliable Renewable Energy Sources

A. VOLOSHIN¹, A. KUCHERIAVENKOV²

¹NRU MPEI; ²ANTRAKS

ID: 11370**B5 PROTECTION AND AUTOMATION - Full Papers**

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Digital substation-roadmap for practical implementation

M. LOUKKALAHTI¹, K. MAJER², J. VALTARI²

¹Helen Electricity Network Ltd; ²ABB

ID: 11372**B5 PROTECTION AND AUTOMATION - Full Papers**

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Modelling, Simulation, and Validation Tests for Sub-harmonics Protection Relay

B. POURNAZARIAN¹, K. TROFAST¹, J. KOPPINEN¹, T. RISSANEN², R. KORHONEN², J. M. GOMEZ³

¹Ampner Oy; ²Fingrid Oyj; ³ERLPhase power technologies Ltd

ID: 11467**B5 PROTECTION AND AUTOMATION - Full Papers**

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Hierarchical protection; backup protection; renewable energy; secondary system anomaly

A Novel Hierarchical Protection System for Power Grids with High Penetration of Renewable Energy Integration

B. LI¹, Q. TIAN¹, X. SHI¹, J. LIU², M. WEN³, Y. QIU⁴

¹XJ Electric Co., Ltd.; ²CEE Research Institute of Science and Technology Co., Ltd; ³State Key Laboratory of Advanced Electromagnetic Engineering and Technology; ⁴State Grid Zhejiang Electric Power Co., Ltd. Hangzhou Power Supply Company

ID: 11468**B5 PROTECTION AND AUTOMATION - Full Papers**

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: New energy sources; Distance protection; internal electromotive force estimation; Positive-sequence voltage; Distance Protection Optimization Scheme

Optimized Distance Protection Scheme for AC Transmission Lines Based on Phase Angle Difference of New Energy Equivalent Source

S. LIN, W. YU, H. LING, X. GAO

CYG SUNRI

ID: 11484**B5 PROTECTION AND AUTOMATION - Full Papers**

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Behaviour of distance protection during off-nominal frequencies in the presence of inverter-based generation

R. CIMADEVILLA, A. CASTAÑÓN

ZIV, Spain

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Deep Learning-Based Faulted-Phase Selector for Transmission Networks with High Renewable Penetration Level

G. RIOS GÓMEZ, M. T. VILLEN MARTÍNEZ, A. A. PRADA HURTADO, E. MARTÍNEZ CARRASCO

CIRCE Technology Center, Spain

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Topics: B5 PS2 - Protection and control in networks with unconventional sources

Considerations on AC transmission distance protection in systems with high penetration of grid-forming inverter-based resources

A. FRETWELL¹, M. RASUL¹, D. PATYNOWSKI², K. ELSHAMY²

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HVDC Transmission Relaying Strategies: Advanced Protection Schemes for Converter Transformer / DC pole zone

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Saudi Electricity Company

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Saudi Electricity Company

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Contingency, IEC 61850 protocol, IEC 61870-104 protocol, load shedding, PLC, SCADA.

Closed-Loop Analysis of WAMPAC Solutions in South Australian Power Grid Using Transient Time-domain Simulation

P. SHAH¹, M. A. KHAN¹, S. NORRIS¹, A. GLATZ¹, D. WILSON¹, M. GOLSHANI¹, D. PERERA², H. KLINGENBERG²

¹GE Vernova United Kingdom; ²ElectraNet Australia

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Advancements for line differential protection using model-based approach

A. TSYLIN¹, Z. GAJIC², A. G. MOSER¹, S. AGANOVIC², R. PAJUNEN²

¹Ørsted; ²Hitachi Energy AB

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Renewable Energy, Inverter Based Resource, Power System Protection, Distance Protection, Unconventional source.

Distance Protection for Inverter Based Resources– A Way Forward with Past Learnings to protect the Future Grid

V. CHAKRAPANI¹, Z. ZHANG², I. VOLOH³

¹GE Vernova United Kingdom; ²Utility Automation Solutions; ³GE Vernova Canada

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Renewable Energy, Inverter Based Resource, Power System Protection, Distance Protection, Unconventional source, Model based design.

Avoiding Surprises with Model Based Twin for Protective Relays

V. CHAKRAPANI¹, I. VOLOH²

¹GE Vernova United Kingdom; ²GE Vernova Canada

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Wide Area Protection Based on Phase Angle of Sequence Components

K. AL-MAITAH

EDCO- Electricity Distribution Company

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Low-voltage AC networks; fault detection and classification; deep learning; data-driven distribution network protection, LSTM

An Improved AI-Driven LVAC Network Fault Detection and Classification

J. YU¹, F. FILGUEIRA², M. DINIZ³, Y. QI⁴, J. LI⁴, M. MA⁴, J. YANG⁴

¹CIGRE UK; ²CIGRE SPAIN; ³Scottish Power Energy Networks UK; ⁴Glasgow University UK

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Network protection performance audits under high levels inverter-based generation systems

A. INSIGNARES¹, J. AGUDELO², L. AGUDELO³, D. ECHEVERRI⁴, B. GUERRERO⁵, J. GONZALES⁶

¹xm; ²xm; ³xm; ⁴Smart Wires Inc; ⁵cidet; ⁶upb

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Static Synchronous Series Compensator (SSSC) and its Challenge for

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¹ISA; ²ISA

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Topics: B5 PS2 - Protection and control in networks with unconventional sources

Methodology for Selecting Line Protection Schemes in Substations in EPM

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¹EPM; ²EPM; ³EPM

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Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Distance Protection, Converter-dominated grids, EMT, HiL, Converter Control

Multi-State Investigation of Distance Protection in Converter-Dominated Grids: From Steady-State to EMT and HiL

S. ANHAUS, A. DAMJANI, W. LETERME

IAEW at RWTH Aachen University

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Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: fault-clearing time, loss of generation, protection requirement, short circuit, voltage drop area

Requirements for Protection Concepts in High-Voltage Networks with High Penetration of Decentralized Generation Systems in Distribution Networks

T. REIMANN, G. SCHMIDT-BANERJEE, D. HILBRICH, T. DEGNER

Fraunhofer IEE, Kassel, Germany

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Topics: B5 PS2 - Protection and control in networks with unconventional sources

Protection Toolchain - A modular toolchain for automated protection concepts in multivariate power systems

G. J. MEYER¹, M. DAUER¹, D. HOLTSCHULTE², T. LORZ³

¹Siemens AG Germany; ²Westfalen Weser Energie Germany; ³Friedrich-Alexander Universität Erlangen- Nürnberg Germany

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Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Unconventional resources, Hybrid Renewable Power Plants, Grid Stability, Centralized Control, Reliability, Photovoltaic, Solar Integration, Wind Turbines, Pump Storages, Remote Terminal Unit

Advanced Centralized Control Strategies for Hybrid Renewable Plants

R. K. GUPTA¹, M. M. ISLAM², A. YADAV¹

¹Siemens Ltd. India; ²Siemens AG Germany

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Challenges and solutions for the distance protection in networks with unconventional sources

J. BLUMSCHEIN, Y. YELGIN

Siemens AG Germany

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: Microgrid, Relay Protection, Distributed Generator, Energy Storage Device, Adaptive Protection, Fault Analysis

Relay Protection Schemes for Medium-Voltage Microgrids with Grid-Forming/Grid-Following Generators and Energy Storage System

Y. HE, J. HAN, G. WANG, C. LEI, D. ZENG, Y. CAI

CSG Guangdong Guangzhou Power Supply Bureau

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: B5 PS2 - Protection and control in networks with unconventional sources

Keywords: HVDC transmission systems, Metallic return conductor, Fault location, Frequency-domain analysis, Protection systems

A Frequency-Based Fault Location Method for Overhead Metallic Return Conductors in HVDC Transmission System

D. RUFINI¹, L. BUONO², F. PALONE³, L. PAPI⁴, G. TRESSO⁵, P. VACANTE⁶

¹Terna, Technology Italy; ²Terna, Technology Italy; ³Terna, Technology Italy; ⁴Terna, Technology Italy; ⁵Terna, Technology Italy; ⁶Terna, Technology Italy

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Keywords: Decarbonization - Integrated System Planning - Round Trip Analysis - New York - Adequacy

New York Grid Performance Gaps Study

S. T. MANZ¹, G. HINKLE¹, J. MACDOWELL¹, A. FOSSA¹, G. JORDAN¹, M. ELKINS¹, J. SPAETH¹, A. GOGOLA¹, S. TUCKER¹, C. CHENG², H. BELLO²

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Keywords: Resource Adequacy - Energy Adequacy - Probabilistic Planning - LOLE/LOLH/EUE Metrics - Transmission Planning - Extreme Weather Scenarios - Integrated Resource and Transmission Planning - Chronological Studies - Grid Resilience - Load Forecasting

Evolving Planning Criteria for a Sustainable Power Grid

M. LAUBY¹, C. SINGH², T. OVERBYE², A. BOSE³, V. VITTAL⁴, D. NOVOSEL⁵, G. VAN WELIE⁶

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Keywords: Climate Change - Extreme Events - Transmission Planning - Power Flow Scenario Selection

Planning for Uncertainty and Variability: Integrated Modelling for Transmission Adequacy

E. VITTAL¹, P. MITRA¹, D. DHUNGANA², P. MCNAMARA³

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Keywords: Innovations, EHV Renewable Energy, Development

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GHD Power Systems Advisory, Australia

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Keywords: Andaman, ANI, Greening the Islands, HVDC, Island interconnection, Multi-terminal, Nicobar, Paradeep, Submarine Cable, Transmission Planning, VSC, 66kV

Greening the Island Initiative: Interconnection of Islands in Andaman & Nicobar Islands and HVDC link from main land India

M. R. KESHARI*, R. KUMAR, A. THAKUR, A. KUMAR

Central Transmission Utility of India Limited

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Keywords: Khavda RE park, LVRT, HVRT, Oscillations, Control Interactions

Design of Inter-state Transmission System for the World's Largest Renewable Energy Park (~45GW) at Khavda, Gujarat in India - Planning Perspective & Transient Stability Analysis

S. SHEKHAR*, P. SINGH, B. WAGH, D. A. KUMAR

Central Transmission Utility of India Limited India

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Grid planning, AC/DC grids, HVDC, Multi-terminal DC grids, techno-economic analysis, Reliability and resilience.

Techno-economic comparison and optimisation of grid planning scenarios for AC/DC grids: a North Sea case study

N. BARLA¹, B. PERREYON¹, A. BENCHAI¹, J.-C. GONZALEZ¹, S. JANKOVIC², C. FOOTE³, C. MACIVER⁴

¹SuperGrid Institute; ²TenneT; ³The National HVDC Centre; ⁴University of Strathclyde UK

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Keywords: Stochastic, Optimisation, Off-Grid, Wind Power, Hydrogen, Electrolyser, Ammonia, Haber-Bosch, Flexibility, Storage

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R. HUIN

EDF

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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Capacity Accreditation - Capacity Credit - Capacity Contribution - Effective Load Carrying Capability - Equivalent Firm Capacity - Marginal Reliability Improvement - Solar Capacity Credit - Wind Capacity Credit - Battery Storage Capacity Credit - CAISO

Rethinking Capacity Accreditation Methods: Unpacking Discrepancies and Practical Insights from a Southeast Asian Case Study

J. A. RANOLA

EPRI, United States of America

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Keywords: EMS, Micro-grid, VSG

Initiatives to Supply 100% Renewable Energy on Hahajima Island Microgrid Project

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TEPCO Power Grid, Inc. Japan

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Keywords: Adequacy, Flexibility, Power Grid Simulation, Renewable Energy

Evaluation of Adequacy and Flexibility of Interconnection in case of Japan with over 90% Renewable Electricity Ratio in FY2040

D. BA¹, K. TAKASE¹, S. KIMURA¹, T. SAITOU¹, T. WAKAYAMA², Y. NAKANISHI³

¹Renewable energy Institute Japan; ²Institute of Science Tokyo Japan; ³Waseda University Japan

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Capacity expansion planning, Decarbonization pathways, Electricity system modelling, Net-zero transition, Power system planning, Resource adequacy, STELLAR model, Sustainable energy, Thermal power plant emissions

Strategic Electricity System Expansion for Net-Zero Transition using the STELLAR Model: Integrating Thermal Emission Constraints and Ensuring Resource Adequacy

A. SWAIN*, V. MENGHANI

Central Electricity Authority, India

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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Large Load Placement, Transmission Margin, Maximum Load, Datacenters, Hydrogen Power Plants

Software Tool for Automatic Evaluation of Large Loads Placement Using Transmission Margin Concepts in the Brazilian Interconnected Power System

R. P. FERNANDES, P. O. LA GATTA, F. F. C. VELIZ, M. HERDADE, F. L. LÍRIO

CEPEL Brazil

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"Planning heavy-duty en-route charging stations considering freight traffic and grid availability"

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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Power system resilience; risk; hydrogeological threats; floods; vulnerability

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Keywords: Offshore Wind; Offshore Network; Multi-Purpose Interconnectors; Market Analyses; Socio-Economic Welfare

"Offshore transmission network and Multi-Purpose Interconnectors: Optimal Configurations for the System"

M. MIGLIORI

TERNA

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Reactive Power, High Voltage, Probabilistic Modelling, Forecasting

Reactive Power Demand Projection from Distribution Networks in Great Britain

N. SIMS¹, G. MCFADZEAN¹, R. TAWN¹, F. VELEZ², Y. WU¹

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ID: 11197

C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Energy transition, climate change, climate factors, electricity consumption forecast, climate impact, adequacy forecast

The Impact of Climate Factors on the Operation and Forecasting of Operating Conditions of the United Power System of Russia to Increase Power System Resilience

D. YARIZ, D. PILENIEKS, I. TUPITSIN, S. GILEVA, S. UTTS

JSC SO UPS

ID: 11198

C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Electricity consumption forecast, Power consumption forecast, EV, EV charging stations, Data centers, Electric heating

Approaches to Incorporating New Consumer Types in Long-Term Power System Development Planning in the Time of Energy Transition

D. PILENIEKS¹, D. YARIZ¹, R. NAUMKIN¹, S. UTTS¹, A. KUVSHINOV³, A. KORNEEV²

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Energy Policy - Long-term Planning - Energy Mix – RES - Power System – Balance - Operational Constraints

Application of Procedures for Building Models for Poland's Long-term Energy Policy

M. PRZYGRODZKI, R. GWÓŹDŹ, P. KUBEK

PSE Innowacje, Poland

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Y. VARDANYAN

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Receiving-end grid, multi-DC infeed capacity, renewable energy integration, scenario construction, IP-AKDE, Copula, bi-level optimization, DC infeed points, source-storage coordination

Scenario-based bi-level optimization approach for enhancing multi-DC infeed capacity and renewable energy integration of receiving-end grids

W. TANG, X. MAO, W. DONG, K. LV

Anhui Electric Power Research Institute

ID: 11471

C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Renewable generation expansion planning, Climate change, Wind-solar complementary, Copula, Stochastic programming

Renewable Generation Expansion Planning Considering Wind-Solar Spatiotemporal Complementarity under Climate Change

Z. XIN, G. LI, Y. HUANG, Z. BIE

Xi'an Jiaotong University

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Energy transition, Power system stability, HVDC carrying characteristics, receiving end power system, VSC-HVDC

HVDC carrying characteristics of receiving end power system considering the VSC-HVDC support

Z. YANG, X. HAN, Y. WANG, Z. WANG, H. LI

State Grid Economic and Technological Research Institute

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Offshore, Transmission Planning, Regulation, Interconnection, HVDC, Multi-Terminal HVDC, Interoperability, Cross-Border

Developments in Regional Offshore Transmission Planning and Coordination

C. HIGGINS, C. TARATORIS, D. SCOVINO, J. SUMNERS

Arup United Kingdom

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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Scenario planning, spatial and temporal resolution, whole system planning

Scenario Planning Methods and Impacts on Investment Outcomes

R. WILLIAMS¹, C. JACKSON², L. TROSHKA³, L. MACDONALD⁴

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Keywords: Electric Power System, Data Centre, Power System Planning, Short-circuit Current Capability, High Voltage, Network Topology, Availability

Approaches to the Design of Internal EHV and HV Networks for Large Data Centres – Three Case Studies

F. VAN DER LINDE¹, C. BODEN¹, L. KRUK², U. DHARANKAR³

¹Jacobs UK; ²Jacobs Australia; ³Jacobs India

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Keywords: Power and Gas Coordination, Integration, flexibility, reliability, optimization, BESS, gas storage, pipeline looping

An Integrated Framework to Enhance Power and Gas Reliability Under High Renewable Penetration: Case of Saudi Arabia

A. NDOUR¹, A. ALRASHED¹, A. JAIN¹, K. PAMBOUR², A. PELUSO², F. HOMAID¹

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: methodology, heat, waves, demand, long-term

The importance of temperature and heat waves as variables in the methodology for estimating long-term maximum integrated demand and their impact on the National Electric System

L. M. AGUILAR LUNA, J. G. GARCIA, F. ORTIZ, N. GARCIA, M. CORTÉS, R. CIPRIAN, R. ARENAS

CENACE Mexico

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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: HVAC, HVDC, offshore grid, offshore substations, onshore grid, grid planning, transmission planning, stakeholder coordination, governance, avoided onshore transmission reinforcement

Offshore Transmission Planning – JWG C1

Y. YANG¹, A. ILICETO², C. PLET³, L. STREGGER⁴, P. RUFFING⁵, R. CHAKRABORTY⁶, E. SPAHIC⁷, S. KODSI⁸, T. EGAN⁹, H. ERGUN¹⁰, V. MARKATSELIS¹¹, R. WILCHES¹², I. HUTT¹³, R. CHAKRABORTY¹⁴

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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Data centre - Artificial intelligence - Carbon emission - Electricity market - Sustainability

Implications of rapid data centre growth on the British power system and environment

M. JAMIESON, S. SKELLERN, C. MACIVER, K. BELL

University of Strathclyde United Kingdom

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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: energy system planning, system resilience, climate change, severe weather events

Modelling Climate Impacts on Long-Term Energy Infrastructure Planning

A. OUDALOV¹, V. N. M. POTHABATHULA¹, M. STOECKLI²

¹Hitachi Energy; ²ELECTROSUISSE / CIGRE Switzerland NC Secretary

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Power system planning, Transmission & Distribution grids, Holistic approach

Inclusion of the distributed Generation Planning and associated local Control Strategies as a key Factor for reliable holistic System Planning

A. ILO

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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Railway decarbonization, energy hubs, whole system approach, wind curtailment reduction, modelling and control

A Decarbonised Railway can support the Power System Resiliency Case Study of Energy Hub Concept in Southwest Scotland

J. YU¹, K. LI², B. SWEENEY³, R. DAIVSON⁴, A. E. ALVAREZ⁴, E. ALLISON⁵

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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Coal phase-out, system reliability, renewable integration, operational security, power system planning

Reliability Assessment in the Chilean Power System in a Full Coal Phase-Out Scenario by 2030

J. AVALOS, R. CARDENAS, P. LAGOS, E. QUINTANA

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Optimization model for determining scenarios of maximum integration of renewable energy plants with identification of Synchronous Must-Run units

D. A. GOMEZ¹, G. F. PAEZ², J. GUTIERREZ³

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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Colombia's Energy Transition Roadmap

Colombia's Energy Transition Roadmap Strategic Planning for a Resilient, Flexible and Sustainable Power System

J. CASTAÑO¹, D. PEREZ², A. CASTRO³, E. TOBON⁴, O. ARANGO⁵, J. MORALES⁶, E. SALAZAR⁷, C. CORREA⁸, C. DUQUE⁹, D. ALVAREZ¹⁰

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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Linear Optimisation, Nodal Reactive Power Demand, Reactive Power Planning, Voltage Control, Voltage Stability

A New Approach to Reactive Power Planning: A Two-Stage Optimisation Framework for Bus-Specific Reactive Power Demand Determination

S. TEPE¹, C. KAMPMANN¹, S. SAMAN², A. MOSER¹, C. F.¹

¹RWTH Aachen University Germany; ²Amprion GmbH Germany

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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Power generation planning, high renewable energy penetration, multi-dimensional evaluation

A Novel Power Generation Planning Method Designed for Future Power System Development

R. LIU¹, M. HAN², C. SHAO¹, Z. LIU¹, X. CHEN¹, X. PAN¹, K. YUAN¹, Y. LI¹

¹Energy Development Research Institute, CSG; ²Guangzhou Power Supply Bureau, CSG

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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition

Keywords: Desert-Gobi-Wasteland New Energy Base; Electric-Thermal Hybrid Energy Storage; Coal-Fired Power Plants; Time-Series Production Simulation

Optimal Configuration Method of Electric-Thermal Hybrid Energy Storage for Desert-Gobi-Wasteland New Energy Base Considering Retrofitted Coal-Fired Power Plants

T. LIU², Y. SHU³, T. BI², A. SHU¹, L. ZHAO¹, N. LIU²

¹China Huaneng Group Energy Research Institute; ²North China Electric Power University; ³State Grid Corporation of China

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¹MedTSO Italy; ²IPTO SA Greece; ³Terna SpA Italy; ⁴Red Electrica Spain

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C. PITAS¹, M. SISINNI², E. BUE³, A. EL SHAMI⁴, A. EL HRAIECH⁴, A. FERRANTE⁴

¹IPTO SA Greece; ²Terna SpA Italy; ³RTE France; ⁴Med-TSO Italy

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Keywords: Reactive power, cables, shunt compensation, voltage control, urban grid, DSO

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P. BÄCHLER¹, P. SCHMITT², B. HEIMBACH³, A. CASURA⁴

¹ewz, Grid Development Switzerland; ²ewz, Primary Equipment in Substations Switzerland; ³ewz, Grid Concepts and Development Switzerland; ⁴ewz, Head of Power Transmission and Distribution Switzerland

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Keywords: High voltage direct current grids, Offshore grids, Offshore wind curtailment, Offshore Grid Meshing, Renewable integration

Assessing the Role of Meshing in HVDC Grids: Impacts on Offshore Wind Curtailment in the North Sea

G. BASTIANEL¹, D. VAN HERTEM², H. ERGUN³

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Keywords: Asset Management - Capital Optimization - Integrated Grid Planning - Investment - Prioritization - Value-Based Decision Making

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A Framework for Co-optimizing Cost and Resilience in Stand-Alone Power Systems for Green Hydrogen Production

M. SAMY¹, A. ELMORSHEDY², S. BARAKAT¹

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Keywords: Climate Change - Extreme Weather - Investment Planning - Resilience

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A. CHATTOPADHYAY¹, L. PETER², F. GHAWASH², M. JAWAD³, P. KOZIOL-BOHATKIEWICZ³, G. CABOUR⁵, M. GIUNTOLI², A. SHIRSAT¹, A. KAMARIOTIS⁴, M. SUBASIC², I. HARJUNKOSKI²

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Keywords: Leveraging, Battery, Energy, Storage

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P. KHURANA*¹, R. R. PANDA²

¹POWERGRID, India; ²International Solar Alliance (ISA)

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National Transmission Company South Africa (NTCSA)

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Keywords: Climate Change - Climate Risk - Climate Resilience - Adaptation - Investment - Decision-Making - Power System

An Approach for Justifying and Prioritizing Adaptation Investments for Climate Resilience

A. STAID¹, W. TAYLOR², O. PELED³, E. VITTAL¹

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Keywords: Frequency Dynamics, Generation Expansion Planning, Optimal portfolio mix, Grid Security Constraints, Voltage Stability

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Keywords: Cost-Benefit Analysis, HVDC System, Transmission Development

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Topics: C1 PS2 - Strategic investment decisions in the context of the energy transition

Keywords: Automatic Curtailment, Digital Flexibility, Grid-scale Storage System

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Y. OGASAWARA¹, T. OHNO², N. KOBAYASHI³, T. KAISO⁴, K. NUSSBAUM⁵, G. LANCEL⁵

¹NEDO – New Energy and Industrial Technology Development Organization Japan; ²Transmission and Distribution IT&OT Systems LLC Japan; ³TEPCO Power Grid, Inc. Japan; ⁴Hokkaido Electric Power Network, Inc. Japan; ⁵RTE – Réseau de Transport d'Electricité France

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Keywords: Storage, Batteries, Renewable Generation, Resilience, Reliability, Flexibility Energy Transition

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Keywords: Optimal trilemma, reliability and power system requirements

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X. V. FILHO¹, J. C. MELLO², E. NERY³, P. C. V. ESMERALDO⁴, D. SOUZA¹

¹ABRAGET Brazil; ²THYMOS Brazil; ³Energy Choice Brazil; ⁴PowerConsult Brazil

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Keywords: electrical energy storage systems, flexibility, energy efficiency, resilience

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N. SHUBIN¹, F. NEPSHA¹, E. PLESNIAEV¹, V. TARASOV², E. SATSUK³

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Keywords: Energy Storage Systems, Battery Energy Storage Systems, Power System Flexibility, Pumped Storage Hydro, Capacity Deficit, RES Integration, Balancing, Fast Response, Flexible Resources

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A. BOLSHAKOV, D. PILENIEKS, S. UTTS, E. SATSUK, R. IZMAILOV

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Keywords: Batteries, Pump Hydro, Energy Storage, System operator, Ancillary services, BESS, Development plans

Energy Storage Systems in Development Plans and Power Markets – GO-15 Vision

S. UTTS¹, D. LAMB², A. PRASAD DAS³, A. NOHARA⁴, C. CHURCHWARD⁵, S. RUGGIERO⁶, M. MALEMATJA⁷

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Keywords: Offshore Wind, Curtailment, Transmission Line, Simulation, Capacity Factor

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J. HONG¹, S. KWON¹, P. SUNG², J. KIM²

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Keywords: Wind power; solar power; flexibility; storage; hydrogen; fuel cell; open-cycle gas turbine; combined-cycle gas turbine; levelized cos of storage(LCOS)

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Keywords: Data center; Phase change materials; brid thermal management system; Thermo-electric coordination

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Keywords: Carbon Border Adjustment Mechanism (CBAM), carbon cap, cost estimation, decarbonization, Emission Trading System (ETS)

Electricity at EU borders under CBAM: Assessing future costs and strategic implications for Bosnia and Herzegovina

A. MERZIĆ¹, A. KAZAGIĆ², Z. BAJRAMOVIĆ³

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Keywords: Cross-Border Trading, Economic Feasibility, Investment Sensitivity Analysis, Renewable Energy Integration, UHVDC Transmission

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S. SONG, W. SHIN, S. LEE, J. Y. YOON

Korea Electrotechnology Research Institute

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G. MAJSTROVIĆ¹, N. HEGER², M. JAŠIĆ³

¹Energy Institute Hrvoje Požar, Croatia; ²GlZ, Germany; ³GlZ, Bosnia and Herzegovina

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Energy Institute Hrvoje Požar, Croatia

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Keywords: Decarbonisation, hybrid systems, energy storage, flexibility, curtailment

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Keywords: infrastructure resilience, infrastructure investment, electricity networks, climate adaptation, physical climate risks, resilience metrics

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Y. ZHOU¹, O. PRITCHARD¹, J. M IAN¹, C. HIGGINS¹, T. CHIKOHORA²

¹Arup UK; ²National Grid Electricity Transmission UK

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Keywords: Transmission planning, network expansion, energy system modelling, spatial optimisation

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L. WOOLHOUSE, M. BARNACLE, S. DOHERTY, R. WILSON, B. KURI, D. OKEKUNLE

SSEN Transmission UK

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Keywords: Electric power system, Transmission capacity, Congestion, Dynamic line rating, Temperature uprating, System protection scheme, Bidding zone, Flexibility, Risk, Non-firm grid connection

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Keywords: archipelago, capacity, grid, interconnection, MVDC, NEOM, planning, power

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A. OUDALOV¹, S. PORRAS APARICIO¹, C. BALZER², A. KHAKPOUR², R. BHATTARAI³, N. SINGH³, M. STOECKLI⁴

¹Hitachi Energy Switzerland; ²Hitachi Energy Germany; ³ENOWA NEOM Saudi Arabia; ⁴ELECTROSUISSE / CIGRE Switzerland NC Secretary

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Strategic Allocation of Lines, Capacity, and Grid-Forming Inverters to Improve Fault Tolerance in Renewable-Rich Network

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¹Graz University of Technology; ²Northeast Electric Power University

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Topics: C1 PS2 - Strategic investment decisions in the context of the energy transition

Keywords: Market Simulation – Open-Source Modelling – Cross-Border Capacity – Private Investment – Project Finance – Apollo-Link

Private Capital for HVDC Interconnectors in Europe: Techno-Economic and Policy Insights

W. HRIBERNIK^{1,3}, S. S. LANDWEHR-ZLOCH², D. SIEBENHOFER³, J. FANALS I BATLLORI⁴

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Topics: C1 PS2 - Strategic investment decisions in the context of the energy transition

Keywords: Data, Driven, Power, System, Planning

Data-Driven Power System Planning using Machine Learning for Load Clustering Identification

C. Y. FOON

Tenaga Nasional Berhad, TNB

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS2 - Strategic investment decisions in the context of the energy transition

Keywords: system integration, power to gas, flexibility, hydrogen, storage, security of supply, regionalization

Design of an integrated electricity fuelled energy system and the systemic roles of hydrogen

A. JONGEPIER, T. ALDERS, F. VAN ALPHEN, E. SAHNI

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS2 - Strategic investment decisions in the context of the energy transition

Keywords: Impulsive wave energy; Hydrogen production by electrolysis of water; Isolated island microgrid; Multi-energy flow coupling Platform

Scheduling Strategy for Movable Electricity-Hydrogen Supplier Powered by Impulsive Wave Energy

L. ZHAO, L. GUO, X. LIN

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Transmission Clusters in Northern Ireland – Optimising the Connection of New Renewable Generation

R. DAVISON-KERNAN

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Improved transformer condition monitoring and improved assessment of the impact of small-scale generation

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A Planning-oriented Contingency Analysis Tool for Custom Power System Models Beyond Native Capabilities of Widely Adopted Power System Software

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¹Smart Wires Inc. Greece; ²VELCO USA; ³Smart Wires Inc. Italy

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Upskilling needs for the Energy System to support the Energy Transition in Europe with a focus on digital skills ETIP SNET WG4 – Digitalisation of the Electricity

A.-G. CHRONIS¹, P. KOTSAMOPOULOS¹, N. HATZIARGYRIOU¹, M. Á. SANCHEZ FORNIE², C. M. DOMINGO², M.-R. SCHULZ³, M. C. JIMENEZ⁴

¹National Technical University of Athens Greece; ²Universidad Pontificia Comillas Spain; ³Siemens Energy Germany; ⁴EPRI Spain

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS2 - Strategic investment decisions in the context of the energy transition

Keywords: Photovoltaic (PV) Power Generation, Energy Storage Systems (ESS), Forecast Deviation Penalties, Economic Viability

Optimal Operation and Economic Analysis of Photovoltaic Power Plants with Energy Storage Systems

M. CHENG¹, S. ZHU², J. LIANG³, X. LAI⁴, S. LU⁵

¹Electric Power Research Institute, China Southern Power Grid Co., Ltd. China; ²Electric Power Research Institute, China Southern Power Grid Co., Ltd. China; ³Electric Power Research Institute, China Southern Power Grid Co., Ltd. China; ⁴Electric Power Research Institute, China Southern Power Grid Co., Ltd. China; ⁵Electric Power Research Institute, China Southern Power Grid Co., Ltd. China

C1 PS3 - Planning the cyber-physical system

ID: 10744

C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS3 - Planning the cyber-physical system

Keywords: Audit-Ready Evidence Repository - Inverter-Based Resource - Lifecycle Configuration Management - Model Quality Testing - Plant Information Governance - Regulatory Compliance - Structured Data Extraction

Revolutionizing IBR Asset Management, Plant Model Development and Testing, and Compliance Across the Asset Lifecycle

R. QUINT^{1,2}, T. SCARAMELLINO², K. THOMAS¹, K. SAMARASEKERA³

¹Elevate Energy Consulting, United States of America; ²GridStrong, United States of America; ³Elevate Energy Consulting, Canada

ID: 10954

C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS3 - Planning the cyber-physical system

Keywords: Watt and Bit, MESH, Cyber-physical system, Distributed energy resources, Sector coupling, Data centres, Utility 3.0, Resilience, Grid flexibility, AI-driven control

MESH: A Cyber-Physical Energy Architecture for Sustainable and Resilient Infrastructure

K. YAMAKI¹, Y. UMAHASHI², H. OKAMOTO¹

¹TEPCO Power Grid Japan; ²Central Research Institute of Electric Power Industry Japan

ID: 11496

C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS3 - Planning the cyber-physical system

Keywords: Machine learning, Power System stability, Artificial Intelligence, GNN, LGBM

Enhancing the planning of power systems through Artificial Intelligence in real multi scenarios within a decarbonization context

E. LORENZO CABRERA, J. GALLEGU FERNÁNDEZ, D. P. MORÁN RÍO, L. MATEO SÁNCHEZ

Red Eléctrica, Spain

ID: 11843

C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS3 - Planning the cyber-physical system

Keywords: Cyber-flexible security service, resilience, adversarial attack, uncertainty

Cyber-Flexible Security Planning for Renewable-Rich Power Systems Under Adversarial Attacks

G. MOKRYANI¹, S. NIKKAH², D. GIAOURIS², A. RABIEE³

¹Jacobs, Future Energy and Power Systems Team United Kingdom; ²Department of Electrical School of Engineering, Newcastle University, Newcastle upon Tyne United Kingdom; ³Department of Electrical and Computer Engineering, Université Laval, Quebec Canada

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS3 - Planning the cyber-physical system

Keywords: capacity expansion model, scenario uncertainty quantification, machine learning, Bayesian Neural Networks

Machine Learning-Based Uncertainty Quantification in Capacity Expansion Models

A. OUDALOV¹, Y. SHALTOUT¹, G. MAVROMATIDIS², A. UPADHYAY², M. STOECKLI³

¹Hitachi Energy Switzerland; ²EMPA Switzerland; ³ELECTROSUISSE / CIGRE Switzerland NC Secretary

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: C1 PS3 - Planning the cyber-physical system
Keywords: Cyber-Physical System Planning, Power System Simulation, Special Protection Schemes

Cyber-Physical Integration of Special Protection Schemes in Thailand: From Simulation to Real-Time Operation

A. LEKKRUASUWAN, S. PATCHANEE

Electricity Generating Authority of Thailand (EGAT)

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Data-driven distribution network expansion planning for hosting new green investments

A. DIMEAS¹, A.-R. LAGOS¹, D. LAGOS¹, A. L. A. SYRRI¹, A. GATOS¹, J. KARAKITSIOS¹, S. KARRAS¹, M. SYMPONI², D. SELIMIS², M. KOUTSOUPIDOU², V. BOGLOU², G. E. LAZARIDOU², T. VASILEIOU²

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C2 POWER SYSTEM OPERATION AND CONTROL

C2 PS1 - Advanced decision support, training and skills for control room personnel

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Constraints for real world transmission topology optimization in transmission grids

N. WESTERBECK¹, C. MERZ¹, J. VAN DIJK², J. VIEBAHN², D. WITTHAUT³

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: Congestion - Forecast, Decision - Support, Dynamic - Reliability - Margin, Probabilistic - Forecasting, Security - Analysis, Transmission - System - Operator

Enhancing Congestion Forecast for TSOs: a Probabilistic Approach

S. KOP¹, P. ARTOISENET², G. MARZANO², A. JAYAN², D. ZHURAVLOVA¹, S. KUNTHIA¹, N. VERSTRAETE², J. BAUSIER²

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: Congestion Management, Topological Remedial Actions, Substation Reconfiguration, Decision Support, Artificial Intelligence, MLOps, Grid Model Management, Substation Inventory, Topology Equivalence Class, Topology Inventory

GridOptions 2.0: Advancing real-world decision support for topological remedial actions

J. VIEBAHN¹, D. BARBIERI¹, H. BUDAYA¹, J. VAN STERKENBURG¹, S. KOP¹, J. VAN DIJK¹, M. JOTHY², V. RENAULT²

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: Fault Location - Grid Resiliency - Synchronized Measurement - Synchro-waveforms - Operations Analytics - Real-time Grid Operations

Advanced Decision Support for Grid Operators Using High-Resolution Optical Sensing and Wide-Area Synchronized Measurements in Puerto Rico

S. E. VEGA BLASINI¹, F. RODRIGUEZ-COLON¹, F. RAHMATIAN²

¹LUMA Energy ServCo, LLC, United States of America; ²NuGrid Power Inc., United States of America

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: Voltage Control - Reactive Power Coordination - Security-Constrained Optimal Power Flow (SCOPF) - Look-Ahead Optimization - Inter-Temporal Constraints - Inverter-Based Resources (IBRs) - Control Room Decision Support

Integrated Framework for Advanced Voltage Management in High Renewable Penetration Systems: From Reactive Power Coordination to Look-Ahead Optimization

F. MAGNAGO, N. VEMPATI, R. TREINEN, R. EMAMI, M. SADAGOPAN

Resource Innovations, United States of America

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: Artificial intelligence, Voltage control, Reactive power control, Photovoltaic

Utilization of Artificial Intelligence for Voltage and Reactive Power Control and Its Operational Results

A. FUKUZAWA, K. ASAMI, S. OSAKI

Chubu Electric Power Grid Co., Inc. Japan

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: Synchrophasor PMU, WAMS, data quality, reliability

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Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: OTS, Operator Training, Dynamic Simulator

System Operator Training using Simulators in Steady-State and Transient Regimes

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ONS Brazil

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: Energy-Meteorology, Potential Maximum Power Demand Error (PMPDE), Behind-the-Meter (BTM) Solar, Grid Stability, Renewable Energy Curtailment

The Reality of Power System Operation in the Era Where Weather Becomes Fuel: The Fierce Battle of PV Curtailment in Korea's Spring of 2025

H. KIM, H.-G. SON, K. S. LEE, C. G. LEE

Korea Power eXchange

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: Forecasting system, Photovoltaic

Development of Electricity Demand Forecasting System in Korea Considering the Volatility of Photovoltaic Power Generation

H.-G. SON¹, H. KIM¹, K. LEE¹, C. G. LEE¹, K.-b. SONG²

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ID: 11427

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: Power System - Automation – Voltage – Reactive Power – Management – Regulation

The Evolution of Hierarchical Voltage Regulation and Reactive Power Management System in Poland's Transmission Network During the Energy Transition

Ł. CZAPLA², M. GŁAZ¹, J. JEMIELITY², P. KOLENDO²

¹PSE S.A., Poland; ²Institute of Power Engineering - National Research Institute, Poland

ID: 11665

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: Adverse condition, dynamic response, frequency, overhead line (OHL), storm Éowyn, SQSS

Strategic operational management of GB National Energy Transmission System during extreme events: Storm Éowyn

P. SARKAR, B. BONJESI

National Energy System Operator UK

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SIPS – the Unknown Superheroes of the Power System

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Towards Automated Fault Diagnosis in Power Transmission Lines Using AI From Data to Real-Time Decision

J. CARREÑO

ENLAZA

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: copula, cascading failure, exceptional contingency, outage validation, probabilistic risk assessment

Risk-based probabilistic System Security Assessment: Swissgrid's Approach from Operational Planning to real-time System Operation

D. RAOOFSHEIBANI¹, D. BERTI¹, F. IANNUCCI¹, A. TOLETTI¹, H. MATTIAT¹, O. HAUBENSAK¹, S. DELEERSNYDER¹, B. GRAND¹, M. STOECKLI²

¹Swissgrid Switzerland; ²ELECTROSUISSE / CIGRE Switzerland NC Secretary

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: decentralized optimization, network security analysis, remedial action optimization, TSO-DSO coordination

OPTESO: An innovative Approach for global OPTimality with limited date Exchange between Transmission and Distribution System Operators

A. TOLETTI¹, R. WU¹, M. BUCHER¹, C. O' MALLEY¹, M. STOECKLI²

¹Swissgrid Switzerland; ²ELECTROSUISSE / CIGRE Switzerland NC Secretary

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: Transmission system incidents, Regional coordination, Security analysis, Contingency management, System resilience.

Operational Security Challenges in the Western Balkans: Lessons Learned from the 2023 and 2024 Regional Grid Incidents

A. KRLJAŠ, T. MILOVANOVIĆ, M. GAČIĆ

Security Coordination Centre SCC Ltd. Belgrade, Serbia

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Advanced decision support for operation of converter-dominated grids with low inertia utilizing a modular development and testing framework

C. HEISING¹, M. HANNA², T. DEGNER³, S. RUHE⁴

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Open-Source State Estimation in 50Hertz MCCS Project

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¹Anfimau Industry Solutions Greece; ²Anfimau Industry Solutions Poland; ³Fraunhofer IEE Germany

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS1 - Advanced decision support, training and skills for control room personnel

Keywords: Operating-Procedures, Training-Programs, Situational-Awareness, Roadmap

A roadmap toward process excellence and digital integration shaping the next generation of Operating Procedures

H. ANGELKORTE¹, A. LIRA², A. SILVA³, A. NEVES⁴, G. AMBONI⁵, H. MENEZES⁶, K. CALDEIRA⁷, R. AZEVEDO⁸

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C2 PS2 - Maintaining operational reliability through flexibility

ID: 10435

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: Advanced decision support, training, skills for control room personnel

Enhancing Resource Adequacy Monitoring in the Indian Power Sector through Real-Time Day-Ahead and Intra-Day Decision Support Tools

S. SINGHA*, S. DEEP, K. KALITA

Grid-India, INDIA

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: Dynamic, Islanding, Readiness, Scheme (DIRS)

Dynamic Islanding Readiness Scheme (DIRS): Real-Time Grid Resilience through Automated Load Balancing

S. DALVI*, M. GOLE, R. MHATRE, A. CHANDRAKAR

Tata Power, INDIA

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: Grid-Forming STATCOM, Grid-Following STATCOM, Synchronous Condenser, Renewable Energy Integration, System Inertia, Frequency Stability, Voltage Control, Inverter-Based Resources, Indian Power Grid, Dynamic Grid Support

Simulation Based Comparative analysis of STATCOM, Grid forming, Grid following and Synchronous Condenser Technologies for Renewable integration in the Indian Grid

P. KALKY*, S. BHATTACHARYA, A. ARORA

GE Vernova T&D India Ltd, INDIA

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: Battery energy storage systems, demand response, fast frequency response, frequency nadir, governor response

Optimizing Battery Energy Storage Systems (BESS) for grid stability in South Africa

N. GUMEDE, M. NTUSI, M. MALEMATJA, T. MODISANE

National Transmission Company South Africa (NTCSA)

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: Black-start, Energy Transition, Flexibility, Resilience, Restoration

Leveraging grid flexibility for enhanced system restoration in South Africa: A Black-Start operational framework

L. NAIDOO

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ID: 10850

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: Security analysis, probabilistic load flow, forecast error model, Schaafe Shuffle technique

A probabilistic congestion signal for optimal management of battery storage systems

A. MARIÉ, T. LECHAT, E. LITTLE, A. BRETON

RTE France

ID: 10853

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: Flexibility assessment, Prospective studies, Reserve requirement, ANTARES, MAUI

Modeling Prospective Reserve Requirements: A Probabilistic Framework Applied to the French Power System

A. AKGÖNÜL, V. TERRIER, P. PLESSIEZ

RTE France

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: Uncertainty Management - Reliability and Efficiency in Grid Operation - Net Uncertainty Forecasts - Dynamic Reserve Requirements - Time-Series Forecasting - Classification

Dynamic Reserve: Data-Driven and Market-Based Uncertainty Management for Grid Operations

A. GHESMATI, C.-H. TSAI, C. WANG

MISO-Energy, United States of America

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: low-carbon energy, wind power plant, wind power generator, power system flexibility, reliability, secondary active power control, hydro power plant, RES

Using RES Generation to Control the Frequency and Active Power Flows of the UPS of Russia for Developing of Flexibility Services and Power System Reliability Improvement

E. SATSUK, E. SOVBAN, A. DEMIDOV, S. UTTS

JSC SO UPS

ID: 11317

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: Inertia, Renewable Energy Sources, Frequency Stability

Strategies for Inertia Assessment and Provision in Power Systems with High Renewable Sources

F. FERREIRA¹, B. PESTANA¹, F. ALVES¹, R. ZYMLER¹, R. BOTTINO¹, G. TARANTO², V. NEUMANN³, E. SODRÉ⁴, R. FERNANDES⁵, P. GOMES⁶

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

An Innovative Special Protection Scheme with Energy Storage and Demand Response in LCC Bipoles

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ID: 11335

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: Brazilian Interconnected Power System, Climate change, Dynamic security assessment, Special operational configuration, Transmission limits

Special Configurations and Transmission Limits for the Operation of the Brazilian Interconnected Power System During Periods of Extreme Drought

R. L. SINDER, R. M. AOUN, R. P. BATAGLIOLI, F. C. JUSAN

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: Flexibility, Machine Learning, Operational Planning, Power System Operation, Time-Series Load Flow

Flexibility assessment from the operational perspective in the Finnish Transmission Network

A.-J. NIKKILÄ, M. KANERVA, M. VIRTANEN, L.-K. VÄISÄNEN, E. IHALAINEN, T. ASP

Fingrid Oyj

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: Frequency Stability, Fast Frequency Control, Low inertia, Damping

Design considerations for Fast Frequency Control in the Nordic Synchronous Area

H. EKESTAM

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Automatic Generation Control in a Renewable Era: A GCCIA Perspective

S. AMER, H. ALZHRANI, N. ALSHAHRANI, R. ALMAGABE

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ID: 11732

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: NPP, FCR, PFR, Nord

PProviding FCR-N with BWR in a Nordic context

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Forsmark/Uppsala University

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Probabilistic Assessment of Seasonal Power System Reliability in Jordan Integrating Renewable Variability

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ID: 12062

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: Energy Storage, Impact of Renewable Energy on Grid, Operational Flexibility, Smart Grid Technologies, Variable Renewable Energy (VRE)

A Case Study of Addressing Challenges of Renewable Energy Integration in Thailand

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

An Optimization-Based Framework for Real-Time Power System Operation: The Colombian Experience

R. JARAMILLO¹, J. TOBON², J. VALENZUELA³

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Topics: C2 PS2 - Maintaining operational reliability through flexibility

A Methodological Framework for Assessing Grid and DER Technologies to Provide Flexibility Service in the Colombian Power System

J. A. ZAPATA¹, J. D. MOLINA², M. MURIEL³

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ID: 12429

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS2 - Maintaining operational reliability through flexibility

Keywords: .VSC-HVDC, dynamic capacity, Transmission Capacity Management (TCM), offshore

Increasing Offshore Wind Infeed Using HVDC Dynamic Capacity in Transmission Capacity Management

J. REIFSCHNEIDER¹, R. FELLER¹, E. HASCHEN¹, K. SCHOENLEBER², F. NEUMANN¹, L. WIMMER¹, E. WEGNER¹, M. THIELE¹, S. SCHMITT²

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C2 PS3 - Power system dynamics and control in operations

ID: 10103

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: dynamic security assessment, grid inertia, sub-synchronous resonance, sub-synchronous oscillation, transient stability, voltage stability

Online Dynamic Security Assessment – A Key to Enhancing Observability and Stability in IBR-dominated Power Systems

T. A. TRAN¹, T. A. NGUYEN², H. B. VU¹

¹Applied Technical Systems JSC, Vietnam; ²Vietnam PRP Corporation

ID: 10138

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Submarine Cables, Frequency, Underfrequency Load Shedding (UFLS) Program

Development of a New Underfrequency Load Shedding Scheme for the Penghu Island Power System

Y.-H. CHANG*, Y.-F. WANG, L.-T. TSAI

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ID: 10216

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Power System Stability, Weak Interface, Total Transfer Capacity, Automation, Real-time calculations

Fast Online Stability Monitoring Trough Identification of Weak Interfaces in Bulk Power Systems

V. PAVLOVSKY¹, L. LUKIANENKO¹, V. HRECHKO¹, V. ZAYCHENKO²

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Under Non-Credible, Contingencies, AC Interconnectors

Managing South Australia's Power System Under Non-Credible Contingencies with two AC Interconnectors

D. PERERA, H. KLINGENBERG, J. BAKER, A. ALISPHIC, R. HEWESTON

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Frequency, Stability, Indian, Power, System, Measurement

Assessing the Impact of Increasing Non-Synchronous Generation on Frequency Stability in the Indian Power System using Measurement-Based Inertia Estimation

A. KUMAR^{*}, A. GAUTAM, M. K. GUPTA, V. PANDEY

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Offshore, Wind, Study, LVRT, HVRT, Reliability

A Study on System behaviour During Different Operating Conditions of Offshore Wind Farm – In Context to the First EHVAC Grid connected Offshore Wind Farm of India

S. RAY^{*1}, A. K. SONI¹, S. SHEKHAR², A. KUMAR¹

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: PMU - Dynamic Phasors - Real-Time Model - State Estimation - Visualization - Animation

Power System Dynamic State Tracking Under Normal and Disturbance Conditions

S. MELIOPOULOS¹, G. COKKINIDES¹, R. ELMOUDI², C. BLACK³, A. KUMPF³

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Oscillations - Operational Experience - Monitoring - Operator Alarms - Synchrophasors

Operational Experience with Synchrophasor-Based Oscillation Monitoring at RTE France

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Forced Oscillations - SCADA - Inferential Statistics - Source Location

Detection and Analysis of Oscillation Events with SCADA-Based Statistical Algorithms

S. S. SHIUAB¹, V. VENKATASUBRAMANIAN¹, V. K. JANDHYALA¹, G. TORRESAN², R. CLEMENT²

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Continental Europe Synchronous Area System (CESAS) - Inter-area Oscillations - Phasor Measurement Unit (PMU) - Synchrophasor - Wide-Area Oscillations Damping Controller (WADC) - Wide-Area Monitoring, Protection and Control (WAMPAC)

Deployment and Operational Experience of an Adaptive Wide-Area Damping Controller at the Italian Power Grid to Mitigate Continental Europe North-South Mode Oscillations

E. FARANTATOS¹, L. ZHU¹, H. WANG², Y. ZHAO², Y. LIU³, G. GIANNUZZI⁴, G. MICCIONE⁴, G. SIANO⁴, P. PAU⁴, S. CASULLI⁴, G. GEMELLI⁴, L. S. AVELLINO⁴, R. CARROLL⁵, C. LACKNER⁵

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Rotor Angle Stability - Transient Stability Analysis, Contingency Screening, Extended Equal Area Criterion, EEAC

Lessons learnt on the EEAC method for fast contingency screening on RTE use-cases

R. CLEMENT, A. GUIRONNET, P. STEVENIN

RTE France

ID: 10957

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Frequency quality degradation, Frequency stability, Load frequency control

Frequency Quality Degradation and Measures in Western Japan

T. ISHII¹, F. TANIGAWA¹, S. DEGUCHI¹, S. MIYAKE¹, T. KAWAGUCHI¹, K. TOKUMITSU², J. TAMURA²

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Cross-border, Frequency, Load Frequency Control, Secondary Control Reserve, Stability

Development of Cross-border Load Frequency Control for the Japanese Power System

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Central Research Institute of Electric Power Industry Japan

ID: 11123

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Machine Learning, Power Grids, Dynamic Stability Assessment, Awareness System

"Practical implementation and Operational Experience of Machine Learning Surrogate Model for Real-Time Dynamic Stability Assessment of the Italian Power System"

G. GIANNUZZI

TERNA

ID: 11124

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Model Predictive Control, Reactive Power Management, Secondary Voltage Control

"Offset-Free Model Predictive Control for Secondary Voltage Regulation: Field Validation on the Italian Transmission Network"

S. TESSITORE

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ID: 11125

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Grid-forming; Damping; Inter-area oscillations; Power system dynamics; Power system control; Wide-area damping control; WADC

Wide-area damping control schemes with grid-forming as actuators

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Power system stability, special protection schemes, interconnections, synchronous operation of power systems, emergency control system, control actions

The Experience of Wide-Area Automatic Centralized Emergency Control System Coordination in Power Systems of Different Countries to Improve the Power System Stability

E. SATSUK, Y. LUZHKOVSKII, D. SAFONOV, D. LOTSMAN, I. OKSHIN, S. UTTS

JSC SO UPS

ID: 11205

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Oscillations, Monitoring, Phasor measurement unit, Phasor data concentrator, Field test

Methods and Techniques for Ensuring the Oscillatory Stability of the Russian Power System

A. GERASIMOV¹, R. IZMAILOV¹, A. SMIRNOV¹, E. SATSUK²

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ID: 11206

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: process visualization, rendering, synchronophasor measurement data, situational analysis, imbalance, low-frequency oscillations, PMU, WAMS

Monitoring the Power System Operating State using 3D Visualization based on PMU Data

O. ZHURAVLEVA¹, N. VOLKOVA¹, O. OPALEV¹, E. SATSUK¹, R. RADIONOV²

¹SO UPS, JSC; ²Alfa Level

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Control Centers - Electromechanical Oscillations - Power System Stability

Electromechanical Oscillation Index for Modern Power Systems

G. K. VENAYAGAMOORTHY^{1,2}, R. RATNAKUMAR¹

¹Clemson University, United States of America; ²University of Pretoria, South Africa

ID: 11307

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Sub-Synchronous Oscillation (SSO) – Oscillation Detection – Low Voltage Frequency Measurement – Inverter-Based Resource (IBR) – Phasor Measurement Unit (PMU)

Innovative Data Analytics of Low Voltage Frequency Measurements for the Detection of Power System Oscillations

A. KORIE¹, G. TAYLOR¹, J. SANCHEZ CORTES², J. ABRAHAM-KODMON², S. PIL OE³, T. HUUHTANEN⁴

¹Brunel University UK; ²NESO UK; ³Reactive Technologies Ltd UK; ⁴Reactive Technologies Ltd Finland

ID: 11321

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Frequency Stability, Voltage Stability, Power Grid Simulation, DSA

Indexes to monitor frequency and voltage stability at operational time frame

X. VIEIRA FILHO¹, J. JARDIM², E. TEICH², D. SOUZA¹

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ID: 11322

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Dynamic Security Assessment, PMU, Angle Difference Monitoring, Operational Awareness

Dynamic Security Assessment of Bulk Transmission Using PMUs

F. ALVES, H. VOLSKIS, A. MOUCO, V. MISSAGIA, J. MINGORANCA, L. FREITAS

ONS Brazil

ID: 11323

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Synchrophasor, PMU, Effective Inertia Estimation, Ambient Data e System Identification

Monitoring Effective Inertia via Ambient Synchronized Phasor Measurements

B. PESTANA¹, G. N. TARANTO², T. M. L. ASSIS³

¹ONS Brazil; ²COPPE/UFRJ University Brazil; ³National Grid United Kingdom

ID: 11325

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Synchrophasor, PMU, WAMS, Brazilian Power Grid

Optimal PMU Allocation for a WAMS-Based EMS in the Brazilian Power Grid

A. MOUCO¹, H. VOLSKIS¹, V. MELO², J. LONDON²

¹ONS Brazil; ²USP University Brazil

ID: 11331

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Power oscillations, Interconnected Power Systems, Transmission System

Impacts of electromechanical oscillations on the operation of the Itaipu 50Hz interconnected power system

J. R. PESENTE¹, A. J. MEZGER²

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ID: 11481

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Wideband oscillations, port-Hamiltonian energy model, energy flow path, oscillation source localization

Instantaneous Energy Dynamics of Wideband Oscillations in Inverter-Dominated Power Systems Based on Port-Hamiltonian Energy Model

N. MA¹, X. ZHANG², C. YIN³

¹Tsinghua University; ²Southwest Jiaotong University; ³State Grid Economic and Technological Research Institute

ID: 11499

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Power system stability; voltage control; reactive power balance; voltage instability; dynamic reactive power compensation

Magnetically Controlled Shunt Reactors as a Countermeasure against Cascading System Failures

V. CIOBAN, D. SHUVALOVA

Faramax, Spain

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

A Novel Approach to Sub-Synchronous Resonance Control & Detection Using Time-Domain Monitors & Image Processing Technique

W. KHARDAWI¹, M. ABIDO², N. IQBAL², U. KHAN², M. SHANMUGAM³

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Black Start (BS), Genetic Algorithm (GA), Blackout, System Restoration Plan

Optimal Restoration of the Power System in case of Black Start Using Genetic Algorithm

H. F. CARLAK¹, E. KAYAR²

¹Akdeniz University; ²Turkish Electricity Transmission Corporation

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Hybrid Phase Angle Monitoring Using PMU and Power Flow Models

R. RUBEŠA, K. MESIĆ, M. REKIĆ, Z. BUNČEC

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Change-point detection, Machine Learning, Sub-synchronous oscillations (SSO), Phasor Measurement Units (PMU).

Early Warning of System Oscillation Events based on Precursory Signs

K. KAWAL, Q. HONG, S. GUO, A. DYSKO, A. E. ALVAREZ, B. STEPHEN, C. BOOTH, N. NORDENA

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ID: 11948

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Maximum Loadability Index, Reactive Compensation actions, Real-Time Monitoring, Voltage Collapse Prevention.

Maximum Loadability Index Adapted for Dynamic Scenarios to Anticipate the Voltage Collapse Events

E. CHAPARRO¹, J. ANDRADE DOS SANTOS²

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Power System - Stability - Inter-area Oscillation - Damping - Island Test - Dynamic Model

Recent ENTSO-E Continental Europe Synchronous Area Extensions for Systems of Ukraine/Moldova (2022) and Systems of Lithuania/Latvia/Estonia (2025) – Continental Europe Perspective

A. MARQUES¹, R. WARZYWODA², M. WILK², J. VANDENDORPE³, J. MASSMANN⁴, M. CREMENESCU⁵, E. GREBE⁶, W. SATTINGER⁷

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Blackout, Inverter-based Resources, UFLS, PMU, Remedial Action Schemes

Dynamic Behaviour and Instability During the 2025 Chilean Blackout: Causes, Controls, and Systemic Impact

V. VELAR, R. ESPINOZA, E. QUINTANA, G. SANCHEZ

Coordinador Electrico Nacional

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Integrating Battery Energy Storage Systems for Primary Frequency Control: A Practical Implementation and Transformation Outlook from the Colombian Power System

O. A. TOBAR¹, J. E. CANDELO², F. HOYOS³, L. QUINTERO⁴

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Primary Frequency Regulation, Inverter-Based Resources, Dynamic Model Estimation, Virtual Compliance Testing, Synchronous Generators Monitoring

Monitoring and Compliance Evaluation of Primary Frequency Regulation in the Peruvian Power System

A. SUAREZ

COES SINAC

ID: 12228

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Frequency control, Inertia, System stability, System rigidity

System Rigidity: a unified Framework for enhancing Stability in low-inertia Power Systems

I. VOKONY, B. HARTMANN, I. TÁCZI, K. JUHÁSZ

Budapest University of Technology and Economics

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Power Transfer Capacity Optimization of a Radial Network using Battery Energy Storage Systems

J. FIGUEROA¹, J. HERRERA², N. TURTURICI³

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Balancing Cellular Autarky and System Frequency: An Inertia-Conscious Dispatch Concept

J. FRERK¹, A. KREIZER¹, M. ZDRALLEK¹, F. FLATTER², C. TROSSEN²

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ID: 12428

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: DC Chopper, DC voltage control, MT-DC Systems, grid-forming and grid-following, HVDC transmission systems

Possible contributions of MT-DC systems with grid-forming properties to AC system stability by providing inertia

A. HEBING, S. LI, J. HANSON

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Online Oscillation Detection based on PMU-Data in the Control System

N. PHILIPPI¹, S. LEKSAWAT¹, P. GIERL¹, S. DALHUES¹, T. PLETZER¹, C. FARKAS², G. SZÜCS², Z. GREGUS²

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ID: 12519

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: High-order Markov chain; Wind power output; First-order difference; Index similarity coefficient; Maximum likelihood estimation

Research on Short Term Wind Power Volatility Characteristics Based on High Order Markov Chain

R. MO, Y. HE, J. WANG, M. ZOU, J. SONG, L. MAO, Y. DAI

Hainan Power Grid Corporation

ID: 12520

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: High-temperature power-to-gas, Dynamic multi-parameter coordination, Maximum production point tracking

Dynamic Multi-Parameter Coordination for Enhanced Efficiency and Grid Responsiveness in High-Temperature Power-to-Gas Systems

X. HUANG¹, Z. LIAO¹, Y. YANG¹, P. LI², P. DAI¹, J. JIANG¹, Y. ZHUO¹

¹CSG Guangdong Guangzhou Power Supply Bureau; ²Tsinghua University

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Goodness of Fit, nodes clustering, PMU measurements, inertia estimation

Dynamic Power System Areas Formation for Continuous Inertia Estimation

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Interaction analysis, Sensitivity analysis, Converter-dominated system, Model order reduction, Reduced order modeling, Gramian analysis, Black-Box system

Interaction Studies in Converter-Dominated Power Systems with Cable Networks and Partial Black-Box Subsystems

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ID: 12632

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Renewable, standardized modeling, electromagnetic transient simulation, small signal stability analysis, control characteristics

A Preliminary Exploration of Standardized Modular Modeling Methodology for Renewable Generation Suitable for Power System Security and Stability Analysis

D. LU¹, Y. ZHU², G. PANG³, D. LI⁴

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ID: 12636

C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Limit time, Transient stability, Post-emergency operation, Critical angle, Iterative calculation, Relay protection, Dispatch control, Calculation cycle duration

Development of “Critical Time Calculation System” program for monitoring transient stability reserve at the dispatch center

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: C2 PS3 - Power system dynamics and control in operations

Keywords: Dynamic security assessment, analysis, monitoring, transient stability, frequency stability, small signal stability

Assessing the dynamic stability of the Slovenian power system

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C3 POWER SYSTEM SUSTAINABILITY & ENVIRONMENTAL PERFORMANCE

C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

ID: 10131

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: offshore, nature inclusive design, NID, stakeholder, co-creation, Natura 2000

Nature Inclusive Design for an artificial energy island – from ideation to implementation

J. MENTENS¹, R. DURINCK², N. BECK¹

ID: 10163

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Assuit West Combined Cycle Power Plant, Carbon Capture, Climate Change, Jojoba Trees, Sustainable Development, Water Scarcity.

Environmentally Sustainable Discharge of Treated Industrial Wastewaters in the Egyptian Power System: A Case Study of Assuit West Power Plant

M. MANSOUR¹, M. BEDROUS², I. ELSAWY¹

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ID: 10300

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: High-voltage substations, DSO, TSO, Biodiversity integration, Nature-inclusive infrastructure, Grid operators, Environmental governance, Harmonization, Monitoring frameworks, Sustainable energy transition, Ecosystem services, Infrastructure planning

Towards a nature-inclusive grid network: Identifying grounds for synergy in the Dutch grid operator sector

R.-P. VAN CAMPEN¹, P. OSKAM²

¹Alliander; ²Stedin

ID: 10301

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Offshore wind farms – Artificial reefs – Nature Inclusive Design – Offshore High Voltage Station – Biodiversity – Benthos – Remotely Operated Vehicle – Epifauna – North Sea

Lights, Camera, Biodiversity! ROV Video Insights from an Offshore High-Voltage Station and NIDs in the Dutch North Sea

E. M. KINGMA¹, O. BITTNER¹, A. HERMANS², M. VAN VELDHUISEN³, B. SCHILT³, G. SWINKELS³, S. JAARSMA³, R. NIJLAND¹, O. G. BOS¹

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Powerlines, Ospreys, distribution, raptor species

Powerlines and Ospreys: The challenges and opportunities of balancing a safe and reliable electricity distribution network with an iconic raptor species in New South Wales, Australia

N. HEGERTY, B. HAYWARD

Essential Energy, Australia

ID: 10341

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Biodiversity Offsetting

Biodiversity Offsetting: The Australian experience with case studies from the states of New South Wales and Western Australia

N. HEGERTY, B. HAYWARD

Essential Energy, Australia

ID: 10471

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Renewable Energy, Transmission, Distribution, Biodiversity, Mitigation, NatureInclusive Design, Preventive Measures, Corrective Measures, Lifecycle Management, Ecological Compensation, Habitat Restoration, Commissioning, Asset Management, End-of-Life.

Integrating Nature-Inclusive Design and Lifecycle Management for Biodiversity Positive Power System Infrastructure

A. TIWARI*, A. YADAV, A. DEVGUNE, S. k GUPTA

Power Grid Corporation of India Limited, India

ID: 10889

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Biodiversity Footprint, Disaggregated Indicators, Life Cycle Assessment, Pressures on Biodiversity, Environmental Indicator, Energy Transition

Forecasting Nature's Footprint: Co-Building Biodiversity Metrics for Tomorrow's Electricity Mix

C. SAINT-SIMON¹, R. DIXON², J. FRAIX³

ID: 10892

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Biomimetics, Submarine cables, Eco-design, Marine biodiversity, sediment erosion control

Offshore Experiment on Biomimetic Solutions aiming at limiting Sediment Erosion

S. ROCHWERGER, G. BUSATO

RTE France

ID: 10898

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Vegetation, machine learning, AI, biodiversity, integrated vegetation management, ecological corridor management, Lidar, Geographic Information System, remote sensing

Exploring the potential of remote sensing, digital tools and smart grids for ecological vegetation management in power line corridors

C. PELTIER¹, M. MURAIL², T. LARCHER¹, T. CHILOU¹

¹Think Smartgrids; ²RTE

ID: 10899

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Power line, submarine power cable, substation, telemetry, fishes, birds, imagery, video detection, elasmobranch, collision risk; Impact assessment; Efficiency of mitigation measures

Birds & fishes: Monitoring strategies to identify and assess impacts of submarine and aerial power cables

L. GARNIER¹, C. FOURDAN¹, H.-P. ROCHE², A. MILLON³, L. COUTURIER⁴, A. HEMERY³

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Indicator, power line, substation, vegetation management, submarine power cable, herbicide, biodiversity, impact, flora, fauna

Biodiversity indicators or bioindicators: useful examples for transmission grid operators

L. GARNIER¹, L. R  MY¹, M. PULICANI¹, C. KERBIRIOU², M. THIBAUT³, A. JOLIVET⁴, M. THIERRY⁵, G. MARTIN⁵

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ID: 10901

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Submarine power cables, marine biodiversity, mitigation measures, environmental monitoring.

Submarine cables and marine biodiversity: Feedback on implementing avoidance and minimization measures as well as monitoring environmental impacts

J. CHARVET, H. CLAUDEL, C. CORBEAU, G. MORIN

RTE France

ID: 10959

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Crow, Heron, Stimulus, Tactile, Wildlife

Application of Repellent Gel to the Surfaces of Transmission Towers for Wild Bird Management

M. SHIRAI

Central Research Institute of Electric Power Industry Japan

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Energy Transition, Curtailment, Intermittency, Ichthyofauna, Mitigation

Hydropower Operation and Fish Conservation: Challenges of a Changing Energy Matrix

R. C. LOURES, R. C. R. d. SOUZA, Y. M. CALDEIRA, A. C. L. R  GO

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Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Conversion of powerline right-of-ways: biodiversity, resilience, and local value in the face of climate change and wildfires

P. MARQUES¹, D. ALMEIDA¹, P. PACHECO²

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Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Birds nesting on pylons of transmission lines in Portugal: results of the first national-scale survey with proposal of measures to promote and protect species of higher conservation value

R. MARTINS¹, J. BERNARDINO¹, R. MORGADO¹, A. MEIRELES², M. ALMEIDA², J. LOPES²

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: GIS-MCDA, renewable energy siting, biodiversity impact, Pareto optimization, capacity factor, net ecological impact

Placement of Renewable Energy Sources-Based Power Plants Considering Biodiversity Impact Mitigation

A. BRAMM, A. KHALYASMAA, P. MATRENIN, S. EROSHENKO

Ural Federal University

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Natural capital, Mitigation Hierarchy, Compensation, Offset

Biodiversity compensation methodology based on natural capital & mitigation hierarchy

E. LÓPEZ, R. SAN MILLÁN

Red Eléctrica, Spain

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Analysis and assessment of impacts, dependencies, risks and opportunities related to nature in electricity transmission

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Medium voltage lines, power outage, bird collisions, bird flight diverters, mute swan

Prevention of Mortality and Power Outages on 22 kV Lines Related to Mute Swan Collisions by Using Bird Flight Diverters in Slovakia

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¹HOPS Ltd, Croatia; ²Raptor Protection of Slovakia, Slovakia

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Keywords: Biodiversity conservation, Bird species diversity, Collision mitigation measures, Transmission line design, Route selection, Ecological impact, Protected natural areas, Collision risk map, Migration corridors, Feasibility analysis, Multi-criteria evaluation

Development of Collision Risk Maps Between Birds and Power Transmission Lines with an Assessment of Applicable Mitigation Measures

N. CUROVIC¹, V. MISIC¹, A. BABIC², M. RAKOVIC³, S. SKORIC³, M. MILUTINOVIC¹, B. VUJIN¹

¹EMS, Serbia; ²GMS Consult, Serbia; ³University of Belgrade, Serbia

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

Reducing wildlife-caused outages and mortality in distribution substations - A systematic approach to risk, design, durable mitigation and conservation.

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C3 PS2 - Building a more sustainable power system for the future

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: renewable energy sources (RES), grid connection, evaluation methodology, environmental aspects, key performance indicators (KPIs), power system.

Enabling Efficient Integration of Renewable Energy Sources into the Grid: A Comprehensive Methodology for Assessing RES Site Suitability in Slovenia Based on Key Performance Indicators

A. CERK, K. A. LESTAN, R. VONČINA, N. MIKLAVČIČ, M. DJURICA, M. IVANOVSKI, D. KOVAČIČ

EIMV, Slovenia

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A closed loop business model: a significant contribution for European TSO's to face copper scarcity?

G. WAHIS

Elia Transmission Belgium, Belgium

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Circular Design, Design Phase, Environmental Passport, Life-Cycle Assessment, High Voltage Substation

A Life-Cycle-Based Environmental Passport for High-Voltage Substations

R. FASEL¹, J. BOYCE², R. DIJCKER², G. KOREVAAR³, J. DEN BREEJEN⁴, F. MIDDEL⁵

¹Hanab Energy Solutions; ²Witteveen&Bos; ³Rotterdam University of Applied Sciences; ⁴TenneT TSO; ⁵Prysmian

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: CLIMATE CHANGE ADAPTATION, PRAGMATIC FRAMEWORK, GUIDELINES, FEEDBACK

Climate Adaptation in Dutch Grid Infrastructure: A Guideline Based Framework with Adaptive Feedback

N. HUIJGEN, E. KARATAY, S. NAUTA

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Pathways, Decarbonization, Energy Transition

Alternate Fuels in Thermal Power Plants : Pathways to Decarbonization and Energy Transition

P. K. GUPTA, D. HALDER, S. MEHTA, A. SHARMA

NTPC Limited, INDIA

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Eco-design, Greenhouse Gas - GHG, Hydro, Emission, Impact, Global warming, SIMAPRO, ECOINVENT

Implementing Eco-Design at EDF HYDRO. Guidelines for Electrical Equipment

M. MULLER-FEUGA, D. HUBER

EDF

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Sustainable Procurement, Corporate Social Responsibility, Circular Economy, Decarbonisation, Green Technologies, Scope 3 Greenhouse Gas Emissions, Raw Material Passport

Advancing Sustainability and CSR in Procurement: A Collaborative TSO Perspective

M. MANTILLA¹, A. LAFRAGETTE¹, S. SUMER², M. MÖLTER², A. GUARNERI³, L. LUCKE¹⁰, R. DE JAMBLINNE⁴, F. KREITZ⁵, S. BOISSEL⁶, K. HOFER⁶, S. MOLINERO⁷, T. SOLBERG¹¹, V. SCHÄFER⁸, L. TRAN⁸, J. DOERRICH⁹, P. RANINGER⁹

¹RTE France; ²Amprion Germany; ³Terna Italy; ⁴Elia Belgium; ⁵50Hertz Germany; ⁶Swissgrid Switzerland; ⁷Redeia Spain; ⁸TenneT; ⁹APG Austria; ¹⁰TransnetBW Germany; ¹¹Statnett Norway

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Energy Planning, Climate Change, Climate Services, Pan-European Climate Database

Leveraging Climate Services to Build Climate Resilient Power Systems

L. DUBUS¹, A. TROCCOLI², A. ZUIKER³, L. STOOP⁴

¹RTE France; ²Inside Climate Service; ³ENTSO-E; ⁴TENNET

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Dynamic MFA, Power Transmission Grid, Circular Economy, Geo-economics, Uncertainty

Material Flow Analysis of Geo-Economic Tensions Affecting the Supply Chains of Low-Carbon Technologies: The Case of the Electric Grid

G. DOUMENC¹, S. MATHY², V. MARCADON¹, H. LE BOULZEC², A. DURANTE¹

¹RTE France; ²GAEL-CNRS

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Ecodesign, Digital asset, Software Defined Grids, open source, Standards, SWHID, SBOM, SPDX, Sustainable IT, ESPR

Harnessing Open-Source Standards for Sustainable Digital Design in the Energy Transition

B. DOLLEY¹, B. GUERRY², M. JAY³

¹RTE France; ²Software Heritage; ³TBC

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: LCA, Ecodesign, EPD, carbon footprint, emissions factor, High Voltage Product, Standards

Tools and methodologies to assess HV products' environmental impacts: state of the art and future trends

S. LAURENT, E. PEREZ, T. PISSARD-GIBOLLET, C. DUMOULIN, C. PERRIER, F. JACQUIER

GE Vernova

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Ecodesign, GIS, LCA, decision matrix, project, sensitivity analysis, Rethink

An innovative ecodesign methodology for a sustainable switchgear: the case of the new 245kV GIS

C. DUMOULIN¹, S. LAURENT¹, C. SANNIER², S. OMONT², C. CHARBUILLET³

¹GE Vernova; ²AMVALOR; ³ENSAM Ecole Nationale Supérieure des Arts et Métiers

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: CO2 Equivalent Emission, Evaluation Criterion, Life Cycle Assessment, Load Factor, Power Loss, Renewable Energy, Transformer

Impact of Evaluation Criteria of Power Loss in LCA

C. SUZUKI¹, S. AICHI², S. NOGUCHI², M. YOSHIDA¹

¹Chubu Electric Power Co., Inc. Japan; ²Chubu Electric Power Grid Co., Inc. Japan

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Damage assessment, GHG, Impact category, Integration, Land use, Life cycle impact assessment, LIME3, Switchgear

Life Cycle Impact Assessment and Weighting in Switching Station: Insights from a Case Study

R. TAKAHASHI¹, H. NODA², N. ITSUBO³

¹Toshiba Energy Systems & Solutions Corporation Japan; ²Toshiba Corporation Japan; ³Waseda University Japan

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Sulfur Hexafluoride, Calcium Fluoride, Decomposition, Gas-solid Reaction, Resources

Effect of the Fluorine Resource Conversion Process of SF6 Gas for a Circular Economy

S. YASUI¹, H. IWAMOTO², N. SUMIMOTO²

¹Nagoya Institute of Technology Japan; ²Sumitomo Densetsu Co., Ltd. Japan

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Environmental Impact Assessment; Environmental Licensing; Human Rights Due Diligence; Corporate Sustainability; Reporting Standards

Environmental Impact Assessment and Human Rights Due Diligence: Current State of the Art and Possible Convergences

P. VILLELA, D. SOARES
ELETROBRAS Brazil

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Photovoltaic Generation; Floating Photovoltaic Generation; Carbon Footprint; Water Footprint; Life Cycle Analysis

Conventional and Floating Photovoltaic Generation from a Life Cycle Perspective – Carbon and Water Footprint

D. MATOS¹, J. ABREU¹, M. RAMOS¹, I. RAUPP¹, A. MOLLIKA¹, K. GARCIA¹, J. G. LASSIO²

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Sustainable Development Goals; Environmental Performance; Sustainability; Energy Transition

The Role of SDGs in Shaping Sustainability in the Electric Power Sector

K. C. GARCIA¹, T. KATZ², J. d. BREEJEN³, M. MANTILLA⁴

¹CEPEL Brazil; ²Israel Electric Corporation Ltd. Israel; ³Tennet The Netherlands; ⁴RTE France

ID: 11102

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Carbon accounting, Carbon Border Adjustment Mechanism (CBAM), Decarbonization, Environmental Product Declarations (EPD), Life Cycle Assessment (LCA), Power transformers, Product Carbon Footprint (PCF), Regulatory compliance

Harmonizing EPD and CBAM methodologies for carbon footprinting of power transformers

R. SEGURADO SILVA, N. PINHO SILVA, I. ALVITE, Y. CAO, X. CHAO, N. SOUZA SILVA

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: sustainability, archaeological heritage, marine design

Integrating marine archaeology into HVDC marine cable design and realization

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Batteries, Components, Disposal, Energy Storage, Recycled

Environmental controls for Battery Energy Storage Systems

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

A data-driven approach for predicting and monitoring nitrogen oxides emissions of natural gas CCGT in power plants with neural networks

F. PEREIRA

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Energy Systems; Life cycle Assessment; Modular; Power Transformers; Regenerative

Modular and regenerative life cycle assessment indicators for sustainable power systems

G. MADUREIRA¹, M. VIEIRA¹, S. TAVARES¹, J. DIAS DE OLIVEIRA¹, S. SOARES², S. FÉLIX¹

¹UNIVERSIDADE DE AVEIRO; ²UNIVERSIDADE DO MINHO

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Sustainability in HVDC tenders and projects - A pathway to long-term value creation

M. STOLPE

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: SF6-free GIS, F-gas regulation, Strategic decision, Type testing, Reliability, Safety, Technical challenges, Transmission system

Application of SF6-free technology in the Swedish transmission system – overview of the challenges and strategic decision

A. SANDOVAL

Svenska kraftnät

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Transmission assets, impact of climate change, scenarios, exposure, risk calculation

Climate Risk and Vulnerability Assessment for the Croatian Transmission Network

S. CAZIN, D. MEDIMOREC

Croatian TSO Plc. (HOPS d.d.), Croatia

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: CCC, New OHL Optimisation, CO2 Emission Savings, Increased Span Length, GETs

Next Generation Overhead Lines with Carbon Core Conductors: Optimisation of Design Paradigm to meet the Needs of Energy Transition and reduced environmental Footprints

K. REICH¹, D. STRANNER¹, E. BOZSE², M. HAYDEN², W. HEISTER², K. HUGHES-STRAKA², C. LINTNER¹, N. GUERTIN²

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Decommissioning, Environmental Liabilities, Regulatory Frameworks

Beyond 2050: Decommissioning Frameworks and Environmental Liabilities of the Electricity Sector in the EU and Latin America

J. OSSANDON

Environmental Law Center, Faculty of Law, University of Chile

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Circular Economy in Power Transformers: Financial Opportunity and Climate Solution in Colombia

E. CANTOR¹, S. JARAMILLO², J. ALZATE³, C. CUTA⁴

¹Intercolombia; ²Intercolombia; ³Intercolombia; ⁴Intercolombia

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Impacts of Extreme Climate Events on Transmission Systems: Designing for the Next Generation of Grid Resilience

P. NARVAEZ

ESOURCE

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: circularity, sustainability, transformer, LCA, refurbishment, power system, ecodesign

Advancing Circularity in Transformers: Update on recent Solutions and Impacts

A. KOMAROVA¹, T. LANERYD², E. LINDGREN², G. KABLOUTI¹, S. ARREGUIN¹, M. STOECKLI³

¹Hitachi Energy Switzerland; ²Hitachi Energy Sweden; ³ELECTROSUISSE / CIGRE Switzerland NC Secretary

ID: 12315

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: carbon footprint, decarbonization, environmental impact, fluoronitrile, GIS, GWP, HVCB, LCA, sustainability, vacuum interruption

Standardization of LCA for environmental Performance Assessment of High Voltage Switchgear: A critical Evaluation of current Challenges and Needs

K. PANDYA¹, H. KIM², S. KIM², M. GOTTI¹, J. FREY¹, J. MANTILLA¹, M. STOECKLI³

¹HD Hyundai Electric Switzerland; ²HD Hyundai Electric South Korea; ³ELECTROSUISSE / CIGRE Switzerland NC Secretary

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: transformer, sustainability, measurement, assessment, comparative, customer, evaluation, framework, standard

A meta-analysis of Tranformer Sustainability evaluations based on Customers Practices, national level policies and voluntary standards in major markets around the world

G. KABLOUTI¹, N. ASNANI², Y. WIKSTROM³, M. STOECKLI⁴

¹Hitachi Energy Switzerland; ²Hitachi Energy India; ³Hitachi Energy Sweden; ⁴ELECTROSUISSE / CIGRE Switzerland NC Secretary

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Application of new IEC TS 62271-320 for the Evaluation of Life Cycle Assessment (LCA) Methodologies in High-Voltage Switchgear

H. LOHRBERG¹, M. GATZSCHE², A. LAGO³, J. HANSON¹

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ID: 12544

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: .

Use of bird discouragers to prevent bird nesting on lattice transmission towers and an analysis of corrosion resistant fastening technology used to ensure 40+ years service in polluted environments.

B. MCGOWAN

Scientias Energy, Hilti T&D

ID: 12563

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Multi-Criteria Prioritization of Climate Resilience Strategies for Electric Power Networks

E. G. GOULIOTI¹, A. V. GKIKI², C. A. CHRISTODOULOU¹, V. T. KONTARGYRI³

¹NTUA Greece; ²HEDNO Greece; ³UNIWA Greece

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS2 - Building a more sustainable power system for the future

Keywords: Electricity network, Grid losses, Impact categories, LCA, Sustainability, Life cycle

Life Cycle Assessment (LCA) for assessing the sustainability of high-voltage electrical infrastructure Application to the 150kV double-circuit overhead link of the Canino-Arlena power line to the Tuscania Power Station

D. GIORGIANNI

Terna Rete Italia S.p.A. Italy

C3 PS3 - Disclosing sustainability

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS3 - Disclosing sustainability

Navigating scope 3 emissions in the context of increasing grid investments facilitating the energy transition

V. DUFOUR, F. MELGAR, P. VON NORMANN, C. MARLET

Elia Group, Belgium

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS3 - Disclosing sustainability

Keywords: Accountability, ESG (Environmental, Social, and Governance), Greenwashing, Power transmission sector, Reporting standards, Stakeholder pressure, Sustainability reports, Transparency, Artificial Intelligence

Addressing Greenwashing in Sustainability Reports of Power Transmission Companies: Impacts and Solutions

N. SHUKLA*, S. DASARI, A J. RAO, L K KHAJKUMAR, N. SRIVASTAVA

Power Grid Corporation of India Limited, India

ID: 10480

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS3 - Disclosing sustainability

Keywords: Benchmarking, Business Responsibility and Sustainability Reporting (BRSR), Disclosure topics, Environmental, social, and governance (ESG), European Union's Corporate Sustainability Reporting Directive (EU CSRD), Global Reporting Initiative (GRI), Material

Towards Enhancing Sustainability Disclosures – A Comprehensive Analysis of SEBI's BRSR Framework

S. DASARI*, N. SHUKLA, A J. RAO, L KHAJKUMAR, N. SRIVASTAVA

Power Grid Corporation of India Limited, India

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS3 - Disclosing sustainability

Keywords: Integrated Reporting, Sustainability Disclosure, Stakeholder Perception, Scientometric Analysis, Bibliometric Mapping, VOSviewer, Corporate Transparency.

Scientometric Analysis of Sustainability Disclosure and Stakeholder Perception Research

A. TANDON*¹, A. CHOPRA¹, D. S. TANEJA²

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ID: 10890

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS3 - Disclosing sustainability

Keywords: Sustainability Reporting, Reporting Standards, ESG, Scope 3 Greenhouse Gas Emissions, Value Chain, Double Materiality, Energy Transition, Industrial Resilience, Due Diligence

Disclosing Sustainability: Throwback to First Sustainability Reporting – What Next?

M. MANTILLA¹, N. WLOCZYIAK², L. VIOLET¹, R. RAFALOWICZ¹

¹RTE France; ²London School of Economics

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS3 - Disclosing sustainability

Keywords: Primary data, Sustainable procurement, LCA, CSRD, TSOs, Data points, Verification

Unlocking Resilience: Detailed Equipment Data for Future-proof Transmission Grids

M. MANTILLA¹, G. HOESKULDSOTTIR², R. LÓPEZ³, R. DE JAMBLINNE⁴, V. SCHÄFER⁵, A. GUARNERI⁶, R. BARTH⁷, M. VÁZQUEZ⁸, E. FJORTOFT³, A. LAFRAGETTE¹

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS3 - Disclosing sustainability

Keywords: Social Participation; Social Monitoring Forums; Multi-stakeholders dialogue; Social License to Operate

Effectiveness of Social Monitoring Forums: Comparative Analysis of Belo Monte HPP, Santo Antonio HPP and Sitio Grande SHP

D. ROCHA, T. ALENCAR, V. CANÇADO

Ferreira Rocha Brazil

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS3 - Disclosing sustainability

A Paradigm shift in constructing the Transmission Grid in Korea

S.-K. HAN¹, D. LEE¹, J. S. KIM², H.-k. KIM², D.-H. HA³, J.-Y. YOON⁴, J.-Y. KOO⁵

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ID: 12068

C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS3 - Disclosing sustainability

Keywords: Double Materiality, ESG data reliability, Stakeholder Engagement, Sustainability Disclosure

Enhancing the Stakeholders' Trust through a Transparent Sustainability Disclosure: A case study of a Power Company in Thailand

S. WORPONG, W.-a. UDOMLUK, A. NAWAMON, W. NIRADA

Electricity Generating Public Company Limited (EGCO)

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS3 - Disclosing sustainability

Keywords: stakeholder requirements, investors, project, planning, social perception

Stakeholder Reporting Requirements - Impact of Disclosure on Social Perception and Acceptance

L. VUČINIĆ

Electric Transmission System of Montenegro - CGES

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS3 - Disclosing sustainability

Keywords: permitting process, public acceptance, stakeholder engagement, substation siting, underground cables

Improved Stakeholder Engagement Process and Transparency using geospatial Cloud Solutions

S. GRASSI¹, J. WANKE², M. STOECKLI³

¹GILYTICS AG Switzerland; ²A+S Energy Germany; ³ELECTROSUISSE / CIGRE Switzerland NC Secretary

C4 POWER SYSTEM TECHNICAL PERFORMANCE

C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

ID: 10102

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Physics-Informed Neural Networks (PINN), Short Circuit Ratio (SCR), Dynamic stiffness (DS), Direct dynamic stiffness (DDS), quadrature dynamic stiffness (QDS)

Physics-Informed Neural Networks (PINN) for Enhanced Power System Strength Assessment

O. AGAMALOV

TPSPP/Independent Researcher

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Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Open-source tools for frequency-domain stability analysis of black-box and white-box AC/DC grids

J. KIRCHEIS, F. J. CIFUENTES GARCIA, J. BEERTEN

KU Leuven, Etch/EnergyVille, Belgium

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Design of an Energy Hub for Stable Large-Scale Green Hydrogen

G. CHASPIERRE¹, G. MISYRIS², A. BROCHARD³

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Application of Passivity-Based Control Interaction Assessment and Mitigation in AC/DC Power Systems with Black-Box Models

D. LEE, F. J. CIFUENTES GARCIA, E. AVDIAJ, J. BEERTEN

KU Leuven/Etch-EnergyVille, Belgium

ID: 10162

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Continental Europe Synchronous Area - Dispatchable Virtual Oscillator - Droop - Grid-forming Inverter - Inter-area Oscillation - Renewable Energy - Virtual Synchronous Generator

Mitigation of Low-Frequency Inter-Area Oscillation Using Grid-Forming Inverters

L. ZHU¹, B. PAZ¹, D. RAMASUBRAMANIAN¹, E. FARANTATOS¹, G. GIANNUZZI², C. PISANI², G. COLETTA², G. MICCIONE²

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ID: 10183

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Grid Enhancing Technologies - Inverter-Based Resources - Locational Impact - Hosting Capacity - Frequency Response - System Strength

Dynamic Impact Assessment of High IBR Penetration and Grid Enhancement Technologies on Power Systems

D. RAMASUBRAMANIAN, M. SARWAR

Electric Power Research Institute, United States of America

ID: 10348

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Subsynchronous, Robust Data-driven, Grid-forming

Stabilisation of Subsynchronous Controller Interactions using a Robust Data-driven Grid-forming Control in e-STATCOM

S. HAJTALEB, S. ALI, M. RAVANJI, B. BAHRANI

Monash University, Australia

ID: 10350

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Commissioning, Large-scale Solar Plant

The Journey of Commissioning a Large-scale Solar Plant and the Lessons Learnt: Role of Pre-commissioning Platform

R. YAN¹, B. RAMESH¹, T. KUMAR SAHA¹, M. JOHNSON², M. PARKER²

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ID: 10396

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Inverter Capabilities, System Restoration, 100% IBR Power Systems

Grid-Forming Inverter Capabilities for System Restoration in 100% IBR Power Systems

S. GROGAN¹, N. CROOKS¹, B. BADRZADEH¹, E. PIUBELLINI³, T. BRINSMEAD², S. KHAN²

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ID: 10397

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Fault-Ride, Grid-forming Battery Energy, Synchronisation

Fault-Ride-Through Performance of Grid-forming Battery Energy Storage Systems: Observations and Analysis of Synchronisation

S. P. ME, C. TAN, M. KARIMPOUR

AEMO, Australia

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Modelling, Wide Area, RMS, Non-credible

Dynamic Modelling of Coordinated UFLS and DER Shedding in Wide Area RMS Studies of Non-credible Events

S. NELSON¹, J. WATSON¹, A. BRUGGEMANN¹, J. GAO²

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ID: 10492

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Hyperscale Data Centres

Frequency Stability Challenges and Solutions in Low-Inertia Power Systems with Hyperscale Data Centres

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Large, Inverter-Based Loads

Dynamic Modelling of Large Inverter-Based Loads: A Data Centre Perspective

B. BADRZADEH

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ID: 10507

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Challenges, Inverter-Based Resources, Modelling Needs

Protection System Challenges with Inverter-Based Resources: Insights, Modelling Needs, and Performance Recommendations

B. BADRZADEH¹, E. FARAHANI², N. MODI¹

¹Bespoke Energy, Australia; ²Australian Energy Market Operator, Australia

ID: 10508

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: inverters, frequency

Sizing grid-forming inverters to support grid-following inverters using frequency scan approach

N. MODI³, J. LU², D. RATHNAYAKE², S. SHAH¹

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ID: 10509

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Analysis, Modelling, Sub-synchronous Oscillations, Weak Grid

Analysis, Modelling, and Mitigation of Sub-synchronous Oscillations in a Weak Grid with High Inverter-Based Resources

E. FARAHANI¹, N. MODI³, A. JALAI¹, J. R. RAMAMURTHY¹, J. LU¹, D. PREMN², C. HARDT²

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ID: 10511

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: EMT Modelling, NEM 2034

System Services in an Inverter-Dominated Grid: Insights from EMT Modelling of the NEM through to 2034

S. GROGAN, B. BADRZADEH

Bespoke Energy Pty Ltd, Australia

ID: 10553

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Enhancing, Modern, Power Grid, Resilience

Enhancing Modern Power Grid Resilience: BESS Applications for Mitigating Fault/Event Induced Delayed Voltage Recovery Events (FIDVR) in High Space Cooling Load Environments

A. P. SINGH*, A. MODI, S. GHOSH, D. MONDAL

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ID: 10564

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Artificial Intelligence, Data Centres, Dynamic behaviour, Electrolyser, Load, Power quality

Load Characteristics of Emerging Bulk Loads – Electrolysers and Data Centres in the Renewable Energy Era

V. P. YERUBANDI*, A. PAL, M. GUPTA, V. BAGADIA, P. S. DAS, A. KUMAR

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ID: 10634

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Challenges in India's Low-SCR, IBR Dominated Grid

Overvoltage and Voltage Oscillation Challenges in India's Low-SCR, IBR Dominated Grid: Case Study of Partial Blackouts in RE-Rich Regions of India

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Enhancing Grid Resilience through STATCOM Deployment

Enhancing Grid Resilience through STATCOM Deployment with Field Experience and Simulation-Based Insights from Indian RE Zones

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ID: 10676

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Series Compensation - Subsynchronous Resonance - Subsynchronous Control Interaction - Subsynchronous Oscillations - Neutrality

Subsynchronous Neutrality of Series Compensated Lines

P. DATKA, B. GRAY, B. ENGLISH, N. ARMAN

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ID: 10682

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Oscillation - Spectral Analysis - Synchrophasor - PV Plant - Data Center

Suynchrophasor Data-Driven Investigation of Real-World Unstable Controller Dynamics

C. MISHRA¹, B. PUDASAINI¹, L. VANFRETTI², J. DELAREE JR.¹, K. JONES¹, M. MCVEY¹

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Energy Storage System - Data Center - Grid Support - Hardware-in-the-Loop

Leveraging Energy Storage to Accelerate Integration of Data Center Loads

S. MOROVATI¹, O. KITTANEH², T. EMA², A. ZAMANI², J. KRUGER², J. WILTSHIRE³, B. ROSENFELD⁴, S. VASILIC⁴, S. CORHODZIC⁴

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ID: 10724

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Modelica - Electromagnetic Transient (EMT) Simulation - Dynamic Link Libraries (DLL) - Interoperability

EMT Modeling and Simulation of Grid Forming Converters in Modelica Integrating the IEEE/CIGRE 'Real Code'/DLL Modeling Guidelines

L. VANFRETTI, H. CHANG

Rensselaer Polytechnic Institute, United States of America

ID: 10781

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Control and protection, EMT model, intellectual property, MMC, model validation, partially open software

Development of project specific EMT model based on partially open control and protection software

F. MORRETTON¹, M. RAMET², O. JASIM², S. DENNETIERE¹, P. RAULT¹

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ID: 10811

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Battery Energy Storage Systems (BESS) - Grid-Following Converter (GFL) - Grid-Forming Converter (GFM) - Subsynchronous Oscillations (SSO) - Point of Common Coupling (PCC) - Phase Locked Loop (PLL)

Battery Size Reduction via Frequency-Selective Damping for Subsynchronous Oscillation Mitigation

G. E. NORTH PIEGAN III, L. HUANG

George Mason University, United States of America

ID: 10859

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Data Center Modelling - EMT Modelling - Phasor Modelling - Impedance-Based Methods - Eigenvalue Methods - Small Signal Stability

Stability Assessment of Large Electronic Loads: Insights from Impedance and Eigenvalue Analyses

L. SUNDARESH, S. KONSTANTINOPOULOS, B. PAZ, D. RAMASUBRAMANIAN, S. DUTTA, P. MITRA

EPRI, United States of America

ID: 10903

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Electrolyser, synchronous machines, transient stability, grid integration

A case study on the impact of electrolyser behaviour during faults on transient stability

J. SIMOULIN, G. TORRESAN, J. CALLEC, A. GUIRONNET

RTE France

ID: 10904

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Wind turbine, EMT, generic model, offshore, offshore substation design, grid code compliance

EMT generic wind turbine model for offshore substation design

J. MICHEL, A. PETIT, E. MBEROU, P. RAULT

RTE France

ID: 10905

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Inter-area Oscillations, Power Electronic Interfaced Resources (PEIR), POD (Power Oscillation Damping) Controller, Robustness, Requirements

Analysis of classical SISO POD controller robustness for inter-area oscillations damping

P. ZOGHBY¹, A. GUIRONNET¹, G. TORRESAN¹, A. CEDENILLA-BOTE³, L. ROUCO², L. SIGRIST²

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Battery Energy Storage System - Grid-Forming Inverter - Grid-Following Inverter - Inverter-Based Resources - Power System Dynamics - Renewable Energy Systems - Electromagnetic Transient Modelling

System Impact Assessment of Grid-Forming Battery Energy Storage Systems

N. SMITH¹, A. THANT¹, E. MICKELSON¹, M. BESKAR², J.-M. BROWN²

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Voltage Stability - Screening - Inverter-Based Resources - Power Transfer Limit - Phasor Domain Analysis - Electromagnetic Transient Analysis

Dynamic Impedance Method (DZM) Stability Screening for Large Systems

M. RICHWINE¹, N. MILLER², A. SILER¹

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Impedance-Based Stability - Control Interaction - Harmonic Screening - Frequency Domain Screening

Impedance-Based Screening for Control Interaction Risk using Harmonic Impedance Sectors

S. DEENEY, S. ABDELWAHAB, A. JENKINS, D. ROOP

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: System Strength - Survivability - Resilience - Inverter-Based Resources - AC-SCOPF - Voltage Stability

Power System Strength: A Unified Framework for Grid Resilience, Survivability, and Stability under High Penetration of Inverter-Based Resources

F. MAGNAGO, J. DIRKMAN, R. TREINEN, D. CHATTERJEE, M. SADOGAPAN

Resource Innovations, United States of America

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Mitigating, Oscillations, Remediation Approach

Mitigating Oscillations in the Victorian Transmission Network: A Structured Remediation Approach

N. MOHSENI, S. OAG, M. BINET, E. SEMSHIKOV

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: NEM, MODES, DEPENDENCIES

NEM Inter-Area Modes Dependencies

M. DELAC, J. DEERE, X. GAO, T. MADZIKANDA, P. RAI, H. SINGH, A. SURESH, M. TAGHIPOUR

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Cascading failures, Inverter-Based Resources (IBR), Model validation, Partial blackout, Transient stability

Dynamic Analysis of the August 15th, 2023 Partial Blackout in the Brazilian Interconnected Power System

B. PESTANA, A. A. TORRES, D. B. d. OLIVEIRA, D. S. S. V. FILHO, M. C. d. SABOIA, P. E. M. QUINTÃO, T. M. T. d. S. ALVES

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Inverter-based Resources (IBR) System Strength Voltage Source Converter (VSC) High Voltage Direct Current (HVDC) GFM SCR IMR System Stability analysis

Dynamic and Frequency-Domain Assessment of Power System Strength in Grids Dominated by Inverter-Based Resources

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Inverter-based Resources (IBR) Voltage Source Converter (VSC) High Voltage Direct Current (HVDC) GFM GFL Dynamic Analysis Stability Analysis Control Strategy VSM

Evaluation of Grid-Forming Control Strategies for System Stability in Inverter-Dominated Power Networks

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: BESS, Synchronous, Real-World Integration

Compliance and Model Validation of a Grid Forming BESS Replacing Synchronous Generation: Real-World Integration into Australia's Northern Grid

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: BESS, Synchronous Condensers, System Strength Support

Quantitative Assessment of Grid-Forming BESS and Synchronous Condensers for System Strength Support

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¹Australian Energy Market Operator, Australia; ²Bespoke Energy, Australia

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Power System - Synchronization - Stability - Out-of-step Protection

Technical Challenges Related to the Synchronization Process of the Baltic States' Power System with the Continental Europe Synchronous Area

A. KAKOL¹, M. KOSMECKI¹, R. JANKOWSKI¹, B. SOBCZAK¹, J. SMOTER¹, M. WILK²

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

State-Space Models of Virtual Control and Protection Systems for Stability Analysis

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Electromechanical oscillations, power oscillation damping controllers, power converters

Guidelines for the implementation of power oscillation damping controllers in power converters

J. RENEDO, M. MARTÍN ALMENTA, S. MARTÍNEZ VILLANUEVA, A. DÍAZ-GARCÍA, A. CORDÓN, D. GOTTE

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Large Power System Model - CESA - IBR Modeling - Small Signal Stability - Voltage/reactive Power Control Strategy

Impact of Plant Controls of Large-Scale Inverter-based Generation on Inter-Area Oscillations in the Continental Europe Power System

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Variable speed pumped storage unit; Low voltage ride through; Transient stability; Power angle stability; Power systems

Improvement of LVRT behavior of Variable Speed Pumped Storage Units to enhance the transient stability of the power system: A Case Study

X. CHEN, P. ZI, F. ZHAO

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Weak Grid, System Strength Metrics, Offshore Wind Integration, Converter-Dominated Networks

Machine Learning-Assisted Evaluation of Weak Grid Metrics for Converter-Dominated Power Systems

Y. WU, A. GARG, M. FAWAD, M. GALEELA, N. SIMS

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

A New Index for Quantifying Stability Adaptation Effort in Power Electronics-Dominated Power Systems Based on Frequency-Domain Impedance Identification

L. A. GARCÍA-REYES¹, M. MARTÍN ALMENTA¹, E. NUÑO MARTÍNEZ¹, J. RENEDO¹, A. CORDÓN RODRÍGUEZ¹, O. GOMIS-BELLMUNT², E. PRIETO-ARAUJO²

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Co-Simulation for Nuclear Power Plant and Power Electronic Interfaced Devices Interaction Studies

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Impedance-based frequency-domain method for sub synchronous torsional resonance analysis

E. BEHROUZIAN

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: control interaction, frequency domain analysis, frame transformation, impedance analysis tools, sub/super synchronous oscillations

Comparison of Impedance-based Tools for Sub/Super Synchronous Oscillation Analysis

D. CHAKRAVORTY, J. VAHEESHAN

Siemens Energy United Kingdom

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Large Disturbance Analysis, Power System Stability, Low-Inertia Systems, Inter-Area Interactions, Grid Restoration.

Analysis of the Large Disturbance in Georgian Power System: Stability Challenges and Lessons Learnt

P. ELIZARASHVILI, G. AMUZASHVILI, I. VARDIASHVILI, G. SHOVDADZE

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Grid Forming Preserving Control Current Limitation Strategies and Impacts on Grid Support

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Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

A comparative study of negative sequence support of grid-forming voltage source converters with current prioritization schemes

B. VILMANN¹, D. MÜLLER¹, O. SABORÍO-ROMANO¹, B. ZOGHDAR², M. EL-SIED²

¹Technical University of Denmark; ²TotalEnergies

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: High-fidelity models, Digital Twin, Distributed energy resources

Enhancing Power System Stability: Integrating High-Fidelity Plant Controller Models for Distributed Energy Resources

P. SAWKO¹, O. BAGLEYBTER¹, G. FOGGIA²

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ID: 11756

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: sub-synchronous oscillation, super-synchronous oscillation, control interaction, grey-box, white-box, state-space analysis, modal analysis, participation factor analysis

Sub/Supersynchronous oscillation study: A comparative analysis of grey-box and white-box methods

J. VAHEESHAN¹, D. CHAKRAVORTY¹, J. AREVALO-SOLER², M. CHEAH-MANE², D. MOUTEVELIS²

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ID: 11764

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Dynamic security assessment, explainability, frequency stability, interpretability, machine learning (ML), neural networks, power system dynamics, security.

Explainable Machine Learning for Real-Time Frequency Stability Assessment

P. PAPADOPOULOS¹, A. B KILEMBE¹, L. I BENEDETTI¹, I. S. LAMPRIANIDOU²

¹University of Manchester United Kingdom; ²Grid Stability Limited

ID: 11769

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Converter-dominated power systems, Inverter-based resources (IBR), Sub-synchronous control interaction (SSCI), Sub-synchronous oscillation (SSO), Series-capacitor-compensated transmission lines, EMT simulation, Impedance-based frequency scan, WAMS

Sub-Synchronous Control Interaction in a Utility-Scale Solar PV Plant: First evidence and countermeasures in Vietnam's Power Grid

D. N. NGUYEN, Q. PHAM, T. V. NGUYEN *, H. V. A. VO, T. A. DUONG, T. H. TRAN

ID: 11772**C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers**

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: frequency, grid forming, low inertia grid, ROCOF, stability

ROCOF incident study and stability enhancement by grid-forming technology in Danish power system

Y. LIAO¹, J. B. KWON¹, N. QIN¹, H. GONG¹, L. LU¹, A. MORALES-MUNOZ², A. RASIC², J. XU², W. HU³

¹Energinet; ²Huawei Technologies Duesseldorf GmbH; ³Huawei Technologies Co., Ltd

ID: 11773**C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers**

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: converter, frequency scan, harmonic impedance, interoperability, model validation

Frequency-domain screening methods and benchmarking for converter-based systems

Y. LIAO¹, Ö. C. SAKINCI², D. VAHLE³, N. RIEMANN⁴, R. DIMITROVSKI⁵, V. COSTAN⁶, N. KLÖTZL⁵, A. NEUFELD¹, L. DALL¹

¹Energinet; ²TenneT Netherlands; ³Amprion; ⁴50Hertz; ⁵TenneT Germany; ⁶RTE

ID: 11784**C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers**

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: BESS, Inertia, Inter-area Oscillation, POD, Renewable Generator

Impact of BESS-based Power Oscillation Damper (POD) on Inter-area Oscillation Damping in the Argentine Power System

N. DE SAN JUAN, P. LAMBRI, J. C. BRUNELLO, F. GALLEGO

CAMMESA

ID: 11814**C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers**

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Inverter-Based Resources (IBRs); Electromagnetic Transient (EMT) Simulation; Scottish Transmission System; Transmission Owner Tools for EMT Modelling (TOTEM); Vendor Models; Parallel Processing; Future Grid; GB-wide EMT Studies.

Advanced Large-Scale EMT Modelling for the Scottish Transmission System – Capabilities & Experiences

S EDLA¹, J RAMACHANDRAN², Y PIPELZADEH³, D MUTHUMUNI⁴, R. TUMILTY¹

¹Scottish and Southern Electricity Networks – Transmission UK; ²National Energy System Operator UK; ³Manitoba Hydro International UK; ⁴Manitoba Hydro International Canada

ID: 11826**C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers**

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Grid-forming BESS, inverter-based system, commercial stability services, voltage creation, inertia, short circuit level, EMT

Experience with Commercial Stability Service Provision of the UK Blackhillock Large Scale Grid-forming BESS

X. LI¹, A. KNOBLOCH²

¹Zenobe Energy United Kingdom; ²SMA Solar Technology Germany

ID: 11856**C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers**

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Grid Forming Converters, Terminal Angle Reference, PQ Decoupling, Robust Control, Reduced Current Margin

Suppression of Interactions of Parallel Grid Forming Converters using Decoupled Grid Forming Control

R. ST.HILAIRE¹, C. KARAWITA¹, U. ANNAKAGE²

¹TransGrid Solutions, Canada; ²University of Manitoba, Canada

ID: 11859**C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers**

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Power Plant, Synchronous Generator, Synchronous Condenser, Static Frequency Converter, Diesel Generator, Excitation System, Automatic Voltage Regulator, Power System Stabilizer, Short-Circuit Fault Ride-Through, Rate-of-Change-of-Frequency

The Role of EMT Simulation Tools in Operation and Control of Synchronous Generators

A. B DEHKORDI¹, A. FLORIO²

¹RTDS Technologies Inc., Canada; ²Ansaldo Energia SpA, Italy

ID: 11860**C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers**

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: IBR unit-based resources, IBR plant resource, ride-through, balance of plant protection, maximization

Enhancing Grid Stability: A Novel Methodology to Maximize Ride-Through Capability of IBR Inverter Based Resources

K. SAMARASEKERA, R. QUINT, G. GHANAVATI, N. GIFFIN, K. THOMAS

Elevate Energy Consulting

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Large-scale inverter systems, oscillations, coupling, grid forming, grid following

Scalable Stability Analysis and Control Specifications for GFM and GFL Systems

C. LEHMAL, Z. ZHANG, R. SCHÜRHBUR

Graz University of Technology

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Oscillation damping requirements for inverter-based generation in the Colombian power system

N. CASTRILLON¹, J. C. GONZALEZ², M. C. ZAPATA³

¹xm; ²xm; ³xm

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Dissipating Energy Flow (DEF), Source of Oscillation, Wide Area Monitoring System (WAMS)

Real-Time Identification of Power System Oscillation Sources Using DEF Method with WAMS Data: A Case Study in Thailand

N. BURITATHAM, S. PATCHANEE, P. SAWATPIPAT, Y. BUREETAN, A. PUKPRAYURA

Electricity Generating Authority of Thailand (EGAT)

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Short-circuit current, variable renewable energy, decarbonisation

Short-Circuit Current Analysis of the Chilean National Electric System under Operational Conditions with High Penetration of Inverter-Based Variable Renewable Energy

N. CACERES, R. MELLADO

Coordinador Electrico Nacional

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Application of Grid-Enhancing Technologies for Stability Improvement in Low-Inertia Power Systems: A Case Study from Egypt

M. IBRAHIM

AFRY

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Dynamic model verification, Conformity testing, Interoperability, RMS and EMT simulation, IEC 61970-457

A Framework for verifying Dynamic Model Implementations as a Foundation for reliable Power System Studies

C. IVANOV, S. COSIC

gridDigt

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Stability, Impedance, Frequency Domain, Converter

A Scalable Framework for Stability Assessment at the Grid Interface of Power Electronic Interfaced Devices

O. LENNERHAG

Svenska kraftnät

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Electromagnetic Transients-Based Stability Analysis of the Colombian Power System with High IBR Penetration by 2030

E. PEREZ¹, J. G. MIRANDA², J. ESPINOZA³, D. ALVAREZ⁴, J. PEREZ⁵, J. TOBON⁶, J. HERRERA⁷, J. SUAREZ⁸, A. RANGEL⁹, C. GARCIA¹⁰, K. SANTAMARIA¹¹

¹unal; ²unal; ³unal; ⁴unal; ⁵unal; ⁶xm; ⁷unal; ⁸xm; ⁹unal; ¹⁰xm; ¹¹xm

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Pioneering SIL+HIL Validation Methodology for Solar Power Plants in Colombia: A Case Study for Regulatory Compliance and Grid Integration

J. C. SERNA, A. M. VERGARA, D. M. LOPEZ

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Enabling EMT and HIL Simulations for IBR-Dominated Grids: An Equivalent Model of the Chilean Power System

J. CORNEJO¹, D. PERRONE², J. VIVES³, P. SALGADO⁴

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

PV Plant Black-Start Supported by Grid-Forming BESS: A Real EMT Study Based on OEM Models

L. RODRÍGUEZ¹, A. CANO², D. PERRONE³

¹Grupo Estudios Electricos; ²Grupo Estudios Electricos; ³Grupo Estudios Electricos

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

System Strength and Grid-Forming Technologies: A Comprehensive Assessment of the Chilean Power System Towards High IBR Penetration

D. E. PERRONE¹, J. HERRERA², P. HARTUNG³, A. J. ALVAREZ⁴, D. BUSTOS⁵

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ID: 12328

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: grid forming, converter, GFM, BESS, STATCOM, small-signal stability, damping performance, renewable energy integration, synchronous condensers

Demonstrating Stability Enhancement in the Danish Grid through Grid Forming STATCOM and BESS Solutions

M. LARSSON¹, R. HEYDARI², H. ZHANG², A. OWENS², L. LU³, Y. LIAO³, J. B. KWON³, H. GONG³, N. QIN³, M. STOECKLI⁴

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ID: 12363

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Green Hydrogen, Inverter-Based Resources (IBRs), Grid-Forming Inverters (GFMs), System Stability, Remote Grids.

Stability Assessment of Isolated Grids Supplying Green Hydrogen Production under Varying Load Conditions

T. SILJEGOVIC¹, A. VUKOVIĆ¹, M. HANJALIC²

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Short-Circuit Currents, Short-Circuit Calculation, Substation Ratings, Transmission Grid

Influence of Inverter-Based Resources on the Planning of Short-Circuit Withstand and Breaking Capability in Transmission Grids

M. KNITTEL¹, S. B. MEYER¹, B. RUSEK¹, T. HENNIG¹, M. RUGE², L. SCHWALT³, D. JOZWIAK⁴, T. NORRE⁴, P. KROEMER⁵, T. MAI⁶, M. BOZEK⁷

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Comparative Analysis of Voltage Stability in Offshore Power-from-Shore Systems with Fast-Switching On-Load Tap-Changers and STATCOM/TCSC Technologies

I. BURLAKIN¹, S. REHKOPF², J. KOLB³

¹Friedrich-Alexander- Universität Erlangen- Nürnberg Germany; ²Maschinenfabrik Reinhausen GmbH, Germany; ³Unitech Power Systems Norway

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Geographic Mapping of Minimum Fault Levels to Identify Weak Areas on the Irish Grid and the Assessment of New technologies for System Performances Enhancement

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Reducing the number of must-run, conventional sets in Northern Ireland to enhance RES penetration, while maintaining system stability

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System Strength Evaluation Framework for the Irish Power System

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Development of a Roadmap to Integrate System Wide EMT Study Capabilities in Ireland

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Eigenvalue Mode Sensitivity Analysis Under the Influence of SSSC Devices

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Analysis of the Robust Operation of a Hybrid Power Station Incorporating Diesel Generators and Battery Energy Storage Systems in a Novel Data Center Electrical Topology

G. KARVELIS¹, C. AGATHOKLEOUS¹, D. BROCILO², S. VASILIC², S. CORHODZIC²

¹PROTASIS SA Greece; ²META USA

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: EMT simulations, GPU, cuDSS, synchronous generator

Large Scale EMT Simulation using General Purpose GPUs for better Speedup

D. ALUTHGE¹, S. FILIZADEH², I. JEFFREY³, D. MUTHUMUNI⁴

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero
Keywords: Generic model, IEC 61400-27, Power system simulation, Power system stability, Renewable energy, Open-source, Wind energy

Open-Source Framework for Efficient Simulation and Parameter Identification of Full-Converter Wind Turbine Models

J. JIMÉNEZ-RUIZ¹, A. HONRUBIA-ESCRIBANO², R. VILLENA-RUIZ³, E. GÓMEZ-LÁZARO⁴

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Converter-connected generation, fault ride through, loss of synchronism, PLL

Fault ride through issues and evaluation of mitigation techniques in a converter-dominated power system

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ID: 12646

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS1 - Power system stability aspects of decarbonisation of power systems and the road to net-zero

Keywords: Dynamic phenomena, dynamic simulation, power system restoration, black start, benchmark restoration model, BESS, key performance indicators

A benchmark model and KPI framework for studying power system restoration of modern grids

T. SKRJANC¹, L. HERMAN², D. VIRGINILLO³, A. DERVISKADIC⁴, G. TORRESAN⁵, R. MIHALIC⁶, U. RUDEZ⁷

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C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Power quality, monitoring, transmission, disturbances, cybersecurity

News Regarding the Electrical Power Quality Monitoring in the Electrical Transmission Grid

N. CHICIOROAGA¹, C. STANESCU¹, S. GHEORGHE², C. DIACONU¹, A. RADULESCU¹

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Power Quality – Voltage Fluctuations – Renewables – Solar – Distribution – Medium Voltage – Reactive Power

Large, moderately rapid voltage fluctuations due to a PV farm: an additional limit on how much PV fits in the medium-voltage grid

F. GROEMAN¹, M. BERENDE², A. JONKER², E. LAZDANAITE¹, W. KUIJPERS¹

¹DNV; ²Enexis

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: circuit breaker, point-on-wave, PoW, capacitor bank, cable, inrush currents, power quality

Point-on-Wave performance when considering the statistical switching behaviour of the circuit breaker

M. HOOGENDOORN^{1,2}, M. POPOV², K. VELITSIKAKIS¹

¹TenneT TSO; ²Delft University of Technology

ID: 10394

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Curious, converter, harmonics

Curious case of converter control improving on-site harmonics performance

I. ZHENG, Y. LIU, B. JOHN

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ID: 10571

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Co-located Infrastructure, Earth Potential Rise (EPR), Low Frequency Induction (LFI).

Harmonious co-existence of Power and Telecommunication networks: A study on Low Frequency Induction (LFI) risks and Mitigation measures

A. DUBEY*, P. SRIVASTAVA

Central Electricity Authority, INDIA

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Inverter Duty Transformer (IDT), Power Quality, Grid Integration, Condition Monitoring, Fault Diagnosis.

Power Quality Issues Associated with Inverter Duty Transformer

M. CHILUKURI*

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Harmonic emission assessment, measurement uncertainty

Grid code compliance within the constraint of small emission limits

B. PETERSON¹, J. RENS²

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ID: 10906

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Transformer saturation, multi-cycle symmetrical control (MCSC) loads, electromagnetic compatibility (EMC), nonsinusoidal load currents

Effects of multi-cycle symmetrical control (MCSC) loads on the feeding LV distribution transformers

M. MARTINEZ DURO, S. GOURAUD

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Harmonic studies, risk criteria, grid codes, large-scale network modelling, EMT tools.

New approach for assessing the risk of harmonic amplification on the French network.

X.-M. VIEL, F. MORRETTON, S. FILALI, M. PAUMIER, Y. VERNAY

RTE France

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Flicker, LED, Sensory evaluation, Frequency analysis, ΔV_{10} , PV-Inverter

Voltage Fluctuation Test for LED Lighting -Assessment of Relations between ΔV_{10} Flicker Index and Illuminance Change-

N. FUJITA¹, R. AKIYOSHI¹, K. ISHIBASHI¹, H. NAKAYAMA², N. OKADA²

¹TEPCO Holdings Japan; ²Central Research Institute of Electric Power Industry Japan

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Harmonics, IBRs, Series resonance

Experimental Study of the Impacts on 2-9 kHz Harmonics due to IBRs connected to a Distribution Line

K. FUKUSHIMA, N. OKADA

ID: 10969

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Grid Code, Voltage Dip, Inrush Currents

A practical Evaluation Method for Inrush Currents and Voltage Dips during Transformer Energization

R. YONEZAWA¹, T. MASUDA², R. OGAHARA²

¹Central Research Institute of Electric Power Industry Japan; ²Chubu Electric Power Grid Co., Inc. Japan

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: voltage dips propagation, inverter-based resources (IBRs), power quality, distribution systems, wide area monitoring systems (WAMS)

Voltage dips propagation in the transmission system: analysis of the voltage events monitored in the period 2009-2024 by the QuEEN system.

M. ZANONI

RSE

ID: 11243

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: power quality, modular, converter unit, active filter, distorting load

Application of High-Voltage Active Power Filters for Ensuring Power Quality Indices in Networks Supplying Traction Loads

A. MATINYAN¹, A. KISELEV¹, M. PESHKOV¹, K. KOSHELEV¹, V. KARPOV¹, P. SOKUR¹, A. ANTONOV¹, N. SYROVATSKY¹, O. SUSLOVA¹, R. SHAMONOV²

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Power Quality, Total Harmonic Distortion, Synchronized Phasor Measurement System, Phasor Measurement Units, Intelligent Electronic Devices, Power Quality Analysers, Phasor Data Concentrators

Online Monitoring of Power Quality Indicators in Renewable Power Plants Using the Synchronized Phasor Measurement System of the Brazilian National Grid

F. A. OLIVEIRA¹, J. G. PEREIRA¹, M. C. CARDOSO¹, J. L. LOS¹, I. C. DECKER², A. F. C. AQUINO², D. ISSICABA², U. C. NETTO³

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Harmonics, harmonic distortion, harmonic emissions, background distortion, amplification, voltage gain

Challenges in Estimating Amplification of Background Harmonic Voltage Distortion

Z. EMIN¹, R. ARMITT², A. GAIKWAD²

¹EPRI United Kingdom; ²EPRI United States

ID: 11541

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: System Strength, Voltage Fluctuations, Flicker Level, Renewable Resources, Synchronous Generators, Electric Arc Furnace (EAF) Loads

Impact of Replacing Synchronous Generation with Inverter-Based Generation on Voltage Fluctuations

Z. EMIN¹, R. ARMITT², S. SANTOSO³

¹EPRI United Kingdom; ²EPRI United States; ³University of Texas United States

ID: 11555

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Renewable energy sources, reactive power compensation, voltage regulation, voltage ride-through, test-bench tests, electronic on-load tap-changer, OLTC transformer, electrical resonance

Assessment of an electrical resonance issue in a fast electronic on-load tap-changer transformer based test-bench during renewable energy source tests

M. BARRENETXEA¹, E. SAGREDO-BLANCO¹, A. TORRES¹, R. LOPEZ-ERAUSKIN¹, J. UGARTE-VALDIVIESO¹, I. GUDE²

¹Mondragon University, Spain; ²Spain

ID: 11556

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Magnetically controlled shunt reactor, filter-balancing unit, power quality, voltage and current balancing, control algorithm

Voltage Balancing by Magnetically Controlled Reactors in Electric Grids Containing Unbalanced Loads

V. CIOBAN¹, S. DYAGILEVA¹, R. KARYMOV¹, B. OLEKSIUK²

¹Faramax, Spain; ²Siemens Energy, Germany

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Harmonics and High Frequency Characterization of Capacitive Voltage Transformer and HVMAC device

J. ROVIRA¹, A. KHAMLICH¹, T. GARCÍA¹, U. ZATIKA², Á. ZARANDONA²

¹FFII-LCOE, Spain; ²ARTECHE, Spain

ID: 11776

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Harmonic assessment of transmission grid expansion with underground cables via measurement-validated simulation model

B. S. BUKH, F. FARIA DA SILVA, T. JAKOBSEN

Energinet

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Harmonic Studies, Harmonic Propagation, Optimisation

Estimation of harmonic injections for harmonic propagation studies in meshed transmission grids

F. FARIA DA SILVA, T. JAKOBSEN, B. BUKH, A. BUSK, J. JAENSCH

Energinet

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: harmonics, data analytics, long-term measurements, power quality, renewable generation, wind parks

Comprehensive Data Investigation of Harmonic Measurements from Wind Parks for Assessing Mechanisms and Long-Term Variations

R. S. SALLES¹, R. A. d. OLIVEIRA², S. K. RÖNNBERG¹, M. DE CARLI³

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Online Harmonic Resonance Monitoring for Adaptive Control of HVDC System

S. SAKAR

Hitachi Energy

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: HVDC cables, Pipeline, Electromagnetic Interaction, Earth Potential Rise

HVDC Cable–Pipeline Interaction Under Fault Conditions: Induced Currents, EPR, and Safety Implications

A. LOTFI, B. SINGH

Nexans

ID: 11905

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: AC Corrosion, AC interference, Common utility corridor, Electromagnetic compatibility (EMC), Electromagnetic interference (EMI), Earthing systems, Low frequency induction (LFI), Metallic pipelines, Pipeline safety

Holistic Approach for Managing and Mitigating Interference on Metallic Pipelines in Shared Utility corridor

H. NEGI¹, K. MANGLAM¹, K. ALE¹, C. THOMPSON²

¹Arcadis United Kingdom; ²SSN Transmission United Kingdom

ID: 12103

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: Harmonics - Background - Prediction - Transmission System Operator - Planning

Methodologies for Defining Harmonic Specifications in Transmission Systems at Future Points of Connection of Energy Resources

J. WASILEWSKI

Polskie Sieci Elektroenergetyczne S.A., Poland

ID: 12329

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: harmonic amplification, HV cable, EHV, network restoration, black start, parallel resonance, temporary overvoltage

Impact of increasing Underground Cable Penetration in the Swiss Transmission Grid

M. CAI¹, P. SILVA¹, E. GIMENEZ ROMERO¹, M. STOECKLI²

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Keywords: HARMONICS, EMISSION LIMITS, IEC TR 61000-3-6, CONTINGENCIES, ALLOCATION, EMC COORDINATION

Influence of different contingency scenarios on the allocation of harmonic emission limits in transmission systems

E. O. MATTHES¹, M. POURARAB¹, J. MEYER¹, Z. EMIN², G. SINGH², M. HALPIN³

¹TUD Dresden University of Technology; ²EPRI USA; ³Auburn University

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Investigating Implications of Offshore Wind Farm Connections Regarding Harmonic Distortion

D. SCHWANZ

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS2 - Power quality (PQ) and electromagnetic compatibility/ interference (EMC /EMI) aspects of decarbonisation of power systems and the road to net-zero

Investigation in the Effects of GICs on Power System Harmonics

S. BYRNE

EirGrid

C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: High frequency transients, Online monitoring, Transient overvoltages

Results of continuous transient voltage measurement in the Dutch 110kV grid

I. TANNEMAAT¹, K. VELITSIKAKIS¹, S. NAUTA², J. MCBRIDE³

¹TenneT TSO; ²Alliander; ³JMX High Voltage

ID: 10327

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: insulation, double circuit, flashover

Quantifying the effect of differential insulation on double circuit back flashover performance using the leader progression model

E. SACILOTTO

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ID: 10702

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: Temporary Protection Ground, Equipotential Bonding, Lightning Risk, EMT simulations

OHL Work Safety. Use of EMTP to Design the Protocol for Setting Up Temporary Grounding Protection

L. DIAZ, A. DUFAIX

RTE France

ID: 10746

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: Earthing System - Wind Power - Touch Voltage - Step Voltage

Earthing Analysis for Wind Power Plants in Diverse Soil Environments

D. LEWIS¹, R. ANDOLFATO², D. CUCCAROLLO²

¹Bentley Systems, United States of America; ²SINT srl, Italy

ID: 10907

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: Blackout, Power System Restoration, Grid-to-Grid Coupling, Induced Voltage, Resonant Overvoltage, Ferroresonance, Switching Transients

Blackout anticipation test: investigation of induced voltage and resonant event causing sustained high voltage at isolated network

S. SANTOS DA SILVA, T. CANAL, V. RENOUEAU, F.-X. ZGAINSKI

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ID: 10930

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: Arc Fault - Pipeline Damage - Fault Current - Lightning Strike - Risk Assessment

A Probabilistic Method for Estimating Rates of Pipeline Leaks and Ruptures due to Arc Faulting in Shared Utility Rights-of-Way

G. BHATTACHARJEE, E. JAMPOLE, Y. WU, Y. BHARGAVA, A. SHAHSIAH

Exponent, United States of America

ID: 10936

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: Grounding, Lightning, Overhead Lines, Measurements

Enhancing Lightning Performance Assessment Through Uncertainty Quantification in Grounding Resistance Measurements Using the Fall of Potential Method

C. LE MAUFF

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ID: 10970

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: Lightning, Outage rate, Overhead transmission line, Line surge arrester, EGLA

Recent Use of Line Surge Arresters (EGLA) on overhead Transmission Lines in Japan and their Effect on Reducing Lightning Outages

T. MIKI¹, M. MIKI¹, R. NAKANE¹, R. YAMADA², Y. TOMONOU², H. ITOU²

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ID: 10971

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: Charge, Lightning, Lightning-location

Development of a new lightning location system designed for parameter estimation

M. SAITO, A. KUDO

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ID: 11085

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: Dedicated Metallic Return, Overvoltages on VSC Systems, Lightning Performance, Dielectric Strength

Main Issues Regarding HVDC Overhead Transmission Lines Insulation Coordination: VSC Technology and Dedicated Metallic Return

P. C. V. ESMERALDO¹, F. SILVEIRA²

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ID: 11086

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: Transformer Switching, Screening Method, Harmonic Impedance, Short-Circuit Ratio

Screening Method for EMT Studies of Border Transformers in the Brazilian Interconnected Power System

A. R. d. M. TENÓRIO, R. ANTUNES, H. d. O. PESSOA JR

ONS Brazil

ID: 11087

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: Backflashover, HVDC transmission line, Lightning performance of transmission lines, Negative and Positive lightning strokes, Severe thunderstorms

Investigation of the Relative Impact of Negative and Positive Lightning Strokes for Establishing the Lightning Performance of Extra High Voltage Transmission Lines

F. H. SILVEIRA, G. M. ZAGO, G. A. BUENO

UFMG University Brazil

ID: 11088

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: tower grounding, transmission line, windfarm, resistivity survey, geoelectric modelling

A New Methodology for the Grounding Design of Transmission Lines and Windfarm Towers

P. E. FREIRE

PAIOL Engenharia Brazil

ID: 11089

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: direct lightning, electromagnetic transients, hybrid overhead lines, lightning transients, lightning overvoltages

Analysis of Lightning Overvoltages Due to Direct Strikes on Hybrid Overhead Lines

A. PIANTINI, L. B. MORAES, M. SHIGIHARA

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ID: 11249

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: HVDC, Site Pollution Severity (SPS), contamination map

Insulator contamination maps toward outdoor insulation coordination

M. MARZINOTTO

TERNA

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: Fault Identification; Distributed Monitoring Devices; Traveling Wave Data; Sample Imbalance; Deep Learning

Research on Fault Cause Identification Method for Transmission Lines Based on Distributed Transient Traveling Waves

Y. XIE, S. GU, C. ZHAO, Y. ZENG, B. YAN, H. TAO

China Electric Power Research Institute

ID: 11622

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: Offshore wind, sustained overvoltage, insulation coordination, wind farm islanding, overvoltage mitigation

Sustained Overvoltages in Offshore Wind Farm Array Cables under Islanding Conditions

J. LUO¹, C. HIGGINS¹, S. KARAMITSOS², G. LIU², G. LOGAN²

¹Arup Great Britain; ²Scottish Power Renewables Great Britain

ID: 11775

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: Cross-bonding, Bonding Lead, Surge-Voltage-Limiter, Lightning, Transmission

Why bonding leads are usually within 10m?

M. HEIM¹, A. H. MATHEUS¹, A. SIEMSEN¹, J. DYBKJÆR², T. ERLANG², R. A. OLSEN¹

¹Rambø; ²Nexel

ID: 11799

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: lightning current, measurement, surge arrester, waveshape

Real-Time Monitoring of Lightning Currents in Transmission Towers and Line Surge Arresters

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ID: 11919

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: C4 PS3 - Insulation co-ordination and lightning research: paving the way to net-zero in decarbonised power systems

Keywords: Transmission system lightning protection, DBSCAN, SFFOR, Wind

A Dynamic Approach for Assessing Lightning Risk to Electricity Transmission Networks Considering Environmental Factors

C. GU¹, X. HE¹, X. BAI¹, M. FULLEKRUG¹, X. WANG¹, A. ALI², B. SHETTY²

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C5 ELECTRICITY MARKETS AND REGULATION

C5 PS1 - Market designs and non-market approaches to support the energy transition

ID: 10581

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: Adaptive mechanisms, CERC, Cost allocation, DISCOMs, Economic efficiency, Energy justice, Grid resilience, HVDC, India, Institutional capacity, National Electricity Plan, Renewable energy, Regulatory frameworks, Socialization, Tariff rationalization, Tran

Bridging Renewable Ambitions with Grid Economics: India's Transmission Cost Allocation Model

A. KISLAY*, B. P. PANDEY, K. K. JAIN, V. BAGADIA, M. GUPTA

Central Transmission Utility of India Limited, India

ID: 10594

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: Monetization via Securitization of Cash Flows, Competitive Fundraising

Monetization through Securitization of Cash Flows as an Innovative Financing Mechanism for development of Infrastructure Projects in India

D. YADAV¹, B A. SARMA¹, A. K. JAIN², P. PANDEY¹, A. BHARGAVA¹

¹Power Grid Corporation of India Limited, India; ²Grid-India, INDIA

ID: 10751

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: Resource Adequacy - Capacity Expansion Modelling - Capacity Accreditation - Long-Term Planning

Assessing Capacity Accreditation Choice on Resource Mix Outcomes

G. DE MIJOLLA¹, M. IHLEMAN², J. A. RANOLA¹, A. TUOHY¹

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ID: 10909

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: Electricity market, Balancing energy, Replacement Reserves, Agent-based model, Energy transition, 2050 scenarios, Simulation, ATLAS

Simulating the Energy Transition: A Market-Oriented Approach with the ATLAS model

F. COGEN¹, V. DUSSARTRE¹, E. LITTLE¹, F. ROQUES²

¹RTE France; ²Université Paris-Dauphine - PSL

ID: 10972

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: Decarbonized power sources, Carbon neutrality, Investment predictability

Ensuring Investment Predictability for Decarbonized Power Sources - Long-term Decarbonized Power Source Auction -

Y. KATAOKA¹, H. SAKAI¹, D. TAMURA², K. SUGAHARA², S. AMI³, H. ISHIDA³, H. IRIE³

¹Chubu Electric Power Co., Inc. Japan; ²Chubu Electric Power Grid Co., Inc. Japan; ³Mitsubishi Research Institute, Inc. Japan

ID: 10973

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: Distributed Energy Resource (DER), Distributed Electricity Market, Real-time Pricing, Locational Marginal Pricing (LMP), Energy Management System (EMS), Decarbonization, Digitalization

An Integrated Market and Non-Market Approaches for Promoting Green Transformation and Digital Transformation in Japan

H. KIBATA¹, H. HIRANO¹, S. NODA¹, T. KUGE¹, T. ANAI¹, H. OKAMOTO²

¹Tokyo Electric Power Company Holdings, Inc Japan; ²TEPCO Power Grid, Inc. Japan

ID: 10984

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: Electricity Market Design, Electricity Regulation, Infrastructure Investment, Local Loop Unbundling (LLU), Unbundling

Market and regulatory unbundling in South Africa: Lessons from telecommunications for the electricity sector's energy transition

K. SETLHAPALO, S. MAKHATINI, N. KHUMALO, S. JOSEPH

National Transmission Company South Africa (NTCSA)

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C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Comparative analysis of the parameters needed to define the security of supply indicator and its application in the implementation of capacity mechanisms in different european countries

J. AREIAS¹, J. T. SARAIVA¹, N. MARTINS²

¹UNIVERSIDADE DO PORTO; ²REN

ID: 11215

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: Energy Attribute Certificates, Renewable Energy Certificates, Additionality, Market Regulation, Voluntary Demand

Designing EAC Markets for the Energy Transition: Navigating Between Voluntary Incentives and Regulatory Signals

V. BEREZOVSKIY¹, A. PAVLYCHEVA², N. KUZNETSOVA², N. IVANOV³, D. IVASHKIN²

¹Carbon Zero LLC; ²«NP Market Council»; ³SKM.PRO

ID: 11286

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: Energy Hubs; Feasibility Assessment;

Energy Hubs in Brazil: A Proposal for Feasibility Assessment using Real Options Analysis

E. SODRÉ, A. PINHEIRO, R. DIAS, M. MARINHO

POLI-UPE University Brazil

ID: 11293

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: Energy Storage; energy transition; variable renewable energy sources;

Energy Storage and Market Evolution: Regulatory, Operational and Economic Dimensions for the Brazilian Power Sector

C. C. MARTINS¹, C. DORNELLAS²

¹Eletrobras Brazil; ²ALMA SOLAR Energia Brazil

ID: 11294

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: Predictive Models for Bid Discounts; Transmission Auctions; Strategic Bidder Information; Temporal Dynamics Information;

Enhancing Predictive Models for Bid Discounts in Brazilian Transmission Auctions: Integrating Technical Variables, Temporal Dynamics, and Strategic Bidder Information

H. O. M. REIS JÚNIOR

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ID: 11295

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: Market Effects of Wind and Solar Growth; Price and Regulation Signals; Curtailment; Hydropower Flexibility

Market Effects of Wind and Solar Growth in Brazil: Price and Regulation Signals, Curtailment, and the Role of Hydropower Flexibility

G. T. DE CAMARGO¹, C. R. R. DORNELLAS², R. ASANO JUNIOR³, P. T. L. ASANO³

¹Simple Energy Brazil; ²ALMA SOLAR Energia Brazil; ³Universidade Federal do ABC Brazil

ID: 11297

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: Distributed Energy Resources; Fully Liberalized Electricity Market

Distributed Energy Resources and Brazil's Transition to a Fully Liberalized Electricity Market

D. CAPETTA¹, C. DORNELLAS²

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ID: 11298

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: BESS; Market; Regulation; Brazilian Electric System

The Regulatory Role of Battery Energy Storage in Brazil: Gaps and Opportunities

S. DAVID¹, V. BONA²

¹SDavid Advogados Brazil; ²WEG Brazil

ID: 11299

C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: C5 PS1 - Market designs and non-market approaches to support the energy transition

Keywords: Regulatory Enhancements; Severely Polluted Environments

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Keywords: Carbon Border Adjustment Mechanism (CBAM), Greenhouse gas emissionst, Climate neutrality, Carbon leakage, Electricity markets.

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Keywords: Congestion Management - Grid-Edge - Production Cost Modeling - Virtual Power Plant

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W. KENYON¹, R. QUINT², C. BRUNNER³, K. JHALA⁴, C. BRANCUCCI¹

¹Encoord, United States of America; ²Elevate Energy Consulting, United States of America; ³Vermont Electric Coop, United States of America; ⁴Argonne National Lab, United States of America

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Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: Distributed energy resources, Grid congestion, Photovoltaic, Voltage regulation

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Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: Cost comparison study, DER, Monte Carlo simulation

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Keywords: Ground-source heat pump - Photovoltaic-thermal systems - Demand-side flexibility - Low-carbon heating - Residential energy systems - Peak load reduction

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Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: Hosting capacity, Optimal Power Flow, Soft Open Point, flexibility.

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Keywords: flexibility, renewable energy community, distribution network, regulation

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Keywords: Energy Transition, Distributed Energy Resources, TSO-DSO coordination, Capability

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Modeling and Forecasting Spatial Charging Demand for Electric Vehicles: Comparative Analysis of Agent-Based, Statistical, and Geospatial Approaches

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Keywords: Distributed Energy Resources (DER); TSO-DSO Coordination; DER Integration; Power System Decentralization; System Flexibility

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D. S. ISAIAS¹, M. C. P. ARAUJO¹, D. T. NARUTO¹, F. A. MOURINHO¹, A. B. DE MARCO¹, N. HUBNER², G. CUNHA², K. HASHIMOTO³

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Keywords: Battery, Distributed Energy Resources (DER), Electrical Energy Storage, Microgrid, Power Flow Simulation

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Topics: C6 PS1 - Enabling flexibility in distribution networks
Keywords: Power Management Systems; Hybrid Power Plant; Ancillary Services; Virtual Power Plant

Power Management Systems for Hybrid Power Plants to Provide Ancillary Services

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Keywords: Operational Flexibility, BESS, SDDP, GFL, GFM, Optimization, Operational Limits, Stochastic Process

Alternate Framing: Predictive Control and Economic Assessment of Grid-Forming BESS for Flexibility Provision

R. FERNANDES¹, I. SILVA², R. PEREZ³

¹Equans Brazil; ²USP-EESC University Brazil; ³PSR Brazil

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Topics: C6 PS1 - Enabling flexibility in distribution networks
Keywords: Steel rolling, Demand response, Deep reinforcement learning, Production scheduling, Time-of-use electricity pricing, Industrial flexibility, Power system optimization

Joint Optimization of Steel Rolling Process and Power Demand Response: A Deep Reinforcement Learning Approach

F. GONG¹, K. LIU¹, B. ZHENG¹, Y. AI¹, D. LI¹, S. KONG², L. ZHAO¹

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Keywords: Charging pile; distribution network; power quality governance; vehicle-to-grid

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Q. JIA¹, Y. ZHANG², S. CHEN², Y. ZHAO¹, M. WANG¹, P. LI¹, Y. YANG¹

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Topics: C6 PS1 - Enabling flexibility in distribution networks
Keywords: Active Distribution Network, Affine Transformation, Aggregation, Continuous-time, Distributed Energy Resource, Hierarchical Framework, Minkowski-sum, Robust Optimization, Virtual Power Plant

A Continuous-Time Hierarchical Aggregation Framework of Distributed Energy Resource

Z. ZHANG, M. YAN, Y. LIU, T. SIMA, Y. ZHOU, J. WEN

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Visibility, Control, and Risk: Operational Metering Strategies for a CER-Dominated Energy Future

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Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: flexibility, prevention, protection, AIMD, linear programming, edge computing, cloud computing, VPP, grid, AMI

Use of AIMD for Real-time Protection of the Distribution Grid and Use of Linear Programming for Predictive Day-ahead Grid Load Planning as a Solution for Grid Flexibility

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Keywords: Balancing costs, decentralization, distribution networks, flexibility, geographic dispersion

Impact of Photovoltaic Power Plant Topology and Geographical Dispersion on Output Variability in Distribution Networks – a Case Study

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Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: photovoltaic power plants, flexibility, battery energy storage system

Flexibility Needs Assessment in the Distribution System with Significant Generation from Photovoltaic Power Plants

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Keywords: Geospatial data - Energy infrastructure - Regional energy strategic planning

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Keywords: Smart Local Energy Systems, Energy Communities, Flexibility, Low Voltage Network

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Keywords: hydrogen economy, gas turbine generator, grid connection, industrial plant, decarbonisation

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Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: Consensus alternating direction method of multipliers, Distributionally robust optimization, Hydrogen- integrated microgrid, Peer-to-peer trading, Transportation-aware energy management

Distributionally Robust Coordination Framework for Scheduling and Trading in Large-Scale Networked Hydrogen-Integrated Microgrids with Coupled Transportation and Power Networks

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: Solar power, ramp rate control, voltage stability, artificial intelligence, renewable energy integration, grid management

Enhancing Solar Power Projects Viability Through AI-Optimized Ramp Rate Control for Voltage Management in Distribution Networks

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Keywords: Non-Conventional Renewable Energy, Biomass-based generation system, Photovoltaic System, Hybrid Generation.

Hybrid Renewable Energy Systems for Industrial Resilience in Emerging Economies: A Case Study in Paraguay

E. CHAPARRO¹, F. OCAMPOS², J. CHAVEZ³

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Keywords: DER participation, dynamic, Australia

Managing distribution networks and enabling DER participation through dynamic network pricing in Australia – Project Edith

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Keywords: Distribution System Operator, Flexibility Services, Interoperability, Local Flexibility Market, SGAM Framework

Information Technology Architecture Modeling for Local Flexibility Markets Using the Smart Grid Architecture Model

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Enabling System Flexibility through enhanced TSO-DSO Coordination: Insights from Pilot Projects

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Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: Grid-forming, Interoperability, Power Hardware-in-the-loop

Frequency Stability Assessment of the Jeju Island HVDC-Linked Power System Considering the Grid-Forming Capacity under High Renewable Penetration

S. JI¹, C. LEE¹, Y. JANG¹, S. CHOUNG², S. BAE¹

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: Low-Voltage Distribution Network, Photovoltaic (PV) Integration, Reactive power control, Smart inverter, Voltage regulation (VR)

Optimizing Thailand's Distribution System Low-Voltage Network with Advanced Inverter Operation

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Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: Battery Energy Storage Systems, Industrial Resilience, Medium-Voltage Integration, Operational Continuity, Power Disruptions

Battery Energy Storage Systems for Operational Resilience in Oil Refineries: The Case of Refineria Aconcagua, Chile

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Practical application of volt-var control in smart inverters for flexible and resilient distribution system

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: Battery Energy Storage Systems, BEES, Energy Storage, Grid Flexibility, Black Start, Renewable Energy

Battery Energy Storage Systems (BESS) for Grid Applications and Black Start Capability in Challenging Environments: A Case Study

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Enabling Flexibility through Virtual Power Plants in Colombia's Distribution Networks: Barriers and Strategic Actions

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Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: BESS, battery energy storage, stability, sustainability

Battery Energy Storage Systems (BESS) : A New Frontier For Grid Stability and Sustainability Supporting Green Energy in Malaysia

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Methods for the Operational Management of Battery Storage Using Machine Learning in Microgrids

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Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: Co-Innovation, DER integration, Digitalisation, Flexibility, Flexumer, Grid Management, Implementation Roadmap, Regulation, Transformation

Road to flexibility - How to integrate LV and MV flexumers in Distribution Grids - Examples from Germany and Italy

B. GEMSJAEGER¹, F. RE², E. DE LUCA⁴, G. FEDELE⁴, R. SCHMARANZ⁵, M. RUHHUETL⁵, M. NIGGE-URICHER³, L. VAN GRONINGEN³, S. ORREM⁶

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: Asymmetrical Faults, Voltage Support, External System Estimation

Fault Analysis and Voltage Support Strategy Through External System Estimation for Multiple Distributed Energy Resources in Distribution Networks Under Asymmetrical Faults

R. QIU, C. LIU

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: Distribution Networks, Software Defined Controller (SDC), Flexibility, Topology Reconstruction, Safety and Stability

Software Defined Controller to Enable Flexibility in Distribution Networks with Safety and Stability Issues Consideration

Z. HUA, L. SHANG, X. DONG

Wuhan University

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: Distributed power supply; Sealed wave characteristics; Parameter identification; Convolutional neural network optimization algorithm

Parameter identification of closed-wave characteristics of distributed power supply based on convolutional neural network optimization algorithm and measured data

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS1 - Enabling flexibility in distribution networks

Upgrading the short-circuit withstand capability of distribution networks to increase DG hosting capacity

A. TSIMTSIOS, N. SARIDAKIS, V. BAKOLAS, G. KARVELIS

PROTASIS SA Greece

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: User segmentation, Distribution network, Demand response, Charging guidance, Utility function

A User-Centric Flexibility Dispatch Framework: Mitigating EV- Induced Feeder Overloads via Differentiated Incentives

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS1 - Enabling flexibility in distribution networks

Keywords: Distributed generation, renewable energy sources, Internet of Energy, energy router, cyberphysical power system, Intelligent voltage regulator, power flows

Intelligent voltage regulator as a key element of an electrical grid with renewable energy sources operating on the Internet of Energy principle

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C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

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Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

An Optimized Control Strategy for Residential DERs to Enhance Grid Resilience and Provide Ancillary Services in Low-Voltage Distribution Networks

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Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: ADMS - DERMS - DER - BESS - Distribution - Grid Modernization - FLISR

Evolving Grid Management: Integrating ADMS, DERMS and BESS to Optimize Distribution Resiliency

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Flicker, PV Systems

Flicker from PV Systems

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Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Confronting the Complexity: Planning Challenges in Active Distribution Systems for 2030

P. PRALIYA*, A. SANGWAN, M. PATEL, A. PANDEY, S. GEELANI, A. KUMAR

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Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Transition towards Prepaid Smart Metering in India-Framework for Uninterrupted Operations in Active Distribution Systems

N. SRIVASTAVA, A. SINGH, V. AGARWAL, R. SONI, R. SRINIVAS, A. GAUTAM

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Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Capacity Planning - Decarbonisation - Distribution Planning - Electrification - Long-term Planning - Opportunity - Resilience Planning - Risk - Strategic Planning - Strategy

Distribution Strategic Planning to Prepare for Disruptive Future Scenarios

J. PEPPANEN, C. MCENTEE, R. SHERIDAN, L. ALMEIDA

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Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Cost-Benefit Analysis - Distribution Planning - Investment Justification - Investment Prioritisation - Risk Quantification - Value Models

Distribution Investment Prioritization and Justification

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Electric vehicle, e-mobility, managed charging, V2G

Electric vehicle charging for grid flexibility in South Africa

D. CHAPMAN, H. MADHOO

Eskom

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Electric Vehicles - Managed Charging - Flexibility - Flexible Connection - Grid Services - Dynamic Retail Pricing - Grid Modernization

Strategies for Encouraging Flexible Electric Vehicle Charging at Scale

T. HUBERT

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Distribution Energy Resources - DER Connection Limits - Wholesale Electricity Markets - FERC Order No. 2222

Implications of Dynamic Connection Limits for Distribution Utility Oversight of DER-provided Bulk System Services

T. HUBERT

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Distribution - Transmission - Reliability - SAIDI - SAIFI - Time-Series - Forecasting - Portfolio - Puerto Rico

A Cost-Benefit Framework for Grid Modernization Based on Forecasted Reliability Outcomes

J. MORALES, E. GARCIA, H. CAMPAN, F. SAKER

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: MVDC PV collector network, DC/DC converter, MVDC cable, MVDC switchgear, Small-scale and on-site validation

System validation and field experience of MVDC network for linear PV power plant

P. NOVAK², P. DWORAKOWSKI¹, E. LAMARD³, L. RUIZ⁴, O. GRELLIER⁵, P. LECOQ²

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Distribution Network, Flexibilities, Long term planification

Shortest Path Algorithm To Assess New Levers & Flexibilities In Long Term Sizing Distribution Networks

P.-E. TESTELIN¹, C. GISBERT¹, M. HENNEBEL², M. PETIT²

¹EDF; ²Centrale Supélec

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Distribution line, Fault Location, TDR

Fault Locating Using TDR Synchronized with the Phase of Supply Voltage on Overhead Distribution Lines

T. AKIMOTO¹, T. SUGIMOTO¹, M. WAKUTANI¹, S. TOGUCHI², T. MATSUSHIMA³, T. HISAKADO⁴

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Distribution system, Local autonomous control system, Photovoltaic system

Demonstration of local autonomous method for reactive power from solar inverters in a full-scale demonstration facility

N. TAKAHASHI, K. FUKUSHIMA, H. HATTA

Central Research Institute of Electric Power Industry Japan

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Hosting capacity, Power flow analysis, Three-phase voltage unbalance

Derivation and Enhancement of Hosting Capacity Considering Three-Phase Voltage Unbalance in Distribution System

K. YAMAMOTO, S. OE, S. IZUTANI, T. YOSHIOKA, T. ANEGAWA

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Distribution Systems - IEC Common Information Model - Unbalanced Network Modelling

Modelling unbalanced LV distribution networks using the IEC Common Information Model

F. SOLDAN

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Dynamic State Estimation, Iterative Kalman Filter, Modified Augmented Nodal Analysis (MANA), Pseudo-Measurements, Steady State Estimation (SSE), Semi-Dynamic State Estimation

Advancements in Static and Dynamic State Estimation Techniques for Modern Distribution Systems

Z. JAVID¹, M. GALEELA¹, F. u. NAZIR², I. WONG¹

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Ferry electrification, roadmap for electrification, battery-electric propulsion systems, new electric loads

Roadmap for Ferry Electrification: an Italian Case Study

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Hosting capacity, MV distribution networks, probabilistic planning, flexibility

Definition of hosting capacity maps in MV distribution networks

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Holiday resorts - Rural electricity systems - Distribution network constraints - Optimisation

Electricity Self-Sufficiency Improvement at a Holiday Park Resort under Local Grid Constraints

C. E UGALDE-LOO¹, M. ABEYSEKERA¹, D. HERATH²

¹Cardiff University United Kingdom; ²Cardiff University & Toshiba Bristol Research and Innovation Laboratory

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Distributed energy resources (DERs), Distribution transformers, Grid reliability, Inverter impacts, Medium voltage (MV) networks, Renewable integration, Smart grid, Standards evolution, Voltage management

Optimizing voltage management and transformer design in MV networks with high distributed energy resource penetration

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Flexibility, efficiency, multi-energy infrastructure, distributed energy, cogeneration, power-to-heat, thermal storage, simulation

Flexible Multi-Energy Infrastructure: New Approaches to Planning and Operating Active Distribution Systems During the Energy Transition

L. MYSHKINA, F. BYK, E. NASIBOVA

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Distribution generation, hosting capacity, medium voltage networks, PV penetration, PSO optimization

Utilizing distributed generation of PV technology as an additional solution to constrained medium voltage networks

A. RAMDHIN

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Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Integrating Demand Response with a Novel EV Battery Swapping Strategy

H. MANSOURI, M. M. JALALI

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Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Distribution System Operator, Synchrophasor, Wide-Area Measurement System, Zonal Control, Low-Latency, Grid Stability, Energy Transition, Distributed Generation, Blackstart, Hardware-in-the-Loop Simulation

Low-Latency Distribution Services enabled by Synchrophasor-based Control

D. WILSON, S. NORRIS, C. ALLIOUA, S. CLARK

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Distribution System Operator

Analyzing the Role of Distribution System Operator in Context of India's Energy Transition

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Active distribution system, conditional scenario generation, conditional generative adversarial network, reliability evaluation, Monte Carlo simulation, uncertainty

A Reliability Assessment Method Integrating CGAN-Generated Source-Network-Load Scenarios for Active Distribution Systems

X. RONG, Y. HUANG, G. LI, Z. BIE

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: decentralized generators, distribution network, renewable energy system, reactive power control, energy losses, and voltage profile

Photovoltaic Renewable Energy Systems for Power Quality Improvement of Electrical Networks

M. MOFTAH, A. ALSHEHRI, W. ALMLHI

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Fault Section Identification, Distribution Systems, Distributed Energy Resources (DERs), Transformer, Deep Learning

Fault Section Identification in DER-Integrated Distribution Systems Using Transformer-Based Deep Learning

J. HWANG, W. Y. CHOI, G.-H. KIM, J.-H. JEON

Korea Electrotechnology Research Institute

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Photovoltaic (PV) systems, partial shading, current-voltage (U-I) curve, power-voltage (P-V) curve, thermal imaging, performance degradation

Impact of Partial Shading on Photovoltaic System Performance

A. MUJEZINOVIC, A. ALIHODZIC, M. MUFTIC DEDOVIC, A. MAKSUMIC, N. DAUTBASIC, A. MEMIC, S. HUSEINBEGOVIĆ

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems
Keywords: Outage - Inference - Parallel - Processing - AMI - SCADA - Containerization

Scalable Architectures for Real-Time Outage Inference in Power Distribution Networks Using Dynamic Outage Graph Models

K. CHMIELOWIEC¹, Z. WANG², P. BOMBA¹, H. NEL³

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Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

A Conceptual Framework for Planning Active Distribution Systems under Accelerated Expansion of Electric Vehicle Charging Infrastructure

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Charging Station, Electric Vehicles, IDECO, Power Distribution Networks, Power Loss, Power quality, Smart Charging, Sustainable Transportation, Vehicle-to-Grid (V2G), Voltage Stability

The Impact of Electric Vehicle Charging Stations Integration on Distribution Networks – A Case Study of Jordan

W. THIABAT, M. ALSHATNAWI

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: AI, Distribution Networks, CYME, K-Means, DER

AI-Driven Planning Framework for Active LV Distribution Networks Using CYME Simulations and K-Means Clustering under DER Deployment Scenarios

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: V2G, Simulation, Bidirectional Charging, Medium Voltage, Heavy Duty Electric Vehicle, Model Predictive Control

Cost-Benefit Analysis of Vehicle-to-Grid Applications for Medium Voltage-Connected Heavy Duty Vehicles

A. HINTEREGGER, D. STAHLER, S. LEDINGER, J. KAPPELLER, P. REISZ, B. HERNDLER

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Megawatt charging, Traffic analysis, Energy modelling, Data-driven grid models, Grid simulations

Evaluating the Impact of High-Power EV Charging on Medium-Voltage Networks Using Traffic Analysis and Grid Simulations

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: AC Normal Charge, Electric Vehicle, On-board Charger, Power Quality

Assessment of Power Quality Impacts and Integration Limits of Electric Vehicle on AC Charging: A Case Study of Thailand's Urban Distribution System

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Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Interoperability Profile for Consumer and DER Energy Data in Colombia: Enabling DSO Operational Management

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Standardization as a Foundation for the Digital Transformation of Utilities into DSO: The Case of AMI in Colombia

B. CALVACHE¹, M. CASTILLO², H. BRICEÑO³, L. SANTOS⁴, A. RAMIREZ⁵

¹Metrum; ²CHEC; ³CELSIA; ⁴TECUN; ⁵Grupo unión

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Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Trends and Advances of Enablers for the Energy Transition towards Smart Grids by the DSO

E. GOMEZ¹, B. LOPEZ², K. MUÑOZ³, J. UNIGARRO⁴, E. FENOLLOSA⁵

¹UNIVALLE; ²CEO; ³Metrum; ⁴univalle; ⁵S2 Grupo

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Linear PV, electrical railway microgrid, voltage variation, power loss, mismatch, LVDC, MVDC, decarbonization, grid resilience

Linear PV Power Plant Integration into Electrical Railway Microgrid via MVDC Architecture

B. GUO¹, D. BLATTER¹, J. POUGET¹, M. ADHANA², J. SCUDERI³, T. MEIER⁴, M. STOECKLI⁵

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Operating, distributed, reduced curtailment

Model-Free Dynamic Operating Envelopes to support increased penetration of distributed energy resources and reduced curtailment

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Open Charge Point Protocol, Hybrid Energy Storage Systems, Virtual Energy Storage System, Vehicle To Grid, Smart Energy Storage, Charge Point Operator (CPO), Mobility Service Provider (e-MSP)

Integration of EV Community Technology with advanced Energy Storage and smart charging Protocols

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¹RDIUP, France; ²Elektro Ljubljana, Slovenia

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Method for Distribution Network Reconfiguration of Large Scale Low-Voltage Network Areas to reduce Network Reinforcement Costs

T. REBENTISCH¹, C. BECKER¹, T. RIEDLINGER¹, F. TALMOND¹, M. ZDRALLEK¹, M. KERZEL², D. HEUBERGER²

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Digitization - Distribution System - State Estimation - State Forecasting - Error Propagation - Weighted Least Squares Estimator - Gated Recurrent Unit Neural Network

Error propagation in the state estimation and prediction of distribution grids with a limited database

S. STORCH¹, M. FINKEL¹, M. UHRIG², M. KREISSL³, M. RÖTTEL⁴

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Scaling Innovation to System Impact - How the Kopernikus Flagships Translate Research into Grid-Ready Solutions for 2045 Climate Targets

M. DAUER¹, K. SCHOENLEBER², G. MEHLMANN³

¹Siemens AG Germany; ²Hitachi Energy Research Germany; ³FAU Erlangen-Nürnberg Germany

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: grid congestions, grid planning, limit violations, low-voltage distribution grids, scenario generation

Targeted Scenario Generation in Low-Voltage Distribution Grids Using a Genetic Algorithm

P. KVESIĆ, N. ŠTUMBERGER, F. NASR, A. ULBIG

RWTH Aachen University Germany

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Optimizing Grid Operation and Control of a Hybrid Production Plant on Ikaria's Non-Interconnected Network

G. LAMPISIDIS TOMPROS¹, S. PANTELIS¹, K. KAOUSIAS¹, M. FOTOPOULOU², K. N. MALAMAKI³, N. ANDRIOPOULOS³

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Framework Development for Battery Energy Storage System Optimal Placement in Distribution Networks with high DER Integration

D. KRITHIS, C. KRASOPOULOS, M. KAPOGIANNI, F. GAKIS, P. LIONTOS, V. NTALI

HEDNO Greece

ID: 12601

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Ancillary Services; Distributed Energy Resources; Inverter based; Microgrids; Optimum Power Flow; Digital Twin

Active Distribution Networks With Provisioning of Ancillary Services Through Distributed Energy Resources, Inverter Based Resources and Microgrids

T. BLASI¹, T. FERNANDES², A. AOKI³, M. TRINDADE⁴, R. BLASI⁵

¹OPAL-RT Technologies Brazil; ²Federal University of Paraná Brazil; ³Federal University of Paraná Brazil; ⁴OPAL-RT Technologies Brazil; ⁵Federal University of Paraná Brazil

ID: 12626

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS2 - Planning and operations for 2030 and beyond in active distribution systems

Keywords: Electric Vehicles, DC Fast Charging, Harmonics, Total Demand Distortion (TDD), Total Harmonic Distortion (THD), Neutral Current, Hosting Capacity and Low-Voltage Distribution Networks

Assessment of Harmonic Emission from Electric Vehicle Charging and their impact on Distribution Grid Quality

S. F. JUNEJO¹, M. FAHEEM², M. BARANAUSKAS³, S. HÄSÄ⁴, M. ANTILA⁵

¹VTT Technical Research Centre of Finland; ²VTT Technical Research Centre of Finland; ³VTT Technical Research Centre of Finland; ⁴VTT Technical Research Centre of Finland; ⁵VTT Technical Research Centre of Finland

C6 PS3 - Rural and industrial electrification standards, practices and technology options

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Keywords: Behind the Meter (BTM) - Commercial & Industrial (C&I) Microgrid - Distributed Energy Resource (DER) - Electrical Vehicle Supply Equipment (EVSE) - IEEE 2030.5 - Open Charge Point Protocol (OCPP)

Efficient Energy Management Architecture of Distributed Energy Resource Microgrid Site with Electrical Vehicle Supply Equipment

R. SHIEH¹, C.-P. TUNG², C.-Y. LIN², W.-C. MA²

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ID: 10258

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Keywords: Challenges, AIS, GIS, Substation, Transformation

A Smart 1.1 KV Distribution: The Future of Loss Reduction

J. BORISAGAR^{*}, S. RATHOD, R. MAKWANA, D. A. DHANDHIA

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Development of Artificial Intelligence based DSTATCOM System in DC Microgrid for Power Quality Enhancements

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Electrifying Agriculture: A Sub-National Roadmap for the Adoption of Electric Tractors

R. K. PILLAI^{*}, R. SURI, D. KHOSLA, B. K

ISGF INDIA

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Seasonally Informed Design and Development of Hydrokinetic Turbines for Off-Grid Power Generation in a Himalayan River

P. CHAND¹, R. TYAGI^{*1}, P. SAGAR¹, M. K. SINGHAL², A. KUMAR², C. PANT², M. KAMAL³, A. SACHDEVA²

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Keywords: Microgrid - Bronzeville - PMU - Community - Battery Energy Storage System

Technology Meets Community: Installation Paradigm of the Bronzeville Community Microgrid

K. KATONA, C. MUKANIA, K. ROSNER, T. ALFORD, C. KHALID

Commonwealth Edison, United States of America

ID: 10980

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Keywords: Fault detection, inrush-current mitigation, inverter-based microgrid

Simulation and Experimental Verification of Inrush Mitigation and Fault Detection in Inverter-Based Microgrids

R. ITO¹, K. YOSHIYAMA¹, S. MORITA¹, R. KOIZUMI², S. KAWANO³

¹TEPCO Holdings, Inc. Japan; ²TEPCO Power Grid, Inc. Japan; ³Mitsubishi Electric, Corp. Japan

ID: 11216

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Keywords: cable lines, power supply systems, industrial and agricultural consumers, modeling.

Application of Cable Lines of Innovative Designs in Power Supply Systems of Industrial and Agricultural Consumers

A. KRYUKOV¹, K. SUSLOV², P. ILYUSHIN³, E. VORONINA¹, A. KRYUKOV⁴

¹Irkutsk State Transport University; ²National Research University "Moscow Power Engineering Institute"; ³Energy Research Institute of the Russian Academy of Sciences; ⁴Irkutsk National Research Technical University

ID: 11218

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Keywords: off-grid power system, frequency control, voltage control, abruptly variable load, electrical energy storage system, autonomous hybrid power plant, diesel generator, gas piston generator, solar power plant, power quality

Stabilisation of Frequency and Voltage in an Off-Grid Power System with Energy Storage under Abruptly Variable Load

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¹SO UPS, JSC «Branch Regional Dispatching Office, Energy System of Novosibirsk Region, Altai Territory and the Altai Republic»; ²Novosibirsk State Technical University

ID: 11219

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Keywords: Distribution Network, Microgrid, Reliability, Contingency Analysis, Recloser, Optimization, Genetic Algorithm

Optimal Recloser Placement for Improved Reliability in Stand-Alone Industrial Power Supply Systems

N. SERGEEV, Y. KAZANTSEV

Novosibirsk State Technical University

ID: 11271

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Keywords: Battery Energy Storage System (BESS), Frequency Stability, Primary Frequency Response (PFR), Under Frequency Load Shedding (UFLS)

Deploying battery energy storage system to enhance the primary frequency response and under frequency load shedding schemes in islanded microgrids

N. NOBELA, F. OLOO, G. NDLOVU

Council of Scientific and Industrial Research (CSIR)

ID: 11564

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Keywords: Electric power safety hazards; multidimensional coupling modelling; dynamic fault tree; sensitivity analysis; digital twin; intelligent early warning; cloud-edge collaboration

Analysis of the Causes and Evolution Mechanisms of High-Voltage Sensitive Industrial Customers' Power Usage Safety Risks with the Integration of Emerging Grid-Connected Entities

B. ZHENG, J. ZHANG, C. LIU, M. PAN, F. GONG, J. TONG, L. MENG, J. YUAN

China Electric Power Research Institute

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

The development of a hybrid microgrid system to improve the robustness of electrical services in Al Uyaynah City, Saudi Arabia.

H. ALSUBAIE

Saudi Electricity Company

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Black-start Capabilities of the Arholma Microgrid

A. GARDARSDÓTTIR

Vattenfall

ID: 11935

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Keywords: distribution systems, distributed energy resources, Off-grid, DER

Determination of Optimal Hybrid Distributed Generation System Using Two Optimization Schemes

A. AL-KHRESHEH¹, S. HARASIS²

¹EDCO- Electricity Distribution Company; ²Tafila Technical University (TTU)

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Intelligent Design of Microgrids for Rural Areas Using cGANs and Reinforcement Learning applied in the village of La Marina, Valle del Cauca - Colombia

L. f. ORTIZ TORRES¹, J. a. CERON², E. GOMEZ LUNA³

¹gers; ²Univalle; ³Univalle

ID: 12134

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Detection Of The Connection Of Distributed Energy Resources Through An Innovative Emt Signal Analysis Approach

J. NIETO¹, J. CEBALLOS², C. CASTRO³, E. GOMEZ⁴

¹UNIVALLE; ²Univalle; ³M&M Bobinados; ⁴univalle

D1 MATERIALS AND EMERGING TEST TECHNIQUES

D1 PS1 - Testing, monitoring and diagnostics

ID: 10308

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Fiber optic acoustic emission (FOAE) sensing technology, High-voltage Bushing, Partial discharge (PD), Online PD monitoring, PD localization, Power transformer

Partial Discharge Monitoring and Localization in HV Bushings Using Fiber Optic-based Acoustic Emission Sensing Technology

H. HASHEMI-DEZAKI¹, A. ZADEH¹, S. VOETEN², W. ZHAO¹

¹Optics11; ²SGB-SMIT Group

ID: 10515

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Next-Generation Partial Discharge Detection in GIS:

Next-Generation Partial Discharge Detection in GIS: A Hybrid Intelligent Monitoring Solution

M. PAVANKUMAR*, N. VEERENDRA

POWERGRID INDIA

ID: 10516

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Transmission Line Insulator Defect Detection and Diagnostics

Transmission Line Insulator Defect Detection and Diagnostics Using Machine Learning Models

S. REDDY*¹, N S SODHA², A. K. BALI¹

¹Power Grid Corporation of India Limited; ²Ex. Power Grid Corporation of India Limited

ID: 10517

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Information available on the Call for Papers and from your National Committee. Advanced Monitoring Technique for Leakage Current and Partial Discharge

Advanced Monitoring Technique for Leakage Current and Partial Discharge in Inverter-Fed Motor Insulation

M. KUMAR*, M M. RAO, H. R

BHEL INDIA

ID: 10994

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Dry Air-Insulated Switchgear, Partial Discharge (PD), Ultra High Frequency (UHF), Sensitivity

Advanced PD sensor technology for dry air-insulated switchgear

D. MATSUMOTO, M. MIYASHITA, H. OGURA, T. MORI

Mitsubishi Electric Corporation Japan

ID: 10995

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Power transformer, Lightning impulse, Overshoot, IEC 60060-1, IEC 60076-4

Discussion on tolerance of relative overshoot magnitude of lightning impulse voltage waveforms in impulse test of power transformers

S. MIYAZAKI¹, S. YAMADA², Y. NAKASHIMA³, T. SANO⁴

¹Central Research Institute of Electric Power Industry Japan; ²Toshiba Energy Systems & Solutions Corporation Japan; ³Mitsubishi Electric Corporation Japan; ⁴Meidensha Corporation Japan

ID: 11159

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Dielectric Tests, Synchronise Condensers

On-site Dielectric Tests for Synchronise Condensers

W. {, YAN, Y. LI, F. EMMS

National Measurement Institute, Australia

ID: 11223

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: X-ray inspection, high-voltage equipment, radiation, condition control, radiation environment, X-ray apparatus

Integrated Approach to High-Voltage Equipment X-Ray Inspection at the Electric Power Facilities

L. DARIAN¹, R. OBRAZTSOV², O. OZEROV³

¹JSC «Technical Inspection UES» / National Research University «MPEI»; ²JSC "Technical Inspection UES"; ³Dukhov Research Institute of Automatics

ID: 11225

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Transformer, Diagnosis, Dissolved Gas Analysis, Monitoring, Machine Learning, Probabilistic Neural Network, Multilayer Perceptron, Time-Series, Real Time Processing

Condition Diagnosis of Oil-Filled Transformers Based on Online DGA Data Using Machine Learning

M. GARIFULLIN, S. RAKHMANKULOV, I. GALIEV

Kazan State Power Engineering University

ID: 11250

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Breakdown strength, dissolved gas analysis, monitoring, outdoor cable termination, silicone oil, water contamination

"An Integrated Diagnostic Framework of Electrochemical Analysis for Assessing Silicone Oil Health in HV Cable Outdoor Terminations"

F. RICCIARDI

TERNA

ID: 11306

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: UHF, Alternative gas, Condition monitoring, GIS, Partial discharge.

UHF-Based Partial Discharge Diagnostics in SF₆-Alternative Gases

R. ULLAH¹, A. REID¹, M. HADDAD¹, P. TADDEI², M. NAMBIAR², M. BARNETT²

¹Cardiff University UK; ²SEN Transmission UK

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Continuous monitoring and interpretation of total Gas Pressure of dissolved Gases in Power Transformers

T. MELLIN

Vaisala Oyj

ID: 11395

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Nuclear power plant, Thermal power plant, Creep test, Small punch creep test, Integrity evaluation

An Alternative Non-Destructive Method for Evaluating the Remaining Service Life of Thermal and Nuclear Power Plants: Miniaturized-Specimen Creep Testing

H. C. FURTADO¹, F. F. M. SANTOS², L. H. ALMEIDA¹

¹COPPE/UFRJ University Brazil; ²CEPEL Brazil

ID: 11396

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: nuclear power plant, thermal power plant, creep test, integrity evaluation

Remaining useful Life Prediction Methodology for Ferritic Steel Aged in Components of Thermal and Nuclear Power Plant

H. C. FURTADO, G. C. S. ROZA, L. H. ALMEIDA

COPPE/UFRJ Brazil

ID: 11398

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: explosions, fire, fire point, flash point, flammability, high-voltage transformers and reactors, insulating oil properties, maintenance

Properties of Insulating Liquids and Liquid-Impregnated Systems of Power Transformers and Reactors Regarding Fire Risk

A. C. P. MARTINS¹, S. S. d. OLIVEIRA², A. R. MARTINS², P. R. F. C. COSTA²

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ID: 11401

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Radiometric, Monitoring, Partial Discharge, Ultra High Frequency, Capacitive Voltage Transformer

Online Monitoring Strategy of High Voltage Assets in AIS based on Partial Discharge Detection by Radiometric Method

M. A. CAETANO DOS SANTOS¹, C. J. LEZCANO RIVAS², S. H. SOBREIRA OLIVEIRA¹, C. E. CARRERAS RIOS², T. FONSECA DEMARCHI¹

¹Itaipu Binacional Brazil; ²Itaipu Binacional Paraguay

ID: 11537

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Visualisation, insulation, insulation resistance, discharge, dissipation, depolarisation, absorption, accuracy, safety, productivity.

Real-time visualisation of capacitive and depolarisation discharge after DC insulation testing for improved safety, accuracy, and productivity

D. PETSOV, S. ZUREK, P. SWINERD

Megger Instruments United Kingdom

ID: 11559

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Insulators, accelerated test, multifactorial ageing, sand blasting, artificial pollution, hydrophobicity

Multifactorial accelerated ageing tests of overhead line insulators including a sandblasting stage

P. LLOVERA-SEGOVIA¹, C. GARCIA-BARRIOS², P. APARICIO-CILLÁN², M. DOMÍNGUEZ-LAGUNILLA³

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ID: 11562

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Reflection Coefficient Spectrum, MUSIC Algorithm, Defect Localization, Frequency Domain Reflectometry (FDR)

Local Defect Location Method for Long Cables Based on Improved MUSIC-Pseudospectrum

H. WANG, Y. ZHU, Y. HUANG, Y. MA, M. LI, J. HE

Beijing Jiaotong University

ID: 11565

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Triboelectric Nanogenerator (TENG), VOC Sensor, Gas Ionization, Condition Monitoring, Self- powered Sensing, Smart Grid

Electrostatic Ionization VOC Sensor Driven by Triboelectric Nanogenerator for Power Equipment Surrounding Monitoring

H. YANG¹, J. ZHAO¹, B. TIAN¹, L. ZHAO¹, Z. LIU², X. HE¹, Z. WANG¹, B. LUO¹, S. HAN³, H. WANG¹, Z. YE¹, J. LIN¹

¹Southern Power Grid Sensing Technology (Guangdong) Co., Ltd; ²Energy Development Research Institute of China Southern Power Grid; ³Guizhou Power Grid Co Ltd

ID: 11680

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: partial discharge, clustering, pulse spectral analysis, PD feature extraction, PD source separation

Separation of Partial Discharge Sources by Application of Feature Extraction and Clustering Methods

S. HELLING, C. NEUKIRCHEN, C. BRIANO, M. HUZMEZAH

CIGRE Türkiye National Committee

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Partial Discharge, Arc Detection, PD location, Machine Learning, UHF, Signal amplitude.

A UHF PDM System for Arc Detection and Signal Location in GIS

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Overcoming challenges in visual technologies for continuous monitoring of high voltage stations

L. AREVALO

Hitachi Energy

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Natural Esters - Synthetic Esters - Blended Esters - Mineral Oil - Lightning Impulse Voltage - Initiation Voltage - Acceleration Voltage - Negative Polarity - Positive Polarity - Dielectric Liquids

Comparative Analysis of Lightning Properties of Different Types Ester Fluids

F. STUCHALA¹, P. ROZGA¹, F. SCATTIGIO², G. CAMPI²

¹Lodz University of Technology, Poland; ²A&A Fratelli Parodi, Italy

ID: 11782

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: circuit breakers, dynamic contact resistance measurement, test current

Test Current Effect on Reliability of Dynamic Contact Resistance Measurements for Circuit Breakers

T.-H. RENAUDIN, A. TIRRONIEMI, J. HAEMMERLE, S. BOECKING

OMICRON electronics

ID: 11820

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Voltage and Current Imbalances, Ground Fault Diagnostics, Predictive Maintenance.

Advanced Asset Monitoring in HV & EHV Systems Using Digital Signal Processing for Detailed Ground Fault and Imbalance Detection and Analysis

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Reliable power system component design automation, generative modeling, representation learning, end-to-end framework

End-to-end Design Automation for Reliable Power System Components

J. CHAKRAVORTY, N. RIPAMONTI

Hitachi Energy Research

ID: 11884

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Partial discharge, power electronic converters, transformers, rotating machines, high voltage, insulation, breakdown, testing.

Impact of switched voltages from electronic power converters on high voltage insulation systems and components

E. EBERG¹, L. LUNDGAARD¹, T. G. AAKRE¹, A. CAVALLINI²

¹SINTEF Energi; ²University of Bologna

ID: 11949

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: GIS cable termination, partial discharge, time-of-flight, velocity of propagation, condition monitoring

A Case Study on the Signal Delay Effect of Cable Terminations on Time-of-Flight Measurements in GIS

A. GOODWIN¹, G. COAPES¹, M. BOLTZE², F. MACLEOD³, I. BOYD³

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ID: 12022

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Both-Sides Grounded Timing Measurement, Dynamic Resistance Measurement, Timing Measurement Accuracy

Resistance Threshold Method for Accurate and Reliable Both-Sides Grounded Timing Measurements for High-Voltage Circuit Breakers

S. BOECKING^{1,2}, A. NENNING¹, H. BRUMMELHUIS³

¹OMICRON electronics GmbH; ²RWTH Aachen; ³TenneT

ID: 12023

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: high-voltage testing, safety

Minimizing Shock Risk during High-Voltage Measurements with Fast Fault Detection

J. HAEMMERLE, B. UNTERER, L. KLINGENSCHMID

OMICRON electronics GmbH

ID: 12332

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: C4-FN mixture, decomposition products, electrical endurance, electrical lifetime, high voltage circuit breaker, puffer technology, SF6 alternatives, SF6-free circuit breaker, short line fault, terminal fault

Evolution of Gas Composition under Switching of Fault Currents in a 420 kV SF6-free Circuit Breaker

M. GATZSCHE¹, V. TEPPATI¹, S. BUFFONI¹, P. STOLLER¹, M. STOECKLI²

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ID: 12396

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

AI based compression and analysis of partial discharge current pulse waveform in HVAC and HVDC systems

P. TRUE¹, T. GRÄF¹, M. MENGE¹, R. PLATH²

¹Hochschule für Technik und Wirtschaft Berlin; ²Technische Universität Berlin

ID: 12415

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Partial discharge (PD), optical PD measurements, GIS, transient voltages, VFTO

Advanced optical PD diagnostics of GIS at onsite testing and service including transient overvoltages

C. NEUMANN¹, M. VOGL², M. TUCZEK³, L. SCHWALT⁴, P. WENGER⁵

¹Technical University of Darmstadt; ²Vogl electronic Germany; ³Tennet TSO GmbH Germany; ⁴Austrian Power Grid AG Austria; ⁵TransnetBW GmbH Germany

ID: 12420

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Investigation on Aging of Paper and Liquid insulation during Overload Test of Natural Ester Immersed Transformer

A. GAMIL¹, A. AL-ABIAD¹, K. OSTALSKI²

¹Hitachi Energy, Germany; ²Hitachi Energy, Poland

ID: 12523

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Partial discharges, Power Cables, PD detection, Moisture Intrusion, Cable Aging

Degradation Characteristics of Insulation Discharge at the Interface of Moisture-Affected Cable Accessories

C. RAO, G. ZHU, Z. LIU, S. PAN

Sichuan University

ID: 12524

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS1 - Testing, monitoring and diagnostics

Keywords: Generator Circuit Breaker, Contact, Vibration Fingerprints, RQA, Electro-erosion Assessment

Contact Electro-erosion Assessment of Generator Circuit Breaker Based on Vibration-fingerprint-RQA

Z. JIANG, Y. LI

Xi'an High Voltage Apparatus Research Institute Co., Ltd.

D1 PS2 - Materials for electrotechnical purposes and modelling

ID: 10520

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Evaluation and Establishment of Insulation System of Electrical Machines

Evaluation and Establishment of Insulation System of Electrical Machines using Accelerated Ageing Phenomena

R HARI*, D. M. M. RAO, N. SAHOO, V. RAWATIYA

BHEL INDIA

ID: 10916

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Insulating oils, Ester, ECT, Electrical charges, Flow electrification risk, Power Transformers, Pressboard, Paper, Static electrification

Flow electrification risk assessment of conventional and new alternative insulating liquids for power transformers

M.-L. COULIBALY¹, O. MOREAU¹, T. PAILLAT²

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ID: 10996

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Gas insulated Switchgear, Dry-Air, Insulating Spacer, ε -Functionally Graded Materials, insulating coating conductor, Lightning Impulse Flashover Voltage

Suppression of gas pressure and tank diameter of dry air GIS by combination of FGM spacer and insulating coating conductor

K. OKAMOTO¹, H. MASUI¹, N. OSAWA², K. KATO³, N. HAYAKAWA⁴, H. OKUBO⁵

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ID: 10997

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: MV/HV-class XLPE cables, Water tree degradation, Wet design

Water Tree Degradation Impacting on the Insulation Performance of Highly-aged MV/HV-class XLPE Cable

T. TAKAHASHI, T. KURIHARA

Central Research Institute of Electric Power Industry Japan

ID: 10998

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Energy storage system, Lithium ion battery, Nanoparticle synthesis

High-Throughput Synthesis of Size-Controlled Nanoparticles for Lithium Ion Battery using Tandem-Coil Modulated Induction Thermal Plasmas

Y. TANAKA¹, Y. NAKANO¹, T. ISHIJIMA¹, S. WATANABE², K. NAKAMURA², S. OKABE³

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Current, Integration, Charge, Q-t method, Dielectric Properties, Polymer Physics

Anomalous Electric Conduction in Polymeric Insulating Materials: Analysis by Integrated Current

Y. SEKIGUCHI¹, T. ONODA¹, S. MASHIO¹, S. YASUDA¹, O. URAKAWA², T. INOUE²

¹Sumitomo Electric Industries, Ltd. Japan; ²The University of Osaka Japan

ID: 11000

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Ageing Factors, Long-Term Reliability, Synthetic Air-Insulated Switchgear

Investigation of Ageing Factors and Long-Term Reliability in synthetic air-insulated switchgear

Y. TAKAHARA, Y. OYANAGI, K. SATO, R. KURIYAMA, M. MIYASHITA

Mitsubishi Electric Corporation Japan

ID: 11014

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Natural Ester in a fleet of 66 kV class Power Transformers

Application of Natural Ester in a fleet of 66 kV class Power Transformers – a field experience

D. C. S. NARASIMHAN^{*1}, M. G. A MORDE², E. Y. V JOSHI²

¹Savita Oil Technologies India; ²Past President, ERDA Former Head Engg., GETCO India

ID: 11057

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Coating, graphene, grid components, self-lubrication

Extend mechanical and electrical operations as enabler for grid flexibility

M. RIVA

ABB

ID: 11120

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Ageing kinetics of insulating paper immersed in a near carbon neutral re-refined oil

A. PEIXOTO¹, H. CAMPELO², M. FIALHO¹, M. MOREIRA³, M. EUSÉBIO³, R. MARTINS²

¹LABELEC; ²NYMAS AB (PORTUGAL); ³UNIVERSIDADE NOVA DE LISBOA

ID: 11142

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: DFT; modelling; treeing

Quantum chemistry simulations for multi-scale modelling of polymer ageing

G. BUCCELLA

RSE

ID: 11202

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Additive Manufacturing - Rapid Tooling - Fast Prototyping - Epoxy Casting

Additive Manufacturing of Reusable Moulds for Rapid Prototyping of Electrification Devices

A. RYBAK¹, A. SIWEK¹, R. JAVORA²

¹ABB Corporate Technology Center Poland; ²ABB s.r.o. Czech Republic

ID: 11387

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Biodegradability, OECD 301B/F, Insulating Liquids, Transformers, Dispersant, Water-Soluble

Biodegradability Testing of Transformer Insulating Liquids: Decoding the OECD 301 for the electrical industry

T. NORRBY

Nynas

ID: 11399

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Liquid-immersed transformers, Life-prediction tool, Isotopic monitoring, Isotope-ratio analysis, Radioactive carbon analysis, Biogenic carbons

Isotopic Monitoring: A Novel Diagnostic and Life-Prediction Tool for Paper–Oil Insulation in Transformers

H. WILHELM¹, P. FERNANDES¹, Y. MANNES¹, C. SILVA²

¹VEGOOR Brazil; ²ARGO Brazil

ID: 11400

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Accelerated aging, Arrhenius aging model, Silicon degradation, Thermal aging

Accelerated Aging Experiments of Silicon Rubber Insulation for the First 500kV Dry-type Air-core Shunt Reactor in Brazil

L. N. PEREIRA¹, J. WANG², A. ASGEDOM², G. ZHOU²

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ID: 11424

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

The effect of hotspot conditions on DGA key gas generation on novel insulating liquids

P. WEDIN

Nynas

ID: 11549

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: C4F7N – Epoxy resin – EPDM – Thermal test – Electro-thermal test – Material compatibility – GC-MS – SEM/EDX

Overview of Long-Term Compatibility and Ageing Tests for Materials Used in High-Voltage Gas Insulated Switchgear

M. MICHELARAKIS¹, S. SINGH¹, D. CLARK¹, A. HADDAD¹, G. WILSON², M. WALDRON²

¹Cardiff University United Kingdom; ²National Grid Electricity Transmission PLC United Kingdom

ID: 11568

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Artificial Intelligence, Solid Dielectric, Target Design, High-throughput Screening, Polymer

Artificial Intelligence Assisted Development of Dielectric Materials

J. DENG, Q. WANG, Y. ZHOU, X. ZHAN, Z. ZUO, W. WU, S. SHUKLA, X. LIANG, C. WU

Tsinghua University

ID: 11569

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Magnolol epoxy; Mixed resin; Enhance toughness; Reduce dielectric loss

Research on the Performance Improvement of Bio-based Magnolol Epoxy Resin

P. ZHANG, Z. HUANG, C. ZHAO, W. XU

State Key Laboratory of Power Transmission and Transformation Equipment Technology (College of Electrical Engineering, Chongqing University)

ID: 11570

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Silicone Rubber, Tracking, DC Polarity, Composite Insulator

Study on the arc erosion resistance characteristics of silicone rubber under DC voltage

S. ZHOU¹, X. ZHANG², H. LIU², Y. DENG¹, J. YU¹, D. SUN¹, S. XU²

¹China Electric Power Research Institute Co., Ltd.; ²North China Electric Power University

ID: 11571

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: SF₆ leakage detection; Colorimetric film; Gas-insulated equipment; Self-sealing; Flexible echanofluorochromic film

Colorimetric and self-sealing photonic crystal film for early detection of SF₆ leakage in gas-insulated equipment

Y. MIAO, P. XIAO

State Grid Jiangsu Electric Power Co., Ltd. Research Institute

ID: 11572

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Mechanical shearing, grain-oriented silicon steel, magnetic property, transformer

Analysis of the Impact of Mechanical Shearing on the Properties of Grain-Oriented Silicon Steel

Y. WANG, X. ZHAO, Q. SUN, N. LI, F. WANG, Q. LIU

Shandong Taikai Transformer Co., Ltd.

ID: 11624

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Additive Manufacturing, Direct Ink Writing, 3D printing, Rheology, Silicone, PDMS, High Voltage, Insulator Materials, Breakdown Strength, Dielectric Strength

Extrusion Additive Manufacturing of Polydimethylsiloxane Materials and their Performance for Potential Insulation Applications

Y. OSMANI, D. HODGEMAN, I. KINLOCH, L. CHEN, S. BUTLER, V. JARKOV, K. C. CHAN

University of Manchester UK

ID: 11785

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling
Keywords: HVDC Cable Insulation, XLPE, Vinyl Silane, Alkoxy Density

Enhancing HVDC Insulation Performance of XLPE via Tailored Vinyl Silane Additives: Correlating Microstructure, DC Breakdown, and Space Charge Behavior

T. LEE, C. KIM, S. KIM, Y. LEE

Hanwha Solutions

ID: 11800

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: insulating liquids, materials compatibility, infrared spectroscopy, high-pressure liquid chromatography, X-ray fluorescence spectroscopy

Assessment of Material Compatibility with Insulating Liquids through Spectroscopic Analysis

V. ĐURINA, D. VRSALJKO, V. HARAMIJA

KONČAR - Electrical Engineering Institute, Croatia

ID: 11887

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Oil reclaiming, Oil reclamation, Re-refined oil, Oxidation stability, Circularity, Transformer

Quality and Performance of Reclaimed Mineral Oils

L. A. ERIKSSON, S. ARREGUIN

Hitachi Energy

ID: 11995

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Dielectric diagnostics, NDDT, IRCM, composite insulators, ageing, degradation, lifetime assessment, health index.

Advanced Dielectric Diagnostics for Aging Analysis of Silicone Elastomers

J. M. SEIFERT¹, F. LEHRETZ², J. KRESSLER³, M. NASE⁴, S. BHATTACHARYYA⁵, J. SEIFERT⁵

¹TKE Beratungsgesellschaft mbH; ²TenneT TSO GmbH; ³Martin-Luther- Universität Halle-Wittenberg; ⁴Median Kunststoffservice; ⁵TKE GmbH

ID: 12334

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: corrosion testing, outdoor installation, environmental conditions, material performance, reliability

Experience on the Application of IEC Corrosion Tests on Sealing Systems of Enclosures and Auxiliary Equipment to gas-insulated metal-enclosed Switchgear

M. NAEF¹, F. MACEDO¹, J. WEGMANN¹, K. ZWEIACKER¹, P. ESTEVES¹, M. STOECKLI²

¹Hitachi Energy Switzerland; ²ELECTROSUISSE / CIGRE Switzerland NC Secretary

ID: 12336

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: sealing system, permeation, leakage rate, CO₂-based mixture, alternative gas

Improved Sealing Technology for Switchgear with alternative Gases

L. TREIER¹, M. PERRET¹, G. DOLCI¹, C. CABRERA², M. STOECKLI³

¹GE Vernova Switzerland; ²GE Vernova France; ³ELECTROSUISSE / CIGRE Switzerland NC Secretary

ID: 12347

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

A novel method for the monitoring of degradation of inhibitors by means of dissolved gas analysis

I. ATANASOVA- HOEHLEIN, C. SCHUETT, S. POERNBACHER

Siemens-Energy Transformers

ID: 12358

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Alternative liquids, Aging, DGA, Methanol, Power Transformer.

Aging of Two Natural Esters in the Presence of Transformer Construction Materials

D. MIHAJLOVIC¹, A. GAMIL², V. VASOVIC¹, J. LUKIC¹

¹Nikola Tesla Institute of Electrical Engineering, Serbia; ²Hitachi Energy, Germany

ID: 12373

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Material Analysis of Composite Hollow Core Insulator Housings after Long-Term Ageing Test

A. BAUMER¹, C. BAER², K. HINDELANG², M. DOMM¹

¹Reinhausen Power Composites GmbH; ²Wacker Chemie AG

ID: 12484

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Long-term stability of synthetic air in gas-insulated systems and the impact of gas quality on the electric and ageing performance

K. JUHRE, L. HENRICH, K. POHLINK, A. GLAUE

Siemens Energy Global GmbH&Co KG Germany

ID: 12526

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Cable termination; Silicone oil; Polyisobutylene; Trace water; Dielectric properties

Research on the Water Absorption and Insulation Deterioration of Insulating Oil for High-Voltage Cable Terminations

W. ZHANG, C. LI, J. CAO, X. TAN, J. CHEN

Electric Power Research Institute of State Grid Jiangsu Electric Power Co., Ltd.

ID: 12527

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Boron Nitride, Carbon Nanotubes, Thermal Conductivity, Epoxy Composites, Thermal Management

Design and Thermal Conductivity Enhancement Strategies of MWCNTs@BCN Coaxial Nanotube Structures and Their Epoxy Composites

Z. LIU, G. ZHANG, J. BIAN, T. XU, Q. PAN, H. CAI

Guangzhou Power Supply Bureau of Guangdong Power Grid Co., Ltd.

ID: 12620

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS2 - Materials for electrotechnical purposes and modelling

Keywords: Sustainability, Bio-Derived, Epoxy, High Voltage, Breakdown Strength

Greener Grids: Bio-Derived Epoxies for Next-Generation HV Insulation

V. JARKOV

University of Manchester United Kingdom

D1 PS3 - Measurements and modelling of interfaces

ID: 10921

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS3 - Measurements and modelling of interfaces

Keywords: MVDC, GIS, dielectric barrier, surface charges, dust figures, pressurized dry air

Surface Charge Measurements in Non-Uniform Air Pressurized Gaps with a Dielectric Barrier

L. CAIZERGUES¹, A. ZOUAGHI², C. TOIGO¹, A. GIRODET¹, C. VOLLAIRE²

¹SuperGrid Institute; ²Ecole Centrale de Lyon

ID: 11001

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS3 - Measurements and modelling of interfaces

Keywords: Carbon Fiber Reinforced Plastic (CFRP), Multilayer CFRP Panel, Wind Turbine Blades, Aircraft, Lightning, FDTD method, Triangular Prism Cells, Heat Transfer Equation

Electrical and Thermal Phenomena in Anisotropic CFRP Composite Panels

Y. BABA¹, N. HASHINO¹, T. KITAGAWA¹, H. TSUBATA², S. OKABE³

¹Doshisha University Japan; ²Keio University Japan; ³The University of Tokyo Japan

ID: 11141

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS3 - Measurements and modelling of interfaces

Keywords: Magnetic Fields, Respect Width, Electrical Substations, Modelling

Modelling of Respect Width for magnetic field for Electrical Substations of Terna

A. GUARNERI
TERNA

ID: 11760

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS3 - Measurements and modelling of interfaces

Keywords: Lightning Impulse – Dielectric Liquid – GTL - Inception – Breakdown – Light Emission

Comprehensive Analysis of Lightning Performance of the Oil-Wedge Type Electrode Model Immersed in Selected Dielectric Liquids

P. ROZGA¹, F. STUCHALA¹, M. MILONE², E. VAN SCHAİK³, P. HATOS², A. HILKER³, L. DORPMANNS², K. STRZELECKI¹

¹Lodz University of Technology, Poland; ²SGB-SMIT, Germany; ³Shell (SDSI) PTX Projects & Technology The Netherlands

ID: 12333

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS3 - Measurements and modelling of interfaces

Keywords: material compatibility, liquid insulated transformers

The importance of material compatibility for transformers

I. ATANASOVA-HOEHLIN

Siemens-Energy Transformers

ID: 12621

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: D1 PS3 - Measurements and modelling of interfaces

Keywords: Charge transport, Multiscale modelling, Molecular dynamics, Quantum chemistry, Cellulose-oil interface, Moisture deterioration

Charge transport multiscale modelling for bridging material properties to insulation performance: case study of moisture deterioration at cellulose-oil interface

H. ZHAO

High Voltage Lab, Department of Electrical and Electronic Engineering, University of Manchester United Kingdom

D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS & CYBERSECURITY

D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

ID: 10112

D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Solar Power Forecasting, Deep Neural Network, Numerical Weather Prediction, Grid Stability, Renewable Energy

NWPsolarNet: A Scalable Deep Learning Framework for Medium-Term Solar Forecasting across Europe

M. RUS, L. HVASTJA, V. BRAJAK, T. JUSTIN

Medius d.o.o., Slovenia

ID: 10137

D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Corrective Maintenance - Predictive Maintenance - Emergent - Grid - Reliability - PJM - Weather - Machine Learning - Electric - Power - Transmission - Substation

Machine Learning Model for Real-time Prediction of Influx of Critical Corrective Maintenance Work on the Grid

M. JORDAN

Commonwealth Edison, United States of America

ID: 10156

D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Predico Collaborative Forecasting Platform

H. CARSTENS¹, J. R. ANDRADE², C. S. GONÇALVES², A. F. GARCIA², R. J. BESSA², M. URAZAEVA¹

¹Elia Transmission Belgium, Belgium; ²INESC-TEC Portugal, Belgium

ID: 10168

D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Leveraging RAG for Reasoning and Analyses of Electricity Distribution Codes

H. MAHMOUD¹, H. MAHMOUD²

¹Faculty of Engineering, Al Nahda University, Egypt Egyptian Electricity Holding Company (EEHC), EGYPT; ²College of Computing, Birmingham City university, Birmingham, UK

ID: 10523

D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: AI-Powered Predictive Analytics Renewable

AI-Powered Predictive Analytics for Renewable Generation Forecasting and Grid Optimization: Advancing Reliability and Efficiency in the Power Sector

S. AGRAWAL *, A. VERMA

Power Grid Corporation of India Ltd. India

ID: 10524

D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: ANN Based Day Ahead Forecasting

ANN Based Day Ahead Forecasting Model for All India Demand

P. PATEL*, M. SUBHLAXMI, S. MUKHERJEE, A. GUPTA, B S ROY

Grid-India INDIA

ID: 10525

D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: ISTS Communication for cross border

ISTS Communication System for cross border links in Indian Power Sector

N. MISHRA*, M. GUPTA, K. SUMAN

CTUIL INDIA

ID: 10526

D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Real-Time Synchronisation Monitoring IED

Real-Time Time Synchronisation Monitoring System for IEDs in Power System

S. DALVI*, V. S., R. MADANE, A. MAHARNAVAR

Tata Power India

ID: 11002

D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Quantum Computing, Machine Learning, Image Classification, Mathematical Optimization

Considerations for Applying Quantum Machine Learning to Predictive Maintenance and Power Plant Operations in the Electric Power Sector

E. NAMBA¹, T. TOMONO²

¹Electric Power Development Co.,Ltd. Japan; ²Keio University Japan

ID: 11006

D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: MPLS-TP, Enhanced Delay Control (EDC), IP-PCM relay, Line differential protection, Packet-based

Migration To The Next-Gen Packet-Based Transport Network: Enabling IP-Based Power Control Applications of Tomorrow

Y. INOYAMA¹, D. HAEGDORENS²

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ID: 11227

D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: High-voltage outdoor switchgear, robotic diagnostics, automated process control system, multispectral inspection, decision support systems, asset observability, information integration, condition-based maintenance

Deployment of an Intelligent Robotic Diagnostic System for Outdoor Switchgear Equipment Based on Multispectral Analysis and AI

A. KHALYASMAA¹, S. EROSHENKO¹, P. MATRENIN¹, A. BRAMM¹, A. ROMANOV²

¹Ural Federal University; ²MIREA—Russian Technological University

ID: 11230

D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Artificial Intelligence, Machine Learning, Data Validation, Power System Model, Anomaly Detection

Application of AI (ML) Tools for Model Validation and Anomaly Detection

N. BELIAEV, R. BOGOMOLOV, G. UMAROV

SO UPS of Russia

ID: 11231

D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Synchrophasor measurements, wide-area monitoring system, low-frequency oscillations, data quality, anomaly, data-driven analysis, machine learning, artificial neural network

Synchrophasor Data Reliability Monitoring in Power System Operational Mode Analysis

A. RODIONOV¹, K. BUTIN¹, A. POPOV¹, D. DUBININ²

¹Energoservice; ²SO UPS

ID: 11232

D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Large Language Model, LLM, neural network, text detection, OCR, relay protection, automation, machine learning, Data Science, data clustering

AI-Based System for Automated Digitalization of Relay Protection Settings Forms

D. ODNOLKO*, D. VOLODIN, G. GARASHCHENKO, E. MALAKHOV, R. BOGOMOLOV

SO UPS

ID: 11235

D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Renewable energy sources, RES forecasting, telemetry information, data quality, data reliability, error minimization, equipment calibration

The Accuracy of Renewable Energy Generation Forecasting in Energy Systems: Quality Improvement Practices

I. BOBRITSKAYA, S. PRIKHODKO, R. BOGOMOLOV

SO UPS, JSC

ID: 11239

D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Data Loss, Data Latency, LSTM, PDC, PMU, RCA

Leveraging AI to Identify the Root Causes of PMU Data Latency and Loss for Control Room

D. DUBININ¹, A. ZHUK¹, F. GAIDAMAKIN², A. KISLOVSKII², D. UTKIN¹, D. IVANOVSKII¹

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ID: 11240

D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Digital Twins, Interoperability, DERs, Energy Consumers, Flexibility Markets, Grid Integration

Use Cases of Digital Models and Digital Twins in Power Supply Systems of Large Consumers

F. NEPSHA¹, A. NEBERA¹, N. SHUBIN¹, V. VORONIN²

ID: 11402

D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Artificial Intelligence, Structured Data, Engineering Information Modeling, Object-Oriented Data, Legacy Data Extraction, Predictive Analytics

AI Applications in Power Systems: The Role of Structured Data and the Acceleration of Legacy Data Structuring through Artificial Intelligence

R. FERNANDES, J. MAGALHÃES, A. FARIA, P. ANDRADE, A. BELO, L. LINS

SM Energy Brazil

ID: 11573

D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Intelligent distribution grid, Standards recommendation; Multimodal fusion; BM25; GAT

Recommendation Algorithms for Smart Distribution Network Standards

S. WANG, B. XIA, Y. HAN

State Grid INFO&TELECOM GROUP CO.,LTD, Beijing.

ID: 11578

D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: PowerPlan-GPT; multimodal large language model; power supply plan generation; source-grid-load-storage coordination; new power system

PowerPlan-GPT: A Framework for Generating Intelligent Power Supply Solutions Based on Multimodal Models and Its Empirical Application Research

Z. FENG, X. CAI, P. ZHANG, X. ZHAO, Q. CHEN

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ID: 11642

D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Renewable energy forecasting; Deep Learning; Convolutional Neural Networks; Numerical Weather Prediction; Ensemble modeling

Renewable energy forecasting with Deep Learning tools

J. J. ABELLÁN¹, M. T. GARCÍA¹, J. M. SANZ¹, A. RODRÍGUEZ¹, C. E. GONZÁLEZ-GUILLÉN^{2,3}, P. ACUAVIVA², J. CASTELLANO^{2,3}, M. JAENADA^{2,4}, I. VILLANUEVA^{2,5}

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Geothermal Power Plant, Net Power Forecasting, Gradient Boosting Regressor, Ensemble Learning, Hyperparameter Optimization

Performance Comparison of Various Regression Models in Geothermal Power Plant Net Power Generation Prediction

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Artificial Intelligence, Generation forecasts, Load forecasts, Isolated Power Systems

AI-enhanced generation- and load forecasts in isolated power systems

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing

complexity of power grids

Keywords: Co-simulation, Deep neural network, Fault detection, Location and classification

Application of Deep Neural Networks for Fault Detection in Modern Power Systems

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Artificial Intelligence, Cyber-Physical System, Data-Driven Tools, Digitalization, Deployment Readiness, Generation Expansion Planning, Power System Planning

A Comprehensive Framework for the Deployment of AI-Based and Data-Driven Supporting Tools in Generation Expansion Planning

M. WALID ALZAHLAN, M. ALOMARI

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Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Load Forecasting, Meter Data, EV, Spatial Load Forecasting, DERs

Leveraging Meter Load Data to Build a Bottom-up Spatial Load Forecasting

C.-I. CARLIER

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Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Vegetation Management, Grid Reliability, Outage Management, LiDAR, Weather forecasting, GIS, AI

Vegetation Management In The 21st Century: Risk Modelling To Move Away from Cycle-Based Trimming

C.-I. CARLIER

Engineered Intelligence Inc., Canada

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PowerCIM: A Standardized Data Environment for Decision-making in Complex Power Grids

J. STEGIĆ, L. LUTTENBERGER MARIĆ, I. KRAJNOVIĆ, D. PEHARDA

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Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Analytics, Data Historians, Decision-Making, Power Grid, Time-series Data

Unlocking the full potential of data historians across the modern power grid: from generation

K. MANYAPETSA¹, L. BUTHELEZI², P. NGEMA²

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Transforming Information Management: Data Governance in the Operator and Administrator of the Wholesale Energy Market in Colombia

L. CARO¹, A. HINCAPIE²

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Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Real-Time Flexibility Analysis and Visualization of Power Systems Using IoT and Augmented Reality

S. JIMENEZ¹, Y. GARCIA², S. BUSTAMANTE³, B. ARBOLEDA⁴, S. RUIZ⁵, A. PIEDRAHITA⁶

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Condition Monitoring, Power Line Communication, Smart Grid, Power Cable

Analysis and Modelling of Powerline Communication Data for Low Voltage Cable Asset and Condition Management

S. SPIESS, A. B. NUGROHO, N. NIESS, C. FONTEYN, T. KLAUKE QUEDER, A. STAUBACH, H. HIRSCH

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Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Evolution of Interacting Digital Twins for High Voltage Switchgear Monitoring

S. SEHESTEDT¹, S. BUFFONI², J.-E. FREY³, S. SCARPACI⁴

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Towards Trustworthy Artificial Intelligence in Grid Control

M. VOGT¹, C. BROSINSKY², S. BOUCHKATI³, A. KUBIS⁴

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Power AI; Computing Resource Management; Heterogeneous Computing; Elastic Scaling; Model Optimization; Intelligent Inspection

Intelligent Computing Resource Management and Optimization Support for AI Applications in the Power Industry

J. MA, L. YAN, J. NIU, Y. GUO

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Proving the concept of supervised machine learning to predict largest infeed and outfeed volumes and prevent over procurement of reserves – a study of Ireland's three systems

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Machine Learning, Prediction, Data Processing, Cable, Fault, Probability

Fault Roulette: Machine Learning for Prediction of MV Cable Faults in Dublin Central

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS1 - Extracting value from information and data through decision support tools and techniques in managing the increasing complexity of power grids

Keywords: Artificial Intelligence (AI), Common Information Model (CIM), Distribution System Operator (DSO), Distributed Energy Resource (DER), International Electrotechnical Commission (IEC), Interoperability, Knowledge Graph (KG), Ontology, RDF

From documents to knowledge graphs: Intelligent requirements management using CIM-based ontology

D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

ID: 10116

D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Substation Automation Systems (SAS), Digital Substation, Inline Protection, Real-time protection, Protocol-aware security, Intrusion prevention system (IPS), Generic Object Oriented Substation Event (GOOSE), and Sampled Measured Values (SMV)

Cyber Sentinels: Harnessing Deep Packet Inspection for Real-Time Defense of Substation

H.-C. WU, H.-Y. LU, Y.-K. HUANG

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Multi-Area Grids - Automatic Generation Control - Remedial Action Schemes - Cyber-Attacks - Frequency Stability

System-Level Factors Influencing AGC Cyber-Attack Success and RAS Vulnerability in Multi-Area Grids

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Digital substations, IEC 61850, communication protocols, cyber security, cyber attacks, mitigations, cryptography

Cyber Security of Digital Substations: Cyber Threats Identification and Mitigation Evaluation

N. CIBIN¹, J. GODEFROU², D. VAN HOFWEGEN³, H. CARTENS⁴, C. DE HOOGH⁵, J. NIEUWSTAD⁶, O. PETERS⁶, A. ȘTEFANOV¹

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Strengthening Cybersecurity Resilience

Strengthening Cybersecurity Resilience in the Energy Sector: Integrated Approaches and Regulatory Alignment

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Enhancing Cyber Security in OT

Enhancing Cyber Security in Operational Technology (OT) Systems Using Indigenous AI/ML-Based IDS/IPS Solutions

V. BISHNOI*, M. T. REDDY, M. KUMAR

Power Grid Corporation of India Ltd India

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Cybersecurity in Power Automation

Study of Cybersecurity in Power Automation: Implementation Challenges of IEC 62351 for IEC 61850 Systems

K. TS*, S. CHAITANYA, G. GURRALA

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Digital Twin, Cybersecurity in Power Systems, Substation Automation, OT, Situational Awareness

DigiTEL CyberTwin: Integrating Digital Twin and Cybersecurity for Enhanced Situational Awareness in Critical Electrical Substations

B. LEU¹, C. LISMAN¹, C. IONITA¹, A. SUDITU², D. CERNAT², M. STREMTAN², D. NEGREA³, C. OXANII³

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: IEC 62443 - PAC - IEC 61850 - OT-SDN

Cybersecurity Design Considerations for Offshore Wind Energy Facilities Based on IEC 62443

J. DEARIEN¹, S. DAYABHAI²

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Artificial Intelligence - Deep Learning - Cyber Attack - Fault Detection - ICS Kill Chain

AI-Enabled Fault Detection and Cyberattack Differentiation Using ICS Kill Chain

R. JOHN¹, S. GOWDANAKATTE¹, Y. KAYA², S. PILAKKAL²

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Cybersecurity, Artificial Intelligence, EV Charging Infrastructure, ICT Monitoring, CyberAttack Detection, e-Mobility

Cybersecurity and EV Charging: Protecting the Future of e-Mobility

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Demilitarized Zones (DMZ), IT/OT Convergence, Policy Enforcement Points (PEPs), Purdue Model, Zero Trust Architecture (ZTA)

Modified Purdue Model: Introducing the security zone concept for enhanced IT/OT convergence

M. VALA, P. MOCKE

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Cybersecurity, Challenges, Solutions

Securing the Energy Transition: Cybersecurity Challenges and Solutions for Modern Digital Grids

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Critical Infrastructure Cybersecurity, Distributed SOC, Industrial Control Systems (ICS), IT/OT Convergence, Power Utilities, Security Operations Center (SOC)

Dedicated operational technology security operations centre (OT SOC) “A specialized approach to monitoring, threat detection, and incident response tailored to OT environments”

P. MOCKE

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Cybersecurity, Special Protection Schemes (SPS), IEC 61850 GOOSE Communication, MPLS-TP Wide-Area Networks, Software-Defined Networking (SDN)

Cybersecurity Governance and Performance Evaluation in the Largest Special Protection Scheme in Brazil: A Real-World IEC 61850-Based Multi-Company Architecture

H. NETO¹, Y. LOPES¹, I. SIQUEIRA², N. FERNANDES¹

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications
Keywords: Artificial Intelligence; Industrial Control Systems; Cybersecurity; Incident Response; Critical Infrastructure

Application of Artificial Intelligence for Real-Time Intrusion and Anomaly Detection in Industrial Control Systems

M. BRANQUINHO

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

SASMaker: A Framework for Generating Synthetic IEC 61850 Traffic from Diverse Substation Setups

F. NATVIG

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Power cybersecurity; Vulnerability assessment; Knowledge graph; Fuzzy logic reasoning; Industrial control systems; Adaptive risk evaluation

An Adaptive Cybersecurity Vulnerability Assessment Method for Power Systems Using Knowledge Graphs and Fuzzy Logic

L. BI, Z. LIANG, Y. YANG, C. HONG, Y. JIANG, W. XU, P. LI, L. CHEN

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Cybersecurity; Digital Substation; IEC62443-4-2; SPACS

Automating IEC62443-4-2 Conformity Assessment for Substation control systems: raising Cybersecurity to the Next Level

I. FERRERO¹, S. TRUJILLO², B. PEREZ², J. GONZALEZ¹, L. MARTINEZ DE GUEREÑU¹, X. SAEZ DE CAMARA³, C. ARELLANO³, O. SAIZ³

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: IEC 61850, IEC 62351, IEC 62443, Cybersecurity, Secure Substation Design, Risk-Based Design, Power System Vulnerabilities

A Standards-Based Cybersecurity Framework for Substation Automation Design: Applying IEC 61850, 62351, 62443, and Lessons Learned from Real-World Events

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Designing SCADA Architectures for Scalability, Cybersecurity and Digital Resilience

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Cybersecurity, Incident detection, Resilience, SIEM, OT, SCADA, WAMPAC

Operational Integration and Customization of a SIEM System in ANDE's OT Network

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: ADMS, Cybersecurity, Defense-in-Depth, HCI, Hyperconverged, Lessons Learned, OT, Resilience, SCADA, SDN, vIED.

Modernizing the ANDE SCADA Control Center Infrastructure with HCI and SDN: A Strategy for Resilience and Cybersecurity in OT Environments

C. RUIZ DIAZ¹, M. LOREIRO², M. JARA³, E. DAVALOS⁴

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Cyber security, Quantum threat, IPsec, MACsec

Securing Grid Connectivity with Quantum-Safe IPsec

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Application layer, Cybersecurity, IEC 60870-5-104, IEC 62351, SCADA, Transport layer, Threats

Securing IEC 60870-5-104 and DNP3 over IP with IEC 62351: Application and Transport Layer Security

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Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Protecting Critical Power Infrastructure: A Cybersecurity Architecture for Electric Grid Protection Systems

D. ZULUAGA¹, P. CADENA², R. VILLA³, J. MOLINA⁴, Á. SALAZAR⁵, M. LUNA⁶

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Mitigating Cyberattack Risks in Digital Substations Using a Cybersecurity Model

I. F. GOMEZ¹, O. A. TOBAR², J. D. GRAJALES³

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Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Stress testing power systems' systemic resilience against cyber-attacks

K. KUROPTEV¹, B. GRÜGER¹, L. SCHAD², F. STEINKE¹, J. HAACK-STAPPEL³, D. PETERMANN⁴, M. ROGGE⁵, I. SPIECKER GEN. DÖHMANN², T. BLUMENTHAL⁶

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Cyber Threat Intelligence, Critical Infrastructure, Named Entity Recognition, NLP, Token Classification, VERIS, Transformers

VERISBERT: Exploring darkBERT's Capabilities for Cyber Threat Intelligence in Critical Infrastructure

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Digital, Monitoring, Brownfield, IEC 62264-1, IEC 62443, IETF, GDPR, Cybersecurity, Privacy

Security and Data Privacy Architectures for Electrical Monitoring System

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Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Experience implementing IEC 62443 cybersecurity requirements in hybrid Battery/Solar power plant

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Keywords: Cybersecurity, power system protection, quantum Key distribution, rate of change of frequency

A Room-Temperature Quantum Secure ROCOF for Power Grid Reliability

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D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

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Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Integration of Software-Defined Networks (SDN) in 500kV Power Transmission Systems

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: IEC 61850, Segment Routing, IP/MPLS, Differential Protection, C37.94, QoS, Network Resilience, Substation Communication, Wide Area Network, Active Multipath, Asymmetric Delay Control, Synchronization

Segment Routing for Differential Protection: Transport Network Evolution and Field Validation for C37.94 Applications in High Power Substations

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Network transformation, next generation technologies

A proven & optimised approach to Network transformation of legacy networks to next generation technologies

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Hybrid Microwave, DSO, Critical Tele-protection, SCADA

Field Deployment of Hybrid Microwave Technology for DSO in Queensland for Transporting Mission Critical Tele-protection and SCADA services through lab testing

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

The Importance of Automation Systems in the Electrical Interconnection between Brazil, Paraguay, and Argentina: Challenges and Perspectives

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Transition to Packet Networks

Transition to Packet Networks

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Implementation OSTP Amplifier Solution

Implementation of OSTP Amplifier Solution with ROPA Technology and its operational experience

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: (UNMS) for Power SyStem Communication

Unified Network Management System (UNMS) for Power SyStem Communication Network: A Roadmap for Future Grid Communication Management

H B H. KUMAR *, D SURENDER, B. LAKPATHI

Power Grid Corporation of India Ltd India

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: TDM to IP/MPLS in Utilities

Migration Strategy from TDM to IP/MPLS in Utilities : A Roadmap and Lessons Learnt

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Enabling Grid Decarbonisation Telecommunications

Packet-Based Power: Enabling Grid Decarbonisation through Next Generation Telecommunications

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Automation Artificial Intelligence OT Network

Automation and Artificial Intelligence by OT Network Operations Center in Power utility

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Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: IEC 61850 - GOOSE - Routed GOOSE - IP/MPLS - Multicasting - QoS - mVPN - Cybersecurity - Distribution Automation - Network Resilience - Substation Automation - Digitalization

Supporting Routed GOOSE (R-GOOSE) Traffic over IP/MPLS Using Multicast VPNs

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Teleprotection, LTE 450MHz, Distribution Operator System

Private LTE 450 MHz wireless network for MV Teleprotection

V. AUDEBERT, S. SHARIF, J. RACHAD, I. OUSSAKEL

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Smart Grid, IEC 61850, GOOSE, MPLS-TP, Private LTE, Resilience, Low Latency Communications

Enhancing Resilience in Critical Applications through hybrid Optical and PLTE Networks

V. MENEGUIM, R. SERRA, S. RUGGIERI, T. SCHWARTZ
GE Vernova

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Cosimulation platform, zonal control, RES (renewable energy sources), resilience, telecommunication hazards, stress test

Use of co-simulation for zonal congestion management systems to assess the resiliency of the associated ICT infrastructure and validate their performances under communications hazards

G. GIRAUD, A.-C. BONHOMME, A. RAHMOUN

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Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Delay time, IP, MPLS-TP, Protection relay, Pseudowire, SDH

Evaluating transmission performance for migration from SDH/PDH networks to MPLS-TP and IP networks

H. DOI¹, A. TANAK¹, E. OHBA¹, K. IKEDA¹, D. HAEGDORENS², T. KATO³

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: High-speed PLC, IEEE 802.11ah, SHDSL, Smart Maintenance, VDSL, Wi-Fi HaLow

Field Evaluation of diverse Communication Methods for supporting smart Maintenance in remote hydroelectric Power Facilities

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: All Photonics Network, Low Latency, Teleprotection

Application of All-Photonics Network (APN) for Power Communication

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Bidirectional Forwarding Detection (BFD), Circuit Emulation Service (CES), Ethernet, Legacy services, Microwave, MPLS-TP, Protection switching, Traffic engineering

Realisation of a resilient Packet-based Network over Wireless Microwave Technology

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: IP Converter, legacy-to-IP Migration, TDM Replacement

Case Study of Legacy Communication Migration to IP Networks in Japan

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: IEEE 1588, Precision Time Protocol (PTP), Time Synchronization Phasor Measurement Unit (PMU), IEC 61850

Measurement of PTP Synchronization Accuracy and Study of its Application to IP Networks of Japanese TSOs

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Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Wireless communications, Private 5G, Wi-Fi, Smart safety

An Example of Building and Using a Smart Safety Network Using Private 5G/Wi-Fi

S. TODOROKI, K. MARUYAMA, M. WATANABE, Y. TAKEDA, H. KAI

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: In-house development, Remote Sensing, Snow accretion on power line

Upgrading Remote Sensing Terminals to prevent Power Transmission Failures due to Snow Accretion

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Wide Area Protection Signalling and Control, SIPS, MPLS-TP, IEC 61850, Centralized Offline and Online Configuration.

Deployment of multipoint grid control applications over mixed communication networks using protection signaling devices

S. BUJORE, M. AGRAWAL, L. ESTELRICH, P. ALEMAN

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: BSS, Framework, OSS, Telecoms Management, ITIL

A hybrid OSS framework for utility telecommunications: Bridging operational technology and information technology service management

B. SHEZI, M. MTHUNZI, T. KHUZWAYO, N. SHONGWE, K. HALEFOSE, K. SETLHAPELO, U. DYANTYI, A. MASEKO

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Adaptive traffic, IEC 60870-5-104, Machine Learning, Performance Optimisation, SCADA, Traffic shaping

Optimising IP based SCADA IEC 60870-5-104 protocol performance through adaptive machine learning driven traffic shaping in classical computing environments

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: SCADA, EMS, cloud, architecture, system operator

Transition to SCADA/EMS Cloud Architecture in Big Power Systems in the Light of Present-Day Challenges and Cybersecurity Requirements

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Power line communications (PLC), orthogonal frequency-division multiplexing (OFDM), adaptive orthogonal frequency-division multiplexing (AOFD), partial discharge (PD), predictive analysis

Adaptive OFDM PLC Technology as a Tool for Automation of Distribution Electrical Networks and Monitoring the State of Power Cable Systems and Overhead Lines

V. HAIIRAPETYAN¹, A. LIFSHITS¹, I. ZAIKOV², G. BURAKOV², E. ILYICHEV¹, V. GUSEV¹

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation
Keywords: Line differential protection, packet based network, GOOSE

Line differential protection over packet-switched network: performance and considerations in South Africa

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Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

5G-Enabled Smart Grid IoT: Architecture, Use Cases, Challenges & Solutions

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Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: 5G, IEC 61850, IEC 61869, Line differential protection

Benchmarking Line Differential Protection under emerging Communication Infrastructures

P. HOVILA¹, H. NIVERI¹, P. KUJANPÄÄ¹, P. RAUSSI², H. KOKKONIEMI-TARKKANEN²

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Pilot project: Line differential protection over Ethernet

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Upgrading Argentina's 500 kV Transmission Network: From Legacy SDH Microwave to Hybrid TDM/Packet Systems for Enhanced Reliability

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Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: IEC 61850, Intent-Based Networking, Substation LAN, Utility WAN, Teleprotection

IEC61850 based PACS network automation enabled via Intent-Based Networking

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Protection automation and control using private 5G: Use-case evaluations for fully digital substations

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Passive Internet of Things, semi passive sensing, ultra-high voltage equipment, MEMS sensors, wireless temperature monitoring, energy harvesting, smart grid

Research on Passive and Semi-Passive P-IoT Sensing for UHV Equipment Monitoring Based on Energy Harvesting and Low-Power Wireless Communication

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation
Keywords: IPv6+, SRv6, SDN, SLA, Smart grid data network

Research and Deployment of IPv6+ and SDN Technologies for Smart Grid Data Networks

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Implementation and Deployment of Multiprotocol Services into a MPLS Critical Infrastructure Network

J. R. FEIJOO MARTÍNEZ, B. PERALTA VICENTE, J. M. DELGADO ÁLVAREZ

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Real-Time IDS for Digital Substations: From Lab to Field Deployment

E. D. GUTIERREZ¹, C. M. NARVAEZ¹, M. GUTIERREZ¹, R. J. RODRIGUEZ²

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Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: IoT – Substation Gateway – Industrial protocols – Data processing – Object model – Real Time Database – Microservice based Architecture – Publisher Subscriber – SCADA

A Universal Gateway for IoT-Driven Power Infrastructure for SCADA Integration

A. KULKARNI, P. KONOVALOV, Y. KULKARNI

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Protection relays using 5G for inter-substation communication to enhance selectivity

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Digital Transformation in Substations Using Mesh Networks: Telecommunications Infrastructure for the Advanced Monitoring Era

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Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: Routable GOOSE, IEC 61850-90-5, Teleprotection, Wide Area Protection, Transmission Line Automation

Real-life case of Routable-GOOSE over MPLS-TP: Implementation, Testing and Validation at Tele-protection Santa Rosa-Carapongo 220 kV line in Perú

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D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY - Full Papers

Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: IEC 61850, line differential protection, MPLS-TP, process bus, inter-substation communication, field experience, interoperability, network segmentation, network clock

Field Experience Report of using Process Bus over Substation Boundaries with multi-vendor line differential Protection

R. BAECHLI¹, R. MOREIRA¹, P. STACHEL², S. VON GLUTZ³, S. MATTMANN³, M. STOECKLI⁴

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Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: digital substation, GOOSE, IEC 61850, line protection, WAN, migration

Field Experience Report of hybrid Distance Protection Solution using IEC 61850 GOOSE Gateway

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Topics: D2 PS3 - Next-generation telecommunications technologies to support grid decarbonisation and digitalisation

Keywords: precision time synchronisation, inter-substation communication, Wide Area Network, IEC 61850, sampled values, interoperability, protection

Precise Time Synchronization for mission critical inter-substation Applications in a multi-vendor Setup

S. MEIER¹, E. LUCENTE¹, A. FREI¹, C. VOTTIS¹, M. STOECKLI²

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