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.

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. BIELLMANN[1], E. BRONNER[2], V. DUBS[3], V. FERNAGUT[3], B. GUIDOUX[3], E. MONNOT[3]
[1]Arabelle Solutions; [2]GE vernova; [3]EDF

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 systeml o

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. SINISCALCHI[1], E. C. BORTONI[2], L. J. L. MENDES[1], C. C. VIEIRA[1], R. A. SOUZA[1]
[1]Eletrobras SA Brazil; [2]Itajubá University Brazil

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
NTPC Limited, India

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. KOROVKIN[2], A. LASHUKOV[1], V. KUZ'MICHEV[3], M. ROYTGARTS*[4], N. GRISHIN[4], R. CHESTYUNIN[5], A. GRIGOR'EV[6], Y. SERGIEVSKIY[7], N. SIZOV[8], P. SOKUR[9], Y. SMETANYUK[10]
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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. LYU[1], Y. GAO[1], Z. LI[2], X. ZHA[1]
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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

H. FOROOZAN[1], O. OREŠKOVIC[1], B. FILIPOVIĆ-GRČIĆ[2], O. HUSNJAK[1], I. KRNIĆ[3], I. KOLIĆ[3], N. MIJALIĆ[3]
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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
University West / Chalmers University of Technology

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

M. EVENKAMP[1], S. GERTZ[2], H. STEINS[3]
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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. WAHDAME[1], D. DE-ROZARIO[1], V. FERNAGUT[2], S. FERRIS[2]
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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

H. W. PENROSE
MotorDoc LLC, United States of America

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
WEG Brazil

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 excier, factory tests

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

E. KADI-OGLY[1], D. DE-ROZARIO[2], B. WAHDAME[2], P. MEYER[2], A. CHEREPANOV[1], A. ALEKSANDROV[1], A. REZNICHENKO[1]
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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
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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. HILDINGER[1], G. KLAUS[2], B. DIEBEL[3], D. EMMRICH[4], G. MORONIS[5], M. ADAM[6], M. GIESE[7], S. ALLGEYER[8]
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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

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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

M. SVANBERG*[1], A. RIDDER[2], D. EMMRICH[3], E. BRESEMANN[2]
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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. GEGÚNDEZ[1], L. ROUCO[2], I. EGIDO[3], E. LOBATO[4], Á. BENÍTEZ DOMÍNGUEZ[5]
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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 Lijiaxia Hydropower Station

J. CHEN[1], Y. JIA[2], L. RUAN[3], C. SUN[4], B. BAO[5], W. JIANG[6], T. WEI[7], X. ZHANG[8]
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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
NHPC Limited India

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. HATTORI[1], K. KOBASHI[2], K. NAKAMURA[3]
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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. UEMORI[1], J. ROCHA[1], E. C. BORTONI[2]
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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. FERREIRA[1], F. R. SPEZIA[2]
[1]Eletrobras Brazil; [2]WEG Brazil

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)

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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
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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. ADHIKARI[1], N. K. SINGH*[1], C. KOLEY[2], B. BHATTACHARJEE[3], A. TIWARY[1], J. PANI[1], P. KUMAR[1]
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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

C. PINTO[1], S. P. JOHANSSON[2], J. ORTEGO[3], I. JARA[3]
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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. SASIC[1], H. SEDDING[1], C. CHAN[1], G. STONE[2]
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ID: 12055
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
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ID: 12237
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. NILSSON[1], P. GENDRE[1], A. GENINI[1], M. ROHRBACH[1], D. RIESEN[1], O. KRONE[1], M. STOECKLI[2]
[1]BKW Energie AG; [2]ELECTROSUISSE / CIGRE Switzerland NC Secretary

ID: 12238
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. NILSSON[1], P. GENDRE[1], A. GENINI[1], M. ROHRBACH[1], D. RIESEN[1], O. KRONE[1], M. STOECKLI[2]
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ID: 12331
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. DRAGOSAVAC[1], Ž. JANDA[1], I. KLASNIC[1], A. MIJAJLOVIC[1], N. LUKIĆ[2], A. LATINOVIC[3], M. ĐORĐEVIĆ[4]
[1]Nikola Tesla Institute of Electrical Engineering, University of Belgrade, Serbia; [2]Elektroprivreda Srbije AD, Serbia; [3]Center for Energy Excellence. Serbia; [4]School of Electrical Engineering, University of Belgrade, Serbia

ID: 12361
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

ID: 12400
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS3 - Asset management and new challenges

Digital Twin Implementations for Subsystems of Turbine Generators and Synchronous Compensators

S. MUSIELAK, H. STEINS, N. DAHRA, J. HOFFMANN, C. ROHR
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. NISHIOKA[1], E. CORAÇA[2], F. CARNEIRO[3]
[1]Tractian Brazil; [2]Tractian Brazil; [3]Tractian Brazil

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. NAKANO[1], H. SAKO[2], S. HOSHI[3]
[1]Mitsubishi Generator Co., LTD. Japan; [2]Mitsubishi Generator Co., LTD. Japan; [3]Hitachi Mitsubishi Hydro Corporation Japan

A2 POWER TRANSFORMERS AND REACTORS

A2 PS1 - Major challenges to the power transformer industry

ID: 10146
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. PERRIER[1], F. JACQUIER[1], S. LAURENT[1], A. TIMERA[2], V. MARCADON[2], A. LAFRAGETTE[2]
[1]GE Vernova; [2]RTE

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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

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Prolec-GE Waukesha, United States of America

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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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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
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Powering the RE Push: A Strategic Procurement Framework for Transformers and Reactors in India's Energy Transition

P. GUPTA*, P. K. CHAURASIA, S V S SATHYANARAYANA
POWERGRID

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
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
POWERGRID

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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

D. HAMOIR[1], A. P. IYER[2], M. ELKARII[2]
[1]Transformer Protector Corporation, United States of America; [2]SERGI 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. LEICH[1], T. VAN DER HOEVEN[1], H. CAMPELO[2], M. TIRONI[3]
[1]DEP/Alliander; [2]Nynas AB; [3]ELETTROMECCANICA TIRONI Srl

ID: 10493
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Major challenges to the power transformer industry
Keywords: Temperature, Silver Suplhide

Redefining Transformer Operating Requirements: A Temperature Based Approach toMitigate Silver Sulphide

A. SULEIMAN[1,2], D. SUSA[3], C. EKANAYAKE[2]
[1]Ausnet Services, Australia; [2]University of Queensland, Australia; [3]GMB-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 Tucurui Dam. Case Study Around Vital Role in Sustainability, Resilience and Reliability.

M. HARADA[1], W. CALIL[1], G. PAJARO[2]
[1]Hitachi Energy Brazil; [2]Hitachi 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. MONTANHA[1], R. ANTUNES[2], A. ROCHA[3], T. MANTHE[4]
[1]Siemens Energy Brazil; [2]ONS Brazil; [3]ATG Brazil; [4]Siemens 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. MARCHESAN[1], M. P. STOCHERO[1], V. C. BENDER[1], R. C. BELTRAME[1], M. C. C. VIEIRA[1], L. H. MEDEIROS[1], S. TENBOHLEN[2], F. L. PROBST[2]
[1]Federal University of Santa Maria Brazil; [2]University of Stuttgart Germany

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. HABUKAWA[1], K. YAMAGUCHI[1], M. KADOWAKI[1], M. CUESTO[2], R. LLAMUZA[2], K. SETHI[3]
[1]Hitachi Energy Japan; [2]Hitachi Energy Spain; [3]Hitachi Energy Germany

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 (N_2) with Reduced Environmental Load and Improved Maintainability

N. NOGUCHI[1], T. ISHIKAWA[1], S. TSUKAO[2], K. UCHIDA[1], T. CHIGIRI[1], K. TAKANO[1]
[1]Toshiba Energy Systems & Solutions Corporation Japan; [2]TEPCO 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, aasset management

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

L. d. N. PEREIRA[1], A. ASGEDOM[2], G. ZHOU[2]
[1]TEEE Brazil; [2]TEEE 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
Hitachi Energy, Italy

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

ID: 11354
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. PAJARO[1], Z. A. AL SHAIBA[2], A. SERT[3], A. JOSEPH[4]
[1]Hitachi Energy, Spain; [2]KAHRAMAA, Qatar; [3]PECHOM, Turkey; [4]Hitachi 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. SZEWCZYK[1], J.-C. DUART[2], A. O'MALLEY[3], R. WIND[4], E. SCHWEIGER[5]
[1]DuPont, Poland; [2]DuPont, Switzerland; [3]Consolidated Edison Co. of NY, USA; [4]Siemens Energy, Austria; [5]Siemens Energy, Germany

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. WANG[1], Z. ZHANG[1], Z. SUN[2], M. WANG[3], F. WANG[1], S. JI[4], L. YING[5]
[1]State Grid Henan Electric Power Research Institute; [2]State Grid Henan Electric Power Company; [3]State Grid Corporation of China; [4]Xi'an Jiaotong University; [5]Wuhan 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. AKYÜZ[1], S. ÇÜRÜKOVA KALE[1], O. SÖNMEZ[1], B. ALBOYACI[2], Y. B. DEMİROL[3]
[1]Sönmez Transformatör; [2]Kocaeli Üniversitesi; [3]Genetek Güç & Enerji

ID: 11723
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
i-DE Redes Eléctricas Inteligentes, Spain

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. MICHALSKI[1], V. MURGIDA[2], L. DE MERCATO[2]
[1]Hitachi Energy Poland; [2]Hitachi 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. HASSAN[1], I. MADSHAVEN[2], K. NIAYESH[1], Ø. L. G. HESTAD[1], F. BACHINGER[3], A. C. MERMIGKAS[2], H. CAMPELO[4], U. PLAZNIK[5]
[1]Department of Electric Energy Norwegian University of Science and Technology (NTNU); [2]Electric Power Technology SINTEF Energy Research; [3]Siemens Energy Austria Gmhb Linz; [4]Nynas AB; [5]Kolektor Etra d.o.o

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. STIRL[1], D. KOCH[2], P. WISCHTUKAT[3], T. BOROOMAND[4]
[1]GE Vernova, Germany; [2]GE Vernova, Germany; [3]Göbel; [4]GE 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. MORLET[1], J.-J. RUIZ[2], S. BRODEUR[3], T. NOVAK[4]
[1]Hitachi Energy, Germany; [2]Hitachi Energy, Spain; [3]Hitachi Energy, Canada; [4]Hitachi 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

L. RESTREPO
CELSIA

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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. HERREÑO[1], F. IBAÑEZ[2]
[1]ISA; [2]ISA

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. BOSNJAK[1], E. PEREZ[2], C. PERRIER[2], S. MICHAUD[2], T. STIRL[3], M. STOECKLI[4]
[1]GE Vernova Switzerland; [2]GE Vernova France; [3]GE Vernova Germany; [4]ELECTROSUISSE / CIGRE Switzerland NC Secretary

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

B. BOSNJAK[1], S. ERDEM[2], M. STOECKLI[3]
[1]GE Vernova Switzerland; [2]GE Vernova Turkey; [3]ELECTROSUISSE / CIGRE Switzerland NC Secretary

ID: 12374
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. SVOBODA[1], L. SPECKNER[2], D. BROCILO[3]
[1]SGB Group, s.r.o.; [2]SGB Germany; [3]META

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'D[1], R. BARDEN[2], P. WERLE[3], U. MAIER[4]
[1]50Hertz Transmission GmbH, Germany; [2]Albert Maier GmbH, Germany; [3]Leibniz University Hannover, Germany; [4]Albert 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. VUKOVIĆ[1], M. CUESTO[2], K. SETHI[1], R. LIAMUZA[2]
[1]Hitachi Energy, Germany; [2]Hitachi 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. GONZÁLEZ[1], M. BERROGAÍN[2], R. NIINA[3]
[1]Hitachi Energy, Germany; [2]Hitachi Energy, Spain; [3]Tampere 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. LI[1], L. LUO[2], Y. ZHAO[2], K. WANG[2], H. ZHANG[3]
[1]China Electric Power Research Institute; [2]Hefei University of Technology; [3]China 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-OSHTORJANI[1], G. KALKAN[2], A. KIRCHNER[3], F. DEHLAS[4], R. FLURI[5]
[1]Rauscher & Stoecklin AG Switzerland; [2]R&S Group AG Ireland; [3]R&S Group AG Switzerland; [4]Rauscher & Stoecklin AG Switzerland; [5]R&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. SANTACROCE[1], G. TRESSO[2], P. VACANTE[3], S. SACCO[4], L. BUONO[5], E. ROTOLO[6], F. PALONE[7]
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A2 PS2 - Power transformer digitalisation journey

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 accurancy, monitoring

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

E. FAKHRI[1], C. ELLEAU[1], J. ZHUO[2], B. PAYA[1], L. BASUYAUX[1], E. EUVRARD[2]
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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
EDF

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
POWERGRID

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
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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
Hitachi Energy, United States of America

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. SCHELLEVIS[1], T. VAN DER HOEVEN[2], B. ROS[1], J. SLANGEN[1], P. SLOOTS[3]
[1]TenneT TSO; [2]DEP/ Alliander N.V.; [3]Royal 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. ROIZMAN[1], P. GREY[2]
[1]IntellPower, Australia; [2]Powercor, 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. WOLMARANS[1], R. DESQUIENS[2], T. GRADNIK[3], F. OSTERMAN[4], Z. DRAPER[5], M. SOTO[6], G. LINORTER[7], V. DURINA[8]
[1]GE VERNOVA; [2]EDF; [3]EIMV; [4]MR; [5]DELTA X RESEARCH; [6]HITACHI ENERGY; [7]SIEMENS ENERGY; [8]KONCAR 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. KANAMORI[1], Y. ITOU[1], H. ISAJI[1], A. IWATA[1], J. KUSANO[2], S. ITO[2]
[1]Chubu Electric Power Grid Co., Inc. Japan; [2]AICHI 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

ID: 11093
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

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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. COUTO[1], M. CASTRO[1], H. CAMPELO[2], P. WEDIN[3], A. SOTO[1], R. CASTRO LOPES[1]
[1]EFACEC; [2]NYMAS AB (PORTUGAL); [3]NYMAS 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. QUINTANILLA[1], E. SANCHEZ[1], R. DESQUIENS[2], D. BORTOLOTTI[2]
[1]Hitachi Energy, Spain; [2]EDF, 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. SUN[1], Y. ZHAO[1], L. LUO[2], W. XU[2], K. WANG[1], J. LI[3]
[1]China Electric Power Research Institute; [2]Hefei University of Technology; [3]Xi'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. ENOKSEN[1], L. LUNDGAARD[1], K. LILAND[1], A. S. TØDENES[2], S. KYRKJEEIDE[3], S. LEIVO[4]
[1]SINTEF Energi; [2]Hitachi Energy; [3]Statnett; [4]Vaisala

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. RAZUM[1], P. MIHOKOVIĆ[2], P. KRIŽIĆ[1], M. ŠTANFEL[2]
[1]Electrical Engineering Institute Ltd., Croatia; [2]KONČAR - Distribution and special transformers Inc., Croatia

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. KOHLBERGER[1], R. GRIVOT[2], A. ALHAFARI[1], I. RULYOV[1], A. AICHHORN[1]
[1]Trench Austria GmbH; [2]RTE France

ID: 11987
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Power transformer digitalisation journey

Grid Load Optimization with Transformer Thermal Digital Twin

F. BELAVIĆ[1], J. RAITH[2], M. STOESSL[2]
[1]Austrian Power Grid AG; [2]Siemens 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. RESING[1], J. FUESER[1], H. HIRSCH[2]
[1]Westnetz GmbH; [2]University 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
Maschinenfabrik Reinhausen Germany

ID: 12493
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. ESLAMIAN[1], E. RAHIMPOUR[2], K. SETHI[1]
[1]Hitachi Energy, Germany; [2]Technical 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. FRÖHLICH[1], D. ALBERT[2], G. LEBER[3], H. RENNER[4]
[1]Graz Univesity of Technology Austria; [2]OMICRON electronics Gmbh Austria; [3]Siemens Energy Austria Gmbh Austria; [4]Graz 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-VALDIVIELSO[1], M. BARRENETXEA[2], J. I. AIZPURUA[3]
[1]Electronics & Computing Science Department, Mondragon University Spain; [2]Electronics & Computing Science Department, Mondragon University Spain; [3]Department 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
POWERGRID, India

ID: 10243
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
POWER GRID CORPORATION OF INDIA LTD, India

ID: 10244
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

ID: 10250
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. VOETEN[1], H. HASHEMI-DEZAKI[2], A. ZADEH[2]
[1]Royal SMIT Transformers; [2]Optics11

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. BHATTI[1], G. PAJARO[2]
[1]Hitachi Energy, Australia; [2]Hitachi Energy, Spain

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. GREY[1], O. ROIZMAN[2]
[1]Powercor/CitiPower, Australia; [2]IntellPower, Australia

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
Elsewedey Electric, Indonesia

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. MARCHESAN[1], L. H. MEDEIROS[1], M. M. OLIVEIRA[2], C. E. G. FALCÃO[1], V. C. BENDER[1]
[1]Federal University of Santa Maria Brazil; [2]Federal University of PAMPA Brazil

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. IARONKA[1], D. SCHMITT[1], A. ROCHA[2]
[1]Trinse Consulting Brazil; [2]ATG 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. ROBALINO[1], R. E. ALVAREZ[2]
[1]Megger, United States of America; [2]IITREE-FI-UNLP, Argentina

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. YOSHIKAWA[1], G. SATO[1], Y. KONISHI[1], S. MATSUMOTO[2]
[1]Yuka Industries Co., Ltd. Japan; [2]Shibaura Institute of Technology Japan

ID: 11028
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
IITREE-FI-UNLP

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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
IITREE-FI-UNLP

ID: 11095
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. LARIN[1], D. MATVEEV[2], M. FROLOV[2], R. KURNYSHOV[1], B. LESIN[3], D. GUREV[3], A. KOZHEVIN[3], V. ABRAMOV[3]
[1]VEI – branch of RFNC-VNIITF; [2]MPEI; [3]SVEL – Power transformers

ID: 11263
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. ATALLA[1], M. ELLENBOGEN[1]
[1]Israel Electric Company; [2]Independent 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. RYDER[1], A. BAJWA[1], R. HOOTON[2]

[1]Doble PowerTest Great Britain; [2]National Grid Great Britain

ID: 11357
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. GARCÍA[1], C. ROY[1], A. NOGUÉS[1], L. OLIVEIRA[2]
[1]Hitachi Energy, Spain; [2]Hitachi Energy, Brazil

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. LI[1], Z. ZHANG[2], H. SUI[2], K. WANG[2], S. ZHANG[2]
[1]SGCC Southwest Branch; [2]China 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. DAGHRAH[1], M. RAHMBEKSCH[2]
[1]Shell U.K. Oil Products Ltd U.K; [2]ENERCON 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
Turkish Electricity Transmission Corporation

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. BRODEUR[1], P. LAMOTHE[1], J.-B. DASTOUS[2]
[1]Hitachi Energy Canada; [2]Hydro-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

E. TENYENHUIS
Hitachi Energy Canada

ID: 11735
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. KWAK[1], M.-S. KANG[2], J.-C. RIBOUD[3]
[1]Hyosung Korea; [2]Hyosung Korea; [3]RTE France

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

ID: 11897
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)

ID: 11980
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS3 - Failure prevention, detection and investigation

Phase Shifting Transformer On-Site Testing – Best Practice

D. ALBERT[1], A. PIRKER[2], T. BEDNARCZYK[1], B. ENGSTLER[1]
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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
Siemens Energy Austria GmbH

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. PIRKER[1], M. DARMANN[1], T. L. UDEH[2], F. BELAVIĆ[3]
[1]VUM Verfahren Umwelt Management GmbH; [2]Carinthia University of Applied Science; [3]Austrian Power Grid AG

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

M. LECHMAN[1], P. WARCZYŃSKI[2]
[1]Polskie Sieci Elektroenergetyczne S.A., Poland; [2]TRAFO-SERWIS, Poland

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. ENGSTLER[1], C. ENGELEN[1], A. HERRERA[1], P. WISCHTUKAT[2]
[1]OMICRON electronics GmbH; [2]Hubert Göbel GmbH

ID: 12048
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. CANTOR[1], S. CARMONA[2], I. LOZADA[3]
[1]Intercolombia; [2]intercolombia; [3]Intercolombia

ID: 12056
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
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. NANYAN[1], G. K. SUPRAMANIAM[1], H. KASIM[2]
[1]Tenaga Nasional Berhad, TNB; [2]TNB Labs Research

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS3 - Failure prevention, detection and investigation

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

ID: 12318
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. MUENSTER[1], T. LAINCK[1], P. WERLE[2]
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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. RADIN[1], B. DJURIC[1], D. JOVANOVIC[1], M. BRDAREVIC[2]
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S. TENBOHLEN[1], D. MARTIN[2], R. GÖTZ[3], F. BELAVIĆ[4]
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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. SETHI[1], M. MUÑOZ[2], J. FORSLIN[3], M. ULIANA[4]
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Keywords: current limitation, DC grid, power testing, protection, superconductivity

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

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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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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
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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

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POWERGRID , India

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

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POWERGRID CORPORATION OF INDIA LTD, India

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

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N. RAJ*, S. RAVAL
Adani Energy Solution Ltd, India

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

Failure of 800 KV Circuit Breaker due to Lightening

J K PRAJAPATI[1], J K GAVEL[2]
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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

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Hitachi Energy, United States of America

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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

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

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

T. INAGAKI[1], T. AKAHOSHI[1], R. MANOHAR[1], S. NEE[2], T. MODEER[2], S. NORRGA[2]
[1]Mitsubishi Electric Corporation Japan; [2]Scibreak AB Sweden Sweden

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Optimum Fault Current Limiter Placement And Its Parameter Calculation

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Failure of Vacuum Interrupter due to unequal flux linkages in master circuit breaker used for short circuit testing – A case study

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Central Power Research Institute, INDIA

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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. WANKHEDE[1], M. BARNETT[1], A. JONES[1], R. SLAUGHTER[1], G. WAKTARE[1], M. KITCHEN[2], D. ARMIT[3], G. SAFIAN[1], S. MANN[1]
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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.

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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

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China Electric Power Research Institute

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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
Svenska kraftnät

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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. BRESTAN[1], P. HACKL[1], L. SCHWALT[2], F. BELAVIĆ[2], J. WEISKAR[3], R. SCHAEFER[3], R. SCHUERHUBER[1]
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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. BISCHOF[1], F. FEUSTEL[1], R. SCHULZE[1], E. SPERLING[1], L. CESKY[2], B. SEVCIK[2]
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Topics: A3 PS1 - Transformation of T&D assets for evolving grid conditions
Keywords: Gas-Insulated Switchgear (GIS), SF_6 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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Impact Of Digital Substations On The Specification And Connection Of Instrument Transformers

J. D. PALENCIA[1], J. TORO[2], J. SANCHEZ[3]
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Operational Excellence Applied To High-Voltage Circuit Breaker Failures At ISA INTERCOLOMBIA

C. URREA AGUIRRE[1], A. RUA MONCADA[2], A. CASTRO LOPEZ[3]
[1]Intercolombia; [2]intercolombia; [3]ISA

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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. KARRER[1], T. ROININEN[2], V. PATEL[2], M. DHOTRE[1], B. RADISAVLJEVIC[1], U. PARIKH[2], M. STOECKLI[3]
[1]Hitachi Energy Switzerland; [2]Hitachi Energy Sweden; [3]ELECTROSUISSE / CIGRE Switzerland NC Secretary

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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. HOLAUS[1], Z. TANASIC[1], E. EMELIYANOV[1], E. MULLER[1], J. SMAJIC[2], M. STOECKLI[3]
[1]HIVODUCT Switzerland; [2]ETH Zurich Switzerland; [3]ELECTROSUISSE / CIGRE Switzerland NC Secretary

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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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Quantifying the Impact of Automated Reclosers on Supply Continuity in Irish MV (Medium-Voltage) Networks

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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 CO2/02 range update from 72 kV up to 420 kV

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

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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

C. GREGOIRE, A. PERRET, C. HUGUENIN, J.-B. JOURJON
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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. LAURENT[1], C. DUMOULIN[1], E. MANGE[1], M. PERRET[1], L. TREIER[1], M. KWIECIEN[2], H. PUTO[2]
[1]GE Vernova; [2]Thoni Alutec

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

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

L.-D. ROUX[1], J.-L. RAYON[2], J.-F. MIRONNEAU[2]
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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

GE Vernova

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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

J. WEBB[1], D. MONTORFARNO[2]
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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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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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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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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 Disconnector and Earthing Switch

T. ONISHI[1], N. IWANADE[1], T. KOIKE[1], A. MUKAIDA[1], T. OZEKI[2], K. IWAHARA[2]
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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. IIJIMA, A. MUKAIDA
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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. YAMADA[1], S. ISHITANI[1], M. SATO[1], H. HAMA[1], A. POETZSCH[2], T. HEINZ[2], K. JUHRE[2], D. CORTESE[3], K. MIANZO[3]
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Decarbonization of Power Systems - Green Equipments (SF_6 Free)

P. PANDEY*, H. MITTAL, S. JAIN, A. K. SINGH
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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. DUTRA[1], L. TOMINAGA[1], J. OLIVEIRA[1], T. MATSUO[2], S. ZIMATH[2], V. WOYAKEWICZ[2], M. OLIVEIRA[3], R. LIMA[3], L. FREITAS[3]
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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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Sizing Vacuum Generator Circuit Breaker with Modern and User-Friendly EMT Model - Field Experience Applications

L. CASADO FULGUEIRAS[1], K. GREBENNIKOV[2], P. LA SETA[2], H. URBANEK[2]
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Testing of Biodegradable Fluids in High Voltage Current Transformers

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

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Megger Sweden

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

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Sustainability and circular economy of T&D equipment
Keywords: C4-FN mixtures, circuit breakers, CO_2/O_2/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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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Sustainability and circular economy of T&D equipment
Keywords: Curbing the global warming trend, 550kVcurrent transformers, Air insulation properties, Improve the insulation strength, Installable and operable with security features

Developmentand Maintenanceof 550kVUHV Clean Air CT

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

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A flash method for recycling insulator core rods into silicon carbide

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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.

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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
Turkish Electricity Transmission Corporation

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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, SF_6-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. BLANCHET[1], J. MATALLANA[1], P. BOFFI[2], A. FERTI[2], J. A. BREIMO[1], A. FICHEUX[3]
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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. PEDERSEN[1], N. STØA-AANONSEN[1], M. GAMMELSÆTER[1], L. AMARAL[2], M. LESSER[3], M. NGUYEN[4], G. BLANCHET[5], M. MAGLIO[6], V. BERGMANN[3], R. MARSKAR[1], T. TREIDER[1], I. B. SPERSTAD[1]
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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

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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

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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
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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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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. BAECKER[1], G. HOFFMANN[1], M. HEDDERGOTT[1], J. KIEFER[1], M. STOECKLI[2]
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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. GOTTI[1], J. MANTILLA[1], X. YE[1], J. KIM[2], S. KIM[2], S. KIM[2], M. STOECKLI[3]
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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 intstrument transformers for power quality metering

X. GU[1], Z. GALIC[1], H.-D. SCHLEMPER[1], M. STOECKLI[2]
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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. KARRER[1], T. ROININEN[2], V. PATEL[2], M. DHOTRE[1], B. RADISLAVLJEVIC[1], M. STOECKLI[3]
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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. LUTZ[1], Z. LUO[1], E. FERDJALLAH[1], M. STOECKLI[2]
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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. PALAZZO[1], D. TEHLAR[1], M. BUJOTZEK[1], K. CHAUHAN[2], M. REFAEY[1], T. RODLER[3], M. TUCZEK[3], M. STOECKLI[4]
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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. PANDYA[1], H. SOHN[2], A. REYES[1], M. GOTTI[1], J. KIM[2], J. MANTILLA[1], M. STOECKLI[3]
[1]HD Hyundai Electric Switzerland; [2]HD Hyundai Electric South Korea; [3]ELECTROSUISSE / CIGRE Switzerland NC Secretary

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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. PERRET[1], M. INVERSIN[2], M. LACUVE[3], D. LEGUIZAMON-CABRA[3], M. STOECKLI[4]
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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. STOLLER[1], B. SPREEN[1], M. NUREDINI[1], R. KARRER[1], F. LUNDQVIST[1], M. STOECKLI[2]
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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. SUTHERLAND[1], M. GOTTI[1], K. PANDYA[1], J. MANTILLA[1], M. STOECKLI[2]
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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. TEPPATI[1], W. THUNBERG[1], Y. LU[1], P. FREI[1], S. KOTILAINEN[1], M. STOECKLI[2]
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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. TEPPATI[1], F. COSTANTINO[1], M. NUREDINI[1], P. FREI[1], M. DHOTRE[1], V. TILLIETTE[1], M. STOECKLI[2]
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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. YE[1], S. BRYNDA[1], O. COSSALTER[1], M. GOTTI[1], J. MANTILLA[1], M. STOECKLI[2]
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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. CERNAT[1], S. WETHEKRAM[1], L. BINNER[1], M. LESSER[1], P. WERDELMANN[2], D. ALFES[2], S. HANS[2], D. E.[2]
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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); CO_2 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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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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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. GENTSCH[1], S. GORTSCHAKOW[2], A. LAWALL[3], F. GRASKOWSKI[3], N. DORRAKI[3]
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Environmental friendly high voltage testing equipment with synthetic air

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A3 PS3 - Asset management strategies for T&D equipment

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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

F. LIMA[1], A. VIEIRA[2], L. GALVAO[2], C. KADASIDDA[3]
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Topics: A3 PS3 - Asset management strategies for T&D equipment
Keywords: Robotic, Automation, Transmission, O&M

Robotic Process Automation for Transmission O&M

R. SAHU*, R. KOPEWAR, S. MALI, M. SHINDE
Tata Power Co. Ltd, India

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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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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
Power Grid Corporation of India Ltd ,India

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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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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
BSES Rajdhani Power Limited , India

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Keywords: switchgear, monitoring

MV Switchgear monitoring & analysis using Panel Health Monitoring System

S. JOSHI*, V. BHOSALE, A. BHUTKAR, A. CHAUHAN
TATA power Co. Ltd, India

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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

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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
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Topics: A3 PS3 - Asset management strategies for T&D equipment
Keywords: 400 kV, GIS, SF_6, restoration, strategy

Case Study on Flashover in a 400 kV GIS Compartment due to undetected SF_6 pressure drop and restoration strategy

P. SHARMA*[1], B. B. NANDA[1], R. R. TRIPATHI[2], R. SHANKAR[3]
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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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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS3 - Asset management strategies for T&D equipment
Keywords: Implementation of SF_6 Online Monitoring, HV Circuit Breakers

Innovative Implementation of SF_6 Online Monitoring for HV Circuit Breakers

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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. SASAMORI[1], M. SATO[1], N. IGURA[1], A. HATSUZAKI[2], Y. YAMAMOTO[2], A. SUGAWARA[2]
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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

A. MAYANK*, B. ANAND, S. K. GUPTA, D. Y. DWIVEDI
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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, SF_6 Monitoring, Reliability-Centered Maintenance (RCM), Smart Sensors, Digital Substation, Asset Health Index, Real-Time Monitoring, Cybersecurity

Integeration 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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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. ALVES[1], M. SANTOS[2], C. CHANGWEI[2], W. FERREIRA[2], J. B. SILVA[3], R. SANTOS[3], R. ANDRADE[3], F. HÖPKER[4], J. SILVA[4], J. DUQUE[4], D. PEDROSA[1], M. PINTO[1], C. HARISSIS[1], A. CABRINO[1], G. MOURA[1], D. PIVOTO[1], C. PEDROSA[1], H. SANTOS[1], B. SARDINHA[1], D. MENDES[1]
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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

J. LIMA MATTJE[1], M. A. CAETANO DOS SANTOS[2], R. GRAEFF[3], P. RASCHKE[4]
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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. ALVES[1], L. SOUZA[2], B. REIS[2], F. PIOTO[2], D. PEDROSA[1], M. PINTO[1], C. HARISSIS[1], A. CABRINO[1], G. MOURA[1], B. SARDINHA[1], I. MODA[1], D. PIVOTO[1], C. PEDROSA[1], H. SANTOS[1], R. FERREIRA[1], D. MENDES[1]
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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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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

F. MWANIKI[1], J. BEKKER[1], E. SPERLING[2], R. SCHULZE[2], J. VERMEULEN[1]
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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

A. PEDRETTI
Hitachi Energy, Italy

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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
Megger Ltd.

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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
AltaLink Management Ltd., Canada

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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. CORONEL[1], P. GARDEL[2], M. CAETANO[3]
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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. KRONEGGER[1], M. STIFTER[1], T. I. STRASSER[2,3], I. A. OGREZEANU[4,1]
[1]Siemens AG; [2]AIT Austrian Institute of Technology; [3]TU Wien; [4]Transilvania University of Brasov

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. SCHWARTZE[1], D. ALBERT[1], S. MOSCHIK[1], M. REICHHARTINGER[2]
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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 VARGAS[1], G. FANDIÑO OLAYA[2]
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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

E. CANTOR[1], A. PATIÑO[2], A. ARIAS[3]
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ID: 12202
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. MUTHUKARUPPAN[1], A. A. R. RAJA GOPAL[2], N. S. ABDUL BAHARI[2]
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Topics: A3 PS3 - Asset management strategies for T&D equipment

From Silo to Synergy: Achieving Interoperability in Asset Performance Management

E. AUMANN[1], J. SKIERSZKAN[1], B. FISCHER[2], L. LINK[2]
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ID: 12411
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. MAURER[1], P. BOLZ[2], M. ZDRALLEK[2], T. BROCK[3]
[1]Maschinenfabrik Reinhausen; [2]University of Wuppertal; [3]Netze 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. KURZ[1], J. KRELING[3], P. MASMEIER[1], M. KOCH[2], R. GÖTZ[3]
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ID: 12425
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. GRÄF[1], S. BORCHERS-TIGASSON[1], S. SCHWANCK[2]
[1]Hochschule für Technik und Wirtschaft Berlin; [2]KEMA Labs, CESI Group, IPH Berlin

ID: 12487
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. DÜRR[1], F. RICHTER[2], U. KALTENBORN[3]
[1]Siemens AG Germany; [2]50Hertz Transmission GmbH Germany; [3]HIGHVOLT 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. MARTINO[1], R. JIMENEZ[2], T. SAUERS[3], R. SCHILLER[4]
[1]ComEd U.S.A.; [2]ComEd U.S.A.; [3]ComEd U.S.A.; [4]ComEd 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. TANG[1], J. WANG[2], J. ZHAO[3], A. FAZLAGIC[4]
[1]Eversource Energy USA; [2]Eversource Energy USA; [3]Eversource Energy USA; [4]Eversource Energy USA

B1 INSULATED CABLES

B1 PS1 - Future cable systems and innovative cable applications

ID: 10117
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. MAMPAEY[1], P. LEEMANS[1], J.-B. ZIMER[1], T. CAPELLE[2], D. LEEMANS[2], A. AIT AMAR[2]
[1]Elia, Belgium; [2]Nexans, 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. ROSS[1], A.-J. DE GRAAF[1], R. ZUIJDERDIJN[2], C.-E. BRUZEK[3], M. YAZDANI-ASRAMI[4], T. SPINA[3], W. SONG[4]
[1]IWO; [2]TenneT TSO; [3]ASG Superconductors S.p.A.; [4]University 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-ROSALES[1], D. WOLDENDORP[1], A. KOLMUS[1], N. DE VISSER[1], J. DE LANGE[1], S. RIEKEN[1,2]
[1]Alliander N.V; [2]IMAPP, 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. ZUIJDERDUIN[1], J. SMIT[1], A. KARAMPEKIOS[1], M. FARAGALLA[1], A. TSEKMES[2], F. MIDDEL[2], T. KOLTUNOWICZ[2], R. BODEGA[2]
[1]TenneT TSO; [2]Prysmian

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 Curent Rating Calulation Method for Submarine Cables Completely Immersed in Water or Partially Buried in the Seabed

X. JIAO, E. FERNANDEZ, J. PATRICK
ELEK Software

ID: 10426
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Future cable systems and innovative cable applications

Insulated Cables Statistics 2023

R. WHEATLAND[1], F. WAITE[2], K. O. ASKLUND[3], J. FUJIHARA[4], P. VAN DER WIELEN[5], S. D. MIKKELSEN[6], N. HAMPTON[7], A. WOOLES[8]
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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. {. C. BASCOM III[1], C. PETROCELLI[2], D. L. TAYLOR JR[2], R. ADAMS[2]
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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. {. C. BASCOM III[1], A. SMITH[2], S. ASHKOURI[2], P. WALL[2], E. AL-SIBAI[2]
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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. ALLAIS[1], B. WEST[1], N. LALLOUET[1], K. ALLWEINS[1], M. GAMMELSAETER[2], A. MORANDI[3], M. SIMONAZZI[3], E. GUERRA[3], J. CANDIDO[4], D. O DONOVAN[5], F. GOMORY[6], E. SEILER[6]
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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. RAKOTOARIVONY[1], P. CLEMENT[1], M. ROULET[2], A. MAISON[2]

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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. ZHAO[1], F. MORICONI[2], K. THOMAS[1], S. ASHWORTH[2], E. GARCIA[2], E. KARACA[2], S. CHRISTO[2]
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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. BELE[1], R. BONDO[1], F. ESTERL[2], Y. LEROY[3], H. RAJADO[4], G. GENDRE[5], B. LEEMANS[3], Y. BREMART[1], G. DENCHE[4], K. SCHMIDLIN[5], P. MEYER[1], S. GROEGER[6]
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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

Y. OTAKE, Y. KISHIDA, Y. YOON, H. SAKAKIBARA
Furukawa Electric Co., Ltd Japan

ID: 10824
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. YAMAMOTO[1], S. TAKEDA[1], T. SHIMOGUCHI[1], D. BOLOTOV[2], R. ALBRECHT[2]
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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. FILIPPOV[1], A. SLAVINSKY[1], V. PSHENNOV[2], D. GVOZDEV[3], V. BOLONOV[3], A. KOROLEV[4]
[1]Izolyator-AKS LLC / NRU MPEI; [2]Izolyator-AKS, LLC; [3]PJSC "Rosseti Moscow Region"; [4]PJSC "Rosseti"

ID: 11268
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. WANG[2], R. ZHANG[1], J. KOTINIITTY[3]
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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, theromplastics, 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

ID: 11368
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Future cable systems and innovative cable applications

Stresses on crossing third-party assets due to lighting strikes along underground HVDC cable rout

P. SIDENVALL
I2G

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. ORTEGO[1], I. JARA[1], W. DOMINGOS DE MEDEIROS[2], L. MERINO[2], P. CHAMORRO-POSADA[3]
[1]Ampacimon, Spain; [2]RDT Lumiker, Spain; [3]Universidad de Valladolid, Spain

ID: 11407
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. RYDÈN
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. CHEN[1], C. TIAN[1], J. GAO[2], M. WU[2]
[1]Far East Cable Co.,ltd.; [2]Xi'an Jiaotong University

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

ID: 11731
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
NKT

ID: 11761
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

F. GAUTHIER[1], G. ANDERS[2], H. BRAKELMANN[3], C. APRAEZ[1]
[1]Eaton, Canada; [2]Technical University of Lodz, Poland; [3]BBC Cable Consulting, Germany

ID: 11789
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. CUPPEN[1], J. J. M. CUPPEN[2], N.-K.C NAIR[1]
[1]University Of Auckland, New Zealand; [2]Neiding 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. BLAIR[1], L. GEORGE[1], M. KELLY[1], M. HOSSEINI[1], P. VERNON[1], R. OU[1], N. KROPF[2]
[1]Synaptec UK; [2]Vattenfall 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
Nexans

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. CHOE[1], J. LIM[1], Y. JUNG[2], K. AHN[3]
[1]KERI; [2]Taihan Cable&Solution; [3]Hwaseung 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. BENGTSSON[1], E. OLSEN[1], D. NILSSON[2], R. HUUVA[2], S. HVIDSTEN[3], H. H. SÆTERNES[3], F. MAUSETH[4]
[1]Nexans Norway; [2]Borealis; [3]SINTEF Energy Research; [4]NTNU

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. DIKAIAKOS[1], T. LUCIGNANO[1], J. NIEMANN-LARSEN[2], S. V. KJÆR[2], G. MERINO[3], L. MERINO[3]
[1]Statnett; [2]Energinet; [3]Lumiker

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. GAMMELSÆTER[1], C.-E. BRUZEC[2], A. MARIAN[3], S. HOLE[4], N. LALLOUET[5], A. MORANDI[6], W. REISER[7]
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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. HØLTO[1], T. A. VE[1], E. H. SWENSEN[1], S. HVIDTSTEN[1], E. OLSEN[2], J. SKAGMEO[2], K. M. BENGTSSON[2]
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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. MATALLANA, 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. RUNDE[1], D. LINHJELL[1], Ø. HESTAD[2], A. MERMIGKAS[1], C. LESAINT[1], K. S. THINN[1], H. H. SÆTERNÆS[1], E. DOEDENS[3], J. I. JUVIK[4]
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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 Mechnical Constant Test of 154kV Eco-friendly Polypropylene Insulated Power Cables

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ILJIN Electric Co., Ltd

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

S. MEMARI[1], U. SCHICHLER[2]
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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. PODKORITNIK[1], R. AHLIN[1], I. KOBAL[1], D. HUC[1], G. MILEV[1], M. SIMON[1], V. DJURICA[1], V. BONČA[2], J. SERDINŠEK[3]
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ID: 12398
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

ID: 12401
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

T. KARMOKAR[1], A. SACIAK[2], S. PAPENHEIM[3], I. NETT[1], V. TACKENBERG[1], V. BERAK[4]
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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. GAO[1], Y. ZHAO[2], F. GAI[1], Y. WANG[2], B. TANG[1], W. LIU[1], T. ZHANG[2], Y. ZHANG[2], J. HOU[3], H. GONG[3], J. GAO[4], L. JIANG[4], L. ZHONG[4]

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ID: 12570
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. BITSI, D. GKITSOS, P. PARISSIS, A. NEGINHAL, N. P. SAKKAS, V. KANAS, A. I. CHRYSOCHOS
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ID: 12571
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. BITSI, I. CHALEPLIDIS, K. KOUTRAS, A. NEGINHAL, D. GKITSOS, D. CHATZIPETROS, E. KYRIAKOPOULOU, G. GEORGALLIS
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ID: 12590
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

C. BARRETT
University of Manchester United Kingdom

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

B. RUTHERFORD[1], A. ROGERS[2], R. EVANS[2], A. HASHIM[2], C. EDWARDS[1]
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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. BRIGANDI[1], T. PERSON[1], R. AARONS[2], B. RICHARDSON[3], S. WOLBACH[4], D. RAMIREZ-WONG[5]
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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. ESCOLANO[1], S. ANILD[2]
[1]RTE; [2]BakerHicks Power

ID: 10283
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. ZEBOUCHI[1], M. KAVIAN[1], J. FERNANDEZ PAREDES[1], V. OP DE BEEK[2], S. WEERSTAND[2]
[1]DNV; [2]TenneT

ID: 10319
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. VELITSIKAKIS[1], M. FARAGALLA[1], A. KUMAR[1], R. ZUIJDERDUIN[1], S. DE CLIPPELAAR[2]
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ID: 10322
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. BREKELMANS[2], G. ROUWHORST[1], A. VAN DER MOLEN[2,3], P. NGUYEN[2], P. VAN DER WIELEN[1,2]
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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. CHAKRABORT*, A. AMIN
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ID: 10355
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. TYAGI[1], J. I[2], A. B. BALAKRISHNAN[1]
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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
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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

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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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ID: 11021
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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ID: 11022
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. FASSARELA[1], R. d. C. FRANÇA[1], T. d. S. d. SILVA[1], E. P. MORAES[1], D. O. SILVEIRA[1], G. T. LOPES[2]
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ID: 11023
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 JUNIOR[1], T. B. RODRIGUES[1], D. L. ARGÔLO[1], T. P. VIÚLA[2], F. R. d. SILVA[2]
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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

C. DAMASCENO[1], D. M. d. ALMEIDA[2]
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ID: 11060
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. MAZZA[1], A. PEGOIANI[2], I. MARINI[2], R. SIRNA[3]
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ID: 11061
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"

L. GARZELLI
TERNA, Italy

ID: 11062
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

V. LI VIGNI
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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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ID: 11066
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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ID: 11117
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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ID: 11265
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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ID: 11278
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

C. FERREIRA, P. REBELO, M. DMITRIEV
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ID: 11290
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

E. GULSKI[1], G. ANDERS[1], J. PARCIAK[2]
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ID: 11308
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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ID: 11381
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
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ID: 11382
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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ID: 11383
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 RIVERA[1], U. RUIZ DE AZÚA FERNÁNDEZ[2], G. DONOSO CONEJO[1], R. REINOSO DELGADO[1], E. NOGUEROLES LAGUIA[1], D. BLANCO SACEDO[1], V. BONET DIAZ[1]
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ID: 11384
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 RIVERA[1], J. ORTEGO[3], G. DONOSO CONEJO[1], R. REINOSO DELGADO[1], E. NOGUEROLES LAGUIA[1], V. BONET DIAZ[1], F. GARNACHO[4], A. KHAMLICHI[2]
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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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ID: 11408
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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ID: 11429
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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ID: 11514
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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ID: 11515
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Recent experience with AC and DC cables, both land and submarine
Keywords: High-voltagecablecircuits, Groundingsystem, Loopresistance, Livedetection

Live Detection Methods and Applications of Loop Resistance in HighVoltage Cable Grounding Systems

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ID: 11516
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. HUI[1], L. FAN[2], L. ZHAO[1], J. LIU[1], Y. ZHAN[1], W. ZHU[1], S. HOU[1]
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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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ID: 11613
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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ID: 11670
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

D. ÇELEN[1], L. RONG[2], Y. MERSİN[1]
[1]Demirer Kablo Tesisleri Sanayi ve Ticaret A.Ş; [2]Jiangsu 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

ID: 11698
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

F. RATKOWSKI
NKT

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. GAROLERA[1], T. KVARTS[1], Z. HUANG[1], G. CALLENDER[2], K. GODDARD[2], J. PENG[1], C. COJOCARU[1]
[1]Ørsted Wind Power; [2]University of Southampton

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

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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
NKT

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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

Y. LIM
CIGRE Korea

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

W. PORADOWSKI[1], G. J. ANDERS[2], M. ENGEBRETHSEN[1], E. FJELD[3]
[1]REN AS; [2]Łódź University of Technology; [3]University of South-Eastern Norway

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

R. A. STØLAN, M. M. HATLO
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. SVOMA[1], L. WILLIAMS[1], C. HIGGINS[2], J. THEOBALD[2]
[1]PowerSure Technology Ltd. UK; [2]Ove Arup UK

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. AINHIRN
Wiener Netze GmbH

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
b2 electronics GmbH

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. APHICHATO, 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. KVARTS[1], X. GIAGKOU[1], J. PILGRIM[2], O. N. CWIKOWSKI[2], A. BINNIAN[2]
[1]Ørsted Wind Power; [2]Ørsted Power

ID: 12115
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

L. RESTREPO
CELSIA

ID: 12234
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
SSEN Transmission UK

ID: 12266
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. ROCHAT[1], G. RIZZO[2], J. DIX[3], N. KROPF[4], M. STOECKLI[5]
[1]EOSS Switzerland; [2]EOSS Italy; [3]Southampton University UK; [4]Vattenfall Germany; [5]ELECTROSUISSE / CIGRE Switzerland NC Secretary

ID: 12268
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. ROCHAT[1], E. NIGRO[2], M. D' AMBROSIO[1], F. BUCCHERI[3], M. STOECKLI[4]
[1]EOSS Switzerland; [2]Prysmian Italy; [3]EOSS Italy; [4]ELECTROSUISSE / CIGRE Switzerland NC Secretary

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. MITIC[1], P. FLETCHER[2], E. SALOMONE[2], S. KNEZEVIC[3], M. STOKIC[1], M. MANDARIC[1]
[1]Mott MacDonald, Serbia; [2]Mott MacDonald, UK; [3]Mott 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 ZAOUI[1], D. DAMM[1], S. BOHR[1], C. CANTINI[2], A. RIDGE[2], M. STROHBACH[1]
[1]AP Sensing GmbH, Germany; [2]AP 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 ZAOUI[1], N. AGHANOURIAN[1], B. DRAPP[1], D. MOCKENHAUPT[1], M. STROHBACH[1], S. SYED[1], F. AINHIRN[2]
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ID: 12569
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. BITSI, 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

ID: 12574
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
Hellenic Cables Greece

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. VRACHAMIS[1], B. GIANELLI[2]
[1]DEME Group Netherlands; [2]DEME 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. SWINKELS[1], E. CHAPMAN[2], C. ROCHAS[1], Z. BURNS[2], P. HARSANYI[2], A. HERMANS[3], K. SCOTT[2]
[1]TSO TenneT; [2]St Abbs Marine Station; [3]Wageningen 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. FENG[1], M. FU[1], L. JIA[1], L. FAN[2], Y. LI[2], Q. LU[3], J. YAN[1], S. HOU[2]
[1]CSG Electric Power Research Institute Co., Ltd. China; [2]China Southern Power Grid Co., LTD China; [3]Dalian 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. DRØIVOLDSMO[2]
[1]NTNU; [2]Nexans

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. GUENDUEZ[1], J. KRAUS[1], M. STOECKLI[2]
[1]KRAUS Consulting GmbH Switzerland; [2]ELECTROSUISSE / CIGRE Switzerland NC Secretary

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. BECAN[1], N. ZIMA[1], R. FILIPIC[1], D. MARIC[1], A. STARC[2], M. STARASINIC[2]
[1]ELES, d.o.o., Slovenia; [2]IBE, d.d., Slovenia

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. DEPAMELAERE[1], P. COUNESON[2], M. JAVORSKY[1]
[1]Bekaert, Belgium; [2]Decube 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

L. DEPPA
WSP, United States of America

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
LineVision, United States of America

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. LOMMERS[1], J. FRANCO[1], T. BÖRGER[1], E. PLATENKAMP[2]
[1]DNV; [2]TenneT TSO

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

I. TANNEMAAT[1], C. ENGELBRECHT[2]
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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

L. STOOP[1], I. TANNEMAAT[1], R. SCHELLEVIS[1], B. VAN DUINEN[2], M. DE DOOIJ[1], W. TROMP[1]
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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
Resonia Limited, India

ID: 10371
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - OHL modernization and emerging technologies
Keywords: Smart Greener Grid Expansion: Re-engineering 66 kVInfrastructure for 220 kV Operation – BBMB Case Study.

Smart Greener Grid Expansion: Re-engineering 66 kVInfrastructure 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.

U. JAISWAL*[1], C. KALRA[2], D. SINGH[3], N. B. PITALE[4]
[1]Resonia Ltd , India; [2]Resonia Ltd , India; [3]Serentica Renewables India Pvt. Ltd.; [4]Resonia Ltd , India

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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Resonia Limited, India

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 Uprating of Overhead Conductors Using Real Time Rating Technology by Identification of Critical Spans/Sections

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Powerlink Queensland, Australia

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. RICHARD[1], C. DUTRIEZ[1], M. DELBOVE[2], E. PLATENKAMP[3]
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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
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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

D. NEZAMOLMOLKI, Z. WEISS
Burns & McDonnell, United States of America

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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[1]Kansai Transmission and Distribution, Inc. Japan; [2]AERO ASAHI CORPORATION Japan; [3]F 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. KONDO[1], R. YUZAWA[1], S. ISHIDA[1], K. YAO[1], T. MASUDA[2], M. OGAWA[2]
[1]Chubu Electric Power Grid Co., Inc. Japan; [2]SENSYN 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
Kyushu Electric Engineering Consultants Inc. Japan

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”

T. YAMAKI[1], N. SUDO[2], K. FUJII[2], T. SHIRAISHI[3], K. NARA[1], M. SUZUKI[4]
[1]Kitanihon electric cable Japan; [2]Tohoku Electric Power Network Japan; [3]TEPCO Power Grid Japan; [4]Tokyo 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; Compactation

Structural analysis of the CICA Cross-Rope tower

R. LOPES[1], P. CAMPOS[1], M. RECHTMAN[1], X. WANG[2], C. LIU[2], Q. HUANG[2], L. ROSA[1], Y. LIU[2], M. FERNANDES[1]
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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

D. BRAGA[1], J. MANOEL[2], R. DOLABELA[2]
[1]Taesa Brazil; [2]Vértice/Vercon Brazil

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 Transmisison Line Projects in the USA

J. BUTLER[1], C. MILITARU[2]
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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

M. BOIANI
TERNA, Italy

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 transmisson lines, stringing job site, IoT, jobsite connection, mainpower reduction, effiency

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

S. NATESAN, R. KHUMALO, D. SEKHOTO
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. NATESAN[1], J. D. SERRANO[2], S. DUBAZANA[2]
[1]National Transmission Company South Africa; [2]Consultant

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. HASSINEN[1], R. BIGIARINI[2], S. PIRINEN[1], D. GABELLI[2]
[1]Exel Composites; [2]Tratos 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-BLANCO[1], P. RODRÍGUEZ-HERRERÍAS[2], C. GARCÍA-BARRIOS[2]
[1]Anisopter Insightful Research, S.L., Spain; [2]Red 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
RecognAIse 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. MARTINEZ[1], V. JIMENEZ[2], J. PULGARIN RIVERA[3]
[1]ISES; [2]ISES; [3]Universidad Distrital Francisco Jose de Caldas

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. BERRIO[1], D. L. ARANGO CAÑAS[2], R. LUNA URIBE[3]
[1]EPM; [2]EPM; [3]EPM

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. JIMENEZ[1], C. MARTINEZ[2], D. TAUTA[3], J. OSORIO[4], A. PEDRAZA[5], H. RESTREPO[6], J. PULGARIN[7]
[1]ISES; [2]ISES; [3]EPM; [4]EPM; [5]ISA; [6]ISA; [7]Universidad distrital

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

D. TAUTA[1], A. PEDRAZA[2], H. RESTREPO[3]
[1]EPM; [2]ISA; [3]ISA

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. MEJIA[1], Á. MAZO[2], B. OSORIO[3], M. ESCOBAR[4], Y. D. PEREZ[5], S. ESTEVEZ[6], A. PEDRAZA[7]
[1]Intercolombia; [2]intercolombia; [3]ISA; [4]Intercolombia; [5]Intercolombia; [6]ISA; [7]ISA

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. VARGAS[1], A. GOMEZ[2], J. M. VARILLA[3], S. CASTILLO[4]
[1]HVM; [2]HVM; [3]HVM; [4]HVM

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. TOTH[1], L. RACZ[2], B. NEMETH[2]
[1]RecognAIse Technologies Inc.; [2]Budapest 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

Uprating of 400 kV overhead lines using conductor temperature sensors and ambient weather stations

R. PUFFER[1], G. MOLINAR[2], C. KANDLBINDER-PARET[2]
[1]RWTH Aachen University; [2]TenneT 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. RÖHM[1], J. MOSCHALL[2]
[1]Omexom Hochspannung GmbH; [2]DB 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. ERSPAMER[1], C. WINTER[2], H. KETTERER[3], A. PFLAUM[4]
[1]Omexom Hochspannung GmbH Germany; [2]Tennet TSO GmbH Germany; [3]Sepa-Tech GmbH Germany; [4]Seilflechter 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. BUTSCHEN[1], B. RUSEK[1], M. RASCHKOWSKI[1], R. SCHADEN[1], F. BERSTER[1], B. KIRBUS[2], A. WESSEL[2], M. POSAUTZ[2]
[1]Amprion GmbH Germany; [2]Fraunhofer IEE

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. TAKAHASHI[1], N. TAKADA[2], T. SHIRAISHI[3], N. SUGA[4], T. TAKAHASHI[5], T. ENAKA[6]
[1]TEPCO Power Grid, Inc. Japan; [2]TEPCO Power Grid, Inc. Japan; [3]TEPCO Power Grid, Inc. Japan; [4]Sumitomo Electric Industries,Ltd Japan; [5]Sumitomo Electric Industries,Ltd Japan; [6]Sumitomo 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
Energyline Ltd England

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 BOE[1], T. ZARGAR[2], R. K. DOWELL[3]
[1]ELIA, Belgium; [2]GridWrap, United States of America; [3]San 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. TANNEMAAT[1], B. GODARD[2], X. PAQUEZ[2], F. ZAIDI[3], R. GHENO[1], M. BUISMAN[1]
[1]TenneT TSO; [2]Ampacimon; [3]AP 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, GDPRel

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

J. SAID[1], D. COLLOT[2], V. LAURENT[2]
[1]RTE France; [2]Mews 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. TERUI[1], M. KATO[1], K. FUJII[1], T. OOTAKI[2], K. YAMAGUCHI[3]
[1]Tohoku Electric Power Network Co., Inc. Japan; [2]KDDI Smart Drone Inc. Japan; [3]KDDI Technology Inc. Japan

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. BRAGA[1], P. LIBERATO[2], P. ROCHA[2], R. PERUCCI[2], T. CORRADI[2]
[1]Taesa Brazil; [2]Engetower Brazil

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

D. BRAGA[1], J. ALEXANDER[2]
[1]Taesa Brazil; [2]University UnB Brazil

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. ROCHA[1], A. COELHO[2], R. SANTOS[2], R. MARTINS[2], L. SILVA CRUZ[1], F. LOPES[3]
[1]UNIVERSIDADE DE COIMBRA; [2]LABELEC; [3]INSTITUTO 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. BABS, 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 SANTOS[1], E. MOAL[2], C. PONS[3]
[1]SHEMAR, Spain; [2]SHEMAR, France; [3]EDF, France

ID: 11552
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Health assessment and refurbishment of OHL

Corrective maintenance of OHL equipped by composite insulators

I. GUTMAN
I2G

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. LIU[1], M. LEI[1], L. GONG[2,3], Y. XING[1]
[1]Hebei University of Technology; [2]State Grid Tianjin Electric Power Company; [3]Chengdong 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. LI[1], Z. ZUO[2], X. LIANG[2], R. TAO[1], C. WU[2], S. LIU[2], R. ZHANG[3], S. WANG[1]
[1]State Grid Zhejiang Electric Power Co Electric Power Research Institute; [2]Tsinghua University; [3]China 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
Saudi Aramco

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. ADUM[1], P. F. DUARTE DE OLIVEIRA[2], E. MATENE[2], J.-P. PARADIS[2]
[1]Statnett SF; [2]PLP

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. LEHRETZ[2], A. ZEITLER[3], S. REICH[6], C. PURUCKER[1], T. RODLER[5], U. STRACKE[4]
[1]Lapp Insulators GmbH; [2]TenneT TSO GmbH; [3]TenneT TSO GmbH; [4]TenneT TSO GmbH; [5]TenneT TSO GmbH; [6]Grindo- 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. ROJAS[1], G. GUERRA[2]
[1]ENLAZA; [2]ENLAZA

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. RESTREPO[1], A. PEDRAZA[2], A. CAMELO[3], Y. PEREZ[4], J. GOMEZ[5], D. ARANGUREN[6], E. PEREZ[7]
[1]ISA; [2]ISA; [3]ISA; [4]Intercolombia; [5]ISA; [6]KERAUNOS; [7]UNAL

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. BEDOYA[1], N. RESTREPO[2]
[1]Intercolombia; [2]intercolombia

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. STRUMBELJ[1], K. VARLI[2], M. STOECKLI[3]
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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. HUDI[1], N. HATTA[2], N. YAAKOB[3]
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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. SEIFERT[1], M. BORNOWSKI[4], C. BÄR[2], U. SCHÄFER[5], U. KREIG[6], M. DOERR[7], K VARLI[8], M. MEISSNER[9], H. WEKENBORG[10], F. LEHRETZ[7], F. BECKER[3], O. HERZ[9], F. SEFFRIN[10], F. SCHMUCK[11], B. ROBBEN[12], H. KRISPIN[13], A. STOCKHAUSEN[14]
[1]TKE GmbH; [2]Wacker Chemie AG; [3]Amprion GmbH; [4]TransNet BW GmbH; [5]E.DIS Netz GmbH; [6]SSB AG Switzerland; [7]TenneT TSO GmbH; [8]Amprion GmbH; [9]Westnetz GmbH; [10]SPIE SAG GmbH; [11]Schmuck HV Insulating Consulting GmbH Switzerland; [12]Siemens Energy Global GmbH & Co. KG; [13]RIBE Elektroarmaturen GmbH; [14]PFISTERER 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

Amprion GmbH

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. KNENICKY[1], M. SVANCAR[1], J. BREJCHA[2], P. SPURNY[2]
[1]EGU – HV Laboratory a.s.; [2]CEPS, 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. GEBHARDT[1], S. KÜHNEL[2], S. KORNHUBER[2], P. WERLE[3]
[1]50 Hertz Transmission GmbH Germany; [2]Zittau/Görlitz University of Applied Sciences Germany; [3]Leibniz 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 Mothed: 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

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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. PLATENKAMP[1], G. LENDERINK[2], L. STOOP[1], T. BÖRGER[3]
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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. PLATENKAMP[1], L. STOOP[1], G. LENDERINK[2], T. BÖRGER[3]
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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
Power Grid Corporation of India Limited , INDIA

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

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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. MARTINS[1], J. B. G. F. DA SILVA[1], C. CHEN[2]
[1]Paranaíba Brazil; [2]State 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. HASSINEN[1], G. DORIGATTI[2], H. KLOSTER[1]
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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 δ)

Naturally Aged RTV Sir Coatings in Harsh Desert Environment: Technical Approach & Estimation Procedure

R. ZNAIDI[1], A. ALTHAGAFI[2], A. ELDEEB[3], K. ALKHALID[4]
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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. OĞUZ[1], V. TÜRKER[1], T. KARTALOĞLU[1], E. ÖZBAY[1], Ü. ÇETİNKAYA[2], M. UZAR[2]
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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. EDWARDS[1], O. HLUSTIK[1], M. GALEELA[1], G. MCFADZEAN[1], G. WILSON[1], A. ALI[2], D. ARMIT[2]
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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. DENT[1], J. MOLLARD[1], G. HEGERL[1], G. WILSON[2], G. EDWARDS[3], C. TURLE[4], A. BHATTACHARYA[1]
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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. NYGAARD[1], K. INGVALDSEN[1], B. ADUM[2], P. A. HAGEN[2]
[1]Norconsult; [2]Statnett

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. NEGI[1], K. MANGLAM[1], N. SILVA[1], C. THOMPSON[2]
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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. WEINDL[1], O. OBERZAUCHER[1], P. MÜLLER[2], M. NUTZ[2]
[1]Austrian Power Grid AG; [2]GeoSphere Austria

ID: 12124
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Sustainability and climate change impacts (with C3)

Implementation of Digital Tools for the Application of the Technical-Environmental Methodology for Sustainability in Transmission Line Projects

H. RESTREPO[1], A. OVIEDO[2], M. CARDENAS[3], F. DUARTE[4], J. GOMEZ[5]
[1]ISA; [2]ISA; [3]Intercolombia; [4]Idependiente; [5]ISA

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. BUGMANN[1], C. LINDNER[1], A. SPOERRI[2], L. SUBAL[2], M. STOECKLI[3]
[1]Axpo Grid AG Switzerland; [2]EBP AG Switzerland; [3]ELECTROSUISSE / 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
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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. TODOROVIĆ[1], I. SALOM[2], N. PETROVIĆ[3], V. ČELEBIĆ[2], M. KABOVIĆ[2], N. CUROVIĆ[4]
[1]Dirigent Acoustics LLC, Serbia; [2]Institute Mihajlo Pupin, University of Belgrade, Serbia; [3]Energy Agency of the Republic of Serbia, Serbia; [4]Elektromreža 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-PAPADOPOULOU[1], J. GLÖGGLER[1], R. JACOB[2]
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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. SCHRÖDER[1], S. MÖLLENBECK[1], P. GIT[2], K. SCHILLAI[3], P. GIT[5], H. KIRCHNER[6], O. PISCHLER[4]
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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. SOUZA[1], C. ARRUDA[2]
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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS

B3 PS1 - Innovative substation concepts, designs and operation experience

ID: 10164
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. GOUDA[1], A. ELDEIN[2], S. YASSIN[3], A. ELMORSHEDY[1]
[1]Cairo University; [2]Aswan University; [3]Upper 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. GRORI[1], P. MELZEN[1], M. CUPPETT[2], M. SCHMITT[2], D. PERSAD[2], A. HOSSAIN[2], T. SCHULZ[2], M. GATZSCHE[3]
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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

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[1]GE Vernova, United States of America; [2]Genesis Energies, United States of America; [3]GE Vernova, United Kingdom; [4]GE 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

D. LEWIS, S. BOZIC
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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

P. SOMBOONYANON[1], B. PALMER[2], B. S. MORENO[2]
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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

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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. FREIRE[1], N. MEQBEL[2], S. BITTENCOURT[3], T. WEI[4], W. JIANZHONG[5], B. ABARCA[6], J. CALDERON[6]
[1]PAIOL Engenharia Brazil; [2]3D Consulting-Geo Germany; [3]Consultant Brazil; [4]China Energy Engineering Group Guangdong Electric Power Design Institute CO., Ltd. China; [5]China Southern Power Grid International Co., Ltd. China; [6]Conexión Energia Chile

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. MAROTTI[1], P. BRITO[1], F. SILVA[1], V. CARAZZAI[1], C. XAVIER[1], D. ARAÚJO[2], R. AGUIAR[3]
[1]ELETROBRAS Brazil; [2]BIM Start Brazil; [3]EnergiaBIM Brazil

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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. VILELA[1], L. VASCONCELOS[2]
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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

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Prefabricated modular substations: Findings from ongoing pilot project

T. JOHANSSON
Vattenfall Eldistribution

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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. KUSCHEL[1], B. LEEMANS[2], V. AELBRECHT[3], K. POHLINK[4], C. BÜTÜNER[5], F. KELCH[6], A. NIJHUIS[7], M. ROLF[8]
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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. ALBERT[1], M. WEIHKOPF[2], M. KUSCHEL[3], P. MENKE[4], L. E. DAHL[5], L. I. STADHEIM[6]
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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

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Electricity Generating Authority of Thailand (EGAT)

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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

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Electricity Generating Authority of Thailand (EGAT)

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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. RINCON[1], J. A. BETANCOURT[2], C. J. SEPULVEDA[3], J. CASTRO[4]
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Digital Twin for Operational Optimization of High Voltage Electrical Substations

L. MONSALVE[1], M. PALACIO[2]
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Grounding protection studying Substations in Industrial Zones – Insights, Innovations, and Challenges

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Automated Generation of Substation 3D Model via Python and 3D CAD Integration

N. ANAYA[1], E. CEBALLOS[2], A. LARIOS[2], J. ARCILA[2]
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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. KOEPPL[1], K.-P. BRAND[2], M. STOECKLI[3]
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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
Tenaga Nasional Berhad, TNB

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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
Monenco Iran Consulting Engineers Co. Iran

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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

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B3 PS2 - Life cycle & asset management

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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. MCGRAIL[1], R. DHIRR[4], L. PAULHIAC[5], J. BEARDSALL[6], C. JOHNSTONE[7], S. SUTTON[2], G. WILSON[3], M. KHALIL[2]
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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

J. VAN ONNA[1], R. VOSSE[2]
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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. NARANPANAWE
Energy Queensland, Australia

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Life cycle & asset management
Keywords: Sulphur Hexaflouride (SF6), HV, Transmission

Sulphur Hexaflouride (SF6) Management Strategy in Transgrid's HV Transmission Network

A. PIANCA, E. LAMPLOUGH
Transgrid, Australia

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Keywords: SF6

SF6 Life Cycle Management strategy by GETCO

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
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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

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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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Keywords: Substation, Extension, Upgrading

Substation Extension & Upgrading Experience

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GERETPL, INDIA

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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
POWERGRID, India

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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
BHEL, INDIA

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Topics: B3 PS2 - Life cycle & asset management
Keywords: EHV, Failure, Risk

Risk Based Inventory Management of EHV Equipment Through Failure Modes and Effects Analysis

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POWERGRID, India

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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
POWERGRID, India

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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

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BHEL INDIA

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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. RAMESH[2], C GOBINATH[3], P. MURTHY[4]
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Powering the Northeast India: "A Case study on the timely completion of 220KV Transmission Project in adverse climatic conditions and various logistical challenges"

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POWERGRID, INDIA

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Role of Online PD Monitoring of GIS in Enhancing Reliability & Avoiding Catastrophic Damage: A Utility Experience and Perspectiv

M. G. GOKHALE[1], S. ADHIKARI[2], N. K. SINGH*[2], A. TIWARY[2], J. PANI[2], P. KUMAR[2]
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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

ID: 10738
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. FICHEUX[1], T. BARBE[1], A. HOLTON[2], C. EDGAR[2]
[1]GE Vernova; [2]SP Energy Networks

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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

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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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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. SASAMORI[1], T. MORI[1], T. SAIDA[2], N. KIKUCHI[3], A. HATSUZAKI[4], S. TSUKAO[5], K. MURAKITA[5]
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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. AICHI[1], S. NOGUCHI[1], S. TSUKAO[2], M. HORIGOME[3], T. UCHII[4], R. TAKAHASHI[4]
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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. MIKUNI[1], T. KAWAMURA[1], Y. ITO[1], S. MATSUDA[2], M. YAEGASHI[2]
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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, SF_6, SF_6 lifecycle, sustainability

SF_6 Monitoring, Recycling and Regeneration: Circular Solutions for the Energy Sector

S. PIROLA
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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
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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

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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

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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. FRAGA[1], E. PINTO[1], A. LACERDA[2]
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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
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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

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Assessing Risk Factors for PD-Activity in 24 kV Secondary Substations Using Machine Learning

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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. KIM[1], H. W. CHA[1], H. D. SEO[1], T. W. AHN[2], J. H. BAN[2], J. S. KIM[3], J. W. KIM[3], W. S. LEE[3], R. LIM[4]
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Case study: Stock-up strategy for equipment with High-Lead-Time spares in offshore substations

E. J. QUINTANA SANTOS, S. JONSSON
Ørsted Offshore Wind Power

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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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Structural & Seismic Consultant

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Topics: B3 PS2 - Life cycle & asset management

Assembly of GIS Substations: The critical link to ensure performance, reliability and longevity

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[1]ISA; [2]ISA

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Reliability and Cost Strategies in Operations and Maintenance: Agile Framework for Operational Excellence

E. CANTOR[1], A. PATIÑO[2], F. DIAZ[3]
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Transforming Data into Decisions: A Model to Maximize Asset Reliability

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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, disconnector, 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. BERNER[1], D. CHRISTEN[1], T. JORGE[1], S. PACHLATKO[1], K. STEINEMANN[1], M. STOECKLI[2]
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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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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
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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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

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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

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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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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

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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
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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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[1]NHPTL-Bina, INDIA; [2]POWERGRID , INDIA

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Assessment of Very Fast Transient Over voltage in GIS Substation through Physical Measurements and System Studies

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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

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POWER GRID CORPORATION OF INDIA LTD

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Grid Expansion and Reinforcement of existing National Grid of Uganda

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Keywords: climate change, offsite power supply, reliability, severe heat, substation control house, switchyard

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Temporary Mobile Substations: A Solution for Modern Grid Expansion Challenges

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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. SOMBOONYANON[1], C. BOWEN[2]
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Innovative Solutions for Enhancing the National Transmission Grid Seismic Resilience

S. MANDOSI
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Mobile Substations: Rapid Response Solutions for Reliability Threats

F. CARACCI
Hitachi Energy, Italy

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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

D. MOMESSO
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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. PINTO[1], F. FRAGA[1], F. ALVARES[1], L. PESSOA[1], A. MACEDO[2], M. SILVA[3]
[1]ELETROBRAS Brazil; [2]UFRPE University Brazil; [3]Volga Engenharia Brazil

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Smart Access Control to Substations

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Keywords: Wildfire, Wind Turbine, Battery Energy Storage Sites (BESS)

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Keywords: gas insulated switchgear, GIS, standardisation, product quality, alternative gas

Modular and prefabricated GIS Product Platform

L. TREIER[1], R. LUESCHER[1], C. COCCHI[1], P. GERBER[1], M. STOECKLI[2]
[1]GE Vernova Switzerland; [2]ELECTROSUISSE / CIGRE Switzerland NC Secretary

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Analysis and Design of Grounding Systems in High-Resistivity Soils for Large Electrical Installations

C. MARCONETTO[1], J. D. VEGA[2], A. E. MUSTO[3]
[1]Grupo Estudios Electricos; [2]Grupo Estudios Electricos; [3]Grupo Estudios Electricos

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Electric Field Stabilisation Technology in the Protection Against Lightning Strikes

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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

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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

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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. VIALON[1], G. FRÜBING[1], R. LOLLIER[2], R. KOMOROWSKI[1]
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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. KABUL[1], A. KUMAR[1], B. KOX[2], K. DYKE[1], B. HOUSTEN[1], R. WINZENBURG[2]
[1]GE Vernova; [2]TenneT TSO

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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

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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. MATURU[1], Y.-J. HAFNER[2]
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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

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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
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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 ± 800kV HVDC system.

D. KUMAR*, N. ADARI, S. K. CHOUDHARY, D. P. TYAGI, D. S. SEN
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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

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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

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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. SHARMA[1], J. CAWTHORNE[2], A. PASHAEI[3], J. A. MORALES[3]
[1]GE Vernova, INDIA; [2]GE Vernova, United Kingdom; [3]National Grid, United Kingdom

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC equipment and systems
Keywords: ±320kV, VSC, HVDC, DC, Line, Fault

DC Line Fault Recovery Performance of the India's first ±320kV VSC HVDC Pugalur-Thrissur Link

N. KUMAR*, A. B CHANDRAN, P. TYAG
POWERGRID INDIA

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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
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Topics: B4 PS1 - DC equipment and systems
Keywords: Transient, Overvoltage, IBR, 800kV, HVDC

Transient Over-voltage Studies of ±800kV, 6000 MW LCC HVDC connected with RE source of Solar and Wind

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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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Life assessment and refurbishment of ±500kV, 2500 MW Talcher-Kolar HVDC Converter Stations

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Analysis of Higher 5th Order Harmonics & tripping of Type 3 filters (5/27) at HVDC Rihand & Dadri terminals

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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. SAAD[1], V. COSTAN[2], J. MICHEL[3], D. PIERSON[4], A. NICHOLS[4], R. MAJUMDER[4], M. VOR DEM BERGE[3]
[1]ACDC Transient; [2]RTE France; [3]RTE-I; [4]Invenergy

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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-TORRES[1], F. PEREZ[1], E. WITZ[1], A. BENCHAIB[1], N. BARLA[1], B. PERREYON[1], M. PANTELI[2], S. HASHEMI[2], S. JANKOVIC[3], C. FOOTE[4], C. MACIVER[5]
[1]SuperGrid Institute; [2]University of Cyprus; [3]TenneT; [4]The National HVDC Centre; [5]University of Strathclyde

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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

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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

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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

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Topics: B4 PS1 - DC equipment and systems
Keywords: Commissioning, offshore, transmission tests, heat-run

Risk analysis of offshore commissioning during power transmission tests

M. SCHUDEL[1], M. HORSNELL[2], S. JAPOKIC[1]
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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

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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. AIHARA[1], M. TAKECHI[1], K. AOKI[1], T. SATO[2], Y. NAKAIDE[3]
[1]TEPCO Power Grid, Inc. Japan; [2]Toshiba Energy Systems & Solutions Co. Japan; [3]Hitachi,Ltd. Japan

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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. IMAI[1], R. HAJIRI[1], T. MATSUNAGA[1], S. INOUE[2], K. KAMIYAMA[2], T. ASAO[2]
[1]Chubu Electric Power Grid Co., Inc. Japan; [2]Hitachi Energy Japan, Ltd. Japan

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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

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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

Opertional 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. BARKER[1], T. QORIA[2], A. WILLIAMS-KELLY[1]
[1]GE Vernova UK; [2]GE Vernova Germany

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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

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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. GANESAN[1], P. HOFBAUER[1], K. LINDEN[2]
[1]SSEN Transmission UK; [2]Hitachi Energy Sweden

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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. STOTT[1], J. JARAMILLO[2], M. CORREA[3], C. SMITH[4], A. GARCIA[5]
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Topics: B4 PS1 - DC equipment and systems
Keywords: HVDC, Synchronous Grid-forming, Inertia, RoCoF.

True Inertia Constant of Synchronous Grid-Forming Control Strategies

C. BARKER[1], T. QORIA[2]
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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. KIM[1], J. LEE[1], J. HONG[1], H. JUNG[1], H. KIM[2]
[1]HYOSUNG CORPORATION; [2]Zeta 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. PARK[1], C.-Y. LEE[2], S.-H. KIM[3], R.-Y. KIM[2]
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Topics: B4 PS1 - DC equipment and systems

Effect of Temporary VSC-HVDC converter blocking on Multiterminal HVDC and offshore windfarm performance

A. ABDALRAHMAN
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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
Hitachi Energy

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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
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ID: 11438
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

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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

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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. LI[1], M. HABIBURRAHMAN[1], Z. TALIB[1], L. BAJAJ[1], N. SINGH[1], S. JOSH[1], M. JAVID[1], B. BAUDRY[1], G. ADAM[1], V. MURUGESAN[2], P. BARUPATI[2], P. KUMAR[2]
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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

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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
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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. ZHANG[1], B. CHENG[1], X. LENG[2], S. CHE[3], Y. DONG[2], R. HU[4], Z. ZHENG[5], W. WANG[3]
[1]China Southern Power Grid Co., Ltd.; [2]China Southern Power Grid Energy Development Research Institute; [3]China Southern Power Grid EHV transmission company; [4]China Southern Power Grid Internet Service Co., Ltd.; [5]South 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. ANDERSSON[3], G. WANG[3], J. LU[3]
[1]SGCC; [2]SPERI; [3]Hitachi 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

ID: 11633
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 Upgarde, Commissioning Strategy, On-Site Experience

Upgrade of Monopole to Bipole in ±500kV, 3000MW Bukdangjin-Godeok LCC HVDC Link - Strategy and Commissioning Experience

W. YANG[1], I. PARK[1], K. SONG[1], U. LEE[1], Y. KIM[1], Y. JANG[1], N. BHOWMIK[2], H. IM[3]
[1]KAPES; [2]GE Vernova; [3]KEPCO

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. KIM[1], J. JEON[1], J. HWANG[1]
[1]Korea Electrotechnology Research Institute; [2]National 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. TAIAROL[1], J. BURROUGHS[2]
[1]Stantec, Canada; [2]Velco, 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. ZENI[1], A. COKIC[1], A. TSYLIN[1], P. MCGARLEY[1], M. PARADIS[2]
[1]Ørsted; [2]ATCO

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. FAWAD[1], A. GARG[1], M. GALEELA[1], Y. WU[1], I. WONG[1], J. LIANG[2]
[1]TNEI Services Ltd United Kingdom; [2]Cardiff 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. LIU[1], Q. HONG[1], L. XU[1], A. DYSKO[1], C. BOOTH[1], X. DING[2]
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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. DUBOIS[1], R. MACNEILL[2]
[1]WSP; [2]Emera

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. DUBOIS[1], H. SPAIN[2], A. BUREK[3], S. CHRISTOU[4]
[1]WSP; [2]Erigrid, Ireland; [3]Hitachi Energy, Sweden; [4]EDF 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. MEISINGSET[1], I. VETVIK[1], G. EVENSET[1], C. E. HILLESUND[1], E. KJØSNES[2], Ø. SAGOSEN[2], J. RIVIERE[2], A. ELMENSHAWY[2], M. V. D. BERGE[3], S. AKKARI[3]
[1]Statnett; [2]Aker Solutions; [3]RTE 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. EIE[1], H. RØRVIK[1], O. HEADLEY[2], S. SØRENSEN[2], H. NURMINEN[3], P. LINDBLAD[3], D. INGEMANSSON[4], G.-O. PERSSON[4], P. PETERSSON[4]
[1]Statnett; [2]Energinet; [3]Fingrid; [4]Svenska Kraftnät

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. GAUN[1], Y. SOLOVYEV[2], L. AREVALO[2], S. WIRTH[2], J. KATZENSTEINER[1]
[1]Coil Innovation GmbH; [2]Hitachi 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. HANSON[1], J. LEIDE[2], A. SIMAKU[4], A. SACIAK[3], T. FRIEß[5], G. BALZER[6]
[1]TU Darmstadt; [2]TU Darmstadt; [3]TU Darmstadt; [4]TU Darmstadt; [5]TU Darmstadt; [6]TU Darmstadt

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

ID: 12077
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

ID: 12078
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

ID: 12079
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. COTTET[1], K. GAJJAR[2], V. K[2], A. SENGUPTA[2], J. LILJEKVIST[3], M. STOECKLI[4]
[1]Hitachi Energy Switzerland; [2]Hitachi Energy India; [3]Hitachi Energy Sweden; [4]ELECTROSUISSE / CIGRE Switzerland NC Secretary

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. WINKELNKEMPER[1], R. IBANEZ CATALA[2], C. KRIGER[3], A. M. NCUBE[4], M. STOECKLI[5]
[1]Pfiffner Instrument Transformer Switzerland; [2]ramDSP Spain; [3]Cape Peninsula University of Technology Rep. of South Africa; [4]CubeIO Rep. of South Africa; [5]ELECTROSUISSE / CIGRE Switzerland NC Secretary

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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. KUHN[1], L. OSTERKAMP[1], W. LETERME[1], G. OGORODNIKS[2], M. QUESTER[2]
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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. WESTERWELLER[1], X. LIE[2], N. VAN DER LAAG[1], R. MANOHAR[2], M. FOEHR[1], A. YU[3]
[1]Siemens Energy Global GmbH & Co. KG; [2]Mitsubishi Electric Cooperation Europe; [3]Mitsubishi 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. SCHOENLEBER[1], R. GORE[3], J. CASTELLANOS[1], B. DECK[2], A. FAIRBROTHER[2], H. ELHUSSINI[4], N. ENGLUND[3], J. JUNG[5], M. GRATZA[5]
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ID: 12410
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. GOERTZ[1], S. WENIG[1], P. PINTER[1], T. SCHAUPP[2], M. SANAEE[2], A. SACIAK[3], I. NETT[4], V. SCHNELL[4]
[1]Mosaic Grid Solutions GmbH; [2]TransnetBW GmbH; [3]50Hertz Transmission GmbH; [4]TenneT TSO GmbH

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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. KAYSER[1], S. SCHLEGEL[1], D. WESTERMANN[1], M. BENGLER[2], S. REHKOPF[2]
[1]TU Ilmenau Germany; [2]Maschinenfabrik Reinhausen GmbH, Germany

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. ZHANG[1], Y. XUE[2], P. LI[3], D. ZHANG[3], J. LEI[3], S. CHEN[3]
[1]CSG Guangdong Guangzhou Power Supply Bureau, South China University of Technology; [2]South China University of Technology; [3]CSG Guangdong Guangzhou Power Supply Bureau

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. KARYSTIANOS[1], P. MANDOULIDIS[1], Y. TSOURAKIS[1], G. FOTOPOULOS[1], A. GIOTIS[1], D. BROUSOVANAS[1], N. GINIS[1], E. BELIVANIS[1], K. ROGDAKIS[1], C. GEORGIOU[1], P. SIDERIS[1], N. KATSARAS[1], M. VOUMVOULAKI[1], C. KARATZAS[1], I. VENETIDIS[1], S. RIGA[1], C. APOSTOLOPOULOS[2], K. KAVOURIDIS[2], K. SPETSIOTIS[2], C. MOULOS[2], D. PEPPAS[2], I. NIKOLAKAKIS[2], I. KOLLIOPOULOS[2], D. KARAKATSANIS[2]
[1]IPTO Greece; [2]ARIADNE INTERCONNECTION Greece

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. LEKIĆ[1], A. KERMANSARAVI[2], H. LI[1], Y. Q. LARES[1], S. ALSARAYREH[1], R. DIMITROVSKI[3]
[1]Delft University of Technology; [2]The Hague University of Applied Sciences; [3]TenneT TSO GmbH

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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*
PGCIL, INDIA

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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

ID: 10591
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
Resonia Limited, INDIA

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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
POWERGRID, INDIA

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. PARMAR[1], I. HUQ[2], O. AMAYA-ZEPEDA[3]
[1]Grid United, LLC, United States of America; [2]Siemens Energy, Germany; [3]Siemens Energy, Canada

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

ID: 11461
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
SIEYUAN ELECTRIC CO., LTD

ID: 11602
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
SIEYUAN ELECTRIC CO., LTD

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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

ID: 11674
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. CARLAK[1], E. KAYAR[2]
[1]Akdeniz University; [2]Turkish Electricity Transmission Corporation

ID: 12305
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

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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. VANDEREECKT[1], J. TANT[2], J. BEERTEN[3]
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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. POURBEIK[1], A. NICHOLS[2], D. PIERSON[3], H. ABRAMS[4], R. MAJUMDER[2]
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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 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

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Concept of Integrated Reactive Power Management in a National Renewable Energy Hub

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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, 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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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
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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: Superconducting Cables, MVDC, DC Circuit Breaker, Converter, Resistive Fault Current Limiter

Superconducting Medium Voltage DC Transmission: Architecture, Protection, and Simulation Insights

C. CREUSOT[1], A. BERTINATO[1], P.-B. STECKLER[1], D. BRASILIANO[1], N. DEVEAUX[1], A. MORANDI[2], E. GUERRA[2], M. SIMONAZZI[2], M. FABBRI[2], G. ANGELI[3], A. MUSSO[3], M. BOCCHI[3]
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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: 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. BONNET[1], R. BAKHSHI-JAFARABADI[2], J. POUGET[1], F. DEHGHAN MARVASTI[2], B. DE FOUCAUD[1], A. SHETGAONKAR[2], H. CLEMOT[1], R. KAMAT TARCAR[2], A. PETIT[1], R. KOORNNEEF[2], C. MARTIN[1], A. LEKIĆ[2], S. DENNETIERE[1], M. POPOV[2]
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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 - 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. WINTER[1], P. SCHOMMER[1], J. HU[2], J. MARSHIK[1], R. PALLAPATI[1], B. BISEWSKI[2]
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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 Converter Stations - Autonomous Inspection Robots - Functional Speciications - Electromagnetic Compatibility (EMC) - Valve Hall Inspection - Substation Robotics - Asset Condition Monitoring - Energy Transition

Deployment Considerations of Autonomous Robots in HVDC Converter Stations

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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: 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. KASUGA[1], T. YAMADA[2], Y. AKIYAMA[3], T. YOSHIHARA[4], S. TOMINAGA[5], T. NAKAJIMA[6]
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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: 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. MANOHAR[1], K. TAHATA[1], Y. TERADA[1], S. NEE[2], T. MODEER[2], L. XU[3]
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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. PAGE[1], T. INAGAKI[1], K. TAHATA[1], S. NORRGA[2], T. MODEER[2], L. XU[3]
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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/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"

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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. DIAS[1], P. M. PORTUGAL[1], M. C. SABOIA[1], P. H. L. d. SANTOS[1], M. A. AREDES[1], C. M. FREITAS[2]
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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

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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: Bipole, SGFM, DMR, Power Electronics Module, Offshore Interconnections, VSC-HVDC, Wind Farms.

TenneT 2GW Bipole Offshore HVDC Transmission Schemes – Key Advanced Control Features

O. JASIM[1], M. KUMAR[1], A. KUMAR[1], S. KABUL[2], A. DEY[3], Z. AHMED[4], R. WINSENBERG[5], B. KOX[4]
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ID: 11283
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. ELGENEDY[1], A. KHAN[1], N. SHARMA[1], C. FOOTE[1], B. MARSHALL[1], G. FINTZOS[2], E. SPAHIC[3]
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ID: 11388
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
Hitachi Energy

ID: 11431
B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
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Virtual Control and Protection System in Real Time Software in the Loop

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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. ZENG[3], X. WEI[1,2], Z. YU[3,1], G. TANG[1], H. RAO[4], Y. SHAN[1], S. LI[1], W. CAI[4], T. JIANG[1]
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ID: 11463
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

ID: 11465
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. RANGASAMY[1], C. FOOTE[1], B. MARSHALL[1], A. KHAN[1], A. JANA[1], W. AHMAD[1], X. HUANG[1], H. BEKKOURI[2], S. S. H. YAZDI[3]
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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. LI[1], Y. FAN[2], C. WU[2], X.-P. ZHANG[2], N. CHEN[2], X. DING[3], R. ZHANG[4]
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ID: 11699
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
Hitachi Energy

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Grid Forming STATCOM Dynamic Performance: A Technical Study

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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
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ID: 11857
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. {. ZHANG[1], M. FERDOUS[1], Q. YANG[2], M. SAEEDIFARD[3]
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Comparative Analysis of AI-Based DVR Control Strategies for Hybrid Renewable Energy Systems: LSTM vs. PSO-Tuned Fuzzy Logic Controller

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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: 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. CASTELLANOS[1], L. XU[2], F. PEREZ[3], A. ZAMA[3], A. BENCHAIB[3]
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Innovation and Challenges in the Implementation of Series FACTS in 500kV Transmission Lines of the Peruvian System

M. P. PASTRANA[1], A. C. CASTRO[2], A. H. HUACCHO[3], C. S. SANCHEZ[4], H. M. MANTILLA[5]
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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. GRADINGER[1], J. BENKE[5], E. GARCIA MARTINEZ[4], J. MUNOZ-CRUZADO ALBA[3], F. WALD[2], M. MOGOROVIC[1], M. STOECKLI[6]
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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. MOGOROVIC[1], R. ALVES[2], A. Z. KHAN[3], L. PETRIANNI[4], M. BARTOLUCCI[4], S. GIOVANETTI[4], R. SANCHEZ[5], G. ANDREELLA[5], M. STOECKLI[6]
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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. KRUEGER[1], C. GERDON[1], J. DILCHERT[1], M. KAHL[2], C. DETERS[2], A. MOSER[1]
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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. SEMMLER[1], J. DORN[1], R. ALVAREZ[1], A. VAN SCHIJNDEL[2], D. SOUBRIER[3], W. KRUSCHEL[4], M. SANAEE[5]
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E-STATCOM, the first of its kind: Design and performance of a supercapacitor energy storage integrated into a STATCOM

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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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ID: 12644
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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

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B5 PROTECTION AND AUTOMATION

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Training of Protection Engineers on the Impact of HVDC Converter Control Parameters on AC Distance Protection: a Practical Workshop

J. VERMUNICHT, R. LOENDERS, G. CHAFFEY, D. VAN HERTEM
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Keywords: Generative AI - Knowledge Management - Digital Substations

Generative AI and its Impact on PACMM Knowledge Management

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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 Lifecyle, Survey, Legacy PAC, IEC 61850-based PAC, Discontinuity, Strategic Resources, IAM

How to preserve and develop PAC skills in a rapidly changing world

R. TROOST, S. VAN DER HEIJDEN, T. ALDERS
Stedin

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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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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring
Keywords: Communication, Competencies, PAC Engineering

Developing Communication Networking Competencies in 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

Analysis of distance relay behavior during intercircuit faults – practical case study and theoretical analysis

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring
Keywords: 3T Framework: GETCO's Protection System

The 3T Framework: GETCO's Approach for Protection System Reliability

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Unlocking the Diagnostic Potential of Digital Relays for Protection Mis operation Analysis and Knowledge Management in the Indian Grid

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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: 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.

J. KUMAR*, G. S*, A. VAISH, R. WADYALKAR
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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: STRATEGIC KNOWLEDGE MANAGEMENT FRAMEWORK PACM

Strategic knowledge management framework for pacm systems in indian power utilities: enabling a future-ready grid

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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: Protection System Experiences. Case Studies

Protection System Experiences. Case Studies, Analysis and Learnings in Project Commissioning and O&M.

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ID: 10611
B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring
Keywords: Tool for SAS Configuration Error

Automated Tool for SAS Configuration Error Detection

A. CHOUDHARY*, V. C REDDY, A. NAYAN, S. K. SINGH, M. KUMAR, M T. REDDY
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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: 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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B5 PROTECTION AND AUTOMATION - Full Papers
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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ID: 10842
B5 PROTECTION AND AUTOMATION - Full Papers
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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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

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Keywords: Sustainable Design - Protection Philosophy - Knowledge Transfer

Knowledge Transfer through Sustainable Design

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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. RYONO[1], H. YAMASHITA[1], T. OTANI[1], T. MIZUKAMI[2], T. OGIYAMA[3], M. ONO[4]
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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
TEPCO Power Grid, Inc. Japan

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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

R. LEHUTSO, K. MANYAPETSA
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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
Belden Brazil

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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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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 PIRES[1], C. A. VILLEGAS GUERRERO[2], F. O. PASSOS[2], P. M. SILVEIRA[2]
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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

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SM Energy Brazil

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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 JUNIOR[1], J. C. M. d. LIMA[2], D. B. d. OLIVEIRA[3], T. M. T. d. S. ALVES[3], J. R. PESENTE[4]
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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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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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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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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. KIREEV[1], A. CHIRKOV[1], Y. CHIRKOV[1], A. CHIRKOVA[1], D. YASKO[2]
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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
Tekvel

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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. ULYANOV[1], A. MOKEEV[2], P. SEITOV[1], S. PISKUNOV[2]
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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

M. BELOVA
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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
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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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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. ALBERO[1], Y. GALVE[1], M. GUTIÉRREZ[1], E. VILLAREAL[2], J. MARTÍN[3]
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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
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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. MERELES[1], C. VILLASANTI[2], A. ORTIZ[3], P. LINDSTROM[4], D. GAMARRA[5]
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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. TEOH[1], J. WRIGHT[1], P. BRUN[2], H. HOANG[3], D.-T. VO[3]
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Expertise Development in Innovative Technologies for Next-Generation Substations

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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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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

T. I. STRASSER[1,2], F. PRÖSTL ANDRÈN[1]
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Efficient Transformation: Innovative Strategy for the Modernization of Busbusbar differential Protections in Critical Substations

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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. KONGKAEO
Electricity Generating Authority of Thailand (EGAT)

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Topics: B5 PS1 - Knowledge management in the field of protection, automation, control, metering and monitoring

Expert Systems for Automated Relay Setting and Coordination in Transmission Lines and Power Transformers.

G. GUTIERREZ[1], C. MENDEZ[2]
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Support tool for establishing the technical analysis methodology for protection relay certification testing over time.

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From Field Experience to Knowledge Transfer: Enhancing Training in Line Differential Protection

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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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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. DAMLJANOVIĆ[1], M. JOVIČIĆ[1], M. ISAILOVIĆ[1], D. TRIJIĆ[2], V. MILANOVIĆ[2], M. PEJČEV[2], Z. STOJANOVIĆ[3], V. CVEJIĆ[4]
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Next Gen Resource Management: Empowering Organizational Agility and Innovation through Workforce Capability Development

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Challenges in training for PAC professionals - And how to overcome these

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Integrated engineering environment for consistent documentation, scalable knowledge transfer, and accelerated PAC project delivery

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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

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Leveraging Digital Twins and AI Chatbots for Knowledge Management and Workforce Development

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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

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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. LIU[1], G. CHAFFEY[1], P. JUDGE[2], D. VAN HERTEM[1]
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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

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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

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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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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

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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

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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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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
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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
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ID: 10626
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 (NPDFD)

SCADA-Compatible Normalized Power Deviation Fault Detection (NPDFD) for Unequal-Rated PV Strings with Irradiance-Based Transient Filtering

J. J.*, 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
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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

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SRLDC GRID -INDIA INDIA

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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

N. SHETH*
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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
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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

S. BHATT*, N. c. PATEL
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

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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

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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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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
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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

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Topics: B5 PS2 - Protection and control in networks with unconventional sources
Keywords: Advanced Protection and Controls for RE Power Networks:

Advanced Protection and Control Stratégies 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

D. MANI[1], A. BONETTI[2], C. HARISPURU[3], N. WETTERSTRAND[4]
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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

A. CHANDA[1], J. B. GRACE[1], M. ALMEIDA[2], M. BAKER[2]
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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

S. S. MANN, D. OSORIO-GARCIA, H. S. POTTER
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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. MUENZ[1], S. BHELA[1], A. BANERJEE[1], S. ELPELT[1], A. STINSKIY[1], S. DAS[2], A. HADDADI[2], E. FARANTATOS[2], D. KELLY[3], M. RENO[3], Z. DONG[4], A. ASHOK[4]
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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

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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. NIE[1], Q. YANG[2], Z. J. ZHANG[3], Q. XIA[4], S. DEBNATH[4], M. SAEEDIFARD[1]
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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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Central Research Institute of Electric Power Industry Japan

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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

M. DAVI[1], F. LOPES[2], V. LACERDA[3], M. OLESKOVICZ[1], O. GOMIS-BELLMUNT[3]
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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

R. DUTRA[1], R. FERNANDES[2], J. M. ORDACGI F[1]
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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

F. LOPES[1], M. DAVI[2], M. OLESKOVICZ[2]
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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)

W. S. HOKAMA[1], D. P. BERNARDON[2], A. HIGA[1], A. P. D. MORAIS[2]
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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

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Conprove Brazil

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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

R. FERNANDES[1], G. SILVA[2], R. DUTRA[3]
[1]Equans Brazil; [2]Auren Energia Brazil; [3]Consultant Brazil

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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. OLIVEIRA[1], T. M. T. S. ALVES[1], J. C. d. LIMA[2], P. H. FLORES[3]
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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. ALVES[1], C. REIZ[1], A. MELIM[1], T. HEKKERT[1], A. CARRAPATOSO[1], C. GOUVEIA[1], A. ALEIXO[2], R. JORGE[2], J. PERES[2]
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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
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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

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS2 - Protection and control in networks with unconventional sources
Keywords: Protection, Invertor, 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. KOZYREV[2], A. RASSHCHEPLYAEV[2], A. VOLOSHIN[1], D. SEROV[1], R. MAXIMOV[1], O. DOBRIAGINA[1], D. ROMANOV[1], I. POLYGALIN[1]
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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. KOZYREV[2], A. RASSHCHEPLYAEV[2], A. VOLOSHIN[1], D. SEROV[1], R. MAXIMOV[1], O. DOBRIAGINA[1], D. ROMANOV[1], I. POLYGALIN[1]
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Impact of increased renewable integration on power swing detection: a case study from the Portuguese DSO

L. NUNES[1], F. MENDES[1], J. SILVA[1], M. SILVA[1], A. LEIRIA[1], A. NEVES[2], J. GOMES[2], M. LOURO[2]
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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

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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. SATSUK[1], D. DUBININ[1], T. KLIMOVA[2], J. IVANOV[2], A. DMITRIEVA[2], M. POROZKOV[2]
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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. EFREMOV[1], A. EFREMOV[1], M. PETRUSHKOV[1], S. SMIRNOV[2]
[1]«Relematika», LLC; [2]JSC «VNIIR»

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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. VOLOSHIN[1], A. KUCHERIAVENKOV[2]
[1]NRU MPEI; [2]ANTRAKS

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Digital substation-roadmap for practical implementation

M. LOUKKALAHTI[1], K. MAJER[2], J. VALTARI[2]
[1]Helen Electricity Network Ltd; [2]ABB

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Modelling, Simulation, and Validation Tests for Sub-harmonics Protection Relay

B. POURNAZARIAN[1], K. TROFAST[1], J. KOPPINEN[1], T. RISSANEN[2], R. KORHONEN[2], J. M. GOMEZ[3]
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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. LI[1], Q. TIAN[1], X. SHI[1], J. LIU[2], M. WEN[3], Y. QIU[4]
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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
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Behaviour of distance protection during off-nominal frequencies in the presence of inverter-based generation
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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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Considerations on AC transmission distance protection in systems with high penetration of grid-forming inverter-based resources
A. FRETWELL[1], M. RASUL[1], D. PATYNOWSKI[2], K. ELSHAMY[2]
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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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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. SHAH[1], M. A. KHAN[1], S. NORRIS[1], A. GLATZ[1], D. WILSON[1], M. GOLSHANI[1], D. PERERA[2], H. KLINGENBERG[2]
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Advancements for line differential protection using model-based approach
A. TSYLIN[1], Z. GAJIC[2], A. G. MOSER[1], S. AGANOVIC[2], R. PAJUNEN[2]
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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. CHAKRAPANI[1], Z. ZHANG[2], I. VOLOH[3]
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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. CHAKRAPANI[1], I. VOLOH[2]
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Wide Area Protection Based on Phase Angle of Sequence Components

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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. YU[1], F. FILGUEIRA[2], M. DINIZ[3], Y. QI[4], J. LI[4], M. MA[4], J. YANG[4]
[1]CIGRE UK; [2]CIGRE SPAIN; [3]Scottish Power Energy Networks UK; [4]Glasgow University UK

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Network protection performance audits under high levels inverter-based generation systems

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Static Synchronous Series Compensator (SSSC) and its Challenge for

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Methodology for Selecting Line Protection Schemes in Substations in EPM

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ID: 12357
B5 PROTECTION AND AUTOMATION - Full Papers
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

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B5 PROTECTION AND AUTOMATION - Full Papers
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
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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. MEYER[1], M. DAUER[1], D. HOLTSCHULTE[2], T. LORZ[3]
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B5 PROTECTION AND AUTOMATION - Full Papers
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

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Challenges and solutions for the distance protection in networks with unconventional sources

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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
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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. RUFINI[1], L. BUONO[2], F. PALONE[3], L. PAPI[4], G. TRESSO[5], P. VACANTE[6]
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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS

C1 PS1 - Holistic planning of an integrated energy system for the energy transition

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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition
Keywords: Decarbonization - Integrated System Planning - Round Trip Analysis - New York - Adequacy

New York Grid Performance Gaps Study

S. T. MANZ[1], G. HINKLE[1], J. MACDOWELL[1], A. FOSSA[1], G. JORDAN[1], M. ELKINS[1], J. SPAETH[1], A. GOGOLA[1], S. TUCKER[1], C. CHENG[2], H. BELLO[2]
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Evolving Planning Criteria for a Sustainable Power Grid

M. LAUBY[1], C. SINGH[2], T. OVERBYE[2], A. BOSE[3], V. VITTAL[4], D. NOVOSEL[5], G. VAN WELIE[6]
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Topics: C1 PS1 - Holistic planning of an integrated energy system for the energy transition
Keywords: Climate Change - Extreme Events - Transmission Planning - Power Flow Scenario Selection

Planning for Uncertainty and Variability: Integrated Modelling for Transmission Adequacy

E. VITTAL[1], P. MITRA[1], D. DHUNGANA[2], P. MCNAMARA[3]
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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

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Central Transmission Utility of India Limited India

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N. BARLA[1], B. PERREYON[1], A. BENCHAIB[1], J.-C. GONZALEZ[1], S. JANKOVIC[2], C. FOOTE[3], C. MACIVER[4]
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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. BA[1], K. TAKASE[1], S. KIMURA[1], T. SAITOU[1], T. WAKEYAMA[2], Y. NAKANISHI[3]
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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

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Keywords: Large Load Placement, Transmission Margin, Maximum Load, Datacenters, Hydrogen Power Plants

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Keywords: Reactive Power, High Voltage, Probabilistic Modelling, Forecasting

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N. SIMS[1], G. MCFADZEAN[1], R. TAWN[1], F. VELEZ[2], Y. WU[1]
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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
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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. PILENIEKS[1], D. YARIZ[1], R. NAUMKIN[1], S. UTTS[1], A. KUVSHINOV[3], A. KORNEEV[2]
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Keywords: Energy Policy - Long-term Planning - Energy Mix – RES - Power System – Balance - Operational Constraints

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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

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Keywords: Renewable generation expansion planning, Climate change, Wind-solar complementary, Copula, Stochastic programming

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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

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Keywords: Electric Power System, Data Centre, Power System Planning, Short-circuit Current Capability, High Voltage, Network Topology, Availability

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[1]Jacobs UK; [2]Jacobs Australia; [3]Jacobs 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. NDOUR[1], A. ALRASHED[1], A. JAIN[1], K. PAMBOUR[2], A. PELUSO[2], F. HOMAID[1]
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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

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Keywords: HVAC, HVDC, offshore grid, offshore substations, onshore grid, grid planning, transmission planning, stakeholder coordination, governance, avoided onshore transmission reinforcement

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Y. YANG[1], A. ILICETO[2], C. PLET[3], L. STREGGER[4], P. RUFFING[5], R. CHAKRABORTY[6], E. SPAHIC[7], S. KODSI[8], T. EGAN[9], H. ERGUN[10], V. MARKATSELIS[11], R. WILCHES[12], I. HUTT[13], R. CHAKRABORTY[14]
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Keywords: Data centre - Artificial intelligence - Carbon emission - Electricity market - Sustainability

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Keywords: energy system planning, system resilience, climate change, severe weather events

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

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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

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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. YU[1], K. LI[2], B. SWEENEY[3], R. DAVISON[4], A. E. ALVAREZ[4], E. ALLISON[5]
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Keywords: Coal phase-out, system reliability, renewable integration, operational security, power system planning

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Optimization model for determining scenarios of maximum integration of renewable energy plants with identification of Synchronous Must-Run units

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Keywords: Colombia's Energy Transition Roadmap

Colombia's Energy Transition Roadmap Strategic Planning for a Resilient, Flexible and Sustainable Power System

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Linking bottom-up and top-down prognosis in integrated distribution grid expansion planning

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Keywords: Linear Optimisation, Nodal Reactive Power Demand, Reactive Power Planning, Voltage Con- trol, Voltage Stability

A New Approach to Reactive Power Planning: A Two-Stage Optimisation Framework for Bus-Specific Reactive Power Demand Determination

S. TEPE[1], C. KAMPMANN[1], S. SAMAAN[2], A. MOSER[1], C. F.[1]
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Keywords: Power generation planning, high renewable energy penetration, multi-dimensional evaluation

A Novel Power Generation Planning Method Designed for Future Power System Development

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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. LIU[2], Y. SHU[3], T. BI[2], A. SHU[1], L. ZHAO[1], N. LIU[2]
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Towards an Efficient, Adequate, Sustainable and Interconnected Mediterranean Power System: Synthesizing the Master Plan

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Keywords: Reactive power, cables, shunt compensation, voltage control, urban grid, DSO

Reactive Power Compensation for the City of Zurich

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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

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H. CHUN, B. JALLOW, W. TU, M. NAZEMI
Pacific Gas and Electric, United States of America

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A Framework for Co-optimizing Cost and Resilience in Stand-Alone Power Systems for Green Hydrogen Production

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Topics: C1 PS2 - Strategic investment decisions in the context of the energy transition
Keywords: Climate Change - Extreme Weather - Investment Planning - Resilience

A Framework to Enhance Grid Resilience for Long-Term Planning of Transmission Systems

A. CHATTOPADHYAY[1], L. PETER[2], F. GHAWASH[2], M. JAWAD[3], P. KOZIOL-BOHATKIEWICZ[3], G. CABOUR[5], M. GIUNTOLI[2], A. SHIRSAT[1], A. KAMARIOTIS[4], M. SUBASIC[2], I. HARJUNKOSKI[2]
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Keywords: Balancing, Risk, Reward, Investment, Strategies

Balancing Risk and Reward: Investment Strategies for Emerging Economies in the Renewable Energy Transition"

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Topics: C1 PS2 - Strategic investment decisions in the context of the energy transition
Keywords: Leveraging, Battery, Energy, Storage

Leveraging Battery Energy Storage in Thermal Power Plants for Enhanced Flexibility, Reliability, and Emergency Backup

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Keywords: Innovative, investments, favouring, Net Zero, Carbon, energy

OSOWOG (One Sun One World One Grid) : Innovative investments favouring Net Zero Carbon energy exchanges among interconnected continents

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Topics: C1 PS2 - Strategic investment decisions in the context of the energy transition
Keywords: Behind-the-meter solar, Consumer behaviour, Demand displacement, Electricity demand forecasting, Rooftop PV

Integrating rooftop solar into load forecasting: A South African emerging methodology

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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. STAID[1], W. TAYLOR[2], O. PELED[3], E. VITTAL[1]
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Topics: C1 PS2 - Strategic investment decisions in the context of the energy transition
Keywords: Frequency Dynamics, Generation Expansion Planning, Optimal portfolio mix, Grid Security Constraints, Voltage Stability

Embedding Grid Security Constraints in Generation Expansion Planning Models: A Real Network Case Study.

E. CLAIROTTE, I. EN-NASYRY, B. RICAUD

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Keywords: Cost–Benefit Analysis, HVDC System, Transmission Development

Advancement of the Long-Term Transmission Expansion Plan for Achieving Carbon Neutrality by 2050

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Keywords: Automatic Curtailment, Digital Flexibility, Grid-scale Storage System

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Y. OGASAWARA[1], T. OHNO[2], N. KOBAYASHI[3], T. KAISO[4], K. NUSSBAUM[5], G. LANCEL[5]
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N. SHUBIN[1], F. NEPSHA[1], E. PLESNIAEV[1], V. TARASOV[2], E. SATSUK[3]
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A. MERZIĆ[1], A. KAZAGIĆ[2], Z. BAJRAMOVIĆ[3]
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G. MAJSTROVIĆ[1], N. HEGER[2], M. JAŠIĆ[3]
[1]Energy Institute Hrvoje Pozar, Croatia; [2]GIZ, Germany; [3]GIZ, Bosnia and Herzegovina

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Keywords: Decarbonisation, hybrid systems, energy storage, flexibility, curtailment

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[1]Arup UK; [2]National Grid Electricity Transmission UK

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M. CHENG[1], S. ZHU[2], J. LIANG[3], X. LAI[4], S. LU[5]

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R. QUINT[1,2], T. SCARAMELLINO[2], K. THOMAS[1], K. SAMARASEKERA[3]

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Integrated Framework for Advanced Voltage Management in High Renewable Penetration Systems: From Reactive Power Coordination to Look-Ahead Optimization

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Keywords: Artificial intelligence, Voltage control, Reactive power control, Photovoltaic

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Keywords: OTS, Operator Training, Dynamic Simulator

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Keywords: Energy-Meteorology, Potential Maximum Power Demand Error (PMPDE), Behind-the-Meter (BTM) Solar, Grid Stability, Renewable Energy Curtailment

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Korea Power eXchange

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Keywords: Forecasting system, Photovoltaic

Development of Electricity Demand Forecasting System in Korea Considering the Volatility of Photovoltaic Power Generation

H.-G. SON[1], H. KIM[1], K. LEE[1], C. G. LEE[1], K.-b. SONG[2]
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Keywords: Power System - Automation – Voltage – Reactive Power – Management – Regulation

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Ł. CZAPLA[2], M. GŁAZ[1], J. JEMIELITY[2], P. KOLENDO[2]
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Keywords: Adverse condition, dynamic response, frequency, overhead line (OHL), storm Éowyn, SQSS

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P. SARKAR, B. BONJESI
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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. RAOOFSHEIBANI[1], D. BERTI[1], F. IANNUCCI[1], A. TOLETTI[1], H. MATTIAT[1], O. HAUBENSAK[1], S. DELEERSNYDER[1], B. GRAND[1], M. STOECKLI[2]
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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. TOLETTI[1], R. WU[1], M. BUCHER[1], C. O' MALLEY[1], M. STOECKLI[2]
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Keywords: Transmission system incidents, Regional coordination, Security analysis, Contingency management, System resilience.

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Keywords: Operating-Procedures, Training-Programs, Situational-Awareness, Roadmap

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H. ANGELKORTE[1], A. LIRA[2], A. SILVA[3], A. NEVES[4], G. AMBONI[5], H. MENEZES[6], K. CALDEIRA[7], R. AZEVEDO[8]
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C2 PS2 - Maintaining operational reliability through flexibility

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Enhancing Resource Adequacy Monitoring in the Indian Power Sector through Real-Time Day-Ahead and Intra-Day Decision Support Tools

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Grid-India, INDIA

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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

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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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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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Keywords: Black-start, Energy Transition, Flexibility, Resilience, Restoration

Leveraging grid flexibility for enhanced system restoration in South Africa: A Black-Start operational framework

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Topics: C2 PS2 - Maintaining operational reliability through flexibility
Keywords: Security analysis, probabilistic load flow, forecast error model, Schaake Shuffle technique

A probabilistic congestion signal for optimal management of battery storage systems

A. MARIÉ, T. LECHAT, E. LITTLE, A. BRETON
RTE France

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Keywords: Flexibility assessment, Prospective studies, Reserve requirement, ANTARES, MAUI

Modeling Prospective Reserve Requirements: A Probabilistic Framework Applied to the French Power System

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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
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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

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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. FERREIRA[1], B. PESTANA[1], F. ALVES[1], R. ZYMLER[1], R. BOTTINO[1], G. TARANTO[2], V. NEUMANN[3], E. SODRÉ[4], R. FERNANDES[5], P. GOMES[6]
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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

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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

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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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Automatic Generation Control in a Renewable Era: A GCCIA Perspective

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Keywords: NPP, FCR, PFR, Nord

PProviding FCR-N with BWR in a Nordic context

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Probabilistic Assessment of Seasonal Power System Reliability in Jordan Integrating Renewable Variability

A. ABUYAHYA
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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

T. SURADANAIPAT, T. ARUNTHANAKIJ
Electricity Generating Authority of Thailand (EGAT)

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An Optimization-Based Framework for Real-Time Power System Operation: The Colombian Experience

R. JARAMILLO[1], J. TOBON[2], J. VALENZUELA[3]
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A Methodological Framework for Assessing Grid and DER Technologies to Provide Flexibility Service in the Colombian Power System

J. A. ZAPATA[1], J. D. MOLINA[2], M. MURIEL[3]
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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. REIFSCHNEIDER[1], R. FELLER[1], E. HASCHEN[1], K. SCHOENLEBER[2], F. NEUMANN[1], L. WIMMER[1], E. WEGNER[1], M. THIELE[1], S. SCHMITT[2]
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C2 PS3 - Power system dynamics and control in operations

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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, 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. TRAN[1], T. A. NGUYEN[2], H. B. VU[1]
[1]Applied Technical Systems JSC, Vietnam; [2]Vietnam PRP Corporation

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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
Taiwan Power Company

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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. PAVLOVSKY[1], L. LUKIANENKO[1], V. HRECHKO[1], V. ZAYCHENKO[2]
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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
ElectraNet, Australia

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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
Grid-India, INDIA

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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. SONI[1], S. SHEKHAR[2], A. KUMAR[1]
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Keywords: PMU - Dynamic Phasors - Real-Time Model - State Estimation - Visualization - Animation

Power System Dynamic State Tracking Under Normal and Disturbance Conditions

S. MELIOPOULOS[1], G. COKKINIDES[1], R. ELMOUDI[2], C. BLACK[3], A. KUMPF[3]
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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

S. GHIMIRE[1], V. VENKATASUBRAMANIAN[1], G. TORRESAN[2], S. HIVART[2]
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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. SHIUAB[1], V. VENKATASUBRAMANIAN[1], V. K. JANDHYALA[1], G. TORRESAN[2], R. CLEMENT[2]
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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. FARANTATOS[1], L. ZHU[1], H. WANG[2], Y. ZHAO[2], Y. LIU[3], G. GIANNUZZI[4], G. MICCIONE[4], G. SIANO[4], P. PAU[4], S. CASULLI[4], G. GEMELLI[4], L. S. AVELLINO[4], R. CARROLL[5], C. LACKNER[5]
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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

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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. ISHII[1], F. TANIGAWA[1], S. DEGUCHI[1], S. MIYAKE[1], T. KAWAGUCHI[1], K. TOKUMITSU[2], J. TAMURA[2]
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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

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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"

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TERNA

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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"

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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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Topics: C2 PS3 - Power system dynamics and control in operations
Keywords: Power system stability, special protection schemes, interconnections, synchronous operation ofpower 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

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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

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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. ZHURAVLEVA[1], N. VOLKOVA[1], O. OPALEV[1], E. SATSUK[1], R. RADIONOV[2]
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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

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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. KORIEM[1], G. TAYLOR[1], J. SANCHEZ CORTES[2], J. ABRAHAM-KODMON[2], S. PIL OE[3], T. HUUHTANEN[4]
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Keywords: Frequency Stability, Voltage Stability, Power Grid Simulation, DSA

Indexes to monitor frequency and voltage stability at operational time frame

X. VIEIRA FILHO[1], J. JARDIM[2], E. TEICH[2], D. SOUZA[1]
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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
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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

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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

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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

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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. MA[1], X. ZHANG[2], C. YIN[3]
[1]Tsinghua University; [2]Southwest Jiaotong University; [3]State Grid Economic and Technological Research Institute

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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; voltage control; reactive power balance; voltage instability; dynamic reactive power compensation

Magnetically Controlled Shunt Reactors as a Countermeasure against Cascading System Failures

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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. KHARDAWI[1], M. ABIDO[2], N. IQBAL[2], U. KHAN[2], M. SHANMUGAM[3]
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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

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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
University of Strathclyde United Kingdom

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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. CHAPARRO[1], J. ANDRADE DOS SANTOS[2]
[1]ITAIPU BINACIONAL; [2]ITAIPU BINACIONAL

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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. MARQUES[1], R. WARZYWODA[2], M. WILK[2], J. VANDENDORPE[3], J. MASSMANN[4], M. CREMENESCU[5], E. GREBE[6], W. SATTINGER[7]
[1]REN, Portugal; [2]PSE S.A., Poland; [3]ENTSO-E, Belgium; [4]Amprion, Germany; [5]Transelectrica, Romania; [6]Ruhr-Universität Bochum, Germany; [7]Emeritus, Switzerland

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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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Integrating Battery Energy Storage Systems for Primary Frequency Control: A Practical Implementation and Transformation Outlook from the Colombian Power System

O. A. TOBAR[1], J. E. CANDELO[2], F. HOYOS[3], L. QUINTERO[4]
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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

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
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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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Power Transfer Capacity Optimization of a Radial Network using Battery Energy Storage Systems

J. FIGUEROA[1], J. HERRERA[2], N. TURTURICI[3]
[1]Grupo Estudios Electricos; [2]Grupo Estudios Electricos; [3]Grupo Estudios Electricos

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Balancing Cellular Autarky and System Frequency: An Inertia-Conscious Dispatch Concept

J. FRERK[1], A. KREIZER[1], M. ZDRALLEK[1], F. FLATTER[2], C. TROSSEN[2]
[1]University of Wuppertal Germany; [2]University of Kaiserslautern Germany

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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
TU Darmstadt Germany

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Online Oscillation Detection based on PMU-Data in the Control System

N. PHILIPPI[1], S. LEKSAWAT[1], P. GIERL[1], S. DALHUES[1], T. PLETZER[1], C. FARKAS[2], G. SZÜCS[2], Z. GREGUS[2]
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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

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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. HUANG[1], Z. LIAO[1], Y. YANG[1], P. LI[2], P. DAI[1], J. JIANG[1], Y. ZHUO[1]
[1]CSG Guangdong Guangzhou Power Supply Bureau; [2]Tsinghua University

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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

R. OPREANU[1], R. PLĂMĂNESCU[2], M. ALBU[3]
[1]CNTEE Transelectrica SA, University POLITEHNICA of Bucharest, Faculty of Electrical Engineering Romania; [2]University POLITEHNICA of Bucharest, Faculty of Electrical Engineering Romania; [3]University POLITEHNICA of Bucharest, Faculty of Electrical Engineering Romania

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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

D. LEE[1], J. BEERTEN[2]
[1]KU Leuven, ESAT-Electa/Etch-EnergyVille Belgium; [2]KU Leuven, ESAT-Electa/Etch-EnergyVille Belgium

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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. LU[1], Y. ZHU[2], G. PANG[3], D. LI[4]
[1]Shanghai KeLiang Information Technology Co., Ltd. China; [2]China Electric Power Research Institute China; [3]China Electric Power Research Institute China; [4]China Electric Power Research Institute China

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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

A. FLORINSKII
JSC "System operator of the Unified Energy System" Russia

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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

M. ŠKRLEC[1], J. LASNIK[2], U. RUDEŽ[3]
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C3 POWER SYSTEM SUSTAINABILITY & ENVIRONMENTAL PERFORMANCE

C3 PS1 - Biodiversity conservation & enhancement. Towards positive contribution

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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. MENTENS[1], R. DURINCK[2], N. BECK[1]

[1]Elia Group, Belgium; [2]Attina, Belgium

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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. MANSOUR[1], M. BEDROUS[2], I. ELSAWY[1]
[1]EEHC, EGYPT; [2]Senior Counsellor for Energy & Environment (E&E), EGYPT

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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 CAMPEN[1], P. OSKAM[2]
[1]Alliander; [2]Stedin

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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. KINGMA[1], O. BITTNER[1], A. HERMANS[2], M. VAN VELDHUISEN[3], B. SCHILT[3], G. SWINKELS[3], S. JAARSMA[3], R. NIJLAND[1], O. G. BOS[1]
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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

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Keywords: Biodiversity Offsetting

Biodiversity Offsetting: The Australian experience with case studies from the states of New South Wales and Western Australia

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Essential Energy, Australia

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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-ofLife.

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

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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

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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

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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. PELTIER[1], M. MURAIL[2], T. LARCHER[1], T. CHILOU[1]
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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. GARNIER[1], C. FOURDAN[1], H.-P. ROCHE[2], A. MILLON[3], L. COUTURIER[4], A. HEMERY[3]
[1]RTE France; [2]Biodivwind; [3]IMBE; [4]FEM France Energies Marines

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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. GARNIER[1], L. RéMY[1], M. PULICANI[1], C. KERBIRIOU[2], M. THIBAULT[3], A. JOLIVET[4], M. THIERRY[5], G. MARTIN[5]
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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

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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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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. RÊGO
CEMIG GT Brazil

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Conversion of powerline right-of-ways: biodiversity, resilience, and local value in the face of climate change and wildfires

P. MARQUES[1], D. ALMEIDA[1], P. PACHECO[2]
[1]REN; [2]UNIVERSIDADE DE COIMBRA

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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. MARTINS[1], J. BERNARDINO[1], R. MORGADO[1], A. MEIRELES[2], M. ALMEIDA[2], J. LOPES[2]
[1]UNIVERSIDADE DE COIMBRA (CIBIO); [2]REN

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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
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Analysis and assessment of impacts, dependencies, risks and opportunities related to nature in electricity transmission

M. OLEO DOMINGUEZ, Á. SALINAS DE UGARTE
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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

V. EĆIMOVIĆ[1], M. GALIS[2]
[1]HOPS Ltd, Croatia; [2]Raptor Protection of Slovakia, Slovakia

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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 evaluati

Development of Collision Risk Maps Between Birds and Power Transmission Lines with an Assessment of Applicable Mitigation Measures

N. CUROVIC[1], V. MISIC[1], A. BABIC[2], M. RAKOVIC[3], S. SKORIC[3], M. MILUTINOVIC[1], B. VUJIN[1]
[1]EMS, Serbia; [2]GMS Consult, Serbia; [3]University of Belgrade, Serbia

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Reducing wildlife-caused outages and mortality in distribution substations - A systematic approach to risk, design, durable mitigation and conservation.

B. MCGOWAN
Scientias Energy

C3 PS2 - Building a more sustainable power system for the future

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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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Keywords: Circular Design, Design Phase, Environmental Passport, Life-Cycle Assessment, High Voltage Substation

A Life-Cycle-Based Environmental Passport for High-Voltage Substations

R. FASEL[1], J. BOYCE[2], R. DIJCKER[2], G. KOREVAAR[3], J. DEN BREEJEN[4], F. MIDDEL[5]
[1]Hanab Energy Solutions; [2]Witteveen&Bos; [3]Rotterdam University of Applied Sciences; [4]TenneT TSO; [5]Prysmian

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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
Alliander

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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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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. MANTILLA[1], A. LAFRAGETTE[1], S. SUMER[2], M. MÖLTER[2], A. GUARNERI[3], L. LUCKE[10], R. DE JAMBLINNE[4], F. KREITZ[5], S. BOISSEL[6], K. HOFER[6], S. MOLINERO[7], T. SOLBERG[11], V. SCHÄFER[8], L. TRAN[8], J. DOERRICH[9], P. RANINGER[9]
[1]RTE France; [2]Amprion Germany; [3]Terna Italy; [4]Elia Belgium; [5]50Hertz Germany; [6]Swissgrid Switzerland; [7]Redeia Spain; [8]TenneT; [9]APG Austria; [10]TransnetBW Germany; [11]Statnett Norway

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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. DUBUS[1], A. TROCCOLI[2], A. ZUIKER[3], L. STOOP[4]
[1]RTE France; [2]Inside Climate Service; [3]ENTSO-E; [4]TENNET

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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. DOUMENC[1], S. MATHY[2], V. MARCADON[1], H. LE BOULZEC[2], A. DURANTE[1]
[1]RTE France; [2]GAEL-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. DOLLEY[1], B. GUERRY[2], M. JAY[3]
[1]RTE France; [2]Software Heritage; [3]TBC

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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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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. DUMOULIN[1], S. LAURENT[1], C. SANNIER[2], S. OMONT[2], C. CHARBUILLET[3]
[1]GE Vernova; [2]AMVALOR; [3]ENSAM Ecole Nationale Supérieure des Arts et Métiers

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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. SUZUKI[1], S. AICHI[2], S. NOGUCHI[2], M. YOSHIDA[1]
[1]Chubu Electric Power Co., Inc. Japan; [2]Chubu Electric Power Grid Co., Inc. Japan

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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. TAKAHASHI[1], H. NODA[2], N. ITSUBO[3]
[1]Toshiba Energy Systems & Solutions Corporation Japan; [2]Toshiba Corporation Japan; [3]Waseda 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. YASUI[1], H. IWAMOTO[2], N. SUMIMOTO[2]
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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; Wáter Footprint; Life Cycle Analysis

Conventional and Floating Photovoltaic Generation from a Life Cycle Perspective – Carbon and Water Footprint

D. MATOS[1], J. ABREU[1], M. RAMOS[1], I. RAUPP[1], A. MOLLICA[1], K. GARCIA[1], J. G. LASSIO[2]
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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. GARCIA[1], T. KATZ[2], J. d. BREEJEN[3], M. MANTILLA[4]
[1]CEPEL Brazil; [2]Israel Electric Corporation Ltd. Israel; [3]Tennet The Netherlands; [4]RTE France

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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: 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
R&D NESTER Portugal

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
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Keywords: sustainability, archaeological heritage, marine design

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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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Eskom

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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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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. MADUREIRA[1], M. VIEIRA[1], S. TAVARES[1], J. DIAS DE OLIVEIRA[1], S. SOARES[2], S. FÉLIX[1]
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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
Hitachi Energy

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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. MEĐIMOREC
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. REICH[1], D. STRANNER[1], E. BOZSE[2], M. HAYDEN[2], W. HEISTER[2], K. HUGHES-STRAKA[2], C. LINTNER[1], N. GUERTIN[2]
[1]Austrian Power Grid AG; [2]CTC Global

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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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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. CANTOR[1], S. JARAMILLO[2], J. ALZATE[3], C. CUTA[4]
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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
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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 Cirularity in Transformers: Update on recent Solutions and Impacts

A. KOMAROVA[1], T. LANERYD[2], E. LINDGREN[2], G. KABLOUTI[1], S. ARREGUIN[1], M. STOECKLI[3]
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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: 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. PANDYA[1], H. KIM[2], S. KIM[2], M. GOTTI[1], J. FREY[1], J. MANTILLA[1], M. STOECKLI[3]
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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. KABLOUTI[1], N. ASNANI[2], Y. WIKSTROM[3], M. STOECKLI[4]
[1]Hitachi Energy Switzerland; [2]Hitachi Energy India; [3]Hitachi Energy Sweden; [4]ELECTROSUISSE / CIGRE Switzerland NC Secretary

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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. LOHRBERG[1], M. GATZSCHE[2], A. LAGO[3], J. HANSON[1]
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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
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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

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
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Multi-Criteria Prioritization of Climate Resilience Strategies for Electric Power Networks

E. G. GOULIOTI[1], A. V. GKIKA[2], C. A. CHRISTODOULOU[1], V. T. KONTARGYRI[3]
[1]NTUA Greece; [2]HEDNO Greece; [3]UNIWA 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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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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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

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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 KKHAJKUMAR, 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. CHOPRA[1], D. S. TANEJA[2]
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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. MANTILLA[1], N. WLOCZYSIAK[2], L. VIOLLET[1], R. RAFALOWICZ[1]
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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. MANTILLA[1], G. HOESKULDSDOTTIR[2], R. LÓPEZ[3], R. DE JAMBLINNE[4], V. SCHÄFER[5], A. GUARNERI[6], R. BARTH[7], M. VÁZQUEZ[8], E. FJORTOFT[3], A. LAFRAGETTE[1]
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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. HAN[1], D. LEE[1], J. S. KIM[2], H.-k. KIM[2], D.-H. HA[3], J.-Y. YOON[4], J.-Y. KOO[5]
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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
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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. GRASSI[1], J. WANKE[2], M. STOECKLI[3]
[1]GILYTICS AG Switzerland; [2]A+S Energy Germany; [3]ELECTROSUISSE / CIGRE Switzerland NC Secretary

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C4 PS1 - Power system stability 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 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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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. CHASPIERRE[1], G. MISYRIS[2], A. BROCHARD[3]
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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
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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. ZHU[1], B. PAZ[1], D. RAMASUBRAMANIAN[1], E. FARANTATOS[1], G. GIANNUZZI[2], C. PISANI[2], G. COLETTA[2], G. MICCIONE[2]
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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: 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

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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: 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
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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: Commissioning, Large-scale Solar Plant

The Journey of Commissioning a Large-scale Solar Plant and the Lessons Learnt: Role of Pre-commissioning Platform

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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

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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
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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. NELSON[1], J. WATSON[1], A. BRUGGEMANN[1], J. GAO[2]
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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: Hyrerscale Data Centres

Frequency Stability Challenges and Solutions in Low-Inertia Power Systems with Hyperscale Data Centres

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ID: 10506
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

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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

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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

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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: 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. FARAHANI[1], N. MODI[3], A. JALAI[1], J. R. RAMAMURTHY[1], J. LU[1], D. PREMN[2], C. HARDT[2]
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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 Modelling, NEM 2034

System Services in an Inverter-Dominated Grid: Insights from EMT Modelling of the NEM through to 2034

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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

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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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ID: 10635
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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POWERGRID INDIA

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Suynchrophasor Data-Driven Investigation of Real-World Unstable Controller Dynamics

C. MISHRA[1], B. PUDASAINI[1], L. VANFRETTI[2], J. DELAREE JR.[1], K. JONES[1], M. MCVEY[1]
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Keywords: Energy Storage System - Data Center - Grid Support - Hardware-in-the-Loop

Leveraging Energy Storage to Accelerate Integration of Data Center Loads

S. MOROVATI[1], O. KITTANEH[2], T. EMA[2], A. ZAMANI[2], J. KRUGER[2], J. WILTSHIRE[3], B. ROSENFELD[4], S. VASILIC[4], S. CORHODZIC[4]
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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

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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. MORRETTON[1], M. RAMET[2], O. JASIM[2], S. DENNETIERE[1], P. RAULT[1]
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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
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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
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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

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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
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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. ZOGHBY[1], A. GUIRONNET[1], G. TORRESAN[1], A. CEDENILLA-BOTE[3], L. ROUCO[2], L. SIGRIST[2]
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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. SMITH[1], A. THANT[1], E. MICKELSON[1], M. BESKAR[2], J.-M. BROWN[2]
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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. RICHWINE[1], N. MILLER[2], A. SILER[1]
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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

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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

AEMO, Australia

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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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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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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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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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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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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

E. FARAHANI[1], N. M. MODI[2], M. BHAMBHU[1]
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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. KAKOL[1], M. KOSMECKI[1], R. JANKOWSKI[1], B. SOBCZAK[1], J. SMOTER[1], M. WILK[2]
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State-Space Models of Virtual Control and Protection Systems for Stability Analysis

J. HERNANDEZ
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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. GOTTI
Red Eléctrica, Spain

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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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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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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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A New Index for Quantifying Stability Adaptation Effort in Power Electronics-Dominated Power Systems Based on Frequency-Domain Impedance Identification

L. A. GARCÍA-REYES[1], M. MARTÍN ALMENTA[1], E. NUÑO MARTÍNEZ[1], J. RENEDO[1], A. CORDÓN RODRÍGUEZ[1], O. GOMIS-BELLMUNT[2], E. PRIETO-ARAUJO[2]
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Co-Simulation for Nuclear Power Plant and Power Electronic Interfaced Devices Interaction Studies

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Immittance-based frequency-domain method for sub synchronous torsional resonance analysis

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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
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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. SHOVNADZE
Georgian State Electrosystem

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Grid Forming Preserving Control Current Limitation Strategies and Impacts on Grid Support

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A comparative study of negative sequence support of grid-forming voltage source converters with current prioritization schemes

B. VILMANN[1], D. MÜLLER[1], O. SABORÍO-ROMANO[1], B. ZOGHDAR[2], M. EL-SIED[2]
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Keywords: High-fidelity models, Digital Twin, Distributed energy resources

Enhancing Power System Stability: Integrating High-Fidelity Plant Controller Models for Distributed Energy Resources

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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. VAHEESHAN[1], D. CHAKRAVORTY[1], J. AREVALO-SOLER[2], M. CHEAH-MANE[2], D. MOUTEVELIS[2]
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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. PAPADOPOULOS[1], A. B KILEMBE[1], L. I BENEDETTI[1], I. S. LAMPRIANIDOU[2]
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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

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Keywords: frequency, grid forming, low inertia grid, ROCOF, stability

ROCOF incident study and stability enhancement by grid-forming technology in Danish power system

Y. LIAO[1], J. B. KWON[1], N. QIN[1], H. GONG[1], L. LU[1], A. MORALES-MUNOZ[2], A. RASIC[2], J. XU[2], W. HU[3]
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Keywords: converter, frequency scan, harmonic impedance, interoperability, model validation

Frequency-domain screening methods and benchmarking for converter-based systems

Y. LIAO[1], Ö. C. SAKINCI[2], D. VAHLE[3], N. RIEMANN[4], R. DIMITROVSKI[5], V. COSTAN[6], N. KLÖTZL[5], A. NEUFELD[1], L. DALL[1]
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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

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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 EDLA[1], J RAMACHANDRAN[2], Y PIPELZADEH[3], D MUTHUMUNI[4], R. TUMILTY[1]
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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: 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

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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

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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

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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

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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

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Oscillation damping requirements for inverter-based generation in the Colombian power system

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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
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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

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Application of Grid-Enhancing Technologies for Stability Improvement in Low-Inertia Power Systems: A Case Study from Egypt

M. IBRAHIM
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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
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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

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Electromagnetic Transients-Based Stability Analysis of the Colombian Power System with High IBR Penetration by 2030

E. PEREZ[1], J. G. MIRANDA[2], J. ESPINOZA[3], D. ALVAREZ[4], J. PEREZ[5], J. TOBON[6], J. HERRERA[7], J. SUAREZ[8], A. RANGEL[9], C. GARCIA[10], K. SANTAMARIA[11]
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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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Enabling EMT and HIL Simulations for IBR-Dominated Grids: An Equivalent Model of the Chilean Power System

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PV Plant Black-Start Supported by Grid-Forming BESS: A Real EMT Study Based on OEM Models

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[1]Grupo Estudios Electricos; [2]Grupo Estudios Electricos; [3]Grupo Estudios Electricos

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System Strength and Grid-Forming Technologies: A Comprehensive Assessment of the Chilean Power System Towards High IBR Penetration

D. E. PERRONE[1], J. HERRERA[2], P. HARTUNG[3], A. J. ALVAREZ[4], D. BUSTOS[5]
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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. LARSSON[1], R. HEYDARI[2], H. ZHANG[2], A. OWENS[2], L. LU[3], Y. LIAO[3], J. B. KWON[3], H. GONG[3], N. QIN[3], M. STOECKLI[4]
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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

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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. KNITTEL[1], S. B. MEYER[1], B. RUSEK[1], T. HENNIG[1], M. RUGE[2], L. SCHWALT[3], D. JOZWIAK[4], T. NORRE[4], P. KROEMER[5], T. MAI[6], M. BOZEK[7]
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Comparative Analysis of Voltage Stability in Offshore Power-from-Shore Systems with Fast-Switching On-Load Tap-Changers and STATCOM/TCSC Technologies

I. BURLAKIN[1], S. REHKOPF[2], J. KOLB[3]
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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

C. SUBRAMANIAN
EirGrid

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Reducing the number of must-run, conventional sets in Northern Ireland to enhance RES penetration, while maintaining system stability

G. MCLORN
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System Strength Evaluation Framework for the Irish Power System

M. VAL ESCUDERO
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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. KARVELIS[1], C. AGATHOKLEOUS[1], D. BROCILO[2], S. VASILIC[2], S. CORHODZIC[2]
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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

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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-RUIZ[1], A. HONRUBIA-ESCRIBANO[2], R. VILLENA-RUIZ[3], E. GÓMEZ-LÁZARO[4]
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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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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. SKRJANC[1], L. HERMAN[2], D. VIRGINILLO[3], A. DERVISKADIC[4], G. TORRESAN[5], R. MIHALIC[6], U. RUDEZ[7]
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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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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

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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. GROEMAN[1], M. BERENDE[2], A. JONKER[2], E. LAZDANAITE[1], W. KUIJPERS[1]
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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. POPOV[2], K. VELITSIKAKIS[1]
[1]TenneT TSO; [2]Delft University of Technology

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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
GOLDWIND, Australia

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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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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*
School of Electrical Engineering, VIT University, 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: Harmonic emission assessment, measurement uncertainty

Grid code compliance within the constraint of small emission limits

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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: 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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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, ⊿V10, PV-Inverter

Voltage Fluctuation Test for LED Lighting -Assessment of Relations between ΔV10 Flicker Index and Illuminance Change-

N. FUJITA[1], R. AKIYOSHI[1], K. ISHIBASHI[1], H. NAKAYAMA[2], N. OKADA[2]
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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

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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

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[1]Central Research Institute of Electric Power Industry Japan; [2]Chubu Electric Power Grid Co., Inc. Japan

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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

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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. MATINYAN[1], A. KISELEV[1], M. PESHKOV[1], K. KOSHELEV[1], V. KARPOV[1], P. SOKUR[1], A. ANTONOV[1], N. SYROVATSKY[1], O. SUSLOVA[1], R. SHAMONOV[2]
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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. OLIVEIRA[1], J. G. PEREIRA[1], M. C. CARDOSO[1], J. L. LOS[1], I. C. DECKER[2], A. F. C. AQUINO[2], D. ISSICABA[2], U. C. NETTO[3]
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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

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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. EMIN[1], R. ARRITT[2], S. SANTOSO[3]
[1]EPRI United Kingdom; [2]EPRI United States; [3]University of Texas United States

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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. BARRENETXEA[1], E. SAGREDO-BLANCO[1], A. TORRES[1], R. LOPEZ-ERAUSKIN[1], J. UGARTE-VALDIVIESO[1], I. GUDE[2]
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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. CIOBAN[1], S. DYAGILEVA[1], R. KARYMOV[1], B. OLEKSIUK[2]
[1]Faramax, Spain; [2]Siemens Energy, Germany

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Harmonics and High Frequency Characterization of Capacitive Voltage Transformer and HVMAC device

J. ROVIRA[1], A. KHAMLICHI[1], T. GARCÍA[1], U. ZATIKA[2], Á. ZARANDONA[2]
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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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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
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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. SALLES[1], R. A. d. OLIVEIRA[2], S. K. RÖNNBERG[1], M. DE CARLI[3]
[1]Luleå University of Technology Sweden; [2]Eindhoven University of Technology Netherlands; [3]ELETROBRAS Brazil

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Online Harmonic Resonance Monitoring for Adaptive Control of HVDC System

S. SAKAR
Hitachi Energy

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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

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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. NEGI[1], K. MANGLAM[1], K. ALE[1], C. THOMPSON[2]
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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

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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 amplification, HV cable, EHV, network restoration, black start, parallel resonance, temporary overvoltage

Impact of increasing Underground Cable Penetration in the Swiss Transmission Grid

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[1]Swissgrid Switzerland; [2]ELECTROSUISSE / CIGRE Switzerland NC Secretary

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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. MATTHES[1], M. POURARAB[1], J. MEYER[1], Z. EMIN[2], G. SINGH[2], M. HALPIN[3]
[1]TUD Dresden University of Technology; [2]EPRI USA; [3]Auburn University

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Investigating Implications of Offshore Wind Farm Connections Regarding Harmonic Distortion

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Investigation in the Effects of GICs on Power System Harmonics

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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. TANNEMAAT[1], K. VELITSIKAKIS[1], S. NAUTA[2], J. MCBRIDE[3]
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Keywords: insulation, double circuit, flashover

Quantifying the effect of differential insulation on double circuit back flashover performance using the leader progression model

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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
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Keywords: Earthing System - Wind Power - Touch Voltage - Step Voltage

Earthing Analysis for Wind Power Plants in Diverse Soil Environments

D. LEWIS[1], R. ANDOLFATO[2], D. CUCCAROLLO[2]
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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

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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
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Keywords: Grounding, Lightning, Overhead Lines, Measurements

Enhancing Lightning Performance Assessment Through Uncertainty Quantification in Grounding Resistance Measurements Using the Fall of Potential Method

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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

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Keywords: Charge, Lightning, Lightning-location

Development of a new lightning location system designed for parameter estimation

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Keywords: Dedicated Metallic Return, Overvoltages on VSC Systems, Lightning Performance, Dieletric Strenght

Main Issues Regarding HVDC Overhead Transmission Lines Insulation Coordination: VSC Technology and Dedicated Metallic Return

P. C. V. ESMERALDO[1], F. SILVEIRA[2]
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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
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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
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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

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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

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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

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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

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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. LUO[1], C. HIGGINS[1], S. KARAMITSOS[2], G. LIU[2], G. LOGAN[2]
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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. HEIM[1], A. H. MATHEUS[1], A. SIEMSEN[1], J. DYBKJÆR[2], T. ERLANG[2], R. A. OLSEN[1]
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Keywords: lightning current, measurement, surge arrester, waveshape

Real-Time Monitoring of Lightning Currents in Transmission Towers and Line Surge Arresters

S. GREBOVIĆ[1], V. MILARDIĆ[2], I. UGLEŠIĆ[3], S. SINČIĆ[4], A. ŽUPAN[4], L. ĆURIN[4]
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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. GU[1], X. HE[1], X. BAI[1], M. FULLEKRUG[1], X. WANG[1], A. ALI[2], B. SHETTY[2]
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C5 ELECTRICITY MARKETS AND REGULATION

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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

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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. YADAV*[1], B A. SARMA[1], A. K. JAIN[2], P. PANDEY[1], A. BHARGAVA[1]
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Keywords: Resource Adequacy - Capacity Expansion Modelling - Capacity Accreditation - Long-Term Planning

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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. COGEN[1], V. DUSSARTRE[1], E. LITTLE[1], F. ROQUES[2]
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Keywords: Decarbonized power sources, Carbon neutrality, Investment predictability

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Y. KATAOKA[1], H. SAKAI[1], D. TAMURA[2], K. SUGAHARA[2], S. AMI[3], H. ISHIDA[3], H. IRIE[3]
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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. KIBATA[1], H. HIRANO[1], S. NODA[1], T. KUGE[1], T. ANAI[1], H. OKAMOTO[2]
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Keywords: Electricity Market Design, Electricity Regulation, Infrastructure Investment, Local Loop Unbundling (LLU), Unbundling

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K. SETLHAPELO, S. MAKHATINI, N. KHUMALO, S. JOSEPH
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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

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Keywords: Energy Attribute Certificates, Renewable Energy Certificates, Additionality, Market Regulation, Voluntary Demand

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V. BEREZOVSKIY[1], A. PAVLYCHEVA[2], N. KUZNETSOVA[2], N. IVANOV[3], D. IVASHKIN[2]
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Keywords: Energy Hubs; Feasibility Assessment;

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Keywords: Energy Storage; energy transition; variable renewable energy sources;

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Keywords: Predictive Models for Bid Discounts; Transmission Auctions; Strategic Bidder Information; Temporal Dynamics Information;

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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 CAMARGO[1], C. R. R. DORNELLAS[2], R. ASANO JUNIOR[3], P. T. L. ASANO[3]
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Keywords: Distributed Energy Resources; Fully Liberalized Electricity Market

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Keywords: BESS; Market; Regulation; Brazilian Electric System

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Keywords: Regulatory Enhancements; Severely Polluted Environments

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Keywords: network analysis, grid analysis, flow based, SDAC, FBMC

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Keywords: Ancillary Services, Balancing Market, Balancing Capacity, Energy Law, Auction platform

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K. BIBIĆ
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C5 PS2 - Developing reliable price signals and regulations across the value chain

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Keywords: Demand, Flexibility, Framework

Incentivising flexibility from transmission-connected loads to increase network utilisation and capacity

J. BRIDGE, S. TAYLOR, J. DENNIS, E. BRIDIER, B. BOYD, B. MCGREGOR
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Keywords: Inertia, RoCoF, Ancillary Service, Nodal, Markets

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V. FRANCISCO, M. JIMENEZ, C. VALERIO, J. YAP
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Keywords: Available Capacity; Renewable Energy, X-factor, Deviation Settlement Mechansm;

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A. KUMAR*, S. VEERWAL, A. P. DAS, S. USHA
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Keywords: Deviation settlement, Load Despatch Centres, Metering philosophy, Aggregator, Registration of Aggregator, Renewable Energy (RE), Scheduling

Implementation and Operational Analysis of Aggregators in India's Renewable Energy Sector

K. PRAHARSHA*, M. GOPI, D. V S PHANEENDRA, C R. NAIR
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Topics: C5 PS2 - Developing reliable price signals and regulations across the value chain
Keywords: power market, ancillary service, energy storage systems

Energy Storage Systems as Flexible Market Tool for Russian Power and Capacity Market

I. VORONOV[1], G. LABUTIN[2]
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Keywords: ancillary service, demand response, power market

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Keywords: certification of electricity origin, renewable energy sources, low-carbon generation, Greenhouse Gas Protocol, GHG Protocol, Scope 2 emissions

The Utilization of Tools that Facilitate the Hourly Alignment of Electricity Produced by Renewable and/or Low-Carbon Generation with the Consumption Patterns of End-Users, within the Framework of Investigating the Certification of Electricity Origin in Russia

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Keywords: Electric vehicles, Vehicle-to-Grid, Electricity market, Techno-economic analysis Demand-side flexibility, Sustainable development.

Realizing the Value of Vehicle-to-Grid for Industrial Consumers: Investment Viability and Market Design Considerations

M. DOLMATOVA[1], A. ELTWAM[2]
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Keywords: Effective Load Carrying Capability; Reliability; IBR penetration;

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Keywords: Utility-Scale Battery Integration; regulatory and market enhancements;

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Keywords: Availability-Based Demand Response Procurement; Regulatory Sandbox Framework; Future Regulatory Enhancements

Brazil's Experience with Availability-Based Demand Response Procurement under the Regulatory Sandbox Framework: Lessons Learned and Proposals for Future Regulatory Enhancements

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Keywords: Battery Energy Storage Systems (BESS), Market-Based Dispatch, BESS Alliance, Independent BESS Operators, Market Power

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L. MA[1], Z. ZHAO[2], Q. SUN[2], S. LIN[1], K. GUO[1], R. LIU[1], C. TANG[2]
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Keywords: Energy transition and transactive energy

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T. REMIZOVA[1], D. KOSHELEV[2], M. DOLMATOVA[3]
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DERMS Use Case and Management Methodology: A ComEd Case Study

L. TAO[1], P. KICZULA[2], M. MARTIN-MUNOZ[3], T. OWEI[1], J. BAUER[1], S. PANDEY[4]
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Unified Transmission-Distribution Modeling of Virtual Power Plants for Grid Reliability Studies and Grid-Edge Flexibility

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Keywords: Distributed energy resources, Grid congestion, Photovoltaic, Voltage regulation

Assessment of impact on power flow by DER utilization under grid congestion management using actual distribution network model

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Topics: C6 PS1 - Enabling flexibility in distribution networks
Keywords: Cost comparison study, DER, Monte Carlo simulation

Cost study of DER flexibility installation and distribution system reinforcement to mitigate grid congestion

T. YOSHIOKA, T. ANEGAWA, K. YAMAMOTO, M. WADA
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Topics: C6 PS1 - Enabling flexibility in distribution networks
Keywords: Ground-source heat pump - Photovoltaic-thermal systems - Demand-side flexibility - Low-carbon heating - Residential energy systems - Peak load reduction

Enabling Demand-Side Flexibility in Residential Communities using Low-Carbon Technologies

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Keywords: Carbon emissions reduction - Energy management - Energy storage - Railway electrification - Regenerative braking - Reinforcement learning - Sustainable transportation

A Scalable Approach for Energy Optimisation in Urban Rail Systems

C. E UGALDE-LO[1], P. SAIKIA[1], J. J MUÑOZ-CRIOLLO[1], R. SÁNCHO ACEVEDO[2], J. CÁRPIO IBÁÑEZ[2]
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Topics: C6 PS1 - Enabling flexibility in distribution networks
Keywords: Hosting capacity, Optimal Power Flow, Soft Open Point, flexibility.

Enhancement of flexibility exploitation by Soft Open Point adoption on power distribution networks

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"Renewable Energy Communities and flexibility services: intersecting or parallel paths?"

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Topics: C6 PS1 - Enabling flexibility in distribution networks
Keywords: Energy Transition, Distributed Energy Resources, TSO-DSO coordination, Capability

Assessment of Flexibility from MV and LV Distributed Energy Resources for Enhanced TSO–DSO Interaction: Insights from a Real-World Case Study

D. CASTIGLIONI
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Keywords: Electric Vehicles, Charging Stations, Statistical Analysis, Machine Learning, Geospatial Analysis, Agent modeling

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

TSO-DSO Integration in Brazil: Technical and Regulatory Proposals for the Systemic Integration of Distributed Energy Resources

D. S. ISAIAS[1], M. C. P. ARAUJO[1], D. T. NARUTO[1], F. A. MOURINHO[1], A. B. DE MARCO[1], N. HUBNER[2], G. CUNHA[2], K. HASHIMOTO[3]
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Topics: C6 PS1 - Enabling flexibility in distribution networks
Keywords: Battery, Distributed Energy Resources (DER), Electrical Energy Storage, Microgrid, Power Flow Simulation

Serra da Saudade Microgrid: Validation of Operational Autonomy Through Power Flow Simulations and AMI Measurements

H. COUTO, J. FERNANDES, D. SERVULO, W. SOUZA, W. VELOSO, M. ANTUNES
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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

R. DIAS, G. ANTERO, R. V. GLÓRIA, R. E. ROTUNNO, E. L. v. EMMERIK, T. M. TUXI
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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. FERNANDES[1], I. SILVA[2], R. PEREZ[3]
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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. GONG[1], K. LIU[1], B. ZHENG[1], Y. AI[1], D. LI[1], S. KONG[2], L. ZHAO[1]
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Topics: C6 PS1 - Enabling flexibility in distribution networks
Keywords: Charging pile; distribution network; power quality governance;vehicle-to-grid

Simulation Analysis and Prospect of Charging Pile Access to Distribution Network Considering Power Quality Governance

Q. JIA[1], Y. ZHANG[2], S. CHEN[2], Y. ZHAO[1], M. WANG[1], P. LI[1], Y. YANG[1]
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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

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Integration of Utility-Scale Battery Storage to Enhance Grid Flexibility and Solar Utilization in Qatar's Al Kharsaah Plant

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Empowering Oman's Energy Future: The Role of Electric Distribution System in Managing Electric Vehicle Integration for Grid Stability and Sustainability

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Topics: C6 PS1 - Enabling flexibility in distribution networks
Keywords: Balancing mechanism – Consumer Energy Resource – Operational metering – National Energy System Operator – Aggregators – Flexibility – Future Energy Scenarios

Visibility, Control, and Risk: Operational Metering Strategies for a CER-Dominated Energy Future

M. AKOURY[1], J. WESTON[1], H. DE HEER[2], S. SCHEPER[2], W. GRATTON[3]
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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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Topics: C6 PS1 - Enabling flexibility in distribution networks
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

A. MERZIĆ[1], N. HASANSPAHIĆ[2], N. TURKOVIĆ[2]
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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
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

Š. GRUHONJIĆ FERHATBEGOVIĆ[1], Z. BAJRAMOVIĆ[2]
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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS1 - Enabling flexibility in distribution networks
Keywords: Geospatial data - Energy infrastructure - Regional energy strategic planning

An Integrated Geospatial Data Platform for Energy Planning and Analysis in South Wales

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Topics: C6 PS1 - Enabling flexibility in distribution networks
Keywords: Smart Local Energy Systems, Energy Communities, Flexibility, Low Voltage Network

Community DSO: Assessing the Impact of coordinated Flexibility from Energy Communities

H. DAWSON, O. PATRICK, G. MCFADZEAN, S. SHEEHY
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Topics: C6 PS1 - Enabling flexibility in distribution networks
Keywords: hydrogen economy, gas turbine generator, grid connection, industrial plant, decarbonisation

Use of Hydrogen as an alternative Source of Power for Industrial Plants

B. POUCKOVIC, R. RUST, P. FLETCHER, F. CARACCHINI, K. BARRETT, D. REID
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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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Strategic Design of Sector-Coupled Local Energy Systems: A System Planning Framework for the Energy Transition

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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

J. MOHAMMED DABBAS, M. ARABIYAT
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Topics: C6 PS1 - Enabling flexibility in distribution networks
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. CHAPARRO[1], F. OCAMPOS[2], J. CHAVEZ[3]
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Topics: C6 PS1 - Enabling flexibility in distribution networks
Keywords: DER participation, dynamic, Australia

Managing distribution networks and enabling DER participation through dynamic network pricing in Australia – Project Edith

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Topics: C6 PS1 - Enabling flexibility in distribution networks
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. JI[1], C. LEE[1], Y. JANG[1], S. CHOUNG[2], S. BAE[1]
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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 Refinería 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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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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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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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. GEMSJAEGER[1], F. RE[2], E. DE LUCA[4], G. FEDELE[4], R. SCHMARANZ[5], M. RUHHUETL[5], M. NIGGE-URICHER[3], L. VAN GRONINGEN[3], S. ORREM[6]
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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

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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

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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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Upgrading the short-circuit withstand capability of distribution networks to increase DG hosting capacity

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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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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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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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Keywords: Flicker, PV Systems

Flicker from PV Systems

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Confronting the Complexity: Planning Challenges in Active Distribution Systems for 2030

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Transition towards Prepaid Smart Metering in India-Framework for Uninterrupted Operations in Active Distribution Systems

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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

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Keywords: Cost-Benefit Analysis - Distribution Planning - Investment Justification - Investment Prioritisation - Risk Quantification - Value Models

Distribution Investment Prioritization and Justification

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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

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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

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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

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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

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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

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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

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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. AKIMOTO[1], T. SUGIMOTO[1], M. WAKUTANI[1], S. TOGUCHI[2], T. MATSUSHIMA[3], T. HISAKADO[4]
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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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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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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

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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. JAVID[1], M. GALEELA[1], F. u. NAZIR[2], I. WONG[1]
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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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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-LOO[1], M. ABEYSEKERA[1], D. HERATH[2]
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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

N. NETSHIPALE
Eskom

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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
Novosibirsk State Technical University

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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
Eskom

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Integrating Demand Response with a Novel EV Battery Swapping Strategy

H. MANSOURI, M. M. JALALI
NirouTrans Co.

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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, 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
GE Vernova UK

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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

K. SAREEN *[1], S. BATRA[2], A. SRIVASTAVA[2]
[1]Central Electricity Authority India; [2]CBIP India

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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
Xi'an Jiaotong University

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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
Saudi Electricity Co.

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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. MUJEZINOVIĆ, A. ALIHODŽIĆ, M. MUFTIĆ DEDOVIĆ, A. MAKSUMIĆ, N. DAUTBAŠIĆ, A. MEMIĆ, 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. CHMIELOWIEC[1], Z. WANG[2], P. BOMBA[1], H. NEL[3]
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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

A Conceptual Framework for Planning Active Distribution Systems under Accelerated Expansion of Electric Vehicle Charging Infrastructure

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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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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

A. EMRAN, A. SALMAN, M. AL-DARAGHMEH, H. ALKURDI
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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. STAHLEDER, S. LEDINGER, J. KAPELLER, P. REISZ, B. HERNDLER
AIT Austrian Institute of Technology

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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

G. PARTALIS[1], B. HERNDLER[1], M. REINTHALER[1], M. MAKOSCHITZ[1,2]
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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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Interoperability Profile for Consumer and DER Energy Data in Colombia: Enabling DSO Operational Management

J. D. MOLINA[1], B. CALVACHE[2], J. A. ZAPATA[3]
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Standardization as a Foundation for the Digital Transformation of Utilities into DSO: The Case of AMI in Colombia

B. CALVACHE[1], M. CASTILLO[2], H. BRICEÑO[3], L. SANTOS[4], A. RAMIREZ[5]
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Trends and Advances of Enablers for the Energy Transition towards Smart Grids by the DSO

E. GOMEZ[1], B. LOPEZ[2], K. MUÑOZ[3], J. UNIGARRO[4], E. FENOLLOSA[5]
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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. GUO[1], D. BLATTER[1], J. POUGET[1], M. ADHANA[2], J. SCUDERI[3], T. MEIER[4], M. STOECKLI[5]
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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

P. KILBY[1], H. BISSETT[1], B. SMITH[2], B. BANFIELD[2]
[1]Energy Queensland, Australia; [2]Gridsight, Australia

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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

H. NASSER[1], U. KRISPER[2], D. DIARRA[1]
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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. REBENTISCH[1], C. BECKER[1], T. RIEDLINGER[1], F. TALMOND[1], M. ZDRALLEK[1], M. KERZEL[2], D. HEUBERGER[2]
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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. STORCH[1], M. FINKEL[1], M. UHRIG[2], M. KREISSL[3], M. RÖTTEL[4]
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Scaling Innovation to System Impact - How the Kopernikus Flagships Translate Research into Grid-Ready Solutions for 2045 Climate Targets

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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
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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. LAMPSIDIS TOMPROS[1], S. PANTELIS[1], K. KAOUSIAS[1], M. FOTOPOULOU[2], K. N. MALAMAKI[3], N. ANDRIOPOULOS[3]
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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
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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. BLASI[1], T. FERNANDES[2], A. AOKI[3], M. TRINDADE[4], R. BLASI[5]
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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. JUNEJO[1], M. FAHEEM[2], M. BARANAUSKAS[3], S. HÄSÄ[4], M. ANTILA[5]
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C6 PS3 - Rural and industrial electrification standards, practices and technology options

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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. SHIEH[1], C.-P. TUNG[2], C.-Y. LIN[2], W.-C. MA[2]
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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: 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

Gujarat Power Research and Development, India

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Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Development of Artificial Intelligence based DSTATCOM System in DC Microgrid for Power Quality Enhancements

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Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Electrifying Agriculture: A Sub-National Roadmap for the Adoption of Electric Tractors

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Topics: C6 PS3 - Rural and industrial electrification standards, practices and technology options

Seasonally Informed Design and Development of Hydrokinetic Turbines for Off-Grid Power Generation in a Himalayan River

P. CHAND[1], R. TYAGI*[1], P. SAGAR[1], M. K. SINGHAL[2], A. KUMAR[2], C. PANT[2], M. KAMAL[3], A. SACHDEVA[2]
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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

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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: Fault detection, inrush-current mitigation, inverter-based microgrid

Simulation and Experimental Verification of Inrush Mitigation and Fault Detection in Inverter-Based Microgrids

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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: 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. KRYUKOV[1], K. SUSLOV[2], P. ILYUSHIN[3], E. VORONINA[1], A. KRYUKOV[4]
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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: 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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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
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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: 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
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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: 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
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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.

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Black-start Capabilities of the Arholma Microgrid

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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

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ID: 12032
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 TORRES[1], J. a. CERON[2], E. GOMEZ LUNA[3]
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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

Detection Of The Connection Of Distributed Energy Resources Through An Innovative Emt Signal Analysis Approach

J. NIETO[1], J. CEBALLOS[2], C. CASTRO[3], E. GOMEZ[4]
[1]UNIVALLE; [2]Univalle; [3]M&M Bobinados; [4]univalle

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-DEZAKI[1], A. ZADEH[1], S. VOETEN[2], W. ZHAO[1]
[1]Optics11; [2]SGB-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 SODHA[2], A. K. BALI[1]
[1]Power Grid Corporation of India Limited; [2]Ex. 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. MIYAZAKI[1], S. YAMADA[2], Y. NAKASHIMA[3], T. SANO[4]
[1]Central Research Insititute of Electric Power Industry Japan; [2]Toshiba Energy Systems & Solutions Corporation Japan; [3]Mitsubishi Electric Corporation Japan; [4]Meidensha 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. DARIAN[1], R. OBRAZTSOV[2], O. OZEROV[3]
[1]JSC «TechnicalInspection UES» / National Research University «MPEI»; [2]JSC "Technical Inspection UES"; [3]Dukhov 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. ULLAH[1], A. REID[1], M. HADDAD[1], P. TADDEI[2], M. NAMBIAR[2], M. BARNETT[2]
[1]Cardiff University UK; [2]SSEN Transmission UK

ID: 11377
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. FURTADO[1], F. F. M. SANTOS[2], L. H. ALMEIDA[1]
[1]COPPE/UFRJ University Brazil; [2]CEPEL 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. MARTINS[1], S. S. d. OLIVEIRA[2], A. R. MARTINS[2], P. R. F. C. COSTA[2]
[1]ADPM Engineering Brazil; [2]Consultant Brazil

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 SANTOS[1], C. J. LEZCANO RIVAS[2], S. H. SOBREIRA OLIVEIRA[1], C. E. CARRRERAS RIOS[2], T. FONSECA DEMARCHI[1]
[1]Itaipu Binacional Brazil; [2]Itaipu 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-SEGOVIA[1], C. GARCIA-BARRIOS[2], P. APARICIO-CILLÁN[2], M. DOMÍNGUEZ-LAGUNILLA[3]
[1]Universitat Politècnica de València - ITE, Spain; [2]Red Eléctrica, Spain; [3]ITE Centro Tecnológico, Spain

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. YANG[1], J. ZHAO[1], B. TIAN[1], L. ZHAO[1], Z. LIU[2], X. HE[1], Z. WANG[1], B. LUO[1], S. HAN[3], H. WANG[1], Z. YE[1], J. LIN[1]
[1]Southern Power Grid Sensing Technology (Guangdong) Co., Ltd; [2]Energy Development Research Institute of China Southern Power Grid; [3]Guizhou 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 Committe

ID: 11707
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

F. COOK[1], P. WENGER[2]
[1]Qualitrol United Kingdom; [2]TransnetBW GmbH Germany

ID: 11733
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

ID: 11763
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. STUCHALA[1], P. ROZGA[1], F. SCATTIGIO[2], G. CAMPI[2]
[1]Lodz University of Technology, Poland; [2]A&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

R. CACERES[1], E. VALE[2], M. ESQUIVEL[3]
[1]ITAIPU BINACIONAL; [2]ITAIPU BINACIONAL; [3]ITAIPU BINACIONAL

ID: 11861
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. EBERG[1], L. LUNDGAARD[1], T. G. AAKRE[1], A. CAVALLINI[2]
[1]SINTEF Energi; [2]University 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. GOODWIN[1], G. COAPES[1], M. BOLTZE[2], F. MACLEOD[3], I. BOYD[3]
[1]Siemens Energy United Kingdom; [2]Siemens Energy Germany; [3]SP Energy Networks United Kingdom

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. NENNING[1], H. BRUMMELHUIS[3]
[1]OMICRON electronics GmbH; [2]RWTH Aachen; [3]TenneT

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. GATZSCHE[1], V. TEPPATI[1], S. BUFFONI[1], P. STOLLER[1], M. STOECKLI[2]
[1]Hitachi Energy Switzerland; [2]ELECTROSUISSE / CIGRE Switzerland NC Secretary

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. TRUE[1], T. GRÄF[1], M. MENGE[1], R. PLATH[2]
[1]Hochschule für Technik und Wirtschaft Berlin; [2]Technische 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. NEUMANN[1], M. VOGL[2], M. TUCZEK[3], L. SCHWALT[4], P. WENGER[5]
[1]Technical University of Darmstadt; [2]Vogl electronic Germany; [3]Tennet TSO GmbH germany; [4]Austrian Power Grid AG Austria; [5]TransnetBW GmbH Germany

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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. GAMIL[1], A. AL-ABIAD[1], K. OSTALSKI[2]
[1]Hitachi Energy, Germany; [2]Hitachi 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. COULIBALY[1], O. MOREAU[1], T. PAILLAT[2]
[1]EDF; [2]PPRIME Laboratory Université de Poitiers

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. OKAMOTO[1], H. MASUI[1], N. OSAWA[2], K. KATO[3], N. HAYAKAWA[4], H. OKUBO[5]
[1]Fuji Electric Co., Ltd. Japan; [2]Kanazawa Institute of Technology Japan; [3]N. I. T., Niihama College Japan; [4]Nagoya University Japan; [5]Aichi Institute of Technology Japan

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. TANAKA[1], Y. NAKANO[1], T. ISHIJIMA[1], S. WATANABE[2], K. NAKAMURA[2], S. OKABE[3]
[1]Kanazawa University; [2]Nisshin Seifun Group Inc.; [3]University of Tokyo

ID: 10999
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. SEKIGUCHI[1], T. ONODA[1], S. MASHIO[1], S. YASUDA[1], O. URAKAWA[2], T. INOUE[2]
[1]Sumitomo Electric Industries, Ltd. Japan; [2]The 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 MORDE[2], E. Y. V JOSHI[2]
[1]Savita Oil Technologies India; [2]Past 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. PEIXOTO[1], H. CAMPELO[2], M. FIALHO[1], M. MOREIRA[3], M. EUSÉBIO[3], R. MARTINS[2]
[1]LABELEC; [2]NYMAS AB (PORTUGAL); [3]UNIVERSIDADE 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. RYBAK[1], A. SIWEK[1], R. JAVORA[2]
[1]ABB Corporate Technology Center Poland; [2]ABB 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. WILHELM[1], P. FERNANDES[1], Y. MANNES[1], C. SILVA[2]
[1]VEGOOR Brazil; [2]ARGO 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. PEREIRA[1], J. WANG[2], A. ASGEDOM[2], G. ZHOU[2]
[1]TEEE Brazil; [2]TEEE China

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. MICHELARAKIS[1], S. SINGH[1], D. CLARK[1], A. HADDAD[1], G. WILSON[2], M. WALDRON[2]
[1]Cardiff University United Kingdom; [2]National 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. ZHOU[1], X. ZHANG[2], H. LIU[2], Y. DENG[1], J. YU[1], D. SUN[1], S. XU[2]
[1]China Electric Power Research Institute Co., Ltd.; [2]North China Electric Power University

ID: 11571
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for electrotechnical purposes and modelling
Keywords: SF_6 leakage detection; Colorimetric film; Gas-insulated equipment; Self-sealing; Flexible echanofluorochromic film

Colorimetric and self-sealing photonic crystal film for early detection of SF_6 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. SEIFERT[1], F. LEHRETZ[2], J. KRESSLER[3], M. NASE[4], S. BHATTACHARYYA[5], J. SEIFERT[5]
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ID: 12334
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for electrotechnical purposes and modelling
Keywords: corrosion testing, outdoor installation, enironmental 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. NAEF[1], F. MACEDO[1], J. WEGMANN[1], K. ZWEIACKER[1], P. ESTEVES[1], M. STOECKLI[2]
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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. TREIER[1], M. PERRET[1], G. DOLCI[1], C. CABRERA[2], M. STOECKLI[3]
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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

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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. MIHAJLOVIC[1], A. GAMIL[2], V. VASOVIC[1], J. LUKIC[1]
[1]Nikola Tesla Institute of Electrical Engineering, Serbia; [2]Hitachi Energy, Germany

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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. BAUMER[1], C. BAER[2], K. HINDELANG[2], M. DOMM[1]
[1]Reinhausen Power Composites Gmbh; [2]Wacker 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. CAIZERGUES[1], A. ZOUAGHI[2], C. TOIGO[1], A. GIRODET[1], C. VOLLAIRE[2]
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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. BABA[1], N. HASHINO[1], T. KITAGAWA[1], H. TSUBATA[2], S. OKABE[3]
[1]Doshisha University Japan; [2]Keio University Japan; [3]The 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. ROZGA[1], F. STUCHALA[1], M. MILONE[2], E. VAN SCHAIK[3], P. HATOS[2], A. HILKER[3], L. DORPMANNS[2], K. STRZELECKI[1]
[1]Lodz University of Technology, Poland; [2]SGB-SMIT, Germany; [3]Shell (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-HOEHLEIN
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, TELECOMUNICATIONS & 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, 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: 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

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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: 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

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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

Predico Collaborative Forecasting Platform

H. CARSTENS[1], J. R. ANDRADE[2], C. S. GONÇALVES[2], A. F. GARCIA[2], R. J. BESSA[2], M. URAZAEVA[1]
[1]Elia Transmission Belgium, Belgium; [2]INESC-TEC Portugal, Belgium

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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

Leveraging RAG for Reasoning and Analyses of Electricity Distribution Codes

H. MAHMOUD[1], H. MAHMOUD[2]
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ID: 10523
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: 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

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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: 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, 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: 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, 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: Real-TimeSynchronisation 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, 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: 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. NAMBA[1], T. TOMONO[2]
[1]Electric Power Development Co.,Ltd. Japan; [2]Keio University Japan

ID: 11006
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: 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. INOYAMA[1], D. HAEGDORENS[2]
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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. KHALYASMAA[1], S. EROSHENKO[1], P. MATRENIN[1], A. BRAMM[1], A. ROMANOV[2]
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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, Machine Learning, Data Validation, Power System Model, Anomaly Detection

Application of AI (ML) Tools for Model Validation and Anomaly Detection

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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. RODIONOV[1], K. BUTIN[1], A. POPOV[1], D. DUBININ[2]
[1]Energoservice; [2]SO 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
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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
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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. DUBININ[1], A. ZHUK[1], F. GAIDAMAKIN[2], A. KISLOVSKII[2], D. UTKIN[1], D. IVANOVSKII[1]
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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: 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. NEPSHA[1], A. NEBERA[1], N. SHUBIN[1], V. VORONIN[2]

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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, 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

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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: Intelligent distribution grid, Standards recommendation; Multimodal fusion; BM25; GAT

Recommendation Algorithms for Smart Distribution Network Standards

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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. ABELLÁN[1], M. T. GARCÍA[1], J. M. SANZ[1], A. RODRÍGUEZ[1], C. E. GONZÁLEZ-GUILLÉN[2,3], P. ACUAVIVA[2], J. CASTELLANO[2,3], M. JAENADA[2,4], I. VILLANUEVA[2,5]
[1]Red Eléctrica, Spain; [2]Ravenwits, Spain; [3]Universidad Politécnica de Madrid, Spain; [4]Universidad Nacional de Educación a Distancia, Spain; [5]Universidad Complutense de Madrid, Spain

ID: 11682
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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[1]Turkish Electricity Transmission Corporation; [2]Afyon Kocatepe University; [3]Sakarya University

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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

L. N. H. PHAM[1], F. GONZALEZ-LONGATT[2], S. MOGHADAM[1]
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ID: 11944
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
National Electric Power Company

ID: 11964
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: Load Forecasting, Meter Data, EV, Spatial Load Forecasting, DERs

Leveraging Meter Load Data to Build a Bottom-up Spatial Load Forecasting

C.-I. CARLIER
Engineered Intelligence Inc., Canada

ID: 11965
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: 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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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

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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ID: 12098
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: 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. MANYAPETSA[1], L. BUTHELEZI[2], P. NGEMA[2]
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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

Transforming Information Management: Data Governance in the Operator and Administrator of the Wholesale Energy Market in Colombia

L. CARO[1], A. HINCAPIE[2]
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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. JIMENEZ[1], Y. GARCIA[2], S. BUSTAMANTE[3], B. ARBOLEDA[4], S. RUIZ[5], A. PIEDRAHITA[6]
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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: 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. SEHESTEDT[1], S. BUFFONI[2], J.-E. FREY[3], S. SCARPACI[4]
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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

Towards Trustworthy Artificial Intelligence in Grid Control

M. VOGT[1], C. BROSINSKY[2], S. BOUCHKATI[3], A. KUBIS[4]
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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
State Grid Information & Telecommunication Co.,Ltd

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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

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

P. BEAGON
EirGrid

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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: 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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ID: 12614
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

H. KRISHNAPPA[1], C. VAN DER SLUIS[2]
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D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

ID: 10116
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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
Moxa Inc. Taiwan

ID: 10223
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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

A. AJABNOOR[1], Z. J. ZHANG[2], M. SAEEDIFARD[1], D. GROSS[3]
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ID: 10309
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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. CIBIN[1], J. GODEFROOI[2], D. VAN HOFWEGEN[3], H. CARTENS[4], C. DE HOOGH[5], J. NIEUWSTAD[6], O. PETERS[6], A. ŞTEFANOV[1]
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ID: 10527
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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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ID: 10534
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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

ID: 10665
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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

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ID: 10667
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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. LEU[1], C. LISMAN[1], C. IONITA[1], A. SUDITU[2], D. CERNAT[2], M. STREMTAN[2], D. NEGREA[3], C. OXANII[3]
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ID: 10677
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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. DEARIEN[1], S. DAYABHAI[2]
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ID: 10883
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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

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ID: 11145
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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

R. TERRUGGIA
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ID: 11176
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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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ID: 11252
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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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ID: 11276
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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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ID: 11403
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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. NETO[1], Y. LOPES[1], I. SIQUEIRA[2], N. FERNANDES[1]
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ID: 11405
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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
TI Safe Brazil

ID: 11435
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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ID: 11575
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
Electric Power Research Institute, China Southern Power Grid

ID: 11643
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. FERRERO[1], S. TRUJILLO[2], B. PEREZ[2], J. GONZALEZ[1], L. MARTINEZ DE GUEREÑU[1], X. SAEZ DE CAMARA[3], C. ARELLANO[3], O. SAIZ[3]
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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

A. INSFRAN[1], G. RECALDE[2], M. MENDES[3], P. BENITES[4], E. ARTETA[5]
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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Designing SCADA Architectures for Scalability, Cybersecurity and Digital Resilience

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ID: 11957
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

R. LOREIRO[1], C. RUIZ DIAZ[2]
[1]ANDE; [2]ANDE

ID: 11958
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 DIAZ[1], M. LOREIRO[2], M. JARA[3], E. DAVALOS[4]

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ID: 11969
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

S. MHLONGO, J. MATABOGE, A. MDLULI
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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Protecting Critical Power Infrastructure: A Cybersecurity Architecture for Electric Grid Protection Systems

D. ZULUAGA[1], P. CADENA[2], R. VILLA[3], J. MOLINA[4], Á. SALAZAR[5], M. LUNA[6]
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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. GOMEZ[1], O. A. TOBAR[2], J. D. GRAJALES[3]
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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS2 - Comprehensive approaches to managing cybersecurity in energy applications

Stress testing power systems' systemic resilience against cyber-attacks

K. KUROPTEV[1], B. GRÜGER[1], L. SCHAD[2], F. STEINKE[1], J. HAACK- STAPPEL[3], D. PETERMANN[4], M. ROGGE[5], I. SPIECKER GEN. DÖHMANN[2], T. BLUMENTHAL[6]
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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

G. BENITEZ[1], J. PELAEZ[2], D. SANTO-ORCERO[3]
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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

A. K. BOSE[2], S. SEHESTEDT[1], L. MERKERT[1], I. ANDOR[3]
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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, TELECOMUNICATIONS 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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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
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, TELECOMUNICATIONS 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, TELECOMUNICATIONS 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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ID: 10401
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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

K. KUL, S. DAVIS
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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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, TELECOMUNICATIONS 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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ID: 10544
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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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Power Grid Corporation of India Ltd India

ID: 10545
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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

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ID: 10547
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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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ID: 10549
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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

A. MAYANK*, B. ANAND, S. RAHMAN, G. KHANDELWAL, S. K. GUPTA, D. Y. DWIVEDI
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ID: 10550
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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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ID: 10885
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
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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ID: 10933
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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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ID: 10934
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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

ID: 10935
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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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ID: 11003
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
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. DOI[1], A. TANAK[1], E. OHBA[1], K. IKEDA[1], D. HAEGDORENS[2], T. KATO[3]
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ID: 11004
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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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ID: 11005
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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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Kyushu Electric Power Distribution and Transmisson Co., Inc. Japan

ID: 11007
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS 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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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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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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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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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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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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Keywords: BSS, Frameworx, 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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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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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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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 (AOFDM), 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. HAIIRAPETYAN[1], A. LIFSHITS[1], I. ZAIKOV[2], G. BURAKOV[2], E. ILYICHEV[1], V. GUSEV[1]
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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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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. HOVILA[1], H. NIVERI[1], P. KUJANPÄÄ[1], P. RAUSSI[2], H. KOKKONIEMI-TARKKANEN[2]
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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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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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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

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Real-Time IDS for Digital Substations: From Lab to Field Deployment

E. D. GUTIERREZ[1], C. M. NARVAEZ[1], M. GUTIERREZ[1], R. J. RODRIGUEZ[2]
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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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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. BAECHLI[1], R. MOREIRA[1], P. STACHEL[2], S. VON GLUTZ[3], S. MATTMANN[3], M. STOECKLI[4]
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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: precistion 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

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