

CIGRE Session 2022

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Paris, France

Technical Programme

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A1 - ROTATING ELECTRICAL MACHINES

PS 1 Generation Mix of the Future

ID: 10244

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS1 - Generation Mix of the Future

Keywords: flexible coal-fired, power system

Performance Evaluation of Retrofitted Coal-fired Power Plant Simulation Model

Bongil KOO, Suchul NAM, Baekkyoung KO, Sung-Bum KANG, Joon HAN, Karam HAN

Korea Electric Power Corporation Research Institute

ID: 10430

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS1 - Generation Mix of the Future

A challenge faced in India by the Peak Load Stations with Nation's commitment of massive penetration of Renewables in the Generation Mix

Ashutosh Kumar PANDEY

Power System Operation Corporation Limited

ID: 10431

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS1 - Generation Mix of the Future

Case Study for Synchronous condenser Implementation

R C JHA

NTPC Ltd.

ID: 10740

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS1 - Generation Mix of the Future

Keywords: renewable energy, motor-generator set (M-G set), storage battery, power system security, power system stability

New Proposal of the Motor-Generator Set with Renewable Energy and Storage Battery

Ren AOKI, Yoshihiro KITAUCHI

Central Research Institute of Electric Power Industry (CRIEPI)

ID: 10789

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS1 - Generation Mix of the Future

Keywords: Synchronous condenser, flywheel, augmented inertia, low frequency oscillations, power system stabilizer, wide area damping control

An innovative power system stabilization method with augmented inertia synchronous condensers

Cosimo PISANI, Giorgio GIANNUZZI, Francesco PALONE, Roberto ZAOTTINI, Roberto PUDDU, Benedetto ALUISIO

TERNA S.p.A. Italy

ID: 10834

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS1 - Generation Mix of the Future

Robust Design of Nuclear Turbo-generators and AVR's for increased penetration of renewables and HVDC lines in transmission grids

Hervé BIELLMANN¹, Mohamed BERRIRI¹, Arnaud BUGUIN¹, Stéphane BRAEM², Valentin COSTAN², Vincent FERNAGUT²

¹General Electric; ²EDF

ID: 10114

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS2 - Asset Management of Electrical Machines

Keywords: Battery Energy Storage System; Fuzzy Logic Control; Matlab/Simulink, Subsynchronous Torque Oscillations.

Alleviation of Subsynchronous Torque Oscillations in Series Compensated Power Grid Via Fuzzy Based Battery Energy Storage System

Mohamed Fayez AHMAD

Cairo Electricity Production Company (CEPC) (EEHC)

ID: 10123

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS2 - Asset Management of Electrical Machines

Data Science and AI for On-line Diagnosis of Rotating Machines from Pre-existing Sensors, with applications in Hydro Generators and Wind Generators

M. E. G. ALVES¹, G. P. S. GOMES¹, M. M. PINTO¹, B. F. SARDINHA¹, H. P. SANTOS¹, L. P. FRITOLI¹, M. COSTA¹, D. P. SANTOS¹, D. L. A. NEGRÃO², G. TOYOSHIMA², Iony SIQUEIRA³, R. A. FLAUZINO⁴

¹RADICE TECHNOLOGY; ²IBITU ENERGIA; ³TECNIX; ⁴USP

ID: 10125

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS2 - Asset Management of Electrical Machines

Construction of the Partial Discharge Measurement History According to IEC 60034-27-2

P VILHENA¹, F BRASIL²

¹Eletronorte; ²Devry Faci

ID: 10310

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS2 - Asset Management of Electrical Machines

Keywords: Rotating machine, Insulation system, Thermal index, Ageing, Loss tangent, Partial discharge

Review on Trend of Diagnostic factor as a Function of Thermal and Multi Aging Time of 6.6 kV Rotating Machine Insulation System

S.C. HWANG, Y.H. KIM

HYUNDAI ELECTRIC & ENERGY SYSTEMS CO., LTD., Korea, Republic of (South Korea)

ID: 10355

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS2 - Asset Management of Electrical Machines

Features of Electromagnetic Processes and Force Interactions in Turbogenerators When Consuming Reactive Power

P.A. DERGACHEV, P.A. KURBATOV, E. KURBATOVA

NRU MPEI

ID: 10741

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS2 - Asset Management of Electrical Machines

Keywords: Turbine Generator, Rotor, Fatigue Failure, Preventive Maintenance, NDT

Preventive Maintenance Technology for Enhancement of Turbine Generator Reliability

Kazuaki OGURA, Go KAJIWARA, Kenji TANAKA

Mitsubishi Electric Corporation

ID: 10742

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS2 - Asset Management of Electrical Machines

Keywords: Generator, Stator Coil, Insulation, Partial Discharge, Online, Monitoring, Diagnosis, Isolated Phase Bus

On-line Partial Discharge Monitoring System for Diagnosis of Insulation Condition in Generators

Makoto TAKANEZAWA, Takashi HAKAWA, Tomoaki TAKAHASHI, Abdullah AJLAN, Akira FUJIMOTO, Hideyuki NAKAMURA

TOSHIBA Energy Systems & Solutions Corporation

ID: 10862

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS2 - Asset Management of Electrical Machines

Automated tool for bearing fault diagnosis in induction motors, based on MCSA technique and machine learning algorithm

Guillem GIL-PRieto¹, José A. ANTONINO-DAVIU², Daniel TARÍN-CABALLERO¹, Pascual MULLOR-RUIZ¹, Alfredo QUIJANO-LÓPEZ²

¹Instituto Tecnológico de la Energía (ITE); ²Instituto de Tecnología Eléctrica, Universitat Politècnica de València

ID: 10997

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS2 - Asset Management of Electrical Machines

Performance and Reliability of the Wind Turbines at Lam Takong Jolabha Vadhana Power Plant: A Review

Prapapong VANGTOOK, Panu SUWICHARCHERDCHOO

TNC-CIGRE, Thailand

ID: 11138

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS2 - Asset Management of Electrical Machines

Anomaly Detection in Regulation Ring from Bulb Turbines using Deep Learning

Yuri CROTTI¹, Marcos Hisashi Napoli NISHIOKA¹, Emerson Lima DO NASCIMENTO¹, Tiago Kaoro MATSUO¹, Weslen Silva dos SANTOS²

¹AQTech; ²Santo Antônio Energia Brazil

PS 3 DEVELOPMENTS OF ROTATING ELECTRICAL MACHINES AND OPERATIONAL EXPERIENCE

ID: 10247

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS3 - Developments of Rotating Electrical Machines and Operational Experience

Research on Non-invasive Condition Monitoring-Based Predictive Maintenance of Electric Motors

Yuanqi TANG¹, Xianhe SHANG², Chenjun DAI¹

¹CNNP Rich Energy Corporation Limited.; ²CNNC Nuclear Operation Management Co., Ltd.

ID: 10353

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS3 - Developments of Rotating Electrical Machines and Operational Experience

Series of Powerful Water-cooled Turbine Generator

M.B. ROYTGARTS, O.V. ANTONYUK, A. VARLAMOV, N.V. GRISHIN, V.N. ZHELEZNYAK, D.V. ZHUKOV, A.G. MIGAS

JSC "Power machines"

ID: 10354

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS3 - Developments of Rotating Electrical Machines and Operational Experience

Features of Akkuyu NPP Turbogenerators and Factory Test Results

E. KADI-ÖGLY¹, A. TSVETKOV¹, B. WAHDAME², Ph. MEYER², P. CHAY², D. DE-ROZARIO²

¹Turbine Technologies AAEM; ²GE Power Portfolio

ID: 10432

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS3 - Developments of Rotating Electrical Machines and Operational Experience

Failure of Large Turbo-Generator during first run-Case Study of Indian Power Utility

Ravish Chandra JHA, Kondra NAGESH

NTPC Ltd.

ID: 10836

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS3 - Developments of Rotating Electrical Machines and Operational Experience

Keywords: Hydro Power, Flexibility, Hybrid, Wear and Tear, Ancillary Services

Increasing flexibility of historical power generation thanks to micro hybrid concept, the Xflex hydro live demonstrator at Vogelgrun HPP

Jean-Louis DROMMI¹, Gregory PAIS², Christian LANDRY³, Christophe NICOLET³

¹EDF; ²CEA; ³Power Vision Engineering Sarl, SUISSE

ID: 10863

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS3 - Developments of Rotating Electrical Machines and Operational Experience

Fundamental model of full power converter variable speed Hydro Generators: Control and Simulation

Luis ROUCO¹, Francisco J. PÉREZ-THODEN¹, Fernando PERÁN²

¹Universidad Pontificia Comillas; ²Iberdrola

ID: 11021

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS3 - Developments of Rotating Electrical Machines and Operational Experience

Damaged generator rotors: the economic and logistical benefits of repair over scrapping

Wojciech BETLEJ, Tony CROUCHER

Quartzelec Ltd

ID: 11063

A1 ROTATING ELECTRICAL MACHINES - Full Papers

Topics: PS3 - Developments of Rotating Electrical Machines and Operational Experience

Experience with CO2 free Generator Operation

Uwe EICKELBECK

Siemens Energy, Germany

A2 - POWER TRANSFORMERS AND REACTORS

PS 1 EXPERIENCE AND NEW REQUIREMENTS FOR TRANSFORMERS FOR RENEWABLE GENERATION

ID: 10100

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS1 - Experience and New Requirements for Transformers for Renewable Generation

Keywords: HVDC converter transformer, Condition assessment, Risk assessment, Diagnostics

Condition Assessment of HVDC converter transformers at limited time of outage applied to the Fenno–Skan transmission system

Evgenii ERMAKOV¹, Lena MELZER¹, Tomas LINDSTEDT¹, Niclas SCHÖNBORG², Gert-Ove PERSSON²

¹Hitachi ABB Powergrids, Sweden; ²Svenska kraftnät, Sweden

ID: 10127

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS1 - Experience and New Requirements for Transformers for Renewable Generation

Advantages of Evaluation of the Loading and Ambient Temperature Profile for Solar Collector Power Transformer based on Dynamic Loading Mode

W CALIL¹, E COSTA², T LANERYD³, A GUSTAFSON³

¹Hitachi ABB Power Grids, Brazil; ²São Paulo University,; ³Hitachi ABB Power Grids, Sweden

ID: 10216

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS1 - Experience and New Requirements for Transformers for Renewable Generation

Keywords: microgrid, effective grounding, coefficient of grounding, inverter-based DERs, grounding transformer

New Method for Effective Grounding Design Using Grounding Transformer for the Microgrid with Inverter-based Distributed Energy Resources (DERs)

Aleksandar VUKOJEVIC¹, Paul PABST¹, Keith DSOUZA²

¹Commonwealth Edison, United States of America; ²North Carolina State University, United States of America

ID: 10249

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS1 - Experience and New Requirements for Transformers for Renewable Generation

Investigations on Vacuum Tap Changer Failures of Converter Transformers and Maintenance Suggestions

Linjie ZHAO, Yao YUAN, Jiahui YANG, Xi ZHANG, Lianwei BAO

Electric Power Research Institute of China Southern Grid, China

ID: 10256

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS1 - Experience and New Requirements for Transformers for Renewable Generation

Reverse Power Flow Impacts for Legacy Power Transformers

Ed G. TENYENHUIS

Hitachi ABB Power Grids

ID: 10433

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS1 - Experience and New Requirements for Transformers for Renewable Generation

Design and Operation Consideration for Selection of Transformers for Solar Photovoltaic Plant Applications

Koushik DAS¹, Subir KARMAKAR²

¹NTPC Ltd.; ²NTPC Ltd.

ID: 10771

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS1 - Experience and New Requirements for Transformers for Renewable Generation

Keywords: Reactive power compensation, thyristor controlled transformer, static var compensation, STATCOM, shunt reactors

Design of a 24-pulse 250 Mvar Thyristor Controlled Transformers

Luca BUONO¹, Enrico ROTOLO¹, Francesco PALONE¹, Lorenzo PAPI¹, Simone SACCO¹, Roberto SPEZIE¹, Luca LOMBINI², Dario ROGORA²

¹TERNA RETE ITALIA S.p.A; ²TAMINI, Italy

ID: 10810

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS1 - Experience and New Requirements for Transformers for Renewable Generation

Evaluation and Implementation of HV Dry-Type Shunt Reactors into a 420kV Transmission Grid

Peter DOPPLMAIR¹, Klaus POINTNER¹, Peter VENEDIGER²

¹Trench Group; ²TenneT

ID: 10839

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS1 - Experience and New Requirements for Transformers for Renewable Generation

Keywords: power transformer, electrical and mechanical design, harmonics, vibration, maintenance

Design challenges for large offshore wind turbine transformers

Max GILLET¹, Christophe PERRIER¹, D MARNAY¹, F MARKETOS¹, M KAVUK², H YILDIZ², Tobias STIRL³, T BOROOMAND⁴

¹GE France; ²GE Turkey; ³GE Germany; ⁴GE United Kingdom

ID: 10884

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS1 - Experience and New Requirements for Transformers for Renewable Generation

Mobile Load Flow Reactor for 220kV

Klaus POINTNER¹, Peter DOPPLMAIR¹, Victor J. HERNANDES JIMENEZ², Klaus REISENBERGER¹, Taneli MONNI¹

¹Trench Austria Group; ²RED Eléctrica de España

ID: 10943

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS1 - Experience and New Requirements for Transformers for Renewable Generation

1 Statistical Analysis and Grouping of Measured Power Transformer Overvoltages

Bruno JURIŠIĆ

HRO CIGRE, Croatia

ID: 10953

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS1 - Experience and New Requirements for Transformers for Renewable Generation

On-line differential partial discharge measurements of Condenser Bushings on Power Transformers

Espen EBERG¹, Lars LUNDGAARD¹, Asgeir MJELVE²

¹SINTEF Energy Research; ²Elvia

ID: 11065

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS1 - Experience and New Requirements for Transformers for Renewable Generation

Impact of Transient Voltage Generated by Valve Commutation on HVDC Transformer

Rene WIMMER¹, Thomas HAMMER²

¹Siemens Energy Global GmbH & Co. KG; ²Siemens AG, Germany

ID: 11139

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS1 - Experience and New Requirements for Transformers for Renewable Generation

Bubble Formation in Power Transformers – a Potential Risk for the Future Network Reliability?

Christian POESSNIKER

University of Exeter, Exeter, EX4 4PY United Kingdom

PS 2 BEYOND THE MINERAL OIL-IMMERSED TRANSFORMER AND REACTORS

ID: 10130

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

A Proposal to Reduce Greenhouse Gas Emission in the Electricity Transmission Sector in Brazil: A Calculation Method based on the Use of Natural Ester in Power Transformers

R SILVA, R REINERT

Cargill

ID: 10277

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

A new solution of higher energy-efficient dry-type transformers with Silicon Rubber Casting technology

Shaigen HAN¹, Jian WU², Yonghua JIN³, Liingyu ZHANG³, Yi YANG⁴, Jian HAN⁵

¹Energy Internet Research Institute Co., Ltd. of State Grid, China; ²Jiangsu Dahang Transmission and Distribution Co., Ltd., China; ³Shanghai Zhenger Intelligent Technology Co., Ltd., China; ⁴International Copper Association, China; ⁵Danyang Power Supply Branch of Jiangsu Electric Power Co., Ltd. of State Grid, China

ID: 10437

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

Experience on Design, Manufacturing & Type Testing of First 420kV Class ester fluid filled shunt reactor

Gunjan AGRAWAL

Power Grid Corporation of India Ltd.

ID: 10505

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

Beyond the top oil temperature limit

Tor LANERYD¹, G FRIMPONG², N LAVESSON¹, J CZYZEWSKI³, L FERM¹

¹Hitachi Energy, Sweden; ²Hitachi Energy, United States; ³Hitachi Energy, Poland

ID: 10534

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

Keywords: Gas filled transformer, Disk winding, Partial discharge, Alternative Gas, N2, Dry air

Winding Insulation Characteristics of Gas Filled Transformers with SF6 Alternative Gas

Yoshiki NAKAZAWA, Shigekazu MORI, Kei TAKANO, Naoki NOGUCHI, Takeshi CHIGIRI

Toshiba Energy Systems & Solutions Corporation

ID: 10535

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

Technological Development of Vegetable Oil (Rapeseed Oil) Immersed Transformer

Susumu SAKAMOTO¹, Shin YAMADA²

¹Kitashiba Electric Co., Ltd.; ²Toshiba Energy Systems & Solutions Corp.

ID: 10688

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

Development of Transformer using Natural Ester for a Modular Substation

Jaeyong PARK, Hyeon Gu JEONG, Min Gyu KIM, Seong Eon KIM, Jongchul JUNG, Ik Choon CHO, Jongung CHOI, Young Geun KIM

LS ELECTRIC, Republic of Korea

ID: 10772

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

Keywords: Natural ester, water tolerance, oxidation stability, stray gassing, insulation system

Supporting development of transformers with natural esters by comprehensive evaluation of insulation systems

Fabio SCATIGGIO¹, Giorgio CAMPI¹, Evanne WANG², Radoslaw SZEWCYK²

¹A&A Fratelli Parodi; ²DuPont

ID: 10803

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

420kV Shunt Reactors for Reactive Power Compensation Explaining the Trends Favoring Air-Core Dry-Type Technology

A. GAUN, A. GRISENTI, B. FRÖHLICH, C. NIEDERAUER

Coil Innovation GmbH

ID: 10864

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

Dry-type 145 kV transformers: safe indoor substations with improved environmental performance

Carlos ROY¹, Rafael MURILLO¹, Lorena CEBRIÁN¹, Mariano BERROGAÍN¹, Jason L. BREWER², Jackson WILLIAMS²

¹Hitachi Energy; ²Duke Energy

ID: 11022

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

Design of innovative resilient transformers for maximum operating flexibility

Radoslaw SZEWCZYK¹, Jean-Claude DUART¹, Anastasia O'MALLEY², Kurt KAINEDER³, Robert MAYER³, Ewald SCHWEIGER³

¹DuPont; ²Consolidated Edison Co. of NY; ³Siemens Energy

ID: 11064

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

Testing Challenges with Ester Insulating Liquids

Ivanka HOEHLEIN¹, Carolin SCHUETT²

¹Siemens Energy, Germany; ²Siemens Energy, Germany

ID: 11066

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

Qualification of Insulating Liquids for Power Transformers and Tap-Changers

Rainer FROTSCHER¹, Sebastian REHKOPF²

¹Maschinenfabrik Reinhausen, Germany; ²Maschinenfabrik Reinhausen, Germany

ID: 11125

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

Type Testing of 80MVA Power Transformer with a new Bio-based, Biodegradable and Low Viscosity Insulating liquid

C. P. WOLMARANS¹, Ahmed GAMIL²

¹Nynas; ²SGB-SMIT Group Regensburg

ID: 11140

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS2 - Beyond the Mineral Oil-Immersed Transformer and Reactors

Analysis of new dielectric fluid alternatives using the design of a thermal distribution test platform model and CFD methods.

Pedro José QUINTANILLA CAVIA¹, Agustin SANTISTEBAN DIAZ¹, Ramazan ALTAY², Alfredo ORTIZ FERNÁNDEZ¹

¹University of Cantabria, Spain; ²BEST Transformer, Turkey

PS 3 BEST PRACTICES IN TRANSFORMERS AND REACTORS PROCUREMENT

ID: 10122

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS3 - Best Practices in Transformers and Reactors Procurement

Keywords: power transformers, on load tap changers, varistors, impulse test, IEEE C57.12.90

Impulse Testing of Power Transformers - Impact of Internal Varistors built into On-load Tap Changers

Dharam VIR, Pradeep RAMASWAMY, Yuriy FRADKIN, Tim ROCQUE

Prolec-GE Waukesha, Inc. USA

ID: 10131

A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS3 - Best Practices in Transformers and Reactors Procurement

High Voltage Bushings For Transformers And Shunt Reactors Considering Local Conditions – Brazilian Transmission Network Case

S MONTENEGRO¹, N VIVEIROS², Y NOMI³, R ASANO⁴

¹CHESF; ²SIEMENS-ENERGY; ³HITACHI-ABB; ⁴UFABC

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS3 - Best Practices in Transformers and Reactors Procurement

Keywords: White-box model; Electromagnetic transients; Simulation

Validation of a White-box model of a Distribution Transformer through impulse voltage transfer measurements including non-standard test conditions

Luis BRAÑA^{1,2}, Artur COSTA², Ricardo LOPES¹

¹Efacec Energia, Portugal; ²Faculdade de Engenharia da Universidade do Porto, Portugal

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS3 - Best Practices in Transformers and Reactors Procurement

Keywords: low-Noise, Transformer, 154kV, 50dBA

Introduced the Development of low-Noise (50dBA) Technology for 154kV Class Power Transformers

Chuljun PARK, Kyuho LEE, Moonsik KANG

HYOSUNG Corporation, Korea, Republic of (South Korea)

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White-box Models Development for Insulation Design and Providing Transformers Withstand to High-frequency Resonant Overvoltages

V.S. LARIN¹, D.A. MATVEEV², M.V. FROLOV²

¹All-Russian Electrotechnical Institute (VEI – branch of FSUE “RFNC – VNIITF”); ²Moscow Power Engineering Institute (NRU MPEI)

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State of the art in short-circuit for transformers

Julia FORSLIN¹, J TILLERY¹, M MUNOZ², D SACCONI³

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

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Experiences and Risks when Dealing with Remote Inspections of Factory Acceptance Tests on EHV Inductive Equipment

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Topics: PS3 - Best Practices in Transformers and Reactors Procurement

Keywords: Power transformer, Reactor, Qualification, Factory, Manufacturing

RTE's experience on transformers and reactors procurement

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RTE

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A simplified tool to assess transformer behaviour to GIC and other DC disturbances

Paul POUJADE, Damien BORTOLOTTI, Olivier MOREAU, Mohamed RYADI, Luc PAULHIAC

EDF

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers

Topics: PS3 - Best Practices in Transformers and Reactors Procurement

Keywords: GIC, back-to-back test, magnetic core, structural steel parts, DC component

Qualification test for power transformers GIC capability

Mohamed RYADI¹, Paul POUJADE¹, Damien BORTOLOTTI¹, Damien BORTOLOTTI¹, Olivier MOREAU¹, JT MONTAVONT¹, E ALVADO¹, J RAITH², C LEBER², M STOESSL²

¹EDF; ²SIEMENS ENERGY

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Topics: PS3 - Best Practices in Transformers and Reactors Procurement

A Case Study of Earth Fault on The Power Transformer Caused by Human Error and Inadequate Design in the Interlock System

Yousef MASHAGBEH¹, Sami ABU SHARAR²

¹Samra Electric Power Company, Jordan; ²Samra Electric Power Company, Jordan

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Topics: PS3 - Best Practices in Transformers and Reactors Procurement

Procuring transformers and reactors under a dynamic environment for a sustainable network – the Eskom way

S. MTETWA

Eskom Holdings Limited

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PS 1 DECENTRALISATION OF T&D EQUIPMENT

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Topics: PS1 - Decentralisation of T&D Equipment

Results of Two-year Operation of 220 kV Pilot High Temperature Superconducting Fault Current Limiter (SFCL) in Moscow Power Grid

Petr USTYUZHANIN, Mikhail MOYZYKH, Sergey SAMOILENKOV, Eldar MAGOMMEDOV, Anastasiya TELNOVA, Lenar SABIROV, Kirill BABURIN

JSC "SuperOx"

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS1 - Decentralisation of T&D Equipment

Keywords: metal vapor deposition condensation evaporation surface resistance

Metal Vapor Deposition Patterns and Characteristics on Alumina Ceramic Insulators in Vacuum

Kip BENSON, Subir CHAKRABORTY, Leslie FALKINGHAM, Greg WILK, Gabrielle MADDEN, Francis GOTANCO

S&C Electric Company, United States of America

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Topics: PS1 - Decentralisation of T&D Equipment

Recent HVDC Circuit Breaker Development and Testing

N.A. BELDA¹, R.P.P. SMEETS¹, H. ITO², S. TOKOYODA², T. INAGAKI², S. NEE³, T. MODEER³, S. MEBREHATU⁴, A. HASSANPOOR⁴, C.A. PLET⁵

¹KEMA Labs; ²MITSUBISHI Electric; ³SciBreak AB; ⁴Hitachi ABB Power Grids; ⁵DNV

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS1 - Decentralisation of T&D Equipment

Keywords: Superconducting Fault Current Limiter, Resistive Fault Current Limiter, SFCL, Fault Current, Power System Interconnection

Development of a 22.9 kV/2,000 A Compact R-SFCL

Min Jee KIM, Sung Joon KIM, Gyeong Ho LEE, Chae Yoon BAE, Young-Geun KIM

LS ELECTRIC Co., Ltd., Korea, Republic of (South Korea)

ID: 10655

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS1 - Decentralisation of T&D Equipment

Keywords: High voltage circuit breakers, dielectrics, RDDS, controlled switching

RDDS measurements for 245 kV and 420 kV High Voltage Circuit Breaker

Reto KARRER, M. DHOTRE, V. TEPPATI, S. KOTILAINEN, F. LUNDQVIST, F. AGOSTINI

Hitachi Energy Switzerland

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS1 - Decentralisation of T&D Equipment

Keywords: HVDC, EHVDC-UHVDC, Disconnector, Switching impulse, Lightning Impulse

Sizing and testing of HVDC disconnectors from the dielectric point of view

Eros STELLA¹, Marco NOSILATI¹, Francisco CHACON², Alberto PIGINI³

¹GE Italy; ²GE UK; ³Consultant

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS1 - Decentralisation of T&D Equipment

Short circuit analysis of a Doubly Fed Induction Generator and their Impact on Generator Circuit Breakers

Alois LECHNER¹, Karthikreddy VENNA², Hong URBANEK²

¹Andritz Hydro GmbH; ²Siemens AG Germany

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS1 - Decentralisation of T&D Equipment

Keywords: Composite insulators, long-term experience, long-term test, HTV silicone, LSR silicone

Experience of composite insulators on HV substation: some French examples

Giulio ROCCHETTI¹, J SEIFERT², Minh NGUYEN³, Christian PONS⁴, Eric MOAK⁵

¹REINHAUSEN RFE; ²REINHAUSEN power composites RPC; ³RTE; ⁴EDF; ⁵CAE Impuls'ions

ID: 10844

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS1 - Decentralisation of T&D Equipment

Keywords: Instrument Transformer - Risk based policy - Oil - Paper - IT Failure - Reliability

Risk based replacement policy for RTE's instrument transformer (IT)

Mandana TALEB, S TAZI, Xavier GILLES, B IZAC, L COHEN

RTE

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Topics: PS1 - Decentralisation of T&D Equipment

Seismic performance of instrument transformers

Ivan ČEHIL

HRO CIGRE, Croatia

PS 2 DECARBONISATION OF T&D EQUIPMENT

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Keywords: GIS – 420 kV – SF6-free – Alternative gases - C4F7N – Fluoronitrile – Life cycle assessment

SF6-free Solutions for 420 kV Networks using gas-Insulated Substation (GIS)

Matt BARNETT¹, Arnaud FICHEUX², Samuel SOUCHAL², Bertrand PORTAL², Quentin ROGNARD²

¹SEN Transmission United Kingdom; ²GE Grid Solutions France

ID: 10103

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Keywords: Heptafluoro-iso-butyronitrile (C3F7CN / C4F7N / (CF3)2-CF-CN), Sulfur Hexafluoride (SF6), Gas Insulated Lines and Busbars, Electrical Breakdown, Type Test.

Application of SF6 Alternatives for retro-filling existing Equipment

Lujia CHEN¹, L LOIZOU¹, Q LIU¹, M WALDRON², G WILSON², J OWENS³

¹University of Manchester United Kingdom; ²National Grid United Kingdom; ³3M Company United States

ID: 10126

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Keywords: temperature rise, continuous current, gas-insulated switchgear, live-tank, dead tank

Comparative Continuous and Overload Current Performance of High Voltage Switchgear with SF6 and Alternative Gases

Victor HERMOSILLO¹, Diana LEGUIZAMON-CABRA², Marius CATALA², Ludovic DARLES², Cyril GREGOIRE², Jean-Alain RODRIGUEZ²

¹GE Grid Solutions, United States of America; ²GE Grid Solutions, France

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Substation Equipment Overstress Management CIGRE Technical Brochure 816 Compilation

A CARVALHO¹, J AMON², M LACORTE³, C LINDNER⁴, R KARRER⁵

¹CIGRE-Brasil, Brazil; ²Consultant; ³Consultant; ⁴AXPO; ⁵Hitachi ABB

ID: 10136

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Keywords: C4F7N, C4-FN, SF6-free, Fluoronitrile, Fluoroketon

Design Considerations for Implementing SF6 Alternatives for Distribution Switchgear Applications with Focus on Toxicity and Load Break Performance

Andres LASO¹, Matthew TEFFERI¹, Sebastian GLOMB², Martin GOPPEL², Nenad UZELAC¹, Rene SMEETS³

¹G&W Electric, United States of America; ²DIL0 Armaturen und Anlagen GmbH, Germany; ³KEMA Labs, Netherlands

ID: 10209

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Keywords: Manitoba-Minnesota Transmission Project (MMTP), EHV dry type current transformer, dry insulation technology

A New 500 kV AC Overhead Transmission Line Delivering Clean Hydroelectric Power from Canada to The State of Minnesota USA Utilizing 500 kV Dry Type EHV Current Transformers

Robert MIDDLETON¹, Eric EUVRARD¹, James NICHOLSON²

¹RHM International, United States of America; ²Manitoba Hydro, Canada

ID: 10317

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Keywords: SF6-Free, GCB(Gas Circuit Breaker), CFD(Computational Fluid Dynamics), SLF90, post arc-current

Experimental and Numerical Analysis of the Interruption Capability of SF6-Free 245kV 63kA GCB

Junggho PARK, Manjun HA, Kyongbo SEO, Hongkyu KIM, Joohyun LEE

HYOSUNG Corporation, Korea, Republic of (South Korea)

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Topics: PS2 - Decarbonisation of T&D Equipment

Improving Human Safety & Environment by Innovative Circuit Breaker Testing

Balasaheb DOIPHODE

Scope T&M Pvt. Ltd.

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Topics: PS2 - Decarbonisation of T&D Equipment

Health Indexing and Reliability Assessment of EHV SF6 Circuit Breaker

Sourav ADHYA

Adani Transmission Ltd.

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Topics: PS2 - Decarbonisation of T&D Equipment

SF6-alternative 145 kV live-tank circuit breaker

Peter STENGÅRD¹, Partick STOLLER¹, Saskia BUFFONI-SCHEEL¹, Branimir RADISAVLJEVIC¹, Amaya LAGO¹, Mirko PALAZZO², Navid MAHDIZADEH³

¹Hitachi Energy, Sweden; ²Hitachi Energy, Spain; ³Hitachi Energy, Switzerland

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Keywords: SF6 Alternative, Seven Requirements, Health and Safety (EHS), Natural-Origin Gases, CO2/O2 Mixtures, Synthetic Air, N2/O2, Vacuum Circuit Breaker (VCB)

Recent Development of SF6 alternative Switchgear using Natural-Origin Gases in Japan

Toshiyuki UCHII¹, Daisuke YOSHIDA², Shigeyuki TSUKAO³, Koichi TAKETA⁴, Kiyohiro TSUBOI⁵

¹Toshiba Energy Systems & Solutions Corp.; ²Mitsubishi Electric Corp.; ³TEPCO Power Grid, Inc.; ⁴Kansai Transmission and Distribution, Inc.; ⁵Chubu Electric Power Grid Co., Inc.

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Topics: PS2 - Decarbonisation of T&D Equipment

Moving towards carbon neutral high voltage Switchgear by combining eco efficient Technologies

Michael GATZSCHE, Vincent TILLIETTE, Ueli STRAUMANN, Henrik LOHRBERG, Freddy VON ARX, Adrian SKEA, Manuel NAEF, Kalpesh CHAUHAN, Navid MAHDIZADEH

Hitachi Energy Switzerland, Germany, India

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Keywords: SF6 alternatives, MV/HV application

Hivoduct - a novel, compact, pressurized air insulated GIL for 72 kV - 420 kV: Design, Simulation and Test results

Walter HOLLAUS, Michael SCHUELLER, Matthias SCHNEIDER

Hivoduct AG, OST University of Applied Science Switzerland

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Keywords: SF6 alternative, circuit breaker, 145 kV

SF6 alternative Circuit Breaker for 145 kV Gas insulated Switchgear

Patrick STOLLER, Thomas HD. BRAUN, Jakub KORBEL, Markus RICHTER

Hitachi Energy Switzerland, Germany

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Keywords: SF6-Free, Fluoronitile, Reliability, Gas handling, Monitoring

Reliability and Operation Test of SF6-free 170kV 50kA GIS with Fluoronitile (C4F7N) Mixtures

J.U. YEUN, H.S. AHN, J. CHOI, Y.G. KIM

LS ELECTRIC Co., Ltd., Korea, Republic of (South Korea)

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Keywords: GIS, C4-FN, Fluoronitrile, Switchgear, Circuit-breaker

Switchgear scalability demonstration using environment friendly Fluoronitrile gas mixture in 420 kV GIS substations

Cyril GREGOIRE, Q ROGNARD, Thomas BERTELOOT, Diana LEGUIZAMON, Joel OZIL, Samuel SOUCHAL, F BERNARD, Yannick KIEFFEL

GE

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Keywords: Generator Circuit Breakers, GCB, architectures, environmental impact

Integrated disconnecter on Generator Circuit Breakers for environmental and footprint optimization

Jean-Marc WILLIÈME, Denis FRIGIÈRE, Didier RODRIGUEZ, Matthieu BARRE, Blandine REVAUD, Diana LEGUIZAMON

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Topics: PS2 - Decarbonisation of T&D Equipment

Sensitivity Analysis of Capacitive Voltage Transformers for Frequency Response Modelling

Urko ZATIKA LARRINAGA¹, Ixone URRUELA AMIROLA¹, Juan CHACON¹, Alvaro ZARANDONA ARRUEA², Manuel DE LA HOZ²

¹ARTECHE GROUP; ²UPV/EHU

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Topics: PS2 - Decarbonisation of T&D Equipment

Transmitted Overvoltage Requirements for Instrument Transformers

Tin PERKOVIĆ

HRO CIGRE, Croatia

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Keywords: HVCB, C4FN, IEC 62271-100, MOO/CFD, machine learning

Experience in the development of a 170 kV / 50 kA / 60 Hz HVCB using a C4FN+CO2 mixture

Xiangyang YE, Zeljko TANASIC, Hyung Choon KIM, Javier MANTILLA

Hyundai Electric Switzerland Ltd.

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Keywords: Bushing, clean air, high voltage, instrument transformer, natural and syntetic ester

Instrument Transformers and bushings using alternative and eco-friendly high voltage insulation systems

Lorenzo GIOVANELLI¹, Udo PRUCKER², Essedik FERDJALLAH KHERKHACHI³

¹TRENCH Italia Srl; ²TRENCH Germany GmbH; ³TRENCH France SAS

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Topics: PS2 - Decarbonisation of T&D Equipment

Investigation of the Switching Behaviour, Voltage Distribution and Post-Arc Current of series-connected Vacuum Interrupter Units for Live Tank and Dead Tank Circuit Breakers ≥ 420 kV

Tobias GOEBELS¹, Paul Gregor NIKOLIC²

¹Siemens Energy, Germany; ²Siemens Energy, Germany

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Experience with F-gas-free High voltage products for On- and Offshore applications

Peter GRONBACH¹, Ann-Sofie MORTENSEN²

¹Siemens Energy, Germany; ²Siemens Energy, Germany

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS2 - Decarbonisation of T&D Equipment

Research of UHV Gas-insulated Transmission Line (GIL) with Perfluoronitrile (C4F7N) Gas

Keli GAO, Xianglian YAN, Zhibing LI, Wen WANG, Jie HE

China electric power research institute

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UAV usage for Asset Condition Assessment

Marcel ELLENBOGEN

ISRAEL ELECTRIC CORPORATION, Israel

PS 3 DIGITALISATION OF T&D EQUIPMENT

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Keywords: Photonic Voltage Transducer, Photonic Current Transducer, Power Network Monitoring, Smart Grid, Low-power instrument transformer, IEC 61869, IEC 61850-9-2, sampled values

Photonic combined Current and Voltage Transformer demonstration for the Nepalese Grid

G FUSIEK¹, P NIEWCZAS¹, T HEID², N GORDON³, L CLAYBURN³, S BLAIR³, G MCFARLANE⁴, P MUNRO⁴, R MAHARJAN⁵, B B SHAKYA⁵

¹University of Strathclyde United Kingdom; ²CONDIS Switzerland; ³Synaptec, UK; ⁴Instrument Transformers Limited United Kingdom; ⁵Kantipur Engineering College Nepal

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Keywords: High Voltage, Substation Equipment, Unmanned Aerial Vehicle, Partial Discharge, Radio Frequency, Diagnostic.

Rapid AIS PD Surveys using a UAV

Phil MOORE¹, David TEMPLETON¹, Ian KERR², Mark SIMMONS², Damon STEWART²

¹Elimpus Ltd, United Kingdom; ²National Grid United Kingdom

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Application of Machine Learning and Anomaly Detection for On-line Defect Identification in Wall Bushings in HVDC Systems

M ALVES¹, M PINTO¹, G GOMES¹, D ARAUJO¹, F PAIVA¹, B SARDINHA¹, F CARLOMAGNO¹, F FRONTIN¹, L LOPES¹, M COSTA¹, D SANTOS¹, R FLAUZINO², M ALVES³, P FERREIRA³, G LACERDA³, D NASCIMENTO³

¹RADICE TECHNOLOGY; ²USP; ³FURNAZ

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Real-time Leakage Current Measurement System Applied to LT 230 kV Insulators

D USSUNA¹, R CARVALHO¹, V FILHO¹, E FRESHI¹, W FARIAS¹, G SILVA¹, M TONETTI²

¹Instituto de Tecnologia para o Desenvolvimento - LACTEC; ²Companhia Paranaense de Energia Elétrica - COPEL

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Application of digital twin technology in the field of substation equipment operation and maintenance

Shuai ZHANG, Song WANG, Linjie ZHAO, Ruihai LI

China South Power Grid International Co., Ltd., China

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Study and Equipment Development of Transient Characteristics Test on Electronic Current Transformer

Yuanyuan HU^{1,2}, Jie ZHANG^{1,2}, Lin CHENG³, Yue TONG⁴, Xiang LIU⁴, Jun YAO^{1,2}

¹NARI Group Corporation (State Grid Electric Power Research Institute); ²Wuhan Nari Limited Liability Company of State Grid Electric Power Research Institute, Wuhan; ³State Grid Shanxi Electric Power Research Institute, Xian; ⁴China Electric Power Science Research Institute, Wuhan

ID: 10347

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Keywords: LPIT(Low Power Instrument Transformer), 145kV, GIS(Gas Insulated Switchgear), MU(Merging Unit)

LPIT Technology Development for 3-phase 145 kV GIS

Dojin KIM¹, Jongwang KIM¹, Hyunmo AHN¹, Dongjun SIM¹, Cheonho LEE², Youngmin KIM², Jungbae KIM²

¹HYOSUNG Corporation, Korea, Republic of (South Korea); ²HYOSUNG HEAVY INDUSTRIES Co., Korea, Republic of (South Korea)

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Automated Rack In & Rack out of 22kV/33kV AIS Breakers

Sandeep KUMAR

The Tata Power Company Limited

ID: 10566

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Keywords: re-ignitions, Transient recovery voltage, life cycle enhancement, Asset health monitoring, IEC62271-306

Application of controlled switching for a 500kV switchable line reactor connected to 600 MW solar power generating plant to reduce probability of unintentional re-ignitions and life cycle enhancement – A field case study

Tuan HOANGNGOC¹, Urmil PARIKH², Naveen DUBEY², Mirko PALAZZO³, Hong Xuan NGUYEN⁴

¹ABB Power Grids Vietnam; ²ABB Power Products and Systems India Limited; ³Hitachi ABB Power Grids Switzerland; ⁴TOJI Group

ID: 10644

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Keywords: digitization of GIS, monitoring and diagnosis, AI technology

Recent Digitization of GIS and Sophistication of Equipment Condition Monitoring and Diagnosis applying AI Technologies

Eiji MATSUMOTO¹, Kazunori UCHIDA¹, Minoru SAITO¹, Akihiro YAMAGUCHI², Toshihiro MAEKAWA³, Kiyotaka BABA³

¹Toshiba Energy Systems & Solutions Corp.; ²Toshiba Corp.; ³TEPCO Power Grid, Inc.

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Keywords: Switchgear, Circuit - Breaker, Disconnecter, IoT, Sensor, CBM, Current - Waveform, Sound

Development of Switchgear Condition Monitoring using IoT Technology for Condition Based Maintenance

Shinya AICHI, Yasunori ITO, Hiroshi YAMADA, Kaio WAKAIKI, Toshifumi SUGIMOTO

Chubu Electric Power Grid Co., Inc.

ID: 10659

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Keywords: SF6, LPIT, GIS

Optimized LPIT (Low Power Instrument Transformers) applications in GIS based on SF6 and climate friendly insulating Gas g3

Reto CHRISTEN, M. DUPOY, P. JUGE, J. SAINT-MARC

GE Grid Solutions Switzerland, France

ID: 10660

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Keywords: digital monitoring, switching transients, drive technologies, asset management, CBs

Field application of controlled switching & advanced digital monitoring techniques to mitigate switching transients and asset management for various power equipment connected with CBs with different drive technologies

Michael STANEK¹, Urmil PARIKH², Mirko PALAZZO¹, Davide ZANON³, Sebastiano SCARPACI³, Patrik LINDFORS-DAHLIN⁴

¹Hitachi Energy Switzerland; ²ABB Power Products and Systems India Limited; ³Hitachi ABB Powergrids Italy; ⁴ABB Power Grids Sweden AB

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Advanced High Voltage Disconnecter Condition Monitoring

Juan Carlos PÉREZ QUESADA¹, Jonathan REGUERA¹, Iban LANDETA¹, Sergio QUINTIN CLEMENTE², Jose Enrique ALONSO ALFAYATE²

¹MESA/Schneider Electric; ²Red Eléctrica de España

ID: 10876

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Keywords: Controlled switching, bandwidth, accuracy, conventional, voltage

Benefit of high-resolution/high bandwidth acquisition of conventional voltage and current transformers for controlled switching: illustration with latest generation of controller

Alain FANGET, Farid AIT-ABDELMALEK, Jean SOUBIES-CAMY

GE

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Keywords: Mixed reality, augmented reality, virtual reality headset, field commissioning, site acceptance tests

Commissioning of HV primary equipment in pandemic times

Jean SOUBIES-CAMY, J FERNANDES, F DESPONTIN, Jean-Luc RAYON

GE France

ID: 11137

A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers

Topics: PS3 - Digitalisation of T&D Equipment

Keywords: Condition – Monitor, Data – Management, Training, IEC 61580, Failure – Prevention

Monitor Data Management for Asset Failure Prevention

Abigail ZAFRIS, Reynold CORNELL

American Electric Power Service Corporation, United States of America

B1 - INSULATED CABLES

PS 1 LEARNING FROM EXPERIENCES

ID: 10106

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Keywords: XLPE cable - Cable tunnel - Fire performance - Fault simulation - London Power Tunnels

Fire Risk from XLPE Cables in Air

Paul FLETCHER¹, A FENTIMAN¹, G TZEMIS²

¹Mott MacDonald Ltd, United Kingdom; ²National Grid Electricity Transmission United Kingdom

ID: 10276

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Keywords: reliability, fault tree analysis, insulated cable, trifurcating joint

Application of Fault Tree Analysis to Underground Cable Accessories

Andrew R. MORRIS, Najwa ABOUHASSAN

Commonwealth Edison Company, United States of America

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Development of Economic and Environment-friendly 66kV Array Cable

Xiejun XU¹, Kai CHEN¹, Wenlin PAN¹, Qingsheng CHANG², Yanli XU², Xinhao GONG²

¹Hengtong Submarine Power Cable Co., Ltd., China; ²Hengtong Optic-Electric Co., Ltd., China

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Technology of Large Length 500kV XLPE Insulated AC Submarine Cable

Y. ZHAO, M. HU, W. WANG, S. XIE, H. ZHANG

Zhongtian Technology Submarine Cable Co., Ltd., China

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Analysis of Failed Cable Termination: Role of Workmanship and Electrical Stresses

Nitin R SHINGNE

Electrical Research and Development Association (ERDA)

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Simulations of losses in armoured 3-core submarine cables using 3D FEM compared to measurements

Ola THYRVIN¹, Danijela PALMGREN¹, Dag WILLEN²

¹NKT HV Cables AB, Sweden; ²NKT Group A/S, Denmark

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Lightning strike to ground – a case study about observed cable damages, risk estimation and protection method

Valentinas DUBICKAS¹, Erik THUNBERG¹, Johan HANSSON¹, Andreas DERNFALK², Peter SIDENVALL²

¹Svenska kraftnät, Sweden; ²Independent Insulation Group, Sweden

ID: 10512

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Lightning strikes to ground affecting underground power cables

Thomas WORZYK, Ola THYRVIN

NKT HV Cables AB, Sweden

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Failure cause analysis and prevention of subsea cable failures in a joint industry project (JIP CALM)

M. KAVIAN¹, D. SAHA¹, S. ANJUN¹, F.H DE WILD¹, P.C.J. VAN DER WIELEN¹, N. BRUINSMA², A.P. LUIJENDIJK², A. MORENO-RODENAS², N.G. JACOBSEN², T.J. ROETERT², E. KRAS², F.J. SAVENIJE³, E. WIGGELINKHUIZEN³, J. JAYAKUMAR³, M.J. VAN DER HOEK⁴, H. DE BRUIN⁵

¹DNV Asset Management, The Netherlands; ²Deltares Harbour Coastal and Offshore, Hydraulic Engineering, The Netherlands; ³TNO Unit Energy Transition, Research group Wind Energy, The Netherlands; ⁴VanderHoekPhotonics, The Netherlands; ⁵BREM funderingsexpertise, The Netherlands

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Practical experience and modelling of the corrosion behaviour of the Aluminium metallic cable sheath

Roy ZUIJDERDUIN¹, Ranjan BHUYAN¹, Jacco SMIT¹, Matteo CARUSO², Johathan MOENS², Ralf BOSCH², Jos VAN ROSSUM³

¹TenneT TSO; ²Laborelec; ³Prysmian

ID: 10663

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Keywords: dry type outdoor cable termination, field experience

Evolution of dry type outdoor cable terminations based on field experience

Tarek FAHMY¹, Filippo BIONDA¹, Marcel HECKEL²

¹PFISTERER Switzerland AG; ²PFISTERER Kontaktsysteme GmbH

ID: 10665

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Keywords: temperature monitoring, current rating, computation

Temperature monitoring and current rating computation for the Cluster Westlich Aldergrund

Etienne ROCHAT, A. GOY, R. GUERICKE

Omnisens Switzerland, 50Hertz Transmission Germany

ID: 10667

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Keywords: cable temperature monitoring, offshore wind farm

Complex cable temperature monitoring within the largest commissioned offshore wind farm

Etienne ROCHAT¹, Alexandre GOY¹, Fabien RAVET¹, Lukas Milan DOMURATH², Maria-Eftychia VESTARCHI², Hossein GORBANI²

¹Omnisens Switzerland; ²Oersted Denmark

ID: 10668

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Validation of an Efficient 3D Finite Element Model for the Calculation of Losses in Three-Core Armoured Power Cables

Andreas CHRYSOCHOS¹, Dimitrios CHATZIPETROS¹, Ioannis ZTOUPIS¹, James PILGRIM², Vasileios KANAS¹, Konstantinos PAVLOU¹, Kostas TASTAVRIDIS¹, George GEORGALLIS¹

¹Hellenic Cables, Greece; ²University of Southampton, United Kingdom

ID: 10689

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Keywords: Amonton, Coulomb Friction Law, Analysis System, Cable Creepage, Power Cable

Development of Analytical Method for Power Cable Creepage Phenomenon in Duct

Tomonori KAMIBAYASHI¹, Tadanori NAGAYAMA¹, Katsumi IWAMURA², Koki KASHIRO², Hiroyasu NISHIKUBO³

¹Tohoku Electric Power Network Co., Inc.; ²Furukawa Electric Co., Ltd.; ³FITEC Corp.

ID: 10690

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Keywords: SCOF, Degradation, Diagnosis, Gas Analysis, ICP, PD, TJ, PLC

IoF Cause of Breakdown and Replacement of 275 kV SCOF Cable by XLPE Cable in Japan

Yusuke IKEDA¹, Tomoteru KYOUGOKU², Kozo SUZUKI³, Tai YOKOYAMA³, Takayuki MINAMI³

¹TEPCO Power Grid, Inc.; ²TEPCO Holdings, Inc.; ³Sumitomo Electric Industries, Ltd.

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Sequence Impedance of Submarine Cables

T KVARTS, Z HUANG, A C GAROLERA, O THYRVIN

CIGRE Denmark, Denmark

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Determination of Soil Thermal Resistance: A Holistic Approach

Andreas CHRYSOCHOS, Dimitrios CHATZIPETROS, Varvara RIZOU, Konstantinos PAVLOU, Kostas TASTAVRIDIS, George GEORGALLIS

Hellenic Cables, Greece

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Effect of Semi-Conducting Jackets on the Performance of Three-Core Armoured Power Cables

Andreas CHRYSOCHOS, Dimitrios CHATZIPETROS, Dimitrios KOSSYVAKIS, Vasileios KANAS, Konstantinos PAVLOU, Kostas TASTAVRIDIS, George GEORGALLIS

Hellenic Cables, Greece

ID: 10714

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Keywords: HDD;filling materials;thermal modelling

Belgian experience with horizontal directional drilling (HDD) filling materials and thermal modelling of HDD

**Tanguy SNAPS, F. EL BARNOUSI, W. VAN DER AUWERA, Simon STUL
ENGIE**

ID: 10744

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Keywords: Submarine power cables

Effective of Strategic Planning in the Restoration of a Submarine Cable Fault

Ibrahim ALNASSER¹, Yasir AHMED¹, Paul O'ROURKE²

¹Saudi Aramco, Saudi Arabia; ²Construction Director, Greenlink Interconnector Limited, Ireland

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

PD, temperature and acoustic measurement of Eleclink HVDC interconnector – anticipate failures to minimize service disruption and impact on train circulation

Alessandro PISTONESI

PRYSMIAN POWERLINK Italy

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Best practices for Partial Discharge Monitoring of HVDC Cable Systems and Qualification Tests

Fernando GARNACHO^{1,2}, Abderrahim KHAMLICHI^{1,2}, Fernando ÁLVAREZ², Ángel RAMIREZ¹, Carlos VERA², Jorge ROVIRA¹, Pascual SIMÓN¹, Álvaro CAMUÑAS², Eduardo ARCONES², Javier ORTEGO^{2,3}

¹FFII-LCOE; ²UPM; ³AMPACIMON

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

REE's commitment to partial discharge monitoring in its underground cable network

Ricardo GÓMEZ, Ricardo REINOSO, Gonzalo DONOSO, Elena NOGUEROLES

REE

ID: 10869

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Lessons learned in the maintenance of REE's submarine lines

Daniel BLANCO, Álvaro FRANCÉS, Gonzalo DONOSO, Elena NOGUEROLES

REE

ID: 10878

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Keywords: underground cable, pulling forces, calculation tool, installation, ducts

Increasing underground cable pulling length – a way to improve cost efficiency and reliability of projects

Candice HILAIRE, Renaud ROSSETTI

RTE France

ID: 10881

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Keywords: KEYWORDS 225 kV SCFF cables, decommissioning, risk mitigation, high voltage cables recycling

Decommissioning of a self-contained fluid-filled cable: operating method and risks mitigation

Imane KAMAL¹, M LEFEVRE²

¹EDF; ²CTE+

ID: 10955

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Time to failure testing of model HV XLPE Cables in salt Water at high electrical AC Stress and Temperature

Sverre HVIDSTEN¹, Karl Magnus BENGTTSSON², Espen OLSEN²

¹SINTEF Energy Research; ²Nexans Norway

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Formation of Potentially Harmful Shrinkage Cavities During Operation of MassImpregnated Non-Draining HVDC Cables

Magne RUNDE¹, Ø. HESTAD¹, Carl Erik HILLESTAD², B KLEBO-ESPE², H. TOLLEFSEN³, L. LERVIK³, V. DUBICKAS⁴, E. THUNBERG⁴, J. RANTANEN⁵, T. RAUHALA⁵

¹SINTEF Energy Research; ²Statnett; ³Nexans Norway; ⁴Svenska Kraftnät; ⁵Fingrid

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

HVDC Cable Installation in Freshwater Lake (Suldalsvatnet)

Anders RØREN², Ø. PETERSEN², L. SOLBERG¹

¹Nexans Norway AS; ²Statnett

ID: 10960

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Keywords: Instrumentation on HV Cable Systems for condition-based Maintenance

Instrumentation on HV Cable Systems for condition-based Maintenance

Tony LUCIGNANO, J. MATALLANA

Statnett

ID: 10999

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Keywords: submarine cable, external hazards, protection

Future long-distance AC XLPE submarine cable from Khanom to Samui Island. Guidelines to protect the cable against external hazards

Puriwat SUTTITHAM

TNC-CIGRE, Thailand

ID: 11073

B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Advanced Analysis of Partial Discharges on Power Cables

Erik WINKELMANN

HIGHVOLT Prueftechnik Dresden GmbH

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Experiences and Insights Rehabilitating a 69kV SCFF Cable System after Pressure Loss

Jake GELHARD

EHV Power Inc.,Canada

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B1 INSULATED CABLES - Full Papers

Topics: PS1 - Learning from Experiences

Developments towards a Risk Based Maintenance program to reduce fires at LV cable terminations and plastic enclosures

Andre Nico CUPPEN², Bernard GREENWOOD¹, William HEFFERNAN³, David BREDDA¹

¹Unison Networks Ltd.,; ²Powerco Ltd.,; ³EPECentre - New Zealand

ID: 10142

B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Keywords: Oil-filled cable systems, terminations, joints, pipe-type cable systems, transmission asset management strategies

Emerging Asset Management Strategies for OF Cable Technologies in North America

Ivan JOVANOVIĆ

KUVAG Group, United States of America

ID: 10297

B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Operational Simulation on ± 100 kV/1 kA DC Superconducting Energy Pipeline for Energy Interconnection

Zhiyong YAN, Jiahui ZHU, Ming QIU

China Electric Power Research Institute, China

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B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Development, Adjustment and Implementation of the HTS Transmission Cable Line (2.4 Km) in St. Petersburg

V.E. SYTNIKOV, A.V. KASHCHEEV, M.V. DUBININ, A. MATINYAN

"R&D Center @ FGC UES", JSC

ID: 10513

B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Prequalification test of a 525-kV extruded DC cable system under special conditions: challenges and implications on cable system performance

Amirhossein ABBASI, T QUIST, A PETERSSON, Thomas WORZYK, Kristian GUSTAFSSON, Sridhar ALAPATI

NKT HV Cables AB, Sweden

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B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Transient Over Voltage Testing of Cable Systems in MMC-HVDC Links: A Concept Study Including Verification

Sridhar ALAPATI¹, Kenneth JOHANSSON¹, Mats SJÖBERG¹, Magnus KLANG¹, Amirhossein ABBASI¹, Markus SALTZER²

¹NKT HV Cables AB, Sweden; ²NKT GmbH & Co. KG, Germany

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B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Development and site application of intelligent partial discharge and condition assessment system for underground transmission lines

Y.H. JUNG

KEPCO

ID: 10691

B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Keywords: Underground Transmission Lines, Quality Management System, Dielectric Breakdown, Transmission System Operator

A Study of Quality Management System for Underground Transmission Lines by Japanese Transmission System Operators

Takato WATANABE¹, Yutaka TSUJI², Masataka OGURA³

¹Chubu Electric Power Grid Co., Inc.; ²TEPCO Power Grid, Inc.; ³Kansai Transmission and Distribution, Inc.

ID: 10879

B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Keywords: Underground cables, monitoring, Cathodic Protection, LoraWan network, voltage and current sensors

Maintenance and asset digitalisation with cable monitoring systems supervision

Mathieu GROULT, Laura CORDEBART, Matthieu CABAU

RTE France

ID: 10880

B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Keywords: HVDC cable system, ageing, leakage current, tangent delta, measurement.

Evaluation of the HVDC VSC cable system behaviour in presence of transient voltage phenomena

Nicolas GUERRINI¹, Damien BACHELLERIE¹, A FUSTIER¹, F PADILLO¹, Lluís-R SALES CASALS¹, Pierre HONDAA³, PAscale PRIEUR³, G DENCHE CASTEJON², J.M. ARGUELLES ENJUANES²

¹PRYSMIAN; ²REE; ³RTE France

ID: 10882

B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Keywords: submarine export cable, dynamic rating, overplanting, imbalance, offshore wind farm

Optimal energy management of offshore wind farms considering the combination of overplanting and dynamic rating – Results of the CELT4Wind project

Anne BLAVETTE¹, H. BEN AHMED¹, I DAMINOV², S BOURGUET², D TRICHET², G WASSELYNCK², L DUPONT³, T SOULARD⁴, P WARLOP⁵

¹ENS RENNES-CNRS; ²Université de NANTES; ³Université Gustave Eiffel; ⁴Ecole Centrale de NANTES; ⁵WPD

ID: 10939

B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Keywords: Partial discharge, Cable, Termination, Acoustic measurement, RFI measurement

Identification of Partial Discharges in Cable Terminations using Methods based on acoustic, electromagnetic and electrical Measurements

Juhani TAMMI¹, Tuukka SYRJÄNEN¹, Robert ALBRECHT², Kim BACKMAN³, Kari LAHTI⁴, Pertti PAKONEN⁴

¹Fingrid Oyj; ²NL Acoustics; ³Prysmian Group Finland; ⁴Tampere University

ID: 10961

B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Keywords: Single Point Bonding of 3-core Submarine Cables

Single Point Bonding of 3-core Submarine Cables

Espen OLSEN, M. HOVDE

Nexans Norway AS

ID: 11028

B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Keywords: Performance and characterization tests on HPTE insulation material

Performance and characterization tests on HPTE insulation material

Grazia BERARDI

Prysmian Group Italy

ID: 11070

B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Combined Type Test of HVDC Cable System with Integrated DC GIS Components for U₀ = ±525 kV

Dominik HAERING¹, Shoji MASHIO²

¹Südkabel GmbH, Germany; ²Sumitomo Electric Industries, Japan

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B1 INSULATED CABLES - Full Papers

Topics: PS2 - Future Functionalities and Applications

Influence of Cabling on Harmonic Voltages in a Transmission Grid using an Exemplary Test Grid

Andrea Kerstin SCHAEFER¹, Simon MASSAT², Jutta HANSON³, Gerd BALZER⁴

¹Technische Universität Darmstadt, Germany; ²Technische Universität Darmstadt, Germany; ³Technische Universität Darmstadt, Germany; ⁴Technische Universität Darmstadt, Germany

PS 3 TOWARDS SUSTAINABILITY

ID: 10692

B1 INSULATED CABLES - Full Papers

Topics: PS3 - Towards Sustainability

Keywords: Conduit, Duct, Pre Laying, Urbanization, Environmental Impact

Replacement by utilizing existing Facilities for EHV Underground Transmission Lines

Tadahiko SHIRO, Ryosuke ISHII, Masataka OGURA

Kansai Transmission and Distribution, Inc.

ID: 10717

B1 INSULATED CABLES - Full Papers

Topics: PS3 - Towards Sustainability

Keywords: Sustainability; power cable

Towards Sustainability: A Power Cable Industry Supplier's Perspective

Marc BAILLEUL, Annika SMEDBERG, Elisabeth RIBARITS, Davide VIELMI

BOREALISGROUP

ID: 10962

B1 INSULATED CABLES - Full Papers

Topics: PS3 - Towards Sustainability

Availability modelling of submarine high voltage Cable Systems

Abbas LOTFI, M. TANDBERG, Ø. BERGENE

Nexans Norway AS

B2 - OVERHEAD LINES

PS 1 CHALLENGES & NEW SOLUTIONS IN DESIGN AND CONSTRUCTION OF NEW OHL

ID: 10155

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Keywords: distribution line, transmission line, National Electric Safety Code, railroad line crossing, right-of-way

Resilience and Reality: Unique Challenges and Learnings from Circuit Resiliency Project Planning and Execution

Justin KLEEHAMMER

Commonwealth Edison, United States of America

ID: 10300

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Analysis of The Ice-shedding of Wire Based on Elastic Deformation Principle

Haiyun NI, Rongjian LIU, Erlei TANG, Kunchi YANG

Yunnan Power Grid CO., LTD, China

ID: 10362

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Plastically Compacted Steel - aluminium Wires for New Overhead Lines

V. KURYANOV¹, L. GYREVICH², L. TIMASHOVA³, V. FOKIN⁴

¹NRU "Moscow Power Engineering Institute"; ²Volgograd State Technical University; ³JSC "R&D Center "FGC UES"; ⁴LLC "Energoservis"

ID: 10364

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Selection System of High-voltage External Insulation for A.C. and D.C. Electric Transmission on the Basis Pollution Mapping

L.L. VLADIMIRSKII, O.V. SUSLOVA

JSC «NIIPT»

ID: 10445

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Selection of Porcelain Insulator Components for Transmission Lines in High Altitude and Exposure to Ice and Snow

Sakthivelu SUBRAMANIAN

Grasim Industries Ltd (Unit: Aditya Birla Insulators)

ID: 10446

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Design and Testing of UHV 765/400 KV Transmission Line Monopole Structures Powergrid's Experience

Karan Vir Singh PUNDIR

Power Grid Corporation of India Ltd.

ID: 10447

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Improvement of Bearing Capacity of Soil using Bamboo Nailing and Sand Piling for 400kV Transmission Line Tower Foundations in Tripura, India

L K KHAJKUMAR

Power Grid Corporation of India Ltd.

ID: 10449

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Design Innovations for Mitigating Construction Challenges of Overhead Lines

Subhash C TANEJA

Power Grid Corporation of India Ltd.

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B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Full Scale Test of the 400 kV double circuit pylons (Wintrack type III)

J. SPITHOVEN¹, J. VERDUIJN¹, M.R. SHAH MOHAMMADI², T.J. PLOEG², E. PLATENKAMP²

¹TenneT TSO; ²DNV Energy Systems

ID: 10629

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Keywords: Overhead Transmission Lines, Wind Resistant Design, Equivalent Static Wind Load, Basic Wind Speed Map, Snow Resistant Design, Wet-Snow Accretion, Snow Load Map, Seismic Resistant Design, Layer Shear Force Coefficient Method

Latest design Standard on Structures for Transmissions in Japan

Yoshikazu KITANO¹, Soichiro SUGIMOTO¹, Yusuke SATO¹, Shinya HATAKEYAMA², Tomoaki OSONO³, Hiroshi SHIGEMOTO⁴

¹CRIEPI; ²Tohoku Electric Power Network Co., Inc.; ³TEPCO Power Grid, Inc.; ⁴Kansai Transmission and Distribution, Inc.

ID: 10669

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Keywords: test methods, composite insulator, reliability, OHL

Applications of multi-stress Test Methods to evaluate today's Composite Insulator Reliability

Jaka STRUMBELJ¹, Christiane BAER¹, Jan LACHMAN², Frank SCHMUCK³

¹PFISTERER Switzerland AG; ²EGU - HV Laboratory a.s. Czech Republic; ³Schmuck HV Insulation Consulting GmbH Switzerland

ID: 10757

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

RTV Coated Insulators in Harsh Desert Environment

Raouf ZNAIDI, Faisal HUDA, Javier GARCIA, Ahmad ALTHAGAFI

GCCIA, KSA

ID: 10797

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Keywords: Hybrid Transmission Line, HVDC Electric Field, Ion flow

Electrical environment evaluation of HVAC/HVDC hybrid transmission line using a reduced scale-model

Koo Yong SHIN¹, J.A OH¹, S.W LEE¹, T.W KIM¹, J.M WOO², M.N JU²

¹KEPCO, Korea, Republic of (South Korea); ²KERI, Korea, Republic of (South Korea)

ID: 10852

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Electromagnetic interference investigation of two overhead lines with a natural buried gas pipeline: An investigation on the Agri-Horasan Region in Turkey

Özgür ÇETİN¹, Hıdır DÜZKAYA², Cengiz TAPLAMACIOĞLU³

¹Turkish Electricity Transmission Corporation Ankara, Turkey; ²Gazi University Department of Electrical and Electronic Engineering Ankara, Turkey; ³Gazi University Department of Electrical and Electronic Engineering Ankara, Turkey

ID: 10853

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Site Application of Anti Torsion Pendulum and Interphase Space for the Prevention of Ice Load on Transmission Line Systems in Turkey

Mete UZAR¹, Wolfgang TROPFAUER², Dilek GURSU³, Aytaç SAĞIR⁴

¹TEIAS, Turkey; ²Mosdorfer GmbH, Austria; ³T Design, Turkey; ⁴TEIAS, Turkey

ID: 10914

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Affordable towers compaction using aerospace-borrowed lattices

José Ramón LÓPEZ-BLANCO¹, Pablo RODRÍGUEZ-HERRERÍAS², Carlos GARCÍA-BARRIOS²

¹Anisopter Insightful Research; ²Red Eléctrica de España

ID: 10963

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Worlds longest Span with ACSR Conductor – Design challenges

Boris ADUM, Kjell HALSAN

Statnett SF

ID: 10974

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Design of Overhead Lines in a changing Climate

Emilie IVERSEN¹, Bjørn Egil NYGAARD¹, Ø. HODNEBROG², M. SAND², M. RADOJCIC³

¹Kjeller Vindteknikk, part of Norconsult; ²CICERO; ³Statnett SF

ID: 10975

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Structural reliability analysis of Transmission ILine towers by use of advanced Weather Modelling

Andreas LEM¹, Ø. LANDE², S. GRINI³

¹Statnett; ²DNV; ³KVT / Norconsult

ID: 10976

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Development of Aluminium Tower for 420 kV AC line to reduce environmental impact and safety risks under construction

Gilles SABATIER-OLNE¹, Andreas LEM², Øyvind WELGAARD²

¹Efla AS; ²Statnett SF

ID: 11024

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Development of lifting device for raising height of existing towers of overhead lines

Łukasz NAZIMEK, Sławomir LABOCHA, Robert CZYZ

ENPROM Sp. z o.o.

ID: 11076

B2 OVERHEAD LINES - Full Papers

Topics: PS1 - Challenges & New Solutions in Design and Construction of New OHL

Design and construction of a high and heavy lattice tower for 380 kV transmission line

Kyriaki GÜNTHER – PAPADOPOULOU¹, Josef GLÖGGLER EQOS²

¹TenneT TSO GmbH, Germany; ²Energie Deutschland GmbH

PS 2 LATEST TECHNIQUES IN ASSET MANAGEMENT, CAPACITY ENHANCEMENT, REFURBISHMENT

ID: 10278

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Keywords: pollution, insulators, silicone coating, glass insulators, maintenance

Overhead Line Insulators in Operating Constraints Under Severely Polluted Conditions: the Benefits of Silicone Coated Glass Insulators and their Application at the PG&E Diablo Canyon Nuclear Power Plant

Craig ESPINOSA¹, Do VO², Jean-Marie GEORGE³

¹Sediver, United States of America; ²Pacific Gas and Electric, United States of America; ³Sediver, France

ID: 10302

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

A Novel Method for Pollution Detection of External Insulation

Guangning WU, Yujun GUO, Xueqin ZHANG, Guizao HUANG, Chengfeng YIN

Southwest Jiaotong University, China

ID: 10303

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Experimental Study of Dynamic Bending Stiffness of Overhead Conductors with Formed Wires

Zhao ZHANG, Shengchun LIU, Yi QI, Jian ZHANG, Zhen LIU, Long LIU

China Electric Power Research Institute, China

ID: 10363

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Application of a Fibre Bragg Grating-based Sensing System for Icing Detection and Structural Health Monitoring of Transmission Lines in Russia

A.V. VANYAKIN, A. LIKHOBABIN

«Souztechenergo», JSC

ID: 10515

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Countermeasures for high and extreme ice loads typical for Norwegian environment based on concept of heatin

Andreas DERNFALK¹, Christian AHLHOLM¹, Johan LUNDENGÅRD¹, Igor GUTMAN¹, Boris ADUM²

¹Independent Insulation Group, Sweden; ²Statnett, Norway

ID: 10540

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

How to increase Resilience by assessment based on study case 400 kV Overhead Line Stevin – Horta in Belgium

P. SMET¹, B. RISSE¹, T.J. PLOEG², E. PLATENKAMP²

¹ELIA Asset SA; ²DNV Energy Systems

ID: 10577

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Artificial Intelligence in the Diagnosis of Fault Causes in Transmission Lines

Oswaldo ARENAS

INTERCOLOMBIA

ID: 10580

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Preparatory analysis to establish a reliable and efficient DLR system

Balint NEMETH, Gabor GOCSEI, Levente RACZ, David SZABO

Budapest University of Technology and Economics, Hungary

ID: 10624

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Keywords: Transmission overhead lines monitoring, sag monitoring, strain monitoring, weather station

Corelation between tensile Force in Conductors and Stress loading of tensile Towers

Nenad GUBELJAK¹, Viktor LOVRENCIC², Kresimir BAKIC³, Dusan KOZJEK⁴

¹University of Maribor, faculty of Mechanical Engineering, Slovenia; ²C&G d.o.o., Ljubljana, Slovenia; ³ELES, d.o.o., Ljubljana, Slovenia; ⁴ELES, d.o.o., Ljubljana, Slovenia

ID: 10630

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Keywords: Transmission line, Transmission steel tower, Inspection, Repairing, AI, Deep learning, Drone, Carbon fiber-reinforced plastic

Deterioration diagnosis-imaging Technology and deterioration countermeasure Technology for overhead transmission line

Kensei YAMAMOTO, Tomoaki OSONO, Hiroyuki MIYOSHI, Tomoaki KAWAMURA, Motoyuki YAMAZAKI, Tomonori SHIRAISHI

TEPCO Power Grid, Inc

ID: 10631

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Keywords: HTLS, ACFR, TACFR, CFCC, Composite conductor, Long term reliability evaluation, Fitting

Evaluation of long-term Reliability of the carbon fiber core Wire and Development of Technologies to expand its Application

Hiroaki SASA¹, Tomoyuki AOYAMA¹, Naohiko SUDO¹, Kiyonobu NARA², Takao KANEKO³, Mami NAKAGAWA⁴

¹Tohoku Electric Power Network Co., Inc.; ²Kitanihon Electric Cable Co., Ltd.; ³Fujikura Ltd.; ⁴Furukawa Electric Power Systems Co., Ltd.

ID: 10632

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Keywords: Melted conductor, Melted strand, Residual tensile strength, Simple repair

Evaluation of residual mechanical performance of damaged conductor strands due to AC fault arcs for rational repair of overhead line

Keisuke SUGITA, Tomoki MIYOSHI, Tomoaki SEI, Satoru YOSHIDA

Chubu Electric Power Grid Co., Inc.

ID: 10633

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Keywords: Atmospheric corrosion, Under-film corrosion, Deposition, Sea salt, Paint, Transmission tower, Hot-dip galvanizing, Hot-dip zinc-aluminum alloy galvanizing, Maintenance, Life, Cost

Rationalization of maintenance Methods for hot-dip galvanizing transmission Tower

Teruhisa TATSUOKA¹, Hiromitsu IJICHI¹, Keiichi YOSHINO¹, Tomoaki KAWAMURA², Motoyuki YAMAZAKI², Tomonori SHIRAISHI²

¹Tokyo Electric Power Company Holdings, Inc.; ²TEPCO Power Grid, Inc.

ID: 10634

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Keywords: Overhead Transmission Line - Galloping - Bundled Conductor - Spacer - Rotative Clamp, Full Scale Test Line, Observation, Numerical Simulation, Wind Tunnel Test

Efficacy of Loose Spacers in Mitigating Galloping of Bundled Conductors

Tomoki KITASHIMA¹, Takeshi FUJIMOTO¹, Hisato MATSUMIYA², Takuhiko OHASHI³, Tomonori SHIRAISHI⁴, Fumito MINOURA⁴

¹Furukawa Electric Power Systems, Co. Ltd.; ²Central Research Institute of Electric Power Industry; ³TEPCO Power Grid, Inc.; ⁴Tokyo Electric Power Company Holdings, Inc.

ID: 10670

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Keywords: transmission capacity, upgrading HV lines, insulated suspension chain

Upgrading the transmission capacity of existing high voltage lines using insulated suspension chain ISC

Toni WUNDERLIN

AXPO GRID AG Switzerland

ID: 10698

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

A Study on the Life-Time Assessment Ways and Various Failure Types of 154kV Porcelain Insulators Installed in South Korea

Jabin KOO¹, Wonkyo LEE¹, Taeyong KIM²

¹KEPCO; ²Sungkyunkwan University

ID: 10718

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Keywords: inspection techniques; digital tools; overhead lines

Innovative inspection techniques and digital tools for condition follow-up of overhead lines in Belgium

Stephane GERMAIN, Emmeline VRANKEN, P. BUNGA, L. COLLIN, Bernard RISSE

ELIA

ID: 10766

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Keywords: NG, Utilization, Silicon grass, RTV, NSDD

Operational Evaluation of RTV Coating Performance over 17 years on the Coastal Area at Jubail-SA

Jaafar ALTHAWAB, Musleh ALAMERI

Saudi Electricity Company- National Grid SA, Saudi Arabia

ID: 10887

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Metamodel applied to fatigue damage in overhead lines conductors

Julien SAID¹, S EL IDRISSE RAGHINI², M GUEGUIN², E CIEREN², L COHEN¹, F HAFID¹, J.M. GHIDAGLIA³, M COULANGEON⁴, J BROCARD⁴

¹RTE France; ²EUROBIOS; ³Centre Borelli-ENS Paris-Saclay-CNRS-Université Paris-Saclay; ⁴DERVAUX, SICAME GROUP

ID: 10911

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Dynamic line rating in the Spanish overhead transmission network

Antonio USEROS, Alexandra BURGOS, Lucia MATEO, Ricardo REINOSO, José María ABAD, Agustín GUTIERREZ

Red Eléctrica de España

ID: 11074

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Probabilistic safety concept in overhead line construction

Stefan STEEVENS¹, Niklas WINKELMANN²

¹Amprion GmbH, Germany; ²Amprion GmbH, Germany

ID: 11141

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Case Study: Measuring the Size of Electrical Conductors using Lidar Scanning

Brian OBERMEIER

Burns & McDonnell, United States of America

ID: 11142

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Towards a predictive model for the residual strength of PMC composite core in HTLS conductors in function of the operating conditions

Baptiste GARY¹, José PORTOLES¹, Maeva CHAMBAUD¹, Haithem BEL HAJ FREJ², Xavier COLIN²

¹Epsilon Composite France; ²ENSAM France

ID: 11143

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

An Empirical Analysis of the Operational Efficiencies and Risks Associated with Static, Ambient Adjusted, and Dynamic Line Rating Methodologies

Kristine ENGEL*¹, Jonathan MARMILLO¹, Mahraz AMINI², Hamid ELYAS², Babak ENAYATI²

¹LineVision Inc., United States; ²National Grid USA

ID: 11144

B2 OVERHEAD LINES - Full Papers

Topics: PS2 - Latest Techniques in Asset Management, Capacity Enhancement, Refurbishment

Full-Scale Tests for the Purpose of Verifying the Method for Determining the Boom of the Wire Sag by the Period of its own Oscillations

Danil YAROSLAVSKY^{1*}, Marat SADYKOV, Mikhail GORYACHEV

Kazan State Power Engineering University, Russian Federation

See also [C3 PS3](#)

ID: 10135

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Development of Methodology for Insulator Replacement in ± 800 kV DC Strings Using Live Line Procedures

R GARCIA¹, J CARDOSO¹, F SILVA¹, C MATT¹, P MARCONDES², L SENNA², D MACHADO², F FARIA², R COSTA², J GRAHAM², A NIGRI³
¹CEPEL; ²SGBH; ³AINIGRI

ID: 10138

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Wildfire Detection System Using Artificial Intelligence with the Collaboration of the Web Society

C NASCIMENTO¹, A LISBOA², H YEHIA³, H MAGALHÃES³, A NETO⁴, A BARBOSA³, P VENÂNCIO², T REZENDE², A MAGALHÃES⁵, R CAMPOS⁶, M MELO³, G CABELO³, D LIMA⁷, M SOUZA⁷
¹CEMIG D; ²Gaia Solutions on Demand; ³UFMG; ⁴UFVJM; ⁵PUC-MG; ⁶UNIFEI; ⁷Raro Labs

ID: 10146

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Keywords: transmission, reliability, probabilistic modeling, Monte Carlo, simulation

Transmission System Reliability in the Face of Climate Change

Razib HASAN¹, Matthew VIELE¹, William WINTERS¹, John HAUFLE¹, David J. ALLEN²
¹Con Edison, United States of America; ²The Risk Research Group, United States of America

ID: 10152

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Keywords: conductive clothing, AC induction, induced voltage, induced current, proximity work

Development of a Novel Conductive Garment for Protecting Linemen against Transmission Line Induction

Eduardo RAMIREZ BETTONI¹, Balint NEMETH³, Richard CSELKO²
¹Xcel Energy, United States of America; ²High Voltage Laboratory Budapest (BME), Hungary; ³Electrostatics Ltd., Hungary

ID: 10304

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Next-Generation Intelligent Maintenance for Over-Head Electric Power Facilities Using Edge Cloud Collaboration

Hua WU¹, Xiaojing BAI¹, Zengguang OU², Qi ZHANG²
¹North China Electric Power University, China; ²Huawei Cloud, China

ID: 10306

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Altitude correction method of electromagnetic environment for HVDC transmission line and its engineering application

Luxing ZHAO¹, Lei GAO², Jiayu LU¹, Chao LIU², Li XIE¹, Yong JU¹, Feng BAI¹
¹China Electric Power Research Institute, China; ²Electric Power Research Institute of State Grid Tibet Electric Power Co., Ltd.

ID: 10361

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Experience Use of Bird Protection Devices on Power Lines and Environmental Impacts

E.V. LIAPUNOV, Y.V. ZHILKINA
Federal Grid Company of Unified Energy System

ID: 10448

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Powergrid Experience on Installation of Transmission Line Arresters in EHV Transmission line

Navin Kumar MAHATO
Power Grid Corporation of India Ltd.

ID: 10546

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Safe Management of Work in High-Voltage Overhead Lines in The Netherlands

J.R. MEIJERS¹, S.P. GELDERBLOM²

¹QIRION; ²SPIE

ID: 10576

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Optimization of Vegetation Management with Lidar Inspection. Real Application Case

David Ernesto GOMEZ

INTERCOLOMBIA

ID: 10719

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Keywords: Environmental impact;mitigation;110 kV

Environmental impact mitigation for new 110 kV line in natural protected area

Jean-François GOFFINET, N. BLANPAIN, R. MARCHAL, B. VAN ZEGBROECK

ELIA

ID: 10775

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Keywords: Magnetic field, Environmental Impact, Passive Loops, Overhead lines

Design and protection criteria for passive loops on a 400 kV double circuit line

Lorenzo PAPI, Luca BUONO, Piero BERARDI, Gianluigi GEMELLI, Francesco PALONE, Alberto PICCININ, Roberto SPEZIE, Marco VALENTE

TERNA RETE ITALIA S.p.A

ID: 10776

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Keywords: Overhead lines, Environmental Impact, Resilience, Grid-flexibility, Pole Mounted Switchgear

Refurbishment of sectionalizing posts on 245 kV towers for a reduced visual impact and an increased line resilience

Francesco PALONE, Roberto SPEZIE, Andrea VALANT, Dario POLINELLI, Luca BUONO

TERNA S.p.A. Italy

ID: 10888

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Keywords: Helicopter, Tower, lifting, Power line, footprint, Eurocode.

Overhead towers specially designed to be lift by helicopters.

Bruno BARONIAN

AIRTELIS

ID: 10889

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Keywords: Keywords Compositetpylon, composite insulators, public acceptance, environmental impact

2x400kV composite pylon ready for use, nnovative and compact – reducing the impact of OHTL considerable

Stéphane MORICE¹, H SKOUBOE², E FREDERIKSEN³, Julien BROCARD⁴, M DOMM⁵

¹NEXANS; ²BYSTRUP; ³VALMONT; ⁴DERVAUX; ⁵REINHAUSEN POWER COMPOSITES

ID: 10908

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Compliance analysis of exposure limit values of power frequency electromagnetic fields during live-line working on HV overhead lines

Iván HIGUERO-TORRES¹, Guillem GIL-PRIETO¹, Vicente FUSTER-ROIG²

¹Instituto Tecnológico de la Energía (ITE); ²Instituto de Tecnología Eléctrica, Universitat Politècnica de València

ID: 10915

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

A wearable system for Work at Height Safety Management

Pablo RODRÍGUEZ¹, Carmen M^a PEDRAZA¹, Carlos RODRÍGUEZ¹, Rafael MESIA¹, Javier VALDÉS², Abel SANCHO²

¹Grupo Red Eléctrica; ²Advanced Optical Systems

ID: 11145

B2 OVERHEAD LINES - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (joint PS with C3)

Correlation of the Surface Wettability and the Audible Noise Emission of Overhead Line Conductors

Hannah KIRCHNER, C. M. FRANCK

ETH Zürich, Switzerland

B3 - SUBSTATIONS & ELECTRICAL INSTALLATIONS

PS 1 INCREASED IMPACT OF CLEAN ENERGY TRANSITION ON SUBSTATION DESIGN

ID: 10454

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS1 - Increased Impact of Clean Energy Transition on Substation Design

Battery Energy Storage System at Low Voltage Electricity Distribution Network – A Case Study

Naveen NAGPAL, Sugandhita WADHERA

BSES Rajdhani Power Limited (BRPL), India

ID: 10671

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS1 - Increased Impact of Clean Energy Transition on Substation Design

Keywords: data center, power supply, sustainable

An incremental approach to sustainable data center power supply

Alexandre OUDALOV¹, M. GIESE², K. LAINEZ AMAYA³, S. TROLLE³

¹Hitachi Energy Switzerland; ²Hitachi ABB Powergrids Germany; ³Hitachi ABB Powergrids Sweden

ID: 10890

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS1 - Increased Impact of Clean Energy Transition on Substation Design

Distributed subsea substation for Offshore Renewable Energy collection architectures and compliance with metal-enclosed switchgear's normative references

Isabelle NAJARRE, F. JACQUIER, A GIRODET, M HENRIKSEN, L DALMAR

SuperGrid Institute

ID: 10891

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS1 - Increased Impact of Clean Energy Transition on Substation Design

Keywords: HV compact Indoor Air Insulated Substation, GIS, Technical strategy, QUINET

RTE compact substation industrial strategy due to clean energy transition

Bastien GUERINI, Antoine PETIT

RTE France

ID: 10902

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS1 - Increased Impact of Clean Energy Transition on Substation Design

Keywords: switchgear, offshore wind, high voltage, wind turbine connection, offshore array

PASS M00 Wind – A versatile and robust 66 kV switchgear solution for offshore wind tower

Ennio ERRICO

Hitachi ABB Power Grids Italy S.p.A.

ID: 10998

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS1 - Increased Impact of Clean Energy Transition on Substation Design

Keywords: Substation, TPA, RE, STATCOM, Relocatable Containerized STATCOM (RC STATCOM), Relocation and Containerized solution

Design and Consideration for Relocatable Containerised STATCOM Installation to Provide Grid Flexibility and Stability

Nabhat CHAIYAPHAN

TNC-CIGRE, Thailand

ID: 11001

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS1 - Increased Impact of Clean Energy Transition on Substation Design

Keywords: RE, BESS, Substation, RE smoothing, Safety in design, Lithium-ion battery, Grid Scale

Pilot Project Grid Scale BESS in EGAT system

Suriya PRUNGKHWUNMUANG, Jarawan PIPHATMONGKOLPORN, Wasin APHICHATO

TNC-CIGRE, Thailand

ID: 11079

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS1 - Increased Impact of Clean Energy Transition on Substation Design

Feasibility Tests of a 320 kV Gas-insulated DC Switchgear with Clean Air

Karsten JUHRE¹, Maria KOSSE²

¹Siemens Energy, Germany; ²Technische Universität Berlin, Germany

PS 2 SUSTAINABILITY MANAGEMENT CHALLENGES IN SUBSTATIONS

ID: 10107

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: SF6-free, Fluoronitrile, C4-FN, C4-FN/CO2/O2, EHS, toxicity, REACH

Health and safety assessment of an SF6-alternative gas technology

Fabrice PERROT¹, Yannick KIEFFEL², Bertrand PORTAL², Maxime PERRET³, Jason BONK⁴, John OWENS⁴, Rainer KURZ⁵

¹GE United Kingdom; ²GE France; ³GE Switzerland; ⁴3M Company United States; ⁵3M Deutschland GmbH Germany

ID: 10139

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

New Electrical Automation Engineer Profile and Curriculum

M MENDES

Itaipu Binacional

ID: 10140

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Use of Additive Manufacturing in the Maintenance of Static Compensator

IonyA PINHEL

Furnas Centrais Eléctricas S.A.

ID: 10210

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: greenhouse gases, embodied carbon, Global Warming Potential (GWP), Environmental Product Declaration (EPD), Building Information Modeling (BIM)

Using BIM Technology to Promote the Sustainability of Electrical Substation Projects

Prapon SOMBOONYANON¹, Lyndsey COVERT¹, Brian PALMER²

¹Burns & McDonnell, United States of America; ²Burns & McDonnell, United Kingdom

ID: 10258

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Short-circuit Currents Management at Hydro-Quebec Uprating Versus Limiting Solutions Study

Frédéric DUBÉ

Hydro-Québec

ID: 10318

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: Reliability Management, Maintenance Free, Condition Monitoring, Quality improvement

Reliability Management Strategy for Power Systems Maintenance free

Jaejung KIM, Changhui KIM

HYOSUNG Corporation, Korea, Republic of (South Korea)

ID: 10321

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: Mobile solution, Substation, Cost down

Mobile Solution for Substation Intervention

Minsoo LEE, Ilhoon MOON, Taesung RHO

HYOSUNG HEAVY INDUSTRIES, Korea, Republic of (South Korea)

ID: 10672

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: C4F7N

Return of experience on high voltage equipment in operation using C4F7N mixtures

Maxime PERRET¹, M.M. WALTER¹, Robert LUESCHER¹, Y. KIEFFEL², D. LEGUIZAMON-CABRA², T. BERTELOOT²

¹GE Grid Solutions Switzerland; ²GE Grid Solutions France

ID: 10673

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: SF6, sealing switchgear compartments

Improved sealing of SF6 gas insulated switchgear compartments

Patrick C. STOLLER, Nathan MUEHLBERG, Loic FAVE, Patrick P. MEIER

Hitachi Energy Switzerland

ID: 10674

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: SF6, SF6 alternative, insulation gas, life cycle, high voltage

Life cycle comparison of different high voltage substation technologies using SF6 and alternative insulation gases

M. TREIER¹, L. PERRET¹, Y. KIEFFEL², E. LAURELLE², B. PORTAL², I. HUET²

¹GE Grid Solutions Switzerland; ²GE Grid Solutions France

ID: 10699

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: maintenance, reliability, power transformer

Economic Maintenance Planning of Power Transformer for Expected Cost

Joongwoo SHIN, Jaechul KIM, Kwanghoon YOON

Soongsil University, Korea, Republic of (South Korea)

ID: 10734

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: Knowledge transfer, On the Job Training, PPT framework, Skill, MR - 3DCAD, Digitalization

Knowledge Transfer of Substation Engineering and Experiences in Japan

Yuichiro YAMANE¹, Toshiyuki SAIDA², Akira IWATA³, Koichi TAKETA⁴, Ryo SAEKI⁵

¹Hitachi, Ltd.; ²Toshiba Energy Systems & Solutions Corp.; ³Chubu Electric Power Grid Co., Inc.; ⁴Kansai Transmission and Distribution, Inc.; ⁵TEPCO Power Grid, Inc.

ID: 10735

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: 500 kV Substation, Replacement Work, Maintaining Equipment Reliability, Improving Maintainability and Operability, Resilience, Minimizing De-energization Area and Duration

Life Management and Improvement of Reliability, Maintainability and Operability of 500 kV Substations by Replacing Ageing Equipment

Koichi TAKETA¹, Yasuhito HASHIBA¹, Shinya KAWANO¹, Keita ITO², Mieko NAKANO², Hiroyuki HAMA²

¹Kansai Transmission and Distribution, Inc.; ²Mitsubishi Electric Corporation

ID: 10736

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: Switchgear, SF6 gas, Leakage, Handling standard, Alternative, Study group, Requirement

Management of SF6 Gas Leakage from Substation Equipment and Technical Guidelines on Application of Substation Equipment using SF6 Alternative Gases in Japan

Keisuke NAKAMURA¹, Shigeyuki TSUKAO¹, Takanori NISHIOKA², Koichi TAKETA³, Toshiyuki UCHII⁴, Hiroyuki HAMA⁵

¹TEPCO Power Grid, Inc.; ²Chubu Electric Power Grid Co., Inc.; ³Kansai Transmission and Distribution, Inc.; ⁴Toshiba Energy Systems & Solutions Co.; ⁵Mitsubishi Electric Co.

ID: 10737

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: Resilience, Inundation, Hazard map, Robot, Mobile substation, Waterproof

Resilience Reinforcement of Substations in Japan

Takanori NISHIOKA¹, Mitsunao IWATA¹, Takashi CHIBA², Koichi TAKETA³, Satoshi ICHIHARA⁴

¹Chubu Electric Power Grid Co., Inc.; ²Tohoku Electric Power Network Co., Inc.; ³Kansai Transmission and Distribution, Inc.; ⁴TEPCO Power Grid, Inc.

ID: 10892

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: SF6 free, load-break switch, cyber-security, Shunt Vacuum Interruption, LPVT

The Ring Main Unit of the future for MV distribution networks: sustainable, digital and designed with circular environmental perspectives

Christophe PREVE¹, Stéphane GADAY¹, Venanzio FERRARO¹, Thierry CORMENIER¹, Dominique SERVE¹, François TRICHON¹, Daniel PICCOZ²

¹SCHNEIDER ELECTRIC; ²Daniel PICCOZ SASU France

ID: 10893

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: EHV Substation, Nuclear Power Plant, Disconnecting Circuit Breaker, SF6 gas

Innovative "3D architecture" for an air-insulated substation of nuclear power plant

Damien JOUAN¹, Christophe ELLEAU²

¹EDF CNEPE; ²EDF CIST

ID: 10894

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Keywords: SF6 free-gas, Fluoronitrile, 420 kV, Gas Insulated Line (GIL), Retrofit, Global Warming Potential (GWP)

Way to retrofit 420 kV GIL with fluoronitrile-based gas mix

Thibaut MAUFFREY

GENERAL ELECTRIC France

ID: 10972

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Seismic Level Criteria for Electrical Substations in Colombia and Peru According to IEEE 693

Luis MUNOZ

ISA

ID: 10978

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

TSO perspectives on 40 years of GIS evolution, including SF6 issues, maintenance strategy and specifications recommendations.

Guilhem BLANCHET¹, C. LEPOSTEC², M. INVERSIN³

¹Statnett SF, Norway; ²Hydro Quebec, Canada; ³RTE, France

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

End-of-life procedures and gas reconditioning of SF6 alternative gas mixtures

Sebastian GLOMB¹, Peter PILZECKER²

¹DILO Armaturen und Anlagen, Germany; ²DILO Armaturen und Anlagen, Germany

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

First F-gas-free and climate neutral insulated 420 kV GIS busducts installation at TransnetBW

Mark KUSCHEL¹, Laurentiu Viorel BADICU²

¹Siemens Energy AG, Germany; ²TransnetBW GmbH, Germany

ID: 11167

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS2 - Sustainability Management Challenges in Substations

Contribution to the reduction of global environmental impact through the introduction of environmentally friendly distribution substation

Hiroki KATO

Chubu Electric Power Grid Co., Inc. Japan

PS 3 INTEGRATION OF INTELLIGENCE ON SUBSTATIONS (JOINT PS WITH B5)

See also [B5 PS3](#)

ID: 10188

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: IEC 61850, digital substation, artificial intelligence, synchrophasors, sampled values

Data Sources for Machine Learning Applications in IEC 61850-based Digital Substations

Alexander APOSTOLOV

OMICRON electronics, United States of America

ID: 10189

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: substation design, building information modelling, intelligent design, information technology, BIM software

Results and Lessons Learned from Early Adopters of BIM Technology for Substation Design

Arnold FRY

POWER Engineers, United States of America

ID: 10192

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: IEC 61850, digital smart substation, goose messaging, sampled values, 8500 prints

ComEd's Experience with IEC 61850 at a Digital Smart Substation

John BETTLER, Matthew ROSS

Commonwealth Edison Company, United States of America

ID: 10194

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: substation, robotics, circuit breakers, remote racking, semi-autonomous

Semi-Autonomous Robot for Medium-Voltage Switchgear

Sergo SAGARELI¹, Aalap SHAH²

¹Con Edison of NY, United States of America; ²ULC Technologies, United States of America

ID: 10207

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: Estimation Based Protection (EBP), centralized substation protection, hidden failures, self-healing, coordination free protection

Resilient Cyber Secure Centralized Substation Protection

Athanasios P. MELIPOULOS¹, George J. COKKINIDES¹, Paul MYRDA², Evangelos FARANTATOS², Ramadan ELMOUDI³, Bruce FARDANESH³, George STEFOPOULOS⁴, Clifton BLACK⁵

¹Georgia Institute of Technology, United States of America; ²Electric Power Research Institute, United States of America; ³New York Power Authority, United States of America; ⁴Boston Government Services, United States of America; ⁵Southern Company, United States of America

ID: 10208

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: waveform analysis, incipient fault detection, condition-based maintenance, waveform monitoring

Substation-based Waveform Analytics Monitoring System for Improved Circuit Awareness

Jeffrey A. WISCHKAEMPER, Carl L. BENNER, B. Don RUSSELL, Karthick MANIVANNAN

Texas A&M University, United States of America

ID: 10259

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Condition Assessment of Substation Apparatus - The Challenges of Turning Dreams into Reality

Claude RAJOTTE

Hydro-Québec

ID: 10284

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: machine learning, out-of-distribution, hybrid machine learning

Practical Machine Learning Applications

Tony MCGRAIL¹, Tom RHODES³, Imene MITICHE⁴, Falk WERNER¹, Philip BOREHAM²

¹Doble Engineering, United States of America; ²Doble Engineering, United Kingdom; ³Duke Energy, United States of America; ⁴Glasgow Caledonian University, United Kingdom

ID: 10288

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: condition monitoring, response plan, contextual analysis

Lessons from Action Planning Based on Transformer Condition Monitoring

Tony MCGRAIL¹, Phillip PROUT², Steven RHOADS², Jamie BEARDSALL³, Mark ROWBOTTOM³, Tommy SALMON⁴, Philip BOREHAM⁵

¹Doble Engineering, United States of America; ²National Grid, United States of America; ³Drax Power, United Kingdom; ⁴Dominion Energy, United States of America; ⁵Doble Engineering, United Kingdom

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Research and Judgement on Technical Development Trend of Substation Secondary System in China

Mingjie LI¹, Yu LIU¹, Zhihui SHU¹, Zexin ZHOU¹, Zhongqing LI², Renhui DOU², Xuewei DOU²

¹State Grid of China, China; ²China Electric Power Research Institute China, China

ID: 10315

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Panoramic perception of substation equipment and smart maintenance technology

Renhui DOU¹, Naichao CHANG², Yang SUN², Chen FAN¹, Zexin ZHOU¹

¹State Grid of China, China; ²China Electric Power Research Institute China, China

ID: 10319

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: AHMS(Asset Health Management System), Substation, Mozambique

Application of Substation Asset Health Management System(AHMS) for a Utility in Mozambique

Hwangdong SEO, Sungjik KIM, Jaeryong JUNG

HYOSUNG Corporation, Korea, Republic of (South Korea)

ID: 10366

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Integrated Intellectual Automated System of Monitoring, Diagnosis and Control of Power Transformer Stock Technical Condition

D.A. VODENNIKOV¹, I.V. DAVIDENKO², A.V. SELIKHANOVICH³, L.M. POSPEEV³

¹Federal Grid Company of Unified Energy System; ²Ural Federal University named after the first President of Russia B.N. Yeltsin; ³MTK Biznes.Optima" LLC

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Autonomous Software and Hardware Complex for Preventing Technological Defects of the Basic Substation's Equipment Based on Remote Monitoring Data

G.K. GLADKOVSKII¹, I.L. ARKHIPOV¹, D.S. KAPUSTIN¹, E.V. MAGADEEV¹, A.V. SELIKHANOVICH²

¹Rosseti; ²«MTK Business.Optima» LLC

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

In-house developed tool for automatic extraction of Disturbance Record Files from IEDs and transfer it to cloud storage using capabilities of IEC 61850 Standard & File Transfer Protocol

Sanjay JADAV

Gujarat Energy Transmission Corporation Limited (GETCO)

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Utility experience of real time monitoring of 765kV Circuit breaker and Reactor using advanced sensors and cloud-based asset performance management

Nihar RAJ

Adani Transmission Ltd.

ID: 10457

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

An Intelligent approach for Remote Asset monitoring of substation using Visual Monitoring System

Anoop KUMAR

Power Grid Corporation of India Ltd.

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Implementation Experience of India's First 400 kV Process bus based full digital substation

Ritesh KUMAR

Power Grid Corporation of India Ltd.

ID: 10639

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: Electrical Installations, Online Monitoring, Data Analytics, Low Voltage Network, Electrification of Transport

Online Monitoring and Data Analytics Enabling LV Network Investment Optimisation for a Low Carbon Future in Ireland

Jack HERRING, J FITZGERALD, F PIENAAR, C POWER, H CUNNINGHAM, Dan CANTANASE, EJ SILKE

Cigre Irish National Committee, Ireland

ID: 10738

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: Substation Maintenance, Outdoor patrol tasks, Inspection Robot, Crawler, Autonomously driving

Development of Crawler-Type Robot for Substation Patrol Inspection

Tetsuya OKAZAKI¹, Ryosuke HATANO¹, Keita ITO², Takeshi MAEDA², Masashi KITAYAMA²

¹Chubu Electric Power Grid Co., Inc.; ²Mitsubishi Electric Corporation

ID: 10739

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: Digitalization, Digital Substation, ICT, IoT, Sensor, GIS, GIT, SIS, PD, RIP bushing

Development of sensing Tools for Construction of digital Substations and Enhancement of Reliability through early Identification of Facility Abnormalities

Masaaki NAKAHATA¹, Keisuke YOKOHATA¹, Kiyotaka BABA¹, Kensuke ODAJIMA², Ryuichi SUZUKI³, Tsutomu TERADA⁴

¹TEPCO Power Grid, Inc.; ²Toshiba Energy Systems & Solutions Co.; ³TAKAOKA TOKO CO., LTD.; ⁴MEIDENSHA CORP.

ID: 10777

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: Monitoring, switchgear, circuit breaker, asset performance management, on-site

A versatile and future-proof condition monitoring system for high voltage switchgear

Sebastiano SCARPACI¹, Tim SCHULZE-KOENIG², Stephan SEHESTEDT², Lennard MERKERT², Ralf GRAF², Dominique CACHIN³

¹Hitachi Energy Italy spa; ²Hitachi Energy Germany AG; ³Hitachi Energy Switzerland AG

ID: 10901

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: Monitoring, SF6-alternatives, SF6-free, Digital Twin, Asset Performance Management, IEC 61850

Challenges and trends rising on switchgear monitoring and control applications

Nicolas GADACZ¹, Marius CATALA¹, Jean-Luc RAYON¹, J SHARIF-ASKARY², E STELLA³

¹GENERAL ELECTRIC France; ²CENERAL ELECTRIC USA; ³GENERAL ELECTRIC Italy

ID: 10904

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: IEC 61850, Functional Specification, System Configuration, System Specification, Application Scheme

IEC 61850 specification process applied to classic customer project

Camille BLOCH¹, Christoph BENNAUER², Navdeep AHUJA¹, Thoams STERCKX³

¹SCHNEIDER ELECTRIC FRANCE; ²SCHNEIDER ELECTRIC GERMANY; ³ELIA

ID: 10905

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: LPIT Low-power instrument transformer, IEC 61850-9-2, IEC 61869, process bus, Gas Insulated Switchgear (GIS)

New approach for the on-site calibration of a LPIT in GIS and lessons learned

Laurent-Didier ROUX¹, Gérard CHARROT², Wojciech OLSZEWSKI³, Franz-Werner. GATZEN³

¹RTE France; ²SIEMENS FRANCE; ³SIEMENS GERMANY

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Application of IEC61850 – a DNO approach

Zigor OJINAGA, María ANZOLA, David MACDONALD

i-DE Redes Eléctricas Inteligentes

ID: 11000

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: Digital Substation, IEC 61850, Smart Grid, Substation Renovation

Challenges and experiences on renovation of EGAT's conventional substation to IEC 61850 based digital substation

Kanathip SANTAYANON, Praikanok LERTWANITROT

TNC-CIGRE, Thailand

ID: 11002

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Keywords: Digital Substation, IEC 61850, Smart Grid, Energy Storage, IEDs, BCU, SCADA

EGAT experience on integration between traditional and IEC 61850 control and protection system applied for grid scale energy storage

Anek WUTHAYAVANICH, Thanakrit KITTIWARARAT, Chindarha HANGSAJARA, Kanathip SANTAYANON

TNC-CIGRE, Thailand

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

Test, Installation and Operational Experiences on World's First Substation Integrating Digital, Intelligent and Greenhouse-Gas Free T&D Equipment

Marcel ENGEL¹, Fred OECHSLE²

¹Netze BW GmbH, Germany; ²Netze BW GmbH, Germany

ID: 11078

B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS with B5)

EHV and DC Substation Post Insulators with Integrated Monitoring System

Jens Seifert SEIFERT

Maschinenfabrik Reinhausen GmbH, Germany

B4 - DC SYSTEMS & POWER ELECTRONICS

PS 1 HVDC SYSTEMS AND THEIR APPLICATIONS

ID: 10109

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Keywords: Bipole VSC-HVDC, dynamic EMT studies, stability assessment, integrated offshore HVDC schemes

Modelling and stability Assessment of integrated offshore HVDC networks

Oluwole ADEUYI¹, M H RAHMAN², B MARSHALL², S MARSHALL²

¹SSE Renewables; ²The National HVDC Centre, United Kingdom

ID: 10110

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Keywords: HVDC, DC-DC converters, DC Transmission Grids

Test Systems and Models for DC/DC Converters intended for DC Transmission Grid Applications

D JOVCIC¹, A DARBANDI², P DWORAKOWSKI³

¹University of Aberdeen United Kingdom; ²Manitoba Hydro International Canada; ³SuperGrid Institute France

ID: 10111

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Keywords: HVDC, HVDC offshore, VSC, power density, offshore transmission, IEC61850, Optical Instrument Transformers

HVDC technology advancements for the integration of an Offshore Wind Farm (Sofia Project) and their integration in the Design of the Sofia offshore Wind Farm

Kevin DYKE¹, Matheu RAMET¹, John VODDEN¹, Leandro VACIRCA¹, Raymond TIEU², Christopher SMITH³

¹GE Grid Solutions United Kingdom; ²Sembmarine Singapore; ³RWE Renewables United Kingdom

ID: 10112

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Keywords: HVDC, harmonics performance, harmonic stability, frequency domain simulations, time domain simulations, harmonic design converter method.

The Harmonic Loci-Based Control Design: Practical Methods in Frequency and Time Domain for a Consistent Design of VSC HVDC Harmonic Active Solutions

Jose MONTEIRO¹, Omar JASIM¹, Elisabetta LAVOPA¹, Hani SAAD², Sarath WIJESINGHE³

¹GE Renewable Energy United Kingdom; ²RTE International France; ³RWE Renewables United Kingdom

ID: 10113

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Keywords: Bipolar Balance Control Strategy (BBCS), three-terminal HVDC, electrode system

A novel control Strategy of bipolar Balance for multi-terminal HVDC and its application on a three-terminal HVDC Project

Ziming SONG³, Qi GUO¹, Libin HUANG¹, Mengjun LIAO², Lijun DENG², Mingzhang SU²

¹State Key Lab of HVDC EPRI China Southern Power Grid China; ²CSG Key Lab for Power System Simulation EPRI China Southern Power Grid China; ³Toshiba International (Europe) Limited United Kingdom

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

The Multi-terminal Hybrid HVDC Benchmark Model

P PORTUGAL¹, W CAO², Y ZHOU³, S XU²

¹FURNAS; ²CSG

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

LCC-HVDC and Hybrid LCC-MMC-HVDC Transmission: A Comparison in the Brazilian Power System

E WATANABE¹, R DIAS¹, L PROENÇA¹, A PEDROSO¹, A ALVES¹, J MOOR², B CHUCO², C VIZEU³, J GRAHAM⁴, P ESMERALDO⁴, A TIETZ⁴

¹Coppe/UFRJ; ²CEFET-RJ; ³PowerConsult; ⁴State Grid Brazil Holding

ID: 10211

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Keywords: modulated multilevel converters, dc fault current blocking, HVDC transmission systems

Novel HVDC MMC VSC Topology with DC Fault Current Limiting Capability

Ram ADAPA¹, Mojtaba MOHADDES², Shaahin FILIZADEH³, Nuwan HERATH³

¹Electric Power Research Institute, United States of America; ²TransGrid Solutions, Canada; ³University of Manitoba, Canada

ID: 10212

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Keywords: Modular Multilevel Converter (MMC), grid forming, neutral bus ground switch, flashover, overhead line

Clearance of Temporary Faults in MMC-HVDC Overhead Line Transmission

Neil KIRBY¹, Andrzej ADAMCZYK², John FRADLEY², Carl BARKER²

¹General Electric, United States of America; ²General Electric, United Kingdom

ID: 10213

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Keywords: HVDC IED capability description, HVDC digital substation, IEC 61850 system configuration

Use of IEC 61850 in HVDC

Ajay KOLIWAD¹, Yu DU², Jonathan ALLCOCK²

¹GE Grid Solutions, United States of America; ²GE Grid Solutions, United Kingdom

ID: 10246

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Keywords: HVDC, thyristor valves, voltage stresses, PCAV, operating conditions, LCC HVDC, thyristor valve design

Study on the Converter Valve Peak Voltage of Bukdangjin-Godeok HVDC System under Various Operating Condition

Sunyoung LIM, Hyungbae MOON, Panyoung SUNG, Byungil AHN, Gyeongsu PARK

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Mutual Electromagnetic Interaction Between VSC-HVDC Underground Cable Systems and HVAC Systems in Germany

Joanne HU

RBJ Engineering Corp.

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Business Case Analysis for the Songo Converter Station

Dan KELL

Hatch

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

A New High-Frequency Resonance Suppression Strategy for VSC-HVDC System

Guiyuan LI, Weihuang HUANG, Hong RAO, Yan LI, Shukai XU, Changyue ZOU, Junjie FENG

Electric Power Research Institute of China Southern Power Grid, China

ID: 10320

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Design and Development of Multi-terminal Hybrid UHVDC Control and Protection System

Jiang LU¹, Yunlong DONG¹, Zongyue GAN², Yangzheng WANG¹, Yu LU¹, Jie TIAN¹, Haiying LI¹

¹NR Electric Co., Ltd., China; ²EHV Power Transmission Company, China Southern Power Grid, China

ID: 10322

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Operation mode and post-fault recovery of bipole VSC-HVDC system with offshore wind farms connection

Xiao ZHOU, Congda HAN, Jie YANG, Zhiyuan HE

Global Energy Interconnection Research Institute Co., Ltd, China

ID: 10323

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Keywords: HVDC, Simulink, Xilinx System, HILS, Verification

HVDC Controller with Model-Based Design and Verification through HILS

Hyojin KANG, Sungmin OH, Junchol LEE, Hyunho YOO, Hongju JUNG

HYOSUNG Corporation, Korea, Republic of (South Korea)

ID: 10327

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Review of the Electrical Topology of High-voltage High-capacity DC/DC Converters

Qiang LI, Guangfu TANG, Xiaoguang WEI, Xinying WANG, Kaidong TAN

Global Energy Interconnection Research Institute Co., Ltd, China

ID: 10328

B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

Design and Research of DC Filter for LCC-MMC Multi-terminal HVDC Transmission System

Qingming XIN, Ying HUANG, Xiaobin ZHAO, Shukai XU, Yuxin LU, Dizhen XU

China Southern Power Grid, China

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers

Topics: PS1 - HVDC Systems and their Applications

System Commissioning Test of the UHV LCC-VSC MTDC Project

Shukai XU¹, Yuebin ZHOU¹, Hong RAO¹, Jun CHEN¹, Changyue ZOU¹, Wei WEI¹, Yu YANG¹, Wanyu CAO¹, Chenglin REN¹, Yulong HU²

¹Electric Power Research Institute (State Key Laboratory of HVDC), CSG, China; ²Ultrahigh Voltage Transmission Company, CSG, China

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Staffan NORRGA¹, Ilka JAHN², Cornelis A PLET³, Philipp RUFFING², Geraint CHAFFEY⁴, John N M MOORE⁵, Maksym SEMENYUK⁶

¹KTH Royal Institute of Technology, Sweden; ²RWTH Aachen University, Germany; ³DNV Energy Systems, Canada; ⁴KU Leuven, Belgium; ⁵Consultant, Netherlands; ⁶DNV, Netherlands

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UTN (Universidad Tecnológica Nacional)

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Keywords: HVDC Transmission - Converter, Thyristor – Refurbishment - Control & Protection System - Bipole, Monopole - Ground Return, Metallic Return, Frequency Control

±180kV, 300MW KEPCO BP1 Haenam–Jeju HVDC Scheme Refurbishment – Key Features and Execution Experiences

Byungil AHN¹, Amit KUMAR², Yogesh GUPTA³, Manoj KUMAR³, Fan GUO², Nicolas MOLINIER², David HANSON², Kyoungsoo SONG⁴, Panyoung SUNG¹

¹KAPES, Korea, Republic of (South Korea); ²General Electric, United Kingdom; ³General Electric, India; ⁴KEPCO, Korea, Republic of (South Korea)

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Keywords: Multi-terminal HVDC, Mutivendor, Interoperability, Real-time simulation

Standard Specifications and Simulation Analysis on Control and Protection Scheme for Multivendor Offshore Multi-Terminal HVDC System

Tatsuhito NAKAJIMA¹, Fumihiko OHTA², Masaki MIDORIKAWA³, Rina KUME⁴, Tohru YOSHIHARA⁵, Tsunehisa WACHI⁶

¹Tokyo City University; ²Tokyo Electric Power Company Holdings, Incorporated; ³TEPCO Power Grid, Incorporated; ⁴Toshiba Energy Systems & Solutions Corporation; ⁵Hitachi, Ltd.; ⁶J-POWER Business Service Corporation

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Keywords: VSC HVDC, MMC-VSC, Artificial ground fault test, Actual ground fault

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Tatsuya NAGAI¹, Masanori MORI¹, Takanori UCHIUMI¹, Hirokazu MATSUMOTO², Yuki CHIBA³

¹Hokkaido Electric Power Network, Inc.; ²CRIEPI; ³Toshiba Energy Systems & Solutions Corp.

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Keywords: HVDC, Resonance, Protection, Inrush Current, Redundancy of AC Filters, Multi Vendor, Real Time Digital Simulator, Emergency Start

System Study and Commissioning Test of the Hida-Shinano HVDC Link

Masanori TAKECHI¹, Masahito KANEKO¹, Taizou MATSUDA², Ryuutarou HAJIRI², Takeru MURAO³, Naoki KAWAMURA⁴

¹TEPCO Power Grid, Inc.; ²Chubu Electric Power Grid Co., Inc.; ³Toshiba Energy Systems & Solutions Corporation; ⁴Hitachi, Ltd.

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Keywords: HVDC link, interconnection, coal phase-out

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TERNA Rete Elettrica Nazionale Italy

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Keywords: LCC, VSC, polarity reversal, commutation failures, black start

High performance HVDC – LCC converters for the new SaCol 3 link: Preliminary analysis and simulations

Francesco PALONE¹, Antonio BATTAGLIA¹, Luca BUONO¹, Massimo MARZINOTTO¹, Sino PATTI¹, Stefano LAURIA²

¹TERNA S.p.A. Italy; ²University of Sapienza, Italy

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Keywords: LCC HVDC, Design

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Panyoung SUNG¹, Amit KUMAR², Yogesh GUPTA³, Narasimha BOYALLA², Bruno KAYIBABU², Gearoid OHEIDHIN², Nicolas MOLINIER², Mark POWELL², Junhang LEE⁴

¹KAPES, Korea, Republic of (South Korea); ²GE, United Kingdom; ³GE, India; ⁴KEPCO, Korea, Republic of (South Korea)

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Topics: PS1 - HVDC Systems and their Applications

Keywords: Power Flow Controller, Current Flow Controller, High Voltage, Direct Current, Multi-terminal

Integration of power flow controllers in HVDC grids

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SUPERGRID INSTITUTE

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Keywords: Hardware in the loop, HVDC, control interactions, multi-vendor, real time simulation

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Keywords: Voltage Source Converter, HVDC, Alternate Arm Converter, Modular Multilevel Converter, DC voltage control

EMT Simulation of an HVDC link based on extended overlap-alternate arm converter

Pierre VERMEERSCH¹, François GRUSON¹, Philippe EGROT², Xavier GUILLAUD¹, Frédéric COLAS¹
¹Univ. Lille,-Arts et Metiers Institute of Technology -Centrale Lille - L2EP; ²EDF

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Severity adapted fault clearing strategy for MTDC grids including cables and overhead lines

Pascal TORWELLE¹, Bertrand RAISON², Trung Dung LE³, Marc PETIT³, Alberto BERTINATO¹
¹SUPERGRID INSTITUTE; ²G2Elab-Université Grenoble; ³GeePS, CentraleSupélec

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Keywords: HVDC, Performance, Data, Collection, Sharing, Co-operation, Improvement

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Transmission System testing of a VSC based HVDC System

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¹Statnett, Norway; ²TenneT, Netherlands; ³Hitachi, Sweden

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¹TransnetBW, Germany; ²TransnetBW, Germany

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Survey of the Reliability of HVDC Systems throughout World during 2019 – 2020

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Terna Rete Elettrica Nazionale, Italy

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Topics: PS2 - DC for Distribution Systems

Keywords: ANGLE-DC project, MVDC, cascaded 3L-NPC converters, testbed, demonstration

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CIGRE Denmark, Denmark

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Topics: PS2 - DC for Distribution Systems

Keywords: Direct current system, medium voltage, power electronics, indirect DC converter, boost converter

Unidirectional step-up isolated DC-DC converter for MVDC electrical networks

Piotr DWORAKOWSKI¹, Pierre LE METAYER¹, Drazen DUJIC², Cyril BUTTAY³

¹SUPERGRID INSTITUTE; ²EPFL; ³CNRS-ECL-INSA Lyon

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Keywords: Power Electronics – Power Flow Control – Modular Static Synchronous Series Compensation – Dynamic Performance – Distance Protection – Real-Time Simulation

Real Time dynamic Performance, control interaction and protection Studies of modular static synchronous series compensation Technology in the Great Britain Transmission System

David BARRON¹, Afshin PASHAEI¹, Mark OSBORNE¹, Dionysios STAMATIADIS², Panos XENOS², Babis MARMARAS², Daniel SCHWEER³, Francesca Madia MELE³

¹National Grid, United Kingdom; ²Smart Wires Greece; ³Smart Wires Ireland

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¹Hitachi Energy, Sweden; ²Uddeholm AB; ³Ellevio AB

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Delivery of Modular Static Synchronous Series Compensators on the Greek Transmission System to Provide Substantial Increase in Cross-Border Interconnection Capacity

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¹IPTO, Greece; ²Smart Wires Inc., Greece

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Keywords: Grid Forming Control, Supercapacitor, Energy Storage System, FNN Guideline, Inertia Support, RoCoF, Fast Frequency Response, Renewable Energy System, Virtual Synchronous Machine, FACTS System

Grid-forming FACTS Systems for Increased Renewable Generation Penetration

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Keywords: Oscillation Damping; Reactive Power, STATCOM, Transmission Stability

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Keywords: FACTS, BESS, VRE integration, FACTS with BESS, Weak power system

FACTS with energy storage for renewable integration in Georgia power system

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Keywords: Renewable Energy, Inverter Based Resource, Power System Protection, Distance Protection

Impact of renewable generation Resource on the distance Protection and Solutions

C VENKATESH¹, Iliia VOLOH²

¹GE Grid Solutions, United Kingdom; ²GE Grid Solutions, Canada

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Topics: PS1 - Addressing Protection Related Challenges in Network with Low-Inertia and Low Fault-Current Level

Keywords: Wide area protection, inertia, stability, islanding, system integrity protection, disturbances.

Wide area protection Scheme for prevention of islanding of South Australia

Douglas WILSON¹, Sean NORRIS¹, Devinda PERERA², Leonardo TORRELLI³

¹GE Digital, United Kingdom; ²Electranet Australia; ³CSE Uniserve Australia

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Influence of Inverters Based Sources on Protections Devices

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¹Aviz Consultoria; ²Universidade E. Rio de Janeiro; ³Energoconsult; ⁴Eletrobras; ⁵Unicamp

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From Hertz to Megahertz: Lessons Learned About the Impact of Inverter-Based Wind Turbine Generators on the Protection of Interconnecting Lines

L LOPES¹, K SILVA², R FILHO³, A NETO⁴, M DAVI⁵, F VASQUÉZ², T HONORATO², R REIS⁶, P JUNIOR⁷

¹Federal University of Paraíba (UFPB); ²University of Brasília (UnB); ³ESC Engineering; ⁴National Electric Systems Operator (ONS); ⁵Federal University of Triangulo Mineiro (UFTM); ⁶Federal Rural University of Pernambuco (UFRPE); ⁷Conprove Industry and Commerce

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Topics: PS1 - Addressing Protection Related Challenges in Network with Low-Inertia and Low Fault-Current Level

Keywords: Inverter-Based Resource (IBR), protection, IEC 61850, GOOSE

Reducing the Fault Clearing Times in Networks with Inverter-based DERs

Alexander APOSTOLOV

OMICRON electronics, United States of America

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China Electric Power Research Institute Co., Ltd., China

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Renewable Energy Protection challenges & Overview of Pre-synchronization study for RE (Wind & Solar) Generation in Southern Regional Grid in India

T.Muthu KUMAR

Power System Operation Corporation Limited

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Topics: PS1 - Addressing Protection Related Challenges in Network with Low-Inertia and Low Fault-Current Level

Testing and Analyzing of Distance Protection of a Realistic Offshore Wind Farm Transmission System

Kasper DE KORTE¹, Gerwin VAN DIJK¹, Yilmaz YELGIN², Jose CHAVEZ³, Marjan POPOV³

¹Siemens Nederland N.V.; ²Siemens A.G.; ³Delft University of Technology

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: PS1 - Addressing Protection Related Challenges in Network with Low-Inertia and Low Fault-Current Level

Keywords: Power system, Resilience, Emergency Frequency Control, Renewable Energy Sources, Selfdisconnection Characteristics, Under-frequency Relay, Rate of Change of Frequency Relay, Intelligent Electric Device, Merging Unit, IEC 61850

Experimental Validation of Emergency Frequency Control by considering the Self-disconnection Characteristics of Renewable Energy Sources to enhance the Resilience and Decarbonization Aspects of Power Systems

Hayato SATOH, Noriyuki UEDA, Muneki MASUDA, Hideo KOSEKI, Hiroyuki AMANO

Central Research Institute of Electric Power Industry

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Topics: PS1 - Addressing Protection Related Challenges in Network with Low-Inertia and Low Fault-Current Level

Impact of low Network Inertia on System transient Stability

Urban RUDEZ¹, Adrian KELLY², Koji YAMASHITA³, Yoav SHARON⁴, Ray ZHANG⁵

¹University of Ljubljana, Faculty of Electrical Engineering, Slovenia; ²Electric Power Research Institute (EPRI) international, Ireland; ³University of California Riverside, California, USA; ⁴S&C Electric Company, Chicago, Illinois, USA; ⁵National Grid, United Kingdom

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Topics: PS1 - Addressing Protection Related Challenges in Network with Low-Inertia and Low Fault-Current Level

Protection in Island Systems Operating with High RES Penetration : Case Study Astypalea

Dimitrios LAGOS¹, Alkistis KONTOU¹, Panos KOTSAMPOPOULOS¹, George KORRES¹, Nikos HATZIARGYRIOU¹, Vasilis PAPASPILIOTOPOULOS², Vasilis KLEFTAKIS², Despina KOUKOULA³, Theodora PATSAKA³

¹NTUA, Greece; ²Protasis, Greece; ³Hellenic Electricity Distribution Network Operator, Greece

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Topics: PS1 - Addressing Protection Related Challenges in Network with Low-Inertia and Low Fault-Current Level

Keywords: Protection Automation and Control Systems (PACS), IEC 61850, IED Configurator Tool, UML, SCL

Engineering process and tools to support the specification, configuration, qualification and operation of substations based on IEC 61850 over their whole lifecycle

Thierry COSTE, Aurélie DEHOUCQ, G AUDOUSSET, Q LEBOURG, B GEORGE, K KAMGA

EDF

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Topics: PS1 - Addressing Protection Related Challenges in Network with Low-Inertia and Low Fault-Current Level

Advanced transformer protection to secure discriminating internal faults from inrush currents in inverter-based generation networks

Frank MIESKE¹, Sebastian SCHNEIDER²

¹Siemens AG, Germany; ²Siemens AG, Germany

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A PIRES¹, H LEON¹, L GROPOSO¹, R MAO²

¹GE Grid Solutions; ²CAN

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: PS2 - Applications of Emerging Technology for Protection, Automation and Control

Keywords: synchrophasors, machine learning, fault analysis, modelling, simulation

Use of Machine Learning on PMU Data for Transmission System Fault Analysis

Mladen KEZUNOVIC¹, Zoran OBRADOVIC², Yi HU³

¹Texas A&M University, United States of America; ²Temple University, United States of America; ³Quanta Technology, United States of America

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: PS2 - Applications of Emerging Technology for Protection, Automation and Control

Keywords: IEC 61850, digital substations, centralized protection, functional testing

Functional Testing of Centralized Protection Systems

Alexander APOSTOLOV

OMICRON electronics, United States of America

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: PS2 - Applications of Emerging Technology for Protection, Automation and Control

Keywords: asset management, centralization, containers, cyber security, hypervisor

Common Substation Platform: Utility Requirements Assessment

Paul MYRDA¹, Herb FALK²

¹Electric Power Research Institute, United States of America; ²OTB Consulting, United States of America

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Topics: PS2 - Applications of Emerging Technology for Protection, Automation and Control

CPC Architectures for Small Distribution Substations

José MENDEZ

GE Grid Solutions Canada

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: PS2 - Applications of Emerging Technology for Protection, Automation and Control

Keywords: integrated protection-planning simulation, underfrequency load shedding, inverter-based resources, rate of change of frequency, NERC Standard PRC-006-5

Optimizing Underfrequency Load Shedding Strategies to Improve System Reliability

Ce ZHENG¹, Ashok GOPALAKRISHNAN¹, Sandro G. AQUILES-PEREZ¹, Kevin W. JONES², Reza GANJAVI³, Yimai DONG¹

¹Siemens, United States of America; ²Xcel Energy, United States of America; ³Siemens, Germany

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Intelligent Automatic Control of Isolated Operating Power System

A. ZHUKOV¹, E. SATSUK¹, A.A. LISITSYN², A. GERASIMOV², B. ANDRONOVICH²

¹JSC "System Operator of the Unified Power System"; ²JSC «STC UPS»

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¹JSC «SO UPS»; ²NTI center at MPEI; ³LLC «SmartEPS»

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Development of Stability Monitoring, Emergency Control and Relay Protection Issues Based on Online Analysis of Dynamic Properties of Power Systems

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¹JSC "System Operator of the Unified Power System"; ²NARFU; ³Energoservice

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Practical Investigation of the Operation of Optical Current Transformers and Electronic Voltage Transformers Under Transient Conditions at 500 kV Substation

N.A. IVANOV¹, R.I. KANAFEEV², M.A. YANIN²

¹Skolkovo Institute of Science and Technology; ²PROFOTECH JSC

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Cable Section Fault Identification System for Mixed 110 kV and Higher Overhead-cable Lines Application Experience

G.S. NUDELMAN¹, S.V. BALASHOV¹, E.Y. EROKHIN¹, A.V. SDOBIN¹, A.A. SHAPEEV¹, V.G. ALEKSEEV², V.V. SMEKALOV², S.A. ARUTYUNOV³

¹JSC «VNIIR»; ²JSC «RDC FGC UES»; ³PJSC «FGC UES»

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Automation of Step-down Substations Using New Technologies

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¹ENERGOSERVICE; ²NARFU

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System accuracy evaluation of metering application based on optical current Low Power Instrument Transformers (LPIT) and IEC 61850 SV static energy meters

I. TANNEMAAT¹, E. SCHENKEL¹, G. RIETVELD², A. GALLASTEGI³, M. ACHTERKAMP⁴

¹TSO TenneT; ²VSL; ³ARTECHE; ⁴KEMA

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Topics: PS2 - Applications of Emerging Technology for Protection, Automation and Control

Keywords: Line Current Differential Relay, IP Network, Layer 2 Switch, Asynchronous, Phasor

Line Protection Relay with IP Network

Takayuki INUI¹, Takahiro MORI², Yoshinobu UEDA³

¹Kansai Transmission & Distribution Co., Inc.; ²Toshiba Energy Systems & Solutions Corporation; ³Meidensha Corporation

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Topics: PS2 - Applications of Emerging Technology for Protection, Automation and Control
Keywords: Process bus, Sampling timing synchronisation, Oversampling, Optical splitter

Verification of a New Protection Relay System based on High Reliable Process Bus with Oversampling

Takuya ITO¹, Yujiro FURUSAWA², Yotaro NOSE³, Toshinori SHIMIZU⁴

¹Chubu Electric Power Grid Co., Inc.; ²Fuji Electric Corp.; ³Toshiba Energy Systems & Solutions Corp.; ⁴Mitsubishi Electric Corp.

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Topics: PS2 - Applications of Emerging Technology for Protection, Automation and Control
Keywords: virtual, digital substation

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¹Hitachi Energy Switzerland; ²Hitachi ABB Powergrids Brazil

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Hans BJÖRKLUND

Hitachi Energy, Sweden

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Topics: PS2 - Applications of Emerging Technology for Protection, Automation and Control
Keywords: Compensated neutral; Continuity of supply; Earth fault protection; Faulted phase earthing; Neutral injection systems; Quantitative risk assessment

Hybrid neutral treatment solutions to support post-pandemic changes in work practices, economic recovery and de-carbonisation efforts

Hugh BORLAND, L FICKERT

Cigre Irish National Committee, Ireland

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Keywords: Conductor Breaking, Overhead Line (OH), Internet of Things

Algorithms for automatic detection of faults/harmful events on 132-150 kV overhead lines

Chiara VERGINE¹, Luca BARISON¹, Enrico Maria CARLINI¹, Alessio MARCHESIN¹, Davide RAMPAZZO¹, Stefano QUAIA², Alessandro MAURI²

¹TERNA, Italy; ²Università degli studi di Trieste

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The Rise of the Digital Twin Applications from a single Protection Device to full Digital Substations

Christian ROMEIS¹, Jan Henzgen HENZGEN²

¹Siemens AG, Germany; ²Siemens AG, Germany

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Topics: PS2 - Applications of Emerging Technology for Protection, Automation and Control

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Cezary DZIENIS¹, Joerg BLUMSCHEIN²

¹Siemens AG, Germany; ²Siemens AG, Germany

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Analysis of Network Monitoring in the Context of IEC 61850

P JUNIOR¹, R BERNADINO², G SALGE¹, C MARTINS¹, P PEREIRA², G LOURENÇO²

¹Conprove Ind. e Comércio; ²Conprove Engenharia

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Topics: PS3 - Integration of Intelligence on Substations (Joint PS With B3)

Advantages of Full Digital Substations with architecture based on Process Interface Units (PIU)

A PIRES, H LEON, L PINTOS, P MONTANER

GE Grid Solutions

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS With B3)

Keywords: Merging Unit, Process Bus, Electronic Transformer, Digital Substation

The Development of Merging Unit based on Process Bus for Electronic Transformer in the Digital Substation

J. H. LEE, J. Y. JUNG

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Topics: PS3 - Integration of Intelligence on Substations (Joint PS With B3)

Implementation of Protection Operation Analysis and Fault Management System Based on Fault Data Aggregation and Detailed Digital Simulation

Dmitry YASKO¹, Oleg FEDOROV²

¹JSC «System Operator of the United Power System»; ²JSC «RTSoft»

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Improvement in Asset Management of EHV Substations through remote operations – Case Studies.

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Testing in a process Bus based full digital substation-A Utility's Experience

Prakash CHANDRA

Power Grid Corporation of India Ltd.

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS With B3)

Keywords: Digital Substation, IEC61850, top-down-engineering, testing

Large scale application of fully digital substations at Landsnet

Birkir HEIMISSON¹, Theodór JÓNSSON¹, Priyanka MOHAPATRA², Fred STEINHAUSER²

¹Landsnet, Iceland; ²OMICRON electronics GmbH, Austria

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B5 PROTECTION AND AUTOMATION - Full Papers

Topics: PS3 - Integration of Intelligence on Substations (Joint PS With B3)

Keywords: digital substation, IoT, sensor data, digital enterprise

Integration of Digital Substation IoT Sensor Data into a digital Enterprise

Peter KREUTZER¹, Julio OLIVEIRA²

¹Hitachi Energy Switzerland; ²Hitachi ABB Powergrids Brazil

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B5 PROTECTION AND AUTOMATION - Full Papers

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Keywords: standard, intelligence, IEC 61850, digital substation

Reaping the benefits of new standards editions for better integration of intelligence in IEC 61850 digital substations

Stefan MEIER¹, Ivan GORIN², Krzysztof DRZYDZYK²

¹Hitachi Energy Switzerland; ²Hitachi ABB Powergrids Poland

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Topics: PS3 - Integration of Intelligence on Substations (Joint PS With B3)

Novel approach to implementation of fully digital substation Expectations on pilot project Sigtuna 130/20 kV substation

Anders JOHNSON¹, Florin STELEA², Yiming WU³, David EROL³

¹Vattenfall Eldistribution, Sweden; ²DNV Sweden, Sweden; ³Vattenfall, Sweden

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Topics: PS3 - Integration of Intelligence on Substations (Joint PS With B3)

Keywords: Protection Automation and Control Systems (PACS), IEC 61850, IED Configurator Tool, Engineering approach, E-Monitoring

Digital substation for EDF: engineering approach and E-monitoring development

Valentin BOUVIGNIES, Sylvain AUPETIT, Ryan BELTRANDO

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Process bus busbar distributed protection development

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¹Statnett, Norway; ²Elvia, Norway; ³SINTEF Energy Research, Norway

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Reliability enhancement through machine learning combined with advanced digital methods for the performance evaluation of transformers and reactors

Karsten VIERECK¹, Anatoli SAVELIEV²

¹Maschinenfabrik Reinhausen GmbH, Germany; ²Maschinenfabrik Reinhausen GmbH, Germany

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Keywords: scoring methodologies, stochastic systems, modeling for operations, variable renewable energy sources, renewable generation

Risk Modelling in the Decarbonization of Electric Systems

Alberto J. LAMADRID L.¹, Timothy D. MOUNT², Wooyoung JEON³

¹Lehigh University, United States of America; ²Cornell University, United States of America; ³Chonnam National University, South Korea

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Tao LIN¹, Hui DU¹, Qingyan LI¹, Ruyu BI², Xialing XU³

¹Wuhan University, China; ²State Grid Hubei Electric Power Co., Ltd, China; ³Central China Branch of State Grid Corporation of China, China

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Application of a Deterministic Chaos Theory and Artificial Intelligence Methods for Predicting Accidents in Electric Grids of European Russia

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NRU "MPEI"

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: PS1 - System Transition Resilience & Asset Management Response

Keywords: Asset management method, Power distribution equipment risk, Kaplan-Meier method, Weibull approximation, Time based management, Value based management

Development of Asset Management Method for Power Distribution Equipment

Keita FUKUGAWA, Fumiaki MORISHIGE, Junpei YOSHIKAWA, Hidehiro YAMAMOTO, Takaya SHIGETOU

Chubu Electric Power Grid Co.,Inc.

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: PS1 - System Transition Resilience & Asset Management Response

Keywords: energy transition, decarbonisation, power utilities, asset management, complexity, developing countries, Bosnia and Herzegovina.

Asset Management as a Framework for Energy Transition of Power Utilities in Developing Countries

Anes KAZAGIC¹, Dragan KOMLJENOVIC², Emira KOZAREVIC³, Hasan AVDIC³, Nedim SULJIC³, Admir SOFTIC⁴, Ognjen MARKOVIC⁵, Dinko MARIC⁶

¹EPBiH Power Utility, Bosnia and Herzegovina; ²Hydro-Quebec's Research Institute, Canada; ³University of Tuzla, Bosnia and Herzegovina; ⁴Ministry of Foreign Trade and Economic Relations - MOFTER, Bosnia and Herzegovina; ⁵Center for Sustainable Energy Transition - ReSET, Bosnia and Herzegovina; ⁶EPHZHB Power Utility, Bosnia and Herzegovina

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Keywords: Industrial internet of things, asset performance management, renewables, predictive maintenance, smart digital substation

How the industrial internet of things is driving the asset management digitalization: the implementation of an interconnected asset performance management system in the electrical power distribution sector

Alessandro PEDRETTI¹, Silvia TOFFOLI², Rodrigo MATEINI², Julio OLIVEIRA², Vladimir NOGUEIRA³

¹Hitachi Energy Italy; ²Hitachi Energy Brazil; ³QUAIR Brazil

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: PS1 - System Transition Resilience & Asset Management Response

Keywords: Probability, Power system resilience, Vulnerability

Validation and application of the methodology to compute resilience indicators for the Italian Transmission System

Emanuele CIAPESSONI¹, Diego CIRIO¹, Elisa FERRARIO¹, Matteo LACAVALLA¹, Piero MARCACCI¹, Giovanni PIROVANO¹, Andrea PITTO¹, Francesco MARZULLO², Federico FALORNI², Francesca SCAVO², Alessandro LAZZARINI², Stefano COSTA², Simonetta PIERAZZO², Chiara VERGINE³

¹RSE, Italy; ²TERNA spa, Italy; ³TERNA Rete Italia

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¹Siemens Energy Austria GmbH; ²Siemens Energy AG

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Foundational data layer and data model for Transformer, Cable and GIS specific asset health application

Alexander GLEIM¹, G. ODDEN², Tony LUGINANO², J. F. LANDGRAF², A. WILLERSRUD², Arne SMISETHJELL², H. GRØNSETH²

¹Cognite, Norway; ²Statnett, Norway

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Topics: PS2 - Energy Sector Integration and Tackling the Complexity of Multi-Faceted Network Projects

Keywords: Ancillary services, integrated energy systems, local thermal systems, demand-side management, dynamic systems simulation.

Ancillary Services provision from local thermal Systems to the electrical power System

Carlos UGALDE-LOO, Da MORALES SANDOVAL, I DE LA CRUZ, H BASTIDA, M ABEYSEKERA, Y ZHOU

Cardiff University, United Kingdom

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Keywords: Battery Energy Storage System (BESS), distribution planning, reliability

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EnerNex, United States of America

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Keywords: Renewable Portfolio Standard, 100% zero emission electricity market, Greenhouse Gas (GHG), Electric Vehicle, Hydrogen

A 100% Zero Emission Electricity Market in New York

Jinxiang ZHU¹, Hongyan LI¹, Michael KINTNER-MEYER², Nader SAMAAAN², Allison CAMPBELL², Tony NGUYEN², Malini GHOSAL², Quan NGUYEN²

¹Hitachi Energy, United States of America; ²Pacific Northwest National Laboratory, United States of America

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Ling CHENG¹, Chang LIU¹, Xinghua ZHANG²

¹China Electric Power Research Institute, China; ²State Grid Corporation of China, China

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Sirui ZHANG¹, Hao LI¹, Qing ZHANG², Haidong ZHANG², Bingqing GUO¹, Limin JIANG¹

¹China Electric Power Research Institute Co., Ltd., China; ²State Grid Beijing Electric Power Company, China

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Compatibility & interoperability framework to facilitate the step-wise organic development of multi-terminal HVDC grids

C.A. PLET¹, D. VAN HERTEM², C. BRANTL³, M. WANG², H. EVANS⁴, J.N. MOORE⁷, C.T. NIEUWENHOUT⁵, A. ARMENI⁶

¹DNV; ²KU Leuven; ³RWTH Aachen; ⁴CarbonTrust; ⁵RU Groningen; ⁶TenneT; ⁷

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Mid-term Electricity Storage Needs of the Power System of Cyprus

Pantelis DRATSAS¹, George PSARROS¹, Stavros PAPATHANASIOU¹, Dimitrios EVAGOROU², Andreas FRIXOU², Andreas POULLIKKAS²

¹NTUA, Greece; ²CERA, Cyprus

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Implementation and Application of the Demand Response Mechanism and the Concept of Active Energy Complexes for the Development and Improvement of the Efficiency of UPS of Russia

M.A. KULESHOV¹, K.A. DATSKO², S.A. UTTS¹, Evgenia I. SMIRNOVA¹

¹JSC SO UPS; ²JSC NTC UPS

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CIGRE Denmark, Denmark

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Topics: PS2 - Energy Sector Integration and Tackling the Complexity of Multi-Faceted Network Projects

Keywords: Energy Storage System, System Planning, Renewable Energy, solar photovoltaic, Grid Connection

Energy Storage Planning and Grid Connection Analysis for Renewable Energy in Kinmen

Ping-Heng HO¹, Shen-Jen HSIAO¹, Tsun-Yu HSIAO¹, Peter Yuinhong LIU², Chen-Han WU¹, Yung-Fu WANG¹

¹Taiwan Power Company (Taipower); ²Taiwan Electric Research & Testing Center

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Jaime ZAPATA

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Keywords: Hydrogen, electrolysers, renewable energy variability, green hydrogen costs, CCS

Cost of green hydrogen production. The influence of electrolyser technology, res characteristics and CCS

Alessandro CLERICI¹, Samuele FURFARI²

¹WEC Italy, IEEE; ²Universite Libre de Bruxelles and European Society of Engineers and Industrialis, Belgiumts

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Keywords: Integrated Energy Systems, Energy Systems Simulation, Energy System Modeling, Power to Gas, Sector Coupling

Optimising Italian Electricity and Gas Sectors Coupling in a 2030 Decarbonized Energy System

Laura TAGLIABUE¹, Dario SIFACE¹, Fabio LANATI¹, Maria GAETA¹, Giovanni MICHELI², Maria Teresa VESPUCCI²

¹RSE, Italy; ²Università degli Studi di Bergamo, Italy

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Topics: PS2 - Energy Sector Integration and Tackling the Complexity of Multi-Faceted Network Projects

Keywords: Dispatching – Flexibility - Storage - Operation - Operating Reserve – Interconnections – Renewables – Planning - Transmission Systems - Mixed Integer – KSA

KAIROS, An Innovative Tool for Planning Renewable Energies and Flexibility Options in the MENA Region: A case study on the KSA Power System

Marco STABILE¹, Pierluigi VICINI¹, Bruno COVA¹, Malik M. AL HAJJI², Mohannad AL GHAMDI²

¹CESI S.p.A. Italy; ²SEC/NG - Saudi Electricity Company, National Grid - Kingdom of Saudi Arabia

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Combined HVDC system approach for offshore wind power integration and interconnection

Ying-Jiang HÄFNER, Sasitharan SUBRAMANIANS, S. R. CHOUDHURY

Hitachi Energy, Sweden

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Topics: PS2 - Energy Sector Integration and Tackling the Complexity of Multi-Faceted Network Projects

Keywords: OSOWOG, Renewable Energy, CO2 emissions, Paris agreement, Interconnection, cost recovery

Interconnection of South Asia for exchanging renewable energy

Philippe LIENHART, Nicolas CHAMOLLET

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Storage and Demand Response inclusion in the network extension planning process

Raúl RODRÍGUEZ-SÁNCHEZ¹, Santiago GARCÍA-LÁZARO¹, Gianluigi MIGLIAVACCA², Dario SIFACE²

¹TECNALIA R&I (BRTA); ²RSE SpA

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Methods to identify the optimal operating area of a grid booster

Markus GÖDDE¹, Michael DÖRING²

¹UMLAUT ENERGY GMBH, Germany; ²UMLAUT ENERGY GMBH, Germany

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Jan-Peter HECKEL¹, Tom STEFFEN²

¹Hamburg University of Technology; ²Hamburg University of Technology

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German HVDC corridors as starting points for a pan-European HVDC overlay grid

Matthias MUELLER-MIENACK¹, Karsten TREPTE²

¹Energy Advisory & DNV GL Energy Advisory GmbH, Germany; ²DNV GL Energy Advisory GmbH

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Enhancing the Green Hydrogen Business Case

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EDF Energy UK R&D, United Kingdom

PS 3 PLANNING UNDER UNCERTAINTY AND WITH CHANGING EXTERNAL CONSTRAINTS

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: PS3 - Planning Under Uncertainty and with Changing External Constraints

Keywords: Probabilistic stability analysis, rotor angle stability, boundary capability assessment, machine learning model, network reduction, data engineering, feature engineering

A probabilistic Approach to stability Analysis for boundary transfer capability Assessment

Diptargha CHAKRAVORTY¹, Gordon MCFADZEAN¹, Gruffudd EDWARDS¹, Max MCFARLANE¹, Dieter GUTSCHOW¹, Sami ABDELRAHMAN², Rasoul AZIZIPANAH-ABARGHOEE²

¹TNEI Services, United Kingdom; ²National Grid ESO, United Kingdom

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: PS3 - Planning Under Uncertainty and with Changing External Constraints

Keywords: Grid-Enhancing Technologies (GETs), advanced power flow control, Dynamic Line Ratings (DLRs), topology optimization, renewable integration

Unlocking the Queue with Grid-Enhancing Technologies: Case Study of the Southwest Power Pool

Jay CASPARY¹, Jesse SCHNEIDER¹, Bruce TSUCHIDA², Ted BLOCH-RUBIN³, Jon MARMILLO⁴, Pablo RUIZ⁵

¹Grid Strategies, United States of America; ²The Brattle Group, United States of America; ³Smart Wires, United States of America; ⁴LineVision, United States of America; ⁵NewGrid, United States of America

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Keywords: Adequacy, Operational Reserve, Flexibility, Uncertainty, Renewable sources

Long-term operational reserves evaluation of multi-area systems – Portuguese case study

Helena AZEVEDO¹, Nuno MARTINS¹, Rui PINTO¹, Ricardo PEREIRA¹, Sónia VILELA¹, Pedro CAROLA¹, Fernando BATISTA¹, Mário Bruno FERREIRA¹, Manuel MATOS^{2,3}, Leonel CARVALHO², Armando LEITE DA SILVA^{2,4}, Mauro ROSA^{2,5}, Pedro VIEIRA^{2,5}, Erika PEQUENO^{2,5}

¹REN, Portugal; ²INESC TEC, Portugal; ³Faculdade de Engenharia, Universidade do Porto, Portugal; ⁴Pontifícia Universidade Católica do Rio de Janeiro, Brasil; ⁵Universidade Federal de Santa Catarina, Brasil

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A resilient improvement planning method of AC/DC hybrid urban receiver-end power grid

Jianing JIAO¹, Lu LIU¹, Haowen CHENG¹, Wenbo XUAN², Hui LI², Tianyu ZHANG²

¹Key Laboratory of Control of Power Transmission and Conversion of Ministry of Education (Shanghai Jiao Tong University), China; ²Development Planning Department, State Grid Tianjin Electric Power Company

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: PS3 - Planning Under Uncertainty and with Changing External Constraints

Keywords: distribution planning, time-series planning, grid flexibility, Distributed Energy Resource (DER) integration, beneficial electrification

Effects of the COVID-19 Pandemic on Distribution Load Profiles

Vincent WESTFALLEN, Marina MONDELLO, Susanne AGUILAR

Commonwealth Edison, United States of America

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Energy Planning considering Citizen Participation: Optimization Models at the Service of a Better Electrical Infrastructure Expansion for Chilean Society

Alex SANTANDER¹, Juan Carlos ARANEDA²

¹Ministry of Energy; ²Coordinador Electrico Nacional

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¹Transelec; ²Estudios Electricos

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Changing paradigm and strategy to reduce the effect of intermittent injection of Power by Renewable Generators through controlled operation of Base load Generators – A Procurer’s perspective

R V SAXENA¹, G S KHANOOJA²

¹M. P. Power Management Co. Ltd.; ²M. P. Power Management Co. Ltd.

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The Gridmaster-toolbox, a step towards a new infrastructure investment paradigm

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¹Siemens Nederland N.V.; ²TU Delft; ³N.V. Nederlandse Gasunie; ⁴TenneT TSO; ⁵Stedin Group; ⁶Quintel Intelligence B.V.; ⁷SmartPort

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Keywords: Non-Firm, Renewable-Energy, Grid-Interconnection

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¹HEDNO, Greece; ²NTUA, Greece

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers

Topics: PS3 - Planning Under Uncertainty and with Changing External Constraints

Keywords: Grid planning, grid flexibility, storage, demand side management

The innovative FlexPlan methodology to reap the benefits of including storage and load flexibility in grid planning: methodology and regional study cases

Gianluigi MIGLIAVACCA¹, Stefania BALLAUCCO¹, Hakan ERGUN², Maxime HANOT³, Jawana GABRIELSKY⁴, Nuno AMARO⁵, Andrei MORCH⁶, Raul RODRIGUEZ-SANCHEZ⁷

¹RSE; ²KEU Leuven; ³N-SIDE; ⁴TU Dortmund; ⁵R&D Nester; ⁶SINTEF Energy; ⁷TECNALIA

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Determining optimal technical solutions for new transmission lines (OHL/UGC) in an early project stage to assess environmental impact and stakeholder involvement

Klemens REICH¹, Anita MACHL¹, Marc BAILLEUL², Rickard LUNDHOLM³, Vaishally BHARDWAJ³, Dirk VAN HERTEM³

¹APG System Operator; ²Borealis; ³KU Leuven

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Topics: PS3 - Planning Under Uncertainty and with Changing External Constraints

Active Network Management solutions and their financial implications on distribution grid development

Sofia NYSTRÖM¹, Emil HILLBERG¹, Maria EDVALL¹, Máté CSŐRE², Bálint BOROVIČS², István TÁCZI²

¹RISE, Sweden; ²E.ON Észak-dunántúli Áramhálózati Zrt, Hungary

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Topics: PS3 - Planning Under Uncertainty and with Changing External Constraints

Keywords: methodology, macro-economic

Long-Term Demand Forecast For Oman Electricity Transmission System Master Plan (2020-2040)

Hisham AL RIYAMI, Aiman AL NAAMANI, Musabah AL SIYABI, Abdullah ALHABSI, Mohamed AL HASNI

Oman Electricity Transmission Company, Oman

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PS 1 SYSTEM CONTROL ROOM PREPAREDNESS: TODAY AND IN THE FUTURE

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Topics: PS1 - System Control Room Preparedness: Today and in The Future

Keywords: Inertia – Forecast - Wide-Area Monitoring – Synchrophasor - Phasor Measurement Unit – RoCoF - Machine Learning

Operational Metering, forecast & validation of effective Area Inertia

Stuart W A CLARK¹, Douglas H WILSON¹, Karine HAY¹, Anna BLACKWELL²

¹GE, United Kingdom; ²National Grid ESO, United Kingdom

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: PS1 - System Control Room Preparedness: Today and in The Future

Keywords: Black Start – Training - Control System – Telecommunication - Distribution System Operator

Development and validation of new organisational Models and Systems for DER led Restoration

Christopher SALTER¹, Michael KENNY¹, Dozie NNABUIFE¹, Peter CHANDLER¹, Dieter GUTSCHOW², Diptargha CHAKRAVORTY²

¹National Grid ESO, United Kingdom; ²TNEI Services, United Kingdom

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: PS1 - System Control Room Preparedness: Today and in The Future

Keywords: synchrophasors, machine learning, system-wide event analysis, automated data analytics

Automated System-wide Event Detection and Classification Using Machine Learning on Synchrophasor Data

Mladen KEZUNOVIC¹, Zoran OBRADOVIC², Yi HU³

¹Texas A&M University, United States of America; ²Temple University, United States of America; ³Quanta Technology, United States of America

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: PS1 - System Control Room Preparedness: Today and in The Future

Keywords: event detection, Kernel Density Estimation (KDE), oscillation, Phasor Measurement Unit (PMU), probability

A KDE-based Methodology for PMU Data Management and Real-time Event Detection

Yidan LU, Yuan KONG, Feng TU

American Electric Power Service Corporation (AEP), United States of America

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Potential and challenges of AI-powered decision support for short-term system operations

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¹TenneT; ²RTE; ³TU Delft

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Wide-Frequency Measurement Technology for Power Electronics- dominated based Power Systems

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¹China Electrical Power Research Institute; ²State Grid Corporation of China

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Keywords: renewable, low inertia, automatic generation control, WAMS/PMU, forecast

Challenges And Responding To The Booming Of Renewables In Vietnam's Power System

The Van NGUYEN, Duc Ninh NGUYEN, Xuan Duc DINH, Minh Quang NGUYEN, Anh Tuan NGUYEN, Thanh Trang NGUYEN

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Reactive Power Management and Other Challenges with High Renewable Penetration: Case study of Indian grid

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¹Power System Operation Corporation Limited; ²Power System Operation Corporation Limited

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Impact of Silt on Hydro Stations of Northern part of Indian Power System and Enhancing the Resilience in Grid Operation through near Real Time Silt Monitoring

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Synchrophasor-based Applications to Enhance Electrical System Performance in the Netherlands

M. POPOV¹, N. KUMAR¹, A. BORICIC¹, J. RUEDA¹, M. TEALANE⁷, I TYURYUKANOV¹, M. NAGLIC¹, A. JONGEPIER², E. WIERENGA³, M. VAN RIET⁴, O. BAGLAYBTER⁵, D. KLAAR⁶

¹Delft University of Technology; ²Enduris B.V.; ³Stedin; ⁴Qirion; ⁵General Electric; ⁶TSO TenneT; ⁷

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Development of Dispatching Monitoring and Control Technology in Russia Based on PMU Data

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Nonparametric Identification of Events in the Western Siberia Power System Based on Big Data Processing of PMU

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Russian National Committee of CIGRE, Russian Federation

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Topics: PS1 - System Control Room Preparedness: Today and in The Future

Keywords: power system operation and security, control center operation, time-series clustering, HRTU

Re-establishing Functional Observability in a Control Center under Total Loss of Normal Communications using Time-series Clustering

Mahendra PATEL¹, Papiya DATTARAY², Lakshmi SUNDARESH¹, Sujit TRIPATHY¹, Vikas SINGHVI¹

¹Electric Power Research Institute, United States of America; ²Electric Power Research Institute, Ireland

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: PS1 - System Control Room Preparedness: Today and in The Future

Keywords: Demand Forecast - Big Data - Machine Learning - Island Power Systems

Applying Big Data Analytics to Demand Forecast in Island Power Systems towards Large Installation of Renewable Energy

Takayuki HIGO¹, Yuji HANAI¹, Kiyoshi TANAKA²

¹Central Research Institute of Electric Power Industry; ²Kyushu Electric Power Transmission and Distribution Co., Inc.

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: PS1 - System Control Room Preparedness: Today and in The Future

Keywords: Integrated Stability Control System, Voltage and Reactive Power Control, Artificial Intelligence, Photovoltaics, System Stability, Over-voltage, Number of Operations of Equipment

Development of New Integrated Stability Control System for Photovoltaics Introduction Expanding Grid Utilizing Artificial Intelligence

Yuuki KAWAURA¹, Nobutoshi SAITO¹, Daichi KATO², Ryo YAMAGUCHI², Masaru TAKEISHI²

¹Chubu Electric Power Grid Co., Inc.; ²Hitachi, Ltd.

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

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Keywords: WAMPC, power system control, power system dynamics, WAMS, Dynamic mode decomposition

Wide Area Monitoring and Protection System for interarea oscillations suppression in the Italian power system

Cosimo PISANI¹, Enrico Maria CARLINI¹, Giorgio GIANNUZZI¹, Salvatore TESSITORE²

¹TERNA S.p.A. Italy; ²università di Napoli, Italy

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Keywords: Black start, Dynamic Analysis, Electric Island, Resilience, Snowstorm

Islanded Operation of the HV/MV network: a Dynamic Study based on a Real-Life Experiment Data

Chiara VERGINE¹, Enrico Maria CARLINI¹, Gaetano PECORARO¹, Mirko PIAZZA¹, Alberto BERIZZI², Davide FALABRETTI², Valentin ILEA², Andrea VICARIO²

¹TERNA S.p.A. Italy; ²Politecnico di Milano

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Topics: PS1 - System Control Room Preparedness: Today and in The Future

Keywords: RTCA, PFC, Decision support tools, control room operation

Development of Innovative Power Flow Controller-compatible RTCA Decision Support Tools for Enhancing Control Centre Operations

Medha SUBRAMANIAN, Marie HAYDEN, Marta VAL ESCUDERO, Mark RAFFERTY, Eoin KENNEDY, Adrian KELLY

Cigre Irish National Committee, Ireland

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

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Keywords: Power system stability, HVDC Transmission, Hybrid AC/DC Transmission Grids, Transient stability

Transient stability enhancement through the control of embedded HVDC transmission systems. Grid2030 RITSE project

Juan Carlos GONZALEZ-TORRES¹, Abdelkrim BENCHAI¹, Hind BEKKOURI¹, Antoine GHYSELINCK¹, Louis FILLIOT¹, Antonio CORDON², Luis CORONADO², Sergio MARTINEZ²

¹SUPERGRID INSTITUTE; ²Red Electrica de Espana

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Resilience Enhancement Applications in Operational Planning and Control for the TSO of Serbia

Ninel CUKALEVSKI¹, Goran JAKUPOVIC¹, Nikola OBRADOVIC²

¹Institute Mihajlo Pupin, Serbia; ²JSC Elektromreza Srbije, Serbia

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Demonstration Project of Low Carbonization and Advancement by Online Optimized Control of Transmission System Voltage and Reactive Power utilizing ICT

Jittipath TRIYANGKULSRI, Nawanat EUA-ANANT

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New voltage control service and VOLTAIRÉE project

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Red Eléctrica de España (REE)

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Testing of Power Oscillation detection algorithm using a Real-Time PMU laboratory

Aníbal PRADA¹, Eduardo MARTÍNEZ¹, José SALDANA¹, Marta BERNAL¹, Noemi GALAN¹, Dalibor BRNOBIC², Vedran GRUDENIC²

¹Fundación CIRCE; ²Studio elektronike Rijeka d.o.o.

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Training platform for proof of future dispatcher tools

Matthias MUELLER-MIENACK¹, André LEHMANN²

¹Energy Advisory & DNV GL Energy Advisory GmbH, Germany; ²DNV GL Energy Advisory GmbH, Germany

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Ad-Hoc Determination and Activation of Remedial Actions in Electro-Thermal System Operations

Andreas KUBIS¹, Jan KEMPER²

¹PSI Software AG, Germany; ²PSI Software AG, Germany

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Machine Learning Using PMU Data to Predict Small Signal Disturbances

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Eskom Holdings Limited

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Simulator-based operator training on power system operating procedures

Hannah Maria Véras Caldeira ANGELKORTE*

Operador Nacional do Sistema Elétrico – ONS, Brazil

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Brazilian Power System Operation Under Extreme Operating Conditions - Recent Examples and Proposals to Face Future Challenges

P GOMES¹, M SANTOS²

¹UERJ/PSQ; ²Independent Consultant

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Brazilian Interconnected Power System - Implementation of Wind Power Farm in Restoration Process: Practices and Experience

A GUARANI¹, N MACIEL², L DUDA²

¹Independent Consultant; ²ONS

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Brazil's Embedded HVDC Systems – Operation Planning Challenges

M NOLI, B SESSA, J CAMELO, V GUALTER

ONS – Operador Nacional do Sistema Elétrico

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Topics: PS2 - Operational Planning Strategies, Methodologies and Supporting Tools

Keywords: Inertia, Frequency, Stability, RoCoF, Frequency Reserve

Inertia Measurements in the GB Power System used for operations and planning Improvements

Brian BERRY¹, Antonio ENAS¹, Anna BLACKWELL², Stewart REID³

¹Reactive Technologies, United Kingdom; ²National Grid ESO, United Kingdom; ³Scottish and Southern EN, United Kingdom

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: PS2 - Operational Planning Strategies, Methodologies and Supporting Tools

Keywords: linear state estimation, model reduction, PMU placement, situational awareness, synchrophasors

Approach to Distribution PMU Placement and Observability Analysis

Shikhar PANDEY¹, Heng CHEN¹, Esa Aleksi PAASO¹, Farnoosh RAHMATIAN², Ali ALVI¹

¹Commonwealth Edison, United States of America; ²NuGrid Power Corp, United States of America

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Challenges and Countermeasures on Operational Planning with High Penetration of Renewable Energy Sources: Chinese Experience and Prospect

Qinyong ZHOU, Shanshan ZHAO, Libo ZHANG, Hailei HE, Dan HUANG, Haoyue GONG

State Key Laboratory of Power Grid Safety and Energy Conservation (China Electric Power Research Institute), China

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Influence of the Fault Ride-Through Control Strategy of Wind Turbines on the Transmission Power of UHVAC/DC

Shiyun XU¹, Huadong SUN¹, Deyang GUO¹, Boyang LI², Bing ZHAO¹

¹China Electric Power Research Institute, China; ²Harbin Institute of Technology Harbin

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

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Low Demand Operation of a Grid with High Share of Inverter-Based Resources - South Australian Case Study

Nilesh MODI, A JALALI

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Implementation of New Dispatch Formulation and Software for Tertiary Frequency Control Reserves in Indian Power System

Saif REHMAN

Power System Operation Corporation Limited

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Topics: PS2 - Operational Planning Strategies, Methodologies and Supporting Tools

Evolution of Renewable Energy Monitoring Centre in Southern Regional Grid: Experience through Data, Forecasting and Challenges

P Sarath BABU

Power System Operation Corporation Limited

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: PS2 - Operational Planning Strategies, Methodologies and Supporting Tools

State Estimation in Medium Voltage Distribution Networks using Pseudo Measurements

Sai Suprabhath NIBHANUPUDI^{1,2}, Anton ISHCENKO², Simon TINDEMANS¹, Peter PALENSKY¹

¹Delft University of Technology, The Netherlands; ²Phase to Phase BV, The Netherlands

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Transition to a new regional coordination framework

D. WEIß⁷, U. ZIMMERMANN¹, J.-F. GAHUNGU⁷, J. VAN ROOST², J. MØLLER BIRKEBÆK³, T. KAPETANOVIC⁴, R. PAPROCKI⁵, D. KLAAR⁶

¹TSCNET Services; ²Coreso; ³Nordic RSC; ⁴APG; ⁵PSE; ⁶TenneT TSO; ⁷No Organisation

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: PS2 - Operational Planning Strategies, Methodologies and Supporting Tools

Keywords: power system, blackout, machine learning, algorithm

Prediction of possible power system blackout risk with machine learning algorithms

Mert KARACELEBI^{1,2}, Alexandre OUDALOV¹, Yi WANG², Panagiotis PAPADOPOULOS³

¹Hitachi Energy Switzerland; ²ETH Zurich Switzerland; ³University of Strathclyde UK

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

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Smart Grid Flexibility Solutions for Transmission Networks with Increased RES Penetration

Ioannis GONOS¹, Christos CHRISTODOULOU¹, Christos DIKAIAKOS², Vassiliki VITA¹, Elias ZAFIROPOULOS¹, Ekhiotz ZUBIETA³, Giovanna SANTAMARIA³, Ngoc Bao LAI⁴, Nicholas Gregory BALTAS⁴, Pedros RODRIGUEZ⁴

¹ICCS/NTUA, Greece; ²IPTO, Greece; ³Empresa Jema Energy S.A, Spain; ⁴Luxembourg Institute of Science and Technology, Luxembourg

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Quantifying the impact of Synchronous Inertial Response and Fast Frequency Response to Frequency Stability for high share of Renewables in HVDC interconnected Jeju system

Jaeyeop JUNG¹, Seunghyuk IM¹, Namki CHOI¹, Byongjun LEE¹, Hongseok CHOI², Jeonghoon SHIN³

¹Korea University, Korea, Republic of (South Korea); ²Korea Power Exchange, Korea, Republic of (South Korea); ³KEPCO Research Institute, Korea, Republic of (South Korea)

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: PS2 - Operational Planning Strategies, Methodologies and Supporting Tools

Keywords: Operational Planning, impact assessment, energy transition, Multi-Situations.

Year-ahead operational planning in an evolving system through multi-situation methods

Jonathan BAUDIER, Nathan CATRIX, Renaud DELACHAUX, Alexandre DUPRE, Anais GOURMELON

RTE France

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: PS2 - Operational Planning Strategies, Methodologies and Supporting Tools

Practical experience of using fully automated centralized voltage regulation in transmission system

Renata RUBEŠA

HRO CIGRE, Croatia

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Technical, Regulatory and Economic Development for Distributed Flexible AC Transmission Systems – D-FACTS

Jorge GONZALEZ

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Topics: PS2 - Operational Planning Strategies, Methodologies and Supporting Tools

Deep Learning Application for Power Generation Forecasting of VRE in Thailand

Jarudate VORASEE, Somphop ASADAMONGKOL, Somruedee TIPMABUTR

TNC-CIGRE, Thailand

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: PS2 - Operational Planning Strategies, Methodologies and Supporting Tools

Topology Optimization of Power Network with Renewable Energy Sources Based on an Adapted Genetic Algorithm

Andrey BRAMM¹, Alexandra KHALYASMAA^{1,2}, Stanislav EROSHENKO^{1,2}, Pavel MATRENIN²

¹Ural Federal University, Russia; ²Novosibirsk State Technical University, Russia

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers

Topics: PS2 - Operational Planning Strategies, Methodologies and Supporting Tools

Black-Start Network Restoration using Offshore Wind Power with AC cables

Leonei NORIS MARTÍNEZ^{*1}, Abdul Wahab KORAI², Victor GARCÍA SUÁREZ³, Huub PUSTJENS³, Volodymyr KALASHNIKOV³, Matthias MÜLLER-MIENACK³

¹TenneT TSO, The Netherlands; ²Siemens Energy, Germany; ³DNV Energy Systems, The Netherlands

C3 - POWER SYSTEM ENVIRONMENTAL PERFORMANCE

PS 1 SETTING AMBITIOUS CLIMATE STRATEGIES IN THE ENERGY SECTOR

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Inserting Crucial Environmental Issues into Energy Planning: Paths for Carbon Reduction

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Diversa Consultancy on Sustainability

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Topics: PS1 - Setting Ambitious Climate Strategies in the Energy Sector

Indigenous Vulnerability and Corporate Climate Change Strategy for the Electricity Companies in Brazil

K GARCIA, L PAZ, W SILVA, I RAUPP, D MATOS, C VASCONCELLOS

Electrical Energy Research Center (CEPEL)

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Topics: PS1 - Setting Ambitious Climate Strategies in the Energy Sector

The Future Landscape of China's Power System and Its Contribution to the 2060 Carbon Neutrality Target

Baoguo SHAN, Jiangtao LI

State Grid Energy Research Institute Co., Ltd., China

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Topics: PS1 - Setting Ambitious Climate Strategies in the Energy Sector

Business Diversification of Coal Mining Enterprises Based on the Development of CMM Utilization Infrastructure

Kirill VARNAVSKIY^{1,2}, Fedor NEPSHA^{3,4}, Roman KOSTOMAROV⁴

¹"KFR Energy", LLC; ²Shandong University of Science and Technology (PRC); ³"INTELAB", LLC; ⁴T.F. Gorbachev Kuzbass State Technical University

ID: 10710

C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS1 - Setting Ambitious Climate Strategies in the Energy Sector

Keywords: Abandoned coal mines, Coal regions, Decarbonization, Energy transition, Utility scale photovoltaic power plants.

Photovoltaic Power Plants on degraded Mining, Slag and Ash dump Areas – a Contribution to Coal Region Transition Processes

Ajla MERZIC, Nedžad HASANSPAHIC, Elma REDZIC, Elvira BECIROVIC, Nedim TURKOVIC, Almin REDZIC, Anes KAZAGIC, Mustafa MUSIC

JP Elektroprivreda BiH, Sarajevo, Bosnia and Herzegovina

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C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS1 - Setting Ambitious Climate Strategies in the Energy Sector

Techno-economic impact of large-scale RES integration in Saudi Arabia

J YASIN¹, M ALGHAMDI¹, A ALI¹, M HUSSAIN¹, M FARHAN¹, M ALZAID¹, B DUPONT², B NERINCX², C DUBOIS², P HENNEAUX², R FAHMI², J DUBOIS², K KAROUI²

¹SAUDI ELECTRICITY COMPANY, KSA; ²ENGIE IMPACT

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C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS1 - Setting Ambitious Climate Strategies in the Energy Sector

Electric solidarity: a research program to model interdependence management in current power systems

Antoine GOUTALAND¹, Nathalie DEVULDER¹, Vincent RINGEISSEN¹, Blanche SEGRESTIN², Kevin LEVILLAIN²

¹RTE France; ²MINES ParisTech

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C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS1 - Setting Ambitious Climate Strategies in the Energy Sector

Keywords: Biomimicry, Biomimetics, Bioinspiration, Energy Transition, Methodology

Biomimicry and energy, a systemic eco-design approach to address the challenges of the energy and ecological transition

Eliot GRAEFF¹, Christophe GOUPIL², Felix GUEGUEN², Pierre MEYER³, Kalina RASKIN¹, Nathalie DEVULDER³

¹CEEBIOS; ²Université Paris Diderot; ³RTE France

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C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS1 - Setting Ambitious Climate Strategies in the Energy Sector

Keywords: Decarbonisation, carbon footprint, direct GHG emissions, indirect GHG emissions, GHG emission inventory

The TSO contributions to the decarbonization of the European economy

Amélie LAFRAGETTE¹, Catherine LELONG¹, Mathilde GRESSET BOURGEOIS¹, Apolline PRADA¹, Mario SISINNI²

¹RTE France; ²TERNA SpA

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C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS1 - Setting Ambitious Climate Strategies in the Energy Sector

Science based targets, emission reduction and carbon neutrality strategies for TSO companies. Experience in Spain

Mercedes VÁZQUEZ MIRANDA

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C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS1 - Setting Ambitious Climate Strategies in the Energy Sector

Regional Sustainability Assessment of Energy Systems: Integrating Stakeholder Perspectives and Conditions on a Regional Scale

Benjamin KRAUS¹, Witold POGANIETZ², Britta BUCHHOLZ³, Johannes GAISER¹

¹Karlsruhe Institute of Technology, Germany; ²Karlsruhe Institute of Technology, Germany; ³Hitachi ABB Power Grids, Germany

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Topics: PS1 - Setting Ambitious Climate Strategies in the Energy Sector

Transition to Climate Neutral, Safe and Sustainable Power Grids - Benefits for Society, Grid Operators and Manufacturers

Dirk HELBIG¹, Shibani BOSE²

¹Siemens Energy, Germany; ²Siemens Energy, Germany

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C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS1 - Setting Ambitious Climate Strategies in the Energy Sector

Assessment of Life Cycle Emissions from Battery (BEV) as compared with DME-fuelled Compression Ignition Engine Vehicles

David BYRNE

EirGrid Plc, Ireland

PS 2 BIODIVERSITY AND THE SUPPLY OF ELECTRICITY, RENEWABLES-BASED OR NOT: RISKS, CHALLENGES, SOLUTIONS AND OPPORTUNITIES

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C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS2 - Biodiversity and the Supply of Electricity, Renewables-Based or Not: Risks, Challenges, Solutions and Opportunities

Peixe Vivo Program: Long-Term Actions for Fish Conservation in Dammed Brazilian Rivers

R FONTES, M CASTRO, R FIORINE

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C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS2 - Biodiversity and the Supply of Electricity, Renewables-Based or Not: Risks, Challenges, Solutions and Opportunities

Keywords: Egyptian Electricity Holding Company (EEHC) - Burullus Power Plant (BPP) – Critical Habitat Assessment (CHA) – Critical Habitat (CH) – Biodiversity Action Plan (BAP), Egyptian Environmental Affairs Agency (EEAA), International Finance Corporation (IFC)

Biodiversity Accommodation in the Burullus Power Plant Project Selection and Preservation of a Potential Protected Offset Area

Marwa Mansour HUSSEIN, Maher Aziz BEDROUS, Ismail Yehya ELSAWY

Egyptian Electricity Holding Company

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C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS2 - Biodiversity and the Supply of Electricity, Renewables-Based or Not: Risks, Challenges, Solutions and Opportunities

Keywords: Environmental Impact Assessment, Mitigation, Vegetation Management, Social Acceptance

The Characteristics of Mitigation Measures in Japan for the Impact of the Power Transmission Line on the Biodiversity

Soh KOBAYASHI, Masaki SHIRAI

CRIEPI

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C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS2 - Biodiversity and the Supply of Electricity, Renewables-Based or Not: Risks, Challenges, Solutions and Opportunities

Keywords: Benthos, renewable marine energy, artificial habitats, electromagnetic fields, heat emission

Exploring environmental impacts of submarine power cables from offshore wind farms

Lisa GARNIER¹, Bastien TAORMINA², Antoine CARLIER³, Nolween QUILLIEN², Damien SAFFROY¹

¹RTE France; ²France Energies Marine; ³IFREMER - DYNECO-LEBCO

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C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS2 - Biodiversity and the Supply of Electricity, Renewables-Based or Not: Risks, Challenges, Solutions and Opportunities

A study of Hydro-floating Solar Hybrid Project impact on aquatic biodiversity : Case study for the Thailand's largest Hydro-floating Solar Hybrid Project at Sirindhorn Dam, Ubon Ratchathani Province

Kamol Karn KIJAWATWORAWET

TNC-CIGRE, Thailand

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C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (Joint with B2)

Innovative engineering solutions to overcome environmental and safety challenges and use of helicopter in Construction of Transmission lines and substations in North East of India

Dr Deepak LAKHAPATI

STERLITE POWER TRANSMISSION LTD

ID: 10531

C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (Joint with B2)

Keywords: Bird flight diverter, Collision, Wind loading, White stork, Well-balanced management

Challenges in Solving Conflicts between Power Line Management and Bird Conservation in Japan

Masaki SHIRAI, Saki TARUISHI, Mikio SHIMIZU

CRIEPI

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C3 POWER SYSTEM ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: PS3 - Environmental and Safety Aspects from OHL (Joint with B2)

Keywords: Corona Effect, Monitoring, Maintenance, High voltage Line

Corona effect measurement in lines with innovation projects in rep

Darwin PADILLA

Red de Energia del Peru

C4 - POWER SYSTEM TECHNICAL PERFORMANCE

PS 1 CHALLENGES AND ADVANCES IN POWER QUALITY (PQ) AND ELECTROMAGNETIC COMPATIBILITY (EMC)

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Comparison of Harmonic Study Results with Long Term Measurements to Propose a more Realistic Way to Represent the System Impedance in Harmonic Performance Studies

M CARLI, B MEYER

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Application of a Methodology for Determining Voltage Harmonic Contributions in a Low-Voltage Busbar

I SANTOS, B GIANESINI, G TRONCHA, R GREGORY., C AZEVEDO, V BRITO

Federal University of Uberlândia

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

A Hosting Capacity Methodology for Brazilian Distribution Networks

I VISCONTI, M ROSADO

Eletrobras Cepel

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Assessing the Risk of Geomagnetic Disturbance on Power System from Perspective of Steady-State Security Region

Chunming LIU, Xiyuan GUAN, Yiqiao HU

North China Electric Power University, China

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Critical Review of Harmonic Assessment Procedures for Transmission Customers and Renewable Generators

Tim BROWNE¹, Vic GOSBELL², R A BARR³

¹Qualis Power; ²University of Wollongong; ³Electric Power Consulting Australia

ID: 10522

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Keywords: Harmonic Multi-Infed Interaction Factor (HMIIF), harmonic impedance, amplification, frequency-domain modeling, multi-frequency stability

Theory and Application of Multi-Frequency Interaction Screening Method

Kaitlyn BABIARZ, David ROOP, Samantha MORELLO

Mitsubishi Electric Power Products, Inc., United States of America

ID: 10526

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Keywords: Photovoltaic, Islanding detection function, Voltage flicker, Static synchronous compensator

Countermeasures Against Voltage Flicker by Photovoltaic Inverters with Islanding Detection Function Occurring in a Wide Area Network

Satoru AKAGI¹, Jun YOSHINAGA¹, Naoki HAYASHI², Satoshi UEMURA³, Tomoaki SHOJI³, Takayuki NAKAJIMA⁴

¹TEPCO Power Grid, Inc.; ²TEPCO Holdings, Inc.; ³Central Research Institute of Electric Power Industry; ⁴Denryoku Computing Center, Ltd.

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Keywords: Harmonic characteristics, 5th, 7th, cancellation, transformer, distribution system, Japanese electric power system

Review of Harmonic Characteristics in the Japanese Electric Power System

Naotaka OKADA

CRIEPI

ID: 10541

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

An Estimation for Short-Circuit Power Changes in the Dutch Grid to Analyze the Impacts of Energy Transition on Voltage Dips

R. TORKZADEH¹, J.B.M. VAN WAES², G. MULDER¹, V. CUK¹, J.F.G. COBBEN¹

¹Eindhoven University of Technology; ²TenneT TSO BV

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Integration of Photovoltaic (PV) Plants into the Railway Electricity Network of the Netherlands: Impact on the Operation of the Railway Network and Grid Code Compliance Assessment

M. POIKILIDIS¹, R. HEUCKELBACH¹, T. PLOEG¹, F. TEN HARVE², G. OLDE MONNIKHOF²

¹DNV; ²ProRail

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Analysis of Harmonic Propagation in Meshed Power Systems using Standing Waves

B.S. BUKH, C.L. BAK, F.F. DA SILVA

CIGRE Denmark, Denmark

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

EMC Simulation Method for Multi-Level VSC HVDC Converters

Gustaf SANDBERG¹, Thomas WEISSEL¹, Göran ERIKSSON², Didier COTTET³, Arne SCHROEDER³

¹Hitachi Energy, HVDC, Sweden; ²Hitachi Energy Research, Sweden; ³Hitachi Energy Research, Switzerland

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Swedish Voltage Quality Regulation Development for the Challenges Imposed by the Energy Transition

Johanna ROSENLIND¹, Herlita BOBADILLA ROBLES¹, Susanne ACKEBY², Daniel KARLSSON³

¹Energy Markets Inspectorate (Ei), Sweden; ²RISE, Sweden; ³DNV, Sweden

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Keywords: Wind farm connection, offshore grid, harmonics, filter, harmonic background

Harmonic Studies Performed by RTE for Wind Farm Connection

Quentin PIRAUD, Xavier-Marie VIEL, Julien MICHEL

RTE France

ID: 10926

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Keywords: DC power quality indices, ripple spectrum, DC disturbance modelling in frequency domain

DC Power Quality Assessment on real MVDC and LVDC Power Systems

Xavier YANG¹, Xingyan NIU¹, Juntao FEI², Chenyu ZHANG², Hao TONG³, Chenchen LIU³, Liang ZHANG⁴

¹EDF R&D France; ²JS EPRI China; ³Goldencooperate Ltd China; ⁴SNPDRI China

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Equivalent Impedance of Wind and Solar Power Plants for AC Harmonic Performance Assessment of VSC-HVDC Systems

Philippe TREMOUILLE¹, Karolina CARVALHO², Juan-Carlos URREGO¹

¹GE France; ²GE UK

ID: 10944

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Keywords: Geomagnetically Induced Current – GIC – Geomagnetic, Disturbance, Power System, Design, Grid, Topology, Series Compensation

Impacts of Transmission System Design Principles on geomagnetically induced Currents in the Finnish Transmission Grid

Lauri ALA-MUTKA¹, Antti HARJULA¹, Liisa HAARLA¹, Krishnat PATIL²

¹Fingrid Oyj; ²Siemens

ID: 11103

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Measurement and Simulation of Harmonic Propagation in Transmission Systems

Robert STIEGLER¹, Jan MEYER²

¹Technische Universität Dresden, Germany; ²Technische Universität Dresden, Germany

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS1 - Challenges and Advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

Synthetic Signals for the Evaluation of Low-Voltage Grid's Measurement Methods

Alexander GALLARRETA*, Jon GONZÁLEZ-RAMOS, Igor FERNÁNDEZ, David DE LA VEGA, Amaia ARRINDA, Itziar ANGULO

University of the Basque Country (UPV/EHU), Spain

PS 2 CHALLENGES AND ADVANCES IN INSULATION COORDINATION AND LIGHTNING RESEARCH

ID: 10215

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS2 - Challenges and Advances in Insulation Coordination and Lightning Research

Keywords: distributed energy resource, ground fault overvoltage, load rejection overvoltage, ferroresonance, open phase

Transformer Configuration Impacts on Transient Phenomena in Inverter-Based Resource Dominated Distribution System - a Case Study

. MAIGHA, Sean CARR, Andreas BRANDT, Mohit SINGH

Commonwealth Edison, United States of America

ID: 10349

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS2 - Challenges and Advances in Insulation Coordination and Lightning Research

Analysis of Measurements and Calculations on Tower Footing Impedances in Transmission Lines

I. TANNEMAAT¹, C.S. ENGELBRECHT², B. KÜCHLER³

¹TenneT TSO; ²EPRI; ³University of Applied Sciences Zittau/Görlitz

ID: 10528

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS2 - Challenges and Advances in Insulation Coordination and Lightning Research

Keywords: Direct lightning, Lightning protection design, Medium-voltage distribution lines, Lightning location system, Flashover

Lightning Performance Assessment of Japanese Medium-Voltage Overhead Distribution Lines considering Regional Characteristics

Kazuyuki ISHIMOTO¹, Koji MICHISHITA², Takashi EGUCHI³, Tomoyuki SATO⁴, Hitoshi SUGIMOTO⁵, Yuusuke KOKUBO⁶

¹CRIEPI; ²Shizuoka University; ³TEPCO HD; ⁴Tohoku Electric Power NW; ⁵Hokuriku Electric Power; ⁶Kansai Electric Power NW

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS2 - Challenges and Advances in Insulation Coordination and Lightning Research

Sympathetic Interaction Phenomena in an AC Offshore Grid - An Investigation Analysis of a C-Type Harmonic Filter Trip Incident & Lessons Learned

K. VELITSIKAKIS¹, M. LIMPENS¹, M. KRANSSE², C. ENGELBRECHT³

¹TenneT TSO; ²Eurovolt Consultancy; ³Engelbrecht Consulting

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS2 - Challenges and Advances in Insulation Coordination and Lightning Research

Evaluation of the Effectiveness of the External Protection System Against Lightning

Carlos WALL, Raúl BIANCHI LASTRA, Beatriz BARBIERI, Patricia ARNERA

IITREE-FI-UNLP

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS2 - Challenges and Advances in Insulation Coordination and Lightning Research

Analysis of Transient Measurements in Transmission Systems Correlation with Network Protocol Data and Lightning Location System Data

Lukas SCHWALT, Matthias MAURER, Stephan PACK

Graz University of Technology

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS2 - Challenges and Advances in Insulation Coordination and Lightning Research

Semi-Probabilistic Insulation Coordination Procedure for HVDC Converter Stations

Liliana AREVALO, Alexander BILOCK, S SATHISH, Andreas HERMANSSON

Hitachi Energy, HVDC, Sweden

ID: 10850

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS2 - Challenges and Advances in Insulation Coordination and Lightning Research

Keywords: Lightning events, automatic system, automatic evaluation, lightning evaluation.

System for Automatic Evaluation of Lightning Effects on Transmission Line and Substation Equipment

Martin SVANCAR¹, Martin KNENICKY¹, Lubomir KOCIS¹, Petr SPURNY², Radek OVESNY²

¹EGU - HV Laboratory a.s., Czech Republic; ²CEPS a.s., Czech Republic

ID: 11012

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS2 - Challenges and Advances in Insulation Coordination and Lightning Research

Keywords: Series Compensation, Transient Overvoltage, Transient Recovery Voltage, Trapped DC Voltage, Electromagnetic Transient, Simulation

Overvoltage simulation Studies for a series compensated Transmission Line in a meshed series compensated Network

Olli-Pekka JANHUNEN, Minna LUOJUS, Pauli PARTINEN, Liisa HAARLA

Fingrid Oyj

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS2 - Challenges and Advances in Insulation Coordination and Lightning Research

Harmonic Filters Characteristics Effects in the Switching Manoeuvre Transient

Juan CHACÓN¹, Dominique ALONSO SORENSEN¹, Manuel DE LA HOZ², Cristina RIOJA BARÓN¹

¹ARTECHE SMART GRID; ²UNIVERSITY OF THE BASQUE COUNTRY UPV/EHU

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS2 - Challenges and Advances in Insulation Coordination and Lightning Research

Ferroresonance in SVC - Onsite Measurement, Analysis with EMT Simulation and Selection of a Mitigation Solution

Benjamin POLLET*, Sébastien DENNETIERE, Yannick VERNAY

RTE, France

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS3 - Challenges and Advances in Power System Dynamics

Keywords: stability analysis, voltage source converters, small-signal modelling, network reduction.

Converter Driven Oscillation in Power Systems with High Penetration of HVDC Interconnectors

Xiaolin DING¹, Chuanyue LI², Jun LIANG², Xueguang WU³

¹National Grid, United Kingdom; ²Cardiff University, United Kingdom; ³Global Energy Interconnection Research Institute, China

ID: 10204

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS3 - Challenges and Advances in Power System Dynamics

Keywords: Fault Level, System Strength, Voltage Sensitivity, Power System Faults, Power System Stability

Implications of Reduced Fault Level and its Relationship to System Strength: A Scotland Case Study

Samuel GORDON, K BELL, Q HONG

University of Strathclyde, United Kingdom

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS3 - Challenges and Advances in Power System Dynamics

Keywords: Blackstart, Distribution Network, Real Time Studies, Hardware in Loop Testing

Real Time Simulation and Demonstration of Black Start on Transmission Networks using Embedded Synchronous Generators

Bharath PONNALAGAN¹, Ian COWAN¹, Md RAHMAN¹, Bemjamin MARSHALL¹, Oluwole ADEUYI¹, Neil MILLER²

¹The National HVDC Centre, United Kingdom; ²Scottish Power Energy Networks, United Kingdom

ID: 10234

C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS3 - Challenges and Advances in Power System Dynamics

Keywords: synchronous condenser, transient stability, grid-forming inverters, dynamic stability, inverter-based resources

System Stability with Synchronous Condensers for Power Export from Inverter Dominant Generation Regions

Matthew RICHWINE¹, Nicholas MILLER²

¹Telos Energy, United States of America; ²HickoryLedge LLC, United States of America

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Topics: PS3 - Challenges and Advances in Power System Dynamics

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Active and Reactive Power Control in an Island System Operated on Inverter-Based Resources

Apostolos PAPAKONSTANTINOU, Spyridon BOSMIS, Stavros PAPATHANASIOU

NTUA, Greece

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS3 - Challenges and Advances in Power System Dynamics

Keywords: Power system reliability, digital twin, common information model (CIM), IEC61850

New Concept of Next-Generation Power System Reliability Control System based on RSDT (Real-time Smart Digital Twin)

Tomoki KAWAMURA, Yoshihiro KITAUCHI

Central Research Institute of Electric Power Industry, CRIEPI

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Topics: PS3 - Challenges and Advances in Power System Dynamics

System Strength Support using Grid-Forming Energy Storage to Enable High Penetrations of Inverter-Based Resources to Operate on Weak Networks

Stephen SPROUL¹, S CHEREVATSKIY¹, S ZABIHI¹, J ZIMMERMANN¹, A OUDALOV²

¹Hitachi ABB Power Grids Australia; ²Hitachi ABB Power Grids Switzerland

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Topics: PS3 - Challenges and Advances in Power System Dynamics

Keywords: aggregated assets, power system, malfunction

Impact of Aggregated Assets in the Power System

Walter SATTINGER¹, M. RAMIREZ², E. HILLBERG³, R. SEGUNDO², A. OBUSEVS², A. CHACKO⁴, D. CLAUSS⁴, P. KORBA²

¹Swissgrid Ltd; ²ZHAW Switzerland; ³RISE Sweden; ⁴TIKO Switzerland

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Experimental Validation of a Grid-Following Wind Turbine Connected to Weak Grids

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CIGRE Denmark, Denmark

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS3 - Challenges and Advances in Power System Dynamics

Keywords: Magnetic;simulations;risk assessment;live black start;test

Electro Magnetic Transient Simulations for Risks Assessment of a Live Black Start Test of an HVDC VSC

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Flexibility Requirements of the KSA Power System in Presence of a Massive Development of Renewable Energies

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¹SEC , KSA; ²CESI, Italy

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Keywords: FACTS, PV, CSP, RES, RoCoF, SCR

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¹SAUDI ELECTRICTY COMPANY, KSA

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¹Svenska kraftnät, Sweden; ²Fingrid Oyj, Finland

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Virtual C&P – A powerful simulation platform for HVDC and FACTS in present and future grids

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¹Hitachi Energy, Sweden; ²Bonneville Power Administration, USA; ³Statnett, Norway

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Grid-Forming Control for STATCOMs – a Robust Solution for Networks with a High Share of Inverter-Based Resources

Rasool HEYDARI¹, Hongyang ZHANG¹, Luca BESSEGATO², Jean-Philippe HASLER¹, Gunnar INGESTROM¹, Andrea GRONDONA¹, Tobias HENNING³, Tobias NEUMANN³, Klaus VENNEMANN³, Marc GROSSMANN³, Robert ZIERMANN³

¹Hitachi Energy, Sweden; ²Svenska kraftnät, Sweden; ³Amprion, Germany

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Topics: PS3 - Challenges and Advances in Power System Dynamics

Cycle Life Assessment of Battery Energy Storage Systems for Primary Frequency Control by Rainflow Counting Algorithm

Mehmet CECECI¹, Ercüment ÖZDEMİRÇİ²

¹The University of Firat, Turkey; ²TEIAS (Turkish Electricity Transmission Coop.), Turkey

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS3 - Challenges and Advances in Power System Dynamics

Keywords: Grid code, power system, Hardware In the Loop, ancillary services, supervision, monitoring

Ancillary Services Supervision with Hardware In the Loop and e-Monitoring New Methods

Laurent CHATONNET¹, Thomas LESCARRET², Marc FLORES¹

¹EDF Hydro/DTG; ²EDF/DPN/UNIE

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS3 - Challenges and Advances in Power System Dynamics

Keywords: Continental Europe, System Split, Frequency Stability, Rate of Change of Frequency, Blackout

Inertia Need and Cost Related to System Splits for the Future Continental Europe Power System

Gregoire PRIME, N BOUSSONIERE, M DESMARTIN, Ye WANG

EDF

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS3 - Challenges and Advances in Power System Dynamics

Keywords: Isolated power systems, Battery Energy Storage System, Grid-feeding, Grid-forming, Synchronous Condensers

Taking Advantage of Grid-Forming BESS Behaviour During Major Outages: Contribution to Improve the Share of Renewable Energy in French Isolated Power Systems

Guilherme SANTOS-PEREIRA¹, F BENAVENT², J WITKOWSKI³, Gregoire PRIME¹

¹EDF Paris-Saclay; ²EDF CIST; ³EDF SEI

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Topics: PS3 - Challenges and Advances in Power System Dynamics

Keywords: High Share of Inverter Based Resources, Transient Stability, Voltage Stability, Fast Frequency Response, Voltage Dip Induced Frequency Dip, System Non-Synchronous Penetration, Data Clustering.

Stability Analysis on the Power System of Ireland and Northern Ireland for Operation with 75% Inverter-Based Resources

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Frequency Regulation for Low Inertia Power System with High Penetration of Photovoltaic System

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¹Electricity Distribution Company, Jordan; ²Al-Ahliya Amman University, Jordan

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The Transient Simulation of Battery Storage Connection to Utility Scale Solar Power Plant Under Low Inertia Scenarios in the Jordanian System

Ahmad TAHSEEN¹, Suad ALMATTAR²

¹National Electric Power Company, Jordan, Jordan; ²National Electric Power Company, Jordan, Jordan

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers

Topics: PS3 - Challenges and Advances in Power System Dynamics

Keywords: Sub-synchronous resonance, Waveform measurement, Frequency Scanning, WAProtector, Real-time operation

Sub-synchronous Resonance Monitoring based on Real Time Data

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Keywords: Electricity Markets, Regional Interconnection, Electricity Trading, Spot Market

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Keywords: congestion management, renewable energy integration, market design, network investment, generation connection

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Hideki KIBATA¹, Takeshi YAMASHITA¹, Hiroshi IRIE², Akihisa SETTAI², Kazuhiko OGIMOTO³

¹Tokyo Electric Power Company Holdings, Inc.; ²Mitsubishi Research Institute, Inc.; ³The University of Tokyo

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Keywords: Cross-border Electricity Trading, Renewable Energy Generations (REGs), Power System Security, Ancillary Services

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TNC-CIGRE, Thailand

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¹CEMIG D; ²CPQD

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Keywords: resource adequacy, loss of load expectation, reliability, probabilistic analysis

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Derek STENCLIK¹, Aaron BLOOM², Gord STEPHEN³, Wesley COLE³, Armando FIGUEROA ACEVEDO⁴, Aidan TUOHY⁵, Genevieve DE MIJOLLA⁵

¹Telos Energy, United States of America; ²NextEra Energy, United States of America; ³National Renewable Energy Laboratory, United States of America; ⁴Midcontinent Independent System Operator, United States of America; ⁵Electric Power Research Institute, United States of America

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¹Australian Energy Market Commission; ²GHD Advisory Australia

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Keywords: Supply-Demand Balance, Fuel Shortage, LNG Stock, Price Spike, Capacity Market, Missing Money

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Kansai Transmission and Distribution, Inc.

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Keywords: Capacity market, Balancing market, Renewable energy installation, Carbon Neutrality

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Yu TAKAMIZAWA¹, Kenichi SUGAHARA², Takao SHINJI³, Akihiko YOKOYAMA⁴

¹Chubu Electric Power Co., Inc.; ²Chubu Electric Power Grid Co., Inc.; ³Advanced Cogeneration and Energy Utilization Center Japan; ⁴The University of Tokyo

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Keywords: RPI-X

Transmission Regulation: The Economic Regulation Applied for Oman Electricity Transmission Network

Alaa ALKIYAMI¹, Zahra ALRAWAHI²

¹Muscat Electricity Distribution Company, Oman; ²Oman Electricity Transmission Company, Oman

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Keywords: carbon pricing, wholesale electricity markets, greenhouse gases, emissions trading system, carbon tax

Carbon Pricing and Wholesale Electricity Markets - Key Impacts and Trends from Around the World

Anthony GIACOMONI¹, Diego ALVARADO², Livia AMORIM³, Kenneth BRUNINX⁴, Brian JOSEPH⁵, Anes KAZAGIC⁶, Rodrigo MORENO⁷, Subhendu MUKHERJEE⁸, Yoann THOMAS⁹, Jarrad WRIGHT¹⁰

¹PJM Interconnection, United States of America; ²Instituto Sistemas Complejos de Ingenieria, Chile; ³Souto Correia, Brazil; ⁴KU Leuven, Belgium; ⁵Ernst & Young, Australia; ⁶EPBiH, Bosnia & Herzegovina; ⁷University of Chile, Chile; ⁸POSOCO, India; ⁹EDF, France; ¹⁰CSIR, South Africa

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Keywords: wholesale electricity market structure, price formation, capacity, accreditation, intermittent energy sources, distributed energy resources

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Rana MUKERJI, Michael DESOCIO, Nicole BOUCHEZ

New York Independent System Operator (NYISO), United States of America

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Gaurav VERMA

Power System Operation Corporation Limited

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International Practices for Reactive Power, Short Circuit Power and Synchronous Inertia Compensation and Tariff Model Proposal for Pilot Synchronous condenser Implementation

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Vehicle-to-Grid as a Tool for Ensuring the Flexibility of Demand for Electric Energy when Reorienting Transport to Electric Vehicles

T.S. REMIZOVA¹, D.B. KOSHELEV²

¹JSC "Administrator of the wholesale Electricity market trading system"; ²PJSC "Rosseti Center"

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Policy and Regulation for Energy Storage Systems in Energy Markets. A Case Study of Russia

V. BEREZOVSKY, A. SVIRIDOV, S. GAFAROV, A. PAVLYCHEVA

Association "NP Market Council"

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T.A. VASKOVSKAYA

National Research University "Moscow Power Engineering Institute"

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Deployment and Evaluation of TSO-DSO-Consumer Coordination in a Market Environment

Nikolaos SAVVOPOULOS¹, Dimitris TRAKAS¹, Aris DIMEAS¹, Nikos HATZIARGYRIOU¹, Emmanouil VOUMVOULAKIS², Eirini LEONIDAKI², Markos CHAMPAKIS²

¹NTUA, Greece; ²HEDNO, Greece

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Implementation of a wholesale electricity market based on bilevel programming algorithm in Cyprus

Amritbir Singh GILL¹, Wan-Ying HUAN¹, Sami AMMARI¹, Ioannis YIANNAKI², Nikos KANELAKIS², Konstantina MENTESIDI², Konstantinos PERRAKIS²

¹GE Digital Services; ²TSOC CYPRUS

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Development of Guarantees of Origin trading in Croatia within the European context

Marko KELAVA

HRO CIGRE, Croatia

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Topics: PS3 - Working With Innovation and Disruption — Preparing For the Future

Keywords: Value-at-Risk (VaR), Conditional Value-at-Risk (CVaR), Historical Simulation method, Variance-covariance method, Monte Carlo method, Ancillary Service, Balancing Market, Portfolio Optimization

Risk Evaluation for Ancillary Service

Omer HADZIC¹, Adnan MUJEZINOVIC², Zijad BAJRAMOVIC², Irfan TURKOVIC²

¹Independent system operator in Bosnia and Herzegovina, Bosnia and Heregovina; ²Faculty of Electrical Engineering, University of Sarajevo, Bosnia and Heregovina

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C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: PS3 - Working With Innovation and Disruption — Preparing For the Future

Spanish Technical Standard (NTS) for grid connection of generation

Sergio MARTÍNEZ-VILLANUEVA¹, Daniel DAVÍ-ARDERIUS², José Luis BORREGO-NADAL³

¹RED ELÉCTRICA DE ESPAÑA (REE); ²ENDESA (ENEL); ³ENTIDAD NACIONAL DE ACREDITACIÓN (ENAC)

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C5 ELECTRICITY MARKETS AND REGULATION - Full Papers

Topics: PS3 - Working With Innovation and Disruption — Preparing For the Future

Evaluation of critical peak pricing impact on Hydro-Quebec residential customers load profile for distribution network planning

Atieh DELAVARI*, Simon SANSREGRET

Hydro-Quebec Research Institute, Canada

C6 - ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES

PS 1 DER SOLUTIONS AND EXPERIENCES FOR ENERGY TRANSITION AND DECARBONISATION

ID: 10311

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS1 - DER Solutions and Experiences for Energy Transition and Decarbonisation

Keywords: Conservation Voltage Reduction, Energy saving, Hardware in the Loop

Control Strategy of Conservation Voltage Reduction for Energy Saving in Low Voltage Distributed Network

Saehwan LIM, Hyeong-Jun YOO, Gyeong-Hun KIM, Jihui HWANG, Jin-Oh LEE

KOREA ELECTROTECHNOLOGY RESEARCH INSTITUTE, Korea, Republic of (South Korea)

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS1 - DER Solutions and Experiences for Energy Transition and Decarbonisation

Keywords: high speed, railway, power supply, power electronics, case studies

Improvement of high speed railway power supply utilizing power electronic solutions - case studies

Philippe MAIBACH

Hitachi Energy Switzerland

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS1 - DER Solutions and Experiences for Energy Transition and Decarbonisation

Two Years of Operation of the S4S Tilos Hybrid Power Station, Experiences and Lessons Learned

Evaggelos TSOUMAS¹, George PECHLIVANOGLU¹, Vasilis KALAVROUZOTIS¹, Vasilis TSIMARAS¹, Antonis MOUSTAKIS¹, Konstantinos KAOUSIAS², Haris KOURELIS², Angeliki KOURI¹

¹EUNICE ENERGY GROUP, Greece; ²HEDNO, Greece

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS1 - DER Solutions and Experiences for Energy Transition and Decarbonisation

Keywords: AHP model, PV technology, power generation, renewable, technologies

Sustainable Generation Expansion Planning (GEP) with renewables: A case study of Bahrain

Abdulla ALABBASI², Matthew LEACHA¹, Jhuma SADHUKHAN¹, Mohammed SANDUK³

¹Centre for Environment and Sustainability, University of Surrey, United Kingdom; ²Bahrain Center for Strategic, International and Energy Studies, Kingdom of Bahrain; ³Chemical Engineering Department, University of Surrey, United Kingdom

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Topics: PS1 - DER Solutions and Experiences for Energy Transition and Decarbonisation

A study on the effect of electric vehicles' charging stochasticity on a machine learning-based fault detection algorithm

Paschalia STEFANIDOU-VOZIKI¹, Nikolaos SAPOUNTZOGLU², Roberto VILLAFILA-ROBLES³, Jose Luis DOMINGUEZ-GARCIA¹

¹IREC; ²ENTSO-E; ³UPC

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS1 - DER Solutions and Experiences for Energy Transition and Decarbonisation

Keywords: v2g, electric vehicles, daily charge curve, pyomo

V2g technology and its impact on the daily load diagram: case se0062 - huancayo – peru

Leonidas SAYAS POMA¹, Fidel MEDINA CATAY²

¹OSINERGMIN; ²Universidad Nacional del Centro del Peru

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Distributed Energy Resource Management System – Challenges and Opportunities

L LEITE¹, D ALVES², M NASCIMENTO³, N TRIVED⁴, B MARTINS⁵

¹FITec, Brazil; ²CEMIG, Brazil; ³CONCERT, Brazil; ⁴VRINDA, EUA; ⁵SCHNEIDER, Brazil

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Keywords: Overhead Line – Active Distribution System – Directional Power Flow

Directional power flow Monitoring in overhead line distribution Networks with high Penetrations of DER

Samuel C E JUPE¹, Ben O BREWIN¹, Sid R HODA¹, S PINKERTON-CLARK², Simon J HODGSON³

¹Nortech Management Limited, United Kingdom; ²Western Power Distribution, United Kingdom; ³Nortech Management Limited, Norway

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

A Power Hardware-in-the-Loop Infrastructure for DER Integration

Olivier TREMBLAY

Hydro-Québec

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Keywords: Distribution Network Reconfiguration, Hosting Capacity, Non-wire alternatives, Advanced distribution management system

Demonstration of Distribution Network Reconfiguration for increasing Hosting Capacity of Renewable Energy considering Multiple Constraints

Sung-Min CHO¹, Hyeong-Jin LEE¹, Won-Wook JUNG¹, Chang-hoon SHIN¹, Ja-Yoon KOO²

¹Korea Electric Power Corporation Research Institute, Republic of Korea; ²Hanyang University, Republic of Korea

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Keywords: Distribution systems, Renewable energy, Self-sufficiency, Variability mitigation, Flexibility

A Study on the Self-sufficient and Flexible Operation Strategies of Distribution System with High Levels of Renewable Energy

G. S. BYEON, H. C. JO, W. B. SON, K. H. CHO, J. Y. KIM, S. K. KIM

Korea Electrotechnology Research Institute, Korea, Republic of (South Korea)

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Keywords: DERMS, reverse power flow, load relief, high voltage, voltage fluctuations

Utilizing DERMS and Utility Owned Weather Stations for High DER Penetration on the Distribution System

Nicholas BURICA, Beata OKRUTA, Imran RAHMAN, Heng CHEN

Commonwealth Edison, United States of America

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Keywords: Distributed Energy Resources (DER), Distributed Energy Resource Management System (DERMS), Advanced Distribution Management System (ADMS), evaluation testing, Virtual Power Plant (VPP)

EPRI's Digital Twin SPIDER Testbed and Benefits

Aditie GARG, Jithendar ANANDAN, Ahm JAKARIA, Rayhan MITHU, Ajit RENJIT

Electric Power Research Institute, United States of America

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Analytic and Heuristic Optimal Reactive Power Management with Shunt Capacitors in Distribution System of Southern Regional Grid of India

Arthi Sahaya RONES V

Power System Operation Corporation Limited

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Analysis and a Conceptual Framework of Short-Term Planning Operation of South American Active Distribution Systems

Mauricio SAMPER, Mauro JURADO, Rodolfo ROSÉS

Institute of Electric Energy (IEE) - UNSJ - CONICET

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Keywords: Volt-VAR Optimization, Conservation Voltage Reduction (CVR), CVR Factor, Energy Efficiency, Demand Response

Volt-VAR Optimization and Benchmarking in a Pilot Project

Tanuj KHANDELWAL¹, Ahmed Y. SABER¹, Lo Chin KIM², Calvin Ku Shong CHING²

¹ETAP, United States of America; ²TNBR, Malaysia

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Keywords: smart inverters, solar photovoltaics (PV), distribution system modelling, voltage regulation

Smart Inverter Functions to Increase PV Hosting Capacity - A Case Study of New York Distribution Circuits

Jouni PEPPANEN, Shammy SAHA, Devin VAN ZANDT, Matt RYLANDER

Electric Power Research Institute, United States of America

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Keywords: Distributed Energy Resources (DER), distribution system modelling, energy storage (ES), smart inverters, solar photovoltaics (PV)

Distributed Energy Resource Benchmark Models for Distribution Impact Assessment Developed by CIGRE Working Group C6.36

Jouni PEPPANEN¹, Jason TAYLOR¹, Daniel FONSECA², Josh SNODGRASS³, Shengen CHEN⁴

¹Electric Power Research Institute, United States of America; ²Sinapsis – Inovação em Energia, Brazil; ³POWER Engineers Inc., United States of America; ⁴RLC Engineering PLLC, United States of America

ID: 10593

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Keywords: Distribution System, Distributed Energy Resource, Voltage Control, Reactive Power

Development of Voltage and Power Flow Control Method for Distribution System Using Distributed Energy Resources

Satoshi UEMURA¹, Hiroyuki HATTA¹, Yasuhiro HAYASHI², Atsushi ISHIGAME³, Jun YOSHINAGA⁴, Kenjiro MORI⁵

¹Central Research Institute of Electric Power Industry (CRIEPI); ²Waseda University; ³Osaka Prefecture University; ⁴TEPCO Power Grid, Inc.; ⁵Tokyo Electric Power Company Holdings, Inc.

ID: 10594

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Keywords: Off-grid - Inverter power supply - Power conditioner system - PV - BESS - Fault detection - Black start - Soft-start

Economical and Technical Evaluation of Transformation from Existing Distribution System to Off-grid

Masato SHIRO¹, Tetsuya HIRAYAMA¹, Hideyasu HOKAZONO¹, Kazuyoshi HASHIKAWA¹, Tomonosuke MORI², Junichi KUMANO²

¹Kansai Transmission and Distribution, Inc.; ²Mitsubishi Electric Corp.

ID: 10595

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Keywords: Connect and Manage, Non-firm Connection, Cost Comparison Study, Grid Reinforcement

Examination of NF-type Connection Power Supply for Interconnection to the Power Distribution System

Jun YOSHINAGA¹, Kazunari ISHIBASHI¹, Kazuki TAKAHASHI¹, Nozomi ANDO², Hiroaki OTAKE², Hiroshi IRIE²

¹TEPCO Power Grid, Inc.; ²Mitsubishi Research Institute, Inc.

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Keywords: Transmission systems, Distribution systems, Demand-side control, DERMS, Optimal Power Flow, Voltage and Current Control

Voltage and Current Control of Transmission and Distribution Systems Utilizing Demand-side DERs

Shunsuke KAWANO, Keisuke YAMANE, Keishi MATSUDA

Mitsubishi Electric Corporation

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Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

A method for Accurate Balanced Radial Distribution System Parameters Estimation

Mahmoud ALY, Mohamed NAYEL, Mansour MOHAMED, Mostafa MERAZY

Assiut University, Egypt

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Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Congestion Management in Distribution Systems with Large Presence of Renewable Energy Sources

Martin LUNDBERG¹, Olof SAMUELSSON¹, Markus MIRZ², Emil HILLBERG³, Niel HANCOCK⁴

¹Lund University, Sweden; ²RWTH Aachen, Germany; ³RISE Research Institutes of Sweden, Sweden; ⁴E.ON Energidistribution, Sweden

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Power quality issues due to PV integration in distribution systems – Two Swedish case studies

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RISE Research Institutes of Sweden, Sweden

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Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Analysis Of The Effect Of Solar Power Plants On Technical Losses In The Grid; Case Study: Kahramanmaras Region in Turkey

Fatma Avli FIRİŞ

AKEDAS Electricity Distribution Corporation Kahramanmaras, Turkey

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Keywords: Control in A.C Microgrids: Hierarchical Control, Technologies and Regulations

Control in AC Microgrids: Hierarchical Control, Technologies and Regulations

Jose RAMIREZ

Universidad del Valle

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Active Network Management (ANM) Experiences in i-DE Networks

Cristina VILA CASTRO

i-DE Redes Eléctricas Inteligentes SAU

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Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

ZellNetz2050 - A Concept for the Efficient and Effective Operation of Multi-Sector Cellular Energy Systems

Felix FLATTER¹, Sara MOHAMMADI²

¹University of Kaiserslautern, Germany; ²University of Kaiserslautern, Germany

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Scenarios and field trials on active distribution grids in the German Kopernikus projects SynErgie and ENSURE

Peter NOGLIK¹, Tobias PLETZER²

¹Hitachi ABB Power Grids, Germany; ²Schleswig-Holstein Netz AG, Germany

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Determination of Real-Time Interdependent Flexibility on multiple Grid Connection Points in an Active Distribution Network

Andreas KUBIS¹, Ankit SINGH²

¹PSI Software AG, Germany; ²PSI Software AG, Germany

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Devising Models for the Integration of DER in Designated Zones in South Africa

Preshaan JAGLAL

Eskom Holdings Limited

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Technological Interventions to maximise Benefits in Electrification Programme

MH XIVAMBU

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Topics: PS2 - Innovative Planning and Operation of Active Distribution Systems

Behind-the-Meter PV Estimation for Grid Awareness and Enhanced Visibility

Aditie GARG

Electric Power Research Institute, USA

PS 3 AGGREGATED DER FOR ENHANCING RESILIENCE, RELIABILITY AND ENERGY SECURITY OF DISTRIBUTION SYSTEMS

ID: 10237

C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

Keywords: microgrid, Vehicle to Grid (V2G), reliability, resiliency, Battery Energy Storage System (BESS)

A Microgrid Platform for V2G: Lessons Learned from the Arlington Microgrid

John GLASSMIRE¹, Scott GIBSON², Ryan M. SMITH¹, Chanaka KEERTHISINGHE³

¹Hitachi Energy, United States of America; ²Snohomish County Public Utility District, United States of America; ³University of Washington, United States of America

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

Keywords: Battery Energy Storage Systems (BESS), Community Energy Storage Systems (CES), resiliency, reliability, peak shaving

Utility Energy Storage Use Cases, Health Monitoring, Data Analysis and Learnings (BESS)

Shikhar PANDEY, Will NATION, Aleksandar VUKOJEVIC, Esa Alekski PAASO

Commonwealth Edison, United States of America

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

Keywords: BESS, Flexibility, Islanded Systems, Laboratorial Testing

Laboratorial testing of island integration of BESS at 5% scale

Carolina JESUS¹, Luís Miguel ROCHA², Pedro REIS², Pedro RIBEIRO², Rui MARTINS², Andreia LEIRIA², Isabel CATARINO¹

¹NOVA School of Science and Technology, Portugal; ²EDP Labelec, Portugal

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

Keywords: VPP(Virtual Power Plant), DER(Distributed Energy Resources), DSO(Distribution System Operator), Cloud, Management

Demonstration of Cloud Based Management and Control System for Virtual Power System in Korea

Seewoo LEE, Jinho LEE, Beomryeol CHOI, Hyeonjeong JO, Bogun JIN

HYOSUNG Corporation, Korea, Republic of (South Korea)

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

A Method for Planning and Assessment of LVDC System in Civil Buildings

Guowei LIU¹, Yuming ZHAO¹, Yangxin QIU², Longjun WANG², Lili MO², Qing ZHONG²

¹Shenzhen Power Supply Bureau Co., Ltd., China; ²School of Electric Power, South China University of Technology, China

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

Keywords: microgrid, Solar PV and Battery Coordination (SBC), Distributed Energy Resources (DER), Hardware in the Loop (HIL)

Coordinated Solar PV-BESS Control in BCM: Algorithm, HIL Testing and Learnings with Different Solar Profiles

Niroj GURUNG, Roshan SHARMA, Honghao ZHENG, Aleksandar VUKOJEVIC

Commonwealth Edison, United States of America

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Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

Research on Operation Control Strategy of Low-voltage DC Microgrid Based on Improved Droop Method

Xiangbiao LENG¹, Kang CHEN², Fei PENG¹, Haixiang YU¹, Junxin NIU¹, Wenlong ZENG¹, Qiaozhang HONG¹

¹China Southern Power Grid Energy Development Research Institute Co., Ltd., China; ²Rizhao Power Supply Company, State Grid Shandong Electric Power Company, China

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Case Study for Greening Island in Andaman

Dhirendra JOSHI¹, Subir KARMAKAR²

¹NTPC Ltd.; ²NTPC Ltd.

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

Keywords: Operation Method, Protection Devices, MVDC, Microgrid System, Distributed Generators

Operation Method of Protection Devices in 5kV MVDC Microgrid System Interconnected with Distributed Generators

Daeseok RHO¹, Byungki KIM², Hosung JIN³

¹Korea University of Technology & Education; ²Korea Research of Energy Research; ³Gana Engineering Institute

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Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

Transient Operation Algorithm of CVCF Inverter-based Micro-grid System

Byungki KIM¹, Daeseok RHO², Hudong LEE², Donghyun TAE²

¹Korea Research of Energy Research; ²Korea University of Technology & Education

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Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

A Hybrid Heuristic Optimization Algorithm for the Rolling Day-Ahead Scheduling of Non-Interconnected Islands in Greece

Charalampos PAPPAS, Despina KOUKOULA, Stefanos KOKKINELIS, Argiro MAGANIOTI, Andreas REPPAS, Theodora PATSAKA
HEDNO, Greece

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A Testbed-based Approach for the Resiliency Assessment of Multi-Microgrids

Michael SPIEGEL, Thomas STRASSER
AIT Austrian Institute of Technology GmbH

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Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

Enhancing grid resilience and flexibility with sustainable data centers

Sten TROLLE¹, Karla LAINEZ AMAYA¹, Marcus GIESE², Mats LARSSON³, Alexandre OUDALOV³, Sebastian ORRAS APARICIO³
¹Hitachi Energy, Sweden; ²Hitachi Energy, Germany; ³Hitachi Energy, Switzerland

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Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

A Research on Power Quality of Storage System in Photovoltaic Energy Generation Systems in Distribution Networks

Halil İbrahim AYDINÖZ

Turkish Electricity Transmission Corporation Turkey

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Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

Economic Analysis of Stand Alone and Grid Connected Microgrid by Using HOMER

Mikail PURLU¹, Belgin Emre TURKAY², Sezen BEYARSLAN³

¹Istanbul Technical University Turkey; ²Istanbul Technical University Turkey; ³Istanbul Technical University Turkey

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

Experimental comparative analysis of photovoltaic inverters profiles in relation to the European network code NC RfG, the technical standards and the requirements of distribution system operators

Zbigniew HANZELKA, Krzysztof CHMIELOWIEC, Łukasz TOPOLSKI, Aleks PISZCZEK, Mateusz DUTKA

AGH University of Science and Technology

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Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

Evaluation and selection of key monitoring variables for estimating operational limits of the BESS in the grid connection through modelling approach

Juan GILABERT-MARZAL¹, Isabel FERRER-GALIANA¹, Alejandro BELINCHON-CALDERÓN¹, Victoria JOVER-MEGÍA¹, Alfredo QUIJANO-LÓPEZ²

¹Instituto Tecnológico de la Energía; ²Instituto de Tecnología Eléctrica, Universitat Politècnica de València

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: PS3 - Aggregated DER for Enhancing Resilience, Reliability and Energy Security of Distribution Systems

Keywords: Hybrid RES, mini-grid, rural electrification, energy storage, mini-grid control

Renewable Energy Hybrid Mini-Grid Concept for Rural Electrification in Georgia

Giorgi ARZIANI, Teona ELIZARASHVILI, Baia KVATADZE

Parvus Consulting, Georgia

D1 - MATERIALS AND EMERGING TEST TECHNIQUES

PS 1 TESTING, MONITORING AND DIAGNOSTICS

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Experience with Electrical Tests in UHVDC System for Safety Quantities Definition for Live Line Working

J CARDOSO¹, R GARCIA¹, F SILVA¹, A NIGRI², J GRAHAM³, R COSTA³, F ZUO³

¹CEPEL; ²Independent Consultant; ³SGBH

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Integrity Evaluation of Thermal Power Plant based on Carbide Precipitation Sequence

H FURTADO, T SANTOS, R SANTANA, B CARDOSO, L ALMEIDA

CEPEL, UFRJ

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Methodologies Development for Power Transformers Incipient Faults Prediction Related to Particles Contamination and Bubble Formation

H WILHELM¹, P FERNANDES¹, L DILL¹, K MOSCON¹, C STEFFENS¹, S PERES¹, V BENDER², T MARCHESAN², J NETO³

¹Vegoor Tecnologia Aplicada, Brasil; ²Universidade Federal de Santa Maria, Brasil; ³Santo Antônio Energia, Brasil

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Keywords: H2 Gas-Led, Stray, Catalytic and Chemical Reaction

The Analysis for the Diagnosis Method about H2 Gas-Led Issue according to Stray, Catalytic and Chemical Reaction for transformers in Service

J.K LEE, K.H LEE, D.H KIM

HYUNDAI ELECTRIC & ENERGY SYSTEMS CO., LTD., Korea, Republic of (South Korea)

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Keywords: machine learning, Duval pentagons, DGA, classification

Machine Learning Algorithm Trained by the Duval Pentagons - A Simplified DGA Approach

Luiz CHEIM

Hitachi Energy, United States of America

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Keywords: high voltage bushing, dielectric frequency response, insulation assessment, temperature, leakage current

Effective Insulation Condition Assessment of HV and EHV Bushings under Critical Environmental and Operational Conditions

Diego ROBALINO¹, Peter WERELIUS², Ismail GUNER³

¹Megger Group, United States of America; ²Megger, Sweden; ³Hydro Quebec, Canada

ID: 10399

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Keywords: accuracy, low-power instrument transformer, capacitive voltage dividers, ratio error, phase error

Aging Assessment of High Accuracy Low Power Voltage Transformer

Mattewos TEFFERI¹, Elisa SCALA², Andrea NALLI², Nick NAKAMURA¹, Blair KERR¹, Laura MAZZOCCHETTI³, Lorenzo PERETTO³, Nenad UZELAC¹

¹G&W Electric, United States of America; ²G&W Altea, Italy; ³University of Bologna, Italy

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Topics: PS1 - Testing, Monitoring and Diagnostics

Research on the Causes of Damage to High-Voltage Oil-Filled Equipment with a “Gas Blanket”

L.A. DARIAN¹, S.M. KOROBEYNIKOV², V.A. LOGUNOV³, R.M. OBRAZTSOV¹

¹JSC “Technical Inspection UES”; ²Novosibirsk State Technical University (NSTU); ³Federal State Unitary Enterprise «Russian Federal Nuclear Center – Zababakhin All– Russia Research Institute of technical Physics»

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

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The Application of Artificial Neural Networks in the Diagnosis of High-Voltage Circuit Breaker

A.R. ROTBLYUT, D.A. PALFEROV, O.P. BUKRIN

OOO Elmash (UETM)

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Keywords: Aging management, nondestructive testing, underfilm corrosion, terahertz waves, millimeter waves, transmission towers

Nondestructive Terahertz and Millimeter Wave Imaging for Underfilm Corrosion

Norikazu FUSE¹, Yasuhiko HORI¹, Tsuguhiro TAKAHASHI¹, Maya MIZUNO²

¹Central Research Institute of Electric Power Industry; ²National Institute of Information and Communications Technology

ID: 10647

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Keywords: Power transformer, Cellulose fiber, Static electrification phenomenon, Insulation paper, Degree of polymerization, ECT

The Evaluation Method of Static Electrification in Aged Power Transformers Using Cellulose Fibers Suspended in Insulating Oil

Masanobu YOSHIDA¹, Hiroko ISAJI¹, Gaku SATO², Yoshinori KONISHI², Takayuki GOTOH²

¹Chubu Electric Power Co., Inc.; ²YUKA Industries. Co., Ltd.

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Keywords: HVDC, GIS, voltage dividers, diagnostic, testing

Diagnostic and testing on GIS voltage dividers for HVDC applications

Uwe RIECHERT¹, Erik SPERLING², Andreas DOWBYSCHE³

¹Hitachi Energy Switzerland; ²Omicron electronics GmbH Switzerland; ³TU Dresden Germany

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

On-load tap changer monitoring and protection by extra power loss and circulating current analysis

Nilanga ABEYWICKRAMA, Tord BENGTSOON

Hitachi Energy Research, Sweden

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Topics: PS1 - Testing, Monitoring and Diagnostics

On-load tap changer switching sequence monitoring – comparison of methods

Joachim SCHIESSLING¹, Cecilia FORSSÉN¹, Nilanga ABEYWICKRAMA¹, Niklas GUSTAVSSON², L LIDÉN², B-O STENESTAM², T LARSSON²

¹Hitachi Energy Research Sweden, Sweden; ²Hitachi Energy Sweden, Sweden

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Topics: PS1 - Testing, Monitoring and Diagnostics

Requirements for Ultra High Frequency Partial Discharge Monitoring Systems for Gas Insulated Systems

Wojciech KOLTUNOWICZ, Glenn BEHRMANN, Matthias BOLZE, Andrea CAPRARA, Graeme COAPES, Fraser COOK, Hiroyuki HAMA, Thomas HUECKER, Carl JOHNSTONE, Stefan NEUHOLD, Claus NEUMANN, S. OHTSUKA, Jean-Francois PENNING, Uwe RIECHERT, Toshiaki ROKUNOHE, Uwe SCHICHLER, Markus SOELLER, Takanori YASOUKA

CIGRE Working Group D1.66

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Keywords: Dissolved Gas Analysis, DGA, Diagnostics, Condition Monitoring

Determination of Gas Solubility Coefficients for Dissolved Gas Analysis (DGA)

Senja LEIVO, Mikko ARONNIEMI, Sami VIRTANEN, Jarkko LARKIO, Toni MELLIN, Lydia HYRSKY, Sutidara NOPAKUN-BOROVSKA Vaisala

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Requirements for Artificial Intelligence Platform addressed to Automatic Assessment of Insulation Condition of Indoor and Outdoor Installations through Partial Discharge Monitoring

Antonio SÁNCHEZ¹, Fernando GARNACHO³, Javier ORTEGO⁴, Fco. Javier MARTÍN², Ricardo REINOSO¹, Ricardo GÓMEZ¹, Alejandro VIVAS¹, Ángel RAMÍREZ³, Abderrahim KHAMLI³, Carlos VERA³, Javier DI DECO⁵, Sergio GONZÁLEZ⁵, Alejandro MUNICIO⁵, Edmundo SANTOLARIA⁵

¹REE; ²ELEWIT; ³LCOE-FFII; ⁴AMPACIMON; ⁵PIPERLAB

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Optimized deployment of online partial discharge monitoring solutions for distribution grids

Antonio GONZÁLEZ¹, Javier ORTEGO^{2,4}, Fernando GARNACHO^{3,4}

¹EDP REDES ESPAÑA; ²AMPACIMON; ³LCOE; ⁴UPM

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Requirements, design principles and testing experience with composite voltages on a ±550 kV HVDC GIS voltage divider

Maria KOSSE¹, Erik SPERLING²

¹Siemens Energy Global GmbH & CO. KG, Germany; ²Omicron Electronics GmbH, Switzerland

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Novel Fiber Optic Sensor Technology for Determining the DP Value of Insulating Paper for Transformers

Tobias MUENSTER¹, Peter WERLE²

¹Leibniz Universität Hannover, Germany; ²Leibniz Universität Hannover, Germany

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Contribution to the standardisation of measurement of composite and combined high voltages

Ernst GOCKENBACH

Gottfried Wilhelm Leibniz Universität Hannover

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS1 - Testing, Monitoring and Diagnostics

Impact of Different Blocking Elements on the DC-Impulse Composite Waveform

Andreas DOWBYSCH¹, Thomas GÖTZ²

¹Technische Universität Dresden; ²Technische Universität Dresden

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Keywords: sulfur hexafluoride, insulation, dielectric medium, fluoronitrile, diffusion

Simulation of Diffusion Behavior for New Insulating Gases

Ang XIAO¹, John OWENS¹, Rudi VAN SAN², Rainer KURZ³

¹3M Company, United States of America; ²3M Company, Belgium; ³3M Company, Germany

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Oxidation Susceptibility of Insulating Mineral Oil and Natural Ester at Different Oxygen Concentrations

P FERNANDES¹, H WILHELM¹, L DILL¹, K MOSCON¹, C STEFFENS¹, T ROCHA²

¹Vegoor Tecnologia Aplicada, Brasil; ²ENEL Distribuição São Paulo, Brasil

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Thermally Upgraded Kraft Paper Performance in Insulating System Using Natural Ester Tested According to IEEE STD C57.100

H WILHELM¹, P FERNANDES¹, L DILL¹, K MOSCON¹, C STEFFENS¹, R MAREK²

¹Vegoor Tecnologia Aplicada, Brasil; ²Consultant, United States

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Research on the application of the environmentally friendly insulating gas CF3I in Electric power apparatus

Yunkun DENG¹, Su ZHAO²

¹Yunnan Power Grid Co., Ltd., China; ²Shanghai Jiao Tong University

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Keywords: Aramid Pressboard, Aramid Paper, Cellulose Pressboard, Dielectric Strength, Creep Strength

Dielectric Performance of Aramid Pressboard in Insulating Liquid

R. Casey BALLARD¹, Radoslaw SZEWCZYK², Thomas PREVOST³, Brad GREAVES³

¹DuPont, United States of America; ²DuPont, Poland; ³Weidmann Electrical Technologies, United States of America

ID: 10404

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Keywords: high voltage, Crosslinked Polyethylene (XLPE), insulation, degassing

New Crosslinking Technologies for Polyethylene Insulated Power Cables

Paul CARONIA¹, Timothy PERSON¹, Jeffrey COGEN¹, Roshan AARONS², Caroline GRAND³, Yabin SUN⁴

¹Dow Chemical, United States of America; ²Dow Chemical, Switzerland; ³Dow Chemical, Spain; ⁴Dow Chemical, China

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Keywords: HVDC, conductivity, XLPE, semicon, interface

Characterization of Extruded Material System for HVDC Cable Application

Timothy PERSON

Dow Inc., United States of America

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Ageing Study on Glass Fiber Composite Rod of Silicone Rubber Insulators

Nitin R SHINGNE

Electrical Research and Development Association (ERDA)

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Acceleration in corona induced degradation of polymeric insulator under low atmospheric pressure

Shakthi P DAS

Indian Institute of Technology, Goa

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Recommendations for IEC 60815-2 based on Functional Performance of Optimized HVCB Porcelain Insulators in Very Highly Polluted Environments

V BALAJI, R JEYAPRAGASH

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Topics: PS2 - Materials for Electro Technical Purposes

Changing of the Insulating Characteristics of Mixtures (Mineral Oil and Synthetic Ester) During Prolonged Exposure of Elevated Temperature

M. LYUTIKOVA¹, A. KONOVALOV², S. KOROBENNIKOV³

¹Federal Grid Company of Unified Energy System; ²Rosseti; ³Novosibirsk State Technical University

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

The Degradation Degree Control of the Hydrocarbon Base of Mineral Oils Using the Specific Degradation Marker in their Infrared Spectrum

M.Sh. GARIFULLIN¹, Yu.N. SLOBODINA¹, A.R. BIKZINUROV¹, R.A. GINATULLIN²

¹Kazan State Power Engineering University; ²Kazan National Research Technological University

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Universal Method for Assessing Oil-Filled Equipment Based on the Results of DGA

I. DAVIDENKO¹, K. OVCHINNIKOV², M. VLADIMIROVA³

¹Ural Federal University; ²quot;Energ-Diagnostics and Analytics" LLC; ³quot;Massa LLC"

ID: 10648

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Keywords: gas insulated switchgear, permittivity functional graded material (ϵ -FGM), nano-micro composite(NMC)

Development of Sophisticated Cone-Type Insulating Spacer for 245 kV Class GIS by Functional Insulating Materials

Kenji OKAMOTO¹, Naoki HAYAKAWA², Masayuki HIKITA³, Hitoshi OKUBO⁴, Katsumi KATO⁵, Naoki OSAWA⁶

¹Fuji Electric Co., Ltd.; ²Nagoya University; ³Kyushu Institute of Technology; ⁴Aichi Institute of Technology; ⁵National Institute of Technology, Niihama College; ⁶Kanazawa Institute of Technology

ID: 10649

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Keywords: Epoxy nanocomposite, Agglomerate, Electroluminescence, Breakdown, Insulation lifetime

Nanofiller Dispersion Effect on Insulation Performances of Epoxy Nanocomposite Material: Electroluminescence, Breakdown Strength and Electrical Insulation Lifetime

Takahiro UMEMOTO¹, Shigeyoshi YOSHIDA¹, Takahiro MABUCHI¹, Hirotaka MUTO¹, Muneaki KURIMOTO², Kazuyuki TOHYAMA³

¹Mitsubishi Electric Corporation; ²Nagoya University; ³National Institute of Technology, Numazu College

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Keywords: FGM - Nanocomposite - Gas -Insulation - Switchgear - Generator - Enamel - Epoxy

Joint R & D Project on the Development of Electric Power Equipment using new Functional Insulating Materials

Kazuo ADACHI¹, Hirotaka MUTO², Kenji OKAMOTO³, Yoshikazu HOSHINA⁴, Nobutaka FUJIMOTO⁵

¹Central Research Institute of Electric Power Industry; ²Mitsubishi Electric Corporation; ³Fuji Electric Co., Ltd.; ⁴Toshiba Energy Systems and Solutions Co.; ⁵Sumitomo Seika Chemicals Co., Ltd.

ID: 10685

D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Keywords: residual quartz, lifetime, C-130, alumina porcelain, high voltage insulator

Impact of the residual quartz to the expected lifetime of C-130 alumina porcelain high voltage insulator

Markku RUOKANEN¹, M. VRABEC¹, A. TRNIK², O. AL-SHANTIR², D. MIKUSOVA²

¹PPC Insulators Switzerland; ²Constantine the Philosopher University in Nitra Slovakia

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Test methods and criteria for validation of functional properties of composite insulators related to materials and interfaces

Igor GUTMAN¹, Andreas DERNFALK¹, Johan LUNDENGÅRD¹, Peter SIDENVALL¹, Andre DECKWERTH², Luis DIAZ³, Kjell HALSAN⁴, Michael LEONHARDSBERGER⁵, Milan RADOSAVLJEVIC⁶, Philipp TRENTZ⁷, Keijo VÄLIMAA⁸, Kübranur VARLI⁸

¹I2G, Sweden; ²50Hertz, Germany; ³RTE, France; ⁴Statnett, Norway; ⁵APG, Austria; ⁶Svenska kraftnät, Sweden; ⁷E.ON, Germany; ⁸Amprion, Germany; ⁹Fingrid, Finland

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Mechanical strength of pressboard materials under dynamic compressive stress

Orlando GIRLANDA¹, Sören ÖSTLUND², Peter HEINZIG³, Lars Erik SCHMIDT¹, Radosław SZEWCZYK⁴, Serkan MUMCU⁵

¹HITACHI ENERGY, Sweden; ²KTH ROYAL INSTITUTE OF TECHNOLOGY, Sweden; ³WEIDMANN; ⁴DU PONT; ⁵ENPAY

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Differences in ageing pattern and production/consumption of ageing markers in kraft and thermally upgraded papers immersed in mineral and natural ester oil

Jelena LUKIC¹, Jelena RANKOVIC¹, Draganja MIHAJLOVIC¹, Lars Erik SCHMIDT², Mark JOVALEKIC³

¹Electrical Engineering Institute Nikola Tesla, Serbia; ²Hitachi ABB Power Grids, Germany; ³PUCARO Elektro-Isolierstoffe GmbH, Hitachi ABB Power Grids, Germany

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Thermal faults simulation for aramid insulation in liquid immersed power transformers

Radosław SZEWCZYK¹, Roger C. WICKS¹, Leonardo GALHARDO¹, Helena M. WILHELM², Paulo O. FERNANDES², Lais P. DILL², Camila STEFFENS², Kethlyn G. MOSCON², Sergio M. PERES²

¹DuPont; ²Vegoor Tecnologia Aplicada

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Fingerprinting and testing methods of RTV silicone-coatings for glass insulators

Héctor DE SANTOS¹, Cristina HERRERO-PONCE², Pedro LLOVERA-SEGOVIA^{2,3}

¹VERESCENCE La Granja Insulators; ²Instituto Tecnológico de la Energía; ³Instituto de Tecnología Eléctrica, Universitat Politècnica de València

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Compatibility of Transformer Materials with Insulating Liquids

Ivanka ATANASOVA-HÖHLEIN¹, Veronika HARAMIJA², Dijana VRSALJKO²

¹Siemens Energy, Germany; ²Koncar - Electrical Engineering Institute, Croatia

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Experimental investigations on electro-thermal ageing of EPDM for HVDC cable joints

Isabella NETT¹, Marvin BENDIG²

¹RWTH Aachen University, Germany; ²RWTH Aachen University, Germany

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS2 - Materials for Electro Technical Purposes

Investigations on the long-term performance of Fluoronitrile-containing gas mixtures in gas-insulated systems

Karsten JUHRE¹, Hansgeorg HAUPT²

¹Siemens Energy, Germany; ²TU Darmstadt, Germany

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Topics: PS2 - Materials for Electro Technical Purposes

The use of Niobium Pentoxide as a High-Performance Material for Applications in Energy Storage

Gustavo Henrique GOMES*

Universidade Federal de Minas Gerais, Brazil

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Topics: PS2 - Materials for Electro Technical Purposes

A test setup to find the relation between interfacial pressure and tangential breakdown voltage of epoxy/silicone rubber interface

Sanjay GANESHAN*¹, Armando RODRIGO MOR¹, Panagiotis TSAKONAS²

¹Delft University of Technology, The Netherlands; ²Prysmian Netherlands B.V. The Netherlands

PS3 SIMULATION TOOLS PARTENERED WITH MEASUREMENT TECHNIQUES

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Topics: PS3 - Simulation Tools Partnered With Measurement Techniques

Evaluation of the Electrical Performance of Insulation in High Voltage Equipment Under the Effects of Contaminants Usually Neglected on Ordinary Electric Field Calculations

C ARRUDA¹, A MARTINS², F OLIVEIRA¹, O FILHO¹

¹CEPEL; ²CEMIG GT

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Topics: PS3 - Simulation Tools Partnered With Measurement Techniques

Development and Implementation of Transformer Condition Monitoring Models for the Interpretation of Sensor and SCADA Data

Patrick PICHER

Institut de recherche d'Hydro-Québec (IREQ)

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS3 - Simulation Tools Partnered With Measurement Techniques

Keywords: Infrared thermography, PV modelling, single-diode model, irradiance, temperature

Power generation by unhealthy photovoltaic modules

Rita RAIMUNDO¹, André COELHO², Rui MARTINS², Isabel CATARINO¹

¹NOVA School of Science and Technology, Portugal; ²EDP Labelec, Portugal

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Topics: PS3 - Simulation Tools Partnered With Measurement Techniques

Use of Multiphysics Simulation Tools for Building a Digital Twin of Power Transformers

Stefan TENBOHLEN¹, Chandra Prakash BEURA²

¹University of Stuttgart, Germany; ²University of Stuttgart, Germany

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers

Topics: PS3 - Simulation Tools Partnered With Measurement Techniques

The Use of Machine Learning and Artificial Neural Networks to Recognition of Turning Faults in Power Transformers

Aleksandr KULIKOV, Anton LOSKUTOV, Anna SOVINA

Nizhny Novgorod State Technical University n.a. R.E. Alekseev, Russian Federation

D2 - INFORMATION SYSTEMS & TELECOMMUNICATION

PS1: The opportunities and challenges brought by emerging Information and Communication Technologies to Electric Power Utilities in their path to Digital Transformation

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Application of Artificial Intelligence Tools for Optimized Maintenance Scheduling based on Asset Management Concepts

M ALVES¹, G GOMES¹, M PINTO¹, R FEHLBERG¹, C URAS¹, D ARAUJO¹, S GIROTO¹, G MOURA¹, A CAMPOS², R DIAS², F SILVA², I SIQUEIRA³, R FLAUZINO⁴

¹RADICE TECHNOLOGY; ²CEB; ³TECNIX; ⁴USP

ID: 10407

D2 INFORMATION SYSTEMS AND TELECOMMUNICATION - Full Papers

Topics: PS1 - The Opportunities and Challenges Brought By Emerging Information and Communication Technologies to Electric Power Utilities in Their Path to Digital Transformation

Keywords: IEC 61850, digital substations, artificial intelligence, circuit breaker, condition monitoring

Artificial Intelligence-based Circuit Breaker Monitoring in IEC 61850 Digital Substations

Alexander APOSTOLOV

OMICRON electronics, United States of America

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D2 INFORMATION SYSTEMS AND TELECOMMUNICATION - Full Papers

Topics: PS1 - The Opportunities and Challenges Brought By Emerging Information and Communication Technologies to Electric Power Utilities in Their Path to Digital Transformation

Keywords: data analytics, artificial intelligence, machine learning

Building a National Infrastructure for Artificial Intelligence on the Grid

Sean MURPHY¹, Laurel DUNN¹, Mohini BARIYA¹, Kevin JONES², Theo LAUGHNER³

¹PingThings, Inc., United States of America; ²Dominion Energy, United States of America; ³Lifescale Analytics, United States of America

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An Intelligent Devices Management and Collaborative Computing Technology in Cyber Power Physical System

Pengtian GUO¹, Daoxing LI¹, Kang XU², Zhixiang JI¹, Xiaohui WANG¹, Qi LI²

¹China Electric Power Research Institute Co. Ltd., China; ²Sate Grid Shandong Electric Power Company

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Asset Mapping & Vulnerability Assessment using GIS Tools-Powergrid Experiences

Pankaj MAHATA

Power Grid Corporation of India Ltd.

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Digital Transformation of Indian Electricity Market through Implementation of National Open Access Registry (NOAR)

Subhendu MUKHERJEE

Power System Operation Corporation Limited

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D2 INFORMATION SYSTEMS AND TELECOMUNICATION - Full Papers

Topics: PS1 - The Opportunities and Challenges Brought By Emerging Information and Communication Technologies to Electric Power Utilities in Their Path to Digital Transformation

Keywords: Information, Communication, Maintenance, Education, Mixed Reality, Meter, Deep Learning

The advanced Applications for Equipment Maintenance utilizing the latest Information and Communication Technologies of Japanese Electric Power Utilities

Hiroyukie HATTORI¹, Makoto KUBO²

¹Electric Power Development Co., Ltd.; ²Tohoku Electric Power Network Co., Inc.

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D2 INFORMATION SYSTEMS AND TELECOMUNICATION - Full Papers

Topics: PS1 - The Opportunities and Challenges Brought By Emerging Information and Communication Technologies to Electric Power Utilities in Their Path to Digital Transformation

Keywords: Underground-Cable, Partial-Discharge, Deep-Learning, Ensemble

A Study on Diagnosis and Pattern Analysis of Partial Discharge of Underground Transmission Cables Using Deep Learning Ensemble Model

Mijeong JUN, Jihoon LEE, Huisung YANG

KEPCO KDN, Korea, Republic of (South Korea)

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Topics: PS1 - The Opportunities and Challenges Brought By Emerging Information and Communication Technologies to Electric Power Utilities in Their Path to Digital Transformation

Employing the Digital Platform for Intelligent Control of Distributed Energy Resources

A. NEBERA¹, S. KOVALYOV², N. SHUBIN¹, V. PERELYGIN¹, K. PEREVALOV¹, A. ANDRIEVSKY¹, F. NEPSHA¹, M. KRASILNIKOV¹

¹INTELAB, LLC; ²Institute of Control Sciences V.A. Trapeznikov Academy of Sciences

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Topics: PS1 - The Opportunities and Challenges Brought By Emerging Information and Communication Technologies to Electric Power Utilities in Their Path to Digital Transformation

Implementation of a Decision Support System for Unaccounted Electricity Consumption Detection Using Machine Learning Methods

D.A. AKIMOV², I.P. VOLTOV¹, O.V. TURKINA¹

¹Joint-stock company «Federal Test Center» (JSC «FTC»); ²Limited Liability Company «Digital Solutions Workshop» (LLC «DSW»)

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D2 INFORMATION SYSTEMS AND TELECOMUNICATION - Full Papers

Topics: PS1 - The Opportunities and Challenges Brought By Emerging Information and Communication Technologies to Electric Power Utilities in Their Path to Digital Transformation

Machine Learning Approach for Power Flow Control in Congested Grids with Large Share of Variable Energy Resources

E.A. TSYDENOV, A.V. PROKHOROV

National Research Tomsk Polytechnic University

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Topics: PS1 - The Opportunities and Challenges Brought By Emerging Information and Communication Technologies to Electric Power Utilities in Their Path to Digital Transformation

Application of Modern Time-Series Analytics Tools to Improve Peak Load Management and Planning the EPU Development

Pavel LITVINOV^{1,2}, Sergey NESTEROV^{1,2}

¹RTSOFT JSC; ²INTELAB LLC

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¹Ural Federal University named after the first President of Russia B.N. Yeltsin; ²Novosibirsk State Technical University

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¹Elektro Ljubljana d.d.; ²Elektro Ljubljana d.d.; ³Troia d.o.o.; ⁴Troia d.o.o.

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Keywords: IPPs, CIM, IEC

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Keywords: Data Augmentation, Partial Discharge, Training Dataset

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G. HWANG, H. KWON, S. KOO

LS ELECTRIC, Korea, Republic of (South Korea)

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Keywords: Compact Secondary Substation, CSS, Digitalization, Internet-of-Thing (IoT), Internet-of-Energy (IoE), Predictive Maintenance, Sensing Technology, Brownfield, Greenfield, Data Analytics

Practical Approach to Brownfield compact secondary Substations using the Internet-of-Energy (IoE) for Data-Driven Maintenance and Asset Management

Sanna HÄSÄ¹, Iiris RAUHALAMMI², Shyam MUSUNURI³, Bruno Jorge de Oliveira SOUSA⁴, Martin Davidsen KIRKEGAARD⁵, Tony MÄNTYPURO²

¹Siemens Oy; ²Caruna Networks Oy; ³Siemens AG; ⁴Siemens Energy AS; ⁵Siemens A/S

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¹Red Eléctrica de España; ²Aragón Photonics Labs; ³Universidad de Zaragoza (Grupo Tecnologías Fotónicas)

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¹PSI Software AG, Germany; ²PSI Software AG, Germany

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A Practical Approach on Cybersecurity Measures for Brazilian Utilities

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¹SIEMENS; ²CHESF; ³TI SAFE; ⁴SIDI

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ANEEL (Brazilian Electricity Regulatory Agency)

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SUBNET Solutions

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A Blueprint for Cyber Security of Brownfield Substations in Power Systems using IEC 62443

Vetrivel RAJKUMAR¹, Shyam MUSUNURI², Alexandru STEFANOV¹, Siem BRUIJNS³, Johan DE WIT⁴, Danny KLAAR³, Amadou LOUH⁵, Arnaud THOEN⁵, Peter PALENSKY¹

¹Delft University of Technology; ²Siemens AG; ³TenneT TSO; ⁴Siemens Nederland NV; ⁵Stedin NV

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Topics: PS2 - Cybersecurity Techniques, Technologies and Applications for Securing Critical Utility Assets

Keywords: IEC 61850, cyber security, GOOSE, transmission line protection

Cybersecurity Challenges in IEC 61850-based Transmission Line Protection Systems

Alexander APOSTOLOV

OMICRON electronics, United States of America

ID: 10414

D2 INFORMATION SYSTEMS AND TELECOMUNICATION - Full Papers

Topics: PS2 - Cybersecurity Techniques, Technologies and Applications for Securing Critical Utility Assets

Keywords: Peer to Peer energy sharing, transactive energy, energy storage, hierarchical control, optimization

Securely Implementing and Managing Neighborhood Solar with Storage and Peer-to-Peer Transactive Energy

Steven KNUDSEN¹, Subir MAJUMDER², Anurag K. SRIVASTAVA²

¹KeyLogic Systems, Inc.; ²West Virginia University

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Cybersecurity Master Plan for Chilean Electricity Sector (2021 – 2023)

Eduardo MORALES¹, Jerson REYES², Fernando MUNOZ³, Alvaro ACORIA⁴

¹ENTEL; ²CNE; ³SAESA; ⁴Independent

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S Naresh RAM

Power System Operation Corporation Limited

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A Method in Evaluating the Effectiveness of Substation Firewalls and A Substation Perimeter Architecture in Connecting Third Party Generators to a Transmission Substation

Victor TAN¹, Brendan GRAHAM², Paolo TUAZON²

¹VTan Consulting; ²Power and Water Corporation, Australia

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Development of a Method for Using Artificial Intelligence Systems for Assessing Cybersecurity Threats to Objects of a Digital Electrical Network

Vladimir KARANTAEV, Vladislav KARPENKO

Moscow Power Engineering Institute

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Topics: PS2 - Cybersecurity Techniques, Technologies and Applications for Securing Critical Utility Assets

Keywords: Cybersecurity, Cyber Risk Assessment, Digital Engineering, Digital Twin

Role of Digital Engineering and Digital Twin Technology in Cybersecurity of Electrical Grid

Djenana CAMPARA¹, Andrea HRUSTEMOVIC², Adnan AHMETHODZIC², Nikolai MANSOUROV³, Meludin VELEDAR¹

¹BH K CIGRE, Bosnia and Herzegovina; ²JP Elektroprivreda BiH, Bosnia and Herzegovina; ³KDM Analytics, Canada

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Topics: PS2 - Cybersecurity Techniques, Technologies and Applications for Securing Critical Utility Assets

Keywords: Cybersecurity Posture, Standard Compliance, Cybersecurity Assessment, Scalability Indexes

How to assess the cybersecurity posture of utility infrastructures? A case study from the OSMOSE project

Giovanna DONDOSSOLA¹, Roberta TERRUGGIA¹, Andrea FOSCHINI², Luca ORRU², Giuseppe LISCIADRELLO², Francesco SILLETTI²
¹RSE, Italy; ²TERNA spa, Italy

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Hitachi Energy, Sweden

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Analysis of the impact of cryptography in the GOOSE communications

Miguel Ángel SÁNCHEZ¹, Gerard VIDAL²

¹Arteche; ²Enigmedia

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Dan BORDEA

Romanian NC Cigre, Romania

ID: 11136

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Keywords: SAS, SNMP, MMS, GOOSE, Zero-trust

A Substation-focused NMS for visualizing IEC 61850 Communication Networks

Kate HUANG, King WU, Sever SUDAKOV

Moxa Inc, Taiwan

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A PINHEL

Cigre-Brasil 5G Working Group

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Keywords: LPWA, Private LTE, Software LTE System, Wireless communication, Radio wave propagation, Power plant, Substation

The latest Wireless Communication Technology Initiatives from Japanese Electric Power Utilities

Hiroaki TSUCHIYA¹, Hiroyuki KAI², Ryousuke UMEZAWA³, Yuki IWATA⁴

¹Central Research Institute of Electric Power Industry; ²Kyushu Electric Power Co., Inc.; ³Chubu Electric Power Grid Co., Inc.; ⁴Chugoku Electric Power Transmission & Distribution Co., Inc.

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Seamless extension of fibre optical IP/MPLS network with 5G technology Releases allowing Business service segregation, Precision time synchronization and Critical teleprotection services in Utility distribution networks

Amadouh LOUH¹, Shuang ZHANG², Andrej GOERBING³, Joey GODEFROOI¹, Andreas JAHR³

¹Stedin NV; ²Huawei Technologies; ³Siemens AG

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Power and Water Corporation, Darwin, Australia

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Automation of Distribution Networks Using Cellular Communication Technologies

A. RODIONOV¹, A. POPOV¹, D. ULYANOV¹, S. PISKUNOV¹, A. MOKEEV²

¹ENERGOSERVICE; ²NARFU

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Topics: PS3 - Meeting the Demands of the Modern Utility and DER with an Agile and Resilient Telecommunication Network

Keywords: IEC 61850, time information, WAN

Increasing the availability of modern digital grid applications by offering accurate time of day information as a service of the operational telecommunication network

Ramon BAECHLI¹, Marko BORISAVLJEVIC¹, Adolf FREI¹, Stefan MATTMANN², Yann GOSTELI²

¹Hitachi Energy Switzerland; ²CKW Switzerland

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Experimental evaluation of Teleprotection services over packet-based Networks

Soodesh BULJORE¹, F FONTENELLE¹, L ESTELRICH¹, P ALEMAN¹, M ACACIA²

¹GENERAL ELECTRIC; ²ELIA

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Electric Power Industry of Serbia IP MPLS network upgrade: Providing operational and corporate services

DaniLO LALOVIC¹, Vesna VUKICEVIC¹, Ivan VUKADINOVIC¹, Vigor STANISIC¹, Miodrag JEVTIC¹, Dalibor MITIC¹

Electric Power Industry of Serbia, Serbia

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Thanyapatt SRIJANTHUB

TNC-CIGRE, Thailand

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Design of a daring IP Network Architecture in REE for the unavoidable convergence of services

Juan Ramón FEIJOO MARTÍNEZ, José María DELGADO ÁLVAREZ, Julio ESTÉVEZ, Bruno PERALTA VICENTE

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