CIGRE Paris Session 2024

Technical Programme

See the list of Accepted Paper based on synopses AND Full Papers final review.

Authors have been duly notified about acceptance or non-acceptance.

The selection process is now over.

A1 - POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION
PS1 - ROTATING ELECTRICAL MACHINES AND THE ENERGY TRANSITION

ID: 10306
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS1 - Rotating Electrical Machines and the Energy Transition
Keywords: Nuclear turbogenerators, Grid, PV production, Power capability, technical features

The benefits of nuclear turbogenerators for grids of the future

Herve BIELLMANN, Florent CHARVET, Jacques MARCHAND, Martin TOULEMONDE, Vincent DUBS, Baptiste GUIDOUX, Vincent FERNAGUT, Thierry VINAS
EDF, France

ID: 10692
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS1 - Rotating Electrical Machines and the Energy Transition
Keywords: International Standard; Hydro-Generators; Motor-Generators; IEC 60034-33; Pumped storage

Insights to the new IEC 60034-33 – The Standard for Hydro-Generators and Motor-Generators for Pumped Storage

Thomas HILDINGER
Brazilian NC of CIGRE, Brazil; Voith Hydro

ID: 10904
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS1 - Rotating Electrical Machines and the Energy Transition

Moneypoint Synchronous Condenser and Flywheel - A Zero Carbon Solution to Increasing Renewables and Improving Resilience on the Irish Electricity Grid

Katie WALL, Ruairí COSTELLO
Electricity Supply Board (Ireland)

ID: 11031
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS1 - Rotating Electrical Machines and the Energy Transition

Practical Experience with the Thermal Evaluation and Classification of Type II Machine Insulation Systems according to IEC 60034-18-31

Hans BÄRNKLAU[2], Lena M. ELSPASS[1], Stephan SCHLEGEL[1], Kai NEIKES[2], Jens PROSKE[2]
[1]Technische Universität Dresden, Germany; [2]VEM Sachsenwerk GmbH, Germany

ID: 11065
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS1 - Rotating Electrical Machines and the Energy Transition

Incorporating Fibre Optic Arc Flash Detection into a Conventional Generator Protection Scheme

James DASH, Len GUNN
Origin Energy, Australia

ID: 11102
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS1 - Rotating Electrical Machines and the Energy Transition

Synchronous Condenser to Ensure Stable, Reliable And Quality Power in Renewable Energy Rich Regions – India Perspective

D.K. CHATURVEDI
NTPC

ID: 11271
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS1 - Rotating Electrical Machines and the Energy Transition

Challenges in Core Flux test of Large Hydro Generators with natural frequency near to Power Frequency

Vipin GUPTA, Ashwatthama TIWARY*, Randhir KUMAR*, Sanjeeb BAG
NHPC Limited, India

ID: 11394
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS1 - Rotating Electrical Machines and the Energy Transition

Design individualization of an air-cooled synchronous condenser with directly water-cooled stator winding due to varying market requirements for grid stabilization services

Monja EVENKAMP, Hendrik STEINS, Uwe EICKELBECK, Moritz ACKERMANN
Siemens Energy Global GmbH & Co. KG, Germany

ID: 11744
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS1 - Rotating Electrical Machines and the Energy Transition

Measurement and Practical Applications of Magnetic Flux Sensors by Radial and Tangential Axis in Synchronous Generator-Motors

Oleg AGAMALOV
Tashlyk Pump-Storage Power Plant (TPSPP)

PS2 - EVOLUTION AND DEVELOPMENT

ID: 10123
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS2 - Evolution and Development
Keywords: Rotating diode rectifier, machine, diode failure, frequency, digital signal processor

Rotating diode rectifier, machine, diode failure, frequency, digital signal processor

Marc FLORES, Luc TEMPLIER, Léo PERDRIEL
EDF Hydro DTG, France

ID: 10542
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS2 - Evolution and Development

Damping local and inter-area oscillations with synchronous compensators: a fundamental study

Luis ROUCO, Jorge SUÁREZ, Fidel FERNÁNDEZ-BERNAL, Lukas SIGRIST
ETS ICAI-IIT Universidad Pontificia Comillas, Spain

ID: 10693
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS2 - Evolution and Development
Keywords: Salient pole synchronous machine - Synchronous condenser - Synchronous condenser nameplate - Reactive power management - Capability chart – Power diagram

On the Design of Salient Pole Synchronous Machine to Operate Strictly as Synchronous Condensers

Jorge Johnny ROCHA ECHEVERRIA, Mauro UEMORI
Brazilian NC of CIGRE, Brazil; Trassínio Consultoria Ltda.

ID: 10864
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS2 - Evolution and Development
Keywords: Doubly-Fed Asynchronous Machine, Load Commutated-Cyclo-converter, Low Voltage Ride Through

Retrofit to 2 x 303MW Doubly-Fed Asynchronous Machine (DFAM) System at Oku-Tataragi Pumped Hydro Power Plant of Kansai Electric Power Co.

Akira BANDO[1], Toshinari FUJII[2], Shinji ONO[2], Osamu NAGURA[1], Masayuki OKADA[1], Tomohiro YANO[3]
[1]HM Hydro Corp., Japan; [2]Kansai Electric Power Co., Japan; [3]Hitachi, Ltd., Japan

ID: 11020
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS2 - Evolution and Development

Development and design of an air-cooled 944.5 MVA hydro-generator

Thomas HILDINGER, Gunar KLAUS, Babette SCHWARZ, Georges MORONIS, Stefan ALLGEYER
Voith Hydro, Germany

ID: 11022
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS2 - Evolution and Development

Qualification of a HV-Insulation System according IEC 60034-18-42 for a Hydro-generator Operating with Inverter Technology

Thomas HILDINGER[1], Christian STAUBACH[2]
[1]Voith Hydro, Germany; [2]Hochschule Hannover, Germany

ID: 11171
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS2 - Evolution and Development

Design Aspects of Synchronous Condensers

Gerfried MAIER, Serdar KADAM
Andritz Hydro

ID: 11362
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS2 - Evolution and Development

Development of Engine Mounted Generators for Eco-Friendly Onboard Power Generation in Marine Applications

Sándor Rajmund HORVÁTH
HD Hyundai Electric Hungary Ltd.

PS3 - KEEPING THE LIGHTS ON

ID: 10125
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS3 - Keeping the Lights on
Keywords: HV motors, detection device, fatigue breaking mechanism, coil connections

Fatigue breaking mechanism study at the coils connections of a stator winding and at the magnetic core fasteners

Aymen AMMAR[1], Thibaud FANGET[2], Romain SEIGNEURET[2]
[1]JEUMONT ELECTRIC, France; [2]EDF (DTG CNEPE), France

ID: 10350
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS3 - Keeping the Lights on

Use of Non-Destructive Tests (NDT) for synchronous condensers flywheel inspection

Gianluigi GEMELLI[1], Alessandro DEL GRACCO[1], Mauro GAMBASSI[1], Roberto SPEZIE[1], Andrea VALANT[1], Enrico VELLUCCI[1], Giuseppe NARDONI[2], Pietro NARDONI[2], Marco FEROLDI[2]
[1]TERNA; [2]I&T Nardoni Institute, Italy

ID: 10658
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS3 - Keeping the Lights on

Detection of Generator Earth-brush Fault Types from Shaft Voltage and Currents Measurements to monitor the performance of Earthing Brushes

Oupa MAILULA
Eskom Research, Testing & Development

ID: 10700
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS3 - Keeping the Lights on
Keywords: Deep Learning; Vibration; Wind Turbines; Rolling Bearings; Predictive Maintenance

Deep learning applied to bearing anomaly detection using advanced signal processing techniques

Marcos NISHIOKA, Gustavo G. de SOUZA, Tiago MATSUO, Emerson LIMA DO NASCIMENTO, Vitor POHLENZ
Brazilian NC of CIGRE, Brazil; AQTECH

ID: 10701
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS3 - Keeping the Lights on
Keywords: Corona Effect; Corona Discharges; Corona glove; Partial Discharges; Relief Interface

Reconfiguration of the Corona Prevention System and Application to a Practical Case

Paulo VILHENA[1], Renan DUARTE[1], Fernando BRASIL[1], Jorge Johnny ROCHA ECHEVERRIA[2], Mauro UEMORI[2]
[1]Brazilian NC of CIGRE, Brazil; Eletrobras Eletronorte; [2]Brazilian NC of CIGRE, Brazil; Trassínio Consultoria

ID: 10702
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS3 - Keeping the Lights on
Keywords: Synchronous Compensator, Short Circuit, Stator, Maintenance

The painful (and expensive) experience of having to remedy an avoidable stator failure

Rafael FERREIRA, André GARGHETTI
Brazilian NC of CIGRE, Brazil; CGT Eletrosul

ID: 10865
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS3 - Keeping the Lights on
Keywords: Hydro generator, Non-contact sensor, Condition monitoring and diagnosis, Partial discharge

Application of Non-contact On-line Partial Discharge Monitoring System to Hydro Generator

Tomoaki TAKAHASHI, Makoto TAKANEZAWA, Takashi HARAKAWA, Akira FUJIMOTO, Hirotaka TSUBAKIHARA, Hideyuki NAKAMURA
Toshiba Energy Systems & Solutions Corporation, Japan

ID: 11047
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS3 - Keeping the Lights on
Keywords: EL CID, low flux core test, electromagnetic core test, high flux core test, high frequency, hot spot, interlaminar insulation, core fault, stator core

Low Flux Core Testing of Rotating Electrical Machines at Elevated Excitation Frequencies

Nick STRANGES[1], Mladen SASIC[1], David R BERTENSHAW[2]
[1]QUALITROL® LLC - Iris Power, Canada; [2]ENELEC LTD, United Kingdom

ID: 11661
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS3 - Keeping the Lights on
Keywords: diagnostics, hydrogenerator, stator to rotor eccentricity, vibration and air-gap measurements

Mechanical Diagnostic Campaign of a 415 MW Vertical Francis Hydro-Unit

Ozren ORESKOVIC[1], Ozren HUZNJAK[1], Damijan CERINSKI[2], Andrija KOSTELAC[3], Lucas Eduardo GUNE[4]
[1]Veski Ltd Croatia; [2]4-cube Croatia; [3]Visum Energy Croatia; [4]Hidroeléctrica de Cahora Bassa Mozambique

ID: 11712
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS3 - Keeping the Lights on

Evaluation and Assessment of Operational Data for Condition Based Service Interventions on Synchronous Machines

Sven MUSIELAK, Hendrik STEINS, Jan HOFFMANN, Moritz ACKERMANN
Siemens Energy Global, Germany

ID: 11813
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS3 - Keeping the Lights on
Keywords: Burn-out test, Generator stator, Ground fault generator, Locate phase-to-ground fault

Locate Generator Stator Phase-to-ground Fault Point by Burn-out Test

Aticha WONGKHAMLA, Passapong PORNPACHARAPUN, Yodsanon WITITTHUMAKUN, Apichart PALATORNPARIRUK
Electricity Generating Authority of Thailand (EGAT), Thailand

ID: 11853
A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION - Full Papers
Topics: A1 PS3 - Keeping the Lights on
Keywords: Wind Turbine Maintenance; Automated Diagnostics; Pitch Imbalance; Vibration Analysis

Case Study: How Pitch Imbalance May Affect Vibration and Performance in a Wind Turbine

Marcos H. N. NISHIOKA, Emerson L. do NASCIMENTO, Vitor POHLENZ, Tiago K. MATSUO
AQTech Brazil

A2 - POWER TRANSFORMERS AND REACTORS

PS1 - DESIGN OF RESILIENT TRANSFORMERS

ID: 10122
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: Power Transformers, Dielectric Test, Front of Wave Impulse Test, RSO Test, Impulse Voltage Distribution

Impact of Front of Wave Impulse Testing on Dielectric Design of Transformer

Dharam VIR, Pradeep RAMASWAMY, Tim ROCQUE, Ajith VARGHESE
Prolec-GE Waukesha, United States of America

ID: 10148
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Comparison of Structural Strength of UHV AC Transformers with Different Outgoing Modes under Arc Fault in Oil

Yikun ZHAO[1], Ke WANG[1], Jinzhong LI[2], Shuqi ZHANG[1], Jiaxi LI[1]
[1]China Electric Power Research Institute,China; [2]State Grid Corporation of China,China

ID: 10149
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Research on the Static Stress Distribution of Winding Transposition Structure under External Short-circuit Fault

Yi ZHAO[1], Tao WEN[1], Weijiang CHEN[2], Guangjin ZHANG[3], Ke WANG[4], Jinzhong LI[2]
[1]Hefei university of technology,China; [2]the State Grid Corporation of China,China; [3]Xi'an Jiaotong University,China; [4]China Electrical Power Research Institute,China

ID: 10150
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Transformer Winding Deformation Monitoring Technology Based on Distributed Fiber Optic

Peng LI, Zhengyu XU, Zuoxian WANG, Shuqi ZHANG, Huanchao CHENG
CEPRI,China

ID: 10157
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Research on Analysis for Fire and Explosion Prevention Capability of Large Transformers and its Improvement Measures

Jun DENG, Zhicheng XIE, Zhicheng PAN, Haibin ZHOU
China Southern Power Grid, Co., Ltd. , China

ID: 10256
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: Insulating liquid, requirements, dielectric properties, ageing stability, LCA

Insulating liquid requirements for power transformers

Christophe PERRIER, Marielle MARUGAN, Sébastien LOUISE, Juliette SULPICE
GE Grid Solutions, France

ID: 10259
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: Powers transformers, floating offshore, applications, technology, potential failure

Stresses on Power Transformers in Floating Offshore Applications

Triomphant NGNEGUEU[1], Max GILLET[1], Vivekkumar CHAUBEY[2], Rupesh DARIPA[2], Oguzkan SENTURK[3], Tobias STIRL[4], Jian ZHANG[5], Hongbiao SONG[6]
[1]Grid Solutions , GE Vernova, France; [2]Grid Solutions , GE Vernova, India; [3]Grid Solutions , GE Vernova, Turkey; [4]Grid Solutions , GE Vernova, Germany; [5]Grid Solutions , GE Vernova, China; [6]Grid Solutions , GE Vernova, USA

ID: 10351
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Natural Ester in Arc-Furnace Transformers for Steel Production

Fabio SCATIGGIO[1], Rainer FROTSCHER[2], Cristian CHITTARO[3], Fabrizio FERRARI[4], Giorgio CAMPI[5], Daniele GIRO[3], Luca LOMBINI[4]
[1]A&A Fratelli Parodi, IT; [2]Maschninefabrik Reinahusen GmbH; [3]BS Acciaierie Bertoli Safau; [4]Tamini Trasformatori S.r.l.; [5]A.&A. Fratelli Parodi SpA

ID: 10402
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: Dissolved Gas Analysis, Data Analytics, Power Transformer, Asset Management, Trend Detection, Rate of Change, Anomaly Detection.

Thermal and Electrical Designs of Transformers by Considering Different Insulating Liquids

Qiang LIU[1], Sicheng ZHAO[1], Haichuan YU[1], Zhongdong WANG[1], Mark WILKINSON[2], Massimo NEGRO[3], Christoph KRAUSE[3], Andree HILKER[4], Ed Van SCHAIK[5], Muhammad DAGHRAH[6], Attila GYORE[6]
[1]The University of Manchester UK; [2]SGB-SMIT Group Netherlands; [3]Weidmann Electrical Technology AG Switzerland; [4]Shell Global Solutions Germany; [5]Shell Downstream Services International BV Metherland; [6]M&I Material Ltd UK

ID: 10489
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Challenges regarding Factory acceptance Test of large offshore Shunt Reactors

Daniel WIKBERG
Hitachi Energy Sweden AB, Sweden

ID: 10517
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: Geomagnetic Induced Currents (GIC) - Geomagnetic Disturbance (GMD) - Harmonics- Reactive Power - Temperature - Sound - Transformer

GIC Field Test on 500 kV Single-Phase Transformers

Bart SIMONS[1], Luc DORPMANNS[1], Roland BRANDIS[2], Adedasola A. ADEMOLA[2], Andy SCHUETZINGER[2], Robert ORNDORFF[2], Marlu DEVERICK[2], Francisco VELEZ-CEDENO[2], Katelynn VANCE[2], Micah J. TILL[2], Mike LAMB[2], Matthew GARDNER[2], Emanuel BERNABEU[3]
[1]Royal SMIT Transformers B.V.; [2]Dominion Energy; [3]PJM

ID: 10543
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Dynamic model analysis of shell power transformers under short circuit vibration and the influence in the tank design

Miguel AGUIRRE[1], Daniel GARCÍA-VALLEJO[2], Jesús VÁZQUEZ[2], Carlos NAVARRO[2], Jaime DOMÍNGUEZ-ABASCAL[2]
[1]Hitachi Energy, Spain; [2]University of Seville, Spain

ID: 10545
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Design of transformers suitable for different insulating liquids

Andres AGUADO, Izaskun ARICETA, Diego LUMBRERAS, Miguel MARTINEZ
i-DE Redes Eléctricas Inteligentes, Spain

ID: 10546
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: Life Extension, Sustainability, Transformer

Transformer Sustainable Refurbishment for Ultra Long-Life

Ed TENYENHUIS[1], Lars Andreas ERIKSSON[2], Goizeder PAJARO[3]
[1]Hitachi Energy, Canada; [2]Hitachi Energy, Norway; [3]Hitachi Energy, Spain

ID: 10611
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: High Temperature Insulation System, Nomex®, Aramid Paper, Aramid Board, Ester Liquid, Plug & Play Transformer, Grid Resilience, Mobile Transformer, Rapid Response, Interchangeability, Reconnectable Transformer, Overload Capability

Resilient Transformers – holistic Approach considering Aspects in Operation, Maintenance and Design

Radoslaw SZEWCZYK[1], Jean-Claude DUART[2], Anastasia O'MALLEY[3], Robert MAYER[4], Ewald SCHWEIGER[5]
[1]DuPont, Poland; [2]DuPont, Switzerland; [3]Consolidated Edison Co. of NY, USA; [4]Siemens Energy, Austria; [5]Siemens Energy, Germany

ID: 10659
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Optimized design methodology of a resilient power transformer

Mphumuzi KHOZA
ACTOM HIGH VOLTAGE EQUIPMENT

ID: 10660
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Multidisciplinary approach to achieving resilient transformers – an end user perspective

Sidwell MTETWA
Eskom Holdings SOC Limited

ID: 10712
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: Distribution Transformer, Short Circuit, Dynamic Short Circuit, Impedance, Windings

Swiss Experience in IEC Short Circuit Testing of Distribution Transformers

Marcel STOECKLI[1], Bruno BOSNJAK*[2], Rolf FLURI[3], Davide BOTTA[2]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Rauscher & Stoecklin AG, Switzerland; [3]R&S Group, Switzerland

ID: 10714
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: resilient transformer, overload capability, compactness, weight reduction, ONAN cooling, ester liquid, thermally upgraded paper and pressboard, aramid paper and pressboard, advanced insulation system

Design evaluations with advanced insulation systems for resilient transformers

Marcel STOECKLI[1], Jean-Claude DUART*[2], Radoslaw SZEWCZYK[3], Peter HATOS[4], Marco MILONE[4], Frank KUEBLER[5]
[1]ELECTROSUISSE / CIGRE Switzerland NC Secretary; [2]DuPont, Switzerland; [3]DuPont, Poland; [4]SBG-SMIT Group GmbH, Germany; [5]Krempel, Germany

ID: 10733
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

GIC Test with Mock-up Transformer for Verification of Temperature Rise Calculation

Heesung YOON, Myung Gong SOHN, Tae Sung PARK, Cheul Hyeok CHANG, Woo Heng HEO
Hyosung Heavy Industries, Korea, Republic of (South Korea)

ID: 10784
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Power Transformer Protection against Geomagnetic Induced Currents: Thyristor Neutral Earthing

Aleksandr KHRENNIKOV[1], Alexey KUVSHINOV[2], Vera VAKHNINA[2]
[1]S&T Centre of Rosseti FGC UES, Russian Federation; [2]Togliatti State University, Russian Federation

ID: 10785
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Identification of Switching Operations Leading to Harmful Fast Transient Overvoltages in Power Transformers Windings

Vasily LARIN[1], Anton ZHUYKOV[2], Daniil MATVEEV[3], Mikhail FROLOV[3], Andrey SELIKHANOVICH[4], Alexander SMIRNOV[5]
[1]VEI – branch of RFNC-VNIITF, Russian Federation; [2]FACTS Plus, LLC, Russian Federation; [3]National Research University «MPEI», Russian Federation; [4]BO-Energo, LLC, Russian Federation; [5]SMTT High-Voltage Solutions, LLC, Russian Federation

ID: 10840
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: Transformer, Arc, Tank, Pressure, Rupture, Finite-element, Specification

Specifications for a Calculation Procedure to Achieve an Adequate Arc-Resistant Design for Power Transformers and Reactors

Jean-Bernard DASTOUS
Hydro-Québec, Canada

ID: 10886
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: Geomagnetic Induced Currents (GIC), Site testing, Windings, Structural parts, temperatures

On-site GIC withstand experiment on a 1000 MVA 3-limb autotransformer and a 300 MVA 5-limb transformer Part 1: Design, Modelling, Instrumentation, DAQ and Testing

Roald KLEIVI[1], Dietrich BONMANN[2], Claes CARRANDER[3], Geir Morten BJØRKVIK[1], Dejan SUSA[1]
[1]Statnett; [2]Hitachi Energy Germany; [3]Hitachi Energy Sweeden

ID: 10936
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: Transformers, Resilient, Power, Systems

Flexible Transformers for Resilient and Adaptable Power Systems

Enrique BETANCOURT-RAMIREZ[1], Juan Gonzalo CASTELLANOS-GONZALEZ[1], Omar MENDEZ-ZAMORA[1], Ibrahima NDIAYE[2]
[1]Prolec-GE International, Mexico; [2]GE Research, USA

ID: 11033
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

On-site GIC withstand experiment on a 1000 MVA autotransformer and a 300 MVA 5-limb transformer Part 2: Measurements and Evaluation

Dietrich BONMANN[1], Roald KLEIVI[2], Claes CARRANDER[3]
[1]Hitachi Energy Germany AG, Germany; [2]Statnett Norway; [3]Hitachi Energy Germany AG, SVEDEN

ID: 11136
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: Synthetic ester, transformers, in-service assessment, DGA, 2-FAL

Summary of In-Service Assessment of Synthetic Ester Filled Transformers

Muhammad DAGHRAH[1], Rafat AL JARRAH[2], Ayham BAKHEER[3]
[1]M&I Materials Ltd UK; [2]Princess Sumaya University for Technology Jordan; [3]Jordan Electric Power Company Ltd Jordan

ID: 11156
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Design of rupture-proof transformers equipped with on-load tap-changer in the event of internal arc failures

Moritz BENGLER[1], Michael STEMPLINGER[1], Marc FOATA[1], Sebastian REHKOPF[1], Ewald TASCHLER[2], Martin STOESSL[2], Monther SARI[2]
[1]Maschinenfabrik Reinhausen GmbH; [2]Siemens Energy Austria GmbH

ID: 11237
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: Earthquake, Seismic design, Transformer, Diagnosis, Coil slide

Seismic strengthening of large-capacity transformers and methods of diagnosis in the event of a huge earthquake

Atsushi ETO, Keisuke YOKOHATA, Yuki ISHIKAWA
TEPCO Power Grid, Inc., Japan

ID: 11282
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Short Circuit Tested Power Transformer FAT Healthiness check

Minal KATARIA*, D K Marghade MARGHADE, Sunil Kumar LAL
NTPC, India

ID: 11284
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Indian Experience of Reactive Power Compensation at 220kV Grid using Variable Shunt Reactor (VSR) for Voltage Stability

Ayyaj MANER*, Manali SARVANKAR*, Raiju HASSAN, Vini VAZHAPPULLY, Sonu KAREKAR, Mahesh AMBARDEKAR
Adani Electricity, India

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: Extreme weather, Hydro power, Optical fibre, Specification, Transformer

EDF specifications for hydro power transformers

Olivier VACHERON[1], Mohamed RYADI[2], Dominique SOURIE[1], Jean SANCHEZ[3]
[1]EDF CIH, France; [2]EDF LAB, France; [3]EDF DTG, France

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: High-frequency model, Non-standard impulse waveforms, Power transformer, Overvoltages, White-box model

Calculation of Internal Transformer Overvoltages for Non-Standard Impulse Waveforms

Zvonimir JURKOVIC[1], Bruno JURISIC[1], Mladen MARKOVIC[2], Tomislav ZUPAN[1]
[1]Končar – Electrical Engineering Institute Ltd, Zagreb, Croatia; [2]Končar – Distribution and Special Transformers Inc. Zagreb, Croatia

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers

Calculation and visualization of forces on leads during short circuit of a large offshore power transformer with axially split dual MV windings

Igor TELALOVIĆ
Končar Power Transformers Ltd. – A Joint Venture of Siemens Energy and Končar Croatia

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Topics: A2 PS1 - Design of Resilient Transformers

DC Injection Testing on In-Service Power Transformers for Replicating GIC

Soren SUBRITZKY[1], Andrew LAPTHORN[1], Stewart HARDIE[1], Michael DALZELL[2]
[1]University of Canterbury, New Zealand; [2]Transpower New Zealand

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: Phase shifting transformers, ATP-EMTP modelling, Saturation, Overexcitation, Overfluxing

Modelling of Dual-Core Phase Shifting Transformer in ATP-EMPT environment

Gabriele TRESSO, Luca BUONO, Pierluigi VACANTE, Lorenzo PAPI, Gaia LEONE, Franco DI BONA, Daniele DIFINO, Francesco PALONE
Terna S.p.A. Italy

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS1 - Design of Resilient Transformers
Keywords: HVDC, Ageing, Converter transformer, DC conductivity, Degree of polymerization, Electric field distortion, Oil-paper insulation, Polarization/Depolarization Current, Pulsed Electro-Acoustic

Impact of Cellulose Degradation on Space Charge Dynamics and Conductivity of Synthetic Ester Liquid-Impregnated Kraft Paper Insulation

Abdelrahman ALSHEHAWY
University of Exeter, United Kingdom

PS2 - ADVANCES IN TRANSFORMER ANALYTICS

ID: 10126
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Powers transformers, maintenance, critical outage, technical policies, strategy

RTE's Large Power Transformers: new fleet management strategy

Abasse TIMERA[1], Rudy BLANC[1], Benoît IZAC[2], Philippe CLAUDE[3]
[1]RTE France Substation Expertise Dpt., France; [2]RTE France Asset Management Dpt., France; [3]RTE France R&D Dpt., France

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Vibration Characteristics and Typical Mechanical Failure Analysis of Converter Transformer

Zhicheng PAN, Jun DENG, Zhicheng XIE, Haibin ZHOU
China Southern Power Grid, Co., Ltd. , China

ID: 10317
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Degree of Polymerization, Dielectric Frequency Response, Insulation Transformers, Mineral Oil, Moisture

Analysis of Non-accelerated Thermal Aging of Model Windings Immersed in Mineral Oil and Natural Ester

Diego ROBALINO[1], Matias MEIRA[2], Raul ALVAREZ[3], Fabio SCATIGGIO[4]
[1]MEGGER, United States of America; [2]INTELYMEC (UNCPBA), Argentina; [3]IITREE-FI-UNLP, Argentina; [4]A&A Fratelli Parodi SpA, Italy

ID: 10318
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Transformer Aging, Life Assessment, Digital Twin, Numerical Simulation

Power Transformer Digital Twin: Incorporating Thermodynamic and Water Diffusion Discrete Elements Model for Enhanced Aging Calculation

Alan SBRAVATI, Luiz V. CHEIM, Mauricio SOTO
Hitachi Energy, United States of America

ID: 10403
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Dissolved Gas Analysis, Data Analytics, Power Transformer, Asset Management, Trend Detection, Rate of Change, Anomaly Detection.

Data Analytics for Transformer Dissolved Gas Analysis to Aid Asset Management

Zhongdong WANG[1], Thathsara HERATH[1], Qiang LIU[1], Gordon WILSON[2], Ruth HOOTON[2], David WALKER[3], Timothy RAYMOND[4], Luke van der ZEL[4]
[1]The University of Manchester UK; [2]National Grid Electricity Transmission UK; [3]SP Energy Network UK; [4]Electric Power Research Institute USA

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Statistical Model – Data Mining – Polychlorinated Biphenyls –Asset Management – Pole Mounted Transformers

Data Mining for Targeted PCBs Management of Pole Mounted Transformers

ShengJi TEE, David NEILSON, Matthew JONES, Malcolm BEBBINGTON
SP Energy Networks UK

ID: 10410
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Power Transformer, CFD, Windings, Natural Ester

Analysis of Simplifications and Accuracy of a Thermal-hydraulic Model of Core-type Power Transformer Winding

Sandra COUTO, João SILVA, Beatriz OLIVEIRA, Catarina SOUSA, Ricardo CASTRO LOPES
Power Transformers R&D, Efacec Energia S.A., Portugal

ID: 10411
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Hot-Spot Temperature, Hot-Spot Location, HST, Natural Ester

Evaluation of the Hot-Spots' Location during Dynamic Loading of a Natural Ester Cooled Power Transformer

Beatriz OLIVEIRA, Catarina CORTE-REAL, João SILVA, Sandra COUTO, Ricardo CASTRO LOPES
EFACEC Energia, S.A., Portugal

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Topics: A2 PS2 - Advances in Transformer Analytics

Artificial Intelligence in Transformer Manufacturing

Robin AXELSSON
Hitachi Energy Sweden AB, Sweden

ID: 10612
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: online bushing monitoring, network unbalance, measuring uncertainty of isolation coefficients, cyber security

Application of Online Bushing Monitoring With Low Measurement Uncertainty

Marek ANDRZEJEWSKI[1], Wiesław GIL[1], Maciej LECHMAN[2], Wiktor MASŁOWSKI[1], Piotr RYTKA[2]
[1]MIKRONIKA, Poland; [2]PSE S.A., Poland

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Topics: A2 PS2 - Advances in Transformer Analytics

The evolution of power transformer appraisal methodology towards an effective and efficient risk assessment for the South African power utility

Sidwell MTETWA
Eskom Holdings SOC Limited

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

The usefulness of capacitive moisture sensors in online gas analysers

Carl WOLMARANS
GE Vernova M&D

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Non-uniform winding Temperature Distribution in directed cooling Mode

Tor LANERYD
Hiitachi Energy Sweden AB, Sweden

ID: 10706
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Power Transformer, Renewables, Thermo-Chemical Evaluation, Aging, Dynamic rating

Dynamic Loading of Transformers in Renewable Energy Generation: A Comparison of Traditional Methods and a Novel Thermo-Chemical Evaluation of Transformers Ageing

Wilerson CALIL, Alan SBRAVATI, Luiz V. CHEIM
Brazilian NC of CIGRE, Brazil; HITACHI ENERGY

ID: 10841
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Transformers, Thermal hydraulic network model, Dynamic thermal modelling

Advancements in Dynamic Thermal Modelling of Power Transformers: Integrating Detailed Thermal Hydraulic Network Models

Patrick PICHER[1], Federico TORRIANO[1], Zoran RADAKOVIC[2], Marko NOVKOVIC[2]
[1]Hydro-Québec, Canada; [2]University of Belgrade, Serbia

ID: 10842
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Thermal modeling of power transformer, inverse problem, Physics-Informed Neural Networks, indirect validation of predictive models

Thermal Modeling of Power Transformer and Shunt Reactor Using Physics-Informed Neural Networks

Jhelum CHAKRAVORTY[1], Michele LUVISOTTO[2], Nicolo RIPAMONTI[3], Tor LANERYD[2], Annamalai LAKSHMANAN[3]
[1]Hitachi Energy Research, Canada; [2]Hitachi Energy Research, Sweden; [3]Hitachi Energy Research, Switzerland

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Condition assessment, Diagnosis, DFR, FDS, Bushings

Detecting degraded bushings with DFR – A case study

Lars Andreas ERIKSSON[1], Evgenii ERMAKOV[2], Lars JONSSON[2], Erik NICOLAISEN[3]
[1]Hitachi Energy Norway; [2]Hitachi Energy Sweeden; [3]Statnett

ID: 10890
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Clamping pressure; condition monitoring; power transformer; short circuit performance

Monitoring Clamping Pressure in 40 MVA Power Transformer: A Study of Short and Long-Term Trends

Inge MADSHAVEN[1], Henrik ENOKSEN[1], Stefan JAUFER[2], Christoph KRAUSE[2], Borut PRASNIKAR[3], Asgeir MJELVE[4], Alexander REITBAUER[5], Mohamed RYADI[6]
[1]SINTEF Energy Norway; [2]Weidmann Switzerland; [3]Kolektor Etra Slovenia; [4]Elvia Norway; [5]Siemens Energy Austria; [6]EDF France

ID: 10920
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: transformer, cooling, thermal model, benchmarking, metrics, accuracy

Improvement and Validation of IEC dynamic Transformer thermal Model

Tim GRADNIK[1], Xiang ZHANG[2], Irina LUPANDINA[3], Remi DESQUIENS[4], Alvaro PORTILLO[5], Federico PORTILLO[6], Patrick PICHER[7]
[1]Elektroinstitut Milan Vidmar (EIMV)Slovenian engineering and scientific research organisation; [2]Manchester Metropolitan University; [3]Technische Universität Wien; [4]EDF France; [5]Independent researcher; [6]Independent researcher; [7]Hydro-Québec

ID: 10930
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: DGA, Transformer Failures, Condition Monitoring, Data Analytics, Diagnostics

The Good and Bad about Online Transformer DGA Monitoring

Varun GOYAL
Hydro One, Canada

ID: 10939
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Transformation, Solid-Insulation

Digital Transformation of Power-Transformer Solid-Insulation Drying Process

Gerardo TAMEZ-TORRES, Enrique BETANCOURT-RAMIREZ
Prolec-Ge International, Mexico

ID: 10993
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Partial Discharge (PD), PD Source Localization, PD Signal Propagation, Power Transformer, Ultra-high frequency (UHF) sensor

Modeling and Simulation to Analyze the Propagation of the Partial Discharge UHF Signals and Localization of Their Source in the Power Transformer

Djordje DUKANAC
Joint Stock Company "Elektromreza Srbije", Belgrade, Serbia

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Steady State and Dynamic Thermal Performance of Liquid-Filled Distribution Transformers

Ali AL-ABADI
Hitachi Energy, Germany

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Results of Long-Term Monitoring for the Proof of Stability in the Switching Process of On-Load Tap-Changers based on Vibroacoustic Measurements

Karsten VIERECK[1], Anatoli SAVELIEV[1], Julia MASSMANN[2], Johannes VEIT[2]
[1]Maschinenfabrik Reinhausen GmbH, Germany; [2]Amprion GmbH, Germany

ID: 11056
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Transformer, Partial Discharge, Defect Location, Ultra-High Frequency

Study on Estimation System of Partial Discharge Position in Oil/Gas Transformer

Byoung-Woon MIN, Danbi LEE, Jeong-Bok LEE, Kwang-Don BAE
HD Hyundai Electric, Korea, Republic of (South Korea)

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Australian and New Zealand transformer reliability analytics within the context of the international failure surveys

Daniel MARTIN[1], Stefan TENBOHLEN[2], Zeenat HANIF[2], Chris BECKETT[3]
[1]Essential Energy, Australia; [2]University of Stuttgart, Germany; [3]United Energy, Australia

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Topics: A2 PS2 - Advances in Transformer Analytics

Advancing Electrical Fault Diagnosis in Power Transformers with AI

David ALVAREZ[1], Oswaldo ARENAS[1], Jhonatan ANAYA[1], Isabella ARANGO[2]
[1]ISA Intercolombia; [2]Universidad Nacional

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Voltage harmonics and dc detection on power transformers via vibration measurement analysis

Dennis ALBERT[1,2], Andre WÜRDE[3], Christoph ENGELEN[1]
[1]OMICRON electronics; [2]TU Graz; [3]RWTH Aachen

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Transformer Electromagnetic Modelling based on DC Hysteresis Measurements

Dennis ALBERT[1,2], Alexander FRÖHLICH[1], Sergey ZIRKA[4], Johannes RAITH[3]
[1]Graz University of Technology; [2]OMICRON electronics; [3]Siemens Energy; [4]Dnipro National University Ukraine

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

A Reliable Future in Power Transformers and Reactors Through Proactive Bushing Management

Elkin CANTOR
ISA Intercolombia

ID: 11235
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Shunt reactor, Deterioration, Aging, Criteria of Replacement

Detailed Study of Aging Shunt Reactors to Determine Suitable Maintenance and Replacement Strategies

Takashi YAMAMOTO, Ryo SAEKI, Atsushi ETO, Shunsuke TAMURA, Harukazu AKIYAMA, Yasuhiko HANAMAKI
TEPCO Power Grid, Inc., Japan

ID: 11240
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Transformer Diagnostics, Continuous Monitoring, Active Parts Deformation, Load Condition, Acceleration Sensor, Magnetic Sensor

Power Transformer Diagnostics using Magnetic and Acceleration Sensors

Kohei YAMAGUCHI, Mizuki OGI, Satoshi ICHIMURA, Yusuke TAKENAKA, Kota DOI
Hitachi Ltd., Japan

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Dissolved-gas-analysis, Fault-detection, Machine-learning, Oil-immersed-transformer

Incipient fault detection method for oil-immersed transformer using time series data of dissolved gas analysis

Shunichi HATTORI, Kosuke MIKUNI, Hiroshi MURATA, Taisei HOMMA, Satoru MIYAZAKI, Yoshinobu MIZUTANI
Central Research Institute of Electric Power Industry, Japan

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Aging, Diagnosis, Degree of polymerization, Power transformer, Thermally upgraded paper

Diagnostic method for thermal deterioration of insulating paper used in power transformers based on winding temperature calculation

Satoru MIYAZAKI, Yoshinobu MIZUTANI
Central Research Institute of Electric Power Industry, Japan

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Determination of Short-Circuit Reactance of Transformers from Sweep Frequency Response Analysis Measurements

Sreeram V*, Rajkumar M, Rajaramamohanarao CHENNU, T GURUDEV, S Sudhakara REDDY
Central Power Research Institute, India

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Development of AI-ML based Reliability Centred Maintenance Framework for Power Transformers and Reactors in Powergrid

Deo Nath JHA*, Amandeep SINGH, Devaprasad PAUL, Joseph George JOSE, P R S YADAV, Kuleshwar SAHU, Pradeep KUMAR
Powergrid, India

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

A novel approach in Development of Furan and Methanol-Based Accelerated Ageing Model for Power Transformers and Shunt Reactors

Deo Nath JHA*, Rohit Kumar JAIN, P R S YADAV, Pradeep KUMAR
POWERGRID, India

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

AI-Driven Intelligent Objective Analysis of SFRA Signatures for EHV Transformers and Reactors

Deo Nath JHA*, Maganti SIDDHARDHA, Akash TRIVEDI, Aakash KHANDELWAL, Keshav GUPTA
POWER GRID, India

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Practical Implementation of Two-Dimensional Transformer Fleet Management Approach based on an example of a German Utility.

Alexei BABIZKI[1], Philipp BIRGMEIER[1], Martin GUTH[1], Rolf FUNK[2], Martin KNAPP[2]
[1]Maschinenfabrik Reinhausen GmbH, Germany; [2]Rheinische NETZGesellschaft mbH, Germany

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Shared digital twins as approach for the data-sovereign collaboration between TSO and 3rd Party in the condition assessment of a transformer fleet

Bastian FISCHER[1], Christian HOFMEISTER[1], Jochen JUNG[2], Michael GRATZA[2]
[1]Maschinenfabrik Reinhausen GmbH, Germany; [2]TenneT TSO GmbH, Germany

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Topics: A2 PS2 - Advances in Transformer Analytics

Advancing Transformer Condition Assessment through Fuzzy Logic

Abdulla ALABBASI[1], Mohamed KHALIL[2]
[1]Bahrain Center for Strategic International and Energy Studies, Bahrain; [2]Doble Power Test,UK

ID: 11518
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Cast resin transformer, FEM analysis, Load loss, Winding temperature rise

Characteristic Evaluation and Performance Analysis for Cast Resin Transformer of Large Capacity

Hongwoo JIN, Youngbae CHOI, Byungjun HWANG, Woonghee LEE, Jonggun LEE
HD Hyundai electric, Korea, Republic of (South Korea)

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Advances in Transformer Data Management and Analytics in Malaysian Grid Utility (TNB)'s Perspective

Gobi Kannan SUPRAMANIAM, So'adiah NANYAN, Roslina YASSIN
Tenaga Nasional Berhad, Malaysia

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Requirement for reliable transformer diagnostics using Frequency Response Analysis (FRA)

Evgenii ERMAKOV
Hitachi Energy Sweden AB, Sweden

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Predicting oil quality to support asset management decisions using Markov chains

Niklas SCHMIDT[1], Markus ZDRALLEK[1], Alexei BABIZKI[2], Karlheinz LINDL[2]
[1]University of Wuppertal, Germany; [2]Maschinenfabrik Reinhausen GmbH, Germany

ID: 11675
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: EMTP simulations, field measurements, high frequency model, lightning location system, overvoltages, power transformer

Simulations and Measurements of Lightning Overvoltages Transferred Through Power Transformers

Bruno JURISIC[1], Bozidar FILIPOVIC-GRCIC[2], Tihomir JAKOVIC[1], Tomislav ZUPAN[1]
[1]Končar – Electrical Engineering Institute Ltd. Zagreb Croatia; [2]University of Zagreb Faculty of Electrical Engineering and Computing,Zagreb Croatia

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Topics: A2 PS2 - Advances in Transformer Analytics

A new method for health index calculation using power transformers as an example

Mahmoud MOH'D, Henning SCHNITTKER, Peter WERLE
University of Hannover, Germany

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Dielectric Condition Assessment Index of Power Transformer a Case Study at UIT-JBM Population

Fermi TRAFIANTO, Indra KURNIAWAN, Didik Fauzi DAKHLAN, Ika SUDARMAJA
PT. PLN (PERSERO), Indonesia

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Enhancing Power Transformer Transmission Reliability Evaluating and Strategizing Online Monitoring Implementation for Power Transformer in PLN

Harry GUMILANG, Rahmat BETA, Andhy Dharma SETYAWAN, Tejo WIHARDIYONO
PT.PLN (Persero), Indonesia

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics

Analysis of AC Transformer Reliability

Stefan TENBOHLEN[2], Dan MARTIN[1]
[1]Essential Energy; [2]University of Stuttgart

ID: 11865
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS2 - Advances in Transformer Analytics
Keywords: Digital twins;Distribution transformers;Dynamic loading;Reliability

Estimating the Dynamic Rating of Distribution Transformers using Digital Twins

Saravanan BALAMURUGAN
Minaatral Power Systems Private Limited,India

PS3 - RELIABILITY OF TRANSFORMERS FOR RENEWABLE ENERGY

ID: 10117
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS3 - Reliability of Transformers for Renewable Energy
Keywords: Electric vehicles (EVs), peak load shaving, voltage regulation, type of insulation system

1 How Charging Electric Vehicles Affects the Lifespan of Power Transformers : A Study from Aswan City

Mohamed ORABI[1], Al-Attar ALI[1], Omar ABDEL RAHIM[2], Mostafa ALI ELDAWY[3]
[1]Faculty of Engineering, Aswan University; [2]Egypt-Japan University of Science and Technology; [3]Upper Egypt Electricity Distribution Company

ID: 10413
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS3 - Reliability of Transformers for Renewable Energy
Keywords: Distribution Transformer, Dynamic Voltage Regulator, Condition Monitoring, Amorphous Magnetic Circuit, Distribution Grid Power Quality, Sustainability, Lifecycle Assessment, Predictive Maintenance, Digital Asset Management, Online Monitoring, IANOS

Transforming the Future: The Innovative Design of Distribution Transformers

Andrea SOTO[1], Luís Filipe AZEVEDO[2], Valter PIMENTA[3], Ricardo CASTRO LOPES[1], Fernando XAVIER[2], Ricardo RIBEIRO[3], Pedro Miguel SILVA[1], Simão ALMEIDA[2], Luís Almeno FERNANDES[3]
[1]Power Transformers R&D, Efacec Energia S.A., Portugal; [2]Smart Power R&D, Efacec Energia, S.A., Portugal; [3]Service R&D, Efacec Energia, S.A., Portugal

ID: 10498
A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS3 - Reliability of Transformers for Renewable Energy
Keywords: ReCiPe, Circular Economy, Circularity, Life Cycle Assessment, LCA Software, Power Transformer

Comparative analysis of Life Cycle Assessment methodology for a power transformer manufacturer's transition to Circular Economy

Filipa FARIA[1], Beatriz TEIXEIRA[2], Viviana PINTO[1], Luís Almeno FERNANDES[2], Ricardo RIBEIRO[2]
[1]INEGI, Portugal; [2]Efacec Power Solutions, SGPS, S.A., Portugal

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS3 - Reliability of Transformers for Renewable Energy

Experimental analysis of transient overvoltage protections in distribution transformers

Víctor Manuel GARCÍA-CHOCANO, Antonio NOGUÉS
Hitachi Energy, Spain

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS3 - Reliability of Transformers for Renewable Energy

Wind Farm Transformers. Relevance of FAT Tests for Safe and Reliable Operation

Raúl ALVAREZ[1], Leonardo CATALANO[1], Hernán MAYORA[2], Pablo MORCELLE[1], Tomas SCHMIDT[1]
[1]IITREE-FI-UNLP; [2]FI-UNLP

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS3 - Reliability of Transformers for Renewable Energy
Keywords: Dry-type, Liquid-Cooled, Low-Carbon, Reduced Footprint, Renewable, Solar, Sustainability, Transformer, Wind

The sustainability benefits of liquid cooled dry-type transformers in renewable energy and vent-closed applications

Luiz OLIVEIRA, Müge ÖZERTEN, Ghazi KABLOUTI, Antonio NOGUÉS
Brazilian NC of CIGRE, Brazil; HITACHI

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A2 POWER TRANSFORMERS AND REACTORS - Full Papers
Topics: A2 PS3 - Reliability of Transformers for Renewable Energy

Effects of Rooftop Photovoltaics on the Load Profile and Ageing of Distribution Transformers

Xin ZHONG[1], Chandima EKANAYAKE[1], Hui MA[1], Tapan SAHA[1], David FINK[2], Greg CALDWELL[2]
[1]The University of Queensland; [2]Energy Queensland Limited

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Topics: A2 PS3 - Reliability of Transformers for Renewable Energy

Development of multi-windings power transformer in frequency regulation system

Jaeyong PARK, Hyeon Gu JEONG, Seo Hyun LEE, Min Gyu KIM, Jae Seop RYU, Chae Yoon BAE, Jang Cheol SEO
LS ELECTRIC, Republic of Korea

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Serenay CURUKOVA KALE[1], Oluş SONMEZ[1], Yunus Berat DEMIROL[2], Bora ALBOYACI[3]
[1]Sönmez Transformatör Türkiye; [2]Genetek Güç&Enerji Türkiye; [3]Kocaeli University Türkiye

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Peter DOPPLMAIR[1], Naveen BHARDWAJ[1], Simon EL-KHOURY[2]
[1]Trench Group; [2]RTE

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D K MARGHADE*, Minal KATARIA, A K GUPTA
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Integration of Photovoltaic considering Dynamic Transformer Rating in the Distribution Grid Planning Process

Moritz FRANZ[1], Martin BRAUN[2], Jan WIEMER[2], Denis MENDE[1]
[1]University of Kassel, Germany; [2]Fraunhofer Institut für Energiewirtschaft und Energiesystemtechnik IEE & Universität Kassel, Germany

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Ilya BURLAKIN[1], Sebastian REHKOPF[2], Elisabeth SCHEINER[1], Gert MEHLMANN[1], Matthias LUTHER[1], Martin WOLFRAM[2], Christian HURM[2]
[1]Friedrich-Alexander-University Erlangen-Nueremberg, Germany; [2]Maschinenfabrik Reinhausen GmbH, Germany

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PS1 - ENERGY TRANSITION INVOLVING T&D EQUIPMENT

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Development of High Voltage Intelligent Fast Circuit Breaker

Zhibing LI[1], Yu TIAN[1], Jianwei WEI[2], Bo LIU[3], Sheng YIN[4], Yang TIAN[1], Jinghua JIANG[2], Zhihua MA[3], Qingchao SUN[2], Kejia XIE[3], Liyan ZHANG[4], Enyuan DONG[4]
[1]China Electric Power Research Institute, China; [2]Pinggao Group Co.,Ltd. , China; [3]Shandong Taikai high voltage swichgear CO., LTD. , China; [4]Dalian University of Technology, China

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Bo QI[1], Xiao YANG[1], Mingcheng HUA[1], Yi ZHANG[1], Licheng LU[2], Faqiang YAN[3], Hao TANG[4], Chengrong LI[1]
[1]North China Electric Power University, China; [2]State Grid Smart Grid Research Institute Co. Ltd. , China; [3]Sinoma Jiangxi Electric Porcelain Electrical Co., Ltd. , China; [4]China Electric Power Research Institute , China

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Key Technology Research, Prototype Development, and Engineering Application of Self-trigger/Self-discharge Gap for Fast Control of UHV DC/AC Controllable Arresters

Zhibing LI[1], Ran ZHANG[1], Xiaoang LI[2], Xiaodong XU[1], Huangguo ZHOU[1], Jinyang LIN[1], Ningbo ZHANG[2], Wen WANG[1]
[1]China Electric Power Research Institute,China; [2]Xi'an Jiaotong University,China

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State Grid Hunan Electric Power Company Limted Research Institute, China

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Topics: A3 PS1 - Energy Transition Involving T&D Equipment
Keywords: Solid Insulated Busbar, Pluggable Connectors, Plug-in Bushing, Superconductor Cable, Gas Insulated Switchgear

Solidly Insulated Buses and Pluggable Connectors and Bushings for the Substations Modernization

Boris GUREVICH[1], Can TAKAN[2], Christian SPAETH[3]
[1]Exelon/ComEd, United States of America; [2]Moser-Glaser Ltd., Switzerland; [3]PFISTERER Kontaktsysteme GmbH, Germany

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Arteche Group, Spain

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Topics: A3 PS1 - Energy Transition Involving T&D Equipment
Keywords: DCCB, Residual current switch, Synthetic air, VARC

Development of an HVDC circuit-breaker and study of the requirements -Residual current interruption in multi-terminal HVDC system-

Takashi INAGAKI[1], Motohiro SATO[1], Frederick PAGE[1], Simon NEE[2], Tomas MODEER[2], Staffan NORRGA[2]
[1]Mitsubishi Electric Corporation, Japan; [2]Scibreak AB, Sweden

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Selection Criteria of NGR Value Based on Measurements and Simulation of Actual Fault Events

Dr Subir SEN, B.B MUKHERJEE, Pradeep Tanaji PATIL*, Ashish SONI
Power Grid, India

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Optimization of controlled Switching for Transmission Lines

Urmil PARIKH
Hitachi Energy Sweden AB, Sweden

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Point on Wave (Controlled Switching) - for a wider range of Applications

Gustav STEYNBERG, Klaus BOEHME
Siemens AG, Germany

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Topics: A3 PS1 - Energy Transition Involving T&D Equipment
Keywords: Superconductor, Fault Current, Short-Circuit Current, Fault Current Limiter, Grid Splitting

An Approach for Economic Evaluation of Superconducting Fault Current Limiters in City Grids with Relay Protection Considerations

Mikhail MOYZYKH, Daria KOLOMENTSEVA, Kirill BABURIN, Eldar MAGOMMEDOV
SJSC SuperOx, Russian Federation

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS1 - Energy Transition Involving T&D Equipment
Keywords: Composite insulators, Substations, UHV AC/DC applications, Life-cycle costing

Experience in UHV AC / DC projects in India & China with fully composite external insulation of substation equipment

Eric MOAL[1], Madhu SUDAN[2], Shuchen ZHOU[3], Sida ZHANG[3]
[1]JACKSON AND FRANK, France; [2]GE India Industrial Pvt LTD., India; [3]Jiangsu Shemar Electric CO., LTD, China

ID: 11900
A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS1 - Energy Transition Involving T&D Equipment
Keywords: DC circuit breaker, fusion devices, quench protection circuits, DC fault, nuclear fusion plant.

A Soft-switched Hybrid DC Circuit Breaker for the Protection of Fusion Power Plant Electrical Systems

Hanwen ZHANG[1], Ferro ALBERTO[2], Thomas FRANKE[3], Mattia DAN[2], Cristina TERLIZZI[4], Yanbo WANG[1], Zhe CHEN[1]
[1]Aalborg University; [2]Consorzio RFX; [3]Max-Planck-Institute for Plasma Physics; [4]University of Rome Tor Vergata

PS2 - LOWERING THE CARBON FOOTPRINT OF T&D EQUIPMENT

ID: 10127
A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: Gas Insulated switchgear, Metal enclosed, SF6-free, Circuit- breaker, GIS Bay

SF6-free metal enclosed switchgear at 245kV and above

Cyril GREGOIRE, Antoine PERRET, Jean-Baptiste JOURJON, Samuel SOUCHAL
GE Vernova, France

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Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment

Diagnostic Study of Two-dimensional Distribution Spectroscopy of Vacuum Circuit Breaker Arc

Yilong LI[1], Zhao YUAN[1], Lixue CHEN[1], Shan LIU[1], Liming LIU[1], Penglong YA[1], Chuanqi WU[2], Yuan PAN[1]
[1]Huazhong University of Science and Technology,China; [2]State Grid Hubei Electric Power Research Institute Measurement

ID: 10321
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Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: HV Substation Products, HV Dry Type Insulation Technologies, Non-conventional Instrument Transformers

Safety, Eco-Friendly and Durability Delivered by Advanced Dry Type Insulation Technologies

Robert MIDDLETON, Eric EUVRARD
RHM International, United States of America

ID: 10323
A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: C4-FN, Expected Lifetime, Gas Components, Aging, Thermal Cycling

Component Gas Losses Over Simulated Lifetime in a CO2/C4-FN Gas Blend

Jeff MOORE, Rahul JAIN
S&C Electric Company, United States of America

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Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment

New Approach to Life Cycle Assessment for Digital Solutions & Components

Marco RIVA, Luca MARCOLONGO, Simone CARNÌ, Alessia SIRONI, Claudio CENCI
ELDS Technology Center – ABB SpA, Italy

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: C4-FN, effect of humidity, PD-measurement, fluoronitrile, green gas

The effect of humidity on the AC breakdown behaviour of C4-FN/CO2 (5%/95%) with different humidities and operating pressures, including its corona behaviour

Ewout VAN VELDHUIZEN, André LATHOUWERS, Christian MIER, Mohamad GHAFFARIAN NIASAR
Delft Technical University

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: Alternative gas, Condition monitoring, GIS, Partial discharge

Partial Discharge Measurement in SF6-Alternative Electrical Insulation Systems

Alistair REID[1], Rahmat ULLAH[1], Fatima ELENEZI[1], Manu HADDAD[1], Peter TADDEI[2], Mini NAMBIAR[2], Matthew BARNETT[2]
[1]Cardiff University UK; [2]SSEN Transmission UK

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How working with customers on specifications leads to a reduced carbon footprint impact

Ixone URRUELA, Asier ZORROZUA, Sonia GONZALEZ, Eneko MADARIAGA
Arteche Group, Spain

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: Additive Manufacturing (AM), Laser Directed Energy Deposition (L-DED), Inconel, Circuit Breaker

Advancing Circuit Breaker Maintenance and Repair through Metal Additive Manufacturing Technology

Alexandre PINHEL[1], Rodrigo MAIA[1], Gabriel Ângelo VIEIRA[1], Anselmo THIESEN[2]
[1]Brazilian NC of CIGRE, Brazil; Eletrobras Furnas; [2]Brazilian NC of CIGRE, Brazil; SENAI-SC

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: Current Transformers, Non-invasive Monitoring, Partial Discharges; HFCT; Extra High Voltage Substation

An Advanced Intelligent Online Monitoring System for Current Transformers

George LIRA[1], Ana MAROTTI[2], Edson COSTA[1], Antonio LEITE NETO[1], João MELO[1], André COSTA[2], João Paulo DE SOUZA[3], Fabiana FERNANDES[2], Allan David SILVA[1], João Paulo SOUZA[3]
[1]Brazilian NC of CIGRE, Brazil; Federal University of Campina Grande; [2]Brazilian NC of CIGRE, Brazil; Eletrobras Furnas; [3]Brazilian NC of CIGRE, Brazil; Concert Technologies S.A

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: SF6-alternative, High Voltage Circuit Breaker, CO2-O2-C4FN Gas Mixture, Current Interruption, Post-arc Current, Computational Fluid Dynamics

SF6-alternative 145 kV metal enclosed circuit breaker

Marcel STOECKLI[1], Patrick STOLLER*[2], Mahesh DHOTRE[2], Brooke SPREEN[2], Jakub KORBEL[2]
[1]ELECTROSUISSE / CIGRE Switzerland NC Secretary; [2]Hitachi Energy Switzerland Ltd, Switzerland

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: High voltage circuit breakers, dielectrics, rise of dielectric withstand, controlled switching, SF6 alternatives

RDDS and RRDS characterization for 420 kV 63 kA SF6-free High Voltage Circuit Breaker

Marcel STOECKLI[1], Reto KARRER*[2], Valeria TEPPATI[2], Mahesh DHOTHRE[2], Sami KOTILAINEN[2], Peter FREI[2]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy, Switzerland

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: High voltage circuit breakers, SF6 alternatives, C4-FN mixtures, computational fluid dynamic simulations, short line faults, terminal faults

Development and type testing of a 420 kV 63 kA 50 Hz and 60 Hz SF6-free High Voltage Circuit Breaker

Marcel STOECKLI[1], Valeria TEPPATI*[2], Reto KARRER[2], Mahesh DHOTRE[2], Peter FREI[2], Patrick STOLLER[2], Markus BUJOTZEK[2]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy, Switzerland

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: SF6-free, C4-FN, dual-gas, GIS, CB, short-circuit, switching

72.5 kV C4-FN/O2/CO2 GIS and CB performance and comparison with its SF6-equivalent

Marcel STOECKLI[1], Maxime PERRET*[2], Robert LUESCHER[2], Clement COCCHI[2], Bernhard SPICHIGER[2], Alexis COMBAZ[3]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]GE Vernova, Switzerland; [3]GE Vernova, France

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: Decarbonisation, Environmental impact indicator, Gas insulated switchgear, High voltage circuit breaker, Life cycle assessment, fluoronitriles, Vacuum, PFAS, F-Gas

Evaluation of Environmental Impact of SF6-based, CO2+C4F7N-based GREENTRICTM and Dry air Insulation/Vacuum Interruption-based GREENTRICTM High Voltage Gas Insulated Switchgears through Life Cycle Assessment'

Marcel STOECKLI[1], Kedar PANDYA*[2], Manuel GOTTI[2], Nicole SONG[3], Javier MANTILLA[2], Hyoungjin JOO[3]
[1]ELECTROSUISSE / CIGRE Switzerland NC Secretary; [2]HD Hyundai Electric Switzerland Ltd, Switzerland; [3]HD Hyundai Electric Ltd, South Korea

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: HVCB, CO2 footprint, decarbonization, C4F7N, GWP, F-gas regulations, x-ray emissions-free, CFD, MOO, terminal faults, recovery voltage, carbon-neutral, digital twin, condition monitoring

Experience in the development of a Fluoronitriles-based 145 kV / 40 kA / 50-60Hz HVCB with an extremely low CO2 footprint

Marcel STOECKLI[1], Manuel GOTTI*[2], Kilsoo HAN[3], Jeong Cheol KIM[3], Sihyeong KIM[3], Xiangyang YE[2], Javier MANTILLA[2], Kedar PANDYA[2]
[1]ELECTROSUISSE / CIGRE Switzerland NC Secretary; [2]HD Hyundai Electric Switzerland Ltd, Switzerland; [3]HD Hyundai Electric Ltd, South Korea

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: Dielectric Design, Insulation, Type Test, SF6-alternatives, Gas-Insulated Switchgear, GIS, Dead-Tank Breaker, DTB

High Voltage type testing of a 420 kV SF6-free High Voltage Circuit Breaker for Gas Insulated Switchgear and Dead Tank Breaker Applications

Marcel STOECKLI[1], Peter FREI*[2], Reto KARRER[2], Wilhelm THUNBERG[2], Valeria TEPPATI[2], Brian CHRISTOPHER[3], Matt CUPPETT[3], Carl R. KURINKO[3]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy, Switzerland; [3]Hitachi Energy, United States

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Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment

Future Needs and Common Approach of the Implementation of SF6 Free Equipment in the Grid of Six European TSOs

Frank RICHTER[1], Lisa SCHAEFER[1], Aurelien TAUREAU[2], Jonas BAUMANN[3], Thomas WIJNHOVEN[4], Maria Isabel MARTIN DIAZ-TOLEDO[5], Patrick SCHOERNBOECK[6], Pierre MEYER[2]
[1]50Hertz Transmission GmbH, Germany; [2]RTE, France; [3]Swissgrid AG, Switzerland; [4]Elia Transmission, Belgium; [5]REDEIA, Spain; [6]APG, Austria

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: SF6 Free, GIS, Alterntive

SF6 Free 170kV 50kA GIS verification test considering substation energization

Sooik LEE, Dongwook MOON, Kwangjoong LEE, Seungwan SON
Hyosung Heavy Industries Corporation, Republic of (South Korea)

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Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment

F-gas-free, zero-emission clean air switchgear for 420 kV

Paul Gregor NIKOLIC, S. WILKE, A. GRIEGER
Siemens Energy, Germany

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: Ground fault, Micro-gap, SF6 alternative gas, Temperature measurement

Hot Gas Temperature Measurement in High Voltage Circuit Breakers Using Micro-gaps in SF6-free circuit breakers

Man-Jun HA, Jung-Ho PARK, Dong-Hoon JEONG
Hyosung Corporation

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: Life cycle assessment, Global warming, Switchgears, SF6 gas, Alternative technologies, Standardization

A Common LCA Format for High-Voltage Switchgears

Toshiyuki UCHII[1], Satoshi TAKAHASHI[2], Haruhiko KOYAMA[2]
[1]Toshiba Energy Systems & Solutions Corporation, Japan; [2]JEMA (The Japan Electrical Manufacturers' Association) , Japan

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: Gas - insulated - switchgear (GIS), Global - warming, SF6 - emission, SF6 - alternative - gas, Synthetic - air, Natural - origin - gas, O - ring, Grease, Silver - plating

Lifetime Aspects and Experiences through Commercial Operations of 72 kV SF6-free Gas-Insulated Switchgear using Natural Origin Gas

Tomoya ONISHI[1], Toru KOIKE[1], Akihisa MUKAIDA[1], Hideaki SHIRAI[1], Shigeyuki TSUKAO[2], Syuichi TAMURA[2]
[1]Toshiba Energy Systems & Solutions Corporation, Japan; [2]TEPCO Power Grid, Inc., Japan

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: Synthetic air, Gas-Insulated Switchgear (GIS), Vacuum Circuit-Breaker (VCB), Vacuum Interrupter (VI)

Application of SF6 alternative switchgears – circuit-breakers and GIS using vacuum interrupter in synthetic air-insulated systems –

Naoya AIHARA[1], Ryosuke ITOTANI[2], Koki SADAHIRO[2], Shinichiro NAKAUCHI[1], Kenji SASAMORI[1]
[1]Mitsubishi Electric Corporation, Japan; [2]Kansai Transmission and Distribution, Inc., Japan

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: Carbon neutral, Compactness, SF6-free, Solid-insulated switchgear(SIS), Solid insulation

Long operational experiences of medium-voltage solid-insulated switchgears

Satoru MAENO[1], Yuk ISHIKAWA[2], Ryosuke ITOTANI[3], Yoshimitsu NIWA[4], Hiroyuki SHIRAI[5]
[1]Mitsubishi Electric Corporation, Japan; [2]TEPCO Power Grid, Inc., Japan; [3]Kansai Transmission and Distribution, Inc., Japan; [4]Toshiba Infrastructure Systems & Solutions Corporation, Japan; [5]Hitachi Industrial Equipment Systems Co., Ltd., Japan

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Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment

SF6 alternatives in GIS/AIS Switchgear and challenges faced in its execution and project management

Ravi Sushant CHAUDHARY*, Anshul SHARMA, R. P. S. RANA, M. THIRUMALA
POWERGRID, India

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment

Subject - Life cycle management and life extension of AIS/GIS Switchgear, FACTS equipment by application of RCM

Ravi CHAUDHARY*, Amit KUMAR, R. P. S. RANA, Kuleshwar SAHU, M. Thirumala REDDY
POWERGRID, India

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: Low power instrument transformers; Sustainability; Energy losses; Rogowski coils; Voltage sensors; Medium Voltage Switchgear

Utilization of smart measurement technologies to improve medium voltage switchgear sustainability

Roman PERNICA, Karol MAJER, Pavel VANO
ABB Czech Republic

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Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment

Digital model and supply chain of a MV GIS, to manage a low carbon energy system

Thomas DUERR, Achim KALTER, Florian WOLFRUM, Patrick SCHNEIDER

Siemens AG & Siemens Ag France, Germany

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: Biodegradable Liquids, Dielectric Performance, Instrument Transformers, Partial Discharge, Simulated Aging

Implementation of Various Biodegradable Insulation Liquids in Instrument Transformers Rated at 420 kV

Kresimir KOPRIVEC[1], Igor ZIGER[1], Darko IVANOVIC[1], Tomislav ZUPAN[2]
[1]Končar – Instrument Transformers Zagreb, Croatia; [2]Končar – Electrical Engineering Institute Zagreb, Croatia

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: Gas Insulated Switchgear, GIS, Global Warming Potential, GWP, Voltage Transformer, Sulphur Hexafluoride, SF6, Fluoronitrile, Synthetic Air, Coating, Partial Discharge, Gas Permeation, Compatibility

Design Aspects for the use of Alternative Gases in GIS Voltage Transformers

Marcel STOECKLI[1], Mostafa REFAEY*[2], Martin BOSS[3]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]alumni Pfiffner Instrument Transformers, Switzerland; [3]Pfiffner Instrument Transformers, Switzerland

ID: 11858
A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS2 - Lowering the Carbon Footprint of T&D Equipment
Keywords: SF6 Replacement;Vacuum Circuit Breaker;Contact erosion;Molecular Dynamics

Molecular Dynamics Simulation of Cathode Spots Formation and Contact Erosion in Vacuum Circuit breakers

Haonan YANG
University of Manchester, UK

PS3 - MAINTAINING AND MANAGEMENT T&D ASSETS

ID: 10132
A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS3 - Maintaining and Management T&D Assets
Keywords: Low power instrument transformers, electrical networks, TSO Experience, High voltage applications, evolutions

Status of the utilisation of Low Power Instrument Transformers in electrical networks

Laurent ROUX
RTE, France

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Topics: A3 PS3 - Maintaining and Management T&D Assets

Research on Magnetic-controlled Vacuum Arc Technology and Circuit Breaker Development

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Pinggao Group Co., LTD , China

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Keywords: SF6-alternatives, Health Index, Asset Performance Management, Partial Discharges, UHF measurement

Health Index computation in Switchgear Monitoring Systems: providing Asset Performance Management crucial data straight from the primary equipment

Nicolas GADACZ, Jean-Luc RAYON, Eros STELLA, Samuel FIFI, Raphaël LEBRETON
GE Vernova, France

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Topics: A3 PS3 - Maintaining and Management T&D Assets
Keywords: SF6 Alternatives, Smart Live Tank Circuit Breaker, Asset Performance Management, Monitoring, Control

Return on Experience of Smart Live Tank Circuit Breaker with SF6-Alternative

Nicolas GADACZ[1], Henrik Roland HANSEN[2]
[1]GE Vernova, France; [2]Energinet, Denmark

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Keywords: fault detection and classification, power transmission systems, two-stage detection systems, and optimal and secure power transmission systems

Enhancing Fault Detection and Classification in Power Transmission Systems Using Two-stage Detection System

Hassan MAHMOUD[1], Haitham H MAHMOUD[2]
[1]Egyptian Electricity Holding Company; [2]Birmingham City University

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Keywords: Condition, Monitoring, Save, Asset Management

Condition Monitoring Analyses: from Straightforward to Surprising

Tony MCGRAIL[1], Philip BOREHAM[1], Jamie BEARDSALL[2], Mark ROWBOTTOM[2], Carl JOHNSTONE[3], Rachael SUH[4]
[1]Doble Engineering, United States of America; [2]Drax Power, United Kingdom; [3]i4 Asset Management, United Kingdom; [4]Energy Harbor, United States of America

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Keywords: Active Monitoring, Asset Performance Management, Condition Assessment, Investment Planning, Maintenance Optimization

Utilizing Asset Performance to Guide Asset Replacement and Maintenance Optimization Decisions at TVA

Jeffrey H. NELSON[1], Jay JAYARAMAN[2], Siri VARADAN[3]
[1]Tennessee Valley Authority, United States of America; [2]Hitachi Energy, United States of America; [3]Quanta Technology, United States of America

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Topics: A3 PS3 - Maintaining and Management T&D Assets
Keywords: Condition monitoring, historical failures, current transformers, tangent delta, partial discharges, laboratory research

Towards online condition assessment of oil-paper insulated current transformers: experiences from laboratory experiments

Daniël WOLDENDORP, Sjoerd NAUTA, Reinder PETERSE
Alliander N.V.

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Smart Sensor with Embedded AI Model for Automatic Detection of PD Defects in Distribution Networks

Javier ORTEGO[1], Elvis JORGE[1], J. David BIELVA[2], Antonio GONZALEZ[2]
[1]Ampacimon, Spain; [2]EDP Redes Spain, Spain

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Monitoring 245 kV instrument transformers using AI for condition assessment and operation optimization

Amaia RECALDE[1], Jone JUIZ[1], Iñigo HUERTA[1], Jesús SAEZ[1], Mikel FERNANDEZ[2], Jose Antonio EGUREN[3]
[1]Arteche Group, Spain; [2]Tecnalia, Spain; [3]i-DE (Iberdrola), Spain

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A Wireless Self-Powered and Edge Computing Sensor for Power Quality and Grid Analysis

Antonio-Miguel MUÑOZ-GÓMEZ[1], Alfonso MARECA-MIRALLES[1], Javier BALLESTÍN-FUERTES[1], José-Francisco SANZ-OSORIO[2]
[1]Circe, Spain; [2]University of Zaragoza, Spain

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A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT - Full Papers
Topics: A3 PS3 - Maintaining and Management T&D Assets
Keywords: Frequency response measurement, white noise, instrument transformers, test voltage level, frequency bandwidth, power quality

Test voltage level analysis for frequency response measurements on instrument voltage transformers

Mathieu NADEAU[1], Erik SPERLING[2], Roberto SCHULZE[3]

[1]Hydro-Québec, Canada; [2]OMICRON Energy, Switzerland; [3]OMICRON Energy, Germany

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Topics: A3 PS3 - Maintaining and Management T&D Assets
Keywords: IEC 61850, Optical Current Transformer, Low-Power Instrument Transformer, Substation Instrumentation, Faraday Effect, Process Bus Integration, Comparative Analysis, Laboratory Testing, TECO, Substation Technology

Assessment of Critical Aspects Related to Optical Current Transformer Measurements

Carlos DUTRA[1], Luan TOMINAGA[1], Vitor WOYAKEWICZ[2], Tiago MATSUO[2]
[1]Brazilian NC of CIGRE, Brazil; PowerOpticks; [2]Brazilian NC of CIGRE, Brazil; AQTech

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Keywords: Electric Stray Field, CR Divider, Voltage Divider, Accuracy, Frequency Response Behaviour, Power Quality

Investigation of the impact of external stray fields on voltage divider accuracy for 36 kV and 123 kV system voltage levels

Marcel STOECKLI[1], Erik SPERLING*[2], Roberto SCHULZE[3], Thomas HEID[4]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]OMICRON energy, Switzerland; [3]OMICRON energy, Germany; [4]CONDIS SA, Switzerland

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Keywords: power quality monitoring, transient monitoring, CR-divider, RC-divider, low-power voltage transformer

High bandwidth low-power voltage transformers for power quality measurement and fast transient monitoring in MV and HV substations - technological overview and experience from field installations

Marcel STOECKLI[1], Thomas HEID*[2], Werner SCHOEFFER[3], Dominique ROLLE[4]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]CONDIS SA, Switzerland; [3]Artemes GmbH, Austria; [4]HEIA Fribourg University of Applied Sciences, Switzerland

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Topics: A3 PS3 - Maintaining and Management T&D Assets
Keywords: Asset Performance Management System (APMS), Condition Based Maintenance Strategy, Assets Health Indiex (AHI), Risk Indices, AHI methodology, APMS roadmap, Online Monitoring Systems, Real-time DataHub, IT solution architecture, Data management

Asset Performance Management System Design for a Modern TSO

Ales HVALA[1], Andrej F. GUBINA[2], Despoina MAKRIDOU[3], Anastasios PATSIOTIS[3]
[1]Blueprint Energy Solutions, Austria; [2]IRI UL, Slovenia; [3]TSO Greece

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[1]Powerlink QLD Australia; [2]The University of Queensland, Australia

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Darío Alberto MEYER, Gino Leonel FURLANO, Fabián Edgardo LÓPEZ, Gabriel Franriq BONILLA
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[1]ENLAZA; [2]ARGO; [3]CONECTA; [4]NC CIGRE

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Risk Management Through the Implementation of Digital Twins for the Analysis of Safe Ground Clearance and Solution of Non-Compliance in High-Voltage Transmission Lines

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Current Transformer Hysteresis Modelling for Condition Assessment under standard and non-standard Operation

Dennis ALBERT[1], Nicolai SCHWARTZE[1], Lukas DOMENIG[2]
[1]OMICRON electronics; [2]Graz University of Technology

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Keywords: Maintenance, Reliability Centered Maintenance, Aged Asset, Condition Monitoring, Asset Performance Management

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Toshiaki KONO, Ryoichi SHINOHARA, Hiroaki HASHIMOTO, Li LU
Hitachi Ltd., Japan

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Ravi SAHU, Amit PATEL, Ashish MHATRE, Kapil UMAK
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Keywords: Partial Discharge

A Study on the Location Estimation of the Partial Discharge Signal using Current Transformer Sensors with Ultra-high Frequency Bandwidth in C-GIS

Sang Hyuk IM, Seung Hun OK, Jung Soo LEE, Doo Ki LEE
HD Hyundai-Electric, Korea, Republic of (South Korea)

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Online Partial Discharge Monitoring System for Gas Insulated Substation - Utility Experience

Rashmi* CHAUDHARY, B. P. SONI, Dr. A. J. CHAVDA
Gujarat Energy Transmission Corporation Ltd, India

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Keywords: GIS(Gas Insulated Switchgear), PD(Partial Discharge), UHF(Ultra High Frequency) Sensor, Signal Attenuation, 3D Modeling, FEM(Finite Element Method), Simulation

Research on UHF Sensor Signal Attenuation Simulation Method for Improvement of GIS Partial Discharge Diagnosis

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HD Hyundai Electric, Korea, Republic of (South Korea)

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Failure Investigation of Series Capacitors on Transmission Lines and Novel Technique to Mitigate the Damage During Fire on the Platform.

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POWERGRID, India

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Keywords: High Voltage, Circuit Breaker, Switching, Re-ignition, Vibration, Overvoltage, Grading Capacitor, Partial Discharge, Radio Frequency, Diagnostic.

In-service circuit breaker condition assessment

Phil MOORE[1], Keith WILLIAMS[2], Mark WALDRON[2]
[1]Elimpus Ltd UK; [2]National Grid UK

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Vitsanu PHONPHAI[1], Nicolas GADACZ[2], Charcrist KUHAKARN[1], Panupan THAKONG[1]
[1]Electricity Generating Authority of Thailand (EGAT), Thailand; [2]GE VERNOVA, France

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[1]Nirou Trans Co.; [2]Monenco Iran Consultant Engineering Co., Iran, Islamic Republic of

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Keywords: Post insulators, Disconnectors, Pollution, Online Real Time Monitoring, Diagnostics, Leakage Current, Preventive Maintenance

Real-time pollution monitoring and diagnostics of Air Insulated Switchgear oriented to predictive maintenance

Rodolfo SARACENI[1], Alberto PIGINI[2], Marco NOSILATI[1], Eros STELLA[1]
[1]GE Vernova Italy; [2]Independent Consultant Italy

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Yuantao ZHAO[1,2], Kanghong LIU[1], Mingyue LIU[2], Guojun YU[2], Fan YANG[2], Feng XIA[2], Fei LI[1], Lisheng ZHONG[1]
[1]Xi'an Jiaotong University,China; [2]Ningbo Orient Wires&Cables Co.,Ltd. ,China

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Design, manufacturing, and installation of world's first 500kV three-core XLPE insulated AC submarine cable

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Ningbo Orient Wires &Cables Co.,Ltd. ,China

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Topics: B1 PS1 - Learning from Experiences
Keywords: HVDC cable, bending stiffness, FEM, testing, mechanical

Comparison of bending stiffness modelling and measurements on HVDC cables

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[1]Prysmian Group, France; [2]Prysmian Group, Italy

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SP Group Singapore

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Keywords: DALY (disability adjusted life years) method, Installation cost reduction, Proportional risk assessments, Subsea power cable installation, Unexploded Ordnance (UXO)

A proportional approach of subsea UneXploded Ordnance (UXO)

Marijn HELSLOOT[3], Wino SNIP[1], Ira HELSLOOT[2], Anja DREWS[1]
[1]TenneT; [2]Crisislab; [3]Radboud Universiteit

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Keywords: Dynamic Cable Load – Cable Ampacity – Thermal-Measurements – Finite Differences – Thermal Modelling – XLPE – PILC – WG-B1.91

Using continuous in situ measurements to probe the diverse thermal dynamics of MVAC & HVAC power cables

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Topics: B1 PS1 - Learning from Experiences
Keywords: Power cables, combined testing, insulation, electrical tree, dynamic, mechanical strain

Development of an Electromechanical Test Technique to Grow Electrical Trees in Dynamic Power Cables

Christopher EMERSIC[1], Frances HU[1], Lujia CHEN[1], Simon ROWLAND[1], Aidan EBRAHIM[2]
[1]The University of Manchester UK; [2]ORE Catapult UK

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Analysis of Ground Penetrating Radar (GPR) technologies used in areas with high density of underground utilities for insulated cable projects

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[1]Instituto Tecnológico de la Energía (ITE), Spain; [2]Red Eléctrica, Spain; [3]Universitat Politècnica de València, Spain

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Fault location on the Spain Morocco HV Submarine Cable – Improving Fault Distance Measuring Accuracy

Ricardo GOMEZ RIVERA[1], Manfred BAWART[2], Daniel BLANCO SACEDO[1], Jose Luis FERRERES NOS[3], Ricardo REINOSO DELGADO[1], Gonzalo DONOSO CONEJO[1], Elena NOGUEROLES LAGUIA[1]
[1]Red Eléctrica, Spain; [2]BAUR GmbH, Austria; [3]MARTIN BAUR S.A, Spain

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Red Eléctrica, Spain

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Construction challenges in terms of permitting, consents, and safety issues in highly touristic places in Spain

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Red Eléctrica, Spain

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Topics: B1 PS1 - Learning from Experiences
Keywords: Distributed Temperature Sensing Real Time Thermal Rating Soil Dehydration Backfill Hot Spot

Distributed temperature sensing: detection and mitigation of observed hot spots due to soil dehydration

Daniël VREE, Vincent GEVERS, Wouter VAN DOELAND, Richard KONING
Energy Solutions

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Environmental and Technical Lessons learnt during the cable repair of a legacy cable in a watercourse

Shamaine THULASAIE
Eskom Distribution

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Topics: B1 PS1 - Learning from Experiences
Keywords: submarine, 400kv, pq, type test, accessories

Results of PQ Test and Various Type Tests for AC 400kV Submarine Cable System

Hunjin LEE
LS Cable&System, Korea, Republic of (South Korea)

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Topics: B1 PS1 - Learning from Experiences
Keywords: Floating Wind, Dynamic Power cables, Bend stiffness, Axial tension

Bend Stiffness Test For Cable Considering Tension During Installation Or Operation

Chulmin KIM[1], Jaebok LEE[1], Kwangsu CHAE[1], Yuho RHO[1], Chunsik SHIM[2]
[1]LS Cable & System Ltd; [2]Mokpo National University

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B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: High Voltage - Underground Cable – Transmission System – Distribution System - Energy Utility - Failure Statistic

Failure Statistics of High Voltage Underground Cables in Urban Areas – Experience of the Southeastern Brazilian Large City Centers

Carla DAMASCENO[1], Adilson MENEZES[2], Paulo DEUS[3], Daniel Lucas SILVA[4]
[1]Brazilian NC of CIGRE, Brazil; Consultor; [2]Light SESA; [3]Enel SP; [4]ISA-CTEEP

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Keywords: Extra High Voltage – Underground Transmission Line – Interferences – Magnetic Field – Crossings – Electromagnetic compatibility – Building Information Modelling

Challenges and solutions to implement an underground transmission line in the biggest city of Brazil

Jody FUJIHARA[1], Rogerio LAVANDOSCKI[1], Gabriela RODRIGUES[1], Julio LOPES[2]
[1]Brazilian NC of CIGRE, Brazil; ISA CTEEP; [2]INOVATEC

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Topics: B1 PS1 - Learning from Experiences
Keywords: Underground Transmission Line – Fault location – Preventive maintenance – Corrective maintenance

Learnings from a third party accident in a 220 kV underground transmission line in Colombia

Julio LOPES[1], Antonio PEDRAZA[2]
[1]Brazilian NC of CIGRE, Brazil; INOVATEC; [2]ISA

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Topics: B1 PS1 - Learning from Experiences
Keywords: High voltage, Underground Lines, Cable insulated, Two Cables per Fase

The Construction of High Voltage Underground Lines Using Two Cables Per Phase in Large Cities - Their Motivations, and Installation and Maintenance Complexities

Paulo DEUS, Eduardo LEANDRO, Artur CONFORTI
Brazilian NC of CIGRE, Brazil; ENEL

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Topics: B1 PS1 - Learning from Experiences
Keywords: cable line, insulation, partial discharges, insulation aging, reliability, residual life, overvoltage, insulating materials

Limitation of Switching Overvoltage as a Way to Provide the Reliability of Power Cable Lines

Ian KOROSTELEV[1], Rasim BABAEV[2], Anton KORZHOV[2], Mikhail DZIUBA[2], Valery SAFONOV[2]
[1]Energy+21 JSC / South Ural State University, Russian Federation; [2]South Ural State University, Russian Federation

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Topics: B1 PS1 - Learning from Experiences
Keywords: EPDM PMJ, HVDC PMJ, PMJ

Development of EPDM Insulation Material for 500kV-class HVDC PMJ

Yeonwoo JO, Jaecheol JUNG, Dongseok HONG, Hyunjoo KIM
TAIHAN Cable&Solution, Korea, Republic of (South Korea)

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Topics: B1 PS1 - Learning from Experiences
Keywords: Thermal assessment, Semi-conductive PE Sheath, HVDC, Fault Simulation

Thermal assessment of the transition joint between insulating and semiconductive inner PE sheath

Abbas LOTFI, Martin HOVDE, Allen TUNHEIM
Nexans Norway AS

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B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: Siphon underground XLPE cable system - cross-bonding - earth continuity conductor - insulation coordination

420 kV underground cable system in environment with high electrical resistivity of soil. Use of an earth continuity conductor in combination with cross bonding and consequences on insulation coordination

Jerome MATALLANA[1], Kostas VELITSIKAKIS[2], Thinus DU PLESSIS[2]
[1]Statnett, Norway; [2]TENNET The Netherlands

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Dynamic Analysis on HVDC Land Cable and Prefabricated Joint under Salt-mine Blasts

Yang ZHOU[1], Christian ANDERSSON[1], Markus SALTZER[2], Daniel PESTANA[2], Martin SPLETTSTÖSSER[3], Herbert LOBÜSCHER[3], Marc JEROENSE[4], Giampaolo MARTUFI[1]
[1]NKT Sweden; [2]NKT Germany; [3]TransnetBW Germany; [4]MJ MarCable Consulting Sweden

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Development of an extended commissioning program for temporary 220 kV cable connections

Alexander PIRKER[1], Anita MACHL[2]
[1]Verfahren Umwelt Management GmbH; [2]Austrian Power Grid AG

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The role of quality assurance in a high voltage cable market shaped by the energy transition from a grid operators' perspective

Florian AINHIRN, Andreas BOLZER
Wiener Netze

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Derivation and Application of a Sustainability Assessment System for the Installation of High and Extra-High Voltage Cables in the City of Vienna

Florian AINHIRN[1], Michael KLEIN[1], Alicia OGRYSEK[2], Lea ORTH[2]
[1]Wiener Netze; [2]Technical University Vienna

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New approaches in performing commissioning tests in HVAC on long land and inter array cable projects using Resonant Test Systems

Peter MOHAUPT[1], Marco BRAMBILLA[2], Emilio DEL RIO RUIBAL[2]
[1]Mohaupt HV; [2]Prysmian Powerlink

ID: 11188
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences

Experiences and Perspectives in the Application of the BIM Methodology to the Design and Construction Phases of Underground Transmission Lines for the "El Río" 220 kV Project

Hernan RESTREPO, Antonio PEDRAZA, Luis SARMIENTO
ISA Intercolombia

ID: 11193
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: Cable Condition Monitoring, HV Cable, Cable Termination, Cable Joint, Passive Sensing, Distributed Electrical Sensing, Sheath Current, IEC 61850-9-2, Sampled Values

Installing passive sensing for condition monitoring of a 400 kV cable

Steven BLAIR, Neil GORDON, Iain MCKEEMAN, Philip ORR, Marcus PERRY
Synaptec UK

ID: 11258
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences

Insulated Cables Statistics 2012 to 2021

Russell WHEATLAND[1], Soren MIKKELSEN[2], Francis WAITE[3], Kim ove ASKLUND[4], Peter van der WIELEN[5], Andrew WOOLES[6]
[1]Ausnet Services, Australia; [2]Energinet, Denmark; [3]Balfour Beatty, United Kingdom; [4]Hafslund Nett, Norway; [5]DNV, Netherlands; [6]TE Connectivity, New Zealand

ID: 11275
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: Natural Degradation, Pre-breakdown, Discharge Detection, Water Tree, Wet Design, XLPE, Asset Management

Assessment and asset management of aged 66 kV – 77 kV wet design XLPE cable

Shojii MASHIO[1], Kimihiro IWASAKI[2], Takeshi KAYA[3], Toshihiro TAKAHASHI[4]
[1]Sumitomo Electric Industries, Ltd., Japan; [2]TEPCO Power Grid, Incorporated, Japan; [3]Kansai Transmission and Distribution, Inc., Japan; [4]Central Research Institute of Electric Power Industry, Japan

ID: 11279
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: Optimization, Rationalization, Replacement, Y-branch joint

Challenges and Initiatives for replacement of aged SCFF or HPFF cables to XLPE cables

Hiroki YOKOTA[1], Masahiro NARITA[1], Kimihiro IWASAKI[2], Hidenori SATOU[2], Takeshi KAYA[3], Tatsuhiko SAKAMOTO[3]
[1]Furukawa Electric Co., Ltd., Japan; [2]TEPCO Power Grid, Incorporated, Japan; [3]Kansai Transmission and Distribution, Inc., Japan

ID: 11307
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: Ampacity, Cable, Harmonic, Triplen

Cable Current rating in the presence of Harmonics

Andreas CHRYSOCHOS, Konstantina BITSI, Iordanis CHALEPLIDIS, Dimitrios CHATZIPETROS, Varvara RIZOU, Vasileios KANAS
Hellenic Cables, Greece

ID: 11308
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: Cable System, Direct Cross Bonding, Insulation Coordination, Lightning, Overvoltage

Evaluation of Cable Bonding Scheme under Lightning Overvoltages in HVAC Modern Siphon Systems

Christos TRAIANOS[1], Iordanis CHALEPLIDIS[2], Andreas CHRYSOCHOS[2], Dimitrios CHATZIPETROS[2]
[1]Electrical Engineer, Greece; [2]Hellenic Cables, Greece

ID: 11311
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: FEM, Modeling, Rigid Joint, Submarine Cable.

Modeling of the Thermoelectric Performance of Offshore Power Cable Joints

Konstantina BITSI, Dimitrios CHATZIPETROS, Andreas CHRYSOCHOS, Vasileios KANAS
Hellenic Cables, Greece

ID: 11354
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: Electric field, finite element method, heat-shrink cable terminal, structural defect

Electric field analyzes in heat-shrink cable terminals depending on the assembly and defects parameters with FEM

Yunus Berat DEMIROL[1], Elif SAKALLIOGLU[1], Bora ALBOYACI[2], Mehmet Aytaç CINAR[2]
[1]Genetek Güç&Enerji, Türkiye; [2]Kocaeli University, Türkiye

ID: 11356
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences

A Machine Learning-Induced Cable Health Indexing Model for Utilities

Akshat KULKARNI*, Sanjeev KUMAR, Pratik BAJARIA, Yash KULKARNI
OrxaGrid Pvt Ltd, India

ID: 11368
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences

Improvisation in Laying & Installation of HV/EHV Power cables in extreme challenging conditions

Puneet CHAWLA, Jai KUMAR, Dileep K. SHUKLA, Vivek KAPIL, Aruna GULATI
BHEL, India

ID: 11468
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: Single Sheath Bonding-Induced Voltage-Sheath Circulating Current-Earth Continuity Conductor-Ground potential Rise

Single Sheath Bonding Method To Eliminate Earth Continuity Cable

Mohamed KHAN
Electricite De France, UAE

ID: 11568
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences

Challenge of TDR Fingerprint on Viking Link

Henrik Roland HANSEN[1], Manfred BAWART[2], Marco BRAMBILLA[3], Emilio DEL RIO RUIBAL[3]
[1]Energinet; [2]BAUR GmbH; [3]Prysmian Powerlink

ID: 11572
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences

Calculation of Magnetic Fields around Stranded 3 core cables

Thomas KVARTS, Anna Candela GAROLERA
Ørsted Wind Power a/s

ID: 11580
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences

Data-Driven Laying Condition Assessment of High Voltage Cables using Distribute Temperature Sensing - DTS

Soumya THAKUR[1], Joachim HOLBØLL[1], Joachim NIEMANN-LARSEN[2]
[1]Technical University of Denmark (DTU); [2]Energinet

ID: 11755
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: after installation test, cable breakdown, cable discharging, HVDC cable system, onsite, test system protection, wind resistance

Requirements for onsite test systems for the after-installation test of HVDC cable systems

Marcel STOECKLI[1], Michael GAMLIN*[2], Carl-Hendrik STUCKENHOLZ[2], Tobias MUELLER[2], Manuel ECKERT[2]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Haefely AG, Switzerland

ID: 11802
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: Cable monitoring, Distributed Fiber Optic Sensing, Floating offshore technologie, Operation, Maintenance

Complete power cable monitoring for floating marine energy technologies

Pierre CLEMENT[1], Gaetan CALBRIS[1], Caroline LOURIE[2], John EMEC[2]
[1]FEBUS Optics, France; [2]EMEC Ltd, UK

ID: 11827
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: Failure investigation – Failure Analysis - Power Cable - Quality Assurance - Quality Control

Approach, experiences and lessons learned from failures investigations on power cable systems

Peter VAN DER WIELEN[1], Anurag KUMAR[2], Jacco SMIT[2]
[1]DNV & TU Eindhoven; [2]TenneT TSO

ID: 11849
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: Earth continuity conductor, gallery, HV cable, theft prevention

Solutions to prevent theft of earth continuity conductor in galleries and tunnels

Alicia JANDIN, Matthieu CABAU, Mathieu GROULT
RTE, France

ID: 11885
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: Failure cause analysis, backfill, cable failures, power cable, thermal resistivity.

Root Cause Analysis in Onshore Wind Farm MV Cable: A Study Based on IEEE 1511.1 Guide

Phelipe SILVA
BAUR do Brasil

ID: 11892
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: High-voltage XLPE cable, buffer layer defect, detection method, partial discharge, distributed optical fiber.

Comparative Study on Detection Methods for Buffer Layer Defects in High-voltage XLPE Cable with Corrugated Aluminum Sheath

Yanpeng HAO[1], Yanting CHENG[1], Wanxing TIAN[1], Qishun LI[1], Haotian TAN[1], Peng ZHAO[2], Baojun HUI[3], Licheng LI[1]
[1]School of Electric Power Engineering, South China University of Technology; [2]Jiaxing Power Supply Company of State Grid Zhejiang Electric Power Co., Ltd.; [3]Electric Power Research Institute, China Southern Power Grid

ID: 11897
B1 INSULATED CABLES - Full Papers
Topics: B1 PS1 - Learning from Experiences
Keywords: High-Pressure Fluid Filled (HPFF), Cross-linked Polyethylene (XLPE), Self-Contained Fluid Filled (SCFF), Gas Insulated Substation (GIS), Cable.

Design, Qualification Testing and First Installation of a 138 kV High-Pressure Fluid Filled (HPFF) to Cross-Linked Polyethylene (XLPE) Transition Joint

Jake GELHARD
EHV Power Inc., a USi Company

PS2 - FUTURE FUNCTIONALITIES AND APPLICATIONS

ID: 10134
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications
Keywords: MVDC cables system, electrical field stabilization, proposition, qualification procedure, electrothermal stresses

Proposition of qualification procedure for MVDC cables

Amjad MOUHAIDALI[1], Raphaël GUFFOND[2], Ludovic BOYER[1], Lina RUIZ[2]
[1]SuperGrid Institute, France; [2]Nexans, France

ID: 10172
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications

Development and Experiment of Two-section Three-phase Coaxial 10 kV/1 kA HTS Cable with Three-phase Balance Design

Panpan CHEN, Jiahui ZHU, Qifan YANG, Yanfang YANG, Hongjie ZHANG
China Electric Power Research Institute, China

ID: 10328
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications
Keywords: Routing, Superconductor, Transmission, Underground

High-Temperature Superconducting Cable Systems as a Solution to Underground Transmission Line Routing in Congested Project Areas

Collin EDWARDS, Darin LAWTON
Burns & McDonnell, United States of America

ID: 10331
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications
Keywords: Underground Transmission, Submarine, Finite Element Modeling (FEM), Cable Ampacity

Developing an FEM Model of the TB880 3-Core Cable Case Study

Brian RUTHERFORD
Burns & McDonnell, United States of America

ID: 10405
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications
Keywords: Temperature, Crosslinked-polyethylene (XLPE), Qualification Testing

Thermal limit of XLPE insulation: Is 90 still the magic number?

James PILGRIM[1], Thomas ANDRITSCH[2], Paul LEWIN[2], George CALLENDER[2]
[1]Ørsted Wind Power UK; [2]University of Southampton UK

ID: 10520
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications
Keywords: HVDC, GIS, cable connection assemblies, dielectric testing, type test

Recommendations for dielectric testing of HVDC gas insulated cable connection assemblies

C.A. PLET[1], M. KOSSE[2], S. ALAPATHI[3], N. LALLOUET[4], F. JACQUIER[5], U. RIECHERT[6], T. KARMOKAR[7], F. MICHON[8], H. HE[1], H. HE[7], C. BEVERWIJK[9], D. BOA[10], M. YAGI[11], L. HOEFER[12], J. STRIDE[3], K. ZHOU[13], Marco ALBERTINI[8], Diego CISILINO[14], Guoyan SUN[15]
[1]DNV; [2]Siemens Energy; [3]Vattenfal; [4]Nexans; [5]SGI; [6]Hitachi; [7]TenneT; [8]Prysmian; [9]KEMA; [10]SSEN Transmission; [11]Furukawa; [12]Pfisterer; [13]UL; [14]Tech4Speed; [15]Brugg Cables

ID: 10577
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications
Keywords: Temporary Cable Connections, Substation Renovation, Bay Replacement, Pre-fab cable ends, GIS Metal Enclosed Cable Terminations, Cable Core Locking, plug-in/-out system, thermo-mechanical test

Testing Experience on Temporary High Voltage Cable Connection Solutions

Panos TSAKONAS[1], Corné VAN EEDEN[1], Riccardo BODEGA[1], Roy ZUIJDERDUIN[2], Jacco SMIT[2]
[1]Prysmian Group; [2]TenneT

ID: 10775
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications
Keywords: Ampacity, J-tube, Solar radiation intensity, Wind velocity

Analysis of Parameters Affecting Current Rating of Cables Installed in J-tube for Offshore Wind Farms

Ruhi RUHI[1], Tapabrata MUKHERJEE[1], Camilo APRAEZ[1], George J. ANDERS[2]
[1]Eaton Energy Automation Solutions, Canada; [2]Lodz University of Technology, Poland

ID: 10786
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications

Feasibility Assessment of Solutions for the Introduction of High-Temperature Superconducting AC Cable Lines in Megacities

Andrey KASHCHEEV, Mikhail DUBININ, Victor SYTNIKOV, Elena FILIPEVA, Dmitriy SOROKIN
ROSSETI R&D Center, Russian Federation

ID: 10817
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications

Motion Characterization of dynamic Cables with distributed acoustic Sensing obtained from Field Measurements

Simon DE RIJCKE[1], Carlos ARBOLEDA[1], Koen DE BAUW[2], Antoine VERGAERDE[2], Andrès MCKAY[3]
[1]MARLINKS, Belgium; [2]ENGIE Laborelec, Belgium; [3]OCEAN WINDS, Spain

ID: 10951
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications
Keywords: Ampacity Rating Calculation, Distributed Temperature Sensing, Finite Element Analysis, Thermal Network Model

Evaluation of Thermal Network Modelling and Finite Element Analysis for Ampacity Rating Calculation of Wind Farm Export Cable

Camilla ESPEDAL, Henrik STRAND, Espen EBERG, Henrik STRAND, Espen EBERG, Svein Magne HELLESØ, Nina Marie THOMSEN
SINTEF Energiforskning

ID: 11050
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications
Keywords: Cable Ampacity, Cable Dimensioning, Dynamic Load Curve, HVDC Export Cable, Meshed Grid

Cable Dimensioning based on Wind Predictions in an Offshore Meshed Network

Tom EGAN[1], Vasileios L. KANAS[2], Andreas I. CHRYSOCHOS[2], Nikolaos Ion BATISTATOS[2], Maryam ZADFALLAH[1], Henry ABRAMS[1], Casey FONTANA[1]
[1]Invenergy, United States of America; [2]Hellenic Cables, Greece

ID: 11080
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications

Qualification of Submarine AC Cables for 1500 m Water Depth

Lisa JOHANSSON
NKT AB, Sweden

ID: 11179
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications

Development and Validation of a Third-Party Intrusion Detection Software Based on DAS Measurement Data

Florian AINHIRN[1], Andreas BOLZER[1], Werner LIENHART[2], Lisa STRASSER[2]
[1]Wiener Netze; [2]Graz University of Technology

ID: 11329
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications
Keywords: Power cables - Ampacity calculations - Soil dryout - External thermal resistance - Dynamic cable rating

Dynamic cable rating with partial drying of the soil

Robert SPICE[1], Martin HIRD[1], Justin DIX[2]
[1]ITPEnergised UK; [2]University of Southampton UK

ID: 11426
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications

Superconducting Power Cable For 500 MVA at 110 kV in Munich - First Insights in the Test Run

Robert BACH[1], Robert PRINZ[3], Werner PRUSSEIT[4], Dag WILLÉN[2], Patrick MANSHEIM[1], Alexander ALEXSEEV[5], Wescley Tiago BATISTA DE SOUSA[6]
[1]South Westphalia University of Applied Sciences, Germany; [2]NKT Cables Group, Denmark; [3]SWM Infrastruktur GmbH & Co. KG, Germany; [4]THEVA Dünnschichttechnik GmbH, Germany; [5]Linde Kryotechnik AG, Germany; [6]Karlsruher Institut für Technik, Germany

ID: 11430
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications

Concept and development of a digital twin of a 110-kV-cable line

Robert BACH[1], Michael HOISCHEN[1], Rouven BERKEMEIER[1], Judith SCHRAMM[2], Carsten WOLFF[3]
[1]South Westphalia University pf Applied Sciences Soest, Germany; [2]Rheinische NETZGesellschaft mbH, Germany; [3]NKT GmbH & Co. KG, Germany

ID: 11454
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications
Keywords: Reliability Failures Underwater Transmission

High Reliability Zero Failures in Underground and Underwater Transmission Systems

Pablo Enrique REALPOZO DEL CASTILLO[1], Rafael Antonio RAMIREZ RIOS[1], Jose Luis GARCIA-URRESTI[1], Victor SIERRA-MADRIGAL[2]
[1]CIGRE México; [2]ECSA Energía Cables y Sistemas SA de CV México

ID: 11634
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications

New HVDC Insulation System Electrical Evaluation on Small Scale Samples and Model Cables

Marc BAILLEUL[1], Ramona HUUVA[2], Johan ANDERSSON[2], Anette JOHANSSON[2]
[1]BOREALIS N.V., Belgium; [2]BOREALIS AB, Sweden

ID: 11886
B1 INSULATED CABLES - Full Papers
Topics: B1 PS2 - Future Functionalities and Applications
Keywords: Complementarity, Offshore Wind, Offshore Floating Photovoltaics, Cable Pooling, Submarine Cable.

Harnessing solar-wind complementarity to unlock the full potential of submarine high voltage cables: a case study for the Belgian North Sea

Oscar DELBEKE, Johan DRIESEN
KU Leuven

PS3 - TOWARDS SUSTAINABILITY

ID: 10332
B1 INSULATED CABLES - Full Papers
Topics: B1 PS3 - Towards Sustainability
Keywords: Circular Economy, Crosslinked, Thermoset, Cable Materials, Sustainability

Sustainable Circular Solutions for Cables with XLPE Insulation System

Paul BRIGANDI[1], Maria MOUBARAK[2], Edit BERCZI[3], Saurav SENGUPTA[1], Alison SHAPIRO[4]
[1]Dow, United States of America; [2]Dow Deutschland, Germany; [3]Dow Europe GmbH, Switzerland; [4]University of Delaware, United States of America

ID: 10333
B1 INSULATED CABLES - Full Papers
Topics: B1 PS3 - Towards Sustainability
Keywords: Chemistry, Cure-Scorch, Sustainability, XLPE

Positive Impact of Novel XLPE on both Performance and Sustainability

Timothy PERSON[1], Roshan AARONS[2], Edit BERCZI[3], Saurav SENGUPTA[1]
[1]Dow, United States of America; [2]Dow, Germany; [3]Dow, Switzerland

ID: 10358
B1 INSULATED CABLES - Full Papers
Topics: B1 PS3 - Towards Sustainability

Design for sustainability (D4S)

Alberto BAREGGI
PRYSMAN GROUP, Italy

ID: 10622
B1 INSULATED CABLES - Full Papers
Topics: B1 PS3 - Towards Sustainability

Development of GIS Cable Termination with improved Compactness and Compatibility towards SF6 alternative Gases

Lei CHEN
NKT AB, Sweden

ID: 10724
B1 INSULATED CABLES - Full Papers
Topics: B1 PS3 - Towards Sustainability
Keywords: gas insulated lines, pressurized air cables, GIL, GIB, high voltage, medium voltage, SF6-free, operational experience, HV testing

On-site testing and 1-year operational experience for 145 kV, 2500 A pressurized air insulated cables

Marcel STOECKLI[1], Walter HOLAUS*[2], Zeljko TANASIC[2], Raphael LUETHI[2], Jasmin SMAJIC[3]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hivoduct AG, Switzerland; [3]ETH Zurich Institute of Electromagnetic Fields, Switzerland

ID: 10952
B1 INSULATED CABLES - Full Papers
Topics: B1 PS3 - Towards Sustainability
Keywords: HVDC, accessories, alternative gases, dry, termination

Towards innovative solutions to connect HVDC cables with less potential environmental impact

Espen DOEDNES[1], Nils-Bertil FRISK[1], Abdellatif Ait AMAR[2]
[1]Nexans Norway AS Norway; [2]Nexans S.A. France

ID: 11002
B1 INSULATED CABLES - Full Papers
Topics: B1 PS3 - Towards Sustainability
Keywords: High-voltage Cable Systems, HV Intelligent Solutions, Impulse Voltages, Partial Discharge Alarming, Shield Induced Voltages, Shield Currents

Enhanced HV Cable Connection Alarm System: Introducing i-LinkBox™

Sadettin ERDENİZ, Yusuf HIZAL
EM Elektrik-EMELEC Türkiye

ID: 11285
B1 INSULATED CABLES - Full Papers
Topics: B1 PS3 - Towards Sustainability
Keywords: HPFF cable, Pipe coating, Reaction force, Reduced insulation thickness, Replacement

Development of replacing method from HPFF cable to XLPE cable system sustaining old steel pipe

Yusuke MURAKAMI[1], Fumihiko TAKI[1], Kimihiro IWASAKI[1], Takuto KOBAYASHI[2], Makoto SUIZU[3], Ryu MATSUO[4]
[1]TEPCO Power Grid, Incorporated, Japan; [2]TEPCO Holdings, Incorporated, Japan; [3]Sumitomo Electric Industries, Ltd., Japan; [4]STEC, Japan

ID: 11896
B1 INSULATED CABLES - Full Papers
Topics: B1 PS3 - Towards Sustainability
Keywords: Renewable energy sources, underground cable, multiple cables per phase, cable ampacity.

Design process for the assessment of currents distribution and ampacity on high loaded 36 kV links with multiple cables per phase

Enrico DI VITO, Paolo FALESSI, Lorenzo GARZELLI, Luca GUIZZO

Terna SpA

B2 - OVERHEAD LINES

PS1 - CHALLENGES FROM RENEWABLES INTEGRATION AND INFLUENCES OF ENERGY TRANSITION ON OHL

ID: 10173
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Application of Phase-to-phase Spacers in Prevention and Control of Ice-Shedding on Compact Transmission Lines

Zenghao HUANG[1], Hao LI[1], Lingmeng FAN[1], Linjie ZHAO[1], Qi YANG[2], Hao PAN[2]
[1]China Southern Power Grid Research Institute Co., Ltd ,China; [2]Electric Power Science Research Institute of Yunnan Power Grid Co., Ltd China

ID: 10313
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: HVDC, hydrophobic surfaces, polluted insulators, IEC 60815, DC insulators

HVDC overhead line insulators: basics and performance

Jean-Marie GEORGE, Damien LEPLEY
Sediver, France

ID: 10359
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Double circuits overhead lines DC + AC: focus on EMF of the pilot project 500kV DC + 132kV AC

Andrea PIGNATA
TERNA, Italy

ID: 10360
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

The new 500 kV HVDC Italian Overhead Lines

Gabriele TRESSO
TERNA, Italy

ID: 10522
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: Overhead lines, induced currents, temporary earthing, portable earthing device, arcing

Considerations for temporary earthing in compact and heavy loaded OHL

Ebbo DE MEULEMEESTER[1], Ranjan BHUYAN[2], Dhruvi SHUKLA[1], Pragati KIDAMBI[1], Chris ENGELBRECHT[3]
[1]DNV; [2]TenneT TSO; [3]DNV / Technical University of Delft

ID: 10574
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: Overhead Lines, Uprating, HTLS conductor, Tower Reinforcement, Conductor Selection

Design Challenges and Recommendations in Uprating the Existing 380 kV Overhead Lines, The Netherlands

Tom BÖRGER[1], E. PLATENKAMP[2], Jeff BROWN[2], Renata GHENO[1]
[1]DNV; [2]TenneT TSO

ID: 10620
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Nodes-based connection system for the cost-effective assembly of tubular lattice towers

José Ramón LÓPEZ-BLANCO[1], Pablo RODRÍGUEZ-HERRERÍAS[2], Norberto IBÁN-LORENZANA[3], Antolín LORENZANA-IBÁN[4], Álvaro MAGDALENO-GONZALEZ[4], Carlos GARCÍA-BARRIOS[2]
[1]Anisopter Insightful Research, Spain; [2]Red Eléctrica, Spain; [3]CARTIF, Spain; [4]Universidad de Valladolid, Spain

ID: 10766
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: Energy transition, regional interconnections, transmission line optimization, compacting, bundle expansion, Surge Impedance Level (SIL)

500 kV Paranaíba OHL - A HSIL line with high transmission capacity: Design, construction and performance report

Luiza Lemos Nogueira MARTINS, João Batista Guimarães Ferreira DA SILVA, Ricardo ANDRADE, Ronaldo COELHO
Brazilian NC of CIGRE, Brazil; Paranaíba

ID: 10790
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: remote monitoring, power transmission capacity of OHLs, wire state

Real-time Continuous Remote Wire Condition Monitoring System for Evaluation of Overhead Line Capacity

Mikhail PANARIN, Viktor TOKAREV
ServiceEnergy Ltd, Russian Federation

ID: 10900
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Maximizing power transfer and RES integration using Dynamic Line Rating (DLR) - Ireland TSO experience

Kingsuk SAHA[1], Derek CARROLL[1], Andrew MCGRATH[2], Aidan GEOGHEGAN[1], Dag DREJER[3], Vemund LOSNEDAL[3], Aran STOKES[1]
[1]EirGrid; [2]ESB Networks; [3]Heimdall Power

ID: 10912
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

A Data-Driven Machine Learning Framework for Day-ahead Estimation of Dynamic Line Rating in Power Systems

Rohit TRIVEDI, Chittesh CHANDRAN
EirGrid

ID: 10928
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: Braced line posts, Compact lines, Composite insulators, Insulated cross-arm

Evolution, State of the Art and Future Development Trends in Composite Insulated Cross-arm Technology

Usama AHMED[1], Eric MOAL[3], Xinlong WANG[2], Yanlin LI[2], Jie YU[2], Liu CHAO[2]
[1]SHEMAR, Canada; [2]SHEMAR, China; [3]SHEMAR, France

ID: 10954
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: Dynamic line rating - Increased capacity of existing OHL – LIDAR - Sensor application - Weather data

Predicting Capacity Gains from Dynamic Line Rating prior to Sensor Deployment

Tobias AASPRONG, Gunnhild SVANDAL PRESTHUS
Statnett Norway

ID: 10957
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: Ampacity, Conductor, High temperature low sag, Transmission, Test

High temperature low sag conductors in high ice load regions

Vivendhra NAIDOO[1], Bjarni Helgi THORSTEINSSON[2], Kjell Åge HALSAN[2]
[1]EFLA Consulting Engineers Norway; [2]Statnett Norway

ID: 10977
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: Overhead line, Ampacity, DLR, Realtime, Forecast, Conductor temperature, Wind speed

Efficacy of introducing a DLR system for the operation of an overhead line connected with high power photovoltaic facilities

Tomoki KITASHIMA[1], Yves BRUSTEN[2], Daisuke SAITO[1], Brian BERRY[2], Jonathan MCGINNIS[2], Laurent GERLACHE[2]
[1]Furukawa Electric Power Systems, Co. Ltd., Japan; [2]Ampacimon S.A., Belgium

ID: 11044
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: EHV AC, Radio, Interference

Audible Noise and Radio Interference Constraints for Hybrid Conversion of Existing EHV AC Overhead Lines: Mexican and Italian Case Studies

Francesco PALONE[1], Carlos TEJADA-MARTINEZ[2]
[1]Terna SpA, Rome. Italy; [2]Instituto Politécnico Nacional (IPN), México

ID: 11132
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Noise-reducing conductors for reconductoring projects

Jeremy UNTERFINGER, Stefan STEEVENS, Saskia MÖLLENBECK, Benjamin SCHRÖDER, Steffen RIEBLING
Amprion GmbH, Germany

ID: 11141
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: Insulated cross-arms, Overhead lines, Retrofitting, Voltage uprating.

Voltage Uprating of 275 kV Overhead Transmission Lines to 400 kV with Retrofit Insulated Cross-arms (RICA)

James DEAS[1], Usama AHMED[2], Xinlong WANG[3], Yanlin LI[3], Tango Teh PT[4], Alfredo FERNANDEZ[5], Bahare HASSANPOUR[6]
[1]National Grid UK; [2]SHEMAR Canada; [3]SHEMAR China; [4]SHEMAR UK; [5]SHEMAR Spain; [6]Wood plc UK

ID: 11177
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Improved Model for Overhead Line Audible Noise Prediction

Oliver PISCHLER[1], Uwe SCHICHLER[1], Isobel GREEN[2], Azeez AJIBOLA[2]
[1]TU Graz; [2]SSEN Transmission

ID: 11192
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Sustainable Transmission Innovation with Poles, Cables, and Insulators -TRIPI-Study Case in Urabá, Colombia

Jhoinner OSORIO, Diego TAUTA
EPM

ID: 11199
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Optimization Algorithm for Transmission Line Routing with Multicriteria Constraints

Anderson VELANDIA[1], Cristian MENDOZA[1], Fernando DINIZ[2], Judy VALVERDE[1], Wallace HONORATO[2]
[1]Enlaza Grupo Energía Bogotá; [2]Argo

ID: 11422
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Wind speed measurement at the conductor for exact ampacity calculation for overhead power lines

Wolfgang FRÖB[1], Carsten BROCKMANN[2], Andreas HORETH[1], Alexandra KRAEMER[3]
[1]LTB Leitungsbau GmbH, Germany; [2]Fraunhofer-Institut für Zuverlässigkeit und Mikrointegration IZM, Germany; [3]BKW ES, Germany

ID: 11472
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

First HV DC links in KSA OHL networks, conductor design, DC loss studies, manufacturing and testing

Mohamad EL CHMOURI
RIYADH CABLES GROUP, KSA

ID: 11506
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Turning Cold Deserts of India into Solar Energy Powerhouse by Developing a Transmission system Through Snow Cladded Mountains

Karanvir Singh PUNDIR, Nitesh KUMAR, Dr. Subir SEN, Rajesh GUPTA, Abhay CHOUDHARY
Power Grid Corporation of India Limited , India

ID: 11510
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Innovative Solution & Construction Technique For Cable Termination Arrangement for Transmission Line Towers

Rahul PURI*, Nitesh Kumar SINHA, Rajesh GUPTA, Dr. Subir SEN, Abhay CHOUDHARY
Power Grid Corporation of India Limited , India

ID: 11523
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Rock bolting raft foundation of a Long span Narrow based terminal tower for Lower Subansiri Hydropower project – POWERGRID Experience

Pradeep PALANISAMY*, Neeraj Singh GAUTAM, Nitesh Kumar SINHA, Rajesh Gupta GUPTA, Dr Subir SEN, Abhay CHOUDHARY
Power Grid Corporation of India Limited India

ID: 11527
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

DESIGN CONSIDERATIONS & ROUTE SELECTION FOR WORLD's HIGHEST ALTITUDE +/-350 kV MULTIPOLE HVDC TRANSMISSION LINE

Ashish SINGH, Nikhil JHA, Chandra KANT, Anil SHARMA, Rajesh KUMAR
POWERGRID CORPORATION OF INDIA LIMITED , India

ID: 11550
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

A Study on the New Adjustment Device to Adjusting a Sagging of Wires for Overhead Lines

Heejeong YU, Kyunghun LEE, KiHyun CHO, Jongchae KIM
KEPCO, Korea, Republic of (South Korea)

ID: 11667
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Development of Design Rules for the Use of New High-Strength Steels for Lattice Towers

Jan MAESSCHALCK[1], Sofia ANTONODIMITRAKI[2], Marios-Zois BEZAS[2], Jean-François DEMONCEAU[2], Muhammad Omer ANWAAR[3]
[1]ELIA ENGINEERING, Belgium; [2]UNIVERSITY OF LIEGE, Belgium; [3]ARCELOR-MITTAL, Luxembourg

ID: 11687
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Key challenges of Design & Construction in Creek Area of 765 kV D/C Hexa Conductor Based Lakadia Vadodara Transmission Project

Chandan KALRA*, Harish KUMAR*, Prem KUMAR, Rajesh SURI
Sterlite Power Transmission Limited, India

ID: 11717
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: power system, overhead line, dynamic line rating, dynamic modeling

Dynamic modeling and analysis of a DLR System towards increasing overhead transmission Lines ampacity

Jemma MAKRYGIORGOU, Christos – Spyridon KARAVAS, Ioannis MORAITIS, Efthimia CHASSIOTI, Jun RONG
Department of Research Technology & Development, Independent Power Transmission Operator (IPTO) S.A., Athens, Greece

ID: 11724
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL

Emission-free Electric Drum Winch eST 140

Michael ERSPAMER[2], Gisela GRUBER[1], Ulrich OTTERMANN[3]
[1]Zeck GmbH, Germany; [2]Omexom Hochspannung GmbH Zeck GmbH, Germany; [3]TenneT TSO GmbH

ID: 11759
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: bundling effect, connection to grid, corridor usage, stakeholder engagement, routing, renewables, geographic information systems

Optimal routing of corridors and paths of OHL for grid connectivity and substation siting with improved stakeholder engagement

Marcel STOECKLI[1], Stefano GRASSI*[2]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]GILYTICS AG, Switzerland

ID: 11776
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: Artificial intelligence (AI), AC corona, Electric field intensity, Overhead power lines

Advanced Overhead Power Lines Electric Field and Stationary AC Corona Analysis Utilizing Artificial Intelligence

Adnan MUJEZINOVIC, Ajdin ALIHODŽIĆ, Emir TURAJLIĆ, Maja MUFTIĆ DEDOVIĆ, Zijad BAJRAMOVIĆ
University of Sarajevo - Faculty of Electrical Engineering, Bosnia and Herzegovina

ID: 11899
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS1 - Challenges from Renewables Integration and Influences of Energy Transition on OHL
Keywords: Direct Line Monitoring, Dynamic Line Rating, Error Propagation, Maximum Operating Temperature.

Navigating Uncertainties in Dynamic Line Rating Estimation

Brian LEIST, Kristine ENGEL, Josef SPALENKA, Clay WATERS, Rachael GRUDT, Nathan PINNEY, Jon MARMILLO
LineVision Inc.

PS2 - ASSET MANAGEMENT, STRATEGIES, TECHNOLOGIES AND METHODS FOR OHL

ID: 10137
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Assets management tools, OHL, modelling, wind-induced aeolian vibrations, damages

Damage in overhead lines – A tool for lifespan prediction

Julien SAID[1], Emmanuel CIEREN[2], John REFORD[2], Maxime GUEGUIN[2], Rémi CAPILLON[2], Matthieu ANCELLIN[2]
[1]RTE, France; [2]Eurobios, France

ID: 10175
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

A Forest Fire Target Detection Method Based on YOLOV8

Yuanjun ZUO, Zhihong HUANG, Yunlong SUN, Jian XIAO, Sheng WU
State Grid Hunan Electric Power Company Limtted Research Institute, China

ID: 10176
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Analysis of lightning strike distribution of typical 500 kV transmission lines based on lightning data and distributed transient traveling wave

Shanqiang GU, Yingpu XIE, Jian LI, Min WU, Mengfei LEI, Xiaoqin ZHANG
State Grid Electric Power Research Institute,China

ID: 10178
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Experimental Study on the Characteristics of Grounding Devices for Towers of Overhead Transmission Line

Bo ZHANG[1], Sen WANG[2], Shanqiang GU[3], Zhizhong LI[2], Yingpu XIE[3]
[1]Tsinghua University, China; [2]Shaanxi Electric Power Research Institute, China; [3]State Grid Electric Power Research Institute, China

ID: 10179
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Lightning Risk Assessment Method for Transmission Channel Based on EGM and Numerical Solution

Shanqiang GU, Mengfei LEI, Jian LI, Min WU, Hua REN, Yingpu XIE
Wuhan NARI Limited Company, State Grid Electric Power Research Institute, China

ID: 10314
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: overhead line cable, asset management, non-destructive testing, ACSR

Test bench and database for ACSR cable non-destructive testing

Pascale PRIEUR[1], Stéphane HEURTAULT[1], Louise EYMARDAUPHIN[1], Julien SAID[1], Jean-Philippe SAUT[2], Kieu-Diem HO[2]
[1]RTE, France; [2]EUROBIOS, France

ID: 10336
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Artificial Intelligence, Asset Management, Object Detection, Transmission Line Inspection

AI-Enabled Transmission Line Inspections

Zefan TANG, Jing YANG, Junhui ZHAO, Elizabeth HALL, Asim FAZLAGIC
Eversource Energy, United States of America

ID: 10490
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Risk-based after-service Inspections and Testing of overhead Line Composite and Porcelain Insulators for residual Life Assessment

Igor GUTMAN[1], Johan LUNDENGÅRD[1], Matthew HEATH[2], Charles KURNIAWAN[2]
[1]Independent Insulation Group Sweden AB; [2]Transgrid Australia

ID: 10500
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Resilience, Decision Support, Wildfires, Natural Risks, Infrastructure, Protection, Simulation

Decision Support Center with Muti-sensory Data for Infrastructure Protection

João GASPAR[1], Luís Mário RIBEIRO[2], José MOREIRA[1], Carlos VIEGAS[2], Pedro MARQUES[1], David ALMEIDA[2]
[1]REN - Redes Energéticas Nacionais, SGPS, S.A.; [2]Univ Coimbra, ADAI, Department of Mechanical Engineering

ID: 10501
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Polymeric insulators, Condition assessment

Defect Analysis of Polymeric High Voltage Insulators: Condition Assessment and Inspection Techniques

André COELHO[1], Gonçalo PINTADO[2], Pedro NUNES[1], Rui MARTINS[1]
[1]EDP Labelec, Portugal; [2]REN, Portugal

ID: 10502
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Electromagnetic interference, gas pipelines, transmission line

On the assessment of electromagnetic interference of overhead lines and underground cables on gas pipelines

Andreia LEIRIA, João TARQUÍNIO, António ESTEVES
EDP Labelec, Portugal

ID: 10618
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Use of insulating towers in high voltage transmission lines: effect of grounding elimination on lightning performance

Iván HIGUERO-TORRES[1], Carlos GARCÍA-BARRIOS[2], Alexandra BURGOS-MELGUIZO[2], Paulino APARICIO-CILLÁN[2], Pedro LLOVERA-SEGOVIA[1,3], Vicente FUSTER-ROIG[1,3]
[1]Instituto Tecnológico de la Energía, Spain; [2]Red Eléctrica, Spain; [3]Universitat Politècnica de València, Spain

ID: 10621
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Integrated system for work at height safety management

Pablo RODRÍGUEZ[1], Carlos RODRÍGUEZ[2], Guillermo GONZÁLEZ[3], Javier VALDÉS[4], Abel SANCHO[4], Jesús MARTÍN[5], Alejandro SICILIA[5]
[1]Red Eléctrica, Spain; [2]Elewit, Spain; [3]Redeia, Spain; [4]AOS, Spain; [5]Amplia, Spain

ID: 10705
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Experience with Satellite Imagery for Maintenance of OHL Lines

Emanuel DE BOE[1], Görg Philip MAXIMILIAN[2], William VAN DEN BROECK[1], Irid BUFI[2]
[1]ELIA, Belgium; [2]50 hertz, Germany

ID: 10735
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Composite Insulator, Acid Resistance of Silicone Rubber, Hydrophobic Retention, Hydrophobicity Recovery, Hydrophobicity Transfer, Contact Angle

Influence of Acid Attack on the Hydrophobicity of HTV Silicone Rubber on Composite Insulators

Marcel STOECKLI[1], Jaka STRUMBELJ*[2], Yannick INDERBITZIN[2], Urs GASSER[2], Christine BAER[3]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Pfisterer Switzerland AG, Switzerland; [3]Wacker Chemie AG, Germany

ID: 10736
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Audible Noise Mitigation, Corona Discharges, Enlargement of Conductor Diameter, Surface Treatment, Calculation of Audible Noise Emission

Combined Effects of Audible Noise Mitigation Measures for OHLs by Surface Treatments and Enlargement of Conductor Diameter

Marcel STOECKLI[1], Hannah KIRCHNER*[2], Christian FRANCK[2], Benjamin SCHROEDER[3]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]ETH Zurich, Switzerland; [3]Amprion GmbH, Germany

ID: 10768
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Nanosatellites, Monitoring, Overhead Lines, Wildfire, Artificial Intelligence, NDVI and Images

Monitoring Overhead Lines through images from nanosatellites

Carlos NASCIMENTO[1], Thiago MUNIZ[2], Demetrio AGUIAR[2], Valter SILVA[1], Guilherme BRANGIONI[1], Lucas SOUZA[1]
[1]Brazilian NC of CIGRE, Brazil; Cemig GT; [2]Cemig D

ID: 10778
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Corrosion, Atmospheric pollution, Transmission lines, Galvanized carbon steel, Atmospheric corrosion, Artificial Salt Spray, Electrochemical tests

Atmospheric weathering and corrosion, in a tropical country such as Brazil, in the maintenance costs of metallic materials in power transmission lines

Fernando DINIZ[1], Euro PINTO DE ALMEIDA[2], Thiago Luiz FERREIRA[1], Alberto RODRIGUES DE SOUSA[1], Camila PACHER[3], Julia Stefany ALBRECHT[3], Mariana BRAGANÇA[3], Kleber PORTELLA[3], Juliano DE ANDRADE[3], Bruno KOWALCZUK[3], Mauricio MAZUR[3]
[1]Brazilian NC of CIGRE, Brazil; ARGO; [2]Consultor; [3]LACTEC

ID: 10921
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Hyperspectral Imaging for the Corrosion Detection on Metallic Lattice Towers

Frédéric MANGIALETTO[1], Irid BUFI[2], Mohring WENCKE[2], Eveline VRANKEN[1], Roeland VANDEBRIEL[3], Michiel VLAMINCK[3], Zakaria BNOULKACEM[3], Mina ZAHIRI[3], Gonzalo LUZARD[3], Hiep LUONG[3]
[1]ELIA, Belgium; [2]50Hz, Germany; [3]Imec, Belgium

ID: 10973
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Full-scale test, Slim type tower, Tower in Tower, Wind tunnel experiments

Development of the design and construction method for newly constructing a slim tower inside an existing 275 kV tower

Hayato SANO, Motoyuki YAMAZAKI, Yoshiyuki SAITO, Tomoaki OSONO, Keito MURAKAMI, Tomonori SHIRAISHI
TEPCO Power Grid, Japan

ID: 10979
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: CFRP, maintenance technology, reliability, existing tower, flat bar

Development of steel tower reinforcement method using flat bar and steel tower repair method using carbon fiber

Hiromitsu IJICHI, Keito MURAKAMI, Keigo TANAKA, Tomoaki OSONO, Motoyuki YAMAZAKI, Tomonori SHIRAISHI
TEPCO Power Grid, Inc., Japan

ID: 10980
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Anomaly detection, Automated inspection, Drones, Machine learning

Development of automated inspection technology for overhead transmission lines using drones

Fumihiko KONDO[1], Yuki MARUME[1], Takaya MASUDA[2], Masahiro OGAWA[2], Kentaro FUKAMI[2], Erika TANAKA[2]
[1]Chubu Electric Power Grid Co., Inc., Japan; [2]SENSYN ROBOTICS, Inc., Japan

ID: 10981
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Audible noise, Inspection robot, Partial discharge

Field Experience and Maintenance Assessment of RTV Coated Cap and Pin Insulators in Japan

Ryo YUZAWA[1], Asuka TOKURIKI[1], Motohiro MAEDA[2], Toshiyuki NAKACHI[2]
[1]Chubu Electric Power Grid Co., Inc., Japan; [2]NGK Insulators, Ltd., Japan

ID: 10986
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Composite insulator, Spacer, Polymer, Electrical breakdown, Aging

Mechanism Clarification of Insulating Performance Decreasing by Aging of Polymer Insulators for Overhead Transmission Lines

Teruhisa TATSUOKA[1], Toshihiro TSUBOI[1], Hiromitsu IJICHI[2], Tatsuya ISHIKAWA[2], Sakae TANIGUCHI[2], Tomonori SHIRAISHI[2]
[1]Tokyo Electric Power Company Holdings, Inc., Japan; [2]TEPCO Power Grid, Inc., Japan

ID: 11007
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: asset health index, mechanical stresses, temperature influence, tower, vibration

Asset Health Index for Towers and Conductors in the Framework of EU Project FARCROSS

Viktor LOVRENCIC[1], Nenad GUBELJAK[2], Bálint NÉMETH[3], Matej KOVAČ[4], Levente RACZ[5], Ana LOVRENCIC[6]
[1]C&G Ljubljana, Slovenia; [2]Faculty of Mechanical Engineering, Maribor, Slovenia; [3]BME Budapest, Hungary; [4]GRIDPULSE Ljubljana, Slovenia; [5]BME Budapest, Hungary; [6]C&G Ljubljana, Slovenia

ID: 11082
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Case study for refurbishment of 33kV line with surge arresters on the earth wire

Anne WILLIAMS
Aurecon, Australia

ID: 11108
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Impact of Bushfire on Conductor Performance - Prioritising Rectification Works

Matthew HEATH[1], Charles KURNIAWAN[1], Brendan SHANAHAN[1], Tim MACPHERSON[2], Denis DOWLING[2]
[1]Transgrid, Australia; [2]Raedyne Systems, Australia

ID: 11160
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Wind induced acoustic emissions on glass insulators

Carina LINTNER[1], Oskar OBERZAUCHER[1], Michael LEONHARDSBERGER[1], Fabien VIRLOGEUX[2]
[1]Austrian Power Grid AG; [2]Sediver S.A.S.

ID: 11194
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Incorporation of New Technologies (drones) in the Maintenance and Monitoring of the Condition of High-Voltage Transmission Lines in ISA-INTERCOLOMBIA

Natalia RESTREPO, Carlos PUELLO, Juan PEÑA
ISA Intercolombia

ID: 11230
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Drones, innovative methods, asset reliability, technological advances

The use of drones for preventive maintenance of high voltage transmission lines: business case and field experiences

Samuel A. ASTO[1], Daiana A. DA SILVA[2], Alejandra M. LUNA[1]
[1]ISA REP; [2]Military Engineering Institute, Brazil

ID: 11314
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Risk Management – Storm - Resilience - High Voltage – Overhead Line – Protection Zone – Dynamic Model – Network Performance - Optimisation

Towards a Digital Twin for Management of OHL Risk

Ailidh MEEK[1], Matthew JONES[1], Alexandra CAMPBELL[1], Iain DIVERS[1], Taco ENGELAR[2], Mark LEEMAN[2]
[1]SP Energy Networks UK; [2]Neara UK

ID: 11353
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: DLR, overhead line, sensor, neural network, distributed monitoring

Power System Management based on Distributed Line Monitoring

Levente RÁCZ, Dávid SZABÓ, Gábor GÖCSEI, Bálint NÉMETH
Budapest University of Technology and Economics

ID: 11357
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Live-line maintenance, accident analysis, work safety, overhead line, personal protective equipment

Analysis of Live Work Accidents in Transmission Lines and Recommendations to Improve Working Safety

Dávid SZABÓ[1], Dániel BALOGH[1], Bálint NÉMETH[1], Eduardo RAMIREZ-BETTONI[2]
[1]Budapest University of Technology and Economics; [2]Xcel Energy

ID: 11471
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Assessment of Operating Life of Silicone Rubber HV Insulator Coatings in Harsh Desert Environment

Raouf ZNAIDI[1], Ahmad ALTHAGAFI[2]
[1]GCC Interconnection Authority, KSA; [2]GCC Interconnection Authority, KSA

ID: 11504
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Use Of Convolutional Neural Network For Defect Identification From Tower Images And Unsupervised Machine Learning Algorithms For Transmission Line Vulnerability Estimation

Neeraj JOSHI*, Sukdev MONDAL, Neelanjana JAIN, B.C. JHA, Virendra KUMAR, Harsh PAREEK, Sandeep Ramesh BANKAR, VMS Prakash YERUBANDI*, Vinay K CHOWDHARY, Alok RAJ, Vijay Prakash PURI, M S HEJIB, Dharambir KUMAR, Vibhay KUMAR, R K I TYAG
POWERGRID CORPORATION OF INDIA LIMITED, India

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B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Comprehensive Rectification Methodology for Submerged Pile Foundation of Overhead Transmission Line Towers

Pankaj Kumar DWIVEDI, Nitesh Kumar SINHA, Rajesh GUPTA, Dr. Subir SEN, Abhay CHOUDHARY
Power Grid Corporation of India Limited, India

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Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Transforming Transmission Line Surveys: An Innovative AI-Based Optimization Approach

Neeraj Singh GAUTAM*, Priti NAHAR, Rajesh GUPTA, Dr. Subir SEN, Abhay Chaudhary CHAUDHARY
Power Grid Corporation of India Limited, India

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B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Residual Life Estimation of Overhead Transmission Lines based on Asset Health Indexing

Devaprasad PAUL*, Joseph George JOSE, Deo Nath JHA, Kuleshwar SAHU
POWERGRID, India

ID: 11630
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Implementation of AHI for risk-based asset management approach on overhead lines and the strategic value towards transmission grid

Franziska GEBHARDT, Roman SIMKIN, Andre DECKWERTH, Dirk KUNZE
50 Hertz Transmission GmbH, Germany

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B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL

Use of Gantries as Medium-Term Support to Ensure Continuity of Service for OHL After Severe Structural Damage in an Impact Incident

Jan MAESSCHALCK[1], Kris NUYTS[2]
[1]ELIA ENGINEERING, Belgium; [2]SARENS, Belgium

ID: 11710
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: UAVs, OHL Inspection, Fault Detection, Machine Learning, Drones, Artificial Intelligence

The Innovative Project “ALTITUDE” - Automatic aerial Network inspection using Drones and Machine Learning

Georgios CHATZARGYROS[1], Vasiliki KOTOULA[1], Evangelia RIGATI[1], Dimitrios STIMONIARIS[2], Dimitrios TSIAMITROS[2], Apostolos PAPAKONSTANTINOU[3], Argyrios MOUSTAKAS[3], Dimitrios SIMOS[3], Georgios LOUKOS[4], Sotirios CHRISTOPOULOS[4], Georgios DOUKAKIS[4], Konstantinos MARIOLIS[4], Konstantinos KAOUSIAS[4]
[1]Renel I.K.E, Greece; [2]INNORA, Greece; [3]SciDrones, Greece; [4]Hellenic Electricity Distribution Network Operator (HEDNO), Greece

ID: 11898
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: Overhead lines, Aeolian vibration, Wind estimation, Amplitude profile, Fretting fatigue.

Probabilistic Assessment of the Residual Life of Overhead Conductors Under Aeolian Vibrations

Shaoqi YANG[1], Luc CHOUINARD[1], Sébastien LANGLOIS[2], Pierre VAN DYKE[3], Josée PARADIS[3]
[1]McGill University; [2]Université de Sherbrooke; [3]Institut de recherche d'Hydro-Québec

ID: 11906
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: HTLS conductor, Overhead transmission lines, Composite core, Monitoring, Non-Destructive Testing (NDT).

Dielectric testing for integrity assessment of overhead composite core conductors

Léo RICHARD
Epsilon Composite Cable

ID: 11908
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS2 - Asset Management, Strategies, Technologies and Methods for OHL
Keywords: corona discharge, audible noise emission, water droplet, overhead line, negative halfwave.

Investigation of audible noise emissions from corona discharges of single water droplets on different surfaces under AC stress

Yang LU, Christian FRANCK
ETH Zurich

PS3 - IMPACTS FROM CLIMATE CHANGE ON OHL

ID: 10183
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL

Analysis of ice shedding induced faults of multiple voltage levels overhead lines and its mitigation strategies

Kunpeng JI, Bin LIU, Jialun YANG
China Electric Power Research Institute, China

ID: 10184
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL

Design and experimental analysis of arrester for ± 800kV UHVDC OHL

Wei CAO[1,2], Shanqiang GU[1,2], Jian LI[1,2], Shuai WAN[1,2], Jian WANG[3]
[1]Wuhan NARI Limited Company, China; [2]State Grid Electric Power Research Institute, China; [3]State Grid Corporation of China, China

ID: 10185
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL

Development of Galloping Distribution Maps for Overhead Transmission Lines with Specific Return Period in China

Jialun YANG, Bin LIU, Bin ZHAO, Yi LIU, Zhiyuan LU
China Electric Power Research Institute,China

ID: 10186
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL

Potential Wildfire-induced Tripping Section Assessment of Transmission Line Based on Tree Identification and Flame Combustion

Linmeng FAN[1,2], You ZHOU[3], Enze ZHOU[1,4], Lei WANG[1,4]
[1]Electric Power Research Institute,China; [2]Southern Power Grid Co., Ltd.,China; [3]Changsha University of Science and Technology,China; [4]Guangdong Power Grid Co., Ltd.,China

ID: 10307
B2 OVERHEAD LINES - Full Papers

Topics: B2 PS3 - Impacts from Climate Change on OHL
Keywords: IRMA, Numerical model, Hurricane integration, methodology, OHL design rules

Hurricane IRMA feedback in the French West Indies

Pierrick PRIGENT, Jean MARTINON
EDF, France

ID: 10327
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL
Keywords: Covered Conductor, Overhead Line, Wildfire, Distribution, Insulator

Testing the Effectiveness of Covered Conductors for Wildfire Mitigation

Ben GEORGIN[1], Matt BOWERS[1], Alex HUDGINS[1], Hunly CHY[2], Arianne LUY[2]
[1]Exponent, Inc., United States of America; [2]SCE Company, United States of America

ID: 10608
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL
Keywords: Solar absorptivity, Ampacity, Energy transit, Non-contact probe, Live-line measurement, ACSR conductor, Robotic, Non-planar surface

A Novel Probe for Non-Contact, In-Situ Assessment of Solar Absorptivity: The Special Case of ACSR Conductors

Jonathan BELLEMARE, Ghislain LAMBERT, Sébastien LEPROHON, Marion NOURRY, Vincent Q. GUAY, Pierre-Luc RICHARD, Nicolas POULIOT
Hydro-Québec, Canada

ID: 10884
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL
Keywords: meteorological calculations and ice and wind load modeling, dynamic modeling of mechanical loads on OHL towers

Multiphysics OHL modeling

Aleksandar TERZIĆ, Nebojša PETROVIĆ
Elektromreža Srbije JSC, Serbia

ID: 10982
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL
Keywords: Atmospheric Corrosion Monitor, Artificial snow accretion test, Field monitoring, Insulator, Snow accretion

Packed Snow Accretion on Overhead Transmission Line Insulators - Field Monitoring and Snow Conductivity Measurement using Atmospheric Corrosion Monitor -

Manabu SAKATA[1], Yusaku SATO[1], Hiroki MIZOE[2], Masayoshi MASUDA[2], Ryota ICHIKAWA[3]
[1]Nippon Katan Ltd., Japan; [2]Tohoku Electric Power Co., Inc., Japan; [3]Tohoku Electric Power Network Co., Inc., Japan

ID: 10983
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL
Keywords: Auxiliary Member, Semi-Diamond Structure, Snow Accumulation

Design and verification of countermeasure against snow accumulation on transmission towers

Kento FUJII[1], Katsuyuki ENDO[1], Akihiro WATANABE[1], Koichi MINAGAWA[2], Isamu HIROTA[2]
[1]Tohoku Electric Power Network Co., Inc., Japan; [2]TOMOE Corporation, Japan

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B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL

GIS database for overhead lines resilience to extreme ice events

Anne WILLIAMS[1], Matthew HEATH[2], Charles KURNIAWAN[2]
[1]Aurecon, Australia; [2]Transgrid, Australia

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B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL

Data analysis and technical description of the ice monitoring system at Austrian Power Grid

Oskar OBERZAUCHER[1], Carina LINTNER[1], Conner GARCIA[1], Tommy MYRVIK[2]

[1]Austrian Power Grid AG; [2]Heimdall Power

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B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL

Investigation of the future development of temperature and low wind velocity in climate change for the Austrian power grid

Kerstin WEINDL[1], Klemens REICH[1], Hans RESSL[2], Theresa SCHELLANDER-GORGAS[2], Max NUTZ[2]
[1]Austrian Power Grid; [2]Geosphere Austria

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B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL

Satellite Images as a Tool for Risk Management in Transmission Lines: Results of a Pilot with Emphasis on Landslides

Alexander BEDOYA, Mallory SUAREZ
ISA Intercolombia

ID: 11223
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL
Keywords: transmission tower, grounding, impedance, design, improvement

Influence of transient impedance due to atmospheric discharges in the design of grounding of transmission towers

Hugo Eduardo BARREDA SÁNCHEZ
Redinter - Redeia

ID: 11507
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL

Measures to mitigate effect of cyclone on the transmission line structures

Karanvir Singh PUNDIR*, Nitesh Kumar SINHA, Rajesh GUPTA, Dr. Subir SEN, Abhay Choudhary CHOUDHARY
Power Grid Corporation of India Limited , India

ID: 11635
B2 OVERHEAD LINES - Full Papers
Topics: B2 PS3 - Impacts from Climate Change on OHL

Climate change and its associated materials requirements

Franziska GEBHARDT[1], Wencke MOHRING[1], Jan KNACKMUß[1], Dirk KUNZE[1], Milad MEHDIANPOUR[2], Jan MAESSCHALCK[3]
[1]50 Hertz Transmission GmbH, Germany; [2]IPU Ingenieurgesellschaft Berlin mbH, Germany; [3]Elia Engineering, Belgium

B3 - SUBSTATIONS AND ELECTRICAL INSTALLATIONS

PS1 - CHALLENGES AND NEW SOLUTIONS IN T&D SUBSTATION DESIGN AND CONSTRUCTION FOR ENERGY TRANSITION

ID: 10322
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition
Keywords: Distribution of Electricity, Environmentally Conscious Design, Electrical Enclosure, Technology, Substation

Next Generation Distribution Center in a Box (DCIAB)

Kushal SINGH, Jose MITRA, Sean FITZGERALD
Exelon/ComEd, United States of America

ID: 10337
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition
Keywords: Small Modular Reactor, Electrolyzer, Hydrogen, Nuclear, Substation

Small Modular Reactor and Hydrogen Production: "Impacts on Substation Design"

George W. BECKER
POWER Engineers, Inc., United States of America

ID: 10338
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition
Keywords: USA West Coast, Offshore Substation (OSS), Floating Offshore Substation (FOSS), Finite Element Analysis (FEA), Wave Basin Model Test

Conceptual Design of Semi-submersible Floating Offshore HVAC Substation Solution

Hongbiao SONG[1], Zhaoxiang TANG[5], Yang OUYANG[3], Robert LUESCHER[3], Tobias STIRL[4], Hana ASSEFA[2]
[1]GE Vernova Grid Solutions, United States of America; [2]GE Vernova Grid Solutions, Norway; [3]GE Vernova Grid Solutions, Switzerland; [4]GE Vernova Grid Solutions, Germany; [5]Genesis Technip Energies, United States of America

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition

The 36 kV voltage level – a new standard solution for grid integration of renewable energy sources

Andrea VALANT
TERNA, Italy

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition
Keywords: Floating Offshore Substation, FOSS, GIS, Simulation, Vibrations, Experimental Correlation

GIS for offshore and floating applications

Marcel STOECKLI[1], Yang OUYANG*[2], Lukas TREIER[2], Bernhard SPICHIGER[2], Robert LUESCHER[2], Hongbiao SONG[3]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]GE Vernova, Switzerland; [3]GE Vernova, USA

ID: 10738
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition
Keywords: High voltage switchgear, SF6 alternatives, disconnector, earthing switch, C4-FN, LCA

420 kV SF6-free High Voltage Gas Insulated Switchgear Design, Type Tests and Product Footprint

Marcel STOECKLI[1], Vincent TILLIETTE*[2], Navid MAHDIZADEH[2], Ueli STRAUMANN[2], Patrick STOLLER[2], Denis TEHLAR[2], Kalpesh CHAUHAN[3]
[1]ELECTROSUISSE / CIGRE Switzerland NC Secretary; [2]Hitachi Energy Ltd, Switzerland; [3]Hitachi Energy Ltd, India

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition
Keywords: Energy Transition, BESS, Grid Code Compliance, Grid Impact

First Step toward Carbon Neutrality using BESS Project in South Africa

Jung Bae KIM, Minsoo LEE
Hyosung Heavy Industries

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition

The role of increased standardisation in the delivery of substation infrastructure to enable a low carbon future in Ireland

Hugh CUNNINGHAM, Ivan CODD, Enda HARRINGTON, Brendan LINEHAN, Bernard O'SULLIVAN, Colm TWOMEY
Electricity Supply Board (Ireland)

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition

Experience with HVDC GIS application during commissioning and early operation phase

Maria KOSSE[1], Christoph KLEIN[1], Maximilian TUCZEK[2], Frank Rene RICHTER[3], Thomas GÖTZ[1]
[1]Siemens Energy Global GmbH & CO. KG, Germany; [2]TenneT TSO GmbH, Germany; [3]50Hertz Transmission GmbH, Germany

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition

New test and commissioning tools and concepts for Low Power Instrument Transformers

Franz GATZE[2], Peter MENKE[1], Patrick MORITZ[1], Federico CANAS[2], Max BUROW[1], Joerg BLUMSCHEIN[2], Antoni Furlani ROSA[3], Lucas VARELA[3], Thomas NEUMEIER[2]
[1]Siemens Energy, Germany; [2]Siemens AG, Germany; [3]SecuControl, Brazil

ID: 11147
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition
Keywords: Floating, HVAC, HVDC, Offshore Wind, Primary Equipment, Substations

Offshore floating HVAC and HVDC substations – Experiences in design of selected primary equipment

Douglas RAMSAY[1], Mark GEARY[1], Thomas HAMMER[2], Thorsten STEINHOFF[2], Matthias STEUER[2], Stephan VOSS[2], Joerg HAFERMAAS[2], Yana SHATEROVA[2]
[1]Corio Generation UK; [2]Siemens Energy Germany

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition

Optimization of overall HV cable length in hybrid transmission technologies used for evacuation of power from off-shore wind parks/Solar parks by implementation of compact transition station.

BB MUKHERJEE, Sasikiran KANDALAM*, PNV Murali PRAKASH
Power Grid Corp. of India Ltd., India

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Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition

EV Changing Infrastructure Design Challenges And Solutions – Case Study

Nilesh KANE, Ravindra BHANAGE*, Ajay POTDAR
TATA POWER, India

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition

Challenges And Precautions During Design And Engineering Of Gas Insulated Switchgear (GIS) Substation Of Hydro Projects

Gorav VIG *, Sudhir KUMAR, Dileep SHUKLA, Vivek KAPIL, Aruna GULATI
BHEL, India

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Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition

Novel Solution for Converting Existing 400kV I-Type One & a Half Breaker Scheme to D-Type for Evacuating Double Circuit Lines in Same Direction Using 3D Modelling

Nishant SINGH*, Vinay Anand ANAND, Sanjeev SHRIVASTAVA, Aruna GULATI
BHEL, India

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition

Optimization Approach for the Layout design of 400/220kV Gas insulated Switchgear (GIS) Substations

Akhilesh KUMAR*, Aruna GULATI, Vivek KAPIL, Dileep K SHUKLA, Puneet CHAWLA
BHEL, India

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition

Development of DC 320kV, 525kV GIS Cable terminations

Eui-hwan JUNG, Jin-ho NAM, Sung-yun KIM, Si-ho SON, Jung-nyun KIM
LS Cable&system, Republic of (South Korea)

ID: 11816
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS1 - Challenges and New Solutions in T&D Substation Design and Construction for Energy Transition
Keywords: Substation, Station Service Voltage Transformer, SSVT, Auxiliary Power Supply, Electrical Installation

Design and Considerations for Station Service Voltage Transformer (SSVT) to Provide Low-Voltage Supply in EGAT's Substation

Koranee PHONGKHUMPHAI, Nabhat CHAIYAPHAN, Thanyathep NANTACHAI, Korrakot WONGNIYOM, Pornpimon SAWADDEEMONGKON
Electricity Generating Authority of Thailand (EGAT), Thailand

PS2 - RETURN ON OPERATIONAL EXPERIENCES FOR SUBSTATION MANAGEMENT

ID: 10139
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Capacitive Voltage Transformers, power plant substation, diagnosis

In situ monitoring of the precision shift of capacitive voltage transformers

Bernard PAYA[1], Alain JEANMAIRE[1], Benoît BRUCHON[2]
[1]EDF R&D, France; [2]EDF CIST-INGEUM, France

ID: 10141
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Asset management, load capacity, temperature monitoring, wireless sensors

Solutions for temporarily increasing the Reliable Installation Capacity

François GEGOT[1], Lars EBBERS[2], Robert VOSSE[3]
[1]Wika, France; [2]Qirion, Netherlands; [3]Alliander, Netherlands

ID: 10309
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: SF6 Alternatives, AIS circuit breakers, AC transmission network, HV main technologies, Operation and maintenance

Integration, Operation and Maintenance of AIS Circuit Breakers using SF6 alternatives - experience with the 3 HV main technologies

Emmanuel LOPES[1], Minh NGUYEN[2], Benoit BRUCHON[1], Fabrice MARETTE[1]
[1]EDF, France; [2]RTE, France

ID: 10339
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Flexible Conductor Dynamics, Transformer Bushing, Parametric Resonance, Damping, Mode Shapes

Seismic Resilience of Interconnected Substation Equipment: Lessons Learned from a Comprehensive Test and Modelling Program

Leon KEMPNER. JR.[1], M.V. SIVASELVAN[2]
[1]Bonneville Power Administration, United States of America; [2]University at Buffalo, United States of America

ID: 10340
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Risk, Condition, Assessment, Plans

Condition & Risk Assessment: Plans and Reality

Tony MCGRAIL[1], Philip BOREHAM[1], Jamie BEARDSALL[4], Mark ROWBOTTOM[4], Reena DHIR[2], Carl JOHNSTONE[3]
[1]Doble Engineering, United States of America; [2]Manitoba Hydro, Canada; [3]i4 Asset Management, United Kingdom; [4]Drax Power, United Kingdom

ID: 10341
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Automation, Inspection, Robots, Specifications, Substation

System Approach to Evaluation and Deployment of Substation Robotics

Poorvi PATEL[1], Dean GORDON[2], Sergo SAGARELI[3], Dexter LEWIS[1], Sunny BELLARY[1]
[1]Electric Power Research Institute (EPRI), United States of America; [2]Con Edison, United States of America; [3]Black & Veatch, United States of America

ID: 10342
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Substation Security, Substation Manmade Threats, Substation Environmental Threats, Substation Threat Mitigation Tactics

Evaluating and Comparing Substation Threat Mitigation Tactics: Substation Improvements for a More Resilient Power Grid

Paul SOMBOONYANON[1], Connor BOWEN[2]
[1]AEC Lionstech, United States of America; [2]Burns & McDonnell, United States of America

ID: 10343
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Substation Digital Transformation, Substation Digitalization, Substation Advanced Technologies

Overcoming Challenges and Progressing Electrical Substations toward Digital Transformation

Paul SOMBOONYANON[1], Brian PALMER[2]
[1]AEC Lionstech, United States of America; [2]Burns & McDonnell, United Kingdom

ID: 10582
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management

Monitoring System of Earth Loop Impedance to Verify Step and Touch Voltages

José R. VIDAL[2], Abderrahim KHAMLICHI[2,1], Antonio GONZALEZ[3], José L. NAVARRO[4], Pascual SIMÓN[2], Fernando GARNACHO[1]
[1]Universidad Politécnica de Madrid, Spain; [2]FFII-LCOE, Spain; [3]EDP REDES ESPAÑA, Spain; [4]UFD-GRUPO NATURGY, Spain

ID: 10684
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Asset management, asset reliability, risk management, portfolio management, decision making, power transformer, substation

European Experience of Developing from Asset Reliability Information to Risk Method for Optimal Investment on Substation Assets

Jos SLANGEN[1], Qikai ZHUANG[2], Branislav PILAT[3], Despoina MAKRIDOU[4], Ilic VLADIMIR[5], Jan CERNOHORSKY[6], Phillipe CLAUDE[7], Mehdi OTHMANI[7], Uros KERIN[8]
[1]TenneT TSO B.V.; [2]TenneT TSO GmbH; [3]SEPS; [4]IPTO; [5]EMS; [6]CEPS; [7]Rte; [8]ELES

ID: 10716
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Spare Parts; Mean Time To Repair; Inventory; Optimization; Stock-out; Critical Spares; Critical Assets

A system risk approach for management and optimization of critical spare parts

Marcel STOECKLI[1], Enrico CONTE*[2], Sourav ADHYA[3], Sakthivel DURAIAPPAN[4]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy, Switzerland; [3]Hitachi Energy, Poland; [4]Hitachi Energy, India

ID: 10739
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Operational Availability, HV GIS, MRE Code, Service Continuity Guide, Service Continuity, Maintenance, Repair, Extension

New Standards and Solutions for Service Continuity of HV GIS

Marcel STOECKLI[1], Jens HETTLER*[2], Mark KUSCHEL[3], Samuel PACHLATKO[4]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Swissgrid AG, Switzerland; [3]Siemens Energy AG, Germany; [4]Hitachi Energy AG, Switzerland

ID: 10740
B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: SF6 Alternatives, Gas-Insulated Switchgear, GIS, Gas-Insulated Line, GIL transmission, C4-FN fluoronitrile, gas handling, health and safety, retrofill, sealing material, installed base

Retrofill for 420 kV Gas-Insulated Lines: Technical Concept and Return of Experience

Marcel STOECKLI[1], Samuel PACHLATKO*[2], Michael GATZSCHE[2], Freddy VON ARX[2], Manuel NAEF[2], Francesco AGOSTINI[2], Mark WALDRON[3]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy, Switzerland; [3]National Grid Electricity Transmission, United Kingdom

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Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Service Continuity Concept (SCC), Maintenance, Repair and Extension (MRE), gas-insulated switchgear (GIS), buffer gas compartments, work on partitions, Asset Life Cycle (ALC)

Implementation of the new IEC and CIGRE requirements on service continuity to high voltage gas insulated switchgears

Marcel STOECKLI[1], Samuel PACHLATKO*[2], Denis TEHLAR[2], Josef HANSON[3], Jennifer-RuiQiong PAN[4], Benoit GODEAU[5], Thomas WIJNHOVEN[5], Nicolas DEMARTHE[5]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy, Switzerland; [3]Hitachi Energy, Germany; [4]Hitachi Energy, China; [5]Elia, Belgium

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Keywords: Substation; Power Generation; GEOBIM; Reality Capture; GIS; Point Cloud; Digital Twin; BIM

Case Studies - GEOBIM Substation and Power Generation Reality Capture for Digital Twin purposes

Ana MAROTTI[1], Gerson LIMA[2], Daniel FERNANDES[3], Rodrigo AGUIAR[4], Lucas HOLANDA[5], Juliano Calazans MARQUES[6], Sergio SILVEIRA[7]
[1]Brazilian NC of CIGRE, Brazil; Eletrobras FURNAS; [2]Computer Graphics Works; [3]Eletrobras ELETRONORTE; [4]Energia BIM; [5]Eletrobras CHESF; [6]Eletrobras CGT ELETROSUL; [7]Imagem

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Electric power substation; circuit breaker; online monitoring; integrated to the Asset Registry, Operating System and Geographic Information System (GIS); intelligent analysis; Artificial Intelligence; Digital Twins; BIM

Digital twins applied for intelligent analysis and real-time monitoring of circuit breakers in electrical power substations

Ana MAROTTI[1], Giovani BERNARDES[2], Sergio SILVEIRA[3], Clayton DUARTE PESSOA[1], Gerson F. M. LIMA[4], Clodualdo SOUSA[2], Fabiano VILLANI[3]
[1]Brazilian NC of CIGRE, Brazil; Eletrobras FURNAS; [2]UNIFEI; [3]Imagem Geosistemas; [4]Computer Graphics Works

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New Competencies and diagnostic Methods needed for the Application of Composite Insulators in Substations

Peter SIDENVALL
Independent Insulation Group Sweden AB, Sweden

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The Impact of Digital Transformation on the Asset Management System

Dmitry VODENNIKOV[1], Yulia ZHILKINA[1], Svetlana ZAKIROVA[2]
[1]PJSC ROSSETI, Russian Federation; [2]S&T Centre of Rosseti FGC UES, Russian Federation

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: SF6-free GIS, fluoro-nitrile, IEC 61850, LPIT, interoperability, condition monitoring, partial discharge

Experiences with commissioning of a 132 kV GIS SF6-free digital substation

Karl POLLESTAD[1], Jean-Luc RAYON[2], Christopher GEBS[4], Hans Kristian MEYER[3], Asgeir MJELVE[4], Alban LUCIOL[2], Jean-François MIRONNEAU[2], Assan SARR[2]
[1]Bane NOR Norway; [2]GE Renewable Energy France; [3]SINTEF Energy Research Norway; [4]Elvia Norway

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Commissioning and operational experience with the first switchgear of its kind to integrate digital and greenhouse gas-free components for power transmission

Marcel ENGEL[2], Peter MENKE[1], Mark KUSCHEL[1], Fred OECHSLE[2], Julian SPRINGER[2], Grzegorz POLICHT[2], Tim FRITSCH[3], Jakob SIEMAYR[4]
[1]Siemens Energy, Germany; [2]Netze BW GmbH, Germany; [3]Siemens AG, Germany; [4]OMICRON electronics GmbH

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Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Outdoor, GIS, Environment, Long-term, Reliability, Lifecycle, Design, O&M, Economic, Extension

Impact on Engineering and Lifetime Management of High Voltage Outdoor GIS

Toshiyuki SAIDA[1], Keisuke NAKAMURA[2], Tobias ZIESEMER[3], Jens KALLWEIT[4], Manuel NAEF[5], George BECKER[6]
[1]Toshiba Energy Systems & Solutions Co., Japan; [2]TEPCO Power Grid, Inc., Japan; [3]Siemens Energy Global GmbH & Co. KG, Germany; [4]GE Grid Solutions, Germany; [5]Hitachi Energy, Switzerland; [6]POWER Engineers, Inc., USA

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Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Automatic diagnosis, Control and operating current, Hydraulic pump current, Monitoring system

Management experience of condition-monitoring system and development of new IoT devices

Yuki YATABE, Shinya AICH, Takayuki KANAMORI, Tetsuya IKEDA, Yusuke TAKENAKA
Chubu Electric Power Grid Co., Inc., Japan

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Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: SF6 gas, Leakage, Management, Repair

Management of SF6 gas leakage and repair technology in gas insulated equipment

Keisuke NAKAMURA, Keisuke MURAKITA, Shigeyuki TSUKAO, Wataru ISHIKAWA, Harukazu AKIYAMA, Syuichi TAMURA
TEPCO Power Grid, Inc., Japan

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Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Advanced Maintenance, Aging Equipment, Asset Management, Diagnosis of Deterioration

Study on Advanced Maintenance Strategies and Asset Management for Substation Equipment in Japan

Kiyohiro TSUBOI[1], Shinya AICHI[1], Satoshi ICHIHARA[2], Kosho KAMATANI[2], Ryosuke ITOTANI[3], Koki SADAHIRO[3]
[1]Chubu Electric Power Grid Co., Inc., Japan; [2]TEPCO Power Grid, Inc., Japan; [3]Kansai Transmission & Distribution, Inc., Japan

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: SF6 alternative equipment, Synthetic air insulation, Natural ester oil transformer, Deregulation, Fire extinguishing equipment, Remote maintenance, Sensor, Monitoring camera

Sustainable improvement on substation resilience and reliability by using eco-friendly equipment and remote maintenance systems

Ryosuke ITOTANI[1], Koki SADAHIRO[1], Masashi TOKAI[3], Hiroyuki HAMA[2], Kazuki SUGINO[2], Manabu TAKEDA[3]
[1]Kansai Transmission and Distribution, Inc., Japan; [2]Mitsubishi Electric Corporation, Japan; [3]DAIHEN Corporation, Japan

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Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Condition monitoring, IEC61850, IED

Verification of Substation Condition Monitoring by Linking IEDs with Existing Substation Equipment

Hiroko ISAJI, Yousuke OGURA, Masanobu YOSHIDA
Chubu Electric Power Co., Inc., Japan

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Retrofit GIS Service Solution for extended Lifetime Maintenance

Philip BENGTSSON
Hitachi Energy Sweden AB, Sweden

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Operational experience with dynamic current rating of busbar systems in 220-kV-substations

Ralf PUFFER[1], Richard WEISSNAR[2], Klemens REICH[2], Anita MACHL[2]
[1]RWTH Aachen University; [2]Austrian Power Grid AG

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SF6 Insulated Substations: Challenges and Lessons Learned for Improving ISA Group Operational Reliability and Sustainability.

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ISA Interconexión Eléctrica

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Sustainable Urban Electrical Substations: an Integral View for a Sustainable Transformation of the Energy Sector

Andrés LONDOÑO, Diego TAUTA, Juan SIERRA
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Methodology for the Condition Analysis of High Voltage Capacitor Banks (Proposal and application case)

Gerardo GUERRA[1], Fabian ROJAS[1], Edgar TORRES[1], Carlos VARGAS[2], José MORATAYA[2]
[1]Enlaza Grupo Energía Bogotá; [2]Conecta

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: C4-FN, Gas handling, gas quality, SF6 alternative, asset management, service life, gas analysis

Return of experience on gas handling with C4-FN mixtures for high-voltage equipment

Matthew BARNETT[1], Ewan SCOTT[1], Manuel NAEF[2], Michael GATZSCHE[2], Maxime PERRET[3], Fabrice MORAND[4], Peter PILZECKER[5], Martin GOPPEL[5], Frederic LORAY[6], Chrystelle BASSET[6], Roland KURTE[7], Lars BLANZ[7], Neil GWINNUTT[8]
[1]SSEN Transmission UK; [2]Hitachi Energy Switzerland; [3]GE Vernova Switzerland; [4]GE Vernova France; [5]DILO Germany; [6]Air Liquide France; [7]WIKA Germany; [8]EMT United Kingdom

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS - Full Papers
Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Heptafluoro-iso-butyronitrile (C3F7CN; C4F7N; (CF3)2-CF-CN), sulfur hexafluoride (SF6), gas-insulated switchgear (GIS), partial discharge (PD)

Sensitivity Study and Operational PD Monitoring Experiences of SF6-free GIS

Constantinos ONOUFRIOU[1], Lujia CHEN[1], Malcolm SELTZER-GRANT[2]
[1]The University of Manchester UK; [2]Monitra, Manchester UK

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Autonomous Inspection Robots for use in HVDC Converter Halls

Georg FRÜBING[1], David INGRAM[3], Jörg HAFERMAAS[4], Mark VAES[2]
[1]50Hertz Transmission GmbH, Germany; [2]Elia System Operator S.A., Belgium; [3]Ross Robotics Ltd, United Kingdom, Great Britain; [4]Siemens Energy Global GmbH & Co. KG, Germany

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Compact photoacoustic sensor system for the continuous monitoring of SO2 and SF6 percentage in gas-insulated switchgears

Roland KURTE[1], Christian WEBER[2], Daniel STAIGER[1], Johannes KAPP[2], Michael MANN[3], Carlo LEIDECKER[3], Daniel FUCHS[1]
[1]WIKA Alexander Wiegand SE & Co. KG, Germany; [2]Fraunhofer IPM, Germany; [3]TH Aschaffenburg, Germany

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Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Assessment, Key Performance Indicator (KPI), Operation & Maintenance (O&M), Personal Protective Equipment (PPE), Remote Racking Device (RRD), Safety Management System (SMS), Safe electrical arc flash standard (SEAFS)

Continuous Improvement of Arc Flash Assessment for Work Place Safety

Md Abid KHAN, Rashid ALMISFER
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Development of Asset Risk Mapping to Support Asset Management Decision Making in an Integrated Electricity Utility

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Challenges And Lessons Learnt Through Failure Experience And Initiatives To Strengthen Resilience Of The Gas Insulated Switchgear

Mayank RANA*, Pankaj Kumar JHA, M.S. HADA, Sandeep YADAV
POWER GRID CORPORATION OF INDIA LIMITED, India

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Controlled Switching Of Coupled Power Transformers Based On Residual Flux Estimation Including State Of Art Digital Monitoring Technique – Field Experiences

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Hitachi Energy India Limited, India

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Design Philosophy of Extension bays for EHV Gas Insulated Switchgear

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Challenges Of Managing Assets: Initiatives To Strengthen Resilience, Reliability And Security, Best Practice And End-Of-Life Management Considering Sustainability Aspects.

Anoop Kumar SINGH, M A Naveen NAVEEN, Anirban Bhattacharyya BHATTACHARYYA
POWERGRID, India

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Service Continuity Criteria for Gas Insulated Switchgear (GIS) - Utility Experience in Green Field and Brown Field GIS Substations

Rashmi CHAUDHARY *, B P SONI
Gujarat Energy Transmission Corporation Ltd, India

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Gas Insulated Substation (GIS) Overhaul Prioritizing Index Calculation a Case Study East Java and Bali Population

Wisnu F PRADITAMA, Nur Fajar FARDIANSYAH, Muftakhul EFENDI, Fermi TRAFIANTO
PT. PLN (Persero), Indonesia

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Digital Technology Breakthrough Experience in Increasing Grid Operational Efficiency and Productivity

Abdul Halim BAHARUDIN, Sugumar SHUNMUGAM, Zainizam MOHAMED
Tenaga Nasional Berhad, Malaysia

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Spearheading Asean Utility Role in Sustaining Green Environment by Intensifying Effort to Reduce SF6 Leakage in GIS Equipment – User Experience Sharing

Abdul Halim BAHARUDIN[1], Suthep SINGHARERG[2]
[1]Tenaga Nasional Berhad, Malaysia; [2]Electricity Generation of Thailand

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Topics: B3 PS2 - Return on Operational Experiences for Substation Management
Keywords: Substation, Power Transformer, Distribution, Hazard

Amesbury #5 Substation Emergency Power Transformer Relocation

Carli GAVIN
National Grid, United States of America

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Keywords: Substation equipment fault, Lightning protection design, Resilience, Investigation for interpolar flashover, Multiple direct lightning strikes.

Substation Design Improvement Considering Actual Accident Due to Direct Multiple Lightnings

Keisuke MURAKITA
TEPCO Power Grid, Inc.

B4 - DC SYSTEMS AND POWER ELECTRONICS

PS1 - DC EQUIPMENT AND SYSTEMS

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: HVDC transmission topologies, large offshore wind power connection, solutions, technology, renewable energy

Technical-economic analysis of different HVDC transmission topologies for large offshore wind power connection

Tanh VU-CONG, Marco SCHUDEL, William BELE, Guillaume MEYER
RTE, France

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: DC/DC converter, DC voltage control, Modular multilevel converter, Multi- terminal DC grid

EMT simulation of an MTDC system integrating Modular Multilevel DC/DC converter with DC voltage control

Ghazala SHAFIQUE[1,2], Frédéric COLAS[1,2], François GRUSON[1,2], Xavier GUILLAUD[1,3]
[1]L2EP, France; [2]Arts et Metiers, France; [3]Centrale Lille Institute, France

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Topics: B4 PS1 - DC Equipment and Systems
Keywords: DC harmonics, EMT study, HVDC-LCC

Study and mitigation of DC harmonics on Corsica's SACOI HVDC-LCC station causing long unavailability, a case study.

Yannick VERNAY[1], Jordann BRIONNE[2], Julien MICHEL[1]
[1]RTE, France; [2]EDF, France

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Topics: B4 PS1 - DC Equipment and Systems
Keywords: DC breakers, HVDC protection, interoperability, protection components sizing

A contribution to HVDC protection interoperability through components sizing

Myriam RATAJCZYK[1,2,3,4,5], Bertrand RAISON[2,3,4,5], Alberto BERTINATO[1], Pascal TORWELLE[1]
[1]SuperGrid Institute, France; [2]University Grenoble Alpes, France; [3]CNRS, France; [4]Grenoble INP, France; [5]G2Elab, France

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Advancement in HVDC Technology: Exploring Controllable Current Source Converters Utilizing Reverse Blocking IGCTs

Guangfu TANG[1], Xiaoguang WEI[1], Longlong CHEN[2], Taosha JIANG[1], Anyou DONG[1]
[1]Beijing Huairou Laboratory,China; [2]State Grid Smart Grid Research Institute Co., Ltd., China

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Development and Engineering Application of Controllable-Line-Commutated Converter

Zhiyuan HE[1], Chong GAO[1], Kunpeng ZHA[2], Jun YANG[1], Guangfu TANG[3], Dongshan HE[1]
[1]State Grid Smart Grid Research Institute, China; [2]C-EPRI Electric Power Engineering Co., Ltd. , China; [3]Beijing Huairou Laboratory, China

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Key Techniques and Engineering Applications of ± 500kV High Voltage and Large Capacity DC grid Based on Voltage Source Converter with 100% New Energy connected

Jin ZHANG[1], Ming LI[2], Jie LIU[1], Zheng ZHAO[2], Tan LI[2], Qichen CHEN[2]
[1]State Grid Corporation of China, China; [2]State grid economic and technological research Institute Co.,Ltd , China

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Key Technology of Baihetan-Jiangsu ±800kV Hybrid Cascaded UHVDC Transmission Project

Jing ZHOU, Jiapei ZHOU, Dong LIU
State Grid Smart Grid Research Institute Co., Ltd, Beijing, China

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Research and application of new technology and equipment for Baihetan-Jiangsu ±800 kV UHVDC project

Kunpeng ZHA, Fan ZHANG, Yuefeng YANG, Fuyue WEN, Xiaolin ZHANG, Ting ZHAN
C-EPRI Electric Power Engineering Co., Ltd. , China

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The world's first series-connected multi-terminal LCC UHVDC transmission -- System studies for the Jinshang-Hubei ±800 kV project

Ying XU[1], Ying PU[1], Zijian GAO[1], Ling WANG[1], Yajun LU[1], Weiran CAO[2], Andersson MATS[2], Ying YE[2], Xun WANG[2]
[1]State Grid Economic and Technological Research Institute Co.,Ltd. (SPERI),China; [2]Hitachi Energy,China

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Topics: B4 PS1 - DC Equipment and Systems
Keywords: HVDC Upgrade, Refurbishment/Replacement, VSC Converter Technology, Expandable Symmetric Monopole, Project Staging

A Staged Approach for Upgrade of the Square Butte HVDC System

Christian WINTER[1], Peter SCHOMMER[1], Joanne HU[2], Bruno BISEWSKI[2]
[1]Minnesota Power, United States of America; [2]RBJ Engineering, Canada

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Topics: B4 PS1 - DC Equipment and Systems

Innovative Design of a Reduced Scale Prototype for the New Multiterminal Italian HVDC Network with SiC-based HVDC Hybrid Circuit Breaker

Pierluigi VACANTE
TERNA, Italy

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Topics: B4 PS1 - DC Equipment and Systems
Keywords: SIL, Simulation, HVDC, Control, Protection, Black-Box

Software-In-the-Loop Real-Time Simulation of a HVDC Terminal

Carl BARKER[1], Emmanuel AMANKWAH[1], Omar JASIM[1], Samek ELIMBAN[2], Stella ZHANG[2], Hui DING[2], Yuan CHEN[2], Paul FORSYTH[2]
[1]GE Vernova UK; [2]RTDS Technologies Inc.Canada

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: HVDC, harmonics performance, harmonic stability, frequency domain simulations

Application of Harmonic Loci-Based Control Design in Frequency and Time Domain for a Consistent Design of VSC HVDC Harmonic Active Solutions

Omar JASIM, Jose A R MONTEIRO, Nagasesha REDDY
GE Vernova UK

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Successful Test Method for primary Faults on a VSC-HVDC overhead Line

Martin PETTERSSON
Svenska kraftnät, Sweden

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Verification of Performance for VSC-HVDC with a DC primary Fault Test

Martin PETTERSSON
Svenska kraftnät, Sweden

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Topics: B4 PS1 - DC Equipment and Systems
Keywords: HVDC, offshore, planning, modularity, hubs

Modular offshore HVDC transmission planning principles

Cornelis PLET[1], Maksym SEMENYUK[1], Hans CLEIJNE[1], Michel DUBBELBOER[2]
[1]DNV; [2]TenneT

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: Bipole, Power Electronics Module, Offshore Interconnections, VSC-HVDC, Wind Farms, MultiTerminal Direct Current (MTDC)

±525 kV 2 GW Bipole VSC-HVDC Offshore Transmission (TenneT Projects) - Key Design Aspects

Ashish BANGAR[1], Amit KUMAR[2], Francisco CHACON[2], Nadew Adisu BELDA[1], Yogesh GUPTA[2], Olivier RUITON[2]
[1]TenneT; [2]GE Vernova

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LCC UHVDC System Improvements, with a novel Converter Transformer Configuration

Mats ANDERSSON
Hitachi Energy Sweden AB, Sweden

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Topics: B4 PS1 - DC Equipment and Systems
Keywords: HVDC, IT, System, Replacement, Cybersecurity, Extension, HMI

Two Approaches to HVDC IT System Replacement

Colin MADSEN[1], Michael PARADIS[1], Tong SHU[1], Lee HARROP[2], Lydia SMITH[2]
[1]ATCO Electric, Canada; [2]Transpower, New Zealand

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Keywords: Overload, Cable, Design, Maintenance

Labrador Island Link Overload Design Considerations

James NUGENT, Tyler THOMPSON
Newfoundland and Labrador Hydro, Canada

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: Back-to-back, black-start, HVDC, islanded operation, operational flexibility, reactive power, substation design, system resiliency, transmission assets end-of-life, transmission system planning, voltage source converter (VSC), voltage stability, water m

Hydro-Québec's Chateauguay Back-to-Back HVDC Converter Replacement Project: Integration of New Operating Modes for System Resiliency Improvement and Water Management Effectiveness using VSC Technology

Amr ABDELLAOUI, Vito DE LUCA, Marie-Jacinthe HEMSAS
Hydro-Québec, Canada

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Topics: B4 PS1 - DC Equipment and Systems
Keywords: Survey, Reliability, HVDC Systems, LCC, VSC

Survey of the Reliability of HVDC Systems Throughout the World During 2021-2022

P.V.I. TAIAROL
Advisory Group AG-04, Study Committee B4, Canada

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Topics: B4 PS1 - DC Equipment and Systems
Keywords: HVDC, Analysis System, Operational Reliability, Proactive Diagnostics

Development and Application of HVDC Analysis System for Improving Operational Reliability

Woojin CHO[1], Insoo PARK[1], Seonho LEE[2], Olivier CLEMENCON[1]
[1]KAPES, Korea, Republic of (South Korea); [2]KEPCO, Korea, Republic of (South Korea)

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: Power Oscillation Damping Control, Hybrid Simulation

The experience of the Power Oscillation Damping Study based on the hybrid simulation method for the Bukdangjin 2nd project in South Korea

Hyunjae YOO[1], Kumar MANOJ[2], Panyoung SUNG[1], Hyunkeun KU[3], Olivier CLEMENCON[1]
[1]KAPES, Korea, Republic of (South Korea); [2]GE Grid Solution, UK; [3]KEPCO, Korea, Republic of (South Korea)

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: 800 kV - DC Link - Multi-infeed - VRG – Regional - Interconnection – EMT - Modelling

A HVDC 800 kV link, enlarging regional interconnection, to increase the utilization of variable renewable generation

Dourival CARVALHO, Rodrigo CABRAL, Tiago RIZZOTTO, Fabiano SCHMIDT, Thais TEIXEIRA
Brazilian NC of CIGRE, Brazil; EPE

ID: 10773
B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: Crustal Conductance – Geology – Geophysics – Grounding - HVDC Ground Electrodes

Crustal Conductance - an Index for the Estimate of the Minimum Electrode Size and Electrode - Converter Substation Distance

Paulo Edmundo da Fonseca FREIRE
Brazilian NC of CIGRE, Brazil; PAIOL Engenharia

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Topics: B4 PS1 - DC Equipment and Systems

Analysis of Power Oscillation Damping Performance in Grid-forming VSC HVDC System

Jae-hyuk KIM[1], Hyung-seung KIM[1], Hyun-jun KIM[2], Jun-chol LEE[1], Hong-ju JUNG[1]
[1]Hyosung, Korea, Republic of (South Korea); [2]Hyosung Heavy Industries, Korea, Republic of (South Korea)

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: DC TOV SCC, EMT study, HVDC-VSC.

Generic EMT study circuit and TOV for the design of a DC link.

El-Mehdi KARMANI, Julien POUGET, Pierre RAULT, Marco SCHUDEL
RTE, France

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems

The Greenlink Interconnector - A new 504 MW HVDC Interconnector

Jonathan RUDDY[1], Katrin RASCHKE[2], Ernest NKUSI[2], Vincent FOO[3], Katherine HAROLD[4]
[1]Greenlink; [2]Siemens Energy; [3]Sumitomo Electric Industries; [4]WSP

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: HVDC – LCC - MIND cable degradation/failures - cable polarity reversals

Measures to secure long lifetime of an LCC based HVDC link with a potentially aged cable

Magne MEISINGSET[1], Jon Ivar JUVIK[2], Kees KOREMAN[3], Thinus DU PLESSIS[4]
[1]Statnett SF Norway; [2]Statnett SF Norway; [3]Tennet The Netherlands; [4]Tennet The Netherlands

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: Aging, Asset management, C&P (Control and protection) system, Multivendor, Thyristor module, Update

Refurbishment of the control and protection system devices and thyristor valve modules in the 300 MW Shin-Shinano No.2 Frequency Converter

Masanori TAKECHI[1], Masahito KANEKO[1], Shigenori KAKUNO[1], Taihei SATO[2], Takahiko KIKUI[3]
[1]TEPCO Power Grid, Inc., Japan; [2]Toshiba Energy Systems & Solutions Corporation, Japan; [3]Hitachi,Ltd, Japan

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: Vyborg HVDC Back-to-Back Link, Control and Protection System, System Test, Reconstruction, Valve Equipment

Refurbishment and System Test of High Voltage Converter Unit 3 (HVCU3) at Vyborg Back-to-Back HVDC Link

Natalya LOZINOVA[1], Sergey KATANTSEV[2], Olga SUSLOVA[1], Evgeniy ZMAZNOV[1]
[1]JSC «NIIPT», Russian Federation; [2]PJSC ROSSETI, Russian Federation

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A classification framework for HVDC-based transmission grid architectures

Sarah ANHAUS[1], Patrick DÜLLMANN[1], Lars OSTERKAMP[1], Robert DIMITROVSKI[2], Paul MCNAMARA[3], Juan-Carlos GONZALEZ[4]
[1]RWTH Aachen University, Germany; [2]TenneT TSO GmbH, Germany; [3]EPRI Europe, Ireland; [4]Super Grid Institute, France

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Switching Voltage Capability of Air-Core Dry-Type VSC Converter Reactors

Klaus POINTNER, Wolfgang BIERBAUMER, Taneli MONNI
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Advanced Maintenance Recommendation for HVDC and FACTS Air-core Drytype Reactors

Bernhard FRÖHLICH, Alexander GAUN, Christian GRUBERBAUER
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Topics: B4 PS1 - DC Equipment and Systems

Overvoltages experienced by Metallic Return Cables in Bipolar HVDC Configuration

Max GOERTZ[1], Simon WENIG[1], Daniel BARTH[1], Simon BECKLER[2]
[1]Mosaic Grid Solutions GmbH, Germany; [2]TransnetBW, Germany

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Topics: B4 PS1 - DC Equipment and Systems

Sunrise Wind: USA's first HVDC connected offshore wind farm

Lorenzo ZENI[1], Gustavo F. GONTIJO[1], Peter MCGARLEY[1], Lennart SCHUETZE[2], Alejandro B. SALAS[2], Stefan HANSEN[3], Ahmed SOLIMAN[3]
[1]Ørsted; [2]Siemens Energy; [3]Siemens Gamesa Renewable Energy

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DC/DC Conversation and Distributed Grid based Solution of HVDC Tapping

Qi ZHANG[1], Filipe Faria SILVA[1], Roni IRNAWAN[2], Rian FATAH[2]
[1]Aalborg University; [2]Gadjah Mada University

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: Capacitor, Fire, LCC, VESDA, Valve Hall

HVDC Valve Hall Fire Incident: A Case Study at GCCIA Al Fadhili HVDC

Abdullah ALGHAMDI[1], Jayakumar MUTHUSAMY[2], Ranjith PANIGRAHI[3]
[1]GCCIA, KSA; [2]GCCIA, KSA; [3]GCCIA, KSA

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems

Dynamic Performance of Dual HVDC Terminals (±800 KV LCC and ±320 KV VSC) at the same busbar- Operational Expérience

Narendra KUMAR*, Puneet TYAGI, S. BHATTACHARYA, V. DIWAKAR, P. RAVI
POWERGRID, India

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Challenges, Design Considerations & Field Studies for Relocation of Earth Electrode Station- User's Perspective

Narendra KUMAR*[1], Aditya B. CHANDRAN[1], Dr. Puneet TYAGI[1], S. BHATTACHARYA[1], Dr. Subir SEN[1], Rohidas MASKE[2], Sandeep KALANTRI[2], Abhay CHOUDHARY[1]
[1]POWERGRID, India; [2]MSETCL, India

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Operational Experience on the Black-Start Exercise of VSC Based HVDC Systems in Southern Regional Grid of India

Arthi Sahaya Rones V*, Nikhitha C J, T Muthu KUMAR, T SRINIVAS, S P KUMAR
Grid-India, India

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Addressing Operational Contingencies Faced in Parallel Operation of ±800 kV 6000 MW Champa Kurukshetra HVDC Link.

Anoop KUMAR*, Keshav GUPTA, Gopesh Kumar JHAJHARIA, Vishnu Parkash SRIVASTAVA
POWERGRID, India

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Evolving of protection strategies for DMR Faults in the ±800 kV 6000 MW Champa Kurukshetra HVDC Link.

Anoop KUMAR*, Gopesh Kumar JHAJHARIA, Vishnu Parkash SRIVASTAVA
POWERGRID, India

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: Derisk, HVDC, Stability analysis, MIIF

A Novel Methodology to Derisk HVDC and Offshore Wind Connections to A Network

Xiao-Ping ZHANG[1], Shuailong DAI[1], Chengyi WU[1], David LI[1], Dechao KONG[2], Xiaoyao ZHOU[2]
[1]University of Birmingham UK; [2]NG ESO

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: HVDC circuit breakers, VSC, type tests, fully assembled, multi-terminal grids.

Test procedures for ± 500 kV HVDC circuit breakers: how to assess their performances based on current world laboratory facilities

Sino PATTI[1], Massimo MARZINOTTO[1], Giuseppe PELLICCIONE[1], Roy NIJMAN[2], Shankar SUBRAMANY[2], Roberta ALUNNI[3]
[1]Terna S.p.A; [2]KEMA Labs; [3]CESI S.p.A

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: Grid-forming, Virtual Synchronous Machine, MMC, STATCOM, VSC.

Optimal Control Selection for Grid-Forming MMC-Based Assets: An analysis of interplay between GFM and internal MMC controls

Eros AVDIAJ, Jef BEERTEN
KU Leuven ESAT/ELECTA & EnergyVille

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS1 - DC Equipment and Systems
Keywords: Large-scale, New energy, LCC-HVDC, VSC-HVDC, Ultra-long-distance.

Integrated Design Scheme of VSC-HVDC System for 10GW Large-Scale New Energy Ultra-long-distance Transmission

Qingming XIN, Junjie FENG, Zhiyong YUAN, Xiaobin ZHAO, Chuang FU, Ting HOU, Biyue HUANG, Yuebin ZHOU, Changyue ZOU
State Key Laboratory of HVDC, Electric Power Research Institute of China Southern Power Grid, Guangzhou 510663, China

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220kV Direct-connected Static Synchronous Series Compensation and the First Demonstration Application in China

Yuhong WANG, Kunpeng ZHA, Xiong ZHAN, Gang ZHAO, Yuefeng YANG, Lanfang LI, Jialin ZHANG
C-EPRI Electric Power Engineering Co., Ltd , China

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Design of Hybrid Active AC filter Scheme in MinYue back-to-back DC Project

Weimin MA[1], Yiming YANG[1], Fangjie WU[1], Ling WANG[1], Yiming JI[1], Yiran CHANG[2], Xiujuan ZHANG[3]
[1]State Grid Economic & Technological Research Institute , China; [2]RONGXIN HUIKO Electric Co., LTD , China; [3]Sieyuan Qingneng Electric & Electronics Co. Ltd. China

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Key Technologies and Engineering Application of Distributed Power Flow Controller

Yizhe LIN, Lei PAN, Qiang ZOU, Yunlong DONG
NR Electric CO., LTD , China

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Stability enhancement of weak Grids with high penetration of Renewables with grid-Forming STATCOM/Enhanced-STATCOM

Rasool HEYDARI
Hitachi Energy Sweden AB, Sweden

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Health Monitoring Approaches for high Voltage Capacitors in Power Converters

Riddhi GHOSH
Hitachi Energy Sweden AB, Sweden

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS2 - FACTS and Power Electronics
Keywords: Large STATCOM units, SSO detection and mitigation, common control and coordination of STATCOM units, series compensation

Application of Large STATCOMs for Dynamic Reactive Power Support in California 500kV Series Compensated Transmission System

Joanne HU[1], Eric STAUFFER[2], Stefan SCHILLING[3], Bruno BISEWSKI[1], John RANDOLPH[2], Felix NABEIN[3]
[1]RBJ Engineering, Canada; [2]LS Power, USA; [3]Siemens Energy, Germany

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Topics: B4 PS2 - FACTS and Power Electronics

Transformer-coupled Static Synchronous Series Compensators for transmission and distribution operators, based on industrial-class converters

Markel ZUBIAGA[1], Javier CHIVITE[2], Pedro IZURZA[1], David SANTOS[2], Javier CAÑAS[1]
[1]Ingeteam Research Institute, Spain; [2]Ingeteam P. Technology, Spain

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS2 - FACTS and Power Electronics
Keywords: Control, Efficiency, Loss reduction, Power-electronic converter

Experimental validation of the General Power Theory using Power Hardware-inthe-Loop - Opportunities for New Converter Controls

Pitambar JANKEE[1], Trevor GAUNT[1], Zhiwang FENG[2], Graeme BURT[2]
[1]University of Cape Town South Africa; [2]University of Strathclyde United Kingdom

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The Analysis of the SSR between TCSC and Synchronous Generator using RTDS and TCSC Replica

Hyunkeun KU, Seungchan OH, Yonghan KWON, Injoo JUNG, Moonsung BAE, Gumin KWON, Hyukil KWON, Jeonghoon SHIN
Korea Electric Power Corporation, Korea, Republic of (South Korea)

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Topics: B4 PS2 - FACTS and Power Electronics
Keywords: Static Var Compensator – Hunting – Control Interaction – FACTS

Hunting Issues in the Brazilian Interconnected Power System – A Case Study of Multiple SVCs

Antonio Ricardo TENÓRIO[1], Saulo SILVA FILHO[4], Rodrigo PRAXEDES[2], Felipe SOBRINHO[3]
[1]Brazilian NC of CIGRE, Brazil; ONS; [2]ARGO; [3]Hitachi Energy; [4]Jordão Energia

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The Vectorized Approach: An Efficient Method to Model VSC Converters and its Verification Against Tests

Joan HERNANDEZ, P. SAMUELSSON, Y. JIANG HÄFNER
Hitachi Energy Sweden AB

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Improved dynamic Voltage Control based on Network Sensitivity Characteristics

Francisco Javier CIFUENTES GARCIA, Özgür Can SAKINCI, Jef BEERTEN
EnergyVille/KU Leuven, Belgium

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Subsynchronous Resonance Analysis for an M-SSSC FACTS Installation in the Atlantico Region of the Colombian Transmission System

Juan BOTERO[1], Carlos BORDA[1], Mohammad HAMMAD[2]
[1]Smart Wires Inc; [2]Siemens Energy

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Operation of Static Series Synchronous Compensators integrated into the Colombian Power System: Challenges, Experiences and Lessons Learned

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Reflection on applicable standards and learnings from actual failures of power inverters

Muhannad ALSUHAILY[1], Robert HEUCKELBACH[2], Ashutosh SHARMA[3], Sukant BHATTACHARYA[4]
[1]DNV, UAE; [2]DNV, The Netherlands; [3]DNV, UAE; [4]DNV, UAE

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Control Strategies For Parallel Operation Of Statcoms – Securing For Bulk Renewable Energy Transmission

Prashant SALI, Karikalan M, Jaiganesh RAMKUMAR
Siemens Ltd, India

PS3 - NEW TECHNOLOGIES AND CONCEPTS OF DC AND FACTS ENABLING ENERGY TRANSITION

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition

Application of Multi-ports Energy Router to Coordinated Control of Renewable Energy, Network, Load and Storage at County-level Power Grid

Chong ZHANG[1], Zhiyuan HE[1], Xiaotong JI[2], Huafeng WANG[1], Xueguang WU[1], Junda QIN[1]
[1]State Grid Smart Grid Research Institute Co., Ltd. , China; [2]State Grid Hubei Electric Power Co., Ltd. , China

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Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition

Analysis of Oscillation Mechanism of Renewable Energy Generation Integrated into MMC-HVDC Under Islanded and Grid-connected Modes

Yuntao XIAO, Guanghui LI, Weisheng WANG, Guoqing HE, Ni ZHEN
China Electric Power Research Institute, China

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Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition

Grid-Forming Control for VSC-HVDC System with Large-scale New Energy Integration

Xiuda MA, Yu LU, Jie TIAN, Changjiang ZHAN, Nannan WANG, Qiang ZOU, Gang LI
NR Electric Co., Ltd. , China

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition
Keywords: Direct current system, medium voltage, power electronics.

Linear PV power plant based on MVDC collection network

Piotr DWORAKOWSKI[1], Silvain MARACHE[1], Eric LAMARD[2], Caroline RAMONDOU[2]
[1]SuperGrid Institute, France; [2]CNR, France

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition
Keywords: DC Microgrid, HES, RES, Renewable Energy Storage, H2 Integration

Modeling, Analysis, and Control of an Islanded Grid-Connected RES-Hydrogen DC Microgrid with Floating Solar Integration

Libin VARGHESE, Peng ZHANG
Stony Brook University, United States of America

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The innovative Damping Resistor System adopted in the Italian Transmission Grid

Gianluigi GEMELLI
TERNA, Italy

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A new STATCOM topology equipped with short-time energy storage and Grid Forming control for HV network voltage and frequency regulation

Gianluca POSTIGLIONE
Nidec-ASI Italy

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Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition
Keywords: HVDC, Grid-forming, Synchronous-Grid-forming, Demand, Demand-ramp, Fault-recovery, Inertia

Dynamic demand control applied to synchronous grid forming controlled HVDC

Carl BARKER[1], Si DANG[1], Omar JASIM[1], Syed Aaqib HASSAN[2], Girish G[2], Kerry EVANS[3], Taoufik QORIA[4]
[1]GE Vernova UK; [2]GE Vernova India; [3]GE Vernova USA; [4]GE Vernova Germany

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On the Role of Energy Storage in the Future HVDC Systems

Frans DIJKHUIZEN
Hitachi Energy Sweden AB, Sweden

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Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition
Keywords: Multi infeed interaction factor (MIIF), Modular multilevel converter (MMC), HVDC, Point of Interaction (POI), Faults, Load rejection

Analysis of Converter Interactions in HVDC systems

Pragati KIDAMBI MURALI, Jiayang WU, Theo BOSMA, Yontao YANG, Cornelis PLET
DNV

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition
Keywords: DC Transmission, EMT, Grid forming, HVDC, STATCOM

Application of Synchronous Grid Forming Back-to-Back HVDC System for System Frequency Support

Arash FAZEL DARBANDI[1], Phaedra TAIAROL[1], Sharmen ANDREW[2], Ani CHOPRA[2]
[1]Stantec, Canada; [2]Berkshire Hathaway Energy Canada, Canada

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New VSC-HVDC interconnection between the Iberian Peninsula and Balearic Archipelago to enable energy transition

Javier RENEDO, Silvia SANZ VERDUGO, Antonio CORDÓN, Belén SEGURA, David CASTAÑEDA, Rosalia RIVAS, Patricia LABRA
Red Eléctrica, Spain

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition

Development of an EMT model of the Balearic power system

Javier RENEDO[1], Yousef PIPELZADEH[2], Dharshana MUTHUMUNI[3], Farid MOSALLAT[4], Silvia SANZ VERDUGO[1], Antonio CORDÓN[1], Edgar NUÑO[1], Macarena MARTÍN[1]
[1]Red Eléctrica, Spain; [2]MHI, UK; [3]MHI, Canada; [4]Canada

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Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition

Performance of Generic grid forming RMS models under standardized test contingencies

Benjamin PAZ[1], Hazem KARBOUJ[2], Shivraman MUDALIYAR[2], Deepak RAMASUBRAMANIAN[3], Xiaoyao ZHOU[2]
[1]EPRI Europe, Spain; [2]National Grid ESO, UK; [3]EPRI, USA

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Battery storage with power oscillation damper for improved stability performance

Manfred MANCHEN
NamPower

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Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition

DC Circuit Breaker feasibility study - protection system design

Domagoj HART[1], Amjad MOUHAIDALI[1], Alberto BERTINATO[1], Colin FOOTE[2], Suresh RANGASAMY[2], Benjamin MARSHALL[2]
[1]Supergrid Institute, France; [2]SSEN, UK

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition
Keywords: Energy Storage, Grid-Forming Control, Pumped-Storage Hydropower, Static Frequency Converter, Modular Multilevel Converter

Grid-Forming Variable-Speed Full Converter Pumped-Storage Hydropower

Marcel STOECKLI[1], Alexandre CHRISTE*[2], Mats LARSSON[2], Christoph HAEDERLI[2], Michail VASILADIOTIS[2], Tobias THURNHERR[2]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy Switzerland Ltd, Switzerland

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition
Keywords: VSC HVDC, HVDC Light, STATCOM, IGBT, Diode, BIGT

Bi-mode Insulated Gate Transistor BIGT - An Outstanding Key Component in Present and Future HVDC Systems

Marcel STOECKLI[1], Evgeny TSYPLAKOV*[2], Boni BOKSTEEN[2], Luca DE MICHIELIS[2], Ying Jiang HAFNER[3], Gontran PAQUES[2], Jurgen HAFNER[3]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy Semiconductors, Switzerland; [3]Hitachi Energy, Sweden

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B4 DC SYSTEMS AND POWER ELECTRONICS - Full Papers
Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition
Keywords: Offshore Wind, Grid Connection, Grid Forming, Small-signal Stability, Large-signal Stability

Grid Connection of Offshore Wind with Grid Forming Turbines

Marcel STOECKLI[1], Mats LARSSON*[2], Jiuping PAN[3], Alberto BOLZONI[2], Ying-Jiang HAFNER[4], Per HOLMBERG[4], Pankaj ROY[4]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy, Switzerland; [3]Hitachi Energy, United States; [4]Hitachi Energy, Sweden

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Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition

Expandability of offshore HVDC grids during (in) development planning considering protection system design

Merijn VAN DEYCK[1], Geraint CHAFFEY[1], Mudar ABEDRABBO[1], Hakan ERGUN[1], Dirk VAN HERTEM[1], Ervin SPAHIC[2], Dennis DE DECKER[2]
[1]KU Leuven and EnergyVille, Belgium; [2]WindGrid, Elia Group, Belgium

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Functional Modelling for HVDC grids – State-of-the-art and future Outlook

Geraint CHAFFEY[1], Ilka JAHN[2], Melanie HOFFMANN[3], Rodrigo ALVAREZ VALENZUELA[4], Eduardo PRIETO ARAUJO[5], Staffan NORRGA[6]
[1]KU Leuven and EnergyVille, Belgium; [2]RWTH Aachen, Germany; [3]TUBS, Germany; [4]Siemens Energy, Germany; [5]UPC, Spain; [6]KTH, Sweden

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Keywords: DC, DER, Power quality, Simulation, Stability

DC System power quality and stability assessment and management: method, simulation, and on-site validation

Xavier YANG[1], Xingyan NIU[1], Xialin LI[2], Yifeng WANG[2], Wei LI[2], Pengfei LI[3]
[1]EDF R&D, France; [2]Tianjin University, China; [3]Hebei Unviversity, China

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Application of VSC-HVDC Dynamic Capacity: Technical, commercial and legal opportunities and challenges

Kevin SCHOENLEBER[1], Rickard EKSTROM[2], Peter LUNDBERG[2], Nils ENGLUND[2], Jens REIFSCHNEIDER[3], Andreas WASSERRAB[3], Mark THIELE[3], Robert FELLER[3]
[1]Hitachi Energy Research, Germany; [2]Hitachi Energy, Sweden; [3]TenneT TSO, Germany

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Keywords: HVDC, DCCB, Interoperability, Multi-terminal

DC Switching Stations with High-speed DC Breakers: Enabling Multi-vendor DC Grids

Frederick PAGE[1], Yu ARAI[1], Takashi INAGAKI[1], Tomas MODEER[2], Staffan NORRGA[2], Simon NEE[2]
[1]Mitsubishi Electric Corporation, Japan; [2]Scibreak AB, Sweden

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Keywords: Multi-terminal HVDC Transmission Network, Multi-purpose Interconnector (MPI), Windfarms, Real-time Studies

Assessment of Operational Challenges of HVDC Multi-Purpose Interconnectors with Low Short Circuit Levels

Asif KHAN[1], Wasim AHMAD[1], Nikhil SHARMA[1], Ben GOMERSALL[1], Benjamin MARSHALL[1], Richard POOLE[2]
[1]The National HVDC Centre, SSEN UK; [2]National Grid Ventures UK

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Grid Forming Solution for Offshore Wind Park with HVDC Connection

Mian WANG[1], Błazej STRONG[1], André SCHÖN[1], Mohammad SUWAN[1], Roberto ROSSO[1], Nicholas CHEROUVIM[1], Tobias NEUMANN[2], Philipp RUFFING[2], Eduard Wiebe WIEBE[2], Tobias BARTH[1], Thyge KNÜPPEL[3]
[1]Siemens Energy, Germany; [2]Amprion GmbH, Germany; [3]Siemens AG

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Modular Static Synchronous Series Compensator (M-SSSC): EMT Modeling for Real Time and Offline Applications

Camilo ORDONEZ
Smart Wires Inc

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Keywords: Hybrid STATCOM, STATCOM, Synchronous condenser

A study on the mitigation effect of hybrid STATCOM system on low inertia and voltage regulation issue

JooYong JUNG[1,2], WooSeok SEO[1], NamKyu KIM[1], Young-Jin KWON[1]
[1]Hyosung Corporation, Republic of Korea; [2]Yonsei University, Republic of Korea

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Insulation Coordination Criteria of VSC-HVDC Overhead Power Lines in Colombia Considering Climatic and Environmental Conditions

Hernan RESTREPO[1], Cristian C. ACOSTA[2], Alejandro PALACIO[3], Eros ESCOBAR[3], Antonio PEDRAZA[1], Jorge GONZALEZ[3], Ernesto PÉREZ[2]
[1]ISA Interconexión Eléctrica; [2]Universidad Nacional; [3]Universidad pontificia Bolivariana

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Dynamic Analysis of a Synchronverter with Virtual Inertia for Wind Power System Integration

Kah Yung YAP, Osazee Edo IDEHEN, Jakob Boss SKÅRHØJ
Orsted A/S Denmark

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Energy Dissipation Strategies for Offshore MT-HVDC systems

Alban DUVIVIER[1], Nicolaos CUTULULIS[1], Oscar SABORÍO-ROMANO[1], Peter Jan RANDEWIJK[2], Li YANG[3]
[1]DTU; [2]Energinet; [3]KU Leuven

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DC Voltage Control Strategy for NEOM Multi-terminal HVDC Grid

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ENOWA, NEOM, KSA

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Keywords: Parallel HVDC converters, Grid-forming converter, Offshore energy hubs, Virtual impedance, Stability analysis.

Stability Analysis and Mitigation of Power Oscillations Between Parallel MMC-HVDC Connections Operating in Grid-Forming Mode in Offshore Energy Hubs

Benjamin VILMANN[1], Daniel MÜLLER[1], Gustavo Figueiredo GONTIJO[2], Hjörtur JOHANNSSON[1]
[1]Technical University of Denmark; [2]Ørsted Wind Power

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Topics: B4 PS3 - New Technologies and Concepts of DC and FACTS enabling Energy Transition
Keywords: Multiterminal DC (MTDC), DC Grid, DC Circuit Breakers (DCCB), DC Switching Station (DCSS), DC Protection.

Phased Approach to MTDC: Proposed integration of DC Circuit Breakers in a DC Switching Station facilitating a partially selective protection scheme

David DEVOY, Ian COWAN, Perry HOFBAUER
SSEN Transmission

B5 - PROTECTION AND AUTOMATION

PS1 - PRACTICAL EXPERIENCES AND NEW DEVELOPMENTS OF PROCESS BUS

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: Centralised protection, IEC 61850, Process bus, Testing, Virtualisation, Functional tests, System tests

Functional Testing of virtualized and centralized Protection Systems

Janne STARCK[1], Juanita DOMINGUEZ[2], Rob COGGAN[3], Jani VALTARI[1]
[1]ABB Oy; [2]OMICRON Electronics; [3]Energy Queensland

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: Centralised protection, IEC 61850, Virtualisation, Wide-area protection

Demonstration of enhanced and virtualised Protection of the Distribution Network

Anna KULMALA[1], Ontrei RAIPALA[1], Petri HOVILA[1], Boris-Emanuel YAZADZHIYAN[2], Colin SCOBLE[2], Ibrahim ABDULHADI[3]
[1]ABB Oy; [2]UK Power Networks; [3]PNDC

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Integration and Application of merging unit and intelligent terminal in smart substation based on IEC 61850

Chen FAN[1], Zhiqiang YAO[1], Naichao CHANG[2], Yu LIU[2], Zhihuai SHU[2], Zhongqing LI[1], Renhui DOU[1], Jiangwen MENG[1]
[1]China Electric Power Research Institute, China; [2]State Grid Corporation of China, China

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: Process Interface Unit, Requirements, interface, interoperability framework, configuration chain

Process Interface Unit requirements related to industrial deployment

Volker LEITLOFF, Jean-Etienne LEMAIRE, Yann LELOUP, Frédéric FOUSSERET, Maud MERLEY, Alexandre AZEVEDO
RTE, France

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Keywords: Digital Substation, Hydraulic Power Plant, Intelligent Electronic Device (IED), Merging Unit (MU), Nuclear Power Plants

IEC 61850 digital substations technologies applied to power plants

Valentin BOUVIGNIES, Damien JOUAN, Edouard THEZELAIS
EDF, France

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: Process bus implementation

Review by WG B5.69 of published Experience Feedback on Process Bus Implementation

Volker LEITLOFF*[1], Alex APOSTOLOV[2], Thomas CHARTON[3], Rannveig LØKEN[4], Julien SAUNIER[5], Dieter BINON[6], Takaya SHONO[7], René TROOST[8], Sakis MELIOPOULOS[9]
[1]RTE, France; [2]OMICRON, United-states; [3]National grid, Great Britain; [4]Statnett, Norway; [5]Hitachy Energy, France; [6]ELIA, Belgique; [7]Toshiba, Japan; [8]Sedin, Netherlands; [9]Georgia tech, United-states

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: Digital Substation, Intelligent Electronic Device (IED), Merging Unit (MU), Process Bus, Protection Automation and Control Systems (PACS)

Digital substation with process bus: grid operator and PACS manufacturer feedback 2 years after the commissioning

Gérard CHAROT[1], Valentin BOUVIGNIES[2], Julien TISSERAND[3], Samir EL HADI[3], Apolline MAZAS[1], Sylvain AUPETIT[2]
[1]Siemens, France; [2]EDF, France; [3]EDM, France

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: IEC 61850, Object Modelling, Process Interface IED

Object Modeling of Process-near Interface Intelligent Electronic Devices in Digital Substations

Alexander APOSTOLOV
OMICRON electronics, United States of America

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Interoperability of protection devices among a multi-vendor IEC 61850 process bus system

Emiliano CASALE
TERNA, Italy

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: Virtualization, IEC 61850, Digital Substations, Test Philosophy

Unified Grid Control Platform Requirements of Process Bus

Herb FALK[3], Paul MYRDA[1], Glenn WILSON[2], Sean MCGUINNESS[1], Eric UDREN[4]
[1]Electric Power Research Institute (EPRI), United States of America; [2]Southern Company, United States of America; [3]Outside the Box Consulting, United States of America; [4]Quanta Technology, United States of America

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: Low-Power Instrument Transformers, Digital Secondary Systems, Rogowski Coils, Capacitive Dividers, IEC 61869 Series

Quiet Revolution: How Low-Power Instrument Transformers and Digital Secondary Systems are Changing What is Possible

Veselin SKENDZIC[1], Peter MENKE[2], Normann FISCHER[1]
[1]Schweitzer Engineering Laboratories, Inc., United States of America; [2]Siemens Energy, Germany

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B5 PROTECTION AND AUTOMATION - Full Papers
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Keywords: IEC61850, Active Distribution System, Estimation Based Protection (EBP), Coordination Free Protection, Estimation Based Calibration

Protection and Control of Active Distribution Systems

Sakis MELIOPOULOS[1], George COKKINIDES[1], Glenn WILSON[2], Kenneth WILHELM[3], Rebecca RYE[4]
[1]Georgia Tech, United States of America; [2]Southern Company, United States of America; [3]Avista Utilities, United States of America; [4]Dominion Energy, United States of America

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: Centralized Protection and Control, Process Bus, Virtualization, Line Protection

Assessment of Time-Critical IEC 61850 Process Bus Communications in a Virtualized Protection and Control System

Ana Cristina ALEIXO, Fernando GOMES, Carlos ARANTES, José VENTURA, João PERES, Rui JORGE
EFACEC, Portugal

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Keywords: Digital Substation, Redundancy, Resilience, Synchronism, Top-Down Engineering

DSAS Rollout Experience - Picking the Ripe Fruits

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EFACEC, Portugal

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: Current Channel - Distance Protection - Modular Merging Unit solution - Process Bus - Proof of Concept - PTP clock - Remerging application - Sensor - Voltage Channel

Distance Protection Performance Evaluation with Process Bus by using Modular Merging Units

Marieke HEERZE[1], Nicolas BRANCHE[2]
[1]Grid to great; [2]RTE

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Impact on Busbar Protection by mixed analogue Input Chains in digital Substations

Jianping WANG
Hitachi Energy Sweden AB, Sweden

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System Architectures for Virtualisation and Hardware Consolidation

David MACDONALD[1], Mital KANABAR[2], Camilo DE ARRIBA[1], Thomas CHARTON[3], Ibukunolu OLADUNJOYE[3]
[1]GE Grid Automation, Spain; [2]GE Grid Automation, Canada; [3]National Grid, UK

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Implementation of an IEC 61850 MMS interface for Centralized Protection and Control (CPC) virtualized platforms

Carlos ALBERO CASTILLÓN[1], Miguel Ángel OLIVÁN MONGE[1], Yasmina GALVE PASTOR[1], Carlos RODRÍGUEZ DEL CASTILLO[2]
[1]CIRCE Research Centre, Spain; [2]Elewit, Spain

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Practical implementation of full Digital PACS in a Multi-vendor Environment

Dieter BINON, Florian SOYEZ, Thomas STERCKX, Cedric MOORS, Bart CARTON
ELIA GROUP, Belgium

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: IEC 61850 process bus, digital substation, retrofit

Experiences with process bus technology for substation retrofit

Marcel STOECKLI[1], Stefan MEIER*[2], Rajesh K. YADAV[2], Yuji KIMURA[3]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy, Switzerland; [3]Hitachi Energy, Japan

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Keywords: IEC 61850-9-2 process bus, transformer protection

Practical experiences with process bus based transformer protection system

Marcel STOECKLI[1], Stefan MEIER*[2], Ruben MARTINI[3], Markus HELWIG[2]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy, Switzerland; [3]OFIMA, Switzerland

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: digital substation (DS), merging unit (MU), PTP, time synchronization system, protection, automation and control (PAC), IED 61850-9-2, digital exchange

SV-stream Processing in the Event of Synchronization Loss by Publishers

Mikhail BEZDENEZHNYKH, Nikolai DONI, Ivan KOSHELKOV, Nataliya DONI
EKRA Research and Production Enterprise Ltd., Russian Federation

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: transmission line differential protection, IEC 61850-9-2(SV), process bus, cybersecurity, relay protection prototype

Pilot Operation of Transmission Lines Differential Protection with Information Exchange According to IEC-61850-9-2 (SV)

Aleksandr KULIKOV[1], Anton LOSKUTOV[1], Vladimir ZININ[2], Anton PETROV[3]
[1]NNSTU n.a. R. E. Alekseev, Russian Federation; [2]LLC NPP "ALIMP", Russian Federation; [3]JSC "NIPOM", Russian Federation

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: protection and automation, digital substation, process bus, virtual IEDs, migration of functions, pilot operation

Development and Pilot Operation of the Intelligent PAC System Using the Concept of Virtual IEDs and Migration of Functions

Andrey LEBEDEV[1], Alexander VOLOSHIN[1], Andrey ZHUKOV[2], Vitaly AKULICHEV[3]
[1]National Research University «MPEI», Russian Federation; [2]JSC SO UPS, Russian Federation; [3]Rosseti Center, Russian Federation

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Developments and Practical Experiences of Merging Unit

Dmitry ULYANOV[1], Andrey MARTYNOV[1], Alexey MOKEEV[2], Sergei PISKUNOV[2]
[1]Energoservice, Russian Federation; [2]NARFU, Russian Federation

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: Digital Substation, IEC 61850, Process Bus, Sample Value, Station Bus

Experience and Challenges in the Practical Implementation of Four Digital Substations in Brazil

Denys LELLYS[1], Pablo HUMERES[2], Júlio Cesar LIMA[3]
[1]Brazilian NC of CIGRE, Brazil; GE Vernova; [2]Eletrobras CGT ELETROSUL; [3]PUC Minas University

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Keywords: Process Bus, Merging Unit, GOOSE, Sample Values

Digital Substation: Lessons Learned by CPFL in Process Bus Application

Wagner HOKAMA[1], Julia Beatriz CONCEICAO[1], Douglas FERREIRA[2], Daniel BERNARDON[3]
[1]Brazilian NC of CIGRE, Brazil; CPFL Energia; [2]Automalógica; [3]UFSM University

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: LPIT, Optical Current Transformer (OCT), Digital Substation, Process Bus, IEC 61850

LPIT operational experiences and challenges in a Norwegian digital substation

Karl POLLESTAD[1], Thomas JUDENDORFER[2], Christopher GEBS[3]
[1]Bane NOR Norway; [2]Trench Germany; [3]Elvia Norway

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: IEC 61850-9-2LE, IEC 61869-9, Process Bus, Sampled Values

Advantages and Challenges in Implementing the IEC 61869-9 Standard versus IEC 61850-9-2-LE in the Digitization of the Right Bank Substation

Gustavo MERELES[1], João JORGE[2], Jose CHIARADIA[1], Marcos MENDES[1]
[1]Itaipu Binacional; [2]Omicron Brazil

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: Virtualisation – Wide Area Protection – IEC 61850 – Digital Substation – 5G – Validation

Experience from integration, functional and performance testing of virtualised wide area protection

Ibrahim ABDULHADI[1], Boris Emanuel YAZADZHIYAN[2], Colin SCOBLE[2], Ontrei RAIPALA[3], Anna KULMALA[3]
[1]PNDC UK; [2]UK Power Networks UK; [3]ABB Oy Finland

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus

Using process bus over substation boundaries with multi-vendor line differential protection

Philipp STACHEL[1], Yann GOSTELI[2], Adolf FREI[3], Stefan FLEMMING[1]
[1]Siemens AG, Germany; [2]CKW AG, Switzerland; [3]Hitachi Energy Ltd, Switzerland

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus

Experiences from a substation pilot project implementing process bus based partly centralized protection and control

Thomas LIEBACH[1], Bendic RITT[2]
[1]Siemens AG, Germany; [2]Stromnetz Hamburg, Germany

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: Full digital substation, IEC 61850, Process bus, Reliability, Standardisation, Return of Experience

The Full Digital Substation Success in Vietnam

Chee-Pinp TEOH[1], Van Ha NGO[2], Than Tuan BUI[3], Hung HOANG[4], Dang-Thoang VO[4], Chin-Fei CHOW[5], Simon RICHARDS[1]
[1]GE VERNOVA UK; [2]AIT Corporation Vietnam; [3]EGRID Vietnam; [4]GE VERNOVA Vietnam; [5]GE VERNOVA Singapore

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus

Assessment of Distributed and Centralized Protection: Comparison of Response Times for Protective Dynamic System on Process Bus

Johan CASTRO[1], Germán RUEDA[1], Rodolfo GARCÍA[2], César HERNÁNDEZ[1], Germán ZAPATA[1], Oscar TOBAR[1]
[1]Universidad Nacional; [2]Enel Colombia

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: IEC 61850, Process bus, MU, IED, Protection Relay, Ethernet, Processing time, PTP

Merging Unit Performance Evaluation and Issues for Multi-Vendor Configuration in Process Bus

Hiroki DOI[1], Noriyuki UEDA[1], Akihiro TANAKA[1], Kenji KONDOU[2], Makoto MIZUNO[2], Yusaku SANO[2]
[1]Central Research Institute of Electric Power Industry, Japan; [2]TEPCO Power Grid, Incorporated, Japan

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus
Keywords: Process bus based protection systems, Process bus in one and half circuit breaker bus station, IEC 61850 sample value applications, IEC 61850 GOOSE message application, process bus implementing in diameter substation

Case Study: IEC 61850 Process Bus-Based Protection System Applications For One and Half Breaker Bus System in NEPCO 400 Kv stations

Hussien ALMOMANI, Mohammad DAWOOD
National Electric Power Company, Jordan, Hashemite Kingdom of

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Transition from device management to application management for Protection & Control through virtualization and centralization

Matthias REIS, Marcus STOLLFUSS, Saurabh TALWAR
Siemens AG, Germany

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus

How a well-designed, optimized time synchronization concept can increase the reliability and availability of a digital switchgear's protection system

Stefan FLEMMING[1], Andrej GOERBING[1], Joerg WEILBIER[1], Igor KOGAN[1], Ji CHEN[2], Lu WANG[2]
[1]Siemens AG, Germany; [2]Siemens Power Automation Ltd. China

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus

Interoperability Challenges in Multi-Vendor Digital Substations: PTP Time Synchronization and Profile Compatibility

César HERNÁNDEZ[1], Johan CASTRO[1], Oscar TOBAR[1], German RUEDA[1], Germán ZAPATA[1], Rodolfo GARCÍA[2]
[1]Universidad Nacional; [2]Enel Colombia

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus

Utility Experience of FEED for IEC 61850 Process Bus based Protection and Automation system for 765/400/220KV Greenfield Substation

Subir Sen SEN, Rajil SRIVASTAVA, Abhay KUMAR, S.J. LAHIRI, Mr ANURAG, M.S. HADA, C.P AWASTHI, Sitesh BADERIA*
Powergrid Corporation of India Limited, India

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus

Impact of IEC 61869-9 Based Sampled Values on Network Optimization and Protection System Performance in a Process Bus Based Digital Substation

Dr Subir SEN, B.B MUKHERJEE, Abhay KUMAR, Mr ABHISHEK, C.P. AWASTHI, Yashwant K, Sitesh BADERIA, Pradeep PATIL, Ritesh KUMAR*
Power Grid Corporation of India Ltd, India

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus

Commissioning & Operational Experiences of Brownfield & Greenfield Process Bus Substations in POWERGRID

Jeetesh KUMAR*, Gopinath S S, Joydip GHOSH, B. B. SINGH, M.K. JHA
POWERGRID, India

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Topics: B5 PS1 - Practical Experiences and new Developments of Process Bus

A comprehensive approach towards implementing the Process Bus based Substation Automation system in Substations and its benefits.

Vikram GANDOTRA*[1], Laurent TOGNAZZI[2], Hamza EHTISHAM[2], Nimish RASTOGI[3]
[1]Siemens Ltd, India; [2]Siemens AG, Germany; [3]Ex-Siemens Ltd. IIM-Calcutta-India

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Reliable Time Synchronization for IEC 61850 Substations by Distributed Time Sources and Visibility

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Experience and Challenge in Deploying the IEC 61850 Driven Digital Substation within Indonesia Utility Context

Eko PRASETYO, Fermi TRAFIANTO, Amiruddin AMIRUDDIN, Andhy D SETYAWAN
PT. PLN (Persero), Indonesia

PS2 - ACCEPTANCE, COMMISSIONING, AND FIELD TESTING FOR PROTECTION, AUTOMATION AND CONTROL SYSTEMS

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Field Testing, MPLS-TP, Teleprotection, Line Differential, Inter-substation Communications

Field testing, Experiences and Results with Line Differential and Teleprotection Applications in TDM/MPLS-TP Hybrid Networks

Sebastian SJÖGREN, Teemu VIINIKAINEN, Mikko HOLMGREN
Fingrid Oyj

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Distance Protection, Zone settings, IBR, PQ-diagram, Reactive Power Capacity

Coordinating Zone Settings of Distance Protection with Reactive Power Capabilities and Voltage Support of Inverter-based Resources

Mikko HOLMGREN, Minna LUOJUS, Lasse LINNAMAA
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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Distance relay, harmonics, converter-connected generation, relay testing

Performance of Distance Relays in the Finnish Power System under High Penetration of Converter-Connected Generation

Valtteri HYTTI, Pauli PARTINEN
Fingrid Oyj

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Distance Protection, Total Harmonic Distortion, Power System, Secondary Injection

Experiences, Secondary Injection testing and Grid Studies on Distance Protection and Current and Voltage Harmonics during Power System Faults

Mikko HOLMGREN, Juho TUOMINEN, Paavo OJAVALLI
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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: R#SPACE, Protection Automation, Control system

Testing approach for Rte's R#SPACE Protection Automation and Control System

Maud MERLEY*, Jean-Etienne LEMAIRE, Yann LELOUP, Alexandre AZEVEDO, Xavier MICHAUT, Volker LEITLOFF
RTE, France

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SAS2021 Project: benefits of standardization on acceptance, commissioning, and field testing during the whole PACS lifecycle

Alessio TESTARELLA
TERNA, Italy

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Low Power Instrument Transformer (LPIT), Secondary Injection Test Kit, Low Power Relay Test Set, Low Power Voltage Transformer, Merging Units

LPITs in High Voltage Switchgear and Field-testing of Relay Protection with LPIT Inputs

Dhanabal MANI[1], Niclas WETTERSTRAND[2], Peter MENKE[3], Thomas NEUMEIER[4], Franz GATZEN[4]
[1]Megger Dallas, United States of America; [2]Megger Group, Sweden; [3]Siemens Energy, Germany; [4]Siemens AG, Germany

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: IEC 61850, Acceptance, Commissioning and Maintenenace Testing, Efficiency

Improving the Efficiency of Acceptance, Commissioning, and Maintenance Testing of IEC 61850 Based Digital Substations

Alexander APOSTOLOV
OMICRON electronics, United States of America

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Digital Substation, IEC 61850, UCAIug, Interoperability Tests, System Configuration Language

Experience in the UCA International Users Group Interoperability Tests

Keith GRAY[1], Sina KARIMI[2], Chris DYER[1]
[1]POWER Engineers, Inc., United States of America; [2]POWER Engineers Canada, Inc., Canada

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Hardware-in-the-loop, Inverter-based Resource, Modelling, Relay MIsoperation, Relay Testing

Use of Detailed Real-Time System Models to Evaluate Relay Performance Impacted by High Penetration of Inverter-Based Resources

Yi HU[1], Henry CHAO[1], Zheyuan CHENG[1], Juergen HOLBACH[1], Thai Thanh NGUYEN[2], Edward L. SEITER[3], Michael RAZANOUSKY[4], Damir NOVOSEL[1]
[1]Quanta Technology, United States of America; [2]New York Power Authority, United States of America; [3]National Grid, United States of America; [4]New York State Energy Research and Development Authority, United States of America

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Synchrophasor, Testing, Protection, Control, Monitoring, Standards

Life-cycle Testing of Synchrophasor Systems

Mladen KEZUNOVIC
Texas A&M University, United States of America

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Testing, Commissioning, 3-D Printer, IEC61850, GOOSE

Evolution of Testing Practices: A Utility's Experience

Steven WALKER, Matt DUBOIS, Pat SCANNELL. JR., Bill HORN
Commonwealth Edison, United States of America

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Fault Location, Isolation, and Service Restoration; Protection; FLISR; Distribution Automation

Design and Testing of Distributed Fault Location, Isolation and Service Restoration Scheme for Open-loop Electric Distribution Systems using IEC61850 GOOSE

Palberz KHALEDIAN[1], Yujie YIN[2], Amin ZAMANI[2], Farid KATIRAEI[2], John WILTSHIRE[3], Roy LUO[4], Ben ROSENFELD[4], Shawn DEANGELO[4], Drazena BROCILO[4], Selver CORHODZIC[4], Alan DUONG[4]
[1]Quanta Technology, United States of America; [2]Quanta Technology, Canada; [3]Meta Platforms, Ireland; [4]Meta Platforms, United States of America

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Distribution Grid, Real-Time Digital Simulation, Digital Substation, MV Advanced Applications, Protection and Control Centralization, Virtualization, IEC 61850

Testing of Centralized Protection, Control and Advanced Automation for MV networks with DER

Clara GOUVEIA[1], Everton ALVES[1], André MELIM[1], Jorge PEREIRA[1], António CARRAPATOSO[1], Nuno FONSECA[1], José ANDRADE[1], Tiago HEKKERT[1], Ana Cristina ALEIXO[2], Carlos ARANTES[2]
[1]INESC TEC, Portugal; [2]EFACEC, Portugal

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Implementation of the line differential protection in the 30 kV distribution network of i-DE

Iñaki OJANGUREN[1], Ziorta LLONA[2], Oscar HERNANDEZ[1], Isabel LOUREIRO[1], Juan Mari GARCIA[2]
[1]i-DE, Spain; [2]Ingeteam, Spain

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Development and Implementation of a WAMPAC Algorithm for Detecting Real-Time Voltage Instability Phenomena in Electric Power Systems

Anibal Antonio PRADA HURTADO[1], Eduardo MARTINEZ CARRASCO[1], Jose SALDANA[1], Carlos ALBERO CASTILLÓN[1], Konstantinos F. KROMMYDAS[2], Christos-Spyridon G. KARAVAS[2], Konstantinos A. PLAKAS[2], Efthimia CHASSIOTI[2], Ioannis MORAITIS[2]
[1]CIRCE Technological Centre, Spain; [2]Indep. Power Transmission Operator, Greece

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Challenges and perspectives for a new era of protection, automation and control systems through IEC 61850

Victor LLAMAS SANJUAN
CIRCE Centro Tecnológico, Spain

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IEC61850 Engineering of a Digital Substation: Common User Vision on Top-down Engineering

Thomas STERCKX[1], Florian SOYEZ[1], Maud MERLEY[2]
[1]ELIA, Belgium; [2]RTE, France

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Distribution Network, Phasor Measurement, Fault Location, FLISR

PMU-based fault distance calculation in long radial feeders using an enhanced reactance-based approach

Marcel STOECKLI[1], Mayank NAGENDRAN*[2], Lorenzo ZANNI[2], Paolo ROMANO[2], Farnoosh RAHMATIAN[3], Ali ALVI[4], Sihikhar PANDEY[5]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Zaphiro Technologies, Switzerland; [3]NuGrid Power Corporation, United States; [4]Exeloncorp, United States; [5]ComEd, United States

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: process bus, relay protection, testing

The Experience of Commissioning and Initial Maintenance of Relay Protection on Operational Digital Substations with the IEC 61850 Process Bus

Nikolay ALEKSANDROV, Yuriy SMIRNOV, Alexander SHALIMOV
LLC «NPP «Dinamika», Russian Federation

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A New Technological Approach for Commissioning and Operation of Relay Protection and Automation Systems

Alexey ANOSHIN, Aleksandr GOLOVIN, Natalya MARARAKINA
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Experience of the Field Testing of Power Units Control Systems

Andrei GERASIMOV, Ruslan IZMAILOV, Evgeniy SATSUK, Andrei SMIRNOV, Dmitriy KABANOV, Oleg GURIKOV
JSC STC UPS, Russian Federation

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: fault location technology, cable line, overhead line, electrical network topology, single phase-to-earth fault, short circuit

Experimental Verification of Fault Location Technology in Power Distribution Networks with Complex Topology

Andrey KUCHERIAVENKOV, Pavel GOROZHANKIN, Ekaterina KARTASHEVA
ANTRAKS Research&Developmend& Manufacturing Co, Russian Federation

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: PACS, PMU, PDC, synchrophasor, WAMS

Development and Commissioning of PACS for Operating Modes of the Power System Based on PMU Data

Andrey ZHUKOV[1], Evgeniy SATSUK[1], Dmitrii DUBININ[1], Maksim POROZKOV[2], Jury IVANOV[2], Anna DMITRIEVA[2]
[1]JSC SO UPS, Russian Federation; [2]Prosoft systems, Russian Federation

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Methods for Configuring, Testing and Inspecting Automatic Excitation Regulators for Synchronous Generators during Commissioning

Andrey ZHUKOV[1], Evgeniy SATSUK[1], Tatiana KLIMOVA[2], Andrei GERASIMOV[1]
[1]JSC SO UPS, Russian Federation; [2]National Research University «MPEI», Russian Federation

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Device Management, Remote Access, Commissioning Assistance, Testing Traceability

Automating commissioning tests, accepting remote maintenance, and guaranteeing inventory integrity using a Device Management System

Adriano PIRES, David MACDONALD, Mital KANABAR, Shobhit MEHTA
Brazilian NC of CIGRE, Brazil; GE Grid Automation

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Commissioning tests, electromagnetic transients, inverter-based resources, phasor-based protection, time-domain protection, transmission lines

Commissioning Perspectives for the New Era of Transmission Line Protection Schemes: Historical Evolution and Future Expectations

Felipe LOPES[1], Moisés DAVI[2], Giovanni FABRIS[3], Mário OLESKOVICZ[2], Raphael REIS[1]
[1]Brazilian NC of CIGRE, Brazil; UFPB University; [2]USP University; [3]Eletrobras ELETROSUL

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: PTP - Time Synchronization - Interoperability - Process Bus –- PACS Testing

Time Synchronization Interoperability and Testing Challenges for Process Bus

Guilhermme LISBOA, Guilherme NORMANTON
Brazilian NC of CIGRE, Brazil; Belden

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Auditor, Digital Substation, Process Bus, Stand-Alone Merging Unit

Practical approaches for improving reliability and availability of digital multivendor substations

José Eduardo DA ROCHA ALVES JUNIOR, Tiago MORAES, Marco Antonio MACCIOLA RODRIGUES
Brazilian NC of CIGRE, Brazil; Eletrobras CEPEL

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: IEC 61850, Process Bus, PAC System Tests

A Practical Approach to The Requirements and Strategies for Monitoring the IEC 61850 Process Bus in a Multivendor Test Platform

Pablo HUMERES FLORES[1], Mateus ALEXANDRINO[1], Júlio Cesar MARQUES DE LIMA[2], Denise BORGES DE OLIVEIRA[3], Jorge DAMASCENO[4], Denys LELLYS[5], José Eduardo DA ROCHA ALVES JUNIOR[6], João JORGE[7], Paulo Sergio PEREIRA JUNIOR[8]
[1]Brazilian NC of CIGRE, Brazil; CGT ELETROSUL; [2]PUC Minas University; [3]ONS; [4]Siemens; [5]GE Vernova; [6]Eletrobras CEPEL; [7]Omicron Energy; [8]Conprove

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Keywords: vPACS, IEC 61850, software-defined smart grid, virtual IED, virtual Test Set

How to Test Virtual Protection, Automation and Control Systems (vPACS)

Paulo Sergio PEREIRA JUNIOR, Rodolfo Cabral BERNARDINO, Gustavo Silva SALGE, Cristiano Moreira MARTINS, Paulo Sergio PEREIRA, Gustavo Espeinha LOURENÇO
Brazilian NC of CIGRE, Brazil; CONPROVE

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Keywords: FAT, SAT, Inspection and Test Plan, Electrical Commissioning, Technical Training

FAT and SAT Procedures from the Perspective of the Brazilian TSO

Rafael de Oliveira FERNANDES[1], Ricardo DUTRA[2]
[1]Brazilian NC of CIGRE, Brazil; UNICAMP University; [2]State Grid

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Lab Environment for fully digital Substation Solution Validation - technical Solution and testing Solution

Yiming WU
Vattenfall Distribution Sweden AB, Sweden

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A consistency validation Tool for IEC 61850 Substation System Integration Configuration

Yiming WU
Vattenfall Eldistribution Sweden AB, Sweden

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A Study on the Development of Interoperability Test Automation System for Digital Substation

Yu-Yeong PARK, Nam-Ho LEE, Chang-Seob LEE, Woo-Joong KIM, Nam-Dae KIM, Seok-Kon KIM, Byung-Tae JANG
KEPCO Research Institute

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Keywords: LPIT, PACS, on-site calibration procedure, a certification process

Certification and On-site Calibration of Metering System Based on LPIT

Peter MENKE[1], Vladan LAPČEVIĆ[2], Michael FREIBURG[3], Vladimir RAJOVIĆ[4], Mikhail VASSILYEV[2]
[1]Siemens Energy, Germany; [2]Meter&Control, Serbia; [3]TH Köln – University of applied sciences, Germany; [4]University of Belgrade, School of Electrical Engineering, Serbia

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Joint-Development and Demonstration of an Adaptive Protection System at a German DSO – Practical Experiences and Lessons Learned

Jasper LAMMERING[1], Jessica STEPHAN[4], Jan Peter KEMPER[1], Stefan DALHUES[1], Tobias LORZ[2], Wesley DRECHSEL[1], Andreas KUBIS[1], Tobias PLETZER[1], Gerrit ERICHSEN[3]
[1]PSI Software AG, Germany; [2]FAU Nürnberg, Germany; [3]Schleswig-Holstein Netz AG, Germany; [4]In

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Acceptance and Commissioning of a Wide-Area Broken Conductor Detection System for Distribution Networks

Michael STANBURY
Ausgrid, Australia

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Testing of Travelling Wave Fault Locators

Jörg BLUMSCHEIN[1], Bruno Alencar ARRAES[1], Tiago Fernandes BARBOSA[2]
[1]Siemens AG, Germany; [2]Eletrosul, Brazil

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Collaborative Engineering and Testing of Smart Grid Automation Applications

Christof BRANDAUER[1], Filip PRÖSTL ANDRÉN[2], Catalin GAVRILUTA[2], Thomas STRASSER[2], Armin VEICHTLBAUER[3], Gerald STEINMAURER[3], Jürgen RESCH[4], Sebastian SCHÖNDORFER[4]
[1]Salzburg Research; [2]AIT Austrian Institute of Technology; [3]FH Oberösterreich; [4]COPA-DATA

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Retrofit, electromechanical, overcurrent, relays

A modern retrofit solution for induction disc overcurrent relays

Graeme LLOYD[1], Richard DUFFY[1], John WRIGHT[1], Majid HASHEEM[2], Peng SHEN[3], Dickson LAU[4], K M TSANG[4], Carol FISHER[5]
[1]GE Grid Solutions UK; [2]GE Grid Solutions India; [3]GE Grid Solutions Hong Kong; [4]CLP Hong Kong; [5]GE Grid Solutions USA

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Efficiency Improvement in Testing: Maximizing Resources and Reducing Time with Digital Twins

Jhonatan ANAYA, Santiago YEPES
ISA Intercolombia

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Distance Protection, Directional Overcurrent Protection, Wind Farm Protection, Collector Systems, Polarization Techniques, HVDC Protection.

Performance of Distance and Directional Overcurrent protections in a HVDC connected Offshore Windfarm

Chris SMITH[1], Jose JARAMILLO[2], Mauricio CORREA[3], Camilo GARCIA[2], Andres GARCIA[2]
[1]RWE UK; [2]IEB Colombia; [3]GE Vernova France

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User-centric tools for engineering, commissioning and operation of protection and automation devices

Cedric HARISPURU, Francois SIMON
Siemens AG, Germany

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Protection instrument transformers characterization and modelling for travelling wave applications

Federico CANAS[1], Johannes BLESER[1], Cezary DZIENIS[3], Thomas JUDENDORFER[2], Joerg BLUMSCHEIN[1]
[1]Siemens AG, Germany; [2]Trench Germany GmbH, Germany; [3]University of Applied Sciences Zittau / Görlitz, Germany

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B5 PROTECTION AND AUTOMATION - Full Papers
Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Digital substation, Engineering process, IEC 61850, SCL (System Configuration Language), OCL (Object Constraint Language), XML, XSD (XML Schema Definition)

Introduction to IEC 61850-6-3 OCL: Machine-processable rules for validation of IEC 61850 XML-based files

Aurélie DEHOUCK[1], Sina KARIMI[2], Christophe DYER[3], Keith GRAY[3]
[1]EDF R&D, France; [2]POWER Engineers, Inc., Canada; [3]POWER Engineers, Inc., USA

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Performance of the Overcurrent Function in the Event of Loss of Information in the Process Bus Using a Merging Unit Developed in ATP-EMTP

Ernesto PEREZ, Oscar TOBAR, Johan CASTRO, César HERNÁNDEZ
Universidad Nacional

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EMT Based Protection Coordination Study Considering M-SSSC FACTS Technology in the Atlántico Region of the Colombian Transmission System

Alejandro DUQUE[1], Dilan CARO[1], David URBAEZ[1], German GUTIERREZ[2], Jhon CALDERON[3], Carlos BORDA[1]
[1]Smart Wires Inc; [2]ISA Intercolombia; [3]ISA Interconexión Eléctrica

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Enhancing Protection Schemes for Inverter-Based Renewable Generation in Transmission Networks

Oswaldo ARENAS[1], Sebastián MANRIQUE[2]
[1]ISA Intercolombia; [2]FEDERAL UNIVERSITY OF TECHNOLOGY - PARANÁ

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Blackout, Black Start, Grid Protection Relay, Grid Restoration

Performance Test of Grid Protection Relay for Black Start

Tomoya ISHII[1], Atsushi OKAHISA[1], Iori NAKAYAMA[1], Mai ARAKI[2]
[1]Kansai Transmission & Distribution Co, Inc., Japan; [2]Enegate Co., Ltd., Japan

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Autonomous, Decentralization, Post fault calculation, Special Protection Scheme (SPS)

Development and testing of response-based wide area SPS without telecommunication

Tomohiro KURUSHIMA[1], Yoshihiro MATSUBARA[2], Jun YASUE[2], Tadaaki YASUDA[2], Koji SAKAGUCHI[1], Toru MAEDA[1]
[1]Mitsubishi Electric Corp., Japan; [2]TEPCO Power Grid, Inc., Japan

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Keywords: IEC 61850, MMS, Japanese Connect And Manage, N-1 Inter-trip Scheme

IEC 61850 Compliant N-1 Inter Trip Scheme Suitable for Japanese Connect and Manage

Ryuichi KAWAZOE[1], Shotaro SAKAI[1], Kazuhiro KOJIMA[1], Hironori IMAEDA[2], Yutaka ANDO[2]
[1]Chubu Electric Power Grid Co., Inc., Japan; [2]C-tech Corp., Japan

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Protection verification for HVDC connected wind farms

Adnan COKIC[1], Alexander TSYLIN[1], Michael PARADIS[2], Deepak H. NAIR[1]
[1]Ørsted Wind Power A/S; [2]ATCO

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Plug & Play of Protection ,Automation & Communication system with Portable SCADA for EHV Substations

Vivekanandan S*, Tushar KULKARNI, Ganesh Jagtap JAGTAP, Dayanand Konduskar KONDUSKAR, Vishal KULKARNI, Akhilesh Chandrakar CHANDRAKAR
TATA Power Company, India

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Topics: B5 PS2 - Acceptance, Commissioning, and Field Testing for Protection, Automation and Control Systems
Keywords: Protection coordination, protection relay, transmission network, wide area assessment

A wide Area protection coordination assessment for the Albanian transmission System

Aristotelis TSIMTSIOS[1], Vassilis PAPASPILIOTOPOULOS[1], Vassilis KLEFTAKIS[1], Mohammad DJAMALI[2], Ralf KYNAST[3], Elgi HAXHIRAJ[4]
[1]PROTASIS SA, Greece; [2]Fichtner GmbH & Co. KG, Germany; [3]KfW Development Bank, Germany; [4]OST sh.a., Albania

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Sebastian HINCAPIE[1], Jhon CALDERON[2], Carlos BORDA[1], Alejandro DUQUE[1], Pablo MACEDO[1], Juan GALLEGO[3]
[1]Smart Wires Inc; [2]ISA Interconexión Eléctrica; [3]Transelca

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Nikunj KANJARIYA, Sanjay JADAV, Jayesh GANDHI
Gujarat Energy Transmission Corporation Limited

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From Resilient and Ready to Used and Useful: Managing Temporal and Locational Uncertainty in Electrification, DER Adoption, and Climate Adaptation

Kevin HAPP[1], Shaun MORAN[1], Vincent WESTFALLEN[1], Ryan BURG[2]
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[1]ESIG, United States of America; [2]RSE SpA, Italy; [3]PUC, Chile; [4]Hydro-Quebec, Canada; [5]Terna SpA, Italy; [6]TU Graz, Austria; [7]UAST Wien, Austria; [8]University of Birmingham, United Kingdom; [9]Consultant, United States of America; [10]EC JRC, The Netherlands

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[1]Southern California Edison, United States of America; [2]Commonwealth Edison, United States of America; [3]GE Digital, United States of America; [4]New York ISO, United States of America; [5]Argonne National Lab, United States of America; [6]Burns & McDonnell, United States of America; [7]GE Power, United States of America; [8]MPR Associates, United States of America

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Optimal power system planning through P2G and P2H system integration and flexibility

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Stanislav UTTS[1], Valdson Simoes DE JESUS[2], Megan LUND[3], Denis PILENIEKS[1]
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Keywords: Transmission Margin Contracting, Access to the Transmission System, Competitive Margin Procedure, Transmission system Development

Competitive Process for Transmission Margin Contracting by Wind and Solar Generators in Brazil's Transmission Network

Laércio GUEDES[1], Thiago PRADO[2], Sumara TICOM[1], Fernando MACHADO[1], Ivair FREIRIA[1], Lucas SANTOS E SILVA[3], Alexandre DANTAS[1], Roseane NUNES[1], Maria Paula SALVADOR[1], Andreia Maia MONTEIRO[1]
[1]Brazilian NC of CIGRE, Brazil; ONS; [2]Ministério das Minas e Energia - MME; EPE; [3]Consultant

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Keywords: Renewable Sources, Solar Energy, Distributed Generation, ADMS, Storage, Brazilian Utilities

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Energy Transition – Risks Related to Underestimation of Security Issues

Xisto VIEIRA FILHO[1], João Carlos DE OLIVEIRA MELLO[2], Paulo GOMES[3]

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Keywords: decarbonisation, just transition, renewable energy, coal phase-out

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Keywords: Electrification, Energy supply chain, Energy transition, Hydrogen, PtoG

Energy Supply Chain from Hydrogen Production to End Use by PtoG for Carbon Neutrality 2050

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The impact of sub-transmission levels' modelling on congestions' visualization for European transmission grid calculations – a CIGRE benchmark models study

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Keywords: Energy Transition, System Strength, System Planning, Decarbonization

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Ying HAFNER[1], Nand SINGH[2], Grain ADAM[2]
[1]Hitachi Energy, KSA; [2]ENOWA, KSA

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Keywords: Policy-maker, Renewable Energy (RE), Tariff structure, Utilities Green Tariff (UGT), Renewable Energy Certificate (REC)

Calculation Model of Utilities Green Tariff: A sustainable strategy toward renewable energy adoption for regulated market in Thailand

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Alisa FLEANCU[1], Ana – Maria APOSTOIU[2]
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[1]Huazhong University of Science and Technology, China; [2]Hitachi Energy, Switzerland; [3]Hitachi Energy Research, China

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[1]RSE, Italy; [2]Terna, Italy

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Keywords: Distributed Energy Resources, Wholesale Electricity Markets, Grid Services, Flexibility, Reserve

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Electric Power Research Institute (EPRI), United States of America

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Keywords: Battery Sizing, Capacity Expansion, Decarbonization, EV Smart Charging, Zero Emission Power Market

Flexible Capacity Expansion Planning for a Decarbonized Market

Jinxiang ZHU[1], Steven ZHOU[1], Hongyan LI[1], Alexandre OUDALOV[2], Sebastian PORRAS APARICIO[2]
[1]Hitachi Energy, United States of America; [2]Hitachi Energy, Switzerland

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Keywords: Integrated energy systems, flexibility, thermal networks, energy markets, consumer energy resources

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Keywords: electrical energy storage systems, energy efficiency, flexibility, resilience

Unlocking the Potential of Distributed Energy Storage Systems for Island Power Systems

Nikolay SHUBIN[1], Fedor NEPSHA[1], Vladimir TARASOV[2], Evgeniy SATSUK[3]
[1]RTSoft Smart Grid, LLC, Russian Federation; [2]INTER RAO Engineering, LLC, Russian Federation; [3]JSC SO UPS, Russian Federation

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Planning Tool Integration of Demand Flexibility: Focus on Electric Vehicles

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A planning tool for minimizing overloads through active demand and generation response

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[1]Red Eléctrica, Spain; [2]Elewit, Spain

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Keywords: flexibility, hybrid power systems, intermittent renewable energy sources, low carbon future

Reducing balancing power requirements through the complementarity of RES based technologies in hybrid power system concepts

Ajla MERZIC[1], Nedzad HASANSPAHIC[2], Muamer BAHTO[2], Mustafa MUSIC[2]
[1]BH K CIGRE, Bosnia and Herzegovina; [2]Elektroprivreda BiH, Sarajevo, Bosnia and Herzegovina

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Keywords: Coincidence factor, Electric vehicles, Residential flexibility, Smart charging

Flexibility from electric vehicles - residential charging coincidence factors in Norway

Aurora OPSTAD[1], Kristian SEVDARI[2], Heidi S. NYGÅRD[3], Bjørn Harald BAKKEN[1], Gerard DOORMAN[1]
[1]Statnett Norway; [2]Technical University of Denmark -DTU / Statnett Denmark; [3]Norwegian University of Life Sciences Norway

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Matthias HOFMANN[1], Hanne SÆLE[2]
[1]Statnett/NTNU; [2]Statnett, Norway

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Keywords: Clustering, long-term planning, load flow convergence, machine learning, scenario-based analysis, unsupervised learning

Machine Learning Method to Improve Stability Requirements Calculation for the Planning Process

Yueqi WU, Diptargha CHAKRAVORTY, Nicolas MELCHOR
TNEI Services Ltd.UK

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Keywords: Battery Energy Storage System, Flexibility, Energy Arbitrage, Power Production Optimization, Variable Renewable Energy Systems Integration, Technical & Economic Performances, Grid Balancing, Jordanian Power Sector, Energy System Management, Long-Term Plan

Battery Energy Storage System Techno-Economic Performance to Meet the Grid Flexibility: Case Study of Jordan's Power Sector

Murad ALOMARI, Mustafa Walid ALZAHLAN
National Electric Power Company, Jordan, Hashemite Kingdom of

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Keywords: Pumped-Hydro Energy Storage, Flexibility, Energy Arbitrage, System Development, Electricity Generation Optimization, Renewable Energy Integration, RES, Technical & Economic Performances, Grid Balancing, Jordanian Power System, Energy System Management, Lo

Enhancing Grid Stability and Renewable Integration: Examining the Potential of Pumped Hydro Storage as a Key Player in Jordan's Power Sector

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National Electric Power Company, Jordan, Hashemite Kingdom of

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Use instead of curtail" in Germany – Power to Heat technology as flexibility for TSOs to optimize RES feed-in and manage congestion

Wilhelm KIEWITT[1], Matthias GERDES[1], Nidal MEYER[1], Jan SIECK[2], Christoph COSLER[2]
[1]50Hertz Transmission GmbH, Germany; [2]Hamburger Energiewerke GmbH, Germany

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Smart Wires Inc

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Keywords: Green Hydrogen, Power System Expansion; RES Generation

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Enzo SAUMA
Pontificia Universidad Católica de Chile, Chile

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Topics: C1 PS2 - Flexibility as Pivotal Criterion for System Development
Keywords: Optimal capacity expansion planning, multi-energy system planning, flexibility resources, 100% renewable power system

100% RES Power System Supported by Flexibility Resources

Nagaraju POGAKU[1], Nand SINGH[2], Alexandre OUDALOV[3], Sebastian PORRAS APARICIO[4]
[1]ENOWA, KSA; [2]ENOWA, KSA; [3]Hitachi Energy, Switzerland; [4]Hitachi Energy, Switzerland

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Operational analysis of Purulia Pumped Storage Plant (PPSP) and Maximizing the benefits using Mixed Integer Linear Programming (MILP) Model from Flexible Operation

Saibal GHOSH*, Manash Protim NATH, Alok Pratap SINGH, Pinki DEBNATH, Akash Kumar MODI, Saugato MONDAL, Saurav SAHAY, Shyamal KONAR, Rajib SUTRADHAR
Grid Controller of India Limited, India

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Evaluating Strategic Day-ahead Scheduling of Power-to-Hydrogen Facilities in Power Systems with Pervasive Renewable Energy Integration

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Department of Energy (AAU Energy), Aalborg University

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Georgian State Electrosystem

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Keywords: Investment cost, power system economics, profitability, seasonal flexibility, VRE

What are the economic conditions for the feasibility of a low-carbon electricity mix? Profitability and investment considerations for long-term flexibility solutions

Sebastien PEZZA[1], Sandrine SELOSSE[2], Edi ASSOUMOU[2], Caroline BONO[1], Fabien BRICAULT[1]
[1]EDF, France; [2]Mines Paris PSL, France

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30 Years of Reform of the Colombian Electricity Sector: a Macroeconomic Perspective to the Challenges Facing of Energy Transition.

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State Grid Zhejiang Electric Power Research Institute , Hangzhou, China

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The Power Adequacy and Flexibility Assessment in the Process of Energy Transition in the China's Power Sector

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China Electricity Council, China

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Keywords: IBR power, scenarios, RMS simulation, frequency, rotor angle stability

System impacts of IBR power reduction after a short-circuit

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RTE, France

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Application of a multi-hazard risk-based Resilience assessment methodology to real cases in the Italian Transmission System

Emanuele CIAPESSONI
RSE, Italy

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Keywords: Power System Planning and Operation, Renewable Resources, Grid Transformation, Decarbonization, Distributed Resources

Creating a Sustainable National Electric Infrastructure While Maintaining Reliability and Resiliency of the Grid

Vijay VITTAL[1], Anjan BOSE[2], Damir NOVOSEL[3], Mark LAUBY[4], Chanan SINGH[5], Gordon van WELIE[6]
[1]Arizona State University, United States of America; [2]Washington State University, United States of America; [3]Quanta Technology, United States of America; [4]North American Electric Reliability Corporation (NERC), United States of America; [5]Texas A&M University, United States of America; [6]ISO New England, United States of America

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Topics: C1 PS3 - Resilience as Pivotal Criterion for System Development
Keywords: Resilience, substation, power system development, flexibility of power supply, availability of infrastructure

Evaluation of Substation Configuration as an Element of Resilience Management in System Development

Maksymilian PRZYGRODZKI[1], Sławomir KAŁUŻA[1], Agnieszka DZIENDZIEL[1,2], Paweł KUBEK[1,2], Piotr RZEPKA[1,2]
[1]PSE Innowacje, Poland; [2]Silesian University of Technology, Poland

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Topics: C1 PS3 - Resilience as Pivotal Criterion for System Development
Keywords: Resilience, Disruption, Governance, Leadership, Teams, Electrical System, Decision Makers, Attributes

Governance and its importance for the success of an electric power company from the point of view of resilience

Josias MATOS DE ARAUJO[1], Antonio SIMÕES PIRES[2], Marcelo COSTA DE ARAUJO[3]
[1]Brazilian NC of CIGRE, Brazil; Eng Smart Lead; [2]Consultant; [3]Eletronorte

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Keywords: HVDC – Reliability – Resilience – Architectures – Topology

Reliability and Resilience needs for future hybrid AC/DC Grid

Asif KHAN[1], Colin FOOTE[1], Benjamin MARSHALL[1], Paul MCNAMARA[2], Lampros PAPANGELIS[3]
[1]The National HVDC Centre UK; [2]EPRI International Ireland; [3]Engie Impact Belgium

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Assessment of the Resilience of the Colombian Electricity Sector

Jaime ZAPATA[1], Juan MOLINA[2], Luisa BUITRAGO[2]
[1]XM; [2]Colombia Inteligente

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C1 POWER SYSTEM DEVELOPMENT AND ECONOMICS - Full Papers
Topics: C1 PS3 - Resilience as Pivotal Criterion for System Development
Keywords: Resilience, Transmission Planning, Risk Maps

Proposed Methodology for Incorporating Resilience Criteria into Transmission Planning based on Risk Mapping

Lilian HERNANDEZ[1], Francisco BECERRA[2], Roger MELLADO[3]
[1]Comisión Nacional de Energía, Chile; [2]STM, Chile; [3]Coordinador Eléctrico Nacional, Chile

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Improving Distribution Network Climate Resilience Using Statistical Models For Conventional And Technology Agnostic Solutions

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POWERGRID, India

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Topics: C1 PS3 - Resilience as Pivotal Criterion for System Development
Keywords: HVDC, Renewable, transmission, power grid

Less connection for more security – Novel transmission and power grid design in NEOM grid with 100% renewable

Grain ADAM[1], Nand SINGH[2], Ying JIANG HAFNER[3], Mauro MONGE[4]
[1]ENOWA, KSA; [2]ENOWA, KSA; [3]Hitachi Energy, SWEDEN; [4]Hitachi Energy, SWEDEN

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Emergency Dispatch and Electricity Sales Strategies for Distribution Networks Considering Diverse User Demands and Resilience Enhancement

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Xi'an Jiaotong University, China

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Keywords: Geomagnetically Induced Current, Geomagnetic Disturbance, Power Transformers, Power Systems, Magnetotelluric

Verification of a 3-Dimensional Geoelectric Field Model for Geomagnetic Disturbance and Geomagnetically Induced Current Studies

Christopher BALCH[2], Matthew CAHER[1], Gary KOBET[1], Ian GRANT[1], Anna KELBERT[3]
[1]Tennessee Valley Authority, United States of America; [2]CIRES/NOAA, United States of America; [3]United States Geological Survey, United States of America

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Keywords: Resource Adequacy, Probabilistic Analysis, Extreme Events in Power Systems

Weather and Operational Uncertainty in Electricity Market Operations: Stochastic Nodal Adequacy Pricing Approach

F. Selin YANIKARA[2], Alex RUDKEVICH[2], Russ PHILBRICK[1], Richard TABORS[3]
[1]Polaris System Optimization, United States of America; [2]Newton Energy Group, United States of America; [3]Tabors Caramanis Rudkevich, United States of America

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Keywords: Infrastrucuture, Resilience, Power Lines, Fuel Management, Wildfires, Vegetation Management, Extreme Events, Shared Value, Landowners, Wildland Urban Interface

Increasing the resilience of electric transmission grid to extreme events

Pedro MARQUES[1], Luís Mário RIBEIRO[2], João GASPAR[1], Miguel ALMEIDA[2], David ALMEIDA[2]
[1]REN - Redes Energéticas Nacionais, SGPS, S.A; [2]Univ Coimbra, ADAI, Department of Mechanical Engineering

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Keywords: Direct Transfer Trip, Discharge Class, Duty Cycle, Interlock, Sequence Network, Resonance

Mitigating the Risk of Damaging Overvoltages Caused by Back Feeding an Isolated 230 kV Cable System

Bruce CHEN, Baike SHEN, Anil PRADHAN, Edward BURT
BC Hydro, Canada

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Keywords: Photovoltaic Power Generation, Penetration, Satellite Image, Snow Cover, Solar Radiation

Advancing Forecast Technique for Photovoltaic Power Generation in Kansai Area under Snow Conditions

Shiho NAKATA[1], Takayuki YOSHIDA[1], Shota MIYAKE[1], Masaaki SAWASAKI[1], Nozom TAKADA[2], Naoki INABA[2]
[1]Kansai Transmission & Distribution, Inc., Japan; [2]Meteorological Engineering Center, Inc., Japan

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Topics: C2 PS1 - Create Operational Resilience to Extreme/Unpredictable Events
Keywords: Information dissemination, Reserve margin, Supply capacity countermeasures, Unseasonably weather

Tight supply-demand due to unseasonably hot weather and the establishment of countermeasures to deal with the situation

Toshiro KATAOKA, Koji ENYA
TEPCO Power Grid, Inc., Japan

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Topics: C2 PS1 - Create Operational Resilience to Extreme/Unpredictable Events
Keywords: Alarm Management, SCADA, Data Engineering, Machine Learning, Operation

Comprehensible Alarm Text Clustering for Reconfiguration and Real-Time Support

Jhelum CHAKRAVORTY[1], David MARINO[1], Antony HILLIARD[1], Faeza HAFIZ[2], Susanne SCHMITT[3], Georgios MITRENTSIS[3], Giancarlo DALLE AVE[1], Zhaohan SUN[1]
[1]Hitachi Energy Research, Canada; [2]Hitachi Energy Research, USA; [3]Hitachi Energy Research, Germany

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Topics: C2 PS1 - Create Operational Resilience to Extreme/Unpredictable Events
Keywords: Resilience, HILF events, operational resilience, new generation mix, climate change

Power System Resilience: Some Lessons Learned & Best Practices Already Identified, and Other Proposed Measures to Improve the BIPS Operational Resilience

Paulo GOMES[1], Nelson MARTINS[2]
[1]Brazilian NC of CIGRE, Brazil; PSQ; [2]Brazilian National Engineering Academy

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Topics: C2 PS1 - Create Operational Resilience to Extreme/Unpredictable Events
Keywords: HVDC - Electrode sharing - Operating procedure - Installation sharing

Electrode sharing in the Madeira's HVDC and Xingu's HVDC systems – Synergy for an integrated operation

Guilherme AMBONI[1], Ana Bárbara FERNANDES NEVES[1], Edinoel PADOVANI[1], Hanni GONÇALVES[1], Hannah Maria CALDEIRA ANGELKORTE[1], Paulo Eduardo MARTINS QUINTÃO[1], Karina STOCKLER HERSZTERG[1], Sergio Luiz SARDINHA[1], Fernando CATTAN JUSAN[1], Rafael ZYMLER[1], Andre Luiz BARBOSA CORREA[1], Paulo Victor SANTOS[2], Mário ALBUQUERQUE[3], Edson CARVALHO[4], Victor TEIXEIRA[5]
[1]Brazilian NC of CIGRE, Brazil; ONS; [2]Eletrobras ELETRONORTE; [3]IE MADEIRA; [4]BMTE; [5]XRTE State Grid

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Topics: C2 PS1 - Create Operational Resilience to Extreme/Unpredictable Events
Keywords: Commutation Failure, HVDC, Artificial Neural Networks, Synchrophasor Measurement, Predictive Index

Commutation Failure Prediction in the HVDC Multi-Infeed Scenario in Brazil Using Neural Network Technique Application

Rafael DE OLIVEIRA FERNANDES, Maria Cristina DIAS TAVARES
Brazilian NC of CIGRE, Brazil; Unicamp University

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS1 - Create Operational Resilience to Extreme/Unpredictable Events
Keywords: Distribution Three-phase Linear State Estimator, Phasor Measurement Units (PMUs), Microgrid, Situational Awareness and Control, Distributed Energy Resources (DERs)

Pioneering Development and Deployment of Distribution Linear State Estimator: One Utility's Journey

Ali ALVI[1], Thomas ALFORD[1], Marianna VAIMAN[2], Farnoosh RAHMATIAN[3]
[1]ComEd, United States of America; [2]V&R Energy, United States of America; [3]NuGrid Power Corp., Canada

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Impacts of High Renewable Integration on Interconnector Transient Stability – Case Study of Australian Grid

Germane ATHANASIUS, Rodney REUBEN
APD Engineering, Australia

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Topics: C2 PS1 - Create Operational Resilience to Extreme/Unpredictable Events
Keywords: 2021 Jordan blackout, power system resilience, black start units (BSUs), non-black start units (NBSUs), power plant response, preparedness and response strategies, Samra Power Plant, artificial intelligence (AI) techniques, restoration sequences, power gr

Enhancing Power system Resilience: A Case Study of Samra Power Plant Preparedness and Power Restoration during Blackout 2021 in Jordan

Yousef MASHAGBEH, Sara ZYOUD
Samra Electric Power Company, Jordan, Hashemite Kingdom of

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Keywords: power distribution networks, operational resilience, control center, Irbid district electricity company, renewable energy projects

Operational Resilience for Irbid District Electricity Company (IDECO)

Zayed ALHAMMOURI, Haneen BAIDAS
IDECO

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Keywords: Current Zero-Missing, Compensated Cable Circuits, Operational Philosophy, Protection Design

Holistic Approach to Solving the Current Zero Missing Phenomenon in Cable Compensated Networks

Fabian KOEHLER, Keith HARMER, Mark STOCKTON
SSEN Transmission UK

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Development of a Platform for Energy and Power Demand Forecasting Using Advanced Prediction Models, Considering Variables of the Electrical System Operation

Leonardo SANDOVAL[1], Maria ASPRILLA[1], Luis SANTANDER[2], Maria HERNANDEZ[1]
[1]Celsia; [2]Guane Enterprises

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Operation Strategy & Impact Assessment of Extreme Severe Cyclonic Storm 'Biparjoy' on Indian Power System

Akhil GUPTA*[1], Tushar R MOHAPATRA[1], Aman GAUTAM[1], Rohit ANAND[1], M ANANTHAKRISHNAN[1], B M SHAH[2]
[1]Grid Controller of India Limited, India; [2]Gujarat Energy Transmission Corporation

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Keywords: Power System Stability, Voltage and Frequency Recovery, and Oscillation

Analytical review of major disturbances in the electric power system and their impact on the overall power system stability and reliability

Ahmed TAHA, Zain ALABDEEN
Emirates Water & Electricity Company, UAE

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Topics: C2 PS1 - Create Operational Resilience to Extreme/Unpredictable Events
Keywords: Interarea mode, Prony's method, Real-time mode estimation

Real-Time Estimation of Interarea Oscillation Mode Using Sliding Window Prony's Method

Manuel Leonardo SOSA RIOS[1], Oscar Miguel SANTACRUZ SILVERO[1], Luis Fernando COSTA ALBERTO[2], Glauco NERY TARANTO[3]
[1]Itaipu Binacional; [2]University of São Paulo; [3]Federal University of Rio de Janeiro

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Operational Planning for High-Demand Periods in the Indian Power System: Leveraging Operational Experience and Policy Interventions

Talluri SUDHEER*, Anuj KUMAR, Rohit ANAND, Ashok KUMAR, S. C. SAXENA
Grid Controller of India Ltd. India, India

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Methodology of calculating Balancing Reserves in Georgian Power System

David TKESHELASHVILI, Irakli VAKHTANGADZE, Irakli GORDIASHVILI, Ivane MCHEDLISHVILI, Archil KOKHTASHVILI
Georgian State Electrosystem

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Topics: C2 PS1 - Create Operational Resilience to Extreme/Unpredictable Events
Keywords: Distribution Network Resilience, Co-optimizing Restoration, Electric Vehicle, Electric Bus

Resilient Recovery of Distribution Systems in Typhoon Scenario: Co-Optimizing Restoration Service with Multiple Distributed Resources

Wenqiu ZOU
Xi'an Jiaotong University

PS2 - CHANGES ON SYSTEM OPERATION AND CONTROL CONSIDERING THE ENERGY TRANSITION

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Approximate optimal control of wind-HESS system for online frequency regulation based on fuzzy logic control

Zao TANG[1], Jia LIU[1], Pingliang ZENG[1], Youbo LIU[2], Peng LI[3]
[1]Hangzhou Dianzi University, China; [2]Sichuan University, China; [3]North China Electric Power University, China

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Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Ring distribution network, Technical energy losses, Repairing time, Power load flow, Switching strategy

Switching Strategy for Minimizing Energy Losses in Ring Distribution Network during Repairing Time

Abd-El Fattah S. HAMMAD[1], Hossam A. ABD EL GHANY[2], Ahmed M. AZMY[2]
[1]Behira Electricity Distribution Company; [2]Faculty of Engineering, Tanta University

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Automatic Voltage regulators (AVR), French transmission system, SVR

Impact of an enhanced secondary controller on the voltage regulation perfor- mance in the French Transmission System

Julien CALLEC, Adrien GUIRONNET, Carmen CARDOZO, Philippe JUSTON
RTE, France

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An Innovative Indicator for Instability Risk Assessment

Giorgio GIANNUZZI
TERNA, Italy

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Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Battery Energy Storage System, Inverter-Based Resource, Dynamic Modelling, Ride-Through, Solar Photovoltaic

Key Findings and Recommendations Regarding Systemic Performance and Modeling Issues for Bulk Power System Inverter-Based Resources

Alex SHATTUCK[1], Ryan QUINT[2], Aung THANT[1], Rich BAUER[1]
[1]North American Electric Reliability Corporation (NERC), United States of America; [2]Elevate Energy Consulting, United States of America

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Adaptive Capability, Continental Europe Synchronous Area, Inter-area Oscillation, Phasor Measurement Unit (PMU), Wide-area Damping Control

Mitigating Continental Europe North-South Oscillations Using An Adaptive Wide-area Damping Controller: Field Implementation and Testing

Lin ZHU[1], Evangelos FARANTATOS[1], Xinlan JIA[2], Wenpeng YU[2], Yi ZHAO[2], Yilu LIU[2,4], Salvatore TESSITORE[3], Pietro PAU[3], Guido COLETTA[3], Cosimo PISANI[3], Giorgio GIANNUZZI[3]
[1]Electric Power Research Institute (EPRI), United States of America; [2]University of Tennessee, United States of America; [3]Terna, Italy; [4]Oak Ridge National Laboratory, United States of America

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Reactive Power Compensation, DSO-TSO Coordination, Distributed Energy Resources (DER) Integration, Reactive Power Monitoring System

Coordinated Reactive Power Compensation: A Collaborative DSO-TSO Approach

Miguel LOURO[1], Rita LOPES MOURÃO[1], Gonçalo SANTOS[1], José VIEIRA COUTO[2], Filipe RIBEIRO[2]
[1]E-Redes, Portugal; [2]REN, Portugal

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Congestion Management, Topological Remedial Actions, Decision Support, Multi-Objective Optimization, Artificial Intelligence, DC load flow, Human-Machine Interface

GridOptions Tool: Real-World Day-Ahead Congestion Management using Topological Remedial Actions

Jan VIEBAHN[1], Sjoerd KOP[1], Joost VAN DIJK[1], Hariadi BUDAYA[1], Marja STREEFLAND[1], Davide BARBIERI[1], Paul CHAMPION[2], Mario JOTHY[2], Vincent RENAULT[2], Simon TINDEMANS[3]
[1]TenneT TSO; [2]Artelys; [3]TU Delft

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Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Energy Transition, Low Frequency Demand Disconnection, Low-Inertia, RoCoF, System Defence

Improving Frequency Defence Schemes for Critical System Conditions in the Continental European Power System

Padraig BUCKLEY[1], Aleksandar BORIČIĆ[2], Martijn JANSSEN[4], Timothy PLEVIER[4], Jorrit BOS[3], Danny KLAAR[3], Marjam POPOV[1]
[1]Delft University of Technology, Faculty of EEMCS; [2]Delft University of Technology, Faculty of EEMCS & TenneT TSO; [3]TenneT TSO; [4]Alliander N.V.

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Protection Schemes for Renewable Energy Sources Integration in Romanian Power Grid

Roxana A ISTRATE[1], Costel CONSTANTIN[1], Lucian TOMA[2]
[1]CNTEE Transelectrica SA; [2]University Politehnica of Bucharest

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Optimal allocation of Distributed Energy Sources and Capacitor Banks in Distribution Network using Genetic Algorithm

Nikolina MRAKOVIC[1], Zoran MILJANIC[2]
[1]Montenegrin Transmission System; [2]Faculty of Electrical Engineering

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Voltage control sandbox in the Spanish Power System

Juan Julián PEIRÓ, Pablo MARTÍNEZ-FRESNEDA, Hugo GONZÁLEZ, Nicolás SANTOS, Agustín DÍAZ, Marta CABALLERO, Carlos RAMOS
Red Eléctrica, Spain

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Power system inertia, VRE, PFR, RoCoF

Effects of increasing variable renewable energy (VRE) integration on the power system inertia - South African power system

Fiona OLOO
The Council for Scientific and Industrial Research

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Standards-based interoperable Testbed for Development and Assessment of stability monitoring Applications in the Nordic interconnected Grid

Emil HILLBERG
RISE, Sweden

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Challenges of Frequency and Transient Stability arising from the Increased Renewable Energy

Ju-Yong KIM, Tae-Gyun KIM, Hoon-Chul SHIN, Tae-Yong SONG, Jun-Young JOO
Korea Power Exchange, Korea, Republic of (South Korea)

ID: 10748
C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Outage Planning, Outage Planning Coordination, Net Transfer Capacity, Mixed Integer Linear Programming, Contingency Analysis, DC Power Flow, Operational Planning, Asset Management

Outage Planning Automation and Optimization at Swiss Electricity Transmission Grid with High Shares of Hydropower Generation

Marcel STOECKLI[1], Davood RAOOFSHEIBANI*[2], Evangelos VRETTOS[2], Felipe ALVAREZ[2], Beat LOETSCHER[2], Jose ANICETO[2], Adrian SCHULZE[2], Oliver HAUBENSAK[2], Matthias BUCHER[2]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Swissgrid Ltd, Switzerland

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Power System Stability, Cooperative Control, Multi Purpose, BESS, RES

Development of multi-purpose cooperative control method of BESS for a power system with a high share of RES

Ryo YAMAGUCHI[1], Shigeyuki SUGIMOTO[1], Suresh Chand VERMA[1], Kotaro HATTORI[2]
[1]Chubu Electric Power Co., Inc., Japan; [2]Chubu Electric Power Grid Co., Inc., Japan

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Distribution Network, Electricity Demand, Hydrogen, Modelling, Open Data, Renewable Energy, Time Series Data

Development of Future Energy Service Demand Model for Integrated Assessment of High Penetration Renewable Power Generations

Takeyoshi KATO, Chiyori URABE
Nagoya University, Japan

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Wind Generation, Synthetic Inertia, Load-Generation Control, Underfrequency, Overfrequency, Power System Dynamics, Fast Frequency Response

Operation Performance of the Brazilian Electric System with the Contribution of Frequency Controls from the Wind Farms

Flávia FERREIRA[1], Dilton VASCONCELOS[1], Leonardo SANTOS[1], Darlanny DINIZ[1], Arlindo LINS[2]
[1]Brazilian NC of CIGRE, Brazil; ONS; [2]Consultant

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: IT platform architecture, Data exchange, Situational awareness, Voltage stability, Phasor Measurement Units

Wide Area Monitoring and Protection - Application Developments and IT infrastructure

Kjetil O. UHLEN[1], Kjell P. MYHREN[2], Hallvar HAUGDAL[3], Daniel BALTENSPERGER[1], Ole FINSETH[2], Aldrich ZENO[1], Valeria Monteiro DE SOUZA[1]
[1]NTNU Norway; [2]Statnett Norway; [3]SINTEF Energy Norway

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Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition

Adaptive Parameterization of Grid-Supporting Inverters: An Investigation into Complex Coupling Effects for Islanded Operation

Carina LEHMAL, Ziqian ZHANG, Herwig RENNER, Robert SCHÜRHUBER
Graz University of Technology

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Island System, Load Sharing, Power/Frequency Control, Isochronous, Secondary Control, Hybrid Station, Storage

Power sharing and secondary frequency control for Greek island systems supplied by RES+storage hybrid stations and thermal generating plants

Apostolos PAPAKONSTANTINOU, Georgios PSARROS, Stavros PAPATHANASSIOU
National Technical University of Athens (NTUA), Greece

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Non-Interconnected, Isolated Microgrids, Renewable Energy, Wind Park, Control, SCADA

Advanced functionalities for managing Wind Parks in non-interconnected Islands

Stefanos KOKKINELIS, Despoina KOUKOULA, Charalampos PAPPAS, Eleni LAMPRINIDI, Argyro MAGKANIOTI, Konstantinos KAOUSIAS, Andreas REPPAS, Theodora PATSAKA
HEDNO S.A., Greece

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Impact of the balancing strategy in future meshed HVDC offshore systems

Felix RUDOLPH[1], Simon KRAHL[2]
[1]FGH GmbH, Germany; [2]FGH e.V., Germany

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Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition

Operation And Control Challenges With Large Penetration Of Renewable Energy Resources In The Indian Grid

Pankaj Kumar JHA*, M. S. HADA, Jiten DAS
POWERGRID, India

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Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition

Solar Forecasting for Medium Voltage Distributed Energy Resource across a region

Chun Yin FOON, Azizul Hilmi ZULKIFLI, Dg Fatimah AHMAD
Tenaga Nasional Berhad, Malaysia

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Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition

A Concept for Frequency Control and Power Balancing in NEOM Grid of the Future

Lie XU[1], Ramon GIMENEZ[2], Md HABIBURRAHMAN[3], Nagaraju POGAKU[3], Peng LI[3], Nand SINGH[3], Grain ADAM[3]
[1]University of Strathclyde,UK; [2]University Polytechnic of Valencia,SPAIN; [3]ENOWA, NEOM, KSA

ID: 11693
C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Hydroelectric plants, Itaipu Binacional, Monte Carlo simulation, short-term operation planning, uncertainties

Itaipu's experience using Monte Carlo Simulation based tool for short-term operation planning

Ricci OVIEDO, Reinaldo GONZALEZ, Rafael ANDRADE
Itaipu Binacional

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Solar photovoltaic (PV), Intra-hour power generation forecasting, Artificial neural network (ANN), Satellite imagery, Power system operation

Enhanced Intra-hour Solar PV Power Generation Forecast with Satellite Imagery

Jarudate VORASEE, Surat ASVAPOOSITKUL, Somphop ASADAMONGKOL, Somruedee TIPMABUTR
Electricity Generating Authority of Thailand (EGAT), Thailand

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition

An approach to evaluate Under-frequency Load Shedding System of Power System with high share of distributed source

Viet Anh VO HAI*, Anh Tuan NGUYEN, Quynh PHAM, Minh Long VU, Thanh Hai TRAN, The Van NGUYEN, Minh Ha HOANG, Cong Man LE
EVNCRLDC Vietnam

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C2 POWER SYSTEM OPERATION AND CONTROL - Full Papers
Topics: C2 PS2 - Changes on System Operation and Control Considering the Energy Transition
Keywords: Renewable Energy Sources, Energy Transition, Power System Operation, Phasor Measurements Units, Situational Awareness, Linear State Estimation, Oscillations

AEP's Operation Strategy for High Share of RES: Linear State Estimator and Oscillation Monitoring

Horacio SILVA[1], S. WHALEN[1], B. ABU-JARADEH[1], J. KOUTSOURAIS[2], Y. LU[2], P. P. NIEVES[2]
[1]Electric Power Group (EPG); [2]American Electric Power Service Corporation (AEP)

C3 - POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE

PS1 - PUBLIC ACCEPTANCE AND STAKEHOLDER ENGAGEMENT IN POWER SYSTEM GENERATION, TRANSMISSION & DISTRIBUTION INFRASTRUCTURES

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS1 - Public Acceptance and Stakeholder Engagement in Power System Generation, Transmission & Distribution Infrastructures
Keywords: stakeholder engagement, public acceptance, biodiversity, sustainability, nature, nature-inclusive desgin

Harmonizing Nature's Symphony: biodiversity as a powerful tool for public acceptance

Paul HARTMAN[1], Claire DEURVORST[2], Henk SANDERS[2]
[1]Antea Group; [2]TenneT

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS1 - Public Acceptance and Stakeholder Engagement in Power System Generation, Transmission & Distribution Infrastructures

A geodesign-based framework that implements BIM methodology with GIS tools and involve stakeholders in transmission infrastructures projects

Francisco Javier MORENO MARIMBALDO
Red Eléctrica, Spain

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Public acceptance of Facilities in Power Transmission Network in Montenegro

Ljiljana VUČINIĆ, Gordana PEROVIĆ
Crnogorski elektroprenosni sistem

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Multidisciplinary approach to managing wildlife risk in a DSO

Rudi KRUGER
Eskom

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Topics: C3 PS1 - Public Acceptance and Stakeholder Engagement in Power System Generation, Transmission & Distribution Infrastructures

Levels of Electromagnetic Field in the Vicinity of Transmission Overhead Power Lines with Special Conductors

Maja GRBIC[1], Nada CUROVIC[2], Ivan MILANOV[3], Aleksandar PAVLOVIC[1]
[1]Nikola Tesla Institute of Electrical Engineering, Republic of Serbia; [2]Elektromreza Srbije JSC, Republic of Serbia; [3]Elektroistok – Projektni biro, Republic of Serbia

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers

Topics: C3 PS1 - Public Acceptance and Stakeholder Engagement in Power System Generation, Transmission & Distribution Infrastructures
Keywords: Social Impact – Social Licence to Operate – Stakeholders – Stakeholders Engagement – Stakeholders Perception

Periodic stakeholder perception mapping combining social impact and relationship assessments: A strategy to assess and enhance levels of social legitimacy for enterprises

Delfim ROCHA
Brazilian NC of CIGRE, Brazil; Ferreira Rocha Assessoria e Serviços Socioambientais

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Topics: C3 PS1 - Public Acceptance and Stakeholder Engagement in Power System Generation, Transmission & Distribution Infrastructures
Keywords: Dam removal, public acceptance of dam, social impacts, life cycle assessment

Stakeholder Engagement in the Hydropower Decommissioning Process: a Groundbreaking Study in Latin America

Raquel LOURES[1], Marcelo MICHERIF[2], Mariana COELHO[2], Eduardo VAN DEN BERG[3], Paulo POMPEU[3], Adriano LEMOS[1], Yuri CALDEIRA[1], Rafael SOUZA[1], Rafael A. FIORINE[1]
[1]Brazilian NC of CIGRE, Brazil; Cemig GT; [2]SC Empreendimentos; [3]UFLA University - Federal University of Lavras

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS1 - Public Acceptance and Stakeholder Engagement in Power System Generation, Transmission & Distribution Infrastructures
Keywords: Hydroelectric Generation – Indicator Systems – Socio-environmental Programs and Projects – Evaluation Methodology – Efficacy – Effectiveness

Indicator Systems to Measure Efficacy and Effectiveness of Socio-Environmental Programmes of Hydroelectric Power Plants

Ricardo CAVALCANTI FURTADO, Maria F. G. FURTADO, Marcelo FURTADO, Elena FLORISSI
Brazilian NC of CIGRE, Brazil; Diversa Sustainability

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS1 - Public Acceptance and Stakeholder Engagement in Power System Generation, Transmission & Distribution Infrastructures
Keywords: public, risk perception, project feasibility

Dialogue as an Important Link for Increasing the Level of Projects Feasibiltiy

Katarina Ana LESTAN[1], Ana CERK[2], Urška KUGOVNIK[3], Erik MARČENKO[4], Masa DJURICA[5], Maja IVANOVSKI[6], Damjan KOVACIC[7], Andrej SUSTERSIC[8], Rudi VONCINA[9]
[1]Elektroinštitut Milan Vidmar (EIMV); [2]Elektroinštitut Milan Vidmar (EIMV); [3]Elektroinštitut Milan Vidmar (EIMV); [4]Elektroinštitut Milan Vidmar (EIMV); [5]Elektroinštitut Milan Vidmar (EIMV); [6]Elektroinštitut Milan Vidmar (EIMV); [7]Elektroinštitut Milan Vidmar (EIMV); [8]Elektroinštitut Milan Vidmar (EIMV); [9]Elektroinštitut Milan Vidmar (EIMV)

ID: 11069
C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS1 - Public Acceptance and Stakeholder Engagement in Power System Generation, Transmission & Distribution Infrastructures
Keywords: Photovoltaic power generation (PV), Feed-in Tariff, Land use statistics, Satellite image

Investigation on Current Trend of Land Use of Installation Site for Photovoltaic Power Generation Systems

Takeyoshi KATO, Chiyori URABE
Nagoya University, Japan

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Topics: C3 PS1 - Public Acceptance and Stakeholder Engagement in Power System Generation, Transmission & Distribution Infrastructures

Assessing the Sustainability of Future Regional Energy Systems: Integrating Stakeholder Perspectives

Witold POGANIETZ[2], Johannes GAISER[2], Ines JENDRITZKI[2], Peter NOGLIK[1]
[1]Hitachi Energy Germany AG, Germany; [2]Karlsruhe Institute of Technology, Germany

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS1 - Public Acceptance and Stakeholder Engagement in Power System Generation, Transmission & Distribution Infrastructures

Design & Development of India's 1st Indigenous Pivoted Type Insulated Cross Arm for 400kV Transmission Line

Ashish Kr SINGH*, Mahendra CHAURASIA, Chandra KANT, Neeraj Singh GAUTAM, Rajesh GUPTA, Dr Subir SEN, Abhay CHOUDHARY
POWERGRID Corporation Of India Limited, India

PS2 - CLIMATE CHANGE AND IMPACT ON POWER SYSTEM, A HOLISTIC APPROACH

ID: 10120
C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS2 - Climate Change and Impact on Power System, a Holistic Approach
Keywords: Near to Zero Liquid Discharge (NZLD) - Egyptian Electricity Holding Company (EEHC) – Water rationalization - Dissolved Air Flotation process- Filtration system

Installation of Near to Zero Liquid Discharge (NZLD) Units at New Capital Combined Cycle Power Plant (NCCCPP)

Marwa Mansour HUSSEIN[1], Maher Aziz BEDROUS[2], Ismail Yehia Ali ELSAWI[1]
[1]Eyptian Electricity Holding Company EEHC; [2]Senior Counsellor for Energy & Environment

ID: 10237
C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS2 - Climate Change and Impact on Power System, a Holistic Approach

Climate Change Impacts on Low Power Output of Photovoltaic in China

Zongpeng SONG, Bo WANG, Xiaolin LIU, Zheng WANG
China Electric Power Research Institute, China

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS2 - Climate Change and Impact on Power System, a Holistic Approach

Future projections of extreme conditions affecting the Italian Energy System with a multi-hazard approach

Paola FAGGIAN
RSE, Italy

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS2 - Climate Change and Impact on Power System, a Holistic Approach
Keywords: Electrical Substation, Grid Resilience, Climate Change, Coastal Flooding, Substation Cost Estimation

From Risk to Resilience: Quantifying the Financial Impact of Proactive Physical Infrastructure Improvements in Substations

Charlie {Chun} LI[1], Brian P. HERRMANN[1], Matthew D. UBER[2]
[1]Burns & McDonnell, United States of America; [2]J-Power USA, United States of America

ID: 10750
C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS2 - Climate Change and Impact on Power System, a Holistic Approach
Keywords: capacity expansion planning, climate impact, energy planning, European energy system, weather variability

Impact of Climate and Weather Variability on Energy System Planning

Marcel STOECKLI[1], Sebastian PORRAS APARICIO*[2], Alexandre OUDALOV[2], Georgios MAVROMATIDIS[3]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy, Switzerland; [3]ETH Zurich, Switzerland

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS2 - Climate Change and Impact on Power System, a Holistic Approach
Keywords: area planning, carbon emission, land-use change, mitigation, peat

Highlighting forgotten emissions: Calculate and mitigate carbon loss from infrastructure construction on peatland

Ellen TORSÆTER[1], Magni O. KYRKJEEIDE[2], Marte FANDREM[3]
[1]Statnett SF Norway; [2]NINA Norway; [3]NTNU Norway

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS2 - Climate Change and Impact on Power System, a Holistic Approach

Impacts on T&D products by climate change and visa verse

Martin A. STOESSL[1], Ewald SCHWEIGER[2], Eduardo GOMEZ HENNIG[3]
[1]Siemens Energy Austria; [2]Siemens Energy Germany; [3]Siemens Energy Canada

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Topics: C3 PS2 - Climate Change and Impact on Power System, a Holistic Approach

Methodology for the Use of Live Line Works as an Effective Solution During Environmental Phenomena and Regulatory Changes in Developing Countries

William SANTANA, Juan VARELA

ISA Intercolombia

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Topics: C3 PS2 - Climate Change and Impact on Power System, a Holistic Approach

Risk Management of Fluvio-Torrential Events on Electric Transmission Infrastructure in the Face of Climate Change: Lessons Learned from the Mocoa Disaster

Judy VALVERDE, Hernán CORTÉS
Enlaza Grupo Energía Bogotá

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Climate Change Adaptation in Distribution Network Planning: A Resilient Approach for Sustainable Power Systems

Priyanshu PRALIYA*, Ankur SANGWAN, Sovik SHARMA, Akash KUMAR
Tata Power Delhi Distribution Limited, India

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Topics: C3 PS2 - Climate Change and Impact on Power System, a Holistic Approach
Keywords: damages, components reliability, climate change, analytic hierarchy process

Faults and damages in the distribution network due to impact of climate change

Krešimir UGARKOVIC, Ivan ANDRIĆ, Hrvoje JELIĆ, Dinko HRKEC
HEP ODS d.o.o., Croatia

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Development of Trinity Renewable Energy for the Future of East Nusa Tenggara Electricity

Halomoan PARNINGOTAN, Tommy NOVIANTO, Ansats Pram Andreas SIMAMORA, Cristine C BUBRE
PT.PLN (Persero), Indonesia

ID: 11879
C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS2 - Climate Change and Impact on Power System, a Holistic Approach
Keywords: Climate change, transmission grid, adaptation, risk, downburst, flood, scenario, TSO, the Netherlands

The impact of climate change on the Dutch transmission grid: Leading risks and adaptation strategies

Joris DEN BREEJEN[1], Astrid SCHELLINGS-KOEKOEK[2]
[1]TenneT TSO; [2]Movares

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Tata Power Delhi Distribution Limited, India

ID: 11592
C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS2 - Climate Change and Impact on Power System, a Holistic Approach
Keywords: Electrical resilience, Climate change, Climate resilience, Renewable energy sources, Institutional Energy framework, Pollution, Energy taxation, Kuwait

Achieving electrical resilience in the face of climate change in Kuwait

Nayef ALHADAD[1], Jana ALI[2]
[1]Kuwait Authority for Partnership Projects, KUWAIT; [2]Kuwait Authority for Partnership Projects, KUWAIT

ID: 11716
C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
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PT.PLN (Persero), Indonesia

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS2 - Climate Change and Impact on Power System, a Holistic Approach
Keywords: Climate change, transmission grid, adaptation, risk, downburst, flood, scenario, TSO, the Netherlands

The impact of climate change on the Dutch transmission grid: Leading risks and adaptation strategies

Joris DEN BREEJEN[1], Astrid SCHELLINGS-KOEKOEK[2]
[1]TenneT TSO; [2]Movares

PS3 - SUSTAINABILITY STARTING FOR THE SUPPLY CHAIN

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS3 - Sustainability Starting for the Supply Chain
Keywords: Ecodesign, Green Procurement, Grids supply chain, LCA, Sustainability

Ecodesign aspects to enhance circularity and boost sustainable

Marcela MANTILLA, Pascale PRIEUR, Samuel NGUEFEU
RTE, France

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Topics: C3 PS3 - Sustainability Starting for the Supply Chain
Keywords: Product Circularity, High-Voltage equipment, Circularity Strategies, Critical Raw Materials, Life Cycle

Circularity for High-Voltage Equipment

Christophe PERRIER, Thomas BERTELOOT, Eliott PEREZ, Clémence DUMOULIN
GE Grid Solutions, France

ID: 10451
C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS3 - Sustainability Starting for the Supply Chain
Keywords: Construction, Embodied Carbon, Power Infrastructure, Sustainability

A Framework for Sustainability-centric Decision Making in the Selection of Construction Materials for Power System Projects

Alexander D. PAGNOTTA, Lyndsey COVERT
Burns & McDonnell, United States of America

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS3 - Sustainability Starting for the Supply Chain
Keywords: Audible Noise, Corona Effect, HV Overhead Transmission Line

Audible noise reduction of high-voltage overhead lines by applying an eco-design approach while considering impact on the environment

Nebojša PETROVIĆ[1], Iva SALOM[2], Nada UROVIĆ[1], Vladimir ČELEBIĆ[2], Valerijan AKSIĆ[1], Dejan TODOROVIĆ[3], Milenko KABOVIĆ[2]
[1]Elektromreža Srbije JSC, Serbia; [2]Institute Mihajlo Pupin, University of Belgrade, Serbia; [3]Dirigent acoustics LLC, Serbia

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS3 - Sustainability Starting for the Supply Chain
Keywords: Carbon footprint; water footprint, life cycle assessment; sustainability

A step forward on sustainability in the electricity sector: putting LCA on the table

Denise MATOS, Katia GARCIA, Alexandre MOLLICA, Igor RAUPP, Juliano ABREU, João Gabriel LASSIO
Brazilian NC of CIGRE, Brazil; Eletrobras CEPEL

ID: 11067
C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS3 - Sustainability Starting for the Supply Chain
Keywords: Electric vehicle (EV), EV Charger, Modelling, Renewable Energy, Road Traffic Census, LCA

Development of EV Charging Demand Estimation Model based on Road Traffic Census Data for Impact Assessment of High Penetration EV

Takeyoshi KATO, Chiyori URABE
Nagoya University, Japan

ID: 11078
C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS3 - Sustainability Starting for the Supply Chain
Keywords: CO2 Emissions, Life Cycle Assessment, Lithium-ion Battery, Stationary Battery Energy Storage System, Carbon Intensity of Electricity, Degradation, Repurposing, Lifespan

Identifying key factors to mitigate life cycle carbon emissions of stationary battery energy storage systems

Reiko TAKAHASHI[1], Koji NEGISHI[1], Takenori KOBAYASHI[1], Hideki NODA[2], Mami MIZUTANI[2]
[1]Toshiba Energy Systems & Solutions Corporation, Japan; [2]Toshiba Infrastructure Systems & Solutions Corporation, Japan

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C3 POWER SYSTEM SUSTAINABILITY AND ENVIRONMENTAL PERFORMANCE - Full Papers
Topics: C3 PS3 - Sustainability Starting for the Supply Chain

Tackling Scope 3 GHG Emissions of Grid Investments: Creation of Accounting Platform and CO2 Models for Tracking Emissions of Purchased Goods and Works

Vincent DU FOUR, Philipp VON NORMANN
Elia Group, Belgium

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CO2-reduced steel in transformers & challenges with impact evaluation

Matthias SCHICK[1], Marcel HILGERS[1], Georg PUKEL[3], Christina LOSIFIDOU[2], Julian SUER[1], Katherine SCHWIND[2]
[1]Thyssenkrupp Electrical Steel, Germany; [2]Siemens Energy, Germany; [3]Siemens Energy, Austria

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Transforming Sustainable Procurement in the Power Transmission Sector: Evolving Qualification Requirements and Evaluation Criteria

M Siddhardha SIDDHARDHA, Karan SINGH, Priti NAHAR*, Amit BHARGAVA, B Anantha SARMA, G RAVISANKAR
POWERGRID, India

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Keywords: Renewable Energy, Energy Transition, Digitalization, PPA

RENOVA: Traceability System for the Trading of Renewable Energies in the Chilean Electric Market based on Blockchain Technology

Juan AVALOS, Barbara ACEVEDO, Juan Carlos OLMEDO
Coordinador Eléctrico Nacional, Chile

C4 - POWER SYSTEM TECHNICAL PERFORMANCE

PS1 - POWER SYSTEM DYNAMIC ANALYSIS IN THE ENERGY TRANSITION: CHALLENGES, OPPORTUNITIES AND ADVANCES

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Nordic Power System, Power Electronic Interfaced Devices, PEID, Inverter Based Resources, IBR, Converter Stability

Changes in Nordic Power System Dynamics due to Massive Introduction of Wind and Solar Power

Antti HARJULA[1], Herman HÖRNEQUIST[2], Robert ROGERSTEN[2], Christian FLYTKJÆR[3], Olli-Pekka JANHUNEN[1], Jun Bum KWON[3], Eli Maria STENSETH[4], Knut Styve HORNNES[4]
[1]Fingrid Oyj; [2]Svenska Kraftnät; [3]Energinet; [4]Statnett

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Grid connexion requirements, IBR, RMS model validation

An Open-Source Tool for the Validation of Power Park Modules Generic Models

Carmen CARDOZO[1], J. L. MARIN[2], M. DE MIGUEL[2], G. OMS[2], Adrien GUIRONNET[1]
[1]RTE R&D, France; [2]Grupo AIA, Spain

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Co-simulation, EMT-type simulation, FMI, HVDC transmission, Interactions

Parallel simulation of a wide-area EMT model with high penetration of power electronic converters using co-simulation: a real case study

Boris BRUNED, Mehdi OUAFI, Ambroise PETIT, Valentin COSTAN, Yannick VERNAY
RTE, France

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Power systems, Inverted-Bases Resources (IBR), Battery energy storage systems (BESS°, Renewable energy sources (RES)

Study of New Types of Dynamic Interactions in Power Systems with Mixed Conventional and Renewable Generation

Pamela ZOGHBY[1,2,3], Bogdan MARINESCU[2,3], Antoine ROSSE[1], Grégoire PRIME[1]
[1]EDF R&D, France; [2]Ecole Centrale Nantes, France; [3]LS2N, France

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Dynamic assessment of Power System Strength in systems with a large share of generation from renewable sources

Luca BELMONTE
TERNA, Italy

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System stability in dynamic analysis of large power systems enhanced with HVDC reinforcement: HVDC Foggia-Forlì

Andrea URBANELLI
TERNA, Italy

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Regulating Resistors: an Advanced Control Strategy to Achieve Overall System Stability in the Italian Transmission Grid

Cosimo PISANI
TERNA, Italy

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Available Short Circuit MVA, Grid Forming, Positive Sequence Models, Synchronous Condensers

Location and Sizing of Grid Forming Devices in Transmission Power Networks

Deepak RAMASUBRAMANIAN
Electric Power Research Institute (EPRI), United States of America

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Frequency Stability, Inverter-based Resources, Power/Frequency Control, Voltage Control

Unlocking Capability in Transmission Connected Inverters for Improved Reliability of Transmission Power Networks

Deepak RAMASUBRAMANIAN[1], Sushrut THAKAR[1], Julia MATEVOSYAN[2]
[1]Electric Power Research Institute (EPRI), United States of America; [2]Energy Systems Integration Group (ESIG), United States of America

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Offshore Wind Farm, Inter-array Cable, Collector System, Collector Network Equivalent, Electromagnetic Transient

Collector System Equivalencing with Frequency-Dependent Representation for Electromagnetic Transient Models

Swetha SRINIVASAN, Monica PADALA, David ROOP, Kaitlyn BABIARZ, Adam SPARACINO
Mitsubishi Electric Power Products, Inc., United States of America

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Battery Energy Storage System, Grid Forming, Inverter-Based Resource, Modelling

Grid Forming Functional Specifications and Verification Tests for North American Bulk Power System Connected Battery Energy Storage Systems

Aung THANT[1], Hongtao MA[1], Andrew ISAACS[2], Lukas UNRUH[2], Ryan QUINT[6], Deepak RAMASUBRAMANIAN[3], Julia MATEVOSYAN[4], Andy HOKE[5]

[1]North American Electric Reliability Corporation (NERC), United States of America; [2]Electranix, Canada; [3]Electric Power Research Institute (EPRI), United States of America; [4]Energy Systems Integration Group (ESIG), United States of America; [5]National Renewable Energy Laboratory (NREL), United States of America; [6]Elevate Energy Consulting, United States of America

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Intertia Trend, Rate of Change of Frequency, Field Measurement, Generation Mix

Inertia Trend Analysis in the U.S. Eastern Interconnection with Field Measurement Data

Chengwen ZHANG[1], Mark BALDWIN[2], Hongyu LI[1], Zhihao JIANG[1], Saurav DULAL[1], Yilu LIU[1,3]
[1]University of Tennessee, United States of America; [2]Dominion Energy, United States of America; [3]Oak Ridge National Laboratory, United States of America

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: 1% Frequency Droop, Primary Frequency Response, Frequency Containment, Inverter-based Resources, Battery Energy Storage Systems (BESS)

Evaluation of Primary Frequency Response from Inverter-based Resources with 1% Droop Setting

Shruti RAO[1], Jason MACDOWELL[1], Sheila MANZ[1], Sebastian ACHILLES[1], Nicholas MILLER[2], Nitika MAGO[3], Weifeng LI[3], Pengwei DU[3], Luis HINOJOSA[3], Shun Hsien {Fred} HUANG[3]
[1]Consulting Services at GE Vernova, United States of America; [2]Hickory Ledge Consulting LLC, United States of America; [3]Electric Reliability Council of Texas (ERCOT), United States of America

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Simultaneous Voltage and Power Oscillation Damping Control: Towards robust and scalable Grid Requirements and control Solutions

Joakim BJÖRK
Svenska kraftnät, Sweden

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Impact on Frequency Stability of the Feedback in the active Power Control for synchronous Generation

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Impact of active Distribution Networks on Power System Stability – a Case Study

Frédéric SABOT[1], Pierre HENNEAUX[1], Ifigeneia S. LAMPRIANIDOU[2], Panagiotis N. PAPADOPOULOS[2], Keith BELL[2]
[1]BEAMS, Université libre de Bruxelles, Belgium; [2]Dept. of Electronic and Electrical Engineering, University of Strathclyde, United Kingdom

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Impact of Converter-based Demand on Frequency Quality in the Ireland and Northern Ireland Power Systems

Taulant KERCI, Connor DUGGAN, Usman FAROOQ, Simon TWEED, Marta VAL ESCUDERO
EirGrid

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Development of Look Ahead Reactive Power Resource Optimisation Tool for Voltage Security in IBR Dominated Systems

Mohammad JAFARIAN[1], Marta VAL ESCUDERO[1], Niall RUTHERFORD[1], Eoin KENNEDY[1], Diarmaid GILLESPIE[1], Mary HENNESSY[1], Narsi VEMPATI[2], Roger TREINEN[2], Fernando MAGNAGO[2], Joseph BRIGHT[2], Mauro PRAIS[2], Roozbeh EMAMI[2], Madhusudhana SADAGOPAN[2], Wesley VANCE[2]
[1]EirGrid; [2]Resource Innovations

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances

Enhancing the Evaluation of Rate of Change of Frequency During Fault Contingencies Simulated in Phasor-Domain Tools

Mostafa BAKHTVAR[1], Dusko NEDIC[2], Mohammad JAFARIAN[2], Ismail IBRAHIM[2], Emma FAGAN[2], Marta VAL ESCUDERO[2], Eoin KENNEDY[2]
[1]SSE Thermal; [2]EirGrid

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Energy Storage to enhance Transmission Capacity - a Case Study on the Swedish Transmission Grid

Arvid BJÖREMARK
DNV Sweden AB, Sweden

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Power System, Frequency Stability, Frequency Containment Reserve, Demand-Side Device, Lighting Device

Experimental Evaluation of Lighting Device's Potential for Securing Frequency Control Reserve Using Demand-Side Devices

Hayato SATOH, Ayako YASUOKA, Muneki MASUDA
Central Research Institute of Electric Power Industry, Japan

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Automated framework, control interaction, machine learning, python framework, stability analysis, subsynchronous oscillations

Automatic Detection of Subsynchronous Oscillations

Diptargha CHAKRAVORTY[1], Alexandru Christian NEAGU[2], Jochen I CREMER[2]
[1]TNEI Services Ltd UK; [2]Delft University of Technology Netherlands

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Automated framework, control interaction, eigenvalue, frequency domain analysis, grey box method modal analysis, machine learning, small signal analysis, subsynchronous oscillation

Framework for Identification of Subsynchronous Oscillation Risks

Diptargha CHAKRAVORTY[1], Jaime TRIVINO[1], Sami ABDELRAHMAN[2]
[1]TNEI Services Ltd UK; [2]National Grid ESO UK

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Identifying potential sub-synchronous oscillations using impedance scan approach

Shahil SHAH[1], Jingwei LU[2], Nilesh MODI[1]
[1]National Renewable Energy Laboratory, USA; [2]Australian Energy Market Operator, Australia

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances

Large scale grid forming BESS replaces synchronous generation enabling high renewable penetration & low system load in Australia's major northern grid

Brendan TRUONG[1], Stanislav CHEREVATSKIY[2], Stephen SPROUL[2], Vimeshan PILLAY[1], Heath LANG[3]
[1]Power and Water, Australia; [2]Hitachi Energy, Australia; [3]Owners Engineer - Territory Generation, Australia

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On the Use of the Congestion Forecast Processes for Early Warning of Possibly Tensed Situations

Benoît BLETTERIE[1], Martin LENZ[1], Mike Alexander LAGLER[1], Herwig RENNER[2]
[1]Austrian Power Grid; [2]Graz University of Technology

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Impact of Grid-Forming Solutions on North-Western Victorian Network in Australia

Logan PETERS, Yiju MA
Australian Energy Market Operator, Australia

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Phasor Measurement Units, Real Time Monitoring, Voltage Stability Assessment, Power System Security, Oscillation Damping

PMU Applications for Voltage Stability monitoring and Oscillation analysis

Costas VOURNAS[1], Panos MANDOULIDIS[1], Orestis DARMIS[1], Spiros CHOUNTASIS[2], Stavros TSAKIRIS[2], George KORRES[1]
[1]ECE NTUA, Greece; [2]IPTO, Greece

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Photovoltaic (PV), Distributed Resources (DR), Sudden Voltage Change, Point of Common Coupling (PCC), Gird Impact Study (GIS), Energy and Mineral Regulation Commission (EMRC).

A Novel Methodology for Grid Impact Studies of Photovoltaic Systems

Saddam ALTAMIM, Sawsan ABDELAH, Ahmad ALSAYIS
IDECO

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: PMU, Dimensionality Reduction Techniques, Principal Component Analysis, Singular Value Decomposition.

Oscillation Modes Identification Via Singular Value Decomposition and Principal Component Analysis

Carlos FERRANDON[1], Abraham ALVAREZ[1], Jonathan CERVANTES[2], Zia EMIN[3]
[1]PSC UK; [2]Energinet Denmark; [3]EPRI UK

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances

Load Model Evolution for the Colombian Power System

Neby CASTRILLÓN[1], Juan GONZÁLEZ[1], Estefania GALLEGO[1], Natalia BARROS[1], Sebastián LOAIZA[2], Juan MESA[2], Juan GALINDO[3], Juan HOYOS[3]
[1]XM; [2]University Pascual Bravo; [3]Universidad Nacional

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: EMT Analysis, Inverter-Based Resources, RES, SCR

EMT Modeling and Analysis of the Chile's Power Grid with High Penetration of Inverter-Based Renewable Energy Sources

Victor VELAR, Rodrigo ESPINOZA, Eugenio QUINTANA, Simon VELOSO
Coordinador Eléctrico Nacional, Chile

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Variable Renewable Energy, ESCR, EMS-SCADA

Real Time System Strength Monitoring in the Chilean National Electric System

Jorge VARGAS, Rodrigo ESPINOZA, Victor VELAR, Gretchen ZBINDEN
Coordinador Eléctrico Nacional, Chile

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances

STATCOM Modelling Assessment and Performance Analysis in Rajasthan Renewable Complex of India

Ebin Cherian MATHEW*, Priyam JAIN, Gaurab DASH, Aman GAUTAM, Rahul SHUKLA, Manas Ranjan CHAND, Vivek PANDEY, Surajit BANERJEE, S.C. SAXENA
Grid Controller of India Limited, India

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Strategies for Mitigation of Oscillations in IBR Penetrated Network in India

Ebin Cherian MATHEW *, Aman GAUTAM
Grid Controller of India Limited, India

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances

Enabling System-Level EMT Studies of Danish Power Systems

Yicheng LIAO[1], Liang LU[1], Jun Bum KWON[1], Nan QIN[1], Dharshana MUTHUMUNI[2], Yousef PIPELZADEH[2], Karl DIRKS[2]
[1]Energinet; [2]Power Systems Technology Centre

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SSSC Model Validation Experience for the Colombian Power System

Neby CASTRILLÓN, Jaime PINZÓN, Juan GONZÁLEZ, Maria ZAPATA, Camilo MORENO
XM

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances

Comprehensive Analysis of Colombian Power System Oscillations

Juan GONZÁLEZ, Neby CASTRILLÓN, Victor MEZA
XM

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Data Center, Generator Pool, Pulse Load, Model Validation, Dynamic Security

Evaluation of the robust operation of a diesel Generator Pool in new proposed Data Center electrical topology considering specific Generator manufacturer

Georgios KARVELIS[1], Christos AGATHOKLEOUS[1], Vassilis BAKOLAS[1], Drazena BROCILO[2], John WILTSHIRE[2], Salver CORHODZIC[2]
[1]PROTASIS SA, Greece; [2]META, USA

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Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances

Enhancing Dynamic Performance Validation of Transient Stability Models using Argentina's Phasor Measurement Units

Nicolás DE SAN JUAN, Félix GALLEGO, Trinidad UBICI
CAMMESA

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS1 - Power System Dynamic Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Type IV Wind Turbine Generator, Model Validation, EMT Modelling, Offshore Wind, Machine Learning

EMT-Based Machine Learning Model for Fault Ride-Through Assessment in Type IV Offshore Wind Turbine Generators

Gabriel Miguel Gomes GUERREIRO[1], Ranjan SHARMA[1], Frank MARTIN[1], Guangya YANG[2]
[1]SGRE; [2]Technical University of Denmark (DTU)

PS2 - POWER QUALITY (PQ) AND ELECTROMAGNETIC COMPATIBILITY (EMC) ANALYSIS IN THE ENERGY TRANSITION: CHALLENGES, OPPORTUNITIES AND ADVANCES

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Topics: C4 PS2 - Power Quality (PQ) and Electromagnetic Compatibility (EMC) Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: EMT simulation, harmonic studies, sensitivity analysis, wind parks

Sensitivity Analysis Methods for Onshore Harmonic Studies

Benoît DE FOUCAUD, Xavier-Marie VIEL
RTE, France

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Topics: C4 PS2 - Power Quality (PQ) and Electromagnetic Compatibility (EMC) Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Load Composition Modelling, Frequency-Dependent Impedance, Distribution Network, Modelling Process, Motor Load

Influence of Composition-Dependent Load Modelling on System-Wide Harmonic Impedance Characteristics

Peter BONINO, Samantha DEENEY, David ROOP
Mitsubishi Electric Power Products, Inc., United States of America

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS2 - Power Quality (PQ) and Electromagnetic Compatibility (EMC) Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Geomagnetic Disturbance, Geoelectric Field Grid Map, Nearest Neighbor Search, Geomagnetically-Induced Current, Transmission Line Branch Induced Voltage

Real Time Geomagnetic Disturbance Analysis of Bulk Power System Grid using Geoelectric Field Grid Maps

Krishnat PATIL[1], Christopher BALCH[2]
[1]Siemens Power Technologies International, United States of America; [2]CIRES & NOAA Space Weather Prediction Center, United States of America

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS2 - Power Quality (PQ) and Electromagnetic Compatibility (EMC) Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Inverter Based Resources, Power Quality, Harmonic Model, Harmonic Summation, Harmonic Aggregation

Estimation of Harmonic Exponent Summation Factors for Type 3 DFIG Wind Turbines

Amir KAZEMI, Jagdeep KAUR
GE Consulting Services, United States of America

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Topics: C4 PS2 - Power Quality (PQ) and Electromagnetic Compatibility (EMC) Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Emission, Supraharmonics, Summation, Aggregation

Harmonic and Supraharmonic emission and Aggregation Characteristics of some end use loads sold in the US

Gaurav SINGH, Jason JOHNS
Electric Power Research Institute (EPRI), United States of America

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS2 - Power Quality (PQ) and Electromagnetic Compatibility (EMC) Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Power quality, voltage unbalance, negative phase sequence, overhead lines

Voltage unbalance in overhead lines with EHV and HV circuits combined in the same tower

Jeroen VAN WAES[1], Frederik GROEMAN[2], Tam MAI[2], Kees KOREMAN[3]
[1]TenneT TSO / Eindhoven University; [2]DNV; [3]TenneT TSO

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Topics: C4 PS2 - Power Quality (PQ) and Electromagnetic Compatibility (EMC) Analysis in the Energy Transition: Challenges, Opportunities and Advances

Advancing Power Quality Measurements in the Swedish Transmission Grid

Oscar LENNERHAG
Independent Insulation Group Sweden AB, Sweden

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Topics: C4 PS2 - Power Quality (PQ) and Electromagnetic Compatibility (EMC) Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Power Quality, Voltage Dips, Energy Transition

Post-Energy Transition Voltage Dips Assessment: A Dutch Transmission Network Case Study

Roozbeh TORKZADEH[1], Jeroen VAN WAES[2], Sjef COBBEN[1]
[1]Eindhoven University of Technology; [2]TenneT TSO BV and Eindhoven University of Technology

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Topics: C4 PS2 - Power Quality (PQ) and Electromagnetic Compatibility (EMC) Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Geomagnetically induced currents, Power quality, Reactive power Q-loss, Voltage stability

Towards A Novel Approach To Voltage Magnitude, Harmonics, And Voltage Stability In The Presence Of GICs

Trevor GAUNT[1], Pitambar JANKEE[1], Hilary CHISEPO[2], Michel MALENGRET[3]
[1]University of Cape Town; [2]ESP Consulting; [3]MLT Drives, South Africa

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A Methodology to Define Radiated High Frequency Emission of In-Situ Measurements in Harsh Environments

Emil ERIKSSON
Hitachi Energy Sweden AB, Sweden

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Voltage Harmonics Trends based on Field Measurements on the Irish Transmission Network

Daphne SCHWANZ[1], Aisling CARROLL[2], Chandrasekaran SUBRAMANIAN[1], Oisin GOULDING[1], Alan ROGERS[1]
[1]EirGrid; [2]University College Dublin

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Topics: C4 PS2 - Power Quality (PQ) and Electromagnetic Compatibility (EMC) Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Power quality – Harmonic - Harmonic Emission - Background Harmonic - Harmonic Responsibility - Superposition Method - Wind Farm - Wind Turbine - Harmonic Study

Reduction of the Influence of the Background Harmonic Voltage on the Assessment of Harmonic Current at WT Terminals by the Application of the Superposition Method

Miguel P. DE CARLI, Leonardo O. GRANDER
Brazilian NC of CIGRE, Brazil; Eletrobras CGT ELETROSUL

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Keywords: power system, electromagnetic compatibility, investigation method, power plants and substations, monitoring system

Electromagnetic Compatibility in Auxiliary DC Power Supply System

Ruslan BORISOV[1], Andrey GOLDUN[2], Maxim SMIRNOV[2]
[1]National Research University «MPEI», Russian Federation; [2]RPC ELNAP Ltd., Russian Federation

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Harmonic Assessment in Renewable Energy Zones

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HATCH, Australia

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Keywords: HVDC, GIS, VFTO, EMC, IEC Standards

EMC Issues within HVDC System under GIS Environment

Keesang SONG[1], Insoo PARK[1], Gearoid OHEIDHIN[2], Olivier CLEMENCON[1], Chanhyuk YIM[3]
[1]KAPES, Republic of Korea; [2]GE Grid Solutions, United Kingdom; [3]KEPCO, Republic of Korea

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Exploratory Analyses of Power System Harmonic Measurements Using Principal Component Analysis

Bjarne S. BUKH[1], Vladislav AKHMATOV[1], Chris L. SKOVGAARD[1], Filipe F. DA SILVA[2], Claus LETH BAK[2]
[1]Energinet; [2]Aalborg University

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Flexible network model to study the impact of future changes in transmission systems on harmonic levels and impedance

Ana M BLANC[1], Max DOMAGK[1], Jan MEYER[1], Marco LINDNER[2]
[1]Dresden University of Technology, Germany; [2]TransnetBW GmbH, Germany

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Multi-Platform Analysis for Harmonic Emission Assessment of M-SSSC FACTS Devices in the Santa Marta Substation (Colombia)

Juan BOTERO[1], Carlos BORDA[1], Jhon CALDERON[2]
[1]Smart Wires Inc; [2]ISA Interconexión Eléctrica

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Topics: C4 PS2 - Power Quality (PQ) and Electromagnetic Compatibility (EMC) Analysis in the Energy Transition: Challenges, Opportunities and Advances
Keywords: Power Quality, Background Harmonics, Amplification Factor, Planning Level, Data Analysis

Background harmonics: Quantifying network assumptions and impacts

YiLin {Inez} ZHENG
Goldwind

PS3 - INSULATION CO-ORDINATION AND LIGHTNING INTERFERENCE ANALYSIS: CHALLENGES, OPPORTUNITIES AND ADVANCES

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Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: ATP, Grounding Grid, Lightning stroke, Soil Resistivity, Transmission Line Approach (TL), Frequency content, Uniform Soil

Effect of frequency content on the effective area of grounding grid at uniform soil resistivity

Adel Z. EL DEIN[1], Sara YASSIN OMAR[2]
[1]Aswan University, Thebes Technological University; [2]Upper Egypt Electricity Distribution Company

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Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: Overvoltage withstand, transformers, TOV, insulation coordination

Transformer withstand capability to temporary overvoltages: a general determination method from standard input data

Manuel MARTINEZ-DURO
EDF, France

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Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: Incipient Fault Detection, Online Condition Assessment, Condition Based Maintenance, Waveform Analytics

Utilizing Substation-based Monitoring to Improve Condition Assessment of Distribution Networks

Jeffrey WISCHKAEMPER, B. Don RUSSELL, Carl BENNER, Karthick MANIVANNAN
Texas A&M University, United States of America

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Long Tail Withstand Voltage Test (TOV) on the HVDC Cable and Accessories of the Italy-France Interconnection: a comparison between laboratory and infield results

Grazia BERARDI
PRYSMIAN GROUP, Italy

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Contamination Map and Design Optimization for Increased Transmission Reliability and Resilience: The Italian Experience

Massimo MARZINOTTO[1], Alessandra BALZARINI[2], Piero BERARDI[1], Michele DE NIGRIS[2], Paolo OMODEO GIANOLO[2], Alberto PIGINI[3], Giovanni PIROVANO[2], Guido PIROVANO[2], Pierluigi PORTOGHESE[1], Roberto SPEZIE[1], Anna Maria TOPPETTI[2]
[1]TERNA, Italy; [2]RSE – Italy; [3]Consultant - Italy

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Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: Protection, System Interaction, Transients, Transformer Modeling

Enhancing Power Transformer Reliability: High-Frequency Modeling, Transient Interactions, and Overvoltage Protection Scheme

F. NASIRPOUR[1], B. BEHDANI[1], A. HEIDARY[1], M. GHAFFARIAN NIASAR[1], F. GHASSEMI[2], K. VELITSIKAKIS[3], M. VAN RIET[4], M. WILKINSON[5], M. VAN DER MEIJDEN[3], S. NAUTA[4], I. TANNEMAAT[3], J. VEENS[5], M. POPOV[1]
[1]Delft University of Technology, Faculty of EEMCS; [2]National Grid Electricity Transmission plc; [3]TenneT TSO B.V.; [4]Alliander N.V.; [5]Royal SMIT Transformers B.V.

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Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: non-standard waveform, re-ignition, temporary overvoltage, TOV, harmonic resonances, vacuum circuit breaker

Service Experience in the Dutch Transmission Grid with Non-standard Overvoltage Waveforms & their Impact on the Component Insulation

K. VELITSIKAKIS, I. TANNEMAAT
TenneT TSO B.V.

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: Earthing impedance, high frequency, lightning strike, measurement, simulation

A methodology of measuring, modelling and simulating of high frequency earthing impedance

Aman LAMBA, Jiayang WU, Ebbo DE MEULEMEESTER, Onno NOBEL, Leo LAGENDIJK
DNV

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Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: Harmonic, EHV Cable, Inrush Current, Overvoltage

Overvoltages with high harmonics when connecting step-up transformers in a pumped-storage power plant: A case study

Marcel STOECKLI[1], Florian BRANTSCHEN*[2], Romain BIRBAUM[2], Cecile JOST[3], Yves PANNATIER[4], Georg KOEPPL[5]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Alpiq SA, Switzerland; [3]Swissgrid AG, Switzerland; [4]HYDRO Exploitation SA, Switzerland; [5]self employed, Switzerland

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Simplified Methods and Models for Calculation of Switching Overvoltages on Transmission Lines including Effects of corona Discharges

Jan LUNDQUIST
Independent Insulation Group Sweden AB, Sweden

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Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: Gas insulated substations - Clean Air insulation – Sulfur Hexafluoride insulation – Very Fast Transient Overvoltage – Conducting Pipe Modelling - Transformer Modeling

Very Fast Transient Overvoltage Analysis in Clean Air and SF6 Gas Insulated Substation Modules Using the Extended Transmission Line Theory

Edgar RIBEIRO[1], Angélica ROCHA[2], Alberto DE CONTI[3]
[1]Brazilian NC of CIGRE, Brazil; NSA Consultoria e Informática LTDA; [2]ATG Engenharia LTDA; [3]Universidade Federal de Minas Gerais

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Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: Climate change, Lightning, Transmission Line

Climate Characterization and Historical Changes in Density and Intensity of Lightning around the 500 kV Bacabeira-Parnaíba Transmission Line

Rafael SILVA ALÍPIO[1], Ana Clara MARQUES[3], Pedro REGOTO[3], Luciano RITTER[3], Euro PINTO DE ALMEIDA[4], William MEJIA[5], Fernando DINIZ[2], Thiago Luiz FERREIRA[2], Fabian ROJAS[5], Oscar GONZALEZ[5]
[1]Brazilian NC of CIGRE, Brazil; Cefet-MG University; [2]Argo Energia; [3]Climatempo; [4]Consultant; [5]Enlaza GEB

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: Transient Overvoltage, Isolated Ground Systems, Mitigation, Voltage Scaling, Intermittent Earth-Fault

Voltage Scaling Phenomenon in Isolated Ground Systems – Approach and Proposal for Mitigation Analysis of a Real Case in Brazil

Rafael DE OLIVEIRA FERNANDES[1], Caio ELEUTÉRIO[2]
[1]Brazilian NC of CIGRE, Brazil; UNICAMP University; [2]ARGO Energia

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Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: Lightning, Surge, Electromagnet transient analysis, Finite-difference time-domain method, Power cable, Control cable, Transmission line, Substation, Switching

Recent progress in three-dimensional FDTD-based electromagnetic transient analysis of electric power facilities

Akiyoshi TATEMATSU[1], Yoshihiro BABA[2], Toshiaki UEDA[3], Toshihiro TSUBOI[4], Soichi MORIGUCHI[5]
[1]Central Res. Inst. of Electric Power Industry, Japan; [2]Doshisha University, Japan; [3]Daido University, Japan; [4]Tokyo Electric Power Company, Japan; [5]Chubu Electric Power Grid Co, Inc., Japan

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Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: Effective Length, Ground Return Impedance, High Frequency Cable Model, Impulsive Grounding Impedance

Effect of cable sheaths on grounding performance of wind power plants in high frequency region

Melih GÜNERI[1], Bora ALBOYACI[2]
[1]Kratis Engineering Türkiye; [2]Kocaeli University Türkiye

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C4 POWER SYSTEM TECHNICAL PERFORMANCE - Full Papers
Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: ATPDraw, backflashover, lightning overvoltage, transmission line modelling

Evaluation of the Impact of Underbuilt Wire on Backflashover Critical Current in Transmission Line

William Gonzalo FLORES RUIZ[1], Jaimis S. LEON COLQUI[2], Jose PISSOLATO FILHO[2]
[1]National University of Engineering, Peru; [2]State University of Campinas, Brazil

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Transient switching mitigation in 115kV offshore platforms sensitive loads by introducing controlled switching device in three-phase gang-operated breakers

Nabil FARES[1], Thaiban RAJAB[1], Vincent BALVET[2], Abdulaziz HANNANI[1]
[1]Saudi Aramco, KSA; [2]Vizimax, Canada

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POWERGRID Experience on Insulation Coordination of High Voltage Substations Located at High Terrain and Snow Bound Area

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Resonance in 765 KV Shunt Compensated Transmission Lines

Dr Subir SEN, B.B MUKHERJI, Mr ABHISHEK, G.A. SHINDE*, Pradeep PATIL, Pankaj MAHATA, Ashish SHARMA
POWERGRID Corporation of India Ltd, India

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Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: lightning current, measurement, surge arrester, waveshape

Measurement of lightning current circulating in line arresters and through the transmission line tower

Silvia SINČIĆ[1], Ivo UGLEŠIĆ[2], Alan ŽUPAN[1]
[1]Croatian Transmission System Operator (HOPS), Croatia; [2]Faculty of Electrical Engineering and Computing University of Zagreb, Croatia

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Topics: C4 PS3 - Insulation Co-Ordination and Lightning Interference Analysis: Challenges, Opportunities and Advances
Keywords: Critical flashover voltage, EMTP simulations, HV testing, insulator string flashover model, lightning overvoltages

Modelling of Flashover on Insulator Strings of Overhead Lines Due to Lightning Overvoltages

Bozidar FILIPOVIC-GRCIC[1], Nina STIPETIC[1], Franjo VUKOVIC[1], Dalibor FILIPOVIC-GRCIC[2]
[1]University of Zagreb Faculty of Electrical Engineering and Computing, Zagreb, Croatia; [2]Končar – Electrical Engineering Institute Ltd., Croatia

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Supervision and Forecast of Lightning Threat on Transmission Lines

Leonardo PORRAS[1], Ronald DICKSON[1], Guillermo FONSECA[1], Daniel ARANGUREN[2]
[1]ISA Intercolombia; [2]Keraunos SAS

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Analysis of Several Hypotheses that Caused the Explosion of a 500 kV Current Transformer During Disconnector Operations

German GUTIERREZ, Juan RODRIGUEZ
ISA Intercolombia

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[1]TenneT TSO B.V.; [2]Oakley Greenwood; [3]Eirgrid; [4]Posoco; [5]OMIE; [6]Aalborg university

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Keywords: Fuel Cooperation scheme, Co-optimization Market, Renewable Energy Sources

Challenges and future prospects for Japanese wholesale electricity market and balancing market

Hiroki SAKAI[1], Kenichi SUGAHARA[2], Yuki KATAOKA[1], Akihiro MAEKAWA[3], Ken FURUSAWA[4]
[1]Chubu electric Power Grid Co., Inc., Japan; [2]Chubu electric Power Co., Inc., Japan; [3]Kansai Transmission and Distribution, Inc., Japan; [4]Central Research Institute of Electric Power Industry, Japan

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Benchmarking Indian Load Despatch Centres for Excellence and Good Governance: The Experience of LDC Excellence Award in India

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[1]Ex-CEO, Grid-India, India; [2]South Asia Regional Energy Partnership, India; [3]Washington State University, USA; [4]Grid Controller of India Limited, India

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Can Demand Side Management in the Sectors of Industry and Services Increase Market Resilience?

Stephan KIGLE[1], Nadja HELMER[2], Quirin STROBEL[1], Peter WIRTZ[3], Christiane GOLLING[4]
[1]FfE Munich & TUM, Germany; [2]FfE Munich, Germany; [3]RWTH Aachen University, Germany; [4]50Hertz Transmission GmbH, Germany

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Moral Hazard Assessment of Loss Reduction Plans in Colombia

Carolina GOMEZ, Hector GOMEZ
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Keywords: Balancing Reserves, Capacity Allocation, Cross-Zonal Capacity, Electricity Markets

Comparing the Co-Optimized and Market-Based Allocation of Cross-Zonal Capacity for the Exchange of Balancing Capacity

Claire LAMBRIEX, Marlon THIES
RWTH Aachen University

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Conjectural-Variations Equilibria in Electricity-Carbon Coupling Markets: An All-Scenario-Feasible MIP Formulation

Yanzhe REN[1], Yue ZHOU[2], Gengfeng LI[1], Zhaohong BIE[1]
[1]Xi'an Jiaotong University, China; [2]Cardiff University

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Study on the effects of the flow-based approach in the Italian bidding zones capacity calculation

Luca LUZI[1], Mario LIMONE[1], Alessio MARCHESIN[1], Federico DEL PEDRO[2], Ulderico BAGALINI[2], Stefano QUAIA[3], Federico QUAGLIA[1]
[1]TERNA, Italy; [2]CESI GROUP; [3]University of Trieste, Italy

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Keywords: Distributed Energy Resources (DER), Grid Services, Wholesale Electricity Markets, TSO-DSO Coordination

Structuring the Coordination Across Transmission and Distribution to Support Value Stacking Scenarios Combining Multiple DER-Provided Grid Services

Tanguy HUBERT
Electric Power Research Institute (EPRI), United States of America

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Topics: C5 PS2 - Preparing for the Future with Moving Targets
Keywords: Dynamic Reserves, Intermittent Energy Sources, Operating Reserve Requirements, Price Formation, Wholesale Electricity Market Structure

Dynamic Procurement of Reserves in New York Electricity Markets

Pradip KUMAR[1], Matt MUSTO[1], Nate GILBRAITH[1], Rana MUKERJI[1], Michael DESOCIO[2]
[1]New York Independent System Operator (NYISO), United States of America; [2]Luminary Energy, United States of America

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Topics: C5 PS2 - Preparing for the Future with Moving Targets
Keywords: Combined-Cycle Generator, Operational Flexibility, Multiple Configuration Resource Model, Wholesale Electricity Market

Optimizing Combined-Cycle Generators in PJM's Wholesale Electricity Markets Using a Hybrid Multiple Configuration Resource Model for Enhanced Flexibility

Anthony GIACOMONI, Danial NAZEMI
PJM Interconnection, United States of America

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Topics: C5 PS2 - Preparing for the Future with Moving Targets
Keywords: Real-time Pricing, Bid-in Demand, Demand Response, Flexibility, Wholesale Electricity Markets

Finding Flexibility in Large Flexible Loads: Making Demand Equivalent to Generation in Wholesale Markets

Debra LEW[1], Richard O'NEILL[2], Erik ELA[3], Mark AHLSTROM[4]
[1]Energy Systems Integration Group (ESIG), United States of America; [2]Consultant, United States of America; [3]Electric Power Research Institute (EPRI), United States of America; [4]NextEra Energy Resources, United States of America

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Novel Settlement Mechanism for Encouraging Flexibility in the Balancing Markets

Mazaher HAJI BASHI, Brendan O'SULLIVAN
EirGrid

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The Idea of Fed-Balancing Energy Market, a Smart Use of Balancing Capacity Auction Results

Mazaher HAJI BASHI, Niamh DELANEY
EirGrid

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Transforming the power system for future generations - the role of dynamic capacity markets and de-rating factors

Aodhagan DOWNEY
EirGrid

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Topics: C5 PS2 - Preparing for the Future with Moving Targets
Keywords: Brazil; Competitiveness; Market; Offshore; Wind; Perspectives; Regulation; Technology

Analysis on the integration of new technology in the Brazilian electricity market – Offshore wind case

Solange DAVID[1], Vinícius DAVID[2]
[1]Brazilian NC of CIGRE, Brazil; Consultant; [2]Thymos Energia

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Topics: C5 PS2 - Preparing for the Future with Moving Targets
Keywords: Clean energy transition, Connection products, Firm properties, Non-firm properties

Connection products in electricity networks

Eivind GRAMME[1], Selina KERSCHER[2]
[1]Lede Norway; [2]Universsity of oviedo Spain

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Topics: C5 PS2 - Preparing for the Future with Moving Targets

Implementation of Virtual Power Purchase Agreements to Support Carbon Neutral Investments in the Russian Electricity Market

Vladislav BEREZOVSKY[1], Anna PAVLYCHEVA[2], Sergey GAFAROV[3], Andrey SVIRIDOV[3], Victor BALYBERDIN[4]
[1]Carbon Zero LLC, Russian Federation; [2]University of Chicago, USA; [3]Association «NP Market Council», Russian Federation; [4]SKM Market Predictor AS, Norway

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Topics: C5 PS2 - Preparing for the Future with Moving Targets

Impact of Carbon Pricing on Wholesale Electricity Prices and Energy Transition Scenarios in Russia

Vladislav BEREZOVSKY[1], Nikita IVANOV[2], Tatiana REMIZOVA[3], Ljubov CHERNEY[4], Dmitry KOSHELEV[5]
[1]Carbon Zero LLC, Russian Federation; [2]SKM Market Predictor AS, Russian Federation; [3]JSC Administrator of the Wholesale Electricity Market Trading System, Russian Federation; [4]SKM Market Predictor AS, Finland; [5]JSC Novavind, Russian Federation

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Topics: C5 PS2 - Preparing for the Future with Moving Targets
Keywords: Renewable Energy, Storage, Grid Congestion, Connection Agreement, Power Limitation, Hosting Capacity

Connection agreements subject to limitations for renewable generation and storage facilities in Greece

Apostolos PAPAKONSTANTINOU, Evangelos CHATZISTYLIANOS, Georgios PSARROS, Stavros PAPATHANASSIOU
National Technical University of Athens (NTUA), Greece

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Not Drowning, Waving! Australia's Net Zero Ambitions Enabled by multiple approaches? Or drowning in complexity?

Jacqueline BRIDGE, Jonathan DENNIS
Powerlink Queensland, Australia

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Keywords: Distributed Energy Resource (DER), Distributed Energy Trading Market, Demand Side Electrical Value, Energy Management System (EMS), Distribution Locational Marginal Price (DLMP), Value of Lost Load (VoLL)

Mechanisms for Trading the Electrical Value of the Demand Side to Promote the Usage of Distributed Energy Resources

Takeshi YAMASHITA[1], Hideki KIBATA[1], Tokunari ANAI[1], Hiroshi OKAMOTO[2]
[1]Tokyo Electric Power Company Holdings. Inc., Japan; [2]TEPCO Power Grid. Inc., Japan

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Keywords: Prosumer, Peer-to-Peer (P2P) Energy Trading, ERC Sandbox, Hyperledger Fabric Blockchain, Wheeling Charge

Peer-to-Peer Energy Trading via Automated Matching with Public Profit-Sharing Algorithms: A case study for ERC Sandbox in Thailand

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Electricity Generating Authority of Thailand (EGAT), Thailand

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Keywords: Electricity-Carbon Coupling, Market Relationship, Price Correlation, Product System, Emission Factor

Research on Market Mechanism in Electricity-Carbon Coupling System: The Practice of CSG

Nan SHANG
Energy Development Research Institute, China Southern Power Grid

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Topics: C5 PS3 - Emerging Markets and Forms of Markets
Keywords: Bidding, Energy Market, Optimization, Battery Energy Storage Systems, Price Uncertainties

Automated Market Bidding for Battery Energy Storage Systems

Faeza HAFIZ[1], Iiro HARJUNKOSKI[2], Mohamed EISSA[3], Elisabetta VALLARINO[3], Silvia PICERNO[3]
[1]Hitachi Energy Research, United States of America; [2]Hitachi Energy Research, Germany; [3]Hitachi Energy, Italy

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C5 ELECTRICITY MARKETS AND REGULATION - Full Papers
Topics: C5 PS3 - Emerging Markets and Forms of Markets
Keywords: Distributed Energy Resources (DERs), Wholesale Electricity Markets, Grid Services, Metering Telemetry, Measurement & Verification (M&V)

New Market Rules to Meter Behind-the-Meter DERs Participating in Wholesale Electricity Markets: Overcoming Technical Limitations and Economic Barriers

Tanguy HUBERT
Electric Power Research Institute (EPRI), United States of America

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Keywords: Energy Trading, Energy Price Forecasting, Ancillary Service Price Forecast, Probabilistic Forecast, Quantile Forecast

Evaluating the Quality of Probabilistic Forecast for Energy and Ancillary Service Trading

Xiaoming FENG[1], Nandinee HAQ[2]
[1]Hitachi Energy, United States of America; [2]Hitachi Energy, Canada

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Keywords: peak load hours, demand response, forecasting, machine learning

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Vyacheslav VORONIN[1], Fedor NEPSHA[2], Mikhail KRASILNIKOV[2], Kirill PEREVALOV[2]
[1]T.F. Gorbachev Kuzbass State Technical University, Russian Federation; [2]RTSoft Smart Grid, LLC, Russian Federation

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C5 ELECTRICITY MARKETS AND REGULATION - Full Papers
Topics: C5 PS3 - Emerging Markets and Forms of Markets
Keywords: socially vulnerable customers, total cost of delivering electricity solar power plants, prosumer facility, public supplier, financing model

Financing model for the construction of solar power plants on prosumer facilities provided by Public Supplier

Senad AGANOVIC[1], Elvisa BECIROVIC[2], Dzemal HADZIOSMANOVIC[3], Edina AGANOVIC[4]
[1]FERK, Mostar, Bosnia and Herzegovina; [2]Elektroprivreda BiH, Sarajevo, Bosnia and Herzegovina; [3]Elektroprivreda HZ HB, Mostar, Bosnia and Herzegovina; [4]NOS BiH, Sarajevo, Bosnia and Herzegovina

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C5 ELECTRICITY MARKETS AND REGULATION - Full Papers
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Keywords: Hydrogen – Certification – Renewable Energy – Decarbonization

Certification of the electricity used to produce hydrogen

Ricardo GEDRA[1], Vanessa GRUNWALD[1], Anant VENKATESWARAN[2]
[1]Brazilian NC of CIGRE, Brazil; CCEE; [2]Hitachi Energy

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Facilitating Efficiency of LMP-based Electricity Markets Through Distributed Demand Response

Marina DOLMATOVA[1], Alexey SELEZNEV[2]
[1]Association NP Market Council, Russian Federation; [2]SKM Market Predictor AS, Norway

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Enabling Behind the Meter DER Participation to Provide Bulk and Distribution Grid Services

Aditie GARG*[1], Ahmed SAAD[2]
[1]Progressive Grid Solutions Pvt Ltd, India; [2]Electric Power Research Institute (EPRI), USA

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[1]GCC Interconnection Authority, KSA; [2]GCC Interconnection Authority, KSA

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C5 ELECTRICITY MARKETS AND REGULATION - Full Papers
Topics: C5 PS3 - Emerging Markets and Forms of Markets
Keywords: Intraday auctions, Cross-zonal capacity, Market Coupling, Croatian electricity market

The Implementation of Intraday Auctions And Its Impact on The Electricity Market From Local And Regional Perspective

Martina VAJDIĆ, Ana RAGUŽ, Luka ŠEŠO, Marko KELAVA
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Keywords: Market development, Metering

Modernization of Metering System in the Georgian Electricity Market

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Georgian State Electrosystem

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Topics: C5 PS3 - Emerging Markets and Forms of Markets
Keywords: Cross-border Electricity Trading, ASEAN, Greater Mekong Subregion, LTM-PIP, LTMS-PIP, Renewable Energy

ASEAN Cross-Border Electricity Trading Lessons From the LTM-PIP and LTMS-PIP: The Proposed GMS Regional Renewable Energy Market

Suppapit WONGPATTANASIRI, Thamolwan KUNASIRIN, Worrapong WONGLIMAMORNLERT
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Keywords: Metering services, metering aggregation, power markets, retail competition, unbundling

Metering Aggregation: An Approach to Enhance Market Design – A Case Study

Jovanio Silva dos SANTOS
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C6 - ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES

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Electric Vehicle integration on the LV grid for ancillary services provision: an experimental case study leveraging 2nd generation smart meters in Italy

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Demand Shift – Domestic Demand Response – Local Network Management – Distributed Generation – Curtailment Avoidance

Local Network Management and Distributed Generation Curtailment Avoidance through Domestic Demand Response

Kailash SINGH[1], Russell BRYANS[1], Gerard BOYD[1], Malcolm BEBBINGTON[1], Guy SHAPLAND[1], Wendy MANTLE[1], ShengJi TEE[1], Kieron STOPFORTH[2]
[1]SP Energy Networks UK; [2]Octopus Energy UK

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Distributed Energy Resources (DERs), Distribution Services, Flexibility Services, Distribution Planning, Distribution System Conditions

Revisiting the Terminology Used in Distribution Planning to Describe System Conditions Triggering DER-Provided Flexibility Services

Tanguy HUBERT
Electric Power Research Institute (EPRI), United States of America

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Distribution Services, Flexibility Services, Contingency Planning, Contingency Management

Understanding Risk Factors and Risk Management Practices Related to DER-Provided Flexibility Services in the Planning and Operational Timeframes

Tanguy HUBERT
Electric Power Research Institute (EPRI), United States of America

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Distribution Systems, Operational Coordination, Distribution Operations, Distributed Energy Resource System, Integrated Grid

The Evolving Distribution Operations Architecture for a Future Integrated Grid

Jessica LAU, Yashar KENARANGUI, Beth CHACON
Xcel Energy, United States of America

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Keywords: DER, Framework, Capacity, Outage Support, Line Loss Reduction

Quantification of Distribution Grid Value of Distributed Energy Resources

Imran RAHMAN[1], Shikhar PANDEY[1], Farnaz FARZAN[2], Ralph MASIELLO[2], Michael LEE[1], Kathleen KREMER[1], Jessica MILEY[1], Matthew LUDWIG[1]
[1]Commonwealth Edison, United States of America; [2]Quanta Technology, United States of America

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Keywords: Climate Change, Distribution Planning, Extreme Weather Events, Reliability, Resilience

Distribution Planning for Reliability and Resilience

Jouni PEPPANEN, Nick HEINE, Prajjwal GAUTAM, Matthew RYLANDER, Sarmad HANIF
Electric Power Research Institute (EPRI), United States of America

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Demand Flexibility, Demand Response, Demand-side Integration, Distribution Modeling, Distribution Planning

Evaluating Demand Flexibility as a Distribution Planning Alternative

Jouni PEPPANEN[1], Angela CHUANG[1], Alison O'CONNELL[2]
[1]Electric Power Research Institute (EPRI), United States of America; [2]Electric Power Research Institute (EPRI), Ireland

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Dynamic Stability, Electric Vehicles, Equipment Standards, Grid Transformation

Modelling and Studying Increasing Electric Vehicle Charging Loads on Bulk Power System Dynamic Performance: Insights and Recommendations

John Paul SKEATH[1], Ryan QUINT[5], Joseph ETO[2], Parag MITRA[3], Lakshmi SUNDARESH[3], Shruti RAO[4]
[1]North American Electric Reliability Corporation (NERC), United States of America; [2]Lawrence Berkeley National Laboratory (LBNL), United States of America; [3]Electric Power Research Institute (EPRI), United States of America; [4]GE Vernova Consulting Services, United States of America; [5]Elevate Energy Consulting, United States of America

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Keywords: ADMS, Hardware-in-the-Loop, FLISR, Grid Modernization, Distribution

Ensuring ADMS Functionality and Flexibility with Hardware-in-the-Loop Verification

Josh SNODGRASS[1], Christopher HUFF[2], Aleksandar PARMAKOVIC[3]
[1]POWER Engineers, Inc., United States of America; [2]Pacific Gas and Electric, United States of America; [3]Schneider Electric, Serbia

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Keywords: Energy Storage, Grid Edge Solution, Market Revenue, Microgrid, Renewable

Business Cases for Energy Storage Project at Distribution Level Participating in European Electricity Markets with Examples of Real Projects

Takashi USAMI[1], Hamideh BITARAF[2], Ernesto SORESSI[3]
[1]Hitachi, United States of America; [2]Hitachi Energy, United States of America; [3]Hitachi Energy, Italy

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Keywords: Distributed Energy Resources, Flexibility Mobilization, Congestion Management and Voltage Control, Market-based Flexibility Services, Sensitivity-based methods

Coordinated voltage control between Medium and Low Voltage distribution grids with market-based flexibility

Clara GOUVEIA[1], Gil SAMPAIO[1], Fábio RETORTA[1], Ricardo BESSA[1], José VILLAR[1], Miguel LOURO[2], Christian MERCKX[3], Féres BENOTHMAN[3]
[1]INESC TEC, Portugal; [2]E-Redes, Portugal; [3]ENGIE Impact, Belgium

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Portable energy storage; Grid congestion; Demand-side management; Flexible power network

Portable Energy Storage Systems as an Alternative to Reinforcement in Distribution Networks

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Cardiff University UK

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Distributed Energy Resource, Monte Carlo Simulation, Gaussian Mixture, Network Congestion, Distribution Network

Evaluating the Impact of New Technology Deployment on Future Congestion of LV Distribution Grids

Na LI[1], Anton ISHCHENKO[2], Simon TINDEMANS[1], Kenneth BRUNINX[1]
[1]Delft University of Technology; [2]Phase to Phase BV

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Congestion, Congestion Management, System Operation, Flexibility, Hosting Capacity, Risk Management

Implementing congestion management in Dutch distribution grids

Chris RIPKEN, Evert DE HAAN, Atze PETERS, Bart PLUIJMS
Liander

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Topics: C6 PS1 - Flexibility Management in Distribution Networks

Methodology and benefits of integrating a BESS system in the operation of an isolated power systems – Design Approach and Dynamic Simulation

Laura CASADO[1], Pedro RIBEIRO[2], Renato VERISSIMO[2], José DAMASIO[2], José MORI[1], Miquel ESCOTO[1], Fernando HENRIQUES[3]
[1]Siemens, Spain; [2]Siemens, Portugal; [3]EDA, Portugal

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Self-heating vs. district heating: A case beyond power-to-heat

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Energy Router, Flexibility, Optimal Operation, Linearized AC Power Flow, Voltage Stability

Optimal Operation of Distributed Energy Resource Integrated Energy Router to Enhance Local Flexibility

Dongjun HAN, Seungwoo NAM, Dongjun WON
Inha Univercity, Korea, Republic of (South Korea)

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: electric vehicle, charging station, demand side management, V2G

Development of an Electric Vehicle Charging Control System for Substation Load Management

Vyacheslav VORONIN[1], Fedor NEPSHA[2]
[1]T.F. Gorbachev Kuzbass State Technical University, Russian Federation; [2]RTSoft Smart Grid, LLC, Russian Federation

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Active distribution grids, operational planning, flexibility resources, grid

Rethinking Distribution Network Operational Planning with Flexibility Resources

Merkebu Z. DEGEFA[1], Gunnar VIST[2], Mathias F. ELIASSEN[3], Åshild VATNE[4], Rubi RANA[1], Line BERGEFJORD[5], Iver BAKKEN SPERSTAD[1], Sigurd H. JAKOBSEN[1], Raymundo E. TORRES-OLGUIN[1]
[1]SINTEF Energi As Norway; [2]Heimdall Power Norway; [3]Kongsberg Digital Norway; [4]Ashild.Vatne@elvia.no; [5]BKK Norway

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Flexibility – Resources – Digitalisation – Distribution – Planning

Flexibility for increased electrification and utilisation of the distribution grid

Gerd KJØLLE[1], Oddbjørn GJERDE[1], Merkebu Z. DEGEFA[1], Stig SIMONSEN[2], Mariona ZHURI[2], Katrine UTVIK[3]
[1]SINTEF Energy Research Norway; [2]Lede Norway; [3]Elvia Norway

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Battery energy storage systems, Electric vehicles, Fast charging stations, GAP analysis

Evaluation of battery energy storage systems (BESS) in the Norwegian power grid to cope with increased vehicle electrification

Heidi S. NYGÅRD[1], Ruth OLERUD[1], Petter LUNDE[2]
[1]Norwegian University of Life Sciences (NMBU) Norway; [2]Tronrud Engineering Norway

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: electricity fast-charging infrastructure, direct current recharging stations, DC stations, decarbonising transport, e-mobility, electric vehicles, electricity grid connexion, Alternative Fuel supply infrastructure, TEN-T road network

A Methodology for Determining optimal DC Charging-station Locations and Operation for Electric-vehicles based on typical technical and commercial Requirements in Europe

Ursula KRISPER
Elektro Ljubljana, d.d.

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Load forecasting, machine learning, microgrids

Optimal Design of a Microgrid Considering Load Forecasting

Esra AYDIN, Belgin TURKAY, Cenk ANDIC
Istanbul Technical University Türkiye

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Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Wide Area Control, Synchrophasor, System Restoration, Zonal co-ordinated control, Grid Services, Distribution restoration, Virtual Power Plant

Trialling Distribution-based Electricity System Restoration and Other Services

Douglas WILSON[1], Marta LATERZA[1], Marcos SANTOS[1], Richard DAVEY[1], Ian MACPHERSON[2], Mark MORRISON[2], James YU[2]
[1]GE Vernova UK; [2]SP Energy Networks UK

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Topics: C6 PS1 - Flexibility Management in Distribution Networks

Two-stage stochastic programming for optimal BESS & DER Total Cost of Ownership and sizing considering grid services in data centre applications

Marco GIUNTOLI[1], Dario CICIO[2], Fabrizio LANDINI[3]
[1]Hitachi Energy Research, Germany; [2]Hitachi Energy, Switzerland; [3]Hitachi Energy, Italy

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Active Network Management; Digital Substations; Distributed Energy Resources; Distributed Energy Resource Management Systems; Flexible Connections; Flexibility Services; Wide Area Monitoring, Protection and Control

Local Active Network Management (LANM) and the role of Smart Substations in Minimising Curtailment of Flexible DER Connections

Peter WALL[1], Douglas WILSON[1], Lihong HAO[1], Andreas GLATZ[1], Yusen FEI[1], Ivan MARTIN[1], Richard DAVEY[1], Boris YAZADZHIYAN[2], James MILLS[2], Mayamiko HARA[2], Tam SOKARI-BRIGGS[2], Tim MANANDHAR[2]
[1]GE Vernova UK; [2]UK Power Networks UK

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DER integration and optimisation to enable Australia's first fully electric public road transport system

Stephen SPROUL[1], John GLASSMIRE[2], Francesco BACCINO[3], Pablo ALMALECK[3]
[1]Hitachi Energy, Australia; [2]Hitachi Energy, USA; [3]Hitachi Energy, Italy

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Distributed Energy Resource, Electric Vehicle, Photovoltaic, System Analysis

Eliminating overload in distribution systems by utilizing DER

Yoshifumi IKEMOTO[1], Masahiro MINAMI[1], Noriaki KANO[1], Shinya YOSHIZAWA[2], Yohei YAMAGUCHI[2], Yutaka OTA[2]
[1]Kansai Transmission and Distribution, Inc., Japan; [2]Osaka University, Japan

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Distributed Energy Management System (DERMS) for Solar and Storage to Demonstrate Grid Flexibility and Reliability

Aditie GARG*, Summer FABUS, Stuart MCMAHON, Robert MACDONALD, Frazor WATSON
Progressive Grid Solutions Pvt Ltd, India

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Flexible Marketplace for Green Energy Trading Amongst Local Energy Communities

Reji Kumar PILLAI*, Reena SURI, Parul S
ISGF, India

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Low voltage measurement system to support distribution system state estimation

István TÁCZI[1], Kristóf Péter JUHÁSZ[2], István VOKONY[2], Bálint HARTMANN[2]
[1]E.ON DSO; [2]Budapest University of Technology and Economics

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Topics: C6 PS1 - Flexibility Management in Distribution Networks

Kopernikus projects - Field applications and OT-IT-integration to enable the full potential of future power systems

Peter NOGLIK[1], Marco GIUNTOLI[5], Katarina KNEZOVIC[9], Antony HILLIARD[10], Maximilian DAUER[2], Maximilian ROSE[8], Michael GRATZA[3], Andreas SCHLERETH[4], Robert SCHMIDT[6], Stephan RUPP[7], Sebastian BRUSKE[7], Alexander MAGES[4]
[1]Hitachi Energy AG, Germany; [2]Siemens AG, Germany; [3]TenneT TSO GmbH, Germany; [4]Fraunhofer IPA, Germany; [5]Hitachi Energy Research RWTH Aachen, Germany; [6]RWTH Aachen, Germany; [7]Maschinenfabrik Reinhausen GmbH, Germany; [8]Schleswig-Holstein Netz AG, Germany; [9]Hitachi Energy Research, Switzerland; [10]Hitachi Energy Research, Canada

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Wide area protection, Active distribution network, synchrophasor measurements, phasor measurement unit

A New Wide Area Protection Scheme for Active Distribution Network

Khaled AL-MAITAH[1], Abdullah AL-ODIENAT[2]
[1]EDCO; [2]Mutah Univiesity

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Data analytics, planning of distribution networks, PV hosting capacity, smart meters

Revisiting PV Regulatory Connection Rules in LV Jordanian Distribution Feeders through Leveraging Smart Metering Data

Sereen ALTHAHER[1], Alia WEDIAN[2], Sahban ALNASER[1]
[1]University of Jordan; [2]IDECO

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS1 - Flexibility Management in Distribution Networks

Smart Meters: A Key to Sustainable Energy With Applied Study Cases in Palestine

Dana BANNOURA
JDECO

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Topics: C6 PS1 - Flexibility Management in Distribution Networks

Efficient Identification of Customer Types in Energy Consumption Data: Leveraging Dimensionality Reduction and K-Means Clustering Method

Leonie RIEDL[1], Martin BRAUN[1], Philip HEHLERT[2]
[1]Fraunhofer Institut für Energiewirtschaft und Energiesystemtechnik IEE & Universität Kassel, Germany; [2]Georg-August-Universität Göttingen, Germany

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Distribution Network - Transformer Utilisation - Machine Learning - Monitoring

Evaluating Distribution Transformer Utilisation for Flexibility and Enhanced Observability using Multiple Sources of Data

Jelena PONOCKO, Rebecca THRELFALL, Josephine O'BRIEN, Shengji TEE, Russell BRYANS, Malcolm BEBBINGTON
SP Energy Networks UK

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Topics: C6 PS1 - Flexibility Management in Distribution Networks

Energy Storage System Design Considering Multiple Revenue Streams for Large Scale Solar in Malaysia

Junainah SARDI[1], Wan Syakirah WAN ABDULLAH[2], Hazriq Hakimi YAACOB[2], Ahmad Amirul Hakim MOHD HAMID[2]
[1]Universiti Teknikal Malaysia Melaka; [2]Tenaga Nasional Berhad

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Topics: C6 PS1 - Flexibility Management in Distribution Networks

Investigating the Capabilities of Weight-Based Gravity Storage for Delivering Ancillary Services

Alexander SIEMSEN[1], Rasmus VIG JENSEN[1], Lisa CALEARO[1], Jill MACPHERSON[2]
[1]Rambøll Danmark A/S; [2]Gravitricity

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Hybrid power, non-interconnected islands, Pelton turbine, deflector control, needle control, primary frequency response

The challenge of smooth cooperation of hydroelectric Turbines with thermal Units to provide FCR and aFRR in a Non-Interconnected Island

Anastasis TSOUMANIS[1], Stefanos KOKKINELIS[2], Konstantinos NATSIS[1], Stavros PAPATHANASSIOU[3], Despoina KOUKOULA[2], Charalampos PAPPAS[2], Eleni LAMPRINIDI[2], Theodora PATSAKA[2]
[1]PPC Renewables S.M.S.A., Greece; [2]Hellenic Electricity Distribution Network Operator S.A., Greece; [3]National Technical University of Athens, Greece

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Virtual Inertia;Hybrid;Generation;BESS;ESS;Grid Codes;Grid Stability

Impact of hybrid generation and storage system, including virtual inertia, on the grid connection for planning studies

Jorge PÁRRAGA ORTEGA
ITE Instituto Tecnológico de la Energía – UPV Universitat Politècnica de València,Spain

ID: 11863
C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Distribution Grid, Renewable Energy Source, Distributed Energy Resource

The Issues for Japan's Future Distribution Grid

Yuki KAWACHI
Kansai Transmission and Distribution, Inc.,Japan

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Distributed Energy Resources, Energy Storage System, Audio Frequency Load Control, Solar Soak, Demand Flexibility

The Use of Thermal Energy Storage from Residential Hot Water Systems for Flexible Network Demand Management

Wei Jian CHAN
Energex & Ergon Energy (part of Energy Queensland), Australia

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS1 - Flexibility Management in Distribution Networks
Keywords: Electricity theft, illegal connections, non-technical losses (NTL), ground surface conductors, zero sequence current (ZSC), network studies, payment levels, MV-medium voltage, LV-low voltage

How to detect and mitigate electricity theft in a South African distribution network in spite of the inadequacy of the network to be a fully smart system

Ndoro NETSHIPALE
Eskom Holdings SOC Ltd, South Africa

PS2 - POWER ELECTRONIC BASED SOLUTIONS FOR SMART DISTRIBUTION SYSTEMS

ID: 10115
C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS2 - Power Electronic based Solutions for Smart Distribution Systems
Keywords: Wireless power transfer Inductive power transfer (IPT), capacitive power transfer (CPT), and radio waves wireless power transfer (RW-WPT).

Classification of Highly Resonant Wireless Charging Techniques for Light EVs and Similar Low Applications

Eman GOMAA[1], Ahmed SHAWKY[2], Mohammed SAAD[2], Mohammed ORABI[2]
[1]Upper Egypt Electricity Distribution Company; [2]Aswan University

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS2 - Power Electronic based Solutions for Smart Distribution Systems

A Hybrid Networking Scheme With Grid-forming and Grid-following Converters for Resilient Active Distribution System

Zhuhu HUA, Lei SHANG, Xuzhu DONG
Wuhan University, China

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS2 - Power Electronic based Solutions for Smart Distribution Systems
Keywords: Grid Forming (GFM) Control, Black Start, Unbalanced Systems, Current Limiting

Black Start Operation of Grid-Forming Converters Based on Generalized Three-phase Droop Control Under Unbalanced Conditions

Zexian ZENG[1], Prajwal BHAGWAT[2], Maryam SAEEDIFARD[1], Dominic GROSS[2]
[1]Georgia Institute of Technology, United States of America; [2]University of Wisconsin-Madison, United States of America

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS2 - Power Electronic based Solutions for Smart Distribution Systems

Soft Open Point at Bermeo substation to improve distribution system reliability and hosting capacity

Markel ZUBIAGA[1], David SANTOS[2], Eneko OLEA[2], Javier CHIVITE[2], Javier CAÑAS[1], Raul PEÑA[3]
[1]Ingeteam Research Institute, Spain; [2]Ingeteam P. Technology, Spain; [3]Iberdrola, Spain

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS2 - Power Electronic based Solutions for Smart Distribution Systems
Keywords: Low-Voltage Direct Current (LVDC), Microgrids, DC Systems, DC Fault Protection, Solid-State Circuit Breaker (SSCB), Semiconductor Circuit Breaker (SCB), Power Electronics, Integrated Gate-Commutated Thyristor (IGCT)

Semiconductor circuit-breaker based on RB-IGCT to protect LVDC microgrids

Marcel STOECKLI[1], Antonello ANTONIAZZI*[2], Thomas MASPER[2], Thorsten STRASSEL[3], Umamaheswara VEMULAPATI[4], Christian WINTER[4], Tobias KELLER[4]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]ABB, Italy; [3]ABB, Switzerland; [4]Hitachi Energy, Switzerland

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS2 - Power Electronic based Solutions for Smart Distribution Systems

Synthesis of Adaptive Control System of Converter-Interfaced Generation Based on a Virtual Synchronous Generator

Alisher ASKAROV[1], Aleksey SUVOROV[1], Pavel ILYUSHIN[2]
[1]National Research Tomsk Polytechnic University, Russian Federation; [2]Energy Research Institute of the Russian Academy of Sciences, Russian Federation

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS2 - Power Electronic based Solutions for Smart Distribution Systems
Keywords: Electric Vehicle, Dynamic Pricing, Distribution System, Voltage Variation

Evaluation of the Effect of Dynamic Pricing on EV Charging to Voltage Variation in Distribution Lines

Toko MANNARI, Hiroyuki HATTA, Masahito TAKAHASHI
Central Research Institute of Electric Power Industry (CRIEPI), Japan

ID: 11297
C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS2 - Power Electronic based Solutions for Smart Distribution Systems
Keywords: Power Distribution System, IBR, Virtual Inertia Function

Development of GFM Inverters for Increased Penetration of Variable Renewable Energy

Yusuke NISHIDA, Teru MIYAZAKI
Tokyo Electric Power Company Holdings, Inc., Japan

ID: 11414
C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS2 - Power Electronic based Solutions for Smart Distribution Systems
Keywords: Active distribution networks, Conventional inverters, CYMDIST, Distribution systems, IDECO, Renewable Energy Resources, Smart Inverters, Voltage Regulation, Volt-VAR Control

Volt-Var Technique Utilization for Voltage Control in Distribution Networks with Smart Inverters – A Case Study of Jordan

Walaa THIABAT, Mu'men BODOOR, Mahdi ALSHATNAWI, Abdalrheem JAWARNEH, Mohammad NASER
IDECO

ID: 11479
C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS2 - Power Electronic based Solutions for Smart Distribution Systems
Keywords: Fault limiting converter model, DC microgrid protection, fault current limiter, short circuit characteristics

Average Models and Characteristics of Current-Controlled Converters for Fault Analysis in DC Microgrids

Jin-Su KIM[1], Ji-Song HONG[1], Young-Bin CHO[1], Seok-Chan LEE[1], Sang-Yun YUN[2]
[1]LS ELECTRIC Co., Ltd., Korea, Republic of (South Korea); [2]Chonnam University, Korea, Republic of (South Korea)

ID: 11804
C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS2 - Power Electronic based Solutions for Smart Distribution Systems
Keywords: Solar photovoltaic-based microgrid, Distribution systems, Voltage rise suppression, PV curtailment, Financial loss

Voltage Rise Suppression Strategies for Utility-Scale Solar Photovoltaic-based Microgrids

Krit KONGURAI
Electricity Generating Authority of Thailand (EGAT), Thailand

ID: 11866
C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS2 - Power Electronic based Solutions for Smart Distribution Systems
Keywords: smart transformer;real-time simulation;power quality;control system

Smart Transformer Real-time Simulation Model with External Control Script Implementation and Performance Analysis

Ville OLLIKAINEN
VTT Technical Research Centre of Finland

PS3 - RURAL, ISLANDED AND INDUSTRIAL ELECTRIFICATION STANDARDS, PRACTICES AND TECHNOLOGY OPTIONS

ID: 10482
C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options
Keywords: Microgrid, Effective Grounding, Distributed Energy Resources (DERs), Photovoltaic (PV), Resiliency Enhancement

Design and Simulation of Locks Campus Microgrid

Genesis ALVAREZ[1], Robert ALLISON[1], Lung-An LEE[1], Justin SMITH[4], Katelynn VANCE[1], Lou COLANGELO[2], Hermann KOCH[3], Peter GROSSMAN[2], Adam ADDESSO[2]
[1]Dominion Energy, United States of America; [2]RCM Technologies, United States of America; [3]RCM Technologies, Germany; [4]Power System Analytics, United States of America

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Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options

Energy Management System to Improve Resilience in Islanded Interconnected Microgrids

Fundiswa MTHETHWA
Eskom

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Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options

The Design of an Islanded Microgrid in the Kalahari Desert of South Africa: Noenieput Settlement Off-grid Electrification

Soni M
Eskom SOC Ltd

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options
Keywords: protection, direct current, symmetrical monopole, pole to ground fault

Protection scheme for single pole to ground faults in multi-terminal MMC-MVDC grid utilizing sequential tripping

Gvan Chun CHO[1,2], Seul-Ki KIM[1], Gyeong-Hun KIM[1], Jihui HWANG[1]
[1]Korea Electrotechnology Research Institute, Korea, Republic of (South Korea); [2]National Research University 'Moscow Power Engineering Institute', Russia

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options
Keywords: DERs, fault detection, open conductor fault

Detection of Open Conductor Fault using Multiple Measurement Factors of RTUs in Active Distribution Networks with DERs

JiSong HONG
LS ELECTRIC, Korea, Republic of (South Korea)

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers

Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options
Keywords: Grid Connected Microgrid, Independent Operation, Resilience

Challenge to establish decarbonized, resilient, and semi-independent microgrid in islands

Hideo ISHII[1], Naoto HIGA[2], Tomohiro SHIOHAMA[3], Satoru NAKAMURA[3], Kiyomasa KOHATSU[3]
[1]Waseda University, Japan; [2]NEXTEMS, Japan; [3]Okinawa Electric Power Company, Japan

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options
Keywords: Distribution System, Off-Grid, Storage Battery, Photovoltaic

Validation of Off-grid System in Real Cases

Keisuke UEKAWA, Yoshikazu IIDA, Keiichi FUJIMOTO, Yoshiki KAKUMOTO, Noriaki KANO, Yuki KAWACHI
Kansai Transmission and Distribution, Inc., Japan

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options
Keywords: Microgrid, Transmission Investments, Renewable Energy Integration, RES, Batteries, Techno-Economic Analysis, Jordanian Power System, Energy Trading, Peak Power Demand Charges, Bulk Supply

Best Investment Planning of Microgrid Networks: Jordan Case Study

Suad S. ALMATTAR
National Electric Power Company, Jordan, Hashemite Kingdom of

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Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options

Case study promoting a state of art solution for growing residential load in Palestine using community microgrid

Ibrahim KIRIAKOS
JDECO

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A model for future load profiles considering extreme weather conditions

Michael DAHMS, Torsten SOWA
AMPERIAS GMBH, Germany

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Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options
Keywords: Optimal Restoration, Grid-forming, HILs

Optimal Service Restoration Using Distributed Generations After Blackout in Distribution Networks

Saehwan LIM[1,2], Jin-Oh LEE[1], Hyeong-Jun YOO[1], Gyeong-Hun KIM[1]
[1]Korea Electrotechnology Research Institute, Korea, Republic of (South Korea); [2]Yonsei University

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Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options

Achieving successful community engagement in the evolving power system landscape: A case for micro- and mini-grids

Tshwanelo RAKAIBE
Cigre Southern Africa, South Africa

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Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options

A Combined Prepaid and Post-Paid Scheme for Non-Connected Zones and Migration from a Conventional Energy-Based Tariff to an Availability Solution in Terms of Time

Luis BERRÍO, Jimena RAIGOZA, Catalina GARCÉS, Ángela BURITICÁ, Juan FRANCO, Rafael LUNA
EPM

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Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options

Validation of the Engineering for a Protection System in a Microgrid at the Universidad del Valle Campus in Colombia

Andres DÍAZ, Edison FRANCO, Eduardo GOMEZ
Universidad del Valle

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Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options

Impacts and Challenges of the Integration of Connected to the Grid-Microgrids: Colombian Case

Luisa ESCOBAR, Eduardo GÓMEZ
Universidad del Valle

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES - Full Papers
Topics: C6 PS3 - Rural, Islanded and Industrial Electrification Standards, Practices and Technology Options
Keywords: Off-grid power system, electrical energy storage system, autonomous hybrid power plant, solar power plant, gas piston generator, diesel generator, automatic control system, frequency control, abruptly variable load, power quality

An automatic frequency control system for off-grid power systems with energy storages

Gleb NESTERENKO[1], Vyacheslav ZYRYANOV[2]
[1]SO UPS, JSC «Branch Regional Dispatching Office, Energy System of Novosibirsk Region, Altai Territory and the Altai Republic, Russia; [2]Novosibirsk State Technical University, Russia

D1 - MATERIALS AND EMERGING TEST TECHNIQUES

PS1 - TESTING, MONITORING AND DIAGNOSTICS

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

A High Performance Differential Acoustic Emission Sensor for Partial Discharge Detection

Yongling LU[1], Zhen WANG[1], Chengtao LUO[2], Yang SONG[2]
[1]State Grid Jiangsu Electric Power Company Ltd. Research Institute,China; [2]Shanghai Jiao Tong University,China

ID: 10249
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Differential Pressure Method for Measuring Gas Leakage of Dynamic Sealing Units in GIS

Zhiqiang TAO[1], Liang SONG[2], Lu LIU[1], Manuel NAEF[2], Luopeng LIU[2], Yang WANG[1]
[1]Hitachi Energy Research; [2]Hitachi Energy High Voltage Technology Center

ID: 10295
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: UHF monitoring, narrow band system, Power Transformers, noisy environment, SF6-alternatives

Use of narrow band UHF monitoring system for Power Transformer and GIS including SF6-free solution in laboratory and site environments

Raphael LEBRETON, Sebastien LOUISE
GE Vernova, France

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Testing, Measuring and Diagnostic Partial Discharge: use case examples in MV applications

Marco RIVA, Massimo SCARPELLINI, Marco TESTA, Stefano MELZI, Andrea CRESPI
ELDS Technology Centre – ABB spa Italy

ID: 10396
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Use of state observer and load cell sensors for monitoring overhead line ice sleeve overload and conductor temperature

Lorenzo PAPI
TERNA, Italy

ID: 10415
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Compensating Losses in On-line HFCT Partial Discharge Measurements under High Load Current Conditions

Kai Xian LAI, Javan Chun Fong LEE, Bing Hong LECK, Hongyan CAO, Ranjan THIRUCHELVAM, Vincent Kum Kong WONG
SP Group Singapore

ID: 10483
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: Dielectric Frequency Response (DFR), Gas Chromatography, High Molecular Weight Acids, Low Molecular Weight Acids, Water

Determination of Low and High Molecular Weight Carboxylic Acids by Chromatography and Possible Implications for Dielectric Frequency Response Measurements

Lance R. LEWAND, Ronald HERNANDEZ, Zach HOLLAND
Doble Engineering Company, United States of America

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: Bushings, Dielectric Frequency Response, DFR Baseline, Diagnostic Test, Early Detection

Application of Performing DFR on Bushings: Utility Perspective

Poorvi PATEL[1], Peter ZHAO[2], Varun GOYAL[2], Timothy RAYMOND[1]
[1]Electric Power Research Institute (EPRI), United States of America; [2]Hydro One, Canada

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Challenges on atmospheric Corrections for external Insulation Design and Testing - Revisited

Liliana AREVALO
Hitachi Energy Sweden, Sweden

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Diagnostic of On-Load Tap-Changer based on vibroacoustic Measurements

Joachim SCHIESSLING
Hitachi Energy Sweden AB, Sweden

ID: 10513
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: Power Transformers, Dissolved Gas Analysis, Stray Gassing

Stray Gassing of Insulating oils - Transformer condition assessment tool

Anabela PEIXOTO, Cláudia FARINHA, João VALENTIM, Rui MARTINS
EDP Labelec, Portugal

ID: 10556
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: Condition Assessment, Data Analytics, Early Failure, Forecasting, Weibull Distribution, Prognostics, Parameter Estimation, Weighted Linear Regression, Linear Regression, Reliability

Condition Assessment after Early Failures in Power Equipment despite successfully passed Factory Acceptance and Commissioning Tests

Robert ROSS[1], Aart-Jan DE GRAAF[2], Peter YPMA[2], Maria ROSS[2]
[1]TU Delft; [2]IWO

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Pseudo passive sensoring of partial discharges of electrical assets in multiple and remote locations

Daniel BLANCO[1], Fco. Javier DE PAZ[2], Rafael FUERTES[2], Ricardo GÓMEZ[1], Ricardo REINOSO[1], Gonzalo DONOSO[1], Elena NOGUEROLES[1]
[1]Red Eléctrica, Spain; [2]DXIoT Systems, Spain

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: T&D equipment, High Voltage, Disconnectors, TSO, Cyclic Corrosion test, Galvanic corrosion, Type Test, Life Expectancy, Maintenance

Cyclic Corrosion Testing of HV Disconnectors Under Continuous Current

Hélène GAUTHIER, Catherine LE POSTEC
Hydro-Québec, Canada

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: Lifetime, Ageing, GIS Switchgear, RCR Divider, RC Divider, Superimposed Voltage, Impulse Voltage

Lifetime analysis and extended impulse and superimposed impulse voltage tests on a GIS voltage divider for HVDC applications

Marcel STOECKLI[1], Uwe RIECHERT*[2], Erik SPERLING[3], Andreas DOWBYSCH[4]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy, Switzerland; [3]Omicron electronics, Switzerland; [4]Technische Universität Dresden, Germany

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Dissolved Gas On-line Monitor Based on Tunable Diode Laser Absorption Spectroscopy and Enhanced by Vacuum Extraction

Dmitriy VODENNIKOV[1], Alexander GUK[1], Artem KLIMCHUK[2], Mikhail BALANOV[2], Leonid POSPEEV[2]
[1]PJSC ROSSETI, Russian Federation; [2]Individual expert, Russian Federation

ID: 10825
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: chemical markers, methanol, power transformer, insulation ageing, normalization, seasonal changes

Monitoring of Seasonal Changes in the Concentrations of Chemical Markers Dissolved in Power Transformer Oil

Leonid DARIAN[1], Sergey ASOSKOV[2], Vladimir POLISHCHUK[3], Roman OBRAZTSOV[1], Alexey MAKSIMCHENKO[1]
[1]JSC «Technical Inspection UES», Russian Federation; [2]LLC Gazprom Energo, Russian Federation; [3]Joint Institute for High Temperatures of the RAS, Russian Federation

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: X-ray, mobile system, high-voltage equipment, diagnostics, radiation safety

Mobile Diagnostic X-ray System for Inspection of High-voltage Equipment in Operation

Leonid DARIAN[1], Roman OBRAZTSOV[1], Oleg OZEROV[2], Pavel GOLUBEV[1], Pavel GONCHAROV[3]
[1]JSC «Technical Inspection UES», Russian Federation; [2]Dukhov Research Institute of Automatics, Russian Federation; [3]PJSC «Rosseti South», Russian Federation

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: Diagnostics, Dissolved Gas Analysis, HV Equipment, Partial Discharges

Generation of Gases Related to Partial Discharges in High Voltage Equipment: a theoretical-practical approach

Adriana DE CASTRO PASSOS MARTINS[1], Sheila SOUTHGATE DE OLIVEIRA[2], Alain François SANSON LEVY[3], Arthur DE CASTRO RIBEIRO[4], Alexandre R. MARTINS[5]
[1]Brazilian NC of CIGRE, Brazil; CEMIG; [2]Consultant; [3]Consultant; [4]Eletrobras CEPEL; [5]Consultant

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Alternative methods for the simultaneous determination of diagnostic parameters

Ivanka HOEHLEIN, Carolin SCHUETT, Zhe SHAN
Siemens Energy, Germany

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: Space-charge, XLPE-cables, Pulsed-electro-acoustic-method, Load-cycles

Novel Space Charge Measurement System for Full-size XLPE cables under Actual Operating Voltage and Temperature Conditions

Shosuke MORITA[1], Norikazu FUSE[1], Takayuki MATSUBARA[2], Yoshinao MURATA[2], Yoshinobu MURAKAMI[3], Naohiro HOZUMI[3]
[1]Central Research Institute of Electric Power Industry, Japan; [2]Sumitomo Electric Industries Ltd., Japan; [3]Toyohashi University of Technology, Japan

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: Current, Integration, Charge, Q(t) method, Dielectric Properties, Diagnosis

Direct Current Integrated Charge Method as a Useful Tool for Dielectric Measurements

Yoitsu SEKIGUCHI[1], Takashi KURIHARA[2], Hiroaki MIYAKE[3], Tatsuo TAKADA[3]
[1]Sumitomo Electric Industries, Japan; [2]CRIEPI, Japan; [3]Tokyo City University, Japan

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

AI-based DGA Interpretation Method for On-Load Tap-Changers

Rainer FROTSCHER[1], Eva KELEMEN[2], Alexander ALBER[1], Jim RIPPON[2]
[1]Maschinenfabrik Reinhausen GmbH, Germany; [2]ALTALINK, L. P., Canada

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Development and verification of an online method for determining the oil condition of on-load tap-changers and transformers

Andreas KURZ[1], Roland GÖTZ[1], Julia MASSMANN[2], Johannes VEIT[2]
[1]Maschinenfabrik Reinhausen, Germany; [2]Amprion GmbH, Germany

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Optical PD Measurements on GIS and Power Transformers

Claus NEUMANN[1], Maximilian VOGL[2]
[1]Technical University of Darmstadt, Germany; [2]Vogl electronic, Germany

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Effects of Glass Transition Temperature (Tg) of Composite Core Rod on Performance of Polymer Insulators

Nitin SHINGNE*, Uday PUNTAMBEKAR, Satish CHETWANI
Electrical Research and Development Association (ERDA), India

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: transformer health, DGA, sampling, extraction, measurement

Imperative Technicalities for Managing Reliable Dissolved Gas Analysis and Adequate Diagnosis of Contemporary Oil-Filled Power Transformers

Marius GRISARU
Transformer oil tests independent consultant and educationalist at Transformer Academy, Israel

ID: 11379
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Partial discharge behaviour in GIS with C4-FN mixtures:Comparison of conventional and UHF measurement techniques

Johanna LINKE[1], Uwe RIECHERT[2], Stephan SCHLEGEL[1], Willy JAROSCZINSKY[1]
[1]Technische Universität Dresden, Germany; [2]Hitachi Energy, Switzerland

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Evaluation of the Dielectric Strength of Silicone Elastomers at DC Stress

Stefan KUEHNEL[1], Stefan KORNHUBER[1], Jens SEIFERT[3], Jens LAMBRECHT[2], Christiane BAER[2]
[1]Hochschule Zittau/Görlitz, Germany; [2]Wacker Chemie AG, Germany; [3]Maschinenfabrik Reinhausen, Germany

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Tests experiences of Temporary Over-Voltage for HVDC cable system

Dae-Jin PARK, Tae-Ho LEE, Sang-Taek PARK, Jin-Ho NAM, Sung-Yun KIM, Jung-Nyun KIM
LS Cable & System

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

Model To Estimate Solid Insulation Ageing in Power Transformers via Alcohol Based Chemical Indicators

Abhay CHAUDHARY, Dr Subir SEN, B.B MUKHERJEE, V K BHASKAR, Abhishek ABHISHEK, N K BHASKAR, Dr Satish KUMAR, Dr Arun Prakash UPADHYAY*
Power Grid Corporation of India Ltd, India

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics

New Approach in Condition Monitoring of Power Transformers Oil Pumps

Sebastián LAURIA, Franco LEIVA, Agustín AVALOS, Andrés LANTOS
Laboratorio Dr. Lantos

ID: 11820
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: DISSIPATION FACTOR, INSULATION POWER FACTOR, POWER TRANSFORMER

High Insulation Power Factor in Power Transformer!!! Deep Diagnostic Approaches for Root Cause Analysis

Pongpon SINGKHAWAT, Anchalee TONG-IN
Electricity Generating Authority of Thailand (EGAT), Thailand

ID: 11825
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: CORROSIVE SULFUR, IMAGE PROCESSING, POWER TRANSFORMER, TRANSFORMER OIL

How Can Image Processing Empower Decision-Making in Corrosive Sulfur Analysis of Transformer Oil?

Wutthipan PARIYOTHAI, Sirapa THONGDEE
Electricity Generating Authority of Thailand (EGAT), Thailand

ID: 11856
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS1 - Testing, Monitoring and Diagnostics
Keywords: Lightning impulse, negative polarity, positive polarity, dielectric liquids, breakdown voltage, acceleration voltage, mineral oil, ester liquids, bio-based hydrocarbon, GTL

Lightning Properties of selected insulating Liquids based on the Acceleration Voltage Parameter

Filip STUCHAŁA, Paweł RÓZGA
Lodz University of Technology, Institute of Electrical Power Engineering, Poland

PS2 - MATERIALS FOR ELECTROTECHNICAL TECHNICAL PURPOSES AND MODELLING

ID: 10130
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling
Keywords: SF6, equation, data, electrical transmission, distibution equipment

Several equations of state for SF6: how to avoid errors?

Nathalie BARNEL, Alain JEANMAIRE
EDF R&D, France

ID: 10138
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling
Keywords: Fluoronitrile mixtures, SF6, Gas Insulated Substations (GIS), liquefaction properties, thermodynamidc experimental approach

Characterization of the liquefaction properties of fluoronitrile mixtures by a thermodynamic experimental approach

Caterina TOIGO[1], Antoine PEREZ[1], Frank JACQUIER[1], Alain GIRODET[1], Michael INVERSIN[2], Didier LASSERRE[2]
[1]SuperGrid Institute, France; [2]RTE, France

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling

Effect of temperature on the development and partial discharge characteristics of electrical trees under combined AC/DC voltage in epoxy resin

Yingman SUN[1], Xuandong LIU[1], Gaoyi SHANG[1], Hao SUN[1], Hao TANG[2], Xining LI[2]
[1]Xi'an Jiaotong University, China; [2]China electric power research institute, China

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling

Modelling and decoupling of the dielectric response of silicone rubber composites used for outer insulation

Qian WANG, Ying ZHOU, Chao WU, Xidong LIANG
Tsinghua University, China

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling

Research progress in environmentally friendly epoxy resins

Qiang FU[1], Lei PENG[1], Li ZHANG[1], Chengxi FU[2], Musong LIN[1], Zhi LI[1]
[1]Guangdong Key Laboratory of Electric Power Equipment Reliability, Electric Power Research Institute of Guangdong Power Grid Co., Ltd. , China; [2]School of Energy and Environment, City University of Hong Kong, China

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling

Study on Epoxy Resin Insulation Characteristics of Valve-Side Bushing in Converter Transformer Under Composite Voltage and Thermal Field

Hao SUN[1], Xuandong LIU[1], Wanhao SHI[1], Yingman SUN[1], Hao TANG[2], Xining LI[2]
[1]Xi'an Jiaotong University, China; [2]China electric power research institute, China

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling

Study on water ingress characteristics of HTV silicone rubber

Ying ZHOU[1], Xidong LIANG[1], Zhou ZUO[1], Chao WU[1], Qian WANG[1], Shuming LIU[1], Shuqi LIU[1], Yanfeng GAO[2]
[1]Tsinghua University, China; [2]State Grid Jibei Electric Power Co. Ltd. Research Institute, China

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling
Keywords: Resin Impregnated Paper (RIP), HVDC, reliability, DC voltage, breakdown value

Ageing behaviour of RIP material under several DC voltages and temperature

Matthieu DALSTEIN[1], Laura DE FINA[2], Thanh VU-CONG[1], Franck JACQUIER[1], Armando PASTORE[2]
[1]SuperGrid Institute, France; [2]GE RPV, Italy

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling
Keywords: mineral oil, ester oil, biodegradable hydrocarbons, thermal ageing, ageing markers

Alternative liquids for transformers: thermal ageing comparison and ageing markers correlation

Anthony JEANNETON[1], Christophe PERRIER[1], Abderrahmane BEROUAL[2]
[1]GE Grid Solutions, France; [2]Ecole Centrale de Lyon, France

ID: 10299
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling
Keywords: Dielectric properties, liquid nitrogen, resistive superconductive, pre-conditioning, DC applications

Dielectric properties of liquid nitrogen for the design of Resistive Superconductive Fault Current Limiters

Diego BRASILIANO, Christophe CREUSOT, Nicolas DEVEAUX, Alain GIRODET, Laurent MATHRAY
SuperGrid Institute, France

ID: 10487
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling
Keywords: Interfacial Dielectric Strength, Breakdown Strength, Cable Joint, Compatibility

Evaluating the Interfacial Compatibility of Dielectric Materials for Cable Joints

Paul MWASAME[1], Xiaoshuang WEI[1], Timothy PERSON[1], Saurav SENGUPTA[1], Michael CHERRY[1], Wenbo XU[1], Joel CERVA[1], Yuanqiao RAO[1], Junsi GU[1], Robert DRAKE[2]
[1]Dow Chemical, United States of America; [2]Dow Chemical, United Kingdom

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling
Keywords: accelerated testing, thermal aging, ethylene vinyl acetate

Investigation of Aging of the Polymer Cable Composition Based on Ethylene Vinyl Acetate

Darya BOLOTINA[1], Alexander KONONENKO[1], Alexey POMERANTSEV[2], Alexander TSIKANIN[1]
[1]RISI JSC, Russian Federation; [2]RISI JSC, FRCCP RAS, Russian Federation

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling
Keywords: cellulose, insulation, degree of polymerization, supramolecular structure, grinding

The influence of Preparation Method of Cellulose Insulation Samples on Determining the Degree of Polymerization

Leonid DARIAN[1], Victor GAVRILYUK[2], Darya VERAKSO[1]
[1]JSC «Technical Inspection UES», Russian Federation; [2]MIREA — Russian Technological University, Russian Federation

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling
Keywords: Contamination, Finite element method, Insulating paper, Partial discharges

Use of Finite Element Model for Simulation of Partial Discharge Detection Circuit in Contaminated Paper-Oil Insulation Systems

Carlos Kleber DA COSTA ARRUDA[1], Adriana DE CASTRO PASSOS MARTINS[2], Alain François SANSON LEVY[3], Orsino BORGES DE OLIVEIRA FILHO[1]
[1]Brazilian NC of CIGRE, Brazil; Eletrobras CEPEL; [2]CEMIG; [3]Consultant

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling
Keywords: Natural Ester - Paper degradation - IEEE Std C57.100 - Arrhenius curve - Thermal Class - Thermal Index - Sealed Tube - IEC 60076-14

Thermal class of thermally upgraded paper in natural ester and in mineral insulating oils according to IEEE C57.100-2011

Helena Maria WILHELM[1], Paulo FERNANDES[1], Richard MAREK[2]
[1]Brazilian NC of CIGRE, Brazil; Vegoor; [2]Consultant

ID: 10857
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling
Keywords: Aramid/Cellulose - Hybrid Paper - Natural Ester - Paper degradation - IEEE Std C57.100 - Arrhenius curve - Thermal Class - Thermal Index - Sealed Tube - IEC 60076-14

Thermal stresses of hybrid paper (aramid/cellulose) in natural ester and in mineral insulating oils

Helena Maria WILHELM[1], Paulo FERNANDES[1], Richard MAREK[2], Marco MARIN[3], Germano F. MORAES[3], Nelson VELOSO[3], Tiago MARCHESAN[4], Vitor BENDER[4]
[1]Brazilian NC of CIGRE, Brazil; Vegoor; [2]Consultant; [3]COPEL; [4]UFSM University

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling
Keywords: DBDS, elemental sulphur, mineral oil, mitigation, OLTC, oil treatment, silver corrosion, synthetic ester

Silver Corrosion Testing and Mitigation

Jelena LUKIĆ[1], Jelena JANKOVIĆ[1], Draginja MIHAJOVIĆ[1], Sandra GLIŠIĆ[2], Aleksandar ORLOVIĆ[2]
[1]Electrical Engineering Institute Nikola Tesla, Serbia; [2]Faculty of Technology and Metallurgy of the University of Belgrade, Serbia

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling

Assessing dissolved Gas Analysis on inhibited and uninhibited Mineral Oils and natural Esters under simulated Thermal Fault

Pär WEDIN, Elena MINCHAK, Robert FAIRHOLM, Jessica SINGH, Thomas NORRBY
Nynas AB, Sweden

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling
Keywords: Dry Air, ε-Functionally Graded Materials (ε-FGM), Insulating Spacer, Gas-Insulated Switchgears (GIS), Gas-Insulated Transmission Lines (GIL)

Enhancing Electrical Insulation Performance of Insulating Spacers using Functionally Graded Materials in Natural-Origin Gas GIS

Kenji OKAMOTO[1], Naoki HAYAKAWA[2], Katsumi KATO[3], Naoki OSAWA[4], Masahiro KOZAKO[5], Hitoshi OKUBO[6]
[1]Fuji Electric Co., Ltd., Japan; [2]Nagoya University, Japan; [3]N. I. T., Niihama College, Japan; [4]Kanazawa Institute of Technology, Japan; [5]Kyushu Institute of Technology, Japan; [6]Aichi Institute of Technology, Japan

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling

Comparison of PRPD Pattern of Electrical and UHF PD Measurements at Cable Terminations

Rouven BERKEMEIER[1], Robert BACH[1], Niklas PECK[1], Stefan TENBOHLEN[2]
[1]South Westphalia University of Applied Sciences Soest, Germany; [2]Universität Stuttgart, Germany

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling
Keywords: Polymeric insulators, Self-cleaning, Superhydrophobic, Tracking

Development of Superhydrophobic Coating for Outdoor Polymeric Insulators

M-Ramez HALLOUM, Subba REDDY B*
Indian Institute of Science, India

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling

Degassing Simulator for XLPE Cables

Taeuk KIM, Jonghae KIM, Youngjae CHOI, Youngseng KIM
LS Cable & System, Korea, Republic of (South Korea)

ID: 11533
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling

On the development of multiscale conductivity models for extruded HVDC Cable Insulation

Mikael UNGE - NKT AB, Sweden

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS2 - Materials for Electrotechnical Technical Purposes and Modelling

SF6 Gas Disposal Using Microwave Plasma Technology

Sethuraman MUTHUKARUPPAN[1], Avinash Ashwin Raj RAJA GOPAL[2], Nur Syazwani ABDUL BAHARI[2]
[1]Tenaga Nasional Berhad Malaysia; [2]TNB Research Sdn. Bhd. Malaysia

PS3 - MATERIALS TO ENABLE THE ENERGY TRANSITION

ID: 10755
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS3 - Materials to enable the Energy Transition
Keywords: Gaseous Dielectrics, Gas-Insulated System, SF6 Alternative, Fluoronitrile, C4-FN, Material Compatibility, Decomposition

Chemistry of C4-FN gas mixtures and application in high-voltage equipment

Marcel STOECKLI[1], Lise DONZEL*[2], Saskia BUFFONI[2], Pawel KRAWCZYK[2], Michael GATZSCHE[2]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy, Switzerland

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D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS3 - Materials to enable the Energy Transition

Environmentally friendly and highly efficient novel corrosion protection coatings for electrical equipment under harsh environmental conditions

Ivanka HOEHLEIN[2], Jürgen BÜTTNER[1], Valentin KOPP[1], Christian SCHRAMM[1]
[1]Chemische Industrie Erlangen, Germany; [2]Siemens Energy, Germany

ID: 11057
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS3 - Materials to enable the Energy Transition
Keywords: Rechargeble battery cells, lithium ion battery (LiB), All-solid-state battery (ASSB), Dielectric capacitors

Recent development of nanomaterials for batteries and dielectric capacitors for energy storage in Japan

Yasunori TANAKA[1], Makoto KAMBARA[2], Minoru OSADA[3], Shigemitsu OKABE[4], Akiko KUMADA[4]
[1]Kanazawa University, Japan; [2]Osaka University, Japan; [3]Nagoya University, Japan; [4]The University of Tokyo, Japan

ID: 11058
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS3 - Materials to enable the Energy Transition
Keywords: SF6 Alternative, Eco-friendly, Dielectric Breakdown Strength, Machine Learning, Quantum Mechanics

Data-driven Exploration for SF6 alternative Gas with Quantum Mechanics-assisted Machine Learning

Masahiro SATO, Hajime SHIMAKAWA, Akiko KUMADA
The University of Tokyo, Japan

ID: 11644
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS3 - Materials to enable the Energy Transition

New C4-FN and C4-FN mixture gas models as a common reference for users and equipment manufacturers

Christian IHMELS[1], Max CLAESSENS[2], Michael GATZSCHE[2], Maxime PERRET[3], Thomas BERTELOOT[4], Christophe COQUELET[5]
[1]LTP GmbH, Germany; [2]Hitachi Energy, Switzerland; [3]GE Vernova, Switzerland; [4]GE Vernova, France; [5]IMT Mines Albi, France

ID: 11861
D1 MATERIALS AND EMERGING TEST TECHNIQUES - Full Papers
Topics: D1 PS3 - Materials to enable the Energy Transition
Keywords: Biodegradable;dielectric response;FDS;Kraft paper;mineral oil;moisture;PDC;vegetable oil

Experimental evaluation of the dielectric properties of insulating paper impregnated in mineral and vegetable oil as function of moisture

Ismael ANTOLIN, Pedro J. QUINTANILLA, Cristina MENDEZ, Cristian OLMO, Pablo GOMEZ
Departamento de Ingeniería Eléctrica y Energética, Universidad de Cantabria Santander, Spain

ID: 10270
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS1 - IT/OT Solutions to improve the Efficiency and Resilience of Electric Power Systems

Exploration and Practice of Cloud Orchestration in New Power System Distribution Scenarios

Fuyou SUN[1], Xiaolong REN[2], Yunzhan LI[1], Shoubin ZAI[1], Wenbo XIA[1], Lianchang SONG[1]
[1]Huawei Technologies Co., Ltd., China; [2]State Grid Corporation of China, China

ID: 10273
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS1 - IT/OT Solutions to improve the Efficiency and Resilience of Electric Power Systems
Keywords: DoA estimation, Substation asset management, Switched beam antenna array, WSN

Design of smart planar antenna array with optimal directivity in eight directions detecting ISM band wireless sensors for IT/OT solutions and substation asset condition monitoring & deep learning applications

Reham Elsamnty EL SAMNTY[1], Sabah Mashaly MASHALY[1], Ahdab El Morshedy MORCHEDY[2]
[1]Egyptian Electricity Transmission Company (EETC) Egypt; [2]Egyptian National Committee of Cigre

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Keywords: Open-source, standardization, grid-related data models, IEC CIM semantic standards, IOT

A possible win-win cohabitation of open-source and standardization

Laurent GUISE[1], Gilles NATIVEL[2], Benoît JEANSON[3], Philippe TAILHADES[4], Boris DOLLEY[3], Eric LAMBERT[5], Camille BLOCH[6]
[1]Ernergysemantic.com, France; [2]ENEDIS, France; [3]RTE, France; [4]GIMELEC, France; [5]EDF, France; [6]Schneider Electric. France

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OMEGA-X: Energy Data Space for improving efficiency of electric power systems leveraging semantic interoperability and AI

Eric LAMBERT[1], Erik MAQUEDA[2], Javier VALIÑO[3], Olivier GENEST[4], Valentina JANEV[5], Bruno TRAVERSON[1], Maxime LEFRANÇOIS[6], Lina NACHABE[6], Amélie GYRARD[4], Antonio KUNG[4]
[1]EDF R&D, France; [2]Tecnalia, Spain; [3]ATOS, Spain; [4]Trialog, France; [5]Pupin Institute , Serbia; [6]Mines St Etienne, France

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Integrating Artificial Intelligence Models and Synthetic Image Data for Enhanced Asset Inspection and Defect Identification

Po-Chen CHEN[1], Reddy MANDATI[1], Vladyslav ANDERSON[1], Ankush AGARWAL[1], David BARNARD[2], Michael FINN[2], Jesse CROMER[2], Tatjana DOKIC[1], Andrew MCCAULEY[2], Clay TUTAJ[2], Neha DAVE[2], Bobby BESHARATI[1], Jamie BARNETT[2], Timothy KRALL[1]
[1]Exelon Corporation, United States of America; [2]BGE, An Exelon Company, United States of America

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A.I. Searchable Synchrophasor Database for Power System Protection

Alberto RAMIREZ ORQUIN, Vanessa RAMIREZ
Resilient Grids LLC, United States of America

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Digitalization of distribution assets by use of DSO-API-REST

Markel SANZ HERAS[1], David SANTACRUZ PELAEZ[1], Fernando IBÁÑEZ ALAMEDA[2], Jonathan GONZÁLEZ RÍOS[3]
[1]I-DE, Spain; [2]Tecnalia, Spain; [3]Merytronic, Spain

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Keywords: AI, Reinforcement Learning, ESS, Optimal Operation, HILS test

Development and HILS Test of an AI Model for Optimal Operation of ESS in Renewable Energy Integrated EV Charging Station

Yundong SEO[1], Seungho HWANG[1], Gilsung BYEON[2], Dongjun WON[3]
[1]SK Telecom Co., Ltd.; [2]Korea Electrotechnology Research Institute, Korea, Republic of (South Korea); [3]Inha University, Korea, Republic of (South Korea)

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Keywords: common information model (CIM), data verification, grid model verification, network model management

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Keywords: big data, machine learning, RES, forecasting

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[1]Energoservice, Russian Federation; [2]NARFU, Russian Federation; [3]JSC SO UPS, Russian Federation

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Keywords: AI, ADMS, Big Data, decision support system, distribution networks, neural networks, state estimation, power flow forecasting

Symbiosis of Artificial Intelligences in Automated Systems of Supervisory Control of the Electrical Grid of a Distribution Grid Company

Sergey RYKOVANOV, Mikhail KHOZYAINOV
SYSTEL LLC, Russian Federation

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Keywords: Technology; Virtual reality; Power Transmission, Distribution and Generation

Virtual Reality and gamification as tools for training operation teams, maintenance of substations and energy transmission lines

Leandro Henrique DA SILVA[1], Juliano CORTES DE SOUZA[2], Josias MATOS DE ARAUJO[3]
[1]Brazilian NC of CIGRE, Brazil;Virtual Engenharia; [2]Comando Engenharia; [3]Eng Smart Lead

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Keywords: Utility Communications, Substation IED Management, Telecom Management

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Marcelo ZAPELLA, Ramesh POTLAPULA, Adriano PIRES, Mehrdad MESBAH
Brazilian NC of CIGRE, Brazil; GE Grid Solutions

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Keywords: WAMPAC, 5G, IEC 61850, Power System

Enhancing WAMPAC Systems in the Digital Transformation Era: Applied Research on IEC 61850 over 5G

Mayara Helena SANTOS[1], Nicolas FULLI[1], Fabio BRUNS[2], Ana Carolina PEDREIRA CAPELLA[3], Joyce MEIRELLES[2], Yona LOPES[2]
[1]Brazilian NC of CIGRE, Brazil; UFF Fluminense Federal University; YSMART ECT; [2]UFF Fluminense Federal University; [3]TIM Brasil

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Keywords: Hyperparameter tuning, Key Performance Indicators estimation, Machine Learning Regression algorithm, Management decision-making support, Multi-step annual Failure Forecasting, Remote Terminal Unit analog modules

Leveraging Machine Learning for Multi-Step Failure Forecasting in RTU Analog Modules and Estimating Key Performance Indicators to Support Management Decision-Making

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[1]Hitachi Energy Research, Germany; [2]Hitachi Energy Research, USA; [3]Hitachi Energy Research Switzerland; [4]Hitachi Energy South Africa

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Optical Fiber Monitoring and Management System (ONMS)

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Keywords: AI, Machine Learning, Deep Learning, Predictive Maintenance, Wind Turbine

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Keywords: Unified Asset Management Platform, Data Integration, Big Data Analytics, OT integration

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Keywords: Energy, Residential Load Consumption, Electricity Forecasting, Long Short-Term Memory, Multilayer Perceptron

State-of-the-Art Algorithms for short-term residential Load forecasting for Smart Grids

Vasileios LAITSOS[1], Georgios VONTZOS[2], Georgios LOUKOS[1], Paschalis PARASCHOUDIS[1], Sotiris CHRISTOPOULOS[1], Konstantinos KAOUSIAS[1], Katerina DRIVAKOU[3], Despoina MAKRYGIORGOU[4], Dimitrios BARGIOTAS[2]
[1]Hellenic Electricity Distribution Network Operator, Greece; [2]Univ. of Thessaly - Dept. of Elec. and Comp. Eng., Greece; [3]UBITECH ENERGY, Belgium; [4]Independent Power Transmission Operator, Greece

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Green Power Denmark

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Keywords: Big data, Data Lake, data acquisition, lightning induced faults, transmission network, transient analysis

Analyses of Lightning Induced Faults Recorded by Diverse Monitoring Systems in the Transmission Network Based on a New Concept of Data Lake Design

Bozidar FILIPOVIC-GRCIC[1], Bojan FRANC[1], Bruno JURISIC[2], Tihomir JAKOVIC[2], Tomislav ZUPAN[2], Antonija IVISIC[3], Ivan STURLIC[4], Alan ZUPAN[4]
[1]University of Zagreb Faculty of Electrical Engineering and Computing, Zagreb, Croatia; [2]Končar – Electrical Engineering Institute Ltd., Croatia; [3]Business Analytics and BI, Comping d.o.o., Croatia; [4]Croatian Transmission System Operator Plc., Croatia

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Keywords: Artificial Intelligence, Automatic control system, Biogas power plant, Load forecasting, Peak demand reduction

Artificial Neural Network-Based Peak Demand Forecasting and Biogas Power Plant Control for Peak Demand Reduction in Factory

Praditthon PATCHARAUBONGASEAM, Supatchaya LEELUDEJ
Electricity Generating Authority of Thailand (EGAT), Thailand

PS2 - CYBERSECURITY IN EMERGING APPLICATION DOMAINS AND TECHNOLOGIES FOR SECURING ENERGY ORGANISATIONS

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RSE, Italy

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The Elektrilevi's Advanced Remote Engineering Platform (AREP)

Indrek KÜNNAPUU[1], Hando LUUS[2], Rene VOOG[1], Ameen HAMDON[3]
[1]Elektrilevi OÜ, Estonia; [2]Enefit, Estonia; [3]SUBNET Solutions Inc., Canada

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[1]BH K CIGRE, Bosnia and Herzegovina; [2]KDM Analytics, Canada; [3]Elektroprivreda BiH, Bosna i and Herzegovina

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[1]UMS Group; [2]ISA Intercolombia

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A Strategy for Cyber Risk Mitigation in Smart Grids Through Traffic Management

Oscar TOBAR[1], German RUEDA[1], Johan CASTRO[1], Octavio DIAZ[1], German ZAPATA[1], Rodolfo GARCÍA[2]
[1]Universidad Nacional; [2]Enel Colombia

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[1]Universidad Nacional; [2]Universidad de Antioquia

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Keywords: Cybersecurity, protection device management, cloud

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Santitos GARCIA ZAMORA[1], Pavel IPENZA[2], Ameen HAMDON[3]
[1]ENEL Distribution Peru; [2]Nakama S.A.C Peru; [3]SUBNET SOLUTIONS INC

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Gujarat Energy Transmission Co. Ltd, India

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Power Grid Corporation of India Ltd, India

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Hardened (Air-gapped) IT-OT Interconnection – A Case study on Proof of Concept in Context of Power System Operation

K MURALIKRISHNA, Harish RATHOUR, Ankur GULATI, Anwaya Bilas SENGUPTA*
GRID-INDIA, India

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Evaluation of the Maturity of Cybersecurity in the Colombian Power System

Jaime ZAPATA[1], Juan MOLINA[2], Luisa BUITRAGO[2]
[1]XM; [2]Colombia Inteligente

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Analysis of High-Impact Scenarios for Cybersecurity in the Colombian Power System

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[1]CrossDMZ; [2]Independiente; [3]Colombia Inteligente; [4]Universidad del Valle; [5]Escuela Superior de Guerra; [6]Termocandelaria; [7]Kontinua Group

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Enhancing Cybersecurity in Critical Infrastructure: Leveraging Next Generation Firewalls (NGFW) for Robust Protection in OT and Substation Environments

Kgomotso MANYAPETSA
Cigre Southern Africa, South Africa

PS3 - MEETING THE CHALLENGES OF ENERGY TRANSITION WITH RELIABLE, SCALABLE, AND EFFICIENT TELECOMMUNICATIONS NETWORKS

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: 5G, 5G Standalone, Protection, Fault, Fault Indication, Edge Computing

Exploring the Reliability of Commercial 5G Standalone Networks for Virtual Fault Passage Indication

Petra RAUSSI[1], Heli KOKKONIEMI-TARKKANEN[1], Jorma KILPI[1], Anna KULMALA[2], Petri HOVILA[2]
[1]VTT Technical Research Centre of Finland; [2]ABB Oy

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Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: 5G, Edge computing, Fault, Line differential, Protection

Applicability of 5G Communication to Line Differential Protection for Distribution Networks

Petri HOVILA, Petri SYVÄLUOMA, Anna KULMALA, Rajasekaran DEVADASS, Petteri VAARA
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Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: MPLS-TP, teleprotection, PTP, inter substation communications

Migration from TDM Networks to MPLS-TP, Field Experiences

Kimmo KARKULEHTO[1], Antti VIRO[2]
[1]Fingrid Oyj; [2]DNWP

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Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: MPLS-TP, SDH, Line Differential Protection, Teleprotection

Optical Systems Performance for Line Protection Schemes

Jozthdwing RAMIREZ[1], Jose BORDA[2]
[1]Grid Resources Inc Panama; [2]Nakama Soluciones Peru

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Keywords: Utility Infrastructure, Network Telecommunication, Radio Frequency, Smart Metering, Smart City

The Next Generation of Joint-Use Utility Infrastructure

Mahavish MAHMOOD, Marianne GUIEB, Gregory R. BELL
Commonwealth Edison, United States of America

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Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: Passive Optical Network (PON); Gigabyte Passive Optical Network (GPON); Expedited, Deterministic, Redundant, PON (EDRP); Optical Line Terminal (OLT); Optical Network Terminal (ONT)

Redundant Passive Optical Network (PON) Transport for Grid Intelligence

Juan ORNELAS[1], Michael MORGAN[1], Arien MAJETTE[1], James CONWAY[2]
[1]Exelon, United States of America; [2]ComEd, United States of America

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: Evolved Packet Core (EPC), Private Long-Term Evolution (PLTE), Radio Access Network (RAN), User Equipment (UE)

PLTE Testing of Utility Use Cases in Support of Grid Modernization

Jayson SHIAU[1], Arien MAJETTE[2], Nwabueze PHIL-EBOSIE[1], Michael MORGAN[2]
[1]Commonwealth Edison (ComEd), United States of America; [2]Exelon, United States of America

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks

Migration from MPLS-TP & SDH Hybrid Networks to OTN Optical Transport Networks

Ariel CAMPOS
TRANSENER

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Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks

Mapping Multiprotocol Services into a MPLS Critical Infrastructure Network

Juan Ramón FEIJOO MARTÍNEZ, José María DELGADO ÁLVAREZ, Bruno PERALTA VICENTE
Red Eléctrica, Spain

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: Quantum Key Distribution, QKD, MPLS-TP, ETSI GS QKD 014, Encryption, IEEE 1588 PTPv2, Quantum Computing, Post Quantum Cryptography, PQC, Wide Area Network, WAN, Operational Technology, OT, Cybersecurity

Quantum Key Distribution for MPLS-TP Traffic Encryption

Marcel STOECKLI[1], Ramon BAECHLI*[2], Rouven FLOETER[2], Vivek PALANGADAN[2], Axel FOERY[3]
[1]ELECTROSUISSE, Switzerland - CIGRE NC Secretariat; [2]Hitachi Energy, Switzerland; [3]ID Quantique, Switzerland

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: design concept IP MPLS network, high availability, flexibility, and scalability

Electric Power Industry of Serbia IP MPLS network application for communications of technical information systems

Danilo LALOVIĆ[1], Vesna VUKIĆEVIĆ[1], Ivan VUKADINOVIĆ[1], Vigor STANIŠIĆ[1], Zlatko MITROVIĆ[1], Miodrag JEVTIĆ[2], Dalibor MITIĆ[2]
[1]EPS JSC, Serbia; [2]SAGA, Serbia

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Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks

Implementation of “Software-Defined Networking” as an Alternative for Efficient Traffic Management in Digital Substations

Octavio DIAZ[1], Germán RUEDA[1], Johan CASTRO[1], Oscar TOBAR[1], Germán ZAPATA[1], Rodolfo GARCIA[2]
[1]Universidad Nacional; [2]Enel Colombia

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: redundant system, resilience measures, triplex redundancy, virtual switch

IP Network Availability Improvement Initiatives

Sho TAMURA, Yuichi SHINOHARA
TEPCO Power Grid. Inc., Japan

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: Internet protocol, Network, Microwave, MPLS TE, Resilient

Techniques and methods in building resilient networks that support critical applications for Electricity Power Utilities

Ryuichi MURAKAMI[1], Makoto KUBO[1], Hiroyuki NAKAGAWA[2]
[1]Tohoku Electric Power Network Co., Inc., Japan; [2]Nakagawa Juniper Networks, Inc., Japan

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: MPLS-TP, Packet-switched network, Resiliency, TDM, Wireless microwave network

Requirements for resilient packet-switched network using MPLS-TP and wireless microwave technology

Toshiki KINOSHITA[1], Davy HAEGDORENS[2]
[1]Chugoku Electric Power Transmission & Distribution Co., Inc., Japan; [2]OTN Systems, Belgium

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: IEC 61850, Process Bus, Availability, Parallel Redundancy Protocol, High-availability Seamless Redundancy

A Fast and Accurate Calculation Method of Availability for Protection Relays Applying the IEC 61850 Process Bus

Akihiro TANAKA, Eiji OHBA
Central Research Institute of Electric Power Industry, Japan

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: Internet Protocol Security, Optical Fiber Ground Wire, Time Division Multiplexing

Implementing Telecommunications Network For Remote Operation Of Substations From National Transmission Asset Management Centre (NTAMC) By POWERGRID – A Novel Experience

Manoj KUMAR, Anoop Kumar SINGH, Vimlesh KUMAR
POWERGRID, India

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks

Implementation of HVDC-Emergency Power Control at HVDC Raigarh by Integrating Two Different Geographical Locations Through IEC 61850 Platform Over SDH Network

TVS Praveen KUMAR, N.B ADARI, Sunil KUMAR, Yogesh MISAL
POWEGRID, India

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks

Overview of State-of-the-Art Unified Network Management System for Managing Multivendor and Multi-Technology Power System Communication Network and attaining more Reliable, Scalable & Efficient Communication Network

Dr. Sunita CHOHAN*, Shyama KUMARI, Gaurav AWAL, Sangita Sarkar SARKAR, Nutan Mishra MISHRA, VS Bhal BHAL
POWERGRID, India

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: IoT, Wireless communication, 5G, Private 5G, Smartification, Smart industrial safety

Development of Wireless Communication Environments for the Smart Industrial Safety in Power Plants

Kazunari KUWAHARA, Ryota HIGASHI, Tetsuya KOTOKA, Kazuaki NARIAI, Koushiro NAKAGAWA
Kyushu Electric Power Co., Inc., Japan

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks

Strengthen cybersecurity and device management of cellular communication systems

Sever SUDAKOV, Yin CHANG
Moxa Inc. Taiwan

ID: 11781
D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: ANDE, BGP, Fast ReRoute, OSPF, PDC, PMU, Pseudowire, MPLS-TP, SDN, SDH, WAMPAC.

MPLS-TP as a communication protocol for Critical Infrastructure transport networks: Challenges in the implementation of the protocol in WAMPAC systems of ANDE - Paraguay

Chrystian RUIZ DIAZ[1], Enrique DAVALOS[2], Cecilia VEGA[1]
[1]ANDE; [2]Facultad Politécnica – UNA

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D2 INFORMATION SYSTEMS, TELECOMUNICATIONS AND CYBERSECURITY - Full Papers
Topics: D2 PS3 - Meeting the Challenges of Energy Transition with Reliable, Scalable, and Efficient Telecommunications Networks
Keywords: failure detection, network management, network monitoring, Operational Technology, OT, SCADA

Implementation and Impact of Network Management and Monitoring Systems on ANDE's Operational Technology (OT) Network

Ricardo LOREIRO, Chrystian RUIZ DIAZ
ANDE

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EXPERTS
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Sampo Ilmari TURUNEN
Kyoichi UEHARA
Takahiro UMEMOTO
Antonio USEROS
Stanislav UTTS
Maryam VADIATY
Riaz VAJETH
John Michael VAN COLLER
Kurt VAN DAM
Eddie VAN DER DRAAI
Rudolf VAN DER MERWE
Lou VAN DER SLUIS
Peter VAN DER WIELEN
Gordon Luke VAN DER ZEL
David VAN GINDERTAELEN
Jos VAN ROSSUM
Tom VANDERLINDEN
Anant VENKATESWARAN
Pedro P VERGARA
Chiara VERGINE
Yannick VERNAY
István VOKONY
Thanh VU
Dejan VUKOVIC
Detlef WALD
Michael WALTER
Chao WANG
Xiongfei WANG
Ying WANG
Yishen WANG
Zhibo WANG
George WATT
Louise WATTS
Juergen WEIDNER
Kerstin WEINDL
Michael WEIXELBRAUN
Bo WESTMAN
Gayan WIJEWEERA
Christian Erik WINTER
Chris WONG
Jarrad WRIGHT
John William WRIGHT
Guangning WU
Heng WU
Lei XU
Shukai XU
Ying XUE
Diptiman YADAV
Yuichiro YAMANE
Bi Jean Luc YAO
Janez ZAKONJSEK
Roland ZHANG
Tiebin ZHAO
Yulia ZHILKINA
Lisheng ZHONG
Yi ZHOU
Yuanxiang ZHOU
Hugh ZHU