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ABSTRACT BOOK

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PARTNEŘI KONFERENCE:



SESSION 1 – NETWORK COMPONENTS

Guarantee: Karel Kohout, ČEZ Distribuční služby, s.r.o.

PRACTICAL USE OF OPTICAL SENSOR IN 400 KV SUBSTATION

Michal Prchlík, ABB s.r.o.; Jan Dončuk, ČEPS a.s.

When ABB introduced its design of optical instrument transformer, the question was whether this technology will be used in real implementations. Nowadays, this technology is about to be used regularly. Non-conventional instrument transformers tend to be used within power industry technology development more widely. For that reason, CEPS made decision to start a pilot project that is focusing on monitoring the features of current optical instrument transformer and evaluates the data acquired from this transformer and from conventional current transformers. This paper remarks the current optical instrument transformer principles and describes specifics of CEPS pilot project together with already gained experience.

TRENDS AND EXPERIENCE IN BATTERY POWER STORAGE AND LEGISLATION READINESS IN THE CZECH REPUBLIC

Milan Kloubec, ELTRAF, a.s.; Martin Panáč, Siemens, s.r.o.; Michal Jurík, E.ON Distribuce, a.s.

Implementation of high-capacity battery storage systems connected to the DS and TS is the global trend. This paper focuses on latest experience with utilization of high-capacity battery storages in power systems, their potential and associated legislation framework in the Czech Republic. Additionally, the paper presents specific implementations of high-capacity power storages.

IMPLEMENTATION OF RELIABILITY-CENTERED MAINTENANCE FOR 110 KV CIRCUIT BREAKERS

Jiří Horák, Tomáš Raška, ČEZ Distribuce, a. s.

New more sophisticated methods of equipment maintenance are allowed by the trend of lowering costs. Nowadays, ČEZ Distribuce makes use of time oriented maintenance, which means that the equipment is checked in regular intervals. This paper deals with transition to different kind of regular maintenance – Reliability-Centered Maintenance (RCM) for selected DS elements. Pilot project aims on 110 kV sulfur hexafluoride circuit breakers. This paper describes the RCM and conditions of transition from existing periodical maintenance to reliability-centered one, procedures that are needed for setting up the RCM database and actions that are required for implementation itself.

OFF-LINE DIAGNOSTICS OF POWER TRANSFORMER TAP CHANGERS

Václav Straka, Pavel Zítek, "TMV SS" spol. s r.o.

Tap changer is integral component of power transformers and necessary element that is used to voltage regulation as well. At the same time, it is mechanically moving component within active part of machine. This paper introduces procedures that allow for monitoring tap changer dynamics during operation as well as methods that are used for OLTC diagnostics.



TRANSFORMER MONITORING SYSTEMS – QUESTIONS, THEORY, IMPLICATIONS, COMMON SOLUTIONS

Pavel Korbel, TECHSYS – HW a SW, a.s.

Transformer monitoring systems (TMS) can significantly improve efficiency of transformer diagnostic and consequently its operation, management and maintenance thus increasing cost safety as well as reliability of generation, transmission and distribution of electricity. TECHSYS – HW a SW developed and is offering now to its customers two kinds of TMS solutions, which utilize its own mathematical model of transformer. Full-scale online model of machine is created by combining of mathematical model with numerous input values – analogue and state power data, temperatures measurement and gas in oil diagnostics. Two basic solutions offer different approaches for implementing TMS itself as well as its usage within monitoring, managing and automation processes of power utilities.

STRAY CURRENTS – IMPACT ON EARTHING EQUIPMENT

František Rajský, ČEZ Distribuce a. s.

Earthing equipment is one of the most important parts of DS supporting its function and safety during operation. DSO's task is protecting this earthing equipment against potential negative impacts. This paper describes the theory regarding the origin, propagation and potential impact of DC stray currents on buried installations, particularly on DS earthing equipment. Above all, this paper describes and explains possible procedures and protective measures, which can be implemented to avoid (or rather minimize) corrosion cause by stray currents.

APPLICATION OF CROSS-BONDING AT HV AND MV

Jan Vočko, PREdistribuce, a.s.

Cross-bonding system is important part of HV cables and under specific circumstances can be advantageous even at the MV level. Poor installation and dissimilar length of each CB element can create excessive currents in cable shielding, which endanger the overall cable system safety and lead to financial and operational losses. This paper analyzes these issues, their scale and compares its results with those from international PS CIRED – Test recommendations for ground screen power cable connection, which deals with inductive currents and failures associated with misconnected shielding.

IMPACT OF HIGH SUMMER TEMPERATURES AND DROUGHT ON 22 KV AND 110 KV CABLES IN PRAGUE

Milan Singer, důchodce; Jan Vočko, PREdistribuce, a.s.

This paper describes the impact of long summer periods of high temperatures and no precipitation in last years on conditions of earth where DS cables are buried. Above all, this paper provides calculation of the impact of precipitation and drying the earth out on thermal resistance of earth.



EXPERIENCE WITH BUILDING UP AND OPERATION OF SELF-SUPPORTING DIELECTRIC FIBRE CABLE, POWER AND MECHANICAL TESTING

Vratislav Štěpka, Jan Volek - E. ON Distribuce, a.s.;
Eva Müllerová, Josef Formánek, Jiří Laurenc, ZČU v Plzni

This paper defines fundamentals of installation of dielectric fiber cables on supporting points regarding the PNE allowed distance associated with working on MV equipment, installation procedures and materials. It describes experience with pilot project and clearing failure of cable, analysis of failure by cable manufacturer. It describes power and mechanical testing of the cable that is focusing on validation of theoretical presumptions that can affect other non-standard fiber cable installation technologies.

OVERHEAD LINE PARAMETERS REGARDING ITS STRUCTURE AND USAGE

Petr Lehký, EGÚ Brno, a.s.

This paper contains the overview of the structure of conductors that are used for design and installation of overhead lines. The paper deals with definition of fundamental parameters of overhead lines and change of their parameters depending on operational use. Brief assessment of overhead lines utilization is provided as well.

SESSION 2 – POWER QUALITY AND EMC

Garant: Pavel Santarius, VŠB-TU Ostrava

POWER QUALITY WITH PQU REGULATION OF PV INVERTERS

Martin Kurfiřt, Michal Jurík, Jan Jiřička, E.ON Distribuce, a.s.; Jiří Drápela, VUT v Brně

This paper describes the impact of autonomous PQU regulation of PV on power quality in LV DS. Three points are defined within LV network for testing purposes. Inverter is temporarily connected to these points. Various settings of autonomous inverter regulation were tested during one day. Simultaneously, power quality measurement was performed in transformer station as well as at all three points of connection. Evaluation is made with regard to the voltage in each part of LV network and reactive and active power flow.

SUPERCAPACITOR AND ITS IMPACT ON ELIMINATION OF INDUSTRIAL PLANT OUTAGES

Martin Kurfiřt, Jan Jiřička, Martin Kašpírek, E.ON Distribuce, a.s.

This paper deals with function analysis and operation evaluation of supercapacitor that is installed at major consumer (car industry). Supercapacitor itself is connected into the customer inner LV network in specific operation part. Supercapacitor task is to bridge short-time voltage dips originating from supply distribution network so the sensitive paint shop technology will not be affected by such dips. Action time and supercapacitor implementation efficiency are determine as well. Certification was made through power quality measurement at customer for one year period.

IMPACT OF APPLIED AGGREGATION RULES ON THE VOLTAGE EVENT NUMBER

Miloslava Tesařová, ZČU v Plzni; Martin Kašpírek, E.ON Distribuce, a.s.

This paper deals with evaluation of short-term interruptions, dips and swells of voltage within context of possible standardization of their occurrence in DS. Short-term interruptions are often occurring together with long-term interruption or group of other short-term interruptions. Various aggregation rules can be utilized for events evaluation to take real impact of these events on customers into account. Results of various aggregation methods are compared with each other.

STEADY MONITORING OF POWER QUALITY AT VARIOUS KINDS OF CUSTOMER

Daniel Kaminský, Jiří Hula, ELCOM, a.s.

This paper describes full-scale monitoring of power quality in various power network levels. It features diverse requirements for measurement, communication channels and formats, central systems and required resulting data. The paper contains information regarding the systems installed at industrial plant monitoring or local distribution network as well as transmission networks, distribution systems, distribution transformers.



POWER QUALITY MONITORING AND POWER SYSTEM MANAGEMENT IN LARGE YARDS OF CRITICAL INFRASTRUCTURE

Pavel Kubíček, Jan Souček, František Ženožička, MEgA; Patrik Zbořil, Fakultní nemocnice Olomouc; Petr Mlýnek, VUT v Brně

This paper focuses on specific requirements for supply networks in hospital. Paper deals with such power networks monitoring (including communication and measuring elements) that allows for power quality analyzation as well as correct operation of standby supply according to the CSN EN 332000-7-710 standard. Real load monitoring of standby supply results in its optimal design which affects operation and economy as well. The paper describes communication measures that provide high level cyber security and support communication without permanent power supply.

POWER QUALITY DURING IRREGULAR ATMOSPHERIC EVENT

František Ženožička, Ladislav Pospíchal, MEgA - Měřicí Energetické Aparáty, a.s.

Atmospheric events significantly affect the quality and continuity of power supply particularly on overhead lines. This paper describes the effects of heavy thunderstorm.

DISTRIBUTION SYSTEM REACTIVE POWER FLOW IMPACT ON TRANSMISSION SYSTEM VOLTAGE

Miroslav Dubovský, Stredoslovenská distribučná, a.s.

Rising number of capacitive load appliances in distribution networks results in increasing reactive power that overflows to the transmission system through 400 kV/100 kV nodes. Consequently, the voltage in transmission system nodes exceeds limit values. This paper deals with effects of reactive power generation in urban settlement (of about 35.000 citizens) in MV and LV cable distribution network.

ASSESSMENT AND EVALUATION OF SCHULER PK3500 FORGING PRESS CONNECTION TO THE 22 KV NETWORK

Tomáš Hanžlík, Antonín Heřman, Josef Hrouda, Karel Procházka, EGC- EnerGoConsult ČB s.r.o.

This paper describes methodology of assessment and evaluation of forging press (Schuler PK3500) connectivity regarding the input power, power quality, 22 kV distribution network (22 kV/0.4 kV supplying transformer) and protection. It also describes how the assessment and evaluation is affected by the quality of supporting data (such as installed active and reactive power) provided by submitter.

METHODOLOGY FOR VERIFICATION OF FV PARAMETERS USING ELECTRONIC LOAD

Richard Velička, Pavel Santarius, FEI VŠB TU Ostrava

Electronic load allows for verification of several operational modes – constant power, constant current or constant resistance load. Each mode is suitable for measuring a different part of load characteristics. More comprehensive characteristics can be obtained by combining data from these modes. This paper contains verification examples in various modes.

SWITCHING OF POWER EQUIPMENT OFF DURING FIRE OR FLOODS

Pavel Kraják

This paper deals with fire safety of distributed energy sources based on the fire-brigade experience. Installation of power supply in the object is not reflected in relevant regulation. This issue is dealt with in CSN 33 2000-7-712 in general. Appendix 4 of Distribution Network Code deals with various power supply connection according to its operation, based on whether it is capable of island operation or not.

SESSION 3: OPERATION, CONTROL AND PROTECTION

Garant: Petr Toman, VUT Brno

EVALUATION OF CONTROLABLE LOAD ON DISTRIBUTION NETWORK OPERATION

Martin Střelec, ZČU v Plzni; Jan Herman, MycroftMind s.r.o.

Implementation of new technologies into power system introduces new features such as innovative market approaches and measures (e.g. demand response, which uses flexibility of the load part of power system) for system stability. Utilization of flexibility affects the power balance in system and status quantities as well. This paper deals with evaluation of controllable load impact on power system operation based on models using acquired from AMM.

ALTERNATIVE COMMUNICATION USING SDK FOR MAIN COMMUNICATION FAILURE

Pavel Polívka, PREdistribuce, a.s.

This paper describes alternative communication measures that provide data exchange with dispatcher system in case of main communication failure. The paper contains detail information about the alternative communication measures used in PREdi pilot project.

WIRELESS TECHNOLOGIES SUITABLE FOR SMART METERING AND SELECTIVE DEPLOYMENT

**Petr Mlýnek, Pavel Mašek, Radek Fujdiak, VUT v Brně;
Dominik Harman, E.ON Distribuce, a.s.**

This paper deals with analyzation of wireless technologies that are suitable for smart metering and selective deployment, real experimental measuring in locations with inferior signal and testing real wireless meters.

LOAD GENERATOR OF POWER PROTOCOL TRAFFIC – VERIFICATION OF COMMUNICATION TECHNOLOGIES USING THE EMULATION OF DISTRIBUTION TRANSFORMER STATION OPERATION

**Petr Mlýnek, Jan Sláčík, Petr Musil, Petr Blažek, VUT v Brně;
Jan Hlavnička, Lukáš Beneš, E.ON Distribuce, a.s.**

This paper describes the implementation of generic power protocol traffic generator (e.g. IEC 60870-5-104, IEC 61850, DLMS) for emulating and simulating data exchange from transformer station. Additionally, the utilization of generator to identify BPL technology limits within MV lines in center of Brno is described as well.

Chránění

STARTING TRANSFORMER THROUGH REMOTE GENERATOR – BLACKSTARTS AND ISSUES RELATED TO LOW-LOAD ISLANDS

Jiří Bermann, ABB s.r.o.

This paper focuses on starting the transformer through remote generator for testing purpose although this method starts to be topical because of black start of large power plants and islands as well. The voltage and current of synchronous generator itself are determined first and these are later used for no load and short circuit tests. Protection specifics are mentioned as well.

ASSESSMENT OF EFFECTS EXPERIENCED DURING TRANSITION FROM COMPENSATED SYSTEM TO SYSTEM GROUNDED THROUGH RESISTANCE

**David Topolánek, Jaroslava Orságová, Petr Toman, Vojtěch Waserbauer, VUT v Brně;
Martin Fabián, E.ON Distribuce, a.s.**

This paper provides analysis of transition of mixed compensated system to the system grounded through low-resistance node resistor of 600 A and 1000 A. The paper identifies advantages and disadvantages of different node grounding of supply transformer considering both applied protection systems and distribution system safety. All advantages and disadvantages are supported by simulation and subsequently, recommendations are provided. Potential impact on touch/step voltages is discussed as well.

VERIFICATION OF DIRECTION INDICATORS BEHAVIOR DURING MV DISTRIBUTION NETWORK FAILURE

Pavel Glac, Michal Šolle, Jakub Martínek, Aleš Krula, Radek Hanuš, PREdistribuce, a.s.

Accurate and reliable localization of failure at MV level is one of important measure for improving the reliability of distribution network. Together with remote control they help for shortening the outages of power supply. Direction indicators with remote communication will be used in smart stations for operational measurement as well. This paper summarizes the testing, compares measured failure current values and voltages with calculated ones and evaluates the testing equipment behavior.



MATHEMATICAL MODEL OF MV ASYNCHRONOUS MACHINE WITH CIRCUIT BREAKER FOR MODELING OF TRANSIENT PHENOMENA

Jan Pígl, Eaton Elektrotechnika s.r.o.; VUT v Brně.

This paper contains description related to three-phase MV asynchronous machine with circuit breaker mathematical model which is used to calculation of transient phenomena experiencing during tripping the breaker. The study focuses mainly on stator currents profile, earth current, moment and rpm of machine under various phase impedances of the breaker. The model takes the following sources of overvoltage into account: cut off current, repeated breakdown and forced zero current

Provoz

DIFFERENCES AND ADVANTAGES OF ONLINE DIAGNOSTICS VS OFFLINE METHODS

Bedřich Beneš, Ladislav Šťastný, Jiří Zorálek, David Lojek, Modemtec s.r.o.

This paper deals with differences between offline and online diagnostics approach. Insulated status of MV lines and equipment provides an use case for illustrating these differences.

NEW CONCEPT OF THE SWITCHING STATION IN PREDI

Pavel Glac, Michal Šolle, Jakub Martínek, Radek Hanuš, PREdistribuce, a.s.

Remotely controlled and monitored switching stations are used within MV power network for many years now. This concept provides better protection selectivity as well as faster power supply restoration at LV level. New functions and requirements were defined based on general concept of MV network. Protection system, control, alarming and measurement were improved within this concept. Switching station supports self-healing. The concept emphasizes diagnostics and remote management of all secondary hardware.

SESSION 4 – DISTRIBUTED ENERGY RESOURCES AND ELECTRICITY USAGE

Garant: František Kysnar, EGC ČB s.r.o.

ADJUSTMENT OF APPENDIX 4 OF DISTRIBUTION NETWORK CODE

Karel Procházka, EGC – EnerGoConsult ČB s.r.o.

TESTING OF PV INVERTERS IN CEZ DISTRIBUCE LABORATORY

Tomáš Linhart, Jan Švec, Luděk Frejvald, Jiří Dvořák, Stanislav Hes, ČEZ Distribuce, a. s.

The impact of autonomous Q(U) and P(U) characteristics of PV inverters on connectable power is tested within European project (InterFlex). These characteristics are defined in Appendix 4 of Distribution Network Code and are mandatory for every new generating plant that is installed within CEZ Distribuce area. In some case PV inverters characteristics does not reflect these requirements. This paper contains information that relates to testing of PV inverters in CEZ Distribuce laboratory.

TESTOVÁNÍ PROVOZNÍCH PARAMETRŮ VÝKONOVÝCH STŘÍDAČŮ FV SYSTÉMŮ

Michal Vrána, Martin Vojtek, Jan Klusáček, VUT v Brně

SMART INDUSTRY LAB – LABORATORY FOR TESTING THE EQUIPMENT THAT IS CONNECTED TO DISTRIBUTION SYSTEM

Jozef Potoček, VSD, a.s.

New testing facility – Smart Industry Lab - was created by VSD and Technical University in Kosice for modeling LV distribution system. This lab is intended to be used for measuring and testing of operational parameters of equipment that is connected to the distribution system, particularly for prosumers. Smart Industry Lab allows investigate the impact of such equipment on distribution system while simulating connection of various components (such as micro-generators, controllers, appliances and sources of various type, etc.). Smart sensors of power and non-power data can be inspected as well.

BEHAVIOR OF RES DURIN NETWORK FAILURE

Jan Tesař, Martin Pistora, ČEPS, a.s.

This paper deals with behavior of RES during bigger frequency variation event. Such event was experience in the Czech Republic twice this year already. The limit value of frequency for normal system state was experienced throughout the continental Europe in January. This allowed for testing the system protection procedures including RES reaction, regulation, disconnection and above all reconnection. These procedures were widened even more during next more serious frequency drop with higher RES generation.

BILANCE JALOVÝCH VÝKONŮ V SÍTÍCH ES ČR

Jiří Ptáček, EGÚ Brno, a.s.; Karel Procházka, EGC – EnerGoConsult ČB s.r.o.;
zpracováno ve spolupráci s pracovní skupinou NAP SG P10

EVALUATION OF OPERATION MEASUREMENT OF PV INVERTERS SUPPORTING ADVANCED FEATURES IN DS WITHIN INTERFLEX

Jan Švec, Stanislav Hes, Jan Kůla, Pavel Derner, ČEZ Distribuce, a. s.

This paper deals with results of long-term measurement of advance regulation PV inverters that are installed in CEZ LV networks within European project (InterFlex). PV inverters of overall power higher than allowed by standard were installed in three locations. Measurements analysis shows that power quality parameters are not violated nor PV generation is not restricted.

INTERFLEX EUROPEAN PROJECT – FINAL RESULTS AND THEIR UTILIZATION FOR CEZ DISTRIBUCE

Stanislav Hes, Pavel Derner, Jan Kůla, Jan Švec, Tomáš Linhart, ČEZ Distribuce, a. s.

This paper informs about final results of European project (InterFlex) where CEZ Distribuce played the leading role in Demo2 working package. The project focuses on improving flexibility within European DSO networks. The main objective is to increase the potential of distributed energy resources connectivity and improve the integration of electric vehicle recharging station into distribution system through following features: integration of PV supporting Q(U) and P(U) regulation, U/Q regulation of MV connected generation (PVs, WTs and biogas stations), development and implementation of smart recharge stations and PV equipped with energy storage. The paper informs about expected utilization of tested features within next phases as well as their positive gains for CEZ Distribuce.

FOUR-CONDUCTORS MODELING OF LV NETWORKS

Ondřej Novotný, Josef Hrouda, Karel Hojdar, EGC – EnerGoConsult ČB s.r.o.; Alfred Bodor

New modeling methods are forced by increasing requirements on network calculation accuracy. This paper deals with assessment of benefits of modeling LV networks using four-conductor approach vs former single-conductor (symmetric) approach. Neutral conductor currents and voltages during failure as well as under normal operation are analyzed. Additionally, the paper provides the information regarding the impact of neutral conductor earthing on currents and voltages.

EXPERIENCE WITH IMPLEMENTATION OF U/Q REGULATION FOR MV CONNECTED VESTAS WT

Roman Vaněk, ČEZ Distribuce, a.s.

Voltage increase caused by generations connected to HV and MV network shall not exceed 2 % in the point of connection under normal operation. Connectivity evaluation needs to be based on required power factor $\cos \phi = 1$ in the point of connection, if it is not stated otherwise by DSO. This procedure is possible only in case of generation that is fitted with $PF=f(U)$, $Q=f(U)$ or $P=f(U)$ control.

VERIFICATION OF PV CONTRIBUTION TO VOLTAGE STABILITY UNDER LIMIT OPERATIONAL CONDITIONS OF LV SYSTEM

**Michal Vrána, David Topolánek, Jiří Drápela, Václav Vyčítal, Tomáš Hála, VUT v Brně;
Michal Jurík, Radim Blahůšek, Martin Kurfiřt - E.ON Distribuce, a.s.**

This paper focuses on verification and assessment of contribution of PV Q(U) and P(U) regulation to voltage stabilization within real LV system. The paper presents results of tests which simulate the operation of PVs that are spread within selected LV network. The assessment aims at behavior of each PV that supports the voltage according to PQU parametrization and network status at the point of connection. Additionally, it focuses on network operational indicators from the voltage profile size and unbalance along the terminal as well as power balance.

SIMULATION OF VOLTAGE SET VALUE REGULATION FOR SOURCES AND TRANSFORMER TAP CHANGERS IN MV NETWORKS

**Josef Hrouda, Karel Procházka, EnerGoConsult ČB s.r.o.
Roman Vaněk, ČEZ Distribuce, a. s.**

This paper deals with dynamic model of MV network containing HV/MV transformer and distributed generation. HV/MV transformer tap changer and voltage set value regulator models are implemented. Data are supported by CEZ Distribuce. The impact of both devices on regulation is evaluated for modeled network using variable voltage. Additionally, the influence of threshold and voltage set value on possible elimination of reactive power flow through supply transformer is assessed.

OPTIMIZATION OF Q(U) P(U) SETTINGS OF LV SYSTEM CONNECTED PV

**David Topolánek, Jiří Drápela, Václav Vyčítal, Marek Kopička, VUT v Brně;
Radim Blahůšek, Michal Jurík - E.ON Distribuce, a.s.**

This paper deals with analyzation of Q(U) and P(U) regulation of PV connected to the LV system. It aims at both evaluation and assessment of various Q(U) and P(U) settings of plants and P/Q operation areas under normal conditions of LV system. Simulations were performed to find optimal setting respecting the primary operational modes of PV under both single-phase and three-phase connection. The paper specifies general recommendations for suitable P/Q working envelope as well as for Q(U)/P(U) setting that are supporting the voltage stabilization for the best.

EVALUATION OF RES OPERATION IN 2018

Radim Dušek, EGC-EnerGoConsult ČB s.r.o.; Jaroslav Bořek, ČEZ Distribuce, a.s.

This paper deals with evaluation of renewable energy sources (RES) operation, connected into CEZ Distribuce distribution network. Almost half of the LV RES's were evaluated as well as all MV and HV RES's. Evaluation of active and reactive power supply is based on measured values. Contribution of each source type is based on distinction of data according to the point of connection, source type itself etc.

SESSION 5: DISTRIBUTION SYSTEM DEVELOPMENT

Garant: Jaroslav Šabata, EGÚ Brno, a.s.

CONCEPT OF SMART DISTRIBUTION STATIONS IN CEZ DISTRIBUCE

Martin Mach, Ondřej Tupý, ČEZ Distribuce, a. s.

Higher requirements are put on MV/LV distribution stations due to expected increase of RES and e-mobility, increasing requirements on power quality and supply reliability, safe supply during emergencies and progressive transition to automated distribution network. New concept of distribution stations creates suitable environment for system and long-term solutions which allow to CEZ Distribuce adapt for new situation in power industry. Designed modular and open solution allows for local adjustments of the station equipment and facilitates implementation of future features and functions according to regulations and legislation.

PRIORITIZING OF DISTRIBUTION NETWORK REFIT USING PRIOTOOL SW

Martin Hejhal, Radek, Hanuš, Zbyněk Brettschneider, PREdistribuce, a.s.

PREdistribuce uses the in-house SW tool (PRIOTOOL), which is used to optimization of distribution network refit among the others. Thus the prioritization allows for multi-criteria analysis and definition of the ideal procedure of DS refit. SW PRIOTOOL prioritizes the elements for refitting, so the utility strategy would be accomplished as good as possible.

IMPACT OF TRANSFORMERS LOAD ON LOSSES

František Žák, Energetický regulační úřad

Transformers represent important part of power system. Decreasing of transformer losses have impact on operational conditions of transformers as well as their optimum load level. Though new generation of transformers significantly decrease their load, there are numerous transformers in use that are more than 50 years old. Massive reduction of transformer load cannot be expected nowadays, thus load can be reduced by optimization of their operations. To do that, we have to know how each particular transformer loss affects the optimum operational load.

STATISTICAL EVALUATION OF LV MESHED NETWORK OPERATIONAL VALUES

Michal Ptáček, Václav Vyčítal, VUT v Brně; Jan Vaculík, E. ON Distribuce, a.s.

This paper deals with full-scale statistical evaluation of LV mesh network operational values based on long-term measurements at secondary side of each 22/0.4 kV transformers. The mesh network is anonymized as it is classified as critical power infrastructure. The evaluation focuses particularly on active and reactive power flow, keeping the voltage within limits as well as fundamental operational



criteria within whole DS, including comparison between workday and weekend. The paper presents technical issues of simultaneous measurements and associated data post-processing.

DEVELOPMENT OF E-MOBILITY AND REQUIREMENTS OF RECHARGE STATION CONNECTION

Martin Kurfiřt, Jan Hlavnička, Martin Kašpírek, Daniel Kouba, E. ON Distribuce, a.s.

This paper describes e-mobility scenarios in the Czech Republic, particularly the requirements of recharge station connection to the distribution network. It summarizes measurements that were performed and findings these requirements are based on. The whole process of evaluation, assessment and connection is provided in details. Method of each recharge station registration in GIS is described as well.

PRESENT LV NETWORK LOAD ANALYSIS AND CALCULATION OF POWER THAT IS AVAILABLE FOR E-CAR RECHARGING

Filip Brož, Karel Procházka, EGC; Jan Hlavnička, E.ON Distribuce, a.s.

This paper focuses on assessment of available e-car recharge station power that can be connected into the selected LV network. Calculation model reflects specific parameters of LV network (including real network load) and it utilizes data from AMM pilot project.

PROGRESS IN IMPLEMENTATION OF FIBER OPTIC INFRASTRUCTURE IN CEZ DISTRIBUCE A.S.

Pavel Seidl a kolektiv, ČEZ Distribuce, a. s.

This paper deals with the impacts of fiber optic infrastructure implementation on development of distribution system in CEZ Distribuce. Massive expansion of fiber optic infrastructure – particularly on MV level – forced new engineering solutions and material specifications. This paper contains information regarding the project progress, network development processes, maintenance and failures clearing. It summarizes issues of designing and realization of structures including risk assessment.

FUNDAMENTALS OF MV LINE ADJUSTMENT IN FOREST CORRIDORS AND THEIR SIDE-RUN WITH FOREST PATHS

Karol Szarysz, Východoslovenská distribučná, a.s.

Východoslovenska distribucna a.s. went through the R-2 cycle of investment planning by processing the strategic study for defining the scale in which MV overhead lines would be replaced by cables and by introduction of the “Principles of MV overhead lines replacement in forests and side-run with forest paths”. This paper informs about experience gained during implementation of this strategy.

EVALUATION OF POWER SUPPLY QUALITY IN 2018

Jan Liška, Energetický regulační úřad

This paper deals with evaluation of power supply quality and associated services in power industry in the Czech Republic in 2018. Attention is paid to continuity indicators, including the relationship with incentive power quality regulation. The paper includes the information of the CEER's Electricity Quality of Supply Work Stream group, which is dealing with 7th comparison report of power and gas supply quality.

DETERMINATION OF PROBABLE FAILURE LOCATION AT MV USING FAILURE LOCATOR AND RECLOSERS

Branislav Anderko, Slavomír Veseleňák, Východoslovenská distribučná, a.s.

This paper deals with assessment of probable failure localization in MV networks using failure locator (FLOC) and RLC. FLOC is embedded in state-to-the-art protections. It calculates the reactance between protection itself and the point of the failure (so called failure loop reactance). This calculation provides suitable results in case of phase-to-phase failures (i.e. failures that cause breaking the line off).

VIOLATION OF POWER FACTOR SETTINGS AND NON-REQUIRED SUPPLY OF REACTIVE POWER INTO LV DS

**Michal Ptáček, Václav Vyčítal, David Topolánek, Petr Toman, Viktor Jurák, VUT v Brně;
Viktor Blažek, Michal Kučera, E.ON Distribuce a.s.**

Full scale assessment of reactive power overflow at distribution transformer station (DTS) requires not only the detailed measurement on DTS itself but the detailed analyzation of consumer behavior as well. This paper focuses on basic statistical evaluation of active power consumption and reactive power supply and consumption at LV level over selected sample of distribution transformers including potential violation of power factor setting and non-required reactive power supply into distribution system.

DETERMINATION OF PROBABLE FAILURE LOCATION AT MV USING SMART METERS

Martin Stanko, Slavomír Veseleňák, Východoslovenská distribučná, a.s.

This paper deals with assessment of failure localization in LV network using SMART meters based on customer interruption report. The quick customer identification is achieved through name, address, point of connection number, OP number and EIC number. It allows for subsequent verification using ping, requested reading of voltages, currents and breaker status, automatic verification of SMART meter availability and processing spontaneous events either directly at customer (provide that there is SMART meter installed) or at customers connector to the same LV feeder. Localization is based on these information. This paper describes the repair staff deployment prioritization (based on the location), determination of necessary staff and cost saving regarding the offset payment.

SESSION 6: MANAGEMENT, ORGANIZATION, QUALIFICATION

Garant: Martin Schneider, PREměření, a.s.

STRATEGIC PLANS AND DOCUMENTS AFFECTING POWER INDUSTRY, THEIR RELATIONSHIP AND IMPACT ON TECHNOLOGY DEVELOPMENT AND PARTIES CONCERNED

Jan Šefránek, Vladimír Vajnar, Energetický regulační úřad

Nowadays, we experience dynamic evolution in each and every area of power industry, particularly objectives that need to be achieved. Technological development is not an instrument anymore and it has become objective itself. Reasons of this are mostly political and in many times they are closely connected with environmental protection. The future of power industry is then formed by these political decisions. This paper presents fundamental strategic document and tools that are associated with the power industry. It deals with their relationship and their impact on parties concerned, such including power transmission and distribution.

FLEXIBILITY AND LOCAL POWER COMMUNITIES – FUTURE TRENDS

Pavel Círek, Energetický regulační úřad

“Clean Energy for All Europeans” package contains two terms that support customers with better decision making options regarding their supply. It is questionable, whether flexibility is new trend or just utilization of already existing concepts. Local power communities are beneficial regarding the decentralization, development of specifically-designed networks and building up the communities as well. This paper deals with issues associated with local power communities within the legislation framework in the Czech Republic.

E-MOBILITY – OPPORTUNITY FOR CUSTOMER, DISTRIBUTOR OR BOTH?

Martin Schneider, Jindřich Nerad, PREměření, a.s.

Development of e-mobility will cause increase of distributed energy generation. This energy generation is not distributed equally but it can be controlled. This paper deals with question whether the power for e-mobility should be controlled by customers or by DSO



E-MOBILITY INTEGRATION IMPACT ON PRAGUE DS

Jiří Randa, PREdistribuce, a.s.

This paper deals with expected e-mobility impacts on distribution system. It describes short- and middle-term anticipation of development not only e-car number but recharging infrastructure and its requirements on DS as well. This paper describes necessary adjustments of DS and expected financial burden. Final part of this paper outlines the way the economic impact could be mitigated by recharging infrastructure implementation while keeping recharging capacity.

READING THE RESULTS OF GENERATION ADEQUACY AND MEANS OF POWER DEFICIENCY ELIMINATION

David Hrycej, Ondřej Mamula, CIIRC ČVUT

Existing methods and tools for assessment of generation deficiency are lacking the specification of impacts on particular part of state (industry, civilians, transportation, critical infrastructure, etc.) and nonexistent reference values that would trigger the government regulation. Reliability characteristics are under development within the MAFRI project. These characteristics should enhance the MAF indicators and help the responsible parties in decision making process regarding the reliability-focused measures, investment into the infrastructure, etc.

ENGINEERING AND LEGISLATION CHANGES IN POWER INDUSTRY IN 2ND DECADE OF 21ST CENTURY

Hynek Beran, ČVUT

This paper deals with changes in power industry that are expected during 2nd decade of 21st Century. These changes are relating with energy mix, EU legislation, consumption and energy storage as well as power generation. The paper presents some important questions regarding this issue.

FULL-SCALE CYBER SECURITY OF CRITICAL INFORMATION INFRASTRUCTURE IN POWER UTILITY

Karel Štěpán, E.ON Distribuce, a.s.

This paper deals with cyber security as it is carry in the E.ON Distribuce on.

ACCURATE LOCALIZATION OF NON-TECHNICAL LOSS IN DS USING ANALYTIC APPROACH, MONITORING AND NETOWRK ANALYSIS

Petr Lžičář, Awesense Europe s.r.o., Jakub Šatka, Awesense Inc.; Jarmila Verešová, Východoslovenská distribučná, a.s.

True Grid Intelligence (TGI) offers cost-effective solution of improving efficiency and modernization of distribution system combining geographical information and time series data. It supports network monitoring, power audits and real-time network analysis. The paper provides the example of non-technical losses localization in distribution network in Vychodoslovenska distribucna. TGI Raptors sensors were deployed in one village allowing for identification of several unauthorized loads.



SMART METER CONNECTION TO THE FIBER OPTICS COMMUNICATION INFRASTRUCTURE

Martin Vycpálek, PREdistribuce, a.s.; Jiří Adámek, PREnetcom, a.s.

There are ever increasing requirements on volume, matrix and security of data exchange from AMM including their transmission to the customer as well as data center. PREdistribuce has initiated pilot project that is testing the future data exchange between meters and reading center via Smart Energy Gateway. The communication utilizes passive fiber optic network (PON) and active technology (GPON). This paper describes the network specific concept and topology, fiber optic connection to the switchboard including the connection to the meter.

AUXILIARY METHODS OF SPECIFIC APPLIANCES CONSUMPTION USED FOR INVOICING OF UNAUTHORIZED LOAD

Tadeusz Sikora, VŠB-TU Ostrava

Determining the compensation for unauthorized consumption in compliance with public notice number 82/2011 Series can be questionable. This paper deals with alternative calculation of some of the major appliances, such as air conditioning, power heating and boilers.

DATA CONCENTRATORS IN SCADA – LOGIC MODEL, FUNCTIONS AND CYBER SECURITY

Jindřich Zoubek, TECHSYS - HW a SW, a.s.

This paper describes the logic model of data concentrators within secondary HW and SCADA. It points out each function of data concentrator and the importance of this independent solution of data acquisition for improving the control system robustness. Particularly, it deals with improvements such data concentrators provide regarding the cyber security.