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ABSTRACT BOOK

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Book of Abstracts

Hotel Dvořák – Kotnov - November 4-5, 2014

SESSION 1 – NETWORK COMPONENTS

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

HV POWER SWITCHES WITH CO2 QUENCHING GAS

Michal Prchlík, Milan Keller, ABB s.r.o.

SF6 gas has a unique combination of physical properties; for switches there is essential especially high dielectric strength and excellent ability to quench the arc. However, it is proven that the SF6 gas in the free atmosphere contributes to the so-called greenhouse effect. In an ongoing effort to reduce the impact of products on the environment, the ABB company is engaged in the development of switches using alternatives to SF6 gas. The result is a LTA switch, which instead of SF6 gas uses CO2 gas as an quenching and insulating medium.

THE SURVEY OF THE CURRENT CARRYING CAPACITY OF ROPE CONNECTORS OF HV PIPE BUSBARS

Jaroslav Šnajdr, Jan Sedláček, Zdeněk Vostracký – UWB, Regional Innovation Centre for Electrical engineering

Jiří Velek – ČEPS, a.s.

The paper analyzes the rope connectors connecting the pipe busbars in HV substations. The paper builds on the introduction of dynamic loading technology into practice and evaluates the impact of the increased current carrying capacity of selected lines on the temperature of the connectors and the quality of their contacts. There is made a model of selected connectors and calculated the temperature distribution due to the heating effect of electric current when taking into account the impact of standard ambient conditions. To verify the results, the finite component model is compared with the analytical calculation of rope connectors and monitored the actual maximum current carrying capacity considerig the allowable temperature rise. In conclusion the results of variant calculations are summarized, including a sensitivity analysis and there is also included a recommendation for thermal control of the connector system.

AN INCREASE IN FAILURE RATE OF MV INSTRUMENT TRANSFORMERS, ITS CAUSES AND POSSIBLE DIAGNOSTIC METHODS FOR THE DETERMINATION OF THESE CAUSES

Jiří Horák, ČEZ Distribuční služby, s.r.o.

Instrument voltage transformers are an integral part of the equipment of electrical substantions of all voltage levels. In terms of the price of individual components it is not the most expensive equipment of switching stations and power substations, but their failure always causes the substation shut-down with the impact on customers. In recent years we have seen an increase of failures in these devices. The paper analyzes the possible causes of the instrument transformers faults and proposes measures for their early detection and thereby eliminating the costs.

A DETECTION OF CORROSIVE SULFUR IN THE FIELD USING ELECTRICAL MEASUREMENTS

Václav Straka, "TMV SS" spol. s r.o.

Corrosive sulfur is a relatively new phenomenon. A few years ago we thought that it would not apply to machines operating in the Czech Republic and Slovakia. The fact shows that it was a false assumption and the problem of corrosive sulfur affects a relatively significant group of machines. The paper deals with a method that allows a non-invasive detection of phenomena which show the presence of corrosive sulfur or silver in the transformer using electrical measurement methods. A verification of assumptions based on practice is also included.

THE DEVELOPMENT OF DTS ON THE POLYGONAL POLE

Miroslav Fedorčák, Východoslovenská distribučná, a.s.

Miroslav Tilinger, ELV Produkt, a.s.

The paper deals with a new technical solution of a universal type of a pole monted transformer station on the polygonal pole.

THE COURSE OF AN ASSESMENT OF THE CURRENT CURRYING CAPACITY OF ALFE CONDUCTORS

Ondřej Novák, Kamil Čihák, ČEZ Distribuce, a.s.

This paper focuses on the history of the conditions and procedures for the determination of values of the current carrying capacity of AlFe conductors used for the construction of overhead lines in the Czech Republic and SROV.

INCREASED CURRENT CARRYING CAPACITY OF OVERHEAD LINES WITH RESPECT TO CURRENT WEATHER CONDITIONS AND THE PREDICTON OF-THE CARRYING CAPACITY

Petr Lehký, EGÚ Brno, a.s.

Jiří Velek ČEPS, a.s.

The paper shows the possibilities of increasing the current carrying capacity of conductors for overhead lines throughout the year depending on the current and forecasted weather conditions.

THE EXPERIENCE OF PREDISTRIBUCE, A. S. WITH THE NEW CABLES OF A 22-AXEKVCER TYPE

Jiří Ullrich, PREdistribuce, a.s.

The paper describes the history of cable types used in the distribution network of PREdistribuce, a.s. on the voltage level of 22 kV with a focus on current trends in the form of a new cable design of a 22-AXEKVCER type. This is a high voltage cable with an insulation of cross-linked polyethylene with a flame retarding halogen-free polyethylene sheath. In addition, this paper describes the usability and practical experience in the distribution network of PREdistribuce, a.s.; the fire endurance test of the cable and finally the techno-economic evaluation.

INFORMATION FROM THE CIRED NATIONAL CONFERENCES HELD IN CROATIA AND SLOVENIA

František Vybíralík

The information from the CIRED Conferences held in Croatia and Slovenia. It will deal with selected experience from the presentations in the field of electrical substations, overhead and cable lines.

SESSION 2 – POWER QUALITY AND EMC

Guarantor: Pavel Santarius, VSB-TU Ostrava

THE QUALITY LEVEL OF ELECTRICITY IN THE DS IN THE CR

Jan Petrásek, František Kysnar, EGC-EnerGoConsult CB Ltd.

The paper presents the results of the assessment of the quality level of electricity in the supply area of all distribution system operators in the Czech Republic. There has been presented the assessment of data for interchange points between TS and DS since 2006 and data from delivery points of 110kV and power stations of 110kV/MV since 2010. Together with the ongoing (continuous) voltage phenomena there are also evaluated the recorded voltage phenomena. Due to the long-term monitoring of power quality parameters in the above points of DS, the paper comments on trends in power quality parameters at different voltage levels.

THE ASSESSMENT OF SHORT-VOLTAGE EVENTS IN THE TERRITORY OF ČEZ DISTRIBUCE, A.S. COMPANY

Michal Konč, ČEZ Distribuce, a.s.

František Kysnar, Jan Petrásek, EGC-EnerGoConsult CB Ltd.

Distribution system operators are facing the increasing pressure to improve the quality of electricity, even in the period of changes the distribution network are going through nowadays (the expansion of renewable resources, etc..); not only in the field of ongoing (continuous) effects, but also in voltage events. This pressure is evident not only from customers who are connecting more sensitive types of technology, but also from the CEER, who in some European countries present in addition to the usual indicators of SAIDI, SAIFI also the indicators of shorter events - MAIFI.

The paper presents an overview of the current situation in the field of voltage events (dips, swells, interruptions) in the territory of CEZ Distribution, a.s. company at all voltage levels. It uses an extensive monitoring installed in distribution networks of CEZ Distribution, a.s. Additionally, the paper deals with a detailed analysis of short-term interruptions in the selected area, the calculation of MAIFI indicator, but also with a possible approach to the verification of input data for the calculation of this indicator.

THE DEVELOPMENT OF POWER QUALITY OF SELECTED CUSTOMERS OF E. ON DISTRIBUTION COMPANY SINCE 2001

T. Celba, K. Procházka, EGC-EnerGoConsult CB Ltd.

M. Kašpírek, E.ON Distribution

The paper summarizes the results of the monitoring of voltage characteristics according to the CSN EN 50160 standard of selected MV customers of - JČE Company from 2001 to 2004 and later (after the acquisition of JČE) from 2005 to 2014 of E.ON Distribution. In the period from 2001 to 2005 there were monitored 5 or better to say 6 delivery points in the present area of E.ON West, after the year 2006 their number increased to 17 in the whole supply area of E.ON Distribution.

There were monitored either continuous variables – the level and voltage fluctuations, voltage unbalance, a total harmonic distortion and flicker and the limit variables of current, active and reactive power and load distribution in selected zones of power factor, and voltage events, i.e. dips, swells and power supply interruptions. The level of interference (particularly the flicker parameter) in MV

distribution grid is also assessed in relation to the size of the network impedance at customer delivery points.

ELECTRICAL ENERGY SAVERS – AN ANALYSIS OF OPERATING MEASUREMENTS AND AN IMPACT ON THE VOLTAGE QUALITY

Ing. Jan Jiřička, Ing. David Mezera, Ph.D., Ing. Martin Kašpírek, Ph.D., E.ON Česká republika, s.r.o.

The paper analyzes a principle, a function and an impact of the operation of two types of electrical devices for electricity savings: the device designed for conventional types of appliances and the device intended for public lighting. The aim of the measurements carried out on real installations of the customers connected to the E.ON Distribution grid was to verify the principle on which the power saver is working, particularly a behavior in terms of the voltage, active and reactive power; on selected types of appliances to demonstrate the power saver function and identify the savings; to calculate the efficiency of the devices in terms of power flow in front of / behind the device and losses and to identify possible impacts on the distribution grid.

THE BEHAVIOR OF STATIC ELECTRICITY METERS IN ACTIVE NETWORK CONDITIONS

Jiří Drápela, Jan Šlezingr, David Topolánek, Department of Electrical Power Engineering, FEEC, BUT

Static electric meters used at photovoltaic power plants of small output mainly are, as shown recently, subjected to conditions which result in deviation from their expected functions. The problem is in the measurement of the active or possibly reactive power, but also the amount of electrical energy recorded in the registers. We can observe that these effects are the result of deliberate use, or misuse, the way of measurement and registration of electric energy by meters, or even the result of improper performance measurement by electric meters, or by other physical limitation, and by low resistance of electric meters to signals which accompanies the transfer of measured energy. The result is often a significant deviation of the registered energy from the expected and given values. Nevertheless, such electric meters are certified and according to current legislation are marked as suitable. It should also be noted that this issue is not only the domain of photovoltaic sources, but its principles can be extended to other locations of electric meters application, in which we can expect similar conditions.

The paper deals with the classification of mechanisms influencing the registered electrical energy by electric meters with a presentation of the results of the experiments.

DEPENDANCE OF VOLTAGE QUALITY ON A CHANGE OF SHORT-CIRCUIT POWER DURING THE CHANGE OF THE VOLTAGE CONTROL BUS FROM THE 220 KV LEVEL TO THE 400 KV LEVEL

Ing. Mirosav Dubovský, Stredoslovenská energetika, a. s.

As a result of upgrading the transmission system there was a change in the voltage control bus - from the 220 kV level to the 400 KV level. From a given node there is provided power distribution of 110 kV lines and further transformation from 110 kV to 22 kV level and below for most customers. One of the 110 kV outlets powers an operation of an arc furnace with the consumption of approximately 40 MW. The paper deals with the dependence of voltage quality and impacts of the arc

furnace on the voltage quality according to changes in short-circuit power. All findings are based on scientific measurements.

THE CHANGING ROLE OF ROTARY COMPENSATORS DURING VOLTAGE STABILIZATION IN POWER SUPPLY AREA OF KRASÍKOV SUBSTATION

Ing. Jan Šeda, ČEZ Distribuce, a. s., Děčín, Ing. Zdeněk Hruška, ČEPS, a.s. Praha

Ing. Jan Šeda, during the lectures in 2008 and 2009, introduced the participants with special and unique equipment for correction of reactive power in Krasíkov substation - synchronous compensators connected to the tertiary winding of EHV / HV transformers. Then again, particularly in the year 2009 the authors of the lectures pointed that more attention is paid to monitoring of P / f (links between an active power and frequency) than to troubleshooting of U / Q (links between reactive power and voltage). Their findings were based on the events in the area of Krasíkov substation.

Two synchronous machines with a range of -50 to + 100 MVAr were, until the end of the year 2008, more used for supporting the reactive power and thus for an increase of the voltage of 400 kV and also 110 kV. At the end of the year 2008, however, it showed an increase of reactive power in the systems, and thus the need for this power to be drained and to reduce the voltage in both systems. This trend then continued in the following years, especially after the year 2010.

In the lecture there will be given information about the compensators and their options. Further, there will also be outlined the possible causes of changes in their use associated with changes in TS and DS and there will be explained options of compensators´ activities in these changed conditions.

POWER MEASUREMENSTS IN THE THREE-PHASE SYSTEM - DISTORTION, ASYMMETRY

Ing. Jan Souček, MEgA

The paper deals with the definitions of power for a general three-phase asymmetric system with distorted voltage and current. There are presented the best known power definition with evaluation of their strengths and weaknesses. Further there is described the procedure and the possibility of calculating the power by using components from the frequency analysis of voltage and current. The paper also tries to propose variables intended for recording information when considering their information values and the total volume of data. Finally, the theoretical analysis is complemented by measurements with subsequent analysis.

THE PAPER OF CTU IN PRAGUE, FACULTY OF ELECTRICAL ENGINEERING

Josef Tlustý, CTU in Prague, FEE

AN ANALISIS OF HARMONIC VOLTAGE IN A LV DISTRIBUTION GRID

Ing. Martin Kašpírek, Ph.D., Ing. David Mezera, Ph.D., E.ON Česká republika, s.r.o.

Ing. Karel Procházka, CSc., EGC EnerGoConsult CB Ltd.

The paper analyzes the harmonic voltage in LV distribution grid. There is not assessed only the compliance with the CSN EN 50160 standard, but the level of voltage in relation to the limit value for a given harmonic. The subject of the analysis is about 1000 weekly measurements of power quality made at random in the LV distribution grid. The level of harmonics is then related to the known size of the network impedance, which was measured at each power quality measurement. Then there is discussed the issue of exceeding levels for selected harmonic in relation to the limit value according to the CSN EN 50160 standard. In addition to the harmonic the article also describes the correlation of other power quality parameters (voltage deviation, flicker, asymmetry ...) in relation to the size of the impedance of the LV grid.

SESSION 3: OPERATION, CONTROL AND PROTECTION OF NETWORKS

Guarantor: Petr Toman, Brno University of Technology

THE EXPERIENCE FROM SGR IN OPERATION

František Žák, EGE, spol. s r.o.

In grids with a compensation of ground capacitive currents there through the point of ground failure flows a residual current. The residual current is affected by the precision of the tuning of the arc suppression coil, by the extent and parameters of the grid. An important role is played by the size of the active current of the ground fault. With a low resistance of the ground failure there will through the point of the ground failure flow currents of high harmonics. One of the ways how to reduce the current at the point of the ground failure is the grounding of the phase with the ground failure in the power substation. The faulted phase can be grounded directly or via a limiting resistance optionally via reactor. The grounding of the phase through the reactor is known as SGR. This system has been in operation for several years and it is possible to present the practical experience.

EQUIPOTENTIAL CIRCLES AT MV POLES, AN IMPACT OF THE NUMBER AND THE DEPTH OF PLACING ON THE DANGEROUS VOLTAGE

František Brož, Karel Procházka, EGC- EnerGoConsult CB Ltd.

Jaroslava Orságová, David Topolánek, Vojtěch Wasserbauer, BUT

The paper deals with the impact of the placing of equipotential circles on the course of step and touch voltages.

AN ASSESSMET OF A FUNCTION OF A FAULT LOCATOR WHICH USES A TEMPORARY GROUNDING OF HEALTHY PHASE DURING PERNAMENT EARTH FAULT TO INCREASE ITS SENSITIVITY

David Topolánek, Jaroslava Orságová, Petr Toman, BUT

The paper is focused on assessing the appropriateness of the use of healthy phase grounding method for locating of earth faults in compensated distribution systems. The paper is an analysis of the experimental measurements, which verified the accuracy of the locator during assessing the reactance to the point of the earth fault at the time of temporary grounding of healthy phase during the permanent earth fault of the metal, resistance and arc character. The result of this paper is to assess the accuracy of the calculated distance (reactance) of the failure by the locator and recommendations for the use of the described method of locating of the earth fault in our distribution systems.

TRANSFORMERS´ CONCEPTION OF THE CR + SR - STILL CURRENT AND NEEDED

Jiří Bermann, ABB s.r.o.

The paper introduces the elaborated transformers´ conception of the Czech and Slovak Republic networks with a logical sequence of voltage levels including regulation of voltage by taps. In the context it shows the size of the transmitted voltage of a zero component through the systems of HV and MV. It seeks to shed light on the reasons for the form of the conception and gives instructions on how not to spoil it nowadays.

THE USE OF 2G AND 3G GRIDS FOR ASDŘ

Jaromír Kordas, ČEZ Distribuce, a. s.

The paper presents the experience of a twelve year using of a GPRS service, now GPRS / EDGE services and UMTS / HSPA for data transmission in ASDŘ. There are mentioned the results of the tests of used technologies and services for the transmission of signal changes and other data. It assessed the functionality and suitability of available services, especially the 2G and 3G grids for the transmission of changes in measurement values, status and fault signals, a remote control and automation.

POWER LINE COMMUNICATION FOR SMART METERING AND SMART GRID - CURRENT OPTIONS

Petr Mlýnek, Jiří Mišurec, BUT

The paper deals with the survey of the available standards and circuits for communication over power lines. For this purpose, there are mentioned several available modems which can be used for realization and implementation of available standards. There are primarily PRIME and G3-PLC standards which are described and compared in terms of their properties. Furthermore, it deals with the currently widely discussed and new standards of G.hnem and IEEE 1901.2. The last part is focused on the discussion of the use of wider frequency band (FCC) in Europe and on the analysis of appropriate modulation and coding techniques of PLC communication in terms of a specific application.

AN ANALYSIS OF A POSSIBLE ELIMINATION OF OVERVOLTAGE GENERATED DURING A TEMPORARY GROUNDING OFA HEALTHY PHASE DURING AN EARTH FAULT LOCAZATION

David Topolánek, Jaroslava Orságová, Petr Toman, BUT

The paper builds on the results of experimental measurement, which tested the functionality of the automatic system during the grounding of the healthy phase during an earth fault for its localization. During the analysis of the findings there was observed the occurrence of significant overvoltage caused by grounding of the healthy phase. The paper is therefore focused on detailed description of the cause of the overvoltage and on finding of measures that would lead to its elimination. The results of the analysis are supported by a simulation and calculation of a synchronous short-circuit using symmetrical components and a two-port theory.

THE USE OF FAULT LOCATORS IMPLEMENTED IN 22 KV DIGITAL CABLE PROTECTIONS

Martin Horák, Západoslovenská distribúčná, a.s.

Digital protections brought many benefits, new functions and possibilities. Their total contribution is undisputed. One of the additional functionalities of digital protections is also an implemented fault locator. At 110 kV lines, this locator is commonly used for determining the location of interphase and earth faults, as 110 kV lines have a simple topology (point - point) and electrical parameters are constant along the line, possibly along several sections.

The use of fault locators for determining the location of interphase faults on 22 kV lines is disproportionately more difficult. Lines, although radially connected, have a larger number of diverging sections and electrical parameters along the lines change frequently (a different arrangement of conductors, different conductor cross-section). The paper describes the practical experience of using fault locator for 22 kV lines operated by Západoslovenská distribučná.

THE INNOVATION OF VOLTAGE-FREQUENCY PROTECTIONS OF RENEWABLE ENERGY SOURCES ACCORDING TO CHANGES IN THE 03/2014 DISTRIBUTION NETWORK CODE, ANNEX 4

Jaroslav Pospíšil, Tomáš Effenberger, PROTECTION & CONSULTING, s.r.o.

The concept of protection of renewable energy sources in MV and LV grids in the Czech power engineering is given by the distribution network code, Appendix. 4. The distribution network code is in compliance with the Transmission Code 2007. The philosophy of immediate disconnection of plants at faults in a grid that was acceptable earlier is not sustainable with their increasing share in DS. Therefore, the voltage dips at faults in the grid can cause disconnection from the grid only in exceptional cases.

In the new setting of electrical protections there is, for example, accepted “go throught” the fault during the temporary voltage dips (FRT) and in agreement with the DNO the 2nd stage of voltage and frequency protections may not be used. We present a new voltage-frequency protection, which can be used for voltage or frequency lightening of the grid.

THE OPTIMAL SETTING OF PROTECTIONS AND CIRCUIT BREAKERS AS A WAY TO REDUCE THE RISK OF BURNS FROM THE ELECTRICAL ARC IN THE DISTRIBUTION GRID

Jan Pígl, Eaton Elektrotechnika s.r.o.

Nowadays, it is required the constant improvement of the level of security (protection) of workers at work, in all areas of human activity. The newest trend in the service and work with the electrical devices is the evaluation of the risk of burns from electric arc, so called Arc-Flash Hazard Analysis, which is already required under the NFPA 70E-2012 standard in the USA and recently also thanks to NEN 3140 standard (based on the EN 50110-1standard) in the Netherlands. The aim of this paper is to describe the evaluation of the risk of burns from electric arc in distribution network based on the NFPA 70E-2012 standard (Standard IEEE 1584TM-2002) and on several practical examples to show why it is necessary to pay an increased attention to the setting (parameterization) of protections and circuit breakers.

PROCESSBUS IEC 61850-9-2

Pavel Glac, Siemens s.r.o

The communication according to the IEC 61850 standard in the field of management and protection is an absolute standard nowadays. Initial distrust in

the horizontal GOOSE communication and its use for interlocking, but also mechanisms such as reverse blocking, the implementation of an automatic back up, etc. had long passed.

However, with the implementation of the Chapter 9-2, which defines the transmission of measured values (SMV - sampled measured values) for communication network (processbus), leading manufacturers hesitated until recently and the practical implementations have just started to appear. Therefore, it is needed to address the related issues and problems such as communication network topology diagram, redundancy, the connection of unconventional convertors or the use of this technology for phasor measurements.

The paper addresses except these issues also the effort to modify some parts of this chapter based on practical experience with the implementation.

SESSION 4 – DISPERSED GENERATION, UTILISATION OF ELECTRICITY

Guarantor: František Kysnar, EnerGoConsult CB Ltd.

REQUIREMENTS FOR CONNECTING THE HIGH CAPACITY BLOCKS OF NUCLEAR POWER PLANTS

Jiří Hledík, ČEZ, a.s. – ETE

The high capacity blocks of new nuclear power plants are subjected to very strict technical requirements specified in the Transmission Network Code of the Czech Republic and the requirements prepared within the ENTSO-E standard, especially in the European Code of Requirements for Generators (RFG). The technical solution of the block and its power output must be assessed in terms of the impact on the superior electricity grid, i.e. Compliance with the maximum short-circuit contributions, permitted deviation of the voltage and frequency values, the ability to control the block in island operation mode and in the mode of own consumption, ability to operate at faults in the grid and the ability to control of active and reactive power. Requirements for final power output of the block and the block size is also subjected to an analysis of "design to cost".

ASVR OF HORNÍ ŽIVOTICE WIND POWER PLANTS

Roman Vaněk

In the nodal area of 110kV in Horní Životice there is planned to install 106 MW of wind farms. This connected power is necessary to regulate. In connection conditions there is both, cutting down the active power and the regulation of reactive power.

To control the reactive power of these farms CEZ Distribution in cooperation with EGÚ Praha built - Engineering ASVR system that commands the reactive power of the individual parks according the constant voltage of 110kV in the substation of Horní Životice.

PRACTICAL EXPERIENCE WITH THE OPERATION OF ASVR IN HORNÍ LODĚNICE WPP

Richard Habrych, ORGREZ, a.s.

The paper is focused on the issue of effective use of the reactive power of wind power plants in favor of improving the voltage conditions in the 110kV grid. Specifically, the paper is focused on the wind park of Horní Loděnice - 18MW where there was installed the secondary voltage regulation (ASVR) for voltage stabilization needs on the busbar of 110kV Šternberk substation. The article presents the basis for the implementation of ASVR, specific technical implementation, examples of the operation through grafical representation and final assessment.

AN ANALYSIS OF REACTIVE POWER REGULATION AT PV PLANTS

Jaroslav Pospíšil, Pavel Tureček, Tomáš Effenberger, Protection & Consulting, s.r.o.

Within the project task of the active and reactive power control of the PV Plant Vlkoš / it was built in two stages 4 MW and 2.5 MW – with a new type of SMA TLRP invertors / was designed, implemented

and tested the control of P and Q and there was created so called Hybrid control algorithm Q. When checking the regulation of P, Q there was found out the amplitude / of almost 10% / and especially phase asymmetry of voltage / up to 5.5 ° / and they are the root cause of the power imbalance of PV Plant Vlkoš both in the active and, especially, the reactive power. At the end of the paper there is a discussion about the concept of the control of PV Plant at measuring 3-phase power values and phase to phase voltage. There is carried out the evaluation of the reactive power regulation of PV Plant Raková / 6 MW / in the nodal area of Konice in terms of the current energy engineering concept – setting the size of a power factor.

A VERIFICATION OF SPECIFIC PROPERTIES OF PVP AND WPP IN THE DYNAMIC AREA

František Kysnar, EGC – EnerGoConsult CB Ltd.

Jiří Drápela, BUT

The current rules for the assessment of the connectivity of dispersed generation sources are based only on the static modeling. The impact of dispersed generation on the distribution network operation during transient state is not assessed, because, among other things, there is a lack of the necessary tools. Within the project TA03020523 supported by TA ČR a library for making a dynamic model of the distribution system including distributed generation sources is being created. To set the correct parameters of models, a number of measurements on operating resources was carried out, which verified the created models. The paper deals with the results of measuring the specific properties of the selected sources of dispersed generation.

THE PAPER OF BUT – THE TITLE WILL BE PROVIDED LATER

Jiří Drápela

THE EXPERIENCE IN THE OPERATION OF THE WIND FARM KRYŠTOFOVY HAMRY VII. – THE PAPER WILL NOT BE PRESENTED

Vladimír Velek

The various statistics of the sixth year of operation of the wind farm Kryštofovy Hamry. An overview of production and own consumption of the farm.

THE U TŘÍ PÁNŮ III. WIND FARM – THE PAPER WILL NOT BE PRESENTED

Vladimír Velek

The results of the last four years of operation of the wind farm. The statistics of achieved power, overviews of own production and consumption.

THE POTENTIAL OF ELECTRICITY CONSUMPTION MANAGEMENT IN THE CZECH REPUBLIC

Michal Macenauer, EGÚ Brno, a.s.

One of the basic requirements for electricity grid from the beginning of its systematic building was the ability to cope with fluctuating loads, both at the level of the whole system and at the level of local medium-voltage and low-voltage distribution grids. The interconnected system allows a partial offset of fluctuations due to the greater amount of appliances and more resources. Fluctuating load can be managed by suitable sources (startup, shutdown, reducing and increasing of power), or also by a suitable consumption management so that not to reduce the added value from the use of electricity (typically concerning the management of consumption of the thermal storage appliances) . The issue of consumption management is currently gaining importance in the context of the development of intermittent sources of electricity, the expected development of electro mobility and the development of technologies that enable local small-scale electricity storage. The paper offers a pragmatic (if possible ideology free) look at the electrisity consumption management options in the Czech Republic. The prediction of electricity consumption, its nature and the necessary limitations imposed by the methods of its use are taken into account.

THE IMPACT OF DSR SFC ON A FREQUENCY REGULATION QUALITY

Tomáš Linhart, Martin Pistora, Karel Máslo, ČEPS, a.s.

This paper deals with the impact of the expansion of the frequency regulation by temperature-controlled devices, which is described in the draft of the European network code - Demand Connection Code from the 21st of December 2012, the so-called Demand Side Response System Frequency Control. In the first part of the paper there is described the model of frequency dependent thermostatic load in the MODES network simulator. In the second part there is shown the impact of this regulation on the size of frequency deviations - in the operation of the interconnected synchronous zone of the Continental Europe, in the island operation of the electricity grid in the Czech Republic and in a separate operation, which is characteristic of the system restoration after the blackout.

MONITORING AND DIAGNOSTICS OF AN OPERATION OF PV PLANTS

Jaroslav Pospíšil, Petr Pospíšil, Roman Málek,

Marek Špinar, Pavel Tureček, Protection & Consulting, s.r.o.

To assess the PVP connection to the grid, it is necessary to use new approaches that meet the technical requirements of the regulation of the active power, voltage and reactive power, of the operation of photovoltaic power plants at different voltage and frequency, and compliance with standards of electricity quality.

Increased reliability of their production can be achieved by installing the monitoring and diagnostic systems that continuously monitor the performance of all their parts. For example in photovoltaic power plant / PVP / - panels, invertors, electrical part on the MV, LV part and own consumption.

The part of this paper tries to create a single concept, which deals with the inter-annual comparison of the energy produced by the four selected PVP in terms of - the total amount of the energy, losses in the cabling between the invertors and the electricity meter, theoretically generable energy and the impact of aging on the performance of the PVP panels. The study is based on the data from the PSC monitoring system, which provides data from the invertors, the electricity meters and analyzers, from the exposure and temperature sensor.

SESSION 5: DEVELOPMENT OF A DISTRIBUTION SYSTEM

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

GRADUAL REPLACEMENT OF 220 KV GRID FOR 400KV GRID – AN IDEOLOGICAL PROPOSAL

Svatopluk Vnouček, Andrew Kasembe, Jaroslav Čermák, Petr Hamouz – ČEPS, a.s.

Jiří Ptáček, Petr Modlitba, Milan Krátký – EGÚ Brno, a.s.

A limited transmission capacity and gradual aging and phase out of sources connected to the 220 kV power system is causing that the system of 220 kV has already ceased to meet its original function within the transmission system, and therefore the TS CEPS operator decided on the gradual decline of the present 220 kV power system and its replacement with the 400 kV grid.

The paper deals with various aspects of the gradual replacement of the 220 kV grid, a proposal of the most appropriate time procedure for the gradual replacement of the 220 kV system with 400 kV power system while maintaining the reliability of transmission system, the security of power distribution in 110 kV areas and absorption of all sources connected to the existing transmission network. The target state of the replacement should be reached until 2040.

AN OPTIMIZATION OF TECHNICAL SOLUTIONS IN ČEZ DISTRIBUCE, A. S.

Martin Mach and the team of the Department of Optimization of Technical Solutions – ČEZ Distribuce, a. s.

The paper describes a method of optimization of the technical solutions, which is used during the process of preparation and approval of plans of large buildings. The process utilizes the cooperation of experts from various fields for optimizing the key needs of the company and especially the efficiency of investments, a technical standardization, a purchase of materials and services. The method can be used also in the process of designing a building, or in the assessment of project documentation. The optimization of technical solution does not focus only on the best technical solution, but also on the economically best solution for the company and the lifetime period of the plant.

A DECOMPENSATION OF REACTIVE POWER OF POWER LINES

František Žák – EGE, spol. s r.o.

The most recent trend is the gradual replacement of overhead lines for cable lines. This causes a sharp increase in the value of the charging capacitor current. In some grids the increase in the charging capacitor power can be seen in the overcompensation of inductive reactive power demand and grids at times of low load consume capacitive reactive power. This capacitive reactive power demand starts to affect the very economy of network operation. A new look at the issue of the decompensation of reactive power shows the economic aspects associated with losses in the large cable outlets. An important question is also setting the limits when it is advantageous to accept the decompensation of the charging capacitor power.

ISLAND OPERATIONS, EXPERIENCE FROM THE VRCHLABÍ SMART REGION

František Žák – EGE, spol. s r.o., Vlastimil Novotný – ČEZ Distribuce, a.s.

The dependence on electricity of our society increases as well as the requirements for the reliability of its supply. One of the options to ensure the higher reliability of electricity supply is the creation of island operations. Island operations can be developed at different levels. Their formation is largely limited by the properties of local resources and consumption characteristics of the area. The use of island operation must be based on a detailed analysis of local conditions.

Within the Smart Region Vrchlabí project there was built the island operation in a part of the urban network. The main source of islanding is a cogeneration unit, which serves as a source of heat and electricity for the island's area of operation. It is a comprehensive island operation from influencing the source management to consumption management in island operation. Currently, the project is at the stage of a completion of the first real tests.

OPTIONS TO INCREASE DISTRIBUTION RELIABILITY THROUGH INNOVATIVE ELEMENTS IN LV INTERCONNECTED SYSTEMS

Filip Brož, Karel Procházka – EGC České Budějovice s.r.o.

Lukáš Křivanec, Stanislav Votruba – PREdistribuce, a.s.

In densely populated areas interconnected systems may be a solution for increasing the reliability of electricity supply. When using modern elements in these networks, it is possible to reduce some of the typical negative characteristics of the interconnected systems and at the same time be prepared for the further development of renewable energy sources, electro-accumulation and e-mobility. The paper summarizes the selected findings of the study dealing with the comparison of several possible connections of LV outlets from one or more MV / LV distribution substations in terms of losses, supply reliability and other parameters.

THE MV GRID AUTOMATION - RECLOSER

Autoři: Libor Kolář, Daniel Kouba, Peter Múdry, Jiří Čeleda – E.ON Česká republika s.r.o.

The paper deals with the description and evaluation of the pilot project which tested technology for the advanced distribution automation of the MV grids. As an element for distribution automation there was used the breaker with the ability of automatic reclosing, so called Recloser from the TAVRIDA ELECTRIC company. In addition, this study describes the methodology used to find suitable outlets or suitable locations for the placement of reclosers at the first mass placement of these elements in E.ON 22 kV distribution grid to reduce the reliability indicators of SAIDI / SAIFI.

OPTIMIZATION OF INVESTMENT MEASURES REGARDING THE DISTRIBUTION NETWORK RELIABILITY

Daniel Kouba, Miroslav Kopt, Filip Chrášťanský – E.ON Česká republika s.r.o.

Filip Brož – EGC-EnerGoConsult CB Ltd.

The paper describes the selection of the most appropriate technical measures to increase the reliability of the entire distribution grid. It responds to the introduction of the incentive component of distribution reliability from the ERO. There is calculated a contribution to the reliability of the various technical measures of the selected types of networks, which are then extrapolated for the entire

territory of E.ON Distribuce, a.s. All reliability calculations are economically quantified so as to determine the optimal distribution of technical needs, i.e. selection of ideal mix of measures for a predetermined reliability of the distribution grid. Finally, the article deals with the economic assessment of the effectiveness of investment in relation to the Q component of the regulatory formula.

THE QUALITY OF ELECTRICITY SUPPLY

Jan Šefránek – ERO

The paper deals with the evaluation of the quality of electricity supply and related services in electrical power engineering for the year 2013. The paper presents a detailed evaluation of the implementation of quality standards and the achieved level of continuity of electricity supply. Furthermore, it deals with the motivational quality control and changes in this area.

PARTIAL DEPENDENCE BETWEEN COSTS AND QUALITY

Petr Skala, Václav Dětřich, Oto Bucholcer – EGÚ Brno, a.s.

The relationship between the cost of measures that affect the quality, more precisely, the continuity of distribution, and expected indicators of SAIFI and SAIDI is the focal point of all tasks. It is a very comprehensive task. However, if we concentrate only on the selected measures and the set of the selected outlets, the problem will not be hard to solve. Because of these initial assumptions we talk about "partial dependence between costs and quality."

The paper presents a general methodology for calculating the partial dependence between costs and quality based on a Monte Carlo simulation. The advantage of the chosen approach is to get a full distribution function of SAIFI and SAID final indicators, which can then be used (in contradiction to mean values) for recalculation of the quality factor and quantification of associated probabilities and risks.

THE USE OF THE FAILURE DATABASE FOR A RELIABILITY ANALYSIS OF DEVICES

Martin Slivka, Radomír Goňo, Stanislav Rusek, Tadeusz Sikora – VSB-TU Ostrava

This article deals with the analysis of the databases of failures, defects and outages in distribution grids. As a result we can see reliability parameters of important devices entering into the calculation of reliability and the number of failures and faults on individual parts of the grid. In addition, there is also analyzed the possibility of evaluating of specific types and manufacturers of devices.

SESSION 6: CONTROL, ORGANIZATION, QUALIFICATION

Guarantor: Martin Schneider, PREměření, a.s.

NEWS IN TECHNICAL LEGISLATION - THE CURRENT TASK OF DISTRIBUTION NETWORK OPERATORS

Ing. Pavel Kraják, ČEZ Distribuce, a.s.

Legal regulations and technical standards concerning the operation of the distribution system have recently gone through a major change. The main reason is the implementation of the European commission Directive 2012/27/EU of 25 October 2012 on energy efficiency. It has an impact on all three “Energy Acts”:

Act No. 458/2000 Coll., on business conditions and public administration in the energy sectors and on amendment to other laws (the Energy Act)

Act No. 406/2000 Coll., On Energy Management

Act No. 165/2012 Coll., on Supported Energy Sources

In the first half of the year, amendments to the majority of the regulations were not included into the legislative plan.

After a thee year pause, there were major changes in the distribution rules.

In the field of technical standards for power engineering the most important are:

CSN EN 50341-1 – Ovelhead electrical lines exceeding AC 1 kV – Part 1: General requirements – Common specifications

CSN EN 61936 -1 – Power installations exceeding 1 kV AC.– Part 1: Common rules

CSN EN 50110-1 ed 3. Control and work with electrical equipment

CURRENT STATUS OF E. ON PILOT PROJECTS IN THE SM

Milan Rozporka, E.ON Česká republika, s.r.o.

KEY TRENDS IN THE SMART GRIDS STRATEGIES

Ondřej Mamula, Martin Machek, ČEZ, a.s.

The paper introduces the ČEZ Group's approach to the Smart Grids strategy; from capturing key trends, their prioritization and tech-economic impact assessment, through the design of appropriate measures, an evaluation of alternatives to practical verification of promising directions before real placement. In the area of new business concepts linked to the technology measurement and evaluation of energy consumption the paper deals with the placement schedule of new trade tariffs, high standard meter on request, and ways of evaluation of the measured data, advice and tools to achieve economies or the change in customer behavior.

THE SG APPROACHES IN DIFFERENT COUNTRIES, DEMAND RESPONSE

Karel Procházka, EGC-EnerGoConsult CB Ltd.

The paper deals with different approaches to the issue of Smart Grid in individual countries and the issue of Demand Response in this context.

AN IMPACT OF NEW TRENDS IN POWER ENGINEERING ON LOAD AND VOLTAGE IN LV GRID

Zdeněk Müller, CTU in Prague, Stanislav Votruba, PREdistribuce, a.s.

Under the influence of new trends in the power engineering there was carried out an analysis of the impact of these trends (photovoltaic issues, micro-cogeneration systems with heat pumps - heating and air conditioning, electric mobility) in selected parts of the LV grid in urban agglomeration using new methods and approaches. To create the necessary simulation and analysis the stochastic approach was applied; to achieve results with sufficient credibility there was created a sufficient number of scenarios and calculations (about hundreds). This paper describes the procedure of the analysis and selected results.

A METHODOLOGY FOR AN EVALUATION OF A COMMUNICATION PART OF PILOT PROJECTS

Jiří Vodrážka, ČVUT, Stanislav Votruba, PREdistribuce, a.s.

With regard to developments in the field of smart grids and smart metering in the European context, even in the case of distribution networks in the Czech Republic we have to take into account the possibility of integration of new trends in our networks. DSOs must be prepared for this situation, and therefore they have been continuously preparing small pilot projects of smart metering, remote control elements in DTS and the like. This paper describes a methodology that is being created for these purposes – for the uniform and comparable assessment of communication parts of these pilot projects, and which should be one of the important bases during the creation of the communication infrastructure strategy.

NEW TRENDS IN CONSTRUCTION OF INTELLIGENT GRIDS AND A MEASUREMENT OF A NEW GENERATION

Miroslav Hladík, Landis + Gyr

The paper deals with a new approach in the search for optimal solutions and stabilization of grids by integrating of billing and operational measurements including the appropriate work with the measured data. The analysis and practical recommendations are based on the results of selected pilot projects, with regard to the economy of the entire solution.

CHANGES IN THE DISTRIBUTION NETWORK CODE IN 2014

Karel Procházka, Pavel Bürger, EGC-EnerGoConsult CB Ltd.

The paper presents a list of changes in the Distribution Network Code during the year 2014.

PROBABILITY IN THE GRID CALCULATIONS

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

The paper shows the possibilities of new approaches to the calculations for planning and management of the distribution grid. Increasing amount of less predictable phenomena (such as decentralized sources, electric mobility, etc.) reduces the explicitness of existing computational methods which require precise input data. The use of advanced methods of a management theory allows obtaining a more accurate description of reality in terms of increased uncertainty.

OPTIONS OF SIMPLYFIYING THE METHODOLOGY OF SETTING A SURCHARGES FOR NOT KEEPING THE POWER FACTOR RANGE OF CUSTOMERS OF THE CLASS A AND B. REACTIVE POWER FLOWS IN THE 0.4 KV GRIDS AND POSSIBILITIES OF THEIR INFLUENCE WITH ECONOMIC TOOLS

Pavel Bürger, EGC-EnerGoConsult CB Ltd.,

Reactive power flows influence partly the quality of the supplied power, but also affect the throughput of distribution grids. Currently, for the customers of A and B class there is used a rather complicated system of determining surcharges for exceeding the agreed power factor range that is abstruse for customers who are often unable to respond adequately by certain measures on their devices. The paper shows the possibilities of simplifying the methodology used. Further, it analysis the reactive power flows in the at 0.4 kV grid of the selected customers of the class C and there is assessed their impact on the distribution grid together with a proposal how to reduce this impact by economic tools.

THE EXPERIENCE WITH CHARGING INFRASTRUCTURE AND OPERATION OF ELECTRIC CARS IN THE PRE GROUP

Lukáš Kadula, PREměření, a.s.

The PRE Group has been actively engaged in the e-mobility issue for the last five years. The presentation will show the results from the areas of operation of a charging infrastructure (both public and private), a charging system of "refueling electricity", operation of electric passenger cars and electric lorries within the fleet of cars of the PRE Group, a sale and electric bike rental.