

SUMMARY 2010

BULLETIN no.1

1.THE IMPORTANCE OF THE VOLTAGE – REACTIVE POWER CONTROL ASPECT IN THE ELECTRIC TRANSMISSION NETWORK DEVELOPMENT AND THE CONNECTION TO THE GRID OF LARGE POWER SOURCES, WIND OR CONVENTIONAL POWER PLANTS

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Key words: *load characteristics, voltage control, reactive power compensation, energy acquisition*

ABSTRACT:

In the approach of network connection problems of the power plants, the aspects related to the coverage of the consumption curve (active power), aspects for ensuring the active power reserves, of participating to the electricity market usually there are analyzed.

The introduction of new sources in the network however raises major problems of controlling the generated reactive power, the voltage, of observing the electric power quality conditions, of safety in the operation of National Power Systems (NPS).

This paper is intended at emphasizing the necessity of providing reactive power sources, with large band and possibilities of adjustment, together with active power generation. These reactive power sources can be important, related to large investments which have to be considered in the initial power plant investment, which leads to their necessity.

An example is presented for the case of a wind power plant (WPP) with an installed power of 600MW connected in a new 400kV node through a cable network and whose operation in NPS requires a reactive power compensation equipment in the range of +200MVAR and -350MVAR.

2. CONTRIBUTIONS TO THE NATIONAL MANAGEMENT SYSTEM AND EUROPEAN REPORTING OF THE GREENHOUSE GAS EMISSIONS FROM THE INDUSTRIAL SECTORS UNDER THE EU-ETS DIRECTIVE

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Key words: *European emissions trading scheme, ECO₂Nat system, ECO₂Mini system, collecting system, data processing and management, monitoring, reporting, checking*

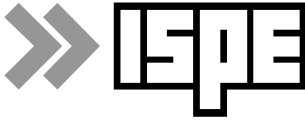
ABSTRACT:

To meet the commitments assumed by the Kyoto Protocol, the European Union introduced the EU ETS, a mechanism based on commercial principles destined to encourage the reduction in greenhouse gas emissions, in a technically and economically efficient way.

In order to harmonize and improve the EU ETS operation, it is necessary to know the procedures applied by each member state for the implementation and operation of the scheme, therefore each member state annually conveys to the European Commission, until the 30th of June this year (for the data from the previous year), a report regarding the application of the requirements of Directive 2003/87/EC regarding the setting of the EU ETS.

To meet the requirements regarding the reporting of the applicaiton of Directive 2003/87/EC, incumbent on Romania as a EU member state, it was necessary to elaborate and implement at a central level a collecting, processing and management system for the data from the EU ETS operators.

This paper presents the information system for the data management regarding the EU ETS implementation (ECO₂Nat System), consisting in the development of a central database, for meeting the requirements of monitoring and reporting the GHG (CO₂) emissions from the sectors, activities and installations under the EU ETS. The data management information system regarding the implementation of the GHG certificate trading Scheme, presented in the paper, is made up of two applications:



- Application at the local level – dedicated to the operators of the ETS (ECO₂Mini) installations operating as an autonomous application:
- Application at a central level - ECO₂Nat – dedicated to the National Agency for Environmental Protection (ANPM), made up of several modules, operating with the server application SQL, making easier the multi access module.

3. THE IMPORTANCE OF CONSIDERING THE LOAD CHARACTERISTICS ACCORDING TO VOLTAGE FOR THE VOLTAGE CONTROL AND SYSTEM FREQUENCY

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Key words: *load characteristics, voltage control, reactive power compensation, power purchasing*

ABSTRACT:

The paper proposes to point out the importance of considering the load characteristics (for the active and reactive power) according to voltage. After presenting the types of load characteristics that can be taken into consideration we will emphasize the need to take them into account for voltage control by switching transformer plots as well as for locating and using the reactive power compensation sources.

At the same time we will point out the importance of taking into account the active power characteristic with voltage for reducing the acquisition from the electricity market and, implicitly, the cost of one kWh, without changing the operating state of the consumers.

4. DYNAMIC STRESS AT ARCHED DAMS

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Key words: *dam, charges, earthquake, earthquake feedback*

ABSTRACT:

The present paper illustrates a possible solution to the problems occurred in the case of the dynamically stressed arched dams, applied to the structural model. The calculation is conducted by the finite element method by using the program SAP2000. The goal of the paper is to obtain concrete results by analytical methods as well as observations regarding the applicability of the calculation at wide scale for such structures.

We tackled the earthquake (according to P100-2006) and the operating vibrations, considered at a general level. At the same time we will take into account the hydrodynamic pressure of the water in the lake, depending on the chosen hypothesis. The calculating hypotheses will be formulated according to the current Romanian standards and provisions.

BULLETIN no 2

1. OXYCOMBUSTION, CONVENTIONAL FIRING AND ROMANIAN LIGNITE

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Key words: *oxycombustion, conventional firing, Romanian lignite, air separation installation, CO₂ compression, retention efficiency, CO₂ purity, O₂ purity, CO₂ storage*

ABSTRACT:

Oxycombustion occurred in the '50s when certain research trends aimed at carrying out a power plant with “zero emissions” [1]. Today oxycombustion is intensely researched as a CO₂ capture technology. Oxycombustion consists in fuel firing using a fuel concentrated in O₂ (40% oxygen 95% purity, and 60% recirculated flue gas for temperature control in furnace), unlike conventional firing made with air (about 21% O₂, the rest being N₂ that does not participate in the firing). In the present paper we used the analytical modeling of firing processes for



emphasizing the peculiarities of oxycombustion as related to conventional firing from the point of view of the variation of flue gas composition and of the influence of the fuel used. It will be noticed that the efficiency of oxycombustion technology in capturing CO₂ does not depend on the quality of fuel and even in the situation of Romanian lignite a retention efficiency of about 98% can be reached.

2.RENEWABLE ENERGY SOURCES – GREAT EXPECTATIONS AND POTENTIAL FOR ROMANIA

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Key words: sustainable development, CO₂ emissions, renewable sources, global and national potential, guarantees of origin, trends

ABSTRACT:

Accession to the European Union forced Romania to adopt a strategy on electricity that energy capacity must purchase annually a mandatory quota of energy to be sold to final consumers, from renewable energy producers. Therefore, in this paper are presented Romania's engagement under Directive 2009/28/EC and national targets assumed by "the Romanian Energy Strategy 2007-2020.

The paper also described the globally and nationally potential of main renewable energy sources (solar, wind, biomass, geothermal and hydro) and trends in the medium and long term, worldwide. Forecast electricity consumption from renewable sources for Romania and its effort to meet the target set for 2020, is presented in the conclusion of the paper.

3. IMPACT OF THE ENVIRONMENTAL INVESTMENTS OVER TECHNICAL AND ECONOMIC PROFITABILITY OF COAL POWER PLANT

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Key words: environmental impact, emissions mitigation, sensitivity test

ABSTRACT:

Coal will remain a basic source for electricity generation in condenser. Interest in coal plants has increased due to:

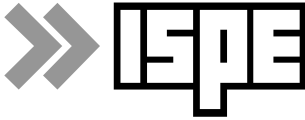
- technological refinements of boilers and steam turbines
- the increasing power generation efficiency of the Rankine cycle
- the development of new technologies, both performant and economically accesible and economic access retention emission, following the provisions of the Kyoto Protocol and to promote the European Directive 2001/80/EC.

The technologies most commonly used worldwide in coal are pulverized coal and circulating fluidized-layer burning. Currently circulating fluidized layer burning technology has become mature and presents a number of advantages over pulverized coal, representing an important option for developing energy power units up to 800 MWe.

Net yield increase of coal plants is due to the transition to steam cycles with overcritical parameters and the design improvement of the ultrasupracritical main equipment (boiler and turbine forced run with three-dimensional system of trays). High costs of materials required will be offset by savings in fuel costs and reductions in emissions.

4. INFLUENCE OF APPLICATION OF THE NEW LEGISLATIVE PACKAGE “ENERGY - CLIMATE CHANGE” ON INDUSTRIAL ACTIVITIES IN ROMANIA

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Eng. Simona Teodorescu - ISPE S.A. Bucharest
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Key words: *new energy – climate change package, EU - ETS scheme, CO₂ allowances and greenhouse gas emissions*

ABSTRACT:

The main objective of this paper is the assessment of the overall impact of energy - climate change package over industrial activities to achieve the GHG emission reductions and to increase the share of renewable energy, action imposed by new energy - climate change legislative package.

Industries sectors will be faced with an increase in energy prices and production costs (due to the cost of buying emission allowances of greenhouse gases associated with running its own business). Analysis undertaken followed the evaluation of additional costs imposed by the impact of new legislative package over those costs

5. MULTICRITERIAL MODEL STRUCTURE ANALYSIS OF ELECTRICITY BALANCE OF ROMANIA IN TERMS OF RESOURCES OPTIMAL MIX OF PRIMARY ENERGY USE

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Keywords: *sustainable development, life cycle analysis, inventory analysis, impact analysis, technical and economic calculations, the cost of economic recovery, optimal load balance of power, multicriterial model*

ABSTRACT:

The main objective of carrying out this work was the creation of a Multi-model analysis of optimal load balance of the Romanian electricity in terms of primary energy mix used for electricity generation, in the light of a particular year chosen. The work is part of a comprehensive material with the name "Contributions to the elaboration of strategies regarding the sustainable development of the Romanian energy sector".

The motivation for choosing this theme comprises two main elements: first need substantiation of the energy sector development strategies using dynamic methods sensitive to legislative changes and secondly the need, the design and implementation of sustainable development strategies in the medium and long term energy sector, to take into account both technical and economic factors and environmental factors.

With the model "Eclipse" (using the Java platform), we achieved a Multi-model analysis of optimal load balance of power in view of Romania in 2020. The program has a comprehensive database for both environment (life-cycle analysis for each succession energy) and for the technical-economic criteria.

BULLETIN no.3

1.GREENHOUSE GAS EMISSIONS FORECAST AT NATIONAL LEVEL AND BY SECTORS, CONSIDERING 2010, 2015 AND 2020 AS TARGET YEARS

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Key words: *climate changes, greenhouse gas (GHG) inventory, GHG emissions forecast, GHG emissions reduction.*

ABSTRACT

The general objective of the paper is to carry out for 2010, 2020 the greenhouse gas emissions forecast (CO₂, CH₄, N₂O, HFCs, PFCs, SF₆) and for sulphur dioxide emissions, nitrogen oxides, volatile organic compounds, amoniac and powder.

The GHG emissions forecast is carried out for 3 scenarios, namely:

- a reference scenario „business as usual” (BAS) possible to be carried out in the future and does not include special activities of GHG emissions reduction;
- a reduction scenario that is similar to the reference one from the point of view of the evolution of the economic and social indicators, but containing politics and programs for GHG emissions reduction;



- a reduction scenario with supplementary measures that is similar to the reduction scenario, but contains programs with supplementary measures for GHG emissions reduction.

2. ECOLOGICAL INNOVATIONS IN ARCHITECTURE

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Key words: *sustainable development, green walls, green roofs, hydroponic culture, vertical gardens, ecological innovations in architecture*

ABSTRACT

The concept of sustainable development was introduced by Gro Harlem Brundland in 1983 (ex-prime minister of Norway) which coined what has become the most often used definition of sustainable development, as a development that "meets the needs of the present without compromising the ability of future generations to meet their own needs".

This premise stands at the base of finding solutions for some of the problems of the environment and climatic issues.

The measures involved in ecologic land and sustainable building derive from several areas: from urban planning, architecture to economic and social specialities.

All this makes us take action not just because we are in the European Union, or because this is the most discussed subject in the last years, but because we need to live in a functional habitat, in one word to improve our quality of life and to make sure that we are leaving in a sustainable world.

We believe that in this millenium in architecture there will not be new constructions in unexplored fields, but it will be regenerated in the existing structures and build on recuperated sites. So, this being said, we think it is time for energy efficiency and recycling, renewable energy sources because this targets sets a favourable framework which opens new markets and leads to significant market growth.

3. BENEFITS OF IMPLEMENTATION OF TRIGENERATION EQUIPMENTS AND SYSTEMS POSSIBILITIES OF APPLICATION AT CIVIL BUILDINGS

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Key words: *trigeneration, efficiency, heating, cooling and electric.*

ABSTRACT

Considering the commitments assumed by Kyoto Protocol, regarding the emissions of greenhouse gases, we suggest to think about the advantages of trigeneration equipment and systems implementation, with possibility of application at civil buildings.

Trigeneration means production from the same source of three forms of energy, namely: electric energy, heating energy and cooling energy. Due to the increased efficiency to convert primary energy to useful energy, and to flexibility of a trigeneration system which is able to adapt at the requirements of a civil building, it has been made a case study regarding the implementation this system as an energy source for Institute for Studies and Power Engineering (ISPE) Bucharest Building. The implementation of this kind of energy source with thermal rehabilitation and modernization of HVAC and lighting installations, will lead to the reduction of global energy consumption of the building and reducing operation costs.

The Kyoto Protocol is an international agreement regarding the environment. The protocol was negotiated in December by 160 countries.

4. TECHNOLOGIES FOR FUTURE – FUEL CELLS – GAS TURBINE

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Key words: *SOFC/MCFC hybrid system, combustion cells, gasdol turbines*

ABSTRACT:

At this time, more than 85% from world's energy comes from fossil fuels (40% from oil, 22% from coal and 23% from gases). Nuclear power and hydroelectric represents 7% from electricity. This shows the dependences of fossil fuels, especially of global energy sector for oil.

Considering the nature of energetic needs and economical benefits and also environmental that are offered by Hybrid system FC /GT, it is necessary the optimization of this system for understanding its dynamic operations.

During the paper is presented an analysis of the Hybrid system and the processes that are taking place. Combined, the hybrid technologies composed from fuel cells and gas turbine (FC/GT) are offering efficient solutions for producing clean power.

BULLETIN no.4

1. WIND POWER PLANTS PARTICIPATION TO THE VOLTAGE REACTIVE POWER CONTROL IN THE OPERATION OF NATIONAL POWER SYSTEM. NORMS – POSSIBILITIES – NECESSITY

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Key words: *wind power plant, voltage control, point of common coupling*

ABSTRACT:

The Wind Power Plants (WPP) foreseen development, their functional features, basically different from the conventional power plants, pose significant safety problems for the power system operation. The Transmission and System Operator (TSO), the specialists in the field initiated the completion of the current Technical Code of ETN in order to standardise WPP integration in NPS (Technical Norm approved by ANRE through Ord. 51/2009). Special attention is paid to WPP contribution to voltage control and their reactive power capabilities.

The paper will include a brief description and comments on this norm. Examples for several WPP with 10MW, 50MW and 200MW installed power, connected in the point of common coupling (PCC) through overhead lines or cables of different lengths (0.7-30km) are presented to describe the variation of reactive power and contribution to voltage control. The constructive possibilities of WPP will be compared with the requirements of the technical norm regarding their connection to public networks and some comments will be made. The authors make proposals for the review and completion of the current norm.

2.NECESSITY AND OPPORTUNITY OF BUILDING A NEW 400 KV OHTL BETWEEN GĂDĂLIN AND SUCEAVA IN THE CONTEXT OF THE EUROPEAN UNION REQUIREMENTS REGARDING THE ENVIRONMENT, SECURITY OF SUPPLY AND ELECTRICITY MARKET

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Key words *400 kV electric line,operating reliability, network losses, economic efficiency, wind power plants*

ABSTRACT:

Following the analysis of the operating mode of the National Power System (NPS) in the perspective of 2014 – 2019, taking into account the change in the structure of the electric power producers for covering the demand



under the conditions required by the European Union, it resulted necessary to close down the ring formed by the 400 kV overhead transmission lines within the NPS by a 400 kV OHTL in the north part of the country. The present paper points out the benefits resulted from carrying out the Gădălin – Suceava 400 kV OHTL that led to demonstrating the oportunity and economic efficiency of this project.

3.THE CRITERIA ADOPTED TO CHOOSE THE ROUTE LINE FOR 400 KV OHL GĂDĂLIN – SUCEAVA OHL TAKING INTO ACCOUNT THE REQUIREMENTS OF THE EU LEGISLATION

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Florin Ștefănescu - Eng.– CN TRANSELECTRICA SA
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Key words: 400 kV overhead line, choice of the OHL path, technical and economic criterion, environmental criterion, multicriterial analysis

ABSTRACT:

The 400 kV Gădălin-Suceava single circuit OHL is the first extra high voltage line in Romania whose design and execution will be done after Romania joined the European Union (EU), paying particular attention to the environmental protection

The line Design began in January 2009 and putting into service are expected after the year 2014

To establish the 400 kV route GadalinSuceava OHL, based on experience in the field worldwide and ISPE experience in designimgand implementing new projects of lines (eg 400 kV s.c. OHL Oradea -Békescsaba and 400 kV OHL s.c. Arad - Nadab) were identified principles and criteria to be taken into consideration when choosing the route variants in the new economic and social conditions and the environment existing in Romania.

4. CURRENT ISSUES RELATED TO WIND POWER PLANTS INTEGRATION INTO THE NATIONAL POWER SYSTEM

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Key words: wind power plant, sizing criteria, load curve, adequacy

ABSTRACT:

Wind Power Plants (WPP) integration in the national power system, given their constructional and functional features utterly different from the conventional sources, requires reconsideration of the current technical regulations

In Romania, except for technical norms related to high performance required to wind generators/plants enacted in 2009, there is no regulation to solve issues conditioning connection resolution

The paper deals with some of the current matters that might facilitate this situation solving: applicability of current Power Transmission Grid (PTG) sizing criteria under WPP conditions, possibility to integrate them in the consumption curve of NPS, conditions of ~g out the investments required by WPP connection, conditions of taking over by the TSO of subsequent expenses triggered by WPP operation, a.s.o.

The paper screens certain problems and suggests solutions to work them out.

It is also the authors' intention to stir the interest for discussions on problems whose resolve conditions design, construction, operation and technical and economic integration of the WPP in the NPS.