

ABSTRACTS 2011

BULETINUL ISPE Nr.1/2011

1. EFFICIENT USE OF HYDROENERGY RESOURCES IN ROMANIA

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Keywords: *hydroelectric power plant, pumping storage hydroelectric power plant, average and dry hydrological years*

Abstract: Romania has a hydro technical potential of 36 TWh, out of which 46% is harnessed. In the year 2007 the electricity produced in hydropower plants was about 16.5 TWh. This production represented about 7% of the electricity production in hydro- power plants of the European Union in 2007, Romania being on the 7th place in the hierarchy of countries using this resource along with Sweden, France, Italy, Austria, Germany and Finland. This paper aims to analyze the benefits of efficient use of the renewable energy sources in the imposed EU conditions regarding the sustainable development and energy security.

2. STRUCTURE OF ELECTRICITY BALANCE OF ROMANIA FOR THE YEAR 2020, ESTABLISHED BASED ON OPTIMAL PRIMARY ENERGY RESOURCES USING THE MULTI-CRITERIA-ANALYSIS MODEL

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Keywords: *sustainable development, life cycle analysis, multi-criteria model*

Abstract: The main objective of carrying out this work was the creation of a multi-criteria model analysis of optimal electricity balance of Romania in terms of primary energy mix used for electricity generation. The paper is part of a comprehensive thesis named "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 the need for substantiation of the energy sector development strategies using dynamic methods sensitive to legislative changes and secondly the need, that conception and implementation of a sustainable development strategies for the energy sector for medium and long term, to take into account technical, economic and environmental factors. The program "Eclipse" (based on the Java platform), is used to achieve a multi-criteria analysis of optimal electricity balance for Romania in 2020. The program has a large database for the environment (fuel life-cycle analysis for each life-cycle stage), technical and economic points of view. It allows numerous changes of parameters and the results can be viewed in real time. The program also allows the user to realize many simulations and interpretations of data that can be used in establishing the energy sector development strategy.

3. ESTABLISHING THE FLOODING LIMITS BY MEANS OF THE SIMULATION MODELS OF THE FREE SURFACE FLOW

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Keywords: *flood, mathematical modelling, flood risk, flood limits*

Abstract: The paper approaches the issue of the areas sensitive to floods.

The assessment of these areas is performed by establishing the flooding limits by means of the simulation models of the water movement with the free surface, taking into account the influence of the hydrotechnical structures upon river flowing.

In the paper the flooding limits were established in the hypothesis of permanent water movement on a branched system with the free surface, for the flowrates with values between 0.1 – 600 m³/s.

To reach the proposed objective were used softs ArcGIS, both for preprocessing and for post - processing, the Hec-Ras for the modelling side and an ArcGIS extension, Hec-GeoRas, used for obtaining the input data in ArcGIS necessary in Hec-Ras.

The results of the study performed include the flooding limits obtained on the area of the Buzău hydrographic basin, as well as their spatial evolution according to the calculation flowrate.

4. STUDY UPON THE POSSIBILITY OF SUPPLYING THE ENERGY ENGINES FROM ECOGEN ENERGY BUZAU WITH BIOGAS

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Key words: *biogas, renewable energy, waste, engines*

Abstract: The removal and treatment of biological waste represents a major issue for industry. A wide range of organic substances from agriculture, pulp and sugar industry can be used by means of anaerobic fermentation, for producing biogas – a mixture of methane and carbon dioxide – that due to the high calorific power can be used as an alternative to fossil fuels.

The engines firing biogas improve waste management by maximizing the use of an economic fuel. The present paper proposed an analysis of the possibility of supplying partially or totally the 3 MW engines of the Ecogen Energy Buzău with biogas that might be produced by using resources available nearby, for example, waste resulted from the sugar factory adjacent to the power plant.

BULETINUL ISPE Nr.2/2011

1. BUILDING MANAGEMENT SYSTEM PROMOTED AT “THE ADVANCED RESEARCH CENTER FOR INNOVATIVE MATERIALS, PRODUCTS AND PROCESSES” - BUCHAREST POLYTECHNICAL UNIVERSITY

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Key words: *BMS, intelligent building, building control*

Abstract: The notion of BMS (Building Management System) means a hierarchical management system, with a distributed structure, that should include as components all the installations corresponding to the building. It is based essentially on a quick efficient data exchange among different components and involved devices. The main aims for the introduction of BMS system in a building are decreased power consumptions and the costs necessary for operating the installations, improving the quality of the services and managing the installations, the increase in the degree of security of the building, equipment and personnel in the building. The BMS represents a management destined to the control and monitoring of the control system and of all the installations (the electric part, thermal installation, lighting, air conditioning, water management and sewerage system), the security system (against breaking-in, access control, closed circuit television) and fire alarm system.

The control systems with which are provided the utilities for which we intend to carry out the coupling to a BMS must perform monitoring, control, command and protections. The BMS is formed by hardware and software. The software uses protocols, such as C-bus, Profibus, protocols using the Internet and open standards (BACnet, LonWorks, Modbus). The hardware component has three functional levels: the that of the controllers, and the communication level (webservers, calculators with dedicated software).

2. CONSIDERATIONS REGARDING THE APPLICATION OF THE TECHNICAL STANDARD “TECHNICAL CONDITIONS FOR CONNECTING THE OVERHEAD TRANSMISSION LINES FOR THE WIND PLANTS” IN THE NPS

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Key words: *Wind power plants (WPP), delimitation point (DP), common coupling point (CCP), busbar (BB), wind generating unit (WGU), dispatching wind power plant (DWPP), non-dispatching wind power plant (NWPP)*

Abstract: The integration into the overhead transmission lines (OHTL) and the distribution lines (DL) of the WPP made it necessary to review the operating conditions both of the new sources and of those already installed in the NPS. In this sense we proposed the supplementary technical conditions for connecting these power sources with random operating state, reflected in the current ANRE technical standard (Order 51/2009). In the current paper we analyze the real possibilities of applying these standards, mainly referring to the participation in the frequency control, the influence upon the transient states

3. WASTE ENERGY VALORIZATION TECHNOLOGIES

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Key words: *municipal waste, incineration, energy valorization*

Abstract: The paper presents the general aspects regarding the municipal waste energy valorization technologies. Waste incineration with or without recovering the flue gas resulted constitutes one of the most important methods for their treatment and elimination applied in the European Union. At the same time, by this procedure also a waste energy valorization is likely.

We performed a comparison between 2 waste energy valorization variants, incineration and gasification, respectively.

Taking into account that by the gasification technology one can use only the sorted (packed) waste, the conclusion of the comparative analysis by which it is confirmed the fact that incineration is the most suitable technology for the municipal waste valorization is correct, because by this process the waste in the community can be fired wholly.

4. URICANI TOWN DISTRICT HEATING BY USING RENEWABLE ENERGY SOURCES

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Key words: *renewable sources, pre-insulated pipes, thermal modules, district heating system monitoring*

Abstract: The European Union energy objectives include also the increase in the share of renewable energy sources to 20% of the whole European Union power consumption in 2020. In Romania there is an important potential of renewable energy sources, made up of hydroelectric power, biomass, wind energy, solar energy and geothermal energy.

The use of wood biomass for heating is promoted by many European Union countries, and the European Commission supports financially projects that use biomass in order to produce electric or/and thermal power production.

Following the continuous deterioration of the state of the district heating system of Uricani town, the local public administrative authority decided to promote a district heating project by using renewable energy sources, respectively biomass in order to access European and governmental funds for its implementation.

Romania has a high wood biomass energy potential, evaluated at about 1700 thousand toe/year, with important reserves found even in the area of Uricani town. That determined the local administrative community to promote

the development of a project for the full rehabilitation of the district heating system in: the source, heat transport networks, thermal points and distribution networks.

BULETINUL ISPE Nr.3/2011

1. REENGINEERING OF SMALL AND MEDIUM ENTERPRISES TO INTEGRATE INTO THE DIGITAL ECONOMY

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Key words: *SME reengineering, sustainable development modelled in operational researches, efficient project management, human resources reinventing in the neurogenetic concept, anticipatory expert systems of holistic vulnerabilities, business reinventing in the digital economy, assisted by intelligent agents*

Abstract:: The significant issues tackled in the present original research are the following:

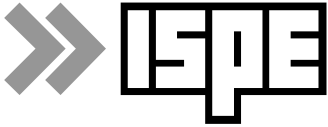
Small and medium enterprises (SME) reengineering modelled in view of integrating the industrial units into the efficient digital economy;
Modelling the SME type industrial enterprises into the concept of the operational researches applicable to the sustainable development of the local industry;
Designing the small and medium industrial units in the concept of efficient management;
Reconfiguring of the human resources modelled in the neurogenetic concept based on professional reengineering, based on the motivational management of labor, promoting creativity and the dialogue based on decision software engineering;
Approaching the coping strategy in view of diminishing human stress at all the ergonomic working levels so that the specialists should work according to vocation;
Selecting the anticipatory expert systems and applying neurogenetical informatics to diminishing the vulnerabilities within the renewed SME;
The concept of the new structures of profitable business by calling upon the Hammer concept regarding the rendering dynamic of sales of all the products offered to the intelligent agents assisted competitive market.
Starting from the experience of the authors developed of a new type of SME. We hope that this innovation will extend in view of bringing closer Romanian SME units to the relevant European enterprises which requires a collaboration between ISPE as designer and the new specialized SME developers so that the profit of each investor should ensure starting from the elaboration phase of the feasibility studies of the new operational structures with minimum economic risk

2. CALCULUS OF ENERGY PERFORMANCE FOR THE PASSIVE HOUSE IN THE POLITEHNICA UNIVERSITY IN BUCHAREST

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Keywords: *passive house, energy, thermal bridges*

Abstract: In this paper we made an energy performance calculus for a passive house in Bucharest that included two coupled homes made in mirror. This calculation was performed with the program Passive House



Planning Package (PHPP), version 2007. It includes a detailed calculation based on input data on areas, wall composition, type of joinery, value of the thermal bridges, the ventilation air demand, type and performance of all the installation elements in the endowment, the number and type of household appliances, the number of permanent users, as well as the climatic data.

By means of this PHPP programming package we perform calculations mainly for:

- U values for the components of the passive house with high thermal insulation;
- power balances, thermal power supply and distribution, electric power demand, primary energy demand;
- designing the ventilation system;
- establishing the thermal power demand for heating (taking into account the climatic data in Romania);
- the thermal comfort for summertime;

by checking out the requirements imposed by the Passive House criterion.

At the same time, the programming package contains many other calculating tools for designing the passive house.

The evaluation criteria for certifying the Passive House, applicable to the residential buildings are:

- Power demand for heating maximum $15 \text{ kWh/m}^2 \times \text{year}$
- The result of the pressure test $n_{50} = 0.6 \text{ h}^{-1}$
- The primary energy demand maximum $120 \text{ kWh/m}^2 \times \text{year}$, including the electric power consumption for domestic appliances.

3. REVIEW OF WORLDWIDE ACHIEVEMENTS AND TRENDS ON OPTICAL CURRENT AND VOLTAGE MEASURING TRANSFORMERS USE

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Key words: *optical current and voltage measuring transformers, optical sensors, power quality*

Abstract: The necessity and appropriateness of using the optical measuring transformers within ETN (Electrical Transmission Network) require review in order to accurately meter the electric parameters (voltage, electric current, power, energy), the quality indicators of the electric power and last but not the least, to reconsider the protection and automation equipment engineering.

The main measuring systems used for the unconventional transformers are the following:

- measuring systems with electromagnetic sensor and optically transferred data via Rogowski coil;
- measuring systems with lead divider and optical transmission for voltage;
- measuring systems with optical sensor and information transfer via optical channel: using Faraday effect for the electric current intensity, i.e. Pockels effect to measure voltage.

The measuring systems based on both optical transfer circuits and optical electric current and voltage sensors have highly significant features for the high and very high voltages.

The paper deals with the features of the optical current and voltage measuring transformers which are beneficial regarding: accuracy class, measurement accuracy, frequency range, weight, operation security, environmental impact, maintenance, etc.

The paper supplies data on their use for voltage ranging between 24kV÷750kV.

The authors introduce the solution adopted for the optical current transformers in Târgoviște and Turnu Măgurele 110kV substations.

4. ANALYZING THE ENVIRONMENTAL IMPACT OF A HOME S+P+2E IN VARIOUS STRUCTURAL VARIANTS

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Key words: *Sustainable development, environmental impact, lifetime analysis, environment*

Summary: The present paper raises the issue of sustainable development in constructions. The integrated design of a structure includes besides the economical sizing of the structural elements, also aspects relating to the impact upon the environment. In the future this type of design will become more and more used as the wish is to carry out sustainable buildings that are not harmful to the environment. The main factor that degrades the environment is the power used during all the stages of carrying out a building, from producing the materials to carrying it out. The paper presents a comparison between three structural variants of a home from the point of view of the impact upon the environment. The categories generated by the impact upon the environment that must be considered include the use of resources, human health and the ecological consequences. The impact upon the environment was analyzed by life cycle in which we took into account only the construction and disposal phases. Following the analysis it resulted that there is no major impact difference between the three studied structural variants. Nevertheless, the analysis of the impact upon the environment is in an incipient phase, as it offers only the qualitative environmental indicators.

BULETINUL ISPE Nr.4/2011

1. OPPORTUNITY FOR ACCESSING TRANSITIONAL DEROGATION PROVIDED FOR IN ARTICLE 10C OF THE DIRECTIVE 2003/87/EC, FOR ELECTRICITY PRODUCTION

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Keywords: *CO₂ emissions, Emission Trading Scheme, transitional derogation*

Abstract: Directive 2009/29/EC amending Directive 2003/87/EC, so as to improve and extend the greenhouse gas emissions allowance trading scheme of the Community is bringing major changes to the EU ETS from 2013.

The main change is that electricity generators will no longer receive free allowances, except for cases falling within Article 10c. As a result, electricity generators will need to integrate purchase of auctions of CO₂ allowances needed to cover emissions, opposed to the current status where certificates are free allocated.

2. IMPLEMENTING A PERSONALIZED SYSTEM FOR MONITORING AND REPORTING CO₂ EMISSIONS

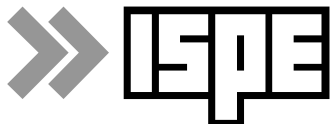
Chief Executive Officer Dorel Bădescu - Institute for Studies and Power Engineering
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Key words: *European emission trading scheme, monitoring and reporting of CO₂ emissions, annual report, ECO₂ Premium-CIA*

Abstract: As target of the EU regarding the emission trading scheme one mentions the promotion of devices properly design to reduce efficiently from technical and economic point of view GHG by economics operators with activity that generate this kind of emission, in order that the completion of the commitment assume by EU under Kyoto Protocol be less expensive.

Starting with 1st January 2007, installations which develops activities as provided by Annex I of GD 780/2006 [4], which transpose in national legislation Directive 2003/87EC [1], will have to monitor and report the GHG emissions according to Order 1175/2006 [2]. This means that the operators will have to monitor all activity data and quality parameters, to document and archive monitoring data developed by all sources, to draw up the annual report and also to retain it and all the data used for emissions calculation for at least 10 years.

One will demonstrate that, for all these problems, the ECO₂ Premium-CIA system is a solution; being software designed to fulfill the obligation under condition of respecting the national monitoring guidelines.



3. GETICA CCS A FULLY INTEGRATED DEMONSTRATION PROJECT IN ROMANIA

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Keywords: *demonstration project, carbon capture, CO₂ transport, CO₂ storage, CO₂ emissions, storage capacity injectivity*

Abstract: The Government of Romania intends to build a CCS demo project as presented in the Memorandum „Action Plan to implement a Demonstration Project regarding Carbon Capture and Storage (CCS) in Romania” signed by the Prime Minister in 17 February 2010.

To achieve this desideratum the Government of Romania, represented by the Minister of Economy, Trade and the Business Environment was addressed to the Romanian engineering companies with extensive experience in reducing pollutant emissions in industrial activities, special for energy producing and geological matters.

The Romanian CCS Demo Project will capture, transport and safely store in excess of 1.5 Million tons per year of CO₂, based on a removal efficiency of 85% from the flue gases emitted by lignite fired power station. The CCS project will consist of the full chain of components for CCS including: CO₂ Capture Plant, transportation by pipeline and underground storage.

A Call for Proposals & National Ranking Program has established the best location is Unit No. 6 of the Base Load TURCENI Power Plant.

The plant will be sized to remove in excess of 85% of the CO₂ contained in the flue gases produced for an equivalent of 250 MW net power output.

The CO₂ will be transported to the nearest suitable storage site by an onshore pipeline, using as possible the existing routes for natural gases oil network.

The available underground data has been identified, for the region of the future CCP, within a radius of 50km. No less than 11 possible onshore storage sites have been identified.

4. STRATEGIC DIRECTIONS FOR THE DEVELOPMENT OF ROMANIAN ENERGY SECTOR

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Eng. Floarea Breazu - Institute for Studies and Power Engineering

Keywords: *primary energy resources, climate change, security of supply*

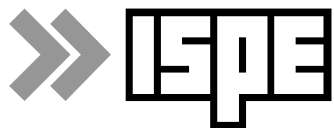
Abstract: This paper proposes that, based on the current situation in the electricity sector, to examine some crucial elements for energy strategy while meeting the targets set by the legislative package "Energy - Climate Change" of the EU. The main objectives resulting are:

1. a 20% reduction of GHG emissions at EU level at least compared to 1990;
2. a 20% increase in the share of renewable energy sources (RES) in total EU energy consumption;
3. a 20% reduction in primary energy consumption and the increasing energy efficiency.

Evaluation of electricity consumption in the long term is based on demographic and the main macroeconomic indicators trends: gross domestic product (GDP), demographic trend (total population).

The final result of the analysis is the new power needs to ensure on long term the safety conditions for consumers taking into account issues such as:

1. the retirement of the existing units at the expiration of the life time;
2. availability of primary energy resources in the country and their costs;
3. possible fuel imports at international market prices;
4. using the best technologies;
5. impact of using RES over National Power System, especially wind power plants;
6. influence the cost of CO₂ emission allowances and the introduction of CCS technology.



Analyzing a strategy regarding the energy sector in terms of electricity security supply, the minimum cost criterion have to be completed by climate change mitigation and limitation of primary energy imports dependence.