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### MANAGEMENT AND ANALYZE OF DYNAMIC PROCESSES OF AUTOMATICALLY REGULATED ASYNCHRONY TRACTION ENGINES ON THE BASIS OF SUBSTANTIAL POWER TRACTION SUB-STATION.

*G.Kokhreidze, N.Kekelia. "Energy". №2(86). 2018. Tbilisi. p. 5-13. geo. sum geo. engl. rus.*

One has discussed specific questions of managing variable power traction engine on the basis of rectifier and voltage inventory aggregations on the basis of IGBT transistor modules. One has represented unification of managing and analyzing the electro-magnetic. Ill. 2, bibl. 5.

### USE OF MULTI-CRITERIA DECISION MAKING ANALYSIS METHODS FOR ELECTRICITY GENERATION PLANNING IN GEORGIA

*L.Vepkhvadze, G.Arabidze. "Energy". №2(86). 2018. Tbilisi. p. 14-25. geo. sum geo. engl. rus.*

This article examines the problem of electricity generation planning in Georgia by employing methods known under the term Multi-Criteria Decision Analysis (MCDA). At first, the electricity balance of Georgia of the years 2013-2017 is considered which shows the importance of electricity generation expansion due to increasing trend of electricity consumption. Furthermore, based on the pre-defined energy objectives and the pre-established assessment criteria, electricity generation technologies are ranked by different MCDM methods, in particular, in the beginning, Analytical Hierarchy Process (AHP) reveals the weights of given criteria assessed by each energy objective. These weights then are imputed within a decision matrix. Finally, the latter matrix is evaluated by three MCDA methods: Technique for Order Preference by Similarity to Ideal Solution, (TOPSIS), Multi-Objective Optimization by Ratio Analysis (MOORA), Optimization of Weighted Aggregated Sum-Product Assessment (WASPAS). The main finding of the research is that in spite of the fact that they require at least twice as much initial construction cost than other generation technologies, reservoir HPPs dominate according to other criteria resulting in their overall preeminence. Tabl. 8, bibl. 15.

### THE INFLUENCE OF THREE PHASE ASYMMETRICAL LOAD ON THE GRID VOLTAGE.

*G.Arziani, I.Gordiashvili. "Energy". №2(86). 2018. Tbilisi. p. 26-29. geo. sum geo. engl. rus.*

The influence of three phase asymmetrical load on the grid voltage is reviewed in the article. There is determined the marginal value of the asymmetrical load above which the limits of the voltage asymmetry specified in the Georgian grid code is violated. Ill. 4, tabl. 1.

### CALCULATION OF TECHNICAL LOSSES IN POWER SUPPLY ELECTRICAL NETWORK 0,4-110 KVBY MEANS OF SOFTWARE PACKAGE.

*Shavelashvili I. "Energy". №2(86). 2018. Tbilisi. p. 30-39. geo. sum geo. engl. rus.*

Article presents the calculation of electrical losses, for electrical distribution network company "Telasi".

Calculation done by means RAP software package for total energy income, outcome and voltage ranges, in respect of structure total losses "Telasi".

Results of technical losses correlates with regulatory rules, but have some differences for certain part of electrical network.

Made conclusions and produced some recommendations. Ill. 4, tabl. 3, bibl. 5.

### QUANTITATIVE ASSESSMENT OF WATER CONTENT OF THE GEORGIAN RIVERS, TAKING INTO CONSIDERATION EXISTING HYDROLOGICAL DATA

*Iu.Lomidze, G.Khelidze, B.Pipia. "Energy". №2(86). 2018. Tbilisi. p. 40-44. geo. sum geo. engl. rus.*

The last assessment of hydropower resources of the Georgian rivers was based on the hydrological data existing up to 1980. Currently, the available hydrological data is that of the period up to the 90s of the XX century. It is noteworthy that hydrological observations have not been performed for most Georgian rivers since 1990s. Therefore, there is no full information regarding the effect of climate change on the hydrological regime of the rivers. In order to assess the impact of climate change on the water content of the rivers, at this stage of the research, we have allocated 10 rivers in four regions of Georgia, for which water expenditure calculations were

carried out. In the case of these rivers, both the reduction and the increase of average multi-year water expenses has been observed using the extended lines of water expenses. Tabl. 1, bibl. 7.

#### **SUPERCONDUCTING MAGNET ENERGY STORAGE INFLUENCE ON OPERATION ELECTRIC SYSTEM.**

*M.Rukhvadze, G.Shovnadze.* "Energy". №2(86). 2018. Tbilisi. p. 45-48. geo. sum geo. engl. rus.

This article discusses the Superconducting Magnet Energy Storage influence on operation electric system. Computer modeling of transient processes was conducted to estimate and is compared curves when using with/without Energy Storage. It is shown that in case of when using energy storage electric system maintain dynamic stability and it is not necessary to switch off consumption. Ill. 7, bibl. 3.

#### **PRINCIPLES OF DETERMINING THE COST OF ENVIRONMENTAL WATER OF GEORGIAN RIVERS FOR HYDROPOWER OBJECTS.**

*Iu.Lomidze, G.Khelidze, K.Pataria, M.Margaleishvili.* "Energy". №2(86). 2018. Tbilisi. p. 49-54. geo. sum geo. engl. rus.

Based on natural conditions in Georgia, hydro systems of derivative type operating in the water flow regime are widespread, where the lower pool of the bed is characterized by a certain degree of deliquification. Therefore, the issue should be reviewed in a complex way, so that complete energetic resource is used to maximum on the one hand, and on the other hand, the main natural conditions are preserved.

The presented method of determining environmental water cost based on the basic value of water represents a 95% cost provision of the minimal average monthly cost for multi-year water expenses. As an example, basic water costs are defined for the rivers that are fully and partially studied in a hydrological way, as well as for the rivers that are not studied in a hydrological way. The performed calculation shows changes in average multi-year basic costs of water in the boundaries from 3.5% to 16.8%, which indicate that the current level of environmental water cost (10% of average multi-year water cost) accepted in the project practice does not correspond to reality. It should be taken for each specific river individually, taking into account the functioning of freshwater ecosystem, provision of satisfactory water requirements for population, agriculture and industry, as well as marginal concentration of water contamination due to non-regulated anthropological activities. Tabl. 1, bibl. 6.

#### **IDEAL CRYSTAL AND REAL METAL.**

*Z.Chachkhiani, G.Darsavelidze, L.Darchiashvili.* "Energy". №2(86). 2018. Tbilisi. p. 55-58. geo. sum geo. engl. rus.

The possibilities of using representation of the Brillouin band structure in the study of the motion of conduction electrons in the periodic field of an ideal crystal are discussed.

The limits of theory applicability and the need for modifications of the band model in case of studying real conducting metals with structural defects are indicated. Bibl. 3.

#### **REMOTE TECHNOLOGIES OF LEARNING IN THE ADDITIONAL PROFESSIONAL EDUCATION.**

*J.Nikuradze, V.Kvintradze, V.Meladze, G.Tabatadze.* "Energy". №2(86). 2018.

Tbilisi. p. 59-63. rus. sum geo. engl. rus.

In the given article the questions of distance education of additional professional schools are considered. In comparison with high schools the pace of development of distance education in the additional professional schools is low, which don't conform to the requirements of modern education process. The distance education doesn't replace the traditional education. Its destination is become the new educational model, which gives the possibility for non-stop self-improvement and directed to formation technologies for quick receiving, treat and practical use the information by the individual. Thus propagation of distance education technologies for the system of additional professional education is necessary, which demands to study mechanisms of its application. Bibl. 3.

#### **DETERMINATION OF THE COEFFICIENT OF LIGHT BEAM IN TECHNICAL OILS.**

*L.Papava, M.Razmadze, L.Akhvlediani. "Energy". №2(86). 2018. Tbilisi. p. 64-67. geo. sum geo. engl. rus.*

The coefficient of light beam preamiation in technical oils, as well as their refraction angle, was studied. The coefficient of light breaking in technical oils (compressor, automotive and transformer) was experimentally studied, which makes it possible to determine the object of observation and fix it, and to avoid various technical processes. Ill.2, bibl. 3.

#### **INORGANIC ANTISUBLIMATION MATERIAL FOR THERMOBATTERIES BRANCHES BASED ON SIGE ALLOYS. *F.Basaria, G.Bokuchava, K.Barbakadze, G.Darsavelidze. "Energy". №2(86). 2018. Tbilisi. p. 68-73. rus. sum geo. engl. rus.***

Polycrystalline SiGe alloys are high-temperature thermoelectric materials and are widely used for production of p- and n-branches of thermoelectric batteries, with working temperature above 1000<sup>0</sup>C. At these temperatures evaporation of germanium and dopant materials (boron and phosphorus) takes place from SiGe alloys. This process might stipulate worsening thermoelectric characteristics of the thermoelectric converter and decreasing duration of its working resource. This highlights the need for the formation of antisublimation coatings on the surface of the thermoelements branches, compatible in their physical-chemical properties with their characteristics.

In practice, silicon nitride and high-temperature organic and inorganic materials are widely used to solve this problem. This is stipulated by the presence of relatively simple technological processes of their creation and practical application. These materials are characterized by high brittleness or become brittle during operation of the thermobatteries at high temperatures. In case of organic materials liquid hydrocarbons are additionally released, which form carbon at high temperatures. As a consequence, the electrical insulating characteristics of thermobatteries deteriorate, which often leads to a short circuit. In the process of operation of thermobatteries, both planned and unplanned changes in temperature often take place. It can cause damage to the continuity of a thin layer of protective coating.

High temperature electroinsulating antisublimation coatings based on vitreous enamels have been created by us for protecting p- and n-types branches of thermoelements based on SiGe. By varying the chemical composition of the glass frit, vitreous enamel has been obtained, that meets the requirements for the physical-chemical properties of antisublimation coatings at temperatures of 1000-1100<sup>0</sup>C.

The following chemical composition of glass frit: Na<sub>2</sub>O-K<sub>2</sub>O-ZnO-Cr<sub>2</sub>O<sub>3</sub>-Al<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub> was developed based on liquid glass Na<sub>2</sub>O•n SiO<sub>2</sub>. Based on these materials, high-temperature antisublimation coatings of the highest quality are formed on the surface of p- and n-branches of SiGe thermoelements. The proposed material can preserve the strength of the connection of the branches of thermoelements at the initial level, their electrical insulation and antisublimation properties in case of temperature change of the thermoelectric generator at a speed of 100<sup>0</sup>C/min in the temperature interval of 1000-25<sup>0</sup>C. Ill. 2, tabl.2, bibl. 10.