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SUMMARIES

PECULIARITIES OF DETERMINING ECONOMIC EFFICIENCY OF DEVELOPMENT OF WATER AND POWER RESOURCES IN GEORGIA. ***N. Kodua, A. Akhvlediani, V. Sharikadze.*** **"Energy". Tbilisi. 2009. №4(52). p.3-7. geo. sum.geo.engl.rus.**

It is shown, that in order to fully develop existing water and power resources of Georgia, it is firstly necessary to fix short term and long term cost limit using supply and consumption curve.

Besides, it is necessary to specify deficit peak zones of a daily load in autumn and winter. The load should be covered with the capacity of new electric power station, however current power cost in this zone is similar to the one in the off-peak zone.

It is not allowed to increase installed capacity for the purposes to increase generation in spring and summer, if the duration of winter deficit zone is not covered.

Consideration of the mentioned requirements showed, that the design capacity of 750 megawatts of Khudoni hydroelectric power plant determined under the conditions of the plant operation in Transcaucasia energy system using selective economy criteria should be reduced to 450 megawatts. Estimations for determining the installed capacity of Khudoni hydroelectric power plant under the method suggested by authors should be continued. Ill. 1, tabl. 1, bibl. 3.

COMPLEX USAGE OF DERIVATIONAL SYSTEMS FOR CONVERTING NON-TRADITIONAL ENERGY SOURCES INTO ELECTRIC POWER. ***R.Pataraia, V.Jamarjashvili, K.Pataraia.*** **"Energy". Tbilisi. 2009. №4(52). p.8-10. geo. sum.geo.engl.rus.**

Conversion of non-traditional energy sources (sun, wind) into electric power is nowadays technically realizable but economically expensive process. There are two ways of converting non-traditional energy source into electric power. First one is to generate electric power and the second – to generate electric power together with other traditional energy sources.

An idea of complex usage of derivational systems during the process of converting non-traditional energy into electric power is presented. The best effect could be achieved by developing solar energy during summer and autumn period.

Usage of Mukhrani irrigation canal is considered for practical realization of the idea. Utilization factor equals 2,1 meaning that the proposed idea is effective. Ill.2, bibl.2.

ANALYSIS OF RESULTS OF LONG-TERM RESEARCH OF VALUES OF DEFORMATION MODULE AND POISSON COEFFICIENT OF ENGURI PLATINUM CONCRETE. ***P.Chichagua, J.Kilasonia, M.Kalabegishvili.*** **"Energy". Tbilisi. 2009. №4(52). p.11-13. geo. sum.geo.engl.rus.**

Estimation of the values of deformation module and Poisson coefficient of Enguri Platinum concrete has been run at Georgian Scientific and Research Institute of Power Engineering and Power Structures and Moscow HydroProject.

Comparative analysis showed satisfactory coincidence of all these researches. The most accurate of all are the values of deformation module of Enguri Platinum concrete run at the department of the research of hydrotechnical structures of Georgian Scientific and Research Institute of Power Engineering and Power Structures, they have been received as a result of testing large size samples within the very structure taking into the consideration real preparation environment, transportation, laying, vibrating and hardening of the concrete.

Poisson coefficient value of the mentioned concrete may be assumed to be ≈0,18. Bibl. 6.

EVALUATION OF OPERATIONAL EFFICIENCY OF GEORGIAN ELECTRIC SYSTEM BASED ON STATISTIC DATA OF OPERATIONAL CHARACTERISTICS AND WAYS OF ITS IMPROVEMENT. ***D.Japaridze, N.Magradze.*** **"Energy". Tbilisi. 2009. №4(52). p.14-22. geo. sum.geo.engl.rus.**

Statistic data of the performance of Georgian electric system over the last years are reviewed and criteria (indicators) to evaluate operational efficiency of the electric system are specified. Joint positive dynamics of data variation of power generation, consumption, import, export, power losses in 35-110 kW electric networks, complete or partial system failures, emergency shutdown of transmission lines, effect of frequency relay, failure of major equipment, on-off switches and voltage transformers, are taken as criteria.

Results of study are given in summary tables of basic criteria of Georgian electric system. Evaluation of operational efficiency of the electric system is performed based on data provided in the table, problems are formulated and practical recommendations are worked out according to the results obtained. Ill. 10, tabl. 2, bibl. 19.

POTENTIAL FOR USING NONSYNCHRONOUS ELECTRICAL MACHINE WITH PHASE-WOUND ROTOR IN MINOR POWER ENGINEERING. ***E.Gersamia, K.Tsereteli, M.Sartania.*** **"Energy". Tbilisi. 2009. №4(52). p. 23-25. geo. sum.geo.engl.rus.**

Among small capacity units with the driver rotation of variable frequency and loading variations, the priority in generating constant frequency and voltage power is given to the unit with bilateral power supply (asynchronized synchronous machine). The article presents the examples of the comparison of technical and economic indices of the phase-wound rotor nonsynchronous generators with other electrical machines. The comparison shows technical and economic advantages of nonsynchronous units over the phase-wound rotor represented by high coefficient of efficiency, improvement of voltage curve and significant decrease of transformer capacity included in the drive circuit. The above circumstances make it perspective to utilize them in minor capacity units. Ill. 1, bibl. 4.

ASYNCHRONOUS MOTOR OF ORIGINAL CONSTRUCTION. ***V.Kldiashvili, E.Ushveridze, S.Mebonia.*** **"Energy". Tbilisi. 2009. №4(52). p.26-27. geo. sum.geo.engl.rus.**

Asynchronous machines are widely used in electrical gears of machines and installations as electrical motors and its expenses nearly half of manufactured electrical energy in world. In article the Asynchronous Motor of Original Construction, in which be means of special method of laying the winding in slots of magnetic metal and addition second groups of windings and condensers achieves much more high effect of using of energy, is proposed. By using of asynchronous motor of such original construction is possible economy more than 20% electrical energy. Ill.1, bibl.1.

ISSUE OF WORKING OUT USER INTERFACE OF POWER UNIT MANAGEMENT. ***L.Imnaishvili, E.Chachkhiani, M.Bedineishvili.*** **"Energy". Tbilisi. 2009. №4(52). p.28-35. geo. sum.geo.engl.rus.**

The issues of developing user interface for such power units as hydro-power plant and high-voltage sub-station are discussed in the article. Number of innovations based on usage of digital fields and computer technologies significantly improving ergonomic factors of the control pane are suggested in the methodology of constructing user interface of the power units. The so called dynamic line concept providing the consumer with the information about the condition of the central alarm is introduced. Dynamic line is a cyclic permuted image which in normal functioning of the station is green and becomes red when central alarm is on. The authors have worked out and presented a lot of innovations enabling to significantly reduce the range of the consumer potential actions thus minimizing likelihood of their accidental operation. Ill.9, bibl. 5.

MATHEMATICAL AND COMPUTER SIMULATION OF NON-SWITCHING PROCESSES IN SEMI-CONDUCTOR TRANSFORMERS OF TRACTION SUB-STATION WITH DIPHASE PARALLELING REACTOR. ***G.Kokhreidze, D.Laoshvili, D.Kokhreidze, L.Injia, I.Kurashvili.*** **"Energy". Tbilisi. 2009. №4(52). p. 36-48. rus. sum.geo.engl.rus.**

Behavior of semi-conducting transformers during non-switching processes are discussed in the article.

Complex equation system for calculating transient process against final winding variables has been obtained; complex inversion has been shown; equation system against derivative desired quantity has been solved as a result of which the desired quantities are presented in an integral form. The obtained expressions allow us to run computer simulation and create virtual model of the transformer system considering basic circuit parameters. Influence of phase current commutation on the ongoing processes is shown as well. Ill. 5, bibl. 5.

MATHEMATICAL AND COMPUTER SIMULATION OF NON-SWITCHING PROCESSES IN TRACTION SUB-STATION TRANSFORMERS ACCORDING TO SCHEME "TWO REVERSE STARS WITH PARALLELING REACTOR". ***G.Kokhreidze, D.Laoshvili, D.Kokhreidze, L.Injia, I.Kurashvili.*** **"Energy". Tbilisi. 2009. №4(52). p.49-57. rus. sum.geo.engl.rus.**

The issues of mathematical and computer simulation of the processes of the transformer system of the traction sub-station are reviewed in the article. Method of complex conversion of variables has been used; final variable equation system has been received and formulas of transition from final complex variables to instantaneous phase values have been shown. General impression of the current passing under the load has been received. Structural (virtual) model for the entire system has been prepared considering main parameters. Results for non-switching interval have been obtained as well. Ill. 3, lit. 4.

ABOUT TWO INTERDUAL SYSTEMS OF KIRCHHOFF EQUATIONS. ***R.Jashi.*** **"Energy". Tbilisi. 2009. №4(52). p.58-62. geo. sum.geo.engl.rus.**

An issue of searching dual pair of design formula and equation systems of lines are studied. Consideration of these very formulas and equations in duality context provides more reliable answer on problem solving and helps researcher avoid incorrect solutions. Dual pairs (some of them for the first time)

made on the basis of design formulas of Ohm and Kirchhoff laws, unknown nodal and loop currents and one nodal tension and one loop current containing complex branching, are suggested.

At the same moment, duality principle presented in general equations is given in evident form as the source of current and tension, which, as a rule, is not observed in well-known equations written based on Kirchhoff law, nodal potentials and loop currents.

The case when the well-known electroscheme of replacement is considered to be incorrect in case the principal of interduality of tension and current sources is not taken into account is described.
Special attention is paid to the fact, that element, scheme, formula and system may be dual and that searching of dual pairs is useful and prospective. Ill. 7.

ENHANCEMENT OF USAGE OF ENERGY EFFICIENCY EFFECTIVENESS OF GEOTHERMAL RESOURCES. ***K.Vezirishvili-Nozadze, N.Mirianashvili, T.Gedevanishvili.*** **"Energy". Tbilisi. 2009. №4(52). p.63-65. rus. sum.geo.engl.rus.**

Presented approach of probabilistic analysis is basically utilized in the projects of the world bank. Subject of the investment analysis is the definition of the effective options of the investment based on which the investment decisions are made. Imitation on model enables us to identify decisions providing the best combination of private and public interests in implementing policy for the enhancement of the efficiency of geothermal energy usage.

The given complex of engineering methods allows to design energy-saving systems and optimize the schemes of geothermal heat and cold supply to the particular consumers. Recommendations worked out are approved and utilized at the Design Institutes of our country. Complex systems of geothermal heat and cold supply saved about 2,7 thousand tons of standard fuel in 2008 and the approved total annual economic efficiency by introducing this systems made $78,5 thousand.

PILOT PROJECTS FOR GEOTHERMAL HEAT AND COLD SUPPLY OF SAMEGRELO REGION AND THEIR EFFICIENCY INDEX. ***K.Vezirishvili-Nozadze, N.Mirianashvili, T.Gedevanishvili.*** **"Energy". Tbilisi. 2009. №4(52). p.66-71. geo. sum.geo.engl.rus.**

The article reviews the usage of geothermal water available in Georgia in heat and cold supply systems together with showing qualitative and quantitative indexes of thermal water. Clear picture of the condition of contemporary fuel and energy complex of Georgian is given too. The article presents the dynamic of fuel consumption in various fields of national economy of the country together with determining the share of geothermal resources in heat and cold supply. Current condition of thermal water fields of Samegrelo region is reviewed, schemes of heat and cold supply of Zugdidi and Tsaishi resorts are worked out and their potential heat consumers are selected.

The article also presents technical and economic indices of the above projects the implementation of which will allow to solve the problem of the heat and cold supply of this region with cheap base renewable thermal water, which is so important for normal functioning of power engineering and establishing rational economy in Georgia. Ill. 2, bibl. 3.

DEVELOPMENT OF CONSTRUCTION OF MECHANISM FOR TURNING TUBES ON THE AUTOMATIC MILL. ***J.Melkadze, M.Mikautadze, S.Mebonia.*** **"Energy". Tbilisi. 2009. №4(52). p. 72-73. geo. sum.geo.engl.rus.**
New construction of mechanism for turning tubes, which provides the realization of rational technology of rolling the tubes, is considered.
Construction of mechanism for turning tubes excludes the using of autonomy source of energy, because the operation of turning tubes on the automatic mill is done with using motion available pneumatic pusher ,and what's it is done in automatic regime ,at result the quality of manufactured production rises and safety condition for working of serving personnel improves. Ill.1, bibl.1.

SOME ASPECTS OF DEVELOPMENT OF POWER INDUSTRY IN AZERBAIJAN. ***A.Kuliev.*** **"Energy". Tbilisi. 2009. №4(52). p. 74-79. rus. sum.geo.engl.rus.**

General picture of development of power industry in Azerbaijan is provided. Proper attention was not paid to power industry during the first years of independence due to instability in the society.

Special attention to the development of the power industry was paid when Azerbaijan switched to market economy: power plants are constructed and field infrastructure is improved. Activity of French national power company Electrosite De France is analyzed. Author believes, that the most important aspect in the development of power industry in Azerbaijan is to work out and introduce respective multi-tariff power payment system. In addition, it is necessary to perform structural changes in country's power industry and also the country should urgently integrate into the international system including European Union. Modernization of power equipment is essential too.

TWO-DIMENSIONAL INDUCTIVE SENSOR OF MECHANICAL DISPLACEMENT. ***P.Mamedov, R.Huseinov, I.Ragimli, Sh.Mamedova.*** **"Energy". Tbilisi. 2009. №4(52). p. 80-83. rus. sum.geo.engl.rus.**

Necessity to decrease the amount of sensors arose in various fields of industry during measuring number of technologic parameters. With respect to such necessity, inductive sensor with solid magnetic conductor enabling to measure two different character mechanic displacements at a time was developed at "electromechanics" department of Sumgait State University. Magnetic conductors of the sensor are made of Ct-45 class solid structural steel. As a result of performed theoretical and experimental studies it was determined, that making the sensor from solid structural steel makes it possible to produce a new sensor with high technical and economic indices. Proposed sensor may be used in information-measuring systems of machine-building industry. Ill.3, bibl.3.

SWITCHING OF TWO-DIMENSIONAL ELECTROMAGNETIC SENSOR INTO CONTROL SYSTEM OF MULTIFUNCTIONAL MACHINES. ***P.Mamedov, R.Dadashev, I.Ragimli.*** **"Energy". Tbilisi. 2009. №4(52). p. 84-86. rus. sum.geo.engl.rus.**

Different machine types are used in number of fields of national economy including machine-building industry. Multifunctional machines are most widely used. An issue of connecting two-dimensional electromagnetic sensors to the control system of multifunctional machines is reviewed. According to proposed scheme, switching of metering circuits of the sensor into the control system of multifunctional machines allows to conclude, that no additional errors occur in running two-dimensional sensors for metering technological parameters and this makes it economically reasonable to use them. Ill.3, bibl.3.

COMPARISON OF TWO METHODS FOR ESTIMATION THE NUMBER OF ENTOMOPATHOGENIC NEMATODES IN SOIL SAMPLES. ***M.Lortkipanidze, M.Kokhia, N.Melashvili.*** **"Energy". Tbilisi. 2009. №4(52). p. 87-90. engl. sum.geo.engl.rus.**

Two methods of collection of insect pathogenic nematodes inhabited in soil samples and their comparative estimation is discussed in the paper. According to the first method the wax moth larva *Galleria mellonella* is used as biological bait (GM), to collect pathogenic nematodes. Biological baits were laid at different depth in the soil layers 1-10 cm like zigzag. Nematodes, which feed on living organisms easily find baits and invade in the body of the insect. The second method is comparatively improved and represents an apparatus – cylinder biological trap (CBT), 10 cm, in diameter, 12 cm in height. The nutrient agar (3 g beef extract, 5 g peptone, 8 g NaCl, 1 g agar) 2-3 mm was poured on the bottom to bring namatodes. *S. Feltiae,* local entomopathogenic nematods - *S. gurgistana* & and *Steinernema sp.*, species of the genus Steinernema were revealed as the result of using both biological traps in nature. It turned out that number of nematodes exceeds in cylinder biological trap, which is explained by suitable construction and volume. The advantage of the trap is that it can be used all the year round both in laboratory and field conditions. Ill.2, tabl.1, bibl. 5.

INCREASING STRENGTH INDEX OF CONCRETE BY TREATING AGGREGATE SURFACE. ***A.Nadiradze, I.Sujashvili.*** **"Energy". Tbilisi. 2009. №4(52). p.91-93. geo. sum.geo.engl.rus.**

Concrete strength significantly changes both during compression and tension by treating an aggregate surface. It is known, that replacement of gravel by road metal increases concrete strength by 10-12%, and this is associated with the increased roughness of the road metal. There have been tests run using three types of aggregates and cement consumptions. It has been identified as a result of the above tests, that in increasing cement consumption from 200 to 400 kg/m3, concrete strength increases by 50-60%. Besides, by using road metal as an aggregate processed in jaw crushers, concrete strength increases by 10%, and if processing road metal in hammer crushers, it increases by 12,5%. Tabl. 7, bibl. 3.

INFLUENCE OF THE AGE ON CREEP OF CONCRETE AT TORSION. ***A.Sakvarelidze, N.Gudushauri.*** **"Energy". Tbilisi. 2009. №4(52). p.94-96. geo. sum.geo.engl.rus.**

The issues of creep of concrete of different ages in torsion are investigated. There were conducted experiments on creep of specimen-cylinders in different ages ,180 at permanent humidity (by mass) and temperature t_0=3;7;14;28;60;180 W=4,7%; T=20±1^{0}C.On the basis of conducted experiments the new type of expression of concrete shear creep has been elaborated. The theoretical dependence of shear nucleus of concrete on age has been established and the analytical expression of the law is elaborated. The work is conducted by support of Georgian National Scientific Foundation (Grant N079). Tabl.4, bibl. 4.

INFLUENCE OF DEFORMATION VELOCITY ON STRENGTH AND DEFORMATION CHARACTERISTICS OF FINE CONCRETE OF DIFFERENT AGES AT TENSION. ***A.Sakvarelidze, N.Gudushauri, I.Giorgadze.*** **"Energy". Tbilisi. 2009. №4(52). p.97-98. geo. sum. geo. engl. rus.**

Influence of deformation velocity on mechanical characteristics (strength, ultimate deformation, module of elasticity) of fine concrete at tension is investigated.

There were tested specimens „flat figure of eight'' of fine concrete of different ages – of 28 and 60 days.

In result of investigations there are established indexes of mechanical characteristics of fine concrete of different ages at different deformation velocities in tension. Investigations have shown that indexes of module of elasticity, limit deformation and strength insignificantly depend on deformation velocity in investigated diapason of velocity. Carried out investigations have shown that at increasing of deformation velocity on 4 degree the limit deformations of tension are changed insignificantly. The indexes of module of elasticity and strength of specimens are increased by 21,6% (concrete age t_0=28 days) and 25,0% (concrete age t_0=60 days), 21,7% (concrete age t_0=28 days) and 22,6% (concrete age t_0=60 days), correspondingly.

The work is conducted by support of Georgian National Scientific Foundation (Grant N079). Tabl.1, bibl. 1.

POLYMERSILICATE COMPOSITES RESISTANT TO AGGRESSIVE ENVIRONMENT. ***L.Shamanauri, J.Aneli.*** **"Energy". Tbilisi. 2009. №4(52). p. 99-103. geo. sum.geo.engl.rus.**

Polymersilicate composites containing andesite and quartz sands are obtained on liquid glass and epoxide resin basis. Physical and mechanic, thermal, acid and water resistance features are studied.

Optimization of material composition as a result of which optimal ingredient content is identified was run using mathematical design method. Acid resistant composites with best features are received experimentally and their technical characteristics exceed the existing analogues. The work was performed in order to use polymersilicate composites as protective anticorrosion coating for internal surfaces of gas ducts in thermal electric power plants. Ill. 1, tabl. 5, bibl. 11.

TECHNOLOGICAL PECULIARITIES OF PRESSURE-DERIVATIVE TUNNEL DRIVING OF ADDITIONAL GENERATION UNIT OF HYDROELECTRIC POWER PLANT ON RIVER MTKVARI. ***T.Lordkipanidze, G.Tchumburidze.*** **"Energy". Tbilisi. 2009. №4(52). p. 104-112. geo. sum.geo.engl.rus.**

Stages of tunnel driving are reviewed. Significant attention is predominantly paid to the peculiarities of tunneling. Technology of stage-by-stage design of transverse tunnel section considering tunnel location is provided. It is considered reasonable to drive tunnel using lower bench method. Peculiarities of treated rock removal are given. Separate operations relating to building constant tunnel lining and basic aspects of conducting filling cementation including running quality specification test are reviewed.

Final tunneling stage - gunning work stages are described. Report is well illustrated with drawings. Ill. 10, bibl. 10.

TELEAUTOMATIC METERING SYSTEM MEASURING WATER LEVEL IN WATER STORAGE. I.*Gabrichidze, G.Zakareishvili, G.Tchumburidze, M.Dzidziguri.* **"Energy". Tbilisi. 2009. №4(52). p. 113-117. geo. sum.geo.engl.rus.**

The article reviews teleautomatic metering system for water storage of hydro power plant, where the float is utilized as a level sensor, and computer network is an information transferring source. Metering float in every position is in balance with its counterbalance. Connecting chain of the float and counterbalance sets an axis of mechanical counter in motion. Disc plates perforated according to Gray code are fixed on each stage of the counter. Reproduction of the meterage of the mechanical counter in power signal is achieved by semi-conductor optical elements. Signals of optical sensors of the counter of water level metering device are transferred to the computer network through an adapter. Accuracy of the water level metering device is 1cm and can be enhanced by adding stages to the counter of the metering device. Ill. 7.

LANDSLIDE CONTROL AND NOTIFICATION EQUIPMENT SYSTEM. ***G.Kharabadze, N.Botchorishvili, I.Gabrichidze, V.Gabrichidze.*** **"Energy". Tbilisi. 2009. №4(52). p. 118-121. geo. sum.geo.engl.rus.**

The article presents the results of long-term observations on the landslide. There is the affect of the landslide, as of a grand geological phenomenon, on other genetically associated geological processes reviewed there. Presented is the control and notification equipment system worked out by the authors allowing to control the landslide from the moment it starts and as far as possible to avoid the expected undesirable accidents. Probability of origin of several landslide points in the high mountainous regions is reviewed in the article. Scheme for providing multichannel radio communication in order to control such phenomenon is developed as well. Ill. 3, bibl. 2.

MUDFLOW AND REGULAR FLOOD FORECAST NOTIFICATION SYSTEM. ***G.Kharabadze, N.Botchorishvili, V.Gabrichidze.*** **"Energy". Tbilisi. 2009. №4(52). p.122-126. geo. sum.geo.engl.rus.**

The article presents current technology based equipment system for observing natural disaster allowing to receive signals on the expected mudflow or regular floods at the control point through an aerial communication. There have been electrical network and design of the water level controlling counter installed in the river, in the areas far from the populated point, worked out. There have been structural

charts of automatically operated radio transmitter and radio receiver worked out too. This allows to periodically record water level, time and date of the measurement at the control point. Other parameters enabling to be fully informed on the created situation based on the received data, which are put into the computer, may be determined as well. Ill. 3, bibl. 2.

RESULTS OF STUDY AND INTRODUCTION OF RENEWABLE ENERGY RESOURCES IN HIGH MOUNTAINOUS VILLAGES OF PSHAV-KHEVSURETI AND KHEVI. ***K.Kobakhidze, N.Chkhenkeli, L.Kobakhidze, G.Bokuchava.*** **"Energy". Tbilisi. 2009.** №4**(52). p. 127-130. geo. sum.geo.engl.rus.**

Results of study and introduction of renewable energy resources in high mountainous villages of Pshav-Khevsureti and Khevi are reviewed. Total solar radiation and average wind velocity data are given. Water and power potential of nine small rivers are evaluated. Operational effectiveness of the equipment functioning on renewable energy sources is evaluated for each village. As a result of the work performed it was determined, that the renewable energy potential in high mountainous Pshav-Khevsureti and Khevi thinly populated villages allows to satisfy local villagers with the required power within the short term and at low costs. Ill. 2, tabl. 3.