International Journal of Engineering & Technology, 7 (4.8) (2018) 459-465

International Journal of Engineering & Technology

Website:www.sciencepubco.com/index.php/IJET

Research paper

Distance Education Possibilities Analysis for Integrated Innovative Projects

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Abstract

The materials presented the possibilities development of solar and wind power plants, project development for all those who are engaged in the power studies and baseness. In this, phase of work in NTU "KPI" – studies the possibility of increasing the economic efficiency of alternative energy sources. A review of the literature and the necessary articles written on the subject: as technologies and economies develop and become more complex, energy needs increase greatly; types and methods of alternative energy, as well as the possibility of calculating the basic set of main economic indicators are classified; identified possible areas of work in obtaining the necessary information and results. Energy is a fundamental input for economic systems. Current economic activity depends overwhelmingly on fossil fuels including oil, coal, and natural gas. These fuels are non-renewable. Renewable sources such as hydroelectric, wind, and solar power currently provide less than 10% of global energy. In just a few decide solar and wind power has developed from alternative energy sources to a new fast growing industrial branch. The history of industrial civilization is a history of energy transitions. In less developed, agrarian economies, people's basic need for food calories is provided through simple forms of agriculture, which is essentially a method of capturing solar energy for human use. As economies develop and become more complex, energy needs increase greatly.

Keywords: *distance learning, alternative energy sources, solar and wind power plants, integrated energy technologies, evidence-based methods, ecological safety, energy needs increase greatly.*

1. Introduction

Distance education possibilities analysis for implementation of interuniversity complex projects by students of higher educational institutions is an obligatory component of teachers and students training for innovative activity [1, 2–16]. One of the modern mankind problem is to expand the use of energy carrier varieties, to determine their role in world politics and economy [5–8, 11]. In writing this article were used varieties of materials and scientific articles that deal with analysis of energy interests, problems and prospects of energy policy [1–24].

Education humanization as a leading component of tendency of its development means the focus of education to the students, creating conditions for their individuality manifestation and development at all education stages in the varieties of higher educational institutions [10–16]. Such conditions contribute to the protection of humanity in general and students in particular from the danger of losing their uniqueness, alienation from life, nature world and culture; they are aimed at maximum satisfaction of the highest human needs in self-actualization, self-realization, professional and social development [12–17, 21, 22].

Humanization is conditional on the highest value of a person with his needs, motives, goals, moral beliefs in the production process. Socio-economic changes in society put forward certain requirements for the educational system and are manifested as tendencies of its development in determining the principles of reforming. Distance education, along with traditional materials – lectures, practical, laboratory, test tasks, also plays an important role in terms of the modern technologies and development reflection, for example, complex problems of alternative energy sources. As a part of the literature review of distance education it is necessary to create reviews of varieties of articles and patents, taking into account the scientific and practical problems of Ukraine and the World [11–19].

Problem statement in general terms and its connection with important **scientific and practical tasks.**

2. Analysis of the current state of the problem

Leading tendencies in the vocational education development, reflecting the general tendencies in the education development – global, national, regional – include specific, for example, the use of alternative energy sources (AES).

Also, it should be noted that the leading tendencies in the vocational education development include its continuity, humanization and humanitarization, democratization, integration, intensification, availability of distance education modern technologies and other indicators [10, 12, 14, 16, 21, 22].

Vocational education is considered as a continuous process due to the needs of modern production in the constant professional and personal development and specialists improvement, in expanding their capabilities within the same profession, and in the changing spheres of professional activity. The leading qualities of a profes-

sional in such conditions are developed system thinking; possession of methodological knowledge that allows not only to operate on the available information, but also to master a variety of activities; active life and professional position; the need for professional and personal development [10–16] and improvement, readiness for this [3–5, 17–20].

This tendency is reflected in the distance continuing vocational education development, a system of multi-level vocational education through the creation of educational programs that ensure the relationship and continuity of the vocational education content at all its stages aimed at continuous development, socialization and professionalization of the specialist's personality [21–27]. The recommended literature as a part of distance education is introduced to the thematic discipline plan, it is an independent work with examples on the theory of discipline and comments-explanations; the presence in the examples of logical-structural schemes-connections of theoretical and applied research [13–16].

Each stage of economic development has been accompanied by a characteristic energy transition from one major fuel source to another. Today, fossil fuels – coal, oil and natural gas –are by far the dominant energy source in industrial economies, and the main source of energy production growth in developing economies (see Figure 1) [1]. But the twenty-first century is already seeing the start of the next great transition in energy sources – away from fossil fuels towards renewable energy sources. This transition is motivated by many factors, including concerns about environmental impacts (particularly climate change), limits on fossil fuel supplies, prices, and technological change. Solar energy comes in three basic forms [2, 16]: low temperature solar thermal; solar electric or photovoltaic (PV); high-temperature solar thermal energy.

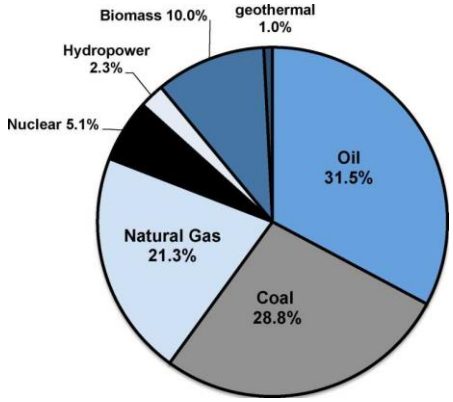

Fig. 1: Global Energy Consumption by Source: International Energy Agency (IEA 2013)

The polysemy of the concept of independent work in the higher education didactics is explained by the complexity of this pedagogical phenomenon, the presence of many different sides in it, each of which in the perspective of studying can be the special study subject. At the same time, it should be noted that all interpretations are characterized by the identification of the concepts of independence, independent activity, independent occupation and self-education. In future professional activity the specialist cannot be guided only by external stimuli and motives. It is important to form internal value motives of activity for his professional development already at the University. Student's independent work, which is considered as an activity, is a multilateral phenomenon.

3. Determination of the basic research criteria

In accordance with the competence-based approach to professional training, the future specialist must acquire experience of creative, research and social activities, which are formed in the process of students' independent work. The formation of a particular culture type occurs in certain socio-economic conditions and reflects the organizational and technical aspects of the production method. Advantages of distance learning over traditional are flexibility (training can take place at any time); selectivity; objectivity; geographical coverage (students from remote country regions can get a quality education and advice of highly qualified specialists); skills formation. The pedagogical literature and educational practice analysis allowed to allocate a set of professionally oriented qualities, the formation of which contributes to the students' independent work (Figure 1–5).

While renewable energy costs are decreasing, future market prices for renewable energy will not necessarily be less than historic fossil fuel prices. Cost challenges for producing renewable energy include renewables' net energy, their intermittency, and their capital intensity. Relevant examples can be integrated renewable energy integrated (Figure 2–4).

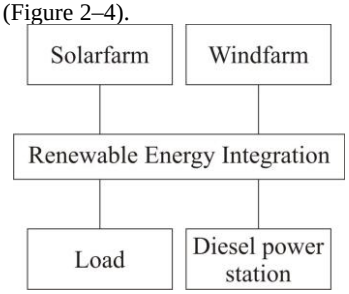

Fig. 2: Example renewable energy integrated

Fig. 3: The Project is supported by the Australian Government through the Renewable Remote Power Generation Program. The Program is implemented by the State's Office of Energy in Western Australia

Fig. 4: Coral Bay, Wind/Diesel System Australia

Distance learning is appropriate as an additional type of education, when there is a certain knowledge base obtained by the student in full-time, then he already has a motivation - raising the qualification level. But distance education cannot replace traditional education due to psychological peculiarities. In fact, distance learning in its characteristics is so different from the traditional that the successful creation and use of distance learning courses should begin with a deep learning objectives analysis, didactic possibilities of new technologies for the educational information transfer, requirements for distance learning technologies in terms of teaching specific disciplines, adjusting learning criteria.

The didactic specificity of distance learning is largely focused on specific cognitive and learning strategies that mobilize cognitive resources (e.g., long-term memory and attention) to achieve the learning goal. In accordance with the competence-based learning model, the independent work goal is to teach students to learn and thereby contribute to their professional development, which involves the formation of professionally significant qualities system in future specialists.

Review of our plan for working with students and the necessary articles written on the subject:

1. The choice of where innovative technologies, taking into account the features of the base object and the type of secondary energy resources.
2. Features process modeling technology for secondary of polyethylene and other plastic waste.
3. Features of technology of hydrogen power industry as part of complex integrated innovation projects.
4. Selection effective management of complex projects for resource and energy conservation.
5. Analysis of economical, ecological, legal and social relations in a new type of integrated complex innovation projects.
6. Methodological and methodical bases of management of complex innovation projects.
7. Selection criteria for evaluation of integrated complex innovation projects.
8. Selection of models encourage staff innovation of integrated complex projects.
9. Development of an algorithm for calculating the graphical interpretation of the results of the experiment.

The technology [2], which to use – direct solar radiation with solar collectors and photovoltaic (PV) panels is now on the brink of a definite commercial breakthrough, growth in the PV-sector has also been very fast during the last few years (Figure 2). Power system (Figure 3) [2] consisting of: 7 x 320kW/50Hz diesel; 3 x 200kW wind turbines 1 x 500kW flywheel.

Demonstration of utility Power Quality despite large wind disturbances. Opportunity to deploy load control with desalination plant next door. In this phase of work in NTU "KPI" explore possible mechanisms for the advancement of economic activity efficiency using wind and solar energy. Types of wind and solar energy and methods of economic evaluation of their work are classified. Renewable Energy Integration (Figure 1–3) [1, 2] – types of microgrids: islanded; embedded. Integration technologies – PowerStore (flywheel and inverter system) for stabilizing the microgrid – MGC600 control platform. Applications – Hybrid islanded systems; Grid connected microgrids and other.

4. A review of the experimental research solar and wind power together with the students

Most renewables are less available and/or have higher costs than fossil fuels used in the recent past. The costs of renewable energy resources are attributable in part to inherent characteristics, particularly their low net energy ratios, intermittent availability, and capital intensity.

Development of new technology will reduce cost but may not make renewable energy cost competitive with market prices of fossil fuels in the near future unless fossil-fuel externalities are considered. The speed of the transition to renewable energy will be highly influenced by policy choices; potential policies include increasing energy research and development expenditures, feed-in tariffs, and renewable energy targets. These questions was designed together with the students, as complex and innovative projects in the student scientific society – is the third stage of the work in NTU "KPI" (Figure 5). Attraction to address environmental problems in Ukraine public student organizations in the process of learning in higher education will allow them to prepare in the future society of Ukraine to the organized collection of various types of waste.

Our work is focus on evidence-based choice of integrated energy of different origin – alternative energy (AE) (Figure 5–9) and energy waste. This will reduce, primarily, the total amount of waste to be disposed of in landfills or polluting harmful emissions. This approach allows using the resource potential of these types of waste, and creating conditions for compliance with legal, health and environmental, economic and organizational aspects of the problem of waste management in general.

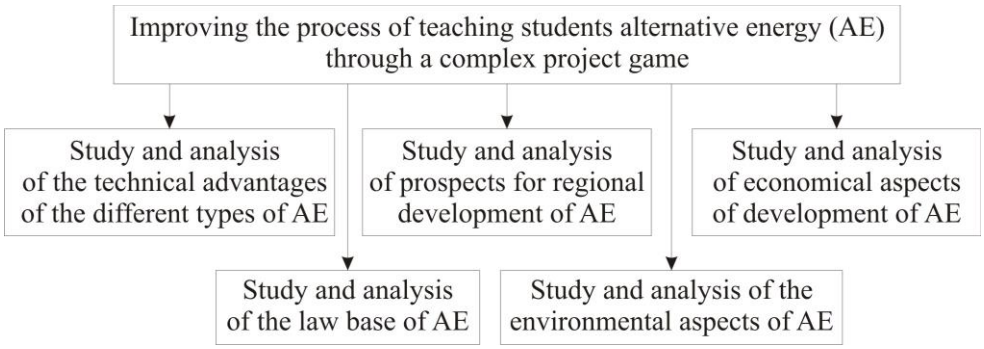

Fig. 5: Improving the process of teaching students

While working to develop the principle of evaluating the effectiveness of the use of funds expended primarily for the construction of a particular object of alternative energy. For example, the methodology to calculate the allocation of public funds for the expansion of the subsequent reinvestigation innovation construction by depreciation and profits, which are formed in the process of the wind power plant (Figure 6–8).

The total number of articles, papers in international and other conferences, study guide, tutorials, and guidelines for students – more than 30 are prepared and published.

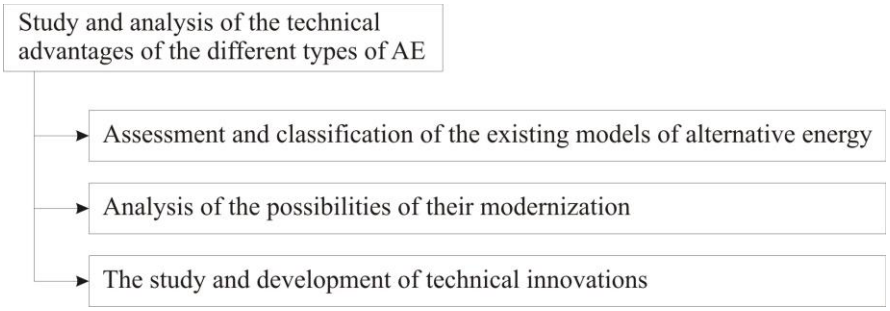

Fig. 6: Study and analysis the process of teaching students

Attraction to address environmental problems in Ukraine public student organizations in the process of learning in higher.

The global system of education is in a state of crisis, which is cause by both internal and external to its factors. For Ukraine, this transition to a market economy, a high level of unemployment among university graduates, especially in the economic crisis, sharply exacerbated the problems and opportunities for young people to find their niche in the job market, highlighted lack of preparation of graduates for the real organizational and technical activities.

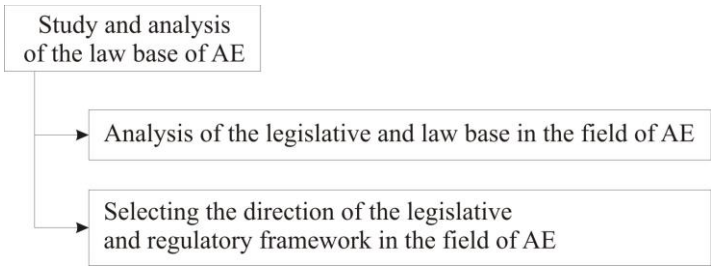

Fig. 7: Study and analysis the process of the law base of AE

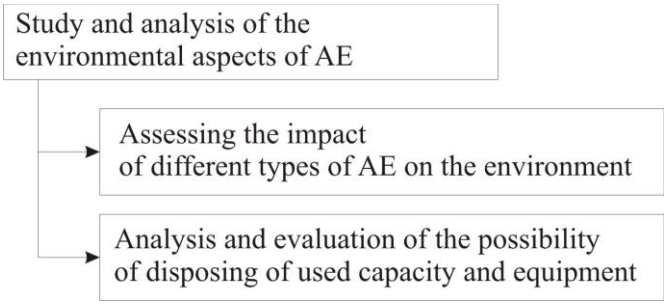

Fig. 8: Study and analysis of the environmental aspects of AE

The problem of learning the practical skills of the students in higher education, even in the most modern of techniques, it is very

difficult to solve[28]. Creating the conditions for training students for the acquisition of the necessary competencies for life will contribute to the competitiveness of graduates in the labor market; the key competence can facilitate their participation in the development of the democratic principles of society.

The efficiency of a solar collector depends on the ability to absorb heat and the reluctance to lose heat once absorbed (Figure 9).

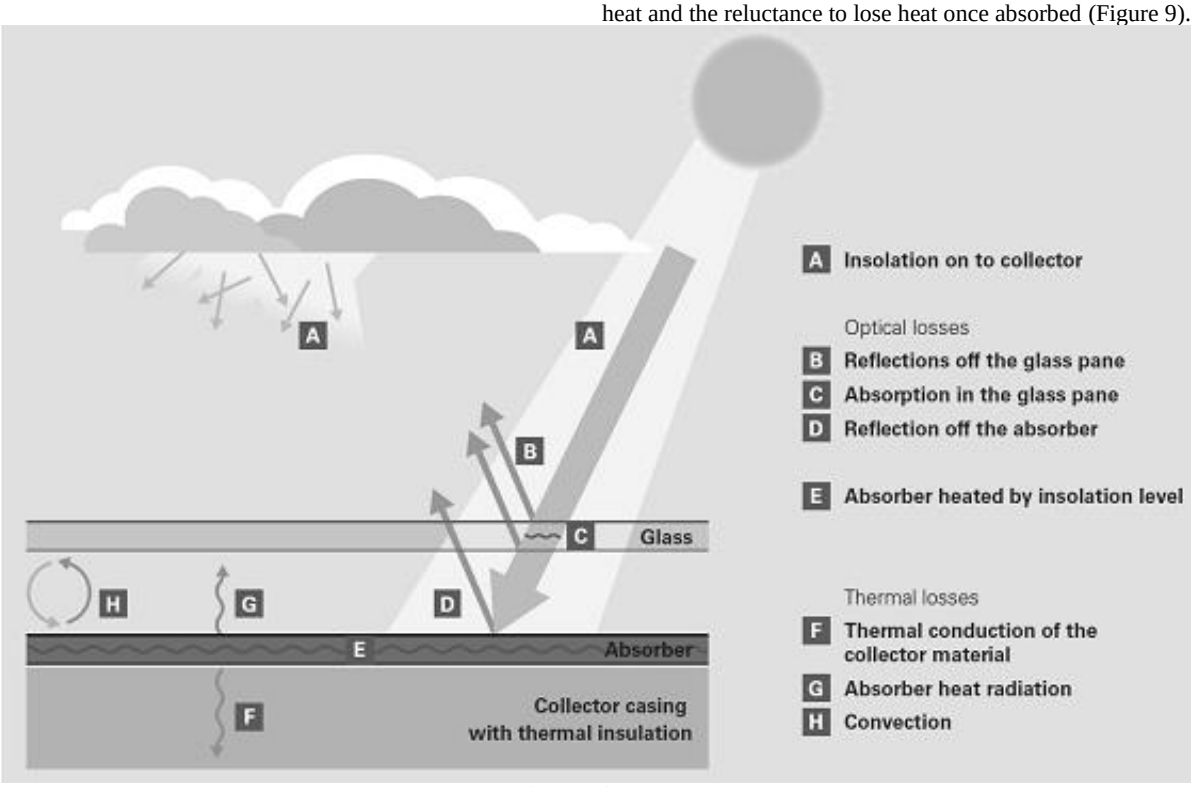

Fig. 9: Principle of energy flows in a solar collector [21]

A simple way to calculate the efficiency is to use equation 1 [21]:

$$\eta_c = \eta_0 - a_1 \frac{(T_m - T_a)}{G} - a_2 \frac{(T_m - T_a)^2}{G} \quad (1),$$

where η_c – collector efficiency; G – total (global) irradience on the collector serface [W/m^2]; T_m – mean collector fluid temperature [°C];T_a –temperature of the ambient air [°C].

5. Discussion questions for students

1. In general, how do renewable energy sources differ from fossil fuels, i.e. what are some common characteristics of renewable energy sources that are different from characteristics of fossil fuels used in the past?

2. Explain the renewable energy sources principle in your own words. How would this apply to developing a portfolio of renewable energy sources in your home region?

3. Is energy conservation likely to be more important in a renewable energy economy than it has been in the past? Explain.

4. Hydropower is currently the largest source of renewably generated electricity in the world, and there is potential for expansion. In some parts of the world, a renewable energy portfolio could be based on hydropower and energy conservation alone. Yet hydropower is also controversial, chiefly because of associated negative externalities. Describe some of these. Do you think more hydropower should be developed in the world?

5. How would you decide whether or not to develop a particular hydro project?

6. Why does public policy have such a prominent role in promoting renewable energy use, and in accelerating the transition to renewable energy?

7. What public policy approaches do you think will be most effective?

Energy is a fundamental input for economic systems. Current economic activity depends overwhelmingly on fossil fuels including oil, coal, and natural gas. These fuels are non-renewable. Renewable sources such as hydroelectric, wind, and solar power currently provide less than 10% of global energy. In just a few decide solar and wind power has developed from alternative energy sources to a new fast growing industrial branch.

The history of industrial civilization is a history of energy transitions. In less developed, agrarian economies, people's basic need for food calories is provided through simple forms of agriculture, which is essentially a method of capturing solar energy for human use [1–5]. Solar or wind energy stored in firewood or other biomass energy meets other basic needs for home heating and cooking.

As economies develop and become more complex, energy needs increase greatly. Historically, as supplies of firewood and other biomass energy proved insufficient to support growing economies in Europe and the United States, people turned to hydropower (also a form of stored solar energy), then to coal during the nineteenth century, and then to oil and natural gas during the twentieth century. In the 1950s nuclear power was introduced into the energy mix.

Most renewable energy is ultimately solar energy. The sun’s energy can be used directly for heat or electricity.

Hydropower comes from falling water, which occurs because solar energy evaporates water at low elevations that later rains on high elevations. The sun also creates wind through differential heating of the earth’s surface.

Biomass energy comes from plant matter, produced in photosynthesis driven by the sun.

6. Conclusions and perspectives of further this direction development

The organization of students' independent work in the process of teaching alternative energy sources as a pedagogical problem as a part of distance education has the following components:

1) theoretical approaches analysis to the independent work organization of higher education students;

2) distance learning didactic bases in the process of students' training;

3) complex innovative projects methods as a basis for the students' independent work organization in the learning process;

4) principles definition of the students' independent work organization in the learning process on the basis of distance learning and project method combination;

5) independent work organization models on the basis of distance learning and projects method combination in the process of technical universities students' training;

6) pedagogical conditions of technical universities students' independent work organization in preparation for the projects protection;

7) textbooks and guidelines publication for the students' independent work organization in the learning process based on distance learning and project method combination;

8) pedagogical experiment to assess the work organization level in the technical universities students' project activities in the training process on the distance learning basis in the form of presentation.

It is established that the students' readiness to independent master and use modern technical means of training, including on the distance learning and the projects method basis, affects the quality of training.

It should be noted, that in fact, due to objective circumstances, now in Ukraine there are very few scientific and technological works (S&T works) and research and development projects (R&D projects) aimed at the modernization of the existing and the new equipment creation and introduction, new energy mix technologies development, but such scientific associations with the participation of higher education institutions as experts and co-executors are extremely necessary now. At the same time, the total amount of S&T works and R&D projects financing per one researcher is 50-80 times lower than in the leading world countries [16].

In order to achieve the necessary level of scientific and technical support for the energy mix enterprises creation and further increase its development level according to the world scientific and technological progress requirements, it is necessary to carry out urgent and promising multifaceted activities, the main of which are the following:

1) S&T works financing increasing, which are carried out by state higher educational institutions (universities) and in fact have human scientific potential, that is, the scientific institution status according to the priority directions of energy mix industries development;

2) new forms establishment of complex multi-level expert university organization for the S&T works evaluation on a free basis, which can receive its funds only at the industrial implementation stage of their results;

3) create a network of the national integrated innovative-technological, information-analytical and consulting centers based on universities to work in which it is necessary to attract leading scientists and specialists under the new criteria, and not under the higher doctorate degree presence, but it is not managers as now, it is, for example, engineers-technologists of the highest qualification under the Candidate of Sciences degree presence;

4) providing benefits to reduce the workload and other relevant status of University teachers who are engaged in the development of non-traditional specific innovative training systems, including highly qualified academic personnel which meets the energy mix industries requirements and priorities;

5) university materials and technical resources development, equipping them with modern equipment and devices of research institutes and energy profile centers;

6) creation of centers to work on the international integration basis, which will provide an opportunity to study and use the world experience in the energy industries technics and technologies development, in particular in the search for new energy production sources and methods;

7) effective planning on the science-based ideas basis and activities coordination with scientific, engineering and design support by concluding the contract-based works;

8) the reproduction of specialists' preparation and retraining systems of major occupations in the industries of innovative holistic enterprises in the energy mix;

9) expansion of Ukraine participation in the international scientific and technical programs implementation, activities revitalization in the international energy organizations in order to gradually move towards more complex organizational forms of international cooperation;

10) creation on the leading Ukrainian universities basis the international energy scientific and technical centers organizations, primarily to address the problematic issues of energy efficiency at innovative integrated enterprises of the energy mix;

11) providing of state support information dissemination on new promising domestic projects, developments and technologies among the world community in order to expand their implementation in Ukraine and abroad;

12) formation of modern technologies for the political and economic decisions preparation and adoption in the energy efficiency field at innovative integrated enterprises of the energy mix, the introduction of new forms of cooperation between the government and the legislature with scientific and professional associations of universities;

13) ensuring the active universities research and consulting centers participation in the development of economically sound mechanisms for the energy efficiency implementation at innovative integrated enterprises of the energy mix, etc.

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