UDC 631.371+621.31

ENERGY SAVING TECHNOLOGIES IN ENERGY AND AGRICULTURE

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Currently, fuel energy provides 87.1% of global energy needs. Our assessment and evaluation of foreign experts show that by the end of the century, more than 80% of global energy consumption will be provided by the fuel-free energy technologies: hydropower, bio-energy, solar, wind and geothermal energy together with the hydrogen energy.

The purpose of research - analysis of energy-saving technologies in the energy and agriculture.

The results of research.

Ways to improve the efficiency of energy use. The efficiency of fuel use in the Russian Federation was in 2011. The 57.3% share of losses in electric networks 10.1% in heating systems 10.7%, the share of energy consumption for own needs of power stations 6.3%, specific energy consumption Winter heating greenhouses at 115 kt. m. / m2, specific fuel consumption for thermal energy from the boiler 177 kg of standard fuel / Gcal, specific fuel consumption for operation of the tractor 21.1 kg of coal equivalent / ha of arable land, the fuel efficiency of new cars running on gasoline 7.28 l / 100 km diesel 6.31 l / 100 km, the specific energy consumption in the buildings of public sector institutions 68 kg of standard fuel / m2 per year in residential buildings 46.4 kg of standard fuel / m2 per year.

To reduce electricity tariffs need to increase the utilization of fuel for energy production at the expense of high-efficiency co-generation power plants to reduce fuel costs and to develop a low-carbon fuel-free and distributed power from renewable energy sources.

We offer the implementation of investment programs of energy companies to allow the design and construction of new boilers only using cogeneration and to set the terms of modernization of existing boilers and other installations in the CHP cogeneration of electricity and heat in a gas turbine power plants.

Allow the design, construction and operation of low-rise buildings, schools, hotels and resort and recreational facilities in the presence of co-generation systems, solar hot water systems on roofs and devices for heating based on heat pumps with a payback period of such systems at least 5 years.

The use of solid and liquid organic wastes as fuel for cogeneration. The total volume of solid waste disposal in landfills cities in Russia is 95 billion. Tons annually increased by 3.5 billion tons. The total area of the polygons in the Russian Federation for the disposal of solid waste is 2,500 km2.

Landfills contain metal, stone, glass and solid organic waste (LLP). Content LLP estimated at 75% of the total weight of the landfill. Thus, as the fuel can be used year 2.625 billion. M of new LLP and 2.375 billion tons LLP from old dumps. This will completely stop the formation of new landfills and to eliminate the old landfill in the amount of 95 billion tons for 95: 2,375 / 0.75 = 30 years.

As a co-generation power plants (IES) suggest the use of gas-fired electrical power plants and thermal power of 1.3 MW, and for gaseous fuels for use plasma technology IES fast pyrolysis processing capacity LLP 100 tons per day, and its own power consumption of 300 kW. Thus, taking into account the energy consumption for its own needs IES will generate into the grid electric power 1 MW per year and process 36,000 tons LLP.

In assessing the payback period of the considered energy projects must take into account the economic effect of the destruction of landfill, land reclamation and environmental improvement in urban and rural settlements.

Other renewable resources LLP is waste in agriculture and forestry, and in treeless areas of energy plantations of fast-growing trees on land not suitable for agricultural production.

The major sources of pollution of the environment and renewable resources for fuel IES are liquid sewage towns and villages, farms liquid effluents, waste liquid sugar and alcohol plants, etc.

For the treatment of liquid organic waste (ZHOO) with a water content of 80-95% in energy plasma pyrolysis techniques are unsuitable because of high energy

costs for predrying ZHOO. Russian scientists have proposed for the processing of new technologies ZHOO supercritical water oxidation (SCWO) of organic matter in the liquid. For IES electrical capacity of 1 MW will require processing 150 tons per day ZHOO, which is associated with a lower content of organic substances in ZHOO compared to LLP. For cities, this means reducing the area under treatment facilities, termination of discharge of sewage into the sea, as is the case in Sochi, Gelendzhik, Malaga, Barcelona (Spain), in the coastal cities of Australia and other countries.

Large farms which now contains several ponds for manure runoff will be able to provide electricity and heat not only their own needs, but also the population of the surrounding villages and rural areas.

We propose to develop a program for recycling of solid and liquid organic waste cities and farms (landfill, sewage and liquid effluents of farms, etc.) into electrical energy and heat with the use of high-tech innovative Russian technology.

One of the ways to reduce the cost of hydrocarbon fuel is biofuels - biodiesel and bioethanol from plant material. In order not to create competition between the production of food and biofuels for the production of biofuels is advisable to use non-food plant material, such as wood biomass for bioethanol and microalgae biodiesel.

The mixed multi-component fuel. Another direction of reducing the cost of motor and heating fuel is the production of multi-component blends with fuel. The content of a hydrocarbon fuel (fuel oil or diesel fuel) in the diesel fuel is a multicomponent 80%. The current piece of equipment for multi-component fuel capacity of 2 t / h installed in the laboratory of biofuels VIESH (Fig. 1).

Fig. 1. An apparatus for manufacturing a multi-component fuel 2 t / h in the department of bio-energy FGBNU VIESH

Advantages of the technology and equipment:

• Low power consumption - 0.5 kWh / m3;

• Small dimensions and weight;

• ease of maintenance;

• long service life.

Using the multi-component fuel in the tractor, marine, automotive, locomotive and stationary diesel engines reduces emissions by 30-40%.

The multi-component fuel boiler content of hydrocarbon fuels is 50%, which is 2 times lower heating costs.

At the level of diesel consumption of 6 million tons a year to 100 sets of equipment for the production of multi-component diesel fuel capacity of 10 m3 / h. With the price of diesel fuel 30 rub. / L annual savings for the purchase of diesel fuel will be 36 billion rubles. (US $ 1.2 billion.).

Consumption of motor fuel cargo by road, water and railway transportation of the Russian Federation is 50 million tce a year with a share of trucks over 60%. Using the multi-component fuel reduces the consumption of diesel, gasoline and fuel oil for transport by 20%, to 10 million tce / year, equivalent to reduction in costs of more than 300 billion rubles. in year.

Contactless electric transport. Perspective direction of reducing the cost of motor fuel is to replace the internal combustion engine to the electric drive, which reduces the cost to $ 1. US per 100 kilometers. Due to the high cost of lithium-ion batteries is advisable to develop the technology of wireless transmission of electricity from an external power source for mobile generating sets.

Development of non-contact power supply system for the transport performed in VIESH based resonant power transmission method for single-conductor cable with the use of Tesla technology.

Electric power from the source to the power consumers is supplied through the air gap between the bottom of the vehicle and the road surface, wherein the laid single-conductor line (Fig. 2).

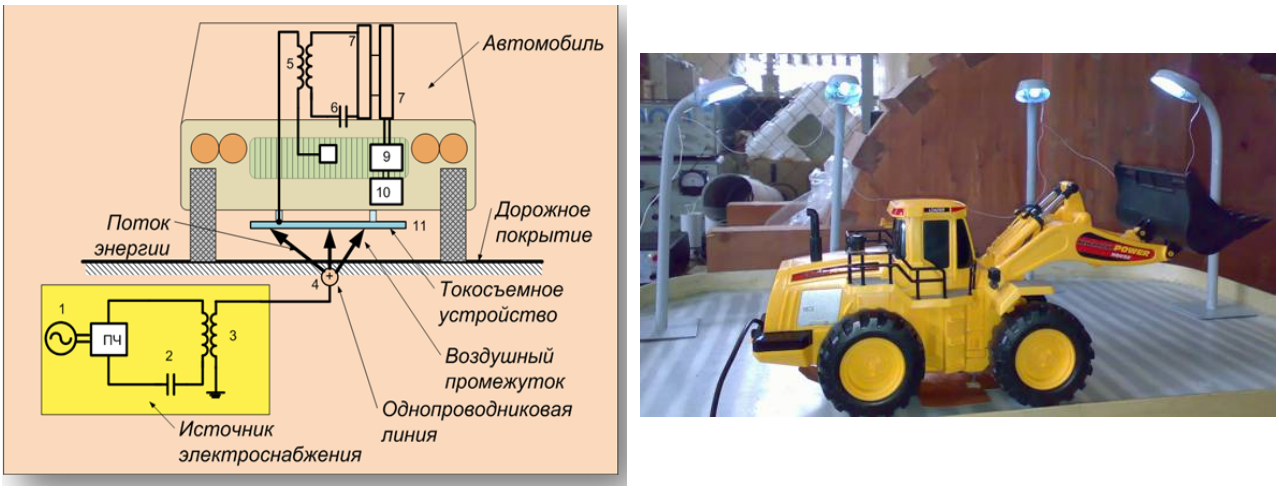

Fig. 2. prototypes of wireless power supply vehicles

Fluorescent lamp with cold cathode and electron emission. There is currently a boom in LED lighting [7]. According to forecasts by 2020, LED lighting should occupy 75% of the Russian market. In the future, LEDs will replace inexpensive fluorescent lamps with cold cathodes, and field emission. This is an effective and inexpensive alternative. The innovative lamps used a completely different principle of operation of other components, but the basic performance characteristics they are the same: 50000-70000 hours durability, reliability, very high efficiency. In contrast to LEDs, in the manufacture of new lamps do not use expensive semiconductors, and the cost of cold cathode tubes, and field emission 3-10 times lower. In 2013, together with the Department VIESH vacuum electronics MIPT patented this technology and proposed lighting scheme using new lamps on the basis of already described resonant power supply system based on the ideas of Tesla.

Fig. 3 electric power from the solar battery 1 or battery 2 charge controller 3 is input to the inverter 4, and then through the capacitors 12, 13 in the low-voltage winding 5 of the high up-resonant transformer 6. The low-potential output of 14 high-voltage winding 7 via a capacitor 15 connected to ground. The high-voltage winding of a high-frequency resonant transformer 7 6 its high-voltage terminal 8 is connected to a single-wire line 9 with lamps 10-1, 10-2, 10-3. . . , 10-n (n = 1, 2, 3,..., N), having natural reservoirs 11-1, 11-2, 11-3,. . . , 11-n (n = 1, 2, 3,..., N). With this you can supply electricity to fixtures and their work.

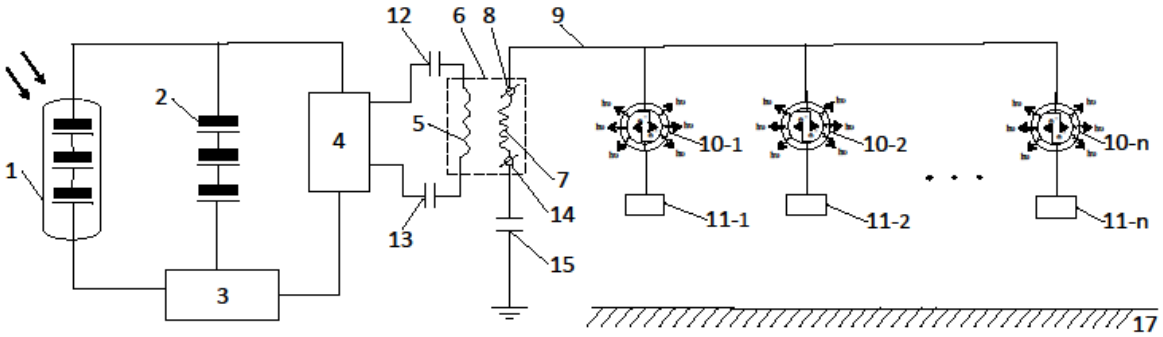

Fig. 3. Scheme of the resonant two-wire electric lighting system using fluorescent lights with cold cathodes

Autocathodes fluorescent lamp emits light output while consuming less than 1 watt of power, equivalent to the luminous flux of energy-saving fluorescent lamp 12 W (Fig. 4).

Fig. 4. Prototype fluorescent lamp
and a cold cathode field emission

Fuelless energy production. Fuel energy currently provides 87.1% of global energy needs. Our assessment and evaluation of foreign experts show that by the end of the century, more than 80% of global energy consumption will be provided by the fuel-free energy technologies: hydropower, bio-energy, solar, wind and geothermal energy together with the hydrogen energy. New Russian technologies of solar energy include chlorine-free technology of solar silicon, solar silicon technology modules with an efficiency of 20% at 60 times the concentration of solar radiation, solar module assembly technology with a lifetime of 40-50 years, the technology of concentrator solar modules.

Solar power (SES) consists of solar photovoltaic modules, support structure, network inverter, electrical substation [8].

It is proposed for the development and manufacture of SES to use three types of units.

SES with stationary concentrators and two-sided planar solar modules with a concentration of 3.5. Concentrator solar module peak power of 0.8 kW at a test site VIESH shown in Fig. 5. The area of the detector relative to the hub without SES decreased by 3 times (design and patent VIESH).

Fig. 5. The experimental sample tracking cylindrical solar concentration module peak power of 800 watts

SES with a concentration of 50-60 with sun tracking. SES cylindrical concentrators and a photodetector matrix based solar cells (ITU) with an efficiency of 20% and a concentration of 50-60 (development and patent VIESH) has an area of photodetectors compared with SES without concentrators 50-60 times smaller. Due to the high level of concentration solar energy necessary to use liquid cooling system and solar tracking.

SES without a hub. SES based on planar solar modules without concentrators has a lifespan of 40-50 years (development and patent VIESH). SES Unit of such a peak power of 1150 W at the test site of the GNU VIESH shown in Fig. 6.

Fig. 6. Solar power plant capacity of 1150 watts

SES can be designed for operation in the production of cogeneration of electricity and heat.

For all three types of SES VIESH detail design, manufacture factory and order a VIESH in manufacturing companies with the unit, carry out technical supervision of installation and commissioning works and commissioning.

The mega-project "Global solar energy." Fig. 7 and 8 shows the global solar power system with non-stop production of electricity in the amount of 20 000 TW • h, equal to the world's energy.

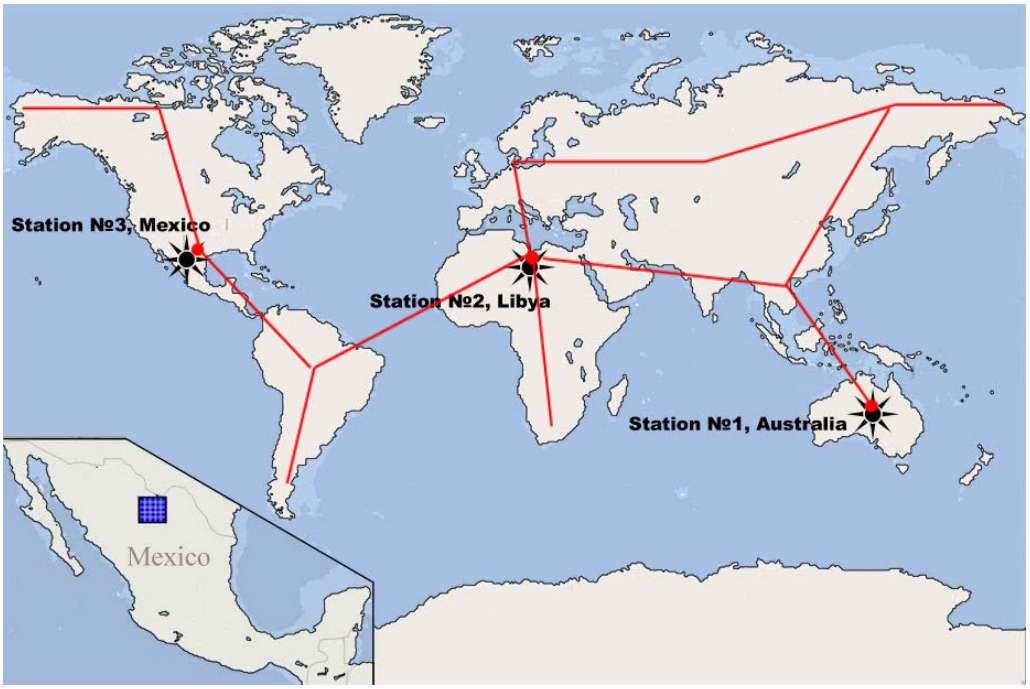

Fig. 7. The global solar energy system of three solar power

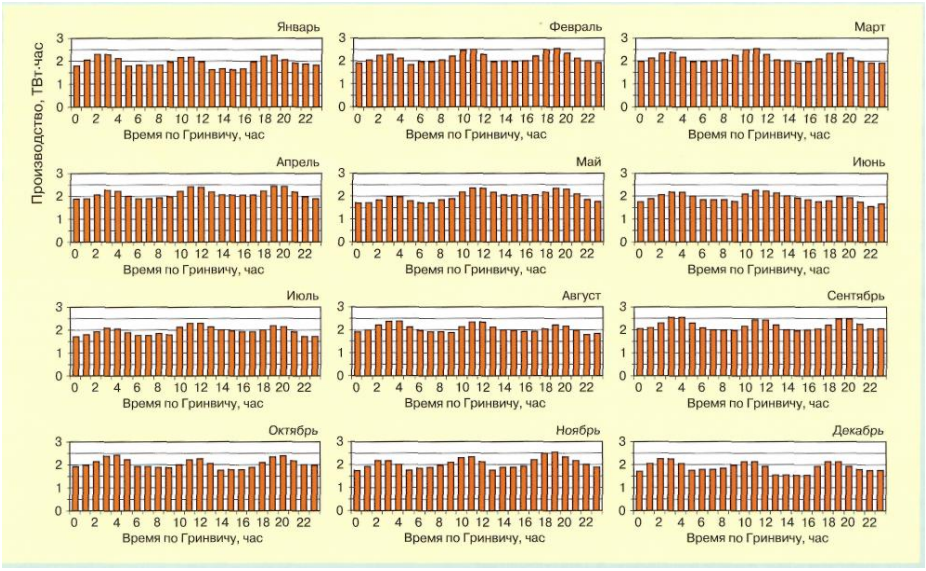

Fig. 8. Round the clock electricity generation global solar power system in the amount of 20 000 TW • h per year

The hydropower will be widely used DAM HPP based svobodnopotochnyh water turbines that use not only the energy of the rivers, but also the energy of the ocean and marine underwater currents, which are generated by the Coriolis forces during the rotation of the Earth, as well as the interaction of gravitational forces of the Moon and the Earth [1].

The speed of the water in the Gulf Stream is 2,235 m / s in La Perouse Strait to 4.5 m / s. If the water velocity 2,235 m / s 500 kW turbine would have a blade

diameter of 17.73 m, the speed of 2,463 rev / min, the shaft torque kg ☐m
efficiency of 37% and produce electrical energy in kWh screen 3725 ☐103 in

By capacity factor (load factor) ocean turbine (load factor 0.75-0.95) 4-8 times the SES (load factor 0,1-0,16) and VES (load factor 0,15-0,23) and comparable to a coal thermal power plant (capacity factor 0.75-0.85). The cost of hydro turbines $ 2500 / kW compared with the cost of coal power plants. The cost of electricity in hydro turbines are no fuel costs, maintenance costs low (2%) and depreciation expense of $ 0.061 / kWh in the amortization period of 20 years and 4% interest rate for the loan.

Compared with a coal thermal power plant turbine reduces CO2 emissions in the amount of 10 833 t / MVt god. Turbine installed at a depth of 50-100 m at the bottom, does not prevent the passage of ships, fishing and is not dangerous for marine life because of the low rotation speed of the blades. In VIESH together with industry developed projects river hydro turbines with capacity of 10-100 kW and sea water turbines capacity of 100-1000 kW.

Robotic systems for growing organic food. In the near future agriculture will be able to move from strictly rural areas to big cities. In VIESH offer multi-storey building in the metropolitan areas of biotechnology factories, capable of perfectly clean conditions and almost no human intervention to grow all kinds of organic matter, from cereals to rabbits. Technologies have low energy consumption, high profitability and allow you to collect, for example, 300 kg of tomatoes from one m2 of land against the standard for greenhouse 30 kg, without the use of any chemicals and GMOs.

VIESH specialists led by head of the laboratory, Professor DI Poverin, offered the world's first project of this robotic industrial complex - "Fractal innovative biotech cluster platform" (FIBKP) with electricity from renewable energy sources.

New principles of agriculture and animal husbandry suggest that planting material, harvesting, feed production, animal care and all the other stages of agricultural production and livestock are carried out in a fully automatic and continuous operation. Unlike hydro and aeroponics, is spotlessly clean and closed

production method based on bionic principles preclude the use of hormones, antibiotics, synthetic additives.

The creation of such enterprises:

• makes it possible to grow large amounts of fresh fruits and berries are unsuitable for agriculture territories and climatically disadvantaged areas.

• allows you to quickly saturate the market with cheap, quality and food safety;

• make agriculture independent of natural anomalies;

• frees the giant territory and inefficiently used manpower.