

KARAGANDA INDUSTRIAL UNIVERSITY



GREEN ENERGY REPORT

Temirtau, 2023



rational use of terrestrial ecosystems
and water resources, climate change

Green Energy Report

Kazakhstan's transition to a «green» economy requires deep systemic transformations aimed at minimizing the impact on the environment and improving the quality of life of the population.

The main priorities for the transition to a "green economy" facing the country are:

- 1) improving the efficiency of resource use (water, land, biological, etc.) and their management;
- 2) modernization of existing and construction of new infrastructure;
- 3) improving the well-being of the population and the quality of the environment through cost-effective ways to mitigate environmental pressure;
- 4) improving national security, including water security.

The concept of the transition of the Republic of Kazakhstan to a "green economy" lays the foundations for deep systemic transformations in order to transition to a new economy by improving the well-being, quality of life of the population of Kazakhstan and joining the country among the most developed countries in the world while minimizing the burden on the environment and degradation of natural resources.

As part of the Concept, at the moment, the second stage is being implemented, designed for 2020-2030.

The Concept covers seven key areas:

- Development of renewable energy sources.
- Energy saving and energy efficiency.
- Development of sustainable and efficient organic agriculture.
- Waste management.
- Rational use of water resources.
- Development of «green transport».
- Conservation and effective management of ecosystems.

In order to ensure the ecological safety of our planet, improve the environmental situation, and maintain a favorable environmental situation, NAO Karaganda Industrial University (KariU) has also joined the national movement.

In order to further reduce electricity consumption, constant work is being carried out to install energy-saving LED panels, preventive energy saving measures are being carried out with employees, and a quantitative analysis of the energy consumed per year is being carried out.



Figure 1 - Energy-saving LED panels in KarIU

Solar panels were installed in the main building of the KarIU, which power the computers in the computer class (Figure 2).

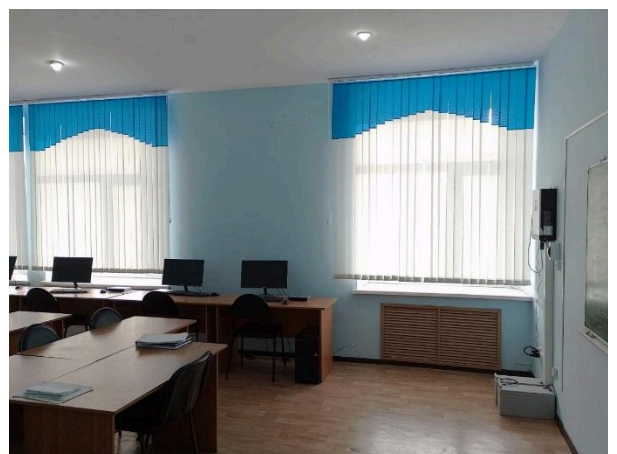


Figure 2 - Solar panels in the main building of the KarIU

Within the framework of the direction «Conservation and effective management of ecosystems», Karaganda Industrial University actively cooperates with the youth resource center

of Temirtau in the project «Zhasyl El», which aims to instill in young people ecological thinking, as well as a sense of responsibility for the preservation of nature and cleanliness in the city and its



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adjacent territories. University students who are part of eco-teams are engaged in garbage collection, cleaning of territories, mowing grass and removing dead wood, as well as actively landscaping the territory and caring for seedlings.

Karaganda Industrial University actively cooperates with the maslikhat of Temirtau, students take an active part in various "green" projects of the city and environmental cleanups.



Figure 3 - Students of Karaganda Industrial University took part in the city clean-up day for the improvement and cleaning of the city of Temirtau

By supporting the concept of a «green economy», the university has reduced the consumption of paper resources through the use of Internet platforms (Moodle, Platonus), electronic libraries, electronic textbooks, virtual laboratories, etc. in the learning process.

In October 2023, teachers of the Department of Energy Onishchenko O.N., Smile A.A. attended a course on the program "Decarbonization of Industry" organized by the NAO "International Center for Green Technologies and Investment Projects" with the support of the Ministry of Ecology and Natural Resources of the Republic of Kazakhstan and the Green Climate Fund.



Figure 4 – Certificate of the Decarbonization of Industry Program

The leading department of KarIU, which is engaged in the promotion of «green» technologies, energy conservation and the use of non-traditional energy, is the Department of Energy. The educational programs «Thermal Power engineering of industrial enterprises and housing and communal services», «Energy supply of industrial facilities» and «Thermal Power engineering of industrial enterprises» provide for the study of disciplines that form a new thinking of energy consumption in all spheres of life, environmental education and culture, competence of rational environmental management, culture of energy consumption, knowledge of «green» economics. These are:

- «Energy saving in industrial enterprises and in housing and communal services»;
- «Energy Audit and Energy Efficiency»;
- «Non-traditional and renewable energy sources»;
- «Green energy»;
- «Equipment of non-traditional and renewable energy installations»;
- "Energy saving, energy audit and energy management";
- module «Application of knowledge in the field of energy saving and "green» energy in industrial enterprises" for applied bachelor's degree.

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The Department of Energy acquired a laboratory installation and stands for conducting practical and laboratory classes in the above disciplines (Fig. 5 and 6).



Figure 5 - A set of educational and laboratory equipment
"Renewable energy sources"

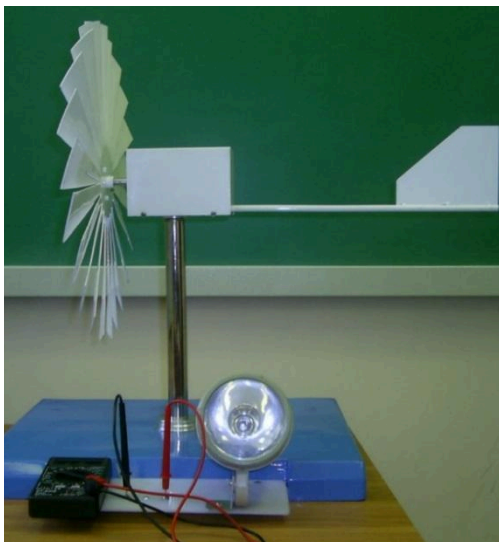


Figure 6 – Laboratory of non-traditional energy



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To study the operation of the wind generating unit at the Department of Energy, students made an operating model of a wind generator with various interchangeable types of wind wheels (see Fig. 7). The manufactured wind generator is not a full-scale wind generating unit designed to supply electricity to consumers, but is a model that allows to study the dependence of electricity generation on wind strength and speed.



a)



b)

a - with an impeller with a horizontal axis of rotation; b - with a carousel-type wind wheel with a vertical axis of rotation

Figure 7 – Appearance of a wind-generating laboratory installation

The Department of Energy has developed information stands, which are located in the classroom and in the passage of the main building.



Figure 8 – Electrified training stand «Thermal power plants of the Republic of Kazakhstan with renewable and non-renewable energy sources»



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Figure 9 – Information stand «How to save energy (useful tips)»



Figure 10 – Information stand «Nuclear power plants are an integral part of carbon-free energy»



Figure 10 – Information stand «Industrialization and digitalization in the energy sector»



Figure 11 –Information stand «Control and measuring devices for energy audit»)

The CarIU structure has a center for «Energy Efficient technologies and energy audit», which is equipped with a fleet of modern measuring instruments. The equipment of the center is actively used by students, undergraduates in the performance of diploma and master's theses of the Department of Energy.



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Energy audit equipment

A GAS analyzer is a device for determining the composition (concentrations) of exhaust flue gases during fuel combustion. It is used to determine the efficiency of burning combustible fuel (especially relevant for liquid fuel boilers).

Portable measuring device for the analysis of flue gases of furnace systems: scarlet furnaces (powered by diesel fuel, gas, wood and coal); low-temperature and condensing boilers; gas water heaters. This device allows you to configure and monitor the compliance of these systems with the established limit values.

It can be used for measurements at thermal power plants.



The AKE-824 ELECTRIC POWER QUALITY ANALYZER (AKIP) allows you to identify deviations in the parameters of the supplied electric energy from the permissible values established by the requirements of GOST standards:

- microprocessor-based power quality recorder - analyzer;
- carrying out measurements in 1-phase and 3-phase networks;
- measurement of alternating voltage and AC power, frequency, power (active, reactive, total), power factor, active and reactive energy.



The ITP-MG4.03 HEAT FLOW METER is a device designed to measure the density of heat flows passing through single-layer and multi-layer enclosing structures of buildings and structures, through cladding and thermal insulation of power facilities during experimental research and under operating conditions.

The device allows you to measure the air temperature inside and outside the room, as well as measure the density of heat flows.



ULTRASONIC FLOWMETER + THICKNESS GAUGE is a device for measuring the thickness of pipelines and reservoirs by non-destructive method. It is used by energy auditors as an addition to an ultrasonic flow meter, since the wall thickness of the pipeline is used as an input value.

Allows you to set the actual flow rate, speed and amount of liquid in the pipeline without cutting into it, using overhead sensors. This device also has the function of a thickness gauge, which allows you to measure the thickness of the walls of a pipeline or tank without causing damage.



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CURRENT PLIERS are a device for instantaneous measurements of parameters (voltage, amperage, active resistance) of AC and DC circuits in electrical installations of industrial, administrative and residential buildings. The principle of operation of modern current clamps is based on the direct measurement of the magnetic field generated by the current in the conductor around the conductor using a Hall sensor and allows you to measure the current of any shape, including direct current.



The testo 882 THERMAL IMAGER is designed for non-contact monitoring of the temperature distribution on the surface under study. Typical applications include:

- building inspection (heating, ventilation and air conditioning systems, departments of chief technologists of companies, technical and expert departments): Assessment of energy intensity of buildings;
- PPR (maintenance, control of mechanical and electrical properties and parameters of systems and mechanical equipment;
- production control (quality assurance), control of production processes.



DIFFERENTIAL DIGITAL PRESSURE GAUGE DMC-01M WITH DATA PROCESSING is a professional device for measuring pressure, dilution and pressure difference of gases, as well as for determining the speed and flow rate of gas and dust and air flows using pressure tubes. It is used in technological and environmental control of emissions from various industries, ventilation control of industrial facilities, aerodynamic research.



The SD-21 VIBRATION ANALYZER is used to assess and predict the state of rotating equipment by vibration, as well as to measure and analyze other types of signals converted into electrical ones.



CORRELATION LEAK DETECTOR SVYAZPRIBOR T10 - is used for accurate and rapid detection of leaks and unauthorized tie-ins in pipelines of household drinking water supply, hot water supply, heating and other pipeline systems, provided that the transported medium exits the pipe under pressure.



The LUXMETER - BRIGHTMETER is a device designed to measure the brightness of extended self-luminous objects by the overhead method (monitor screens) and illumination in the visible range of the spectrum (380 = 760) nm.



Planet

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An ANEMOMETER is a device designed to measure the speed of air movement.

The anemometer can measure the velocity and volumetric flow both in the duct channel itself and at the inlet or outlet from it.

With the help of an anemometer, you can take measurements both at individual points and perform a series of measurements along the entire length of the channel.

If you enter the value of the surface area, the device will automatically calculate the volume of air flow in m^3/h .



The CONTACT THERMOMETER TK-5.06 is designed to measure the temperature of various media, relative humidity of the air by direct contact of the probe with the measuring object.



Every year, KarIU students prepare graduation projects, the topics of which are related to «green» energy, energy conservation, waste recycling. For example: «Project of an energy supply system for a residential building using a wind generator in the conditions of Temirtau»; «Computational and theoretical study of the possibility of recycling solid household waste in Temirtau»; «Project of a heat supply system for a private residential building using solar energy in the conditions of Temirtau»; «Research and prospects for the development of alternative energy in the Karaganda region»; comprehensive diploma project «Development and installation of the training stand Thermal power plants of the Republic of Kazakhstan with renewable and non-renewable energy sources».

Teachers of the Department of Energy publish articles in scientific journals and take part in scientific, technical and scientific conferences on "green" energy: «Efficiency of using heat pump installations in circulating water supply schemes with cooling towers» (Kamarova S.N., Bulletin of KazATK); «Use of thermal energy of mine waters» (Kamarova S.N., XV International Scientific and Practical Conference «Global science and innovations: Sentral Asia»).

In order to continue the implementation of the «green economy» concept, KarIU is developing a program of measures that will be implemented in the future in order to ensure the environmental safety of our country, improve the environmental situation, maintain a favorable environmental situation and protect the environment.