MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN
NON-PROFIT JOINT-STOCK COMPANY
«ALMATY UNIVERSITY OF POWER ENGINEERING AND TELECOMMUNICATIONS NAMED AFTER GUMARBEK DAUKEYEV»
Institute of Energy and Green Technologies

Gumarbek Daukeyev
Energo University

«Agreed»
Director General of the Kazakh Research Institute of Energy named after Academician S.C.Chokin
_____ Bakenov K.A.
«__» _____ 2025

«Approved»
Rector of AUES
_____ Nygymetov G.S.
«__» _____ 2025.

MODULAR EDUCATIONAL PROGRAM «6B07114 RENEWABLE ENERGY TECHNOLOGIES» HIGHER EDUCATION

Field of Education (according to the classifier from October 13, 2018):
6B07 Engineering, manufacturing, and construction industries
Field of Study (according to the classifier from October 13, 2018):
6B071 Engineering and Engineering work

Duration of study: 4 years
Awarded academic degree: Bachelor of Engineering and Technology in the educational program «6B07114 Renewable Energy Technologies»
Qualification level according to the National Qualifications Framework: Level 6

Almaty 2025.

Training trajectories (specializations):

- Design and operation of renewable energy facilities;
- Power supply of autonomous objects and systems;

The educational program "6B07114 Renewable Energy Technologies" was developed based on: National Qualifications Framework, Approved by the Protocol of March 16, 2016 of the Republican Tripartite Commission on Social Partnership and Regulation of Social and Labor Relations; Sectoral Qualifications Framework "Energy", Approved by the Protocol of the Sectoral Commission on Social Partnership and Regulation of Social and Labor Relations in the Energy Industry No. 05-13-3-4 / PR dated July 25, 2019;
State Compulsory Standard of Higher Education. Order of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022, No. 2. Registered with the Ministry of Justice of the Republic of Kazakhstan on July 27, 2022, No. 28916; Professional standards or draft standards.

The educational program "6B07114 Renewable Energy Technologies" was developed at the Department of Electricity Supply and Renewable Energy Sources.

Head of the educational program _____ Soltanayev A.M.

The following took part in the discussion on the development of the educational program:
General Director of Kazakh Research Institute of Energy named after Academician Sh.Ch. Chokin LLP Bakenov K.A.
Director Future Power Solutions LLP Tsatsin D. A

Educational program "6B07114 Renewable Energy Technologies" reviewed and approved on meeting educational and methodological commissions Institute electric power and electrical engineering (minutes No. 7 of 08.05.2025).

Director of the IEGT _____ Amitov E.T.

Educational program "6B07114 Renewable Energy Technologies" reviewed and approved on Scientist Council of the AUPET named after Gumarbek Daukeeva (protocol No.11 of 05/23/2025).

List of designations and abbreviations

HE	Higher education
SCES	State Compulsory Education Standard
EQR	European Qualifications Framework
NCO	National Classifier of Occupations
RK	Republic of Kazakhstan
NQF	National Qualifications Framework
NQS	National Qualifications System
GEM	General educational module
EP	Educational program
GED	General education disciplines
RC	Required component
UC	University component
BD	Basic disciplines
MD	Major disciplines
IET	Individual educational trajectory
SQF	Sectoral Qualifications Framework
PS	Professional standard
PE	Postgraduate education
LN	Learning outcome
CW	Coursework
CGW	Calculation and graphic work
CEC	Catalog of elective courses

1. Educational program passport

No.	Field name	Note
1	Registration number	6B07100080
2	Code and classification of the field of education	6B07 Engineering, manufacturing and construction industries
3	Code and classification of training areas	6B071 Engineering and Engineering Science
4	Group of educational programs	B062 Electrical Engineering and Power Engineering
5	Name of the educational program	6B 07114 Renewable energy technologies
6	Type of OP	a) New OP;
7	The purpose of the OP	Training qualified specialists in the field of designing renewable energy facilities and autonomous power supply systems with the relevant skills and competencies.
8	ISCED level	ISCED 6 Bachelor's degree or equivalent
9	Level according to the National Qualification Test	6
10	Level according to the ORK	6
11	Distinctive features of the OP	New
	Partner university (SOP)	No
	Partner university (DDOP)	North China Electric Power University (NCEPU)
12	List of competencies	6B07114 "Renewable Energy Technologies" program are expressed through competencies aligned with the National and Sectoral Qualification Frameworks, professional standards, and the Dublin Descriptors and European Qualification Framework. Graduates should possess the following competencies: 1) demonstrate developmental knowledge and understanding acquired at the higher education level that provides the basis or opportunity for original development or application of ideas; 2) apply knowledge, understanding, and problem-solving abilities to new or unfamiliar situations in the contexts and frameworks of broader (or interdisciplinary) areas related to the area of study; 3) integrate knowledge, cope with complexity, and make judgments based on incomplete or limited information, taking into account ethical and social responsibility for the application of these judgments and knowledge; 4) clearly and concisely communicate your findings and knowledge and their rationale to specialists and non-specialists; 5) continue learning independently. Requirements for general competencies of bachelor's degree graduates :

		General competencies OK1 – must: - *have an idea of* : ethical and spiritual values, social and legal norms, and the basic elements of anti-corruption culture. - *know* : ethical and legal norms of behavior, the basics of physical education and the principles of a healthy lifestyle, - *be able to* : logically express one's thoughts, competently conduct a philosophical discussion, and adequately navigate various social situations - *have skills* in written and oral communication in the state language and the language of interethnic communication , methods of physical education and health promotion, for an adequate level of physical fitness to ensure full social and professional activity - *be competent* in the field of political relations and processes, the legal system and legislation of Kazakhstan and its history. General competencies OK2 – must: - *have an idea* of industrial sanitation rules, fire safety and labor protection standards - *know* : safety regulations in the electric power industry. - *be able to* : assess the parameters of the production microclimate, the level of dust and gas contamination, implement the main management functions: planning, organization, motivation, control of processes carried out in organizations in the electrical engineering and electric power industry - *have the skills to* : analyze the state of working conditions and labor protection in the organization and apply the practical skills of a manager (goal setting, planning, communication and feedback, making management decisions, managing conflicts and stress, etc.) - *be competent* in the field of human protection from the impact of electric power facilities Basic competencies of BK1 – must: - *have an idea of* : non-sinusoidal modes in linear electrical circuits and balanced and unbalanced modes in three-phase circuits - *know* : the method of analyzing normal and emergency modes of 3-phase electrical circuits - *be able to* : create mathematical models of electrical circuits, evaluate and select effective methods for calculating nonlinear DC electrical circuits - *have skills* in calculating short-circuit currents in electrical networks, in identifying the natural science essence of problems arising in the course of professional activity - *be competent* : in matters of professional activity related to solving differential equations using operational calculus. Basic competencies of BK2 – must: - *have an idea of* : computer network and telecommunications technology, information security - *know* : information resources for searching and storing information - *be able to* : work with databases, spreadsheets, perform data consolidation, and create graphs - *have skills in* : using modern information technologies, managing information using business application programs - *be competent* in the information and communication field and in

		the construction of industrial SCADA systems Basic competencies of BK3 – must: - *have an idea of* : semiconductor and converter devices for renewable energy systems and automation of microprocessor and digital complexes - *know* : nomenclature of materials and products electrical insulation, cable and capacitor technology for selecting the required materials and products for specific devices - *be able to* : assess the status and operating conditions of digital relay protection and automation of a power facility - *have skills* in applying in practice knowledge of the electrophysics of liquid, solid and gaseous dielectrics and determining the response parameters of relay protection of a power facility - *be competent* in digital relay protection and automation of power facilities Basic competencies of BK4 – must: - *have an idea of* the basic principles of operation and parameters of electrical machines, digital and switching electrical devices - *know* : the classification of electrical equipment used in the production, transmission, distribution and consumption of electrical energy - *be able to* : develop design, technological, operating and repair documentation for electrical machines - *have skills* in the use of basic measuring devices, including electronic and digital, multifunctional devices, modern measuring transformers. - *be competent* in the rules for the technical operation of switching power equipment Professional competencies PC1 - must : - *have an idea* : about renewable energy sources, prospects for various types of renewable energy, their classification - *know* : schematic solutions for solar power and heat supply systems , wind and hydroelectric power plants - *be able to* : determine energy potential of wind, solar and hydrological resources, calculations of parameters of the main components and characteristics of wind and solar electricity generation. - *have skills in* : selecting technological equipment for solar power plants, wind power plants and small hydroelectric power plants, in relay protection devices and auxiliary equipment in renewable energy systems, in preparing working documentation design of power supply systems based on renewable energy sources - *be competent* in the field of renewable energy, methods of calculating potential and feasibility study of its application Professional competencies PC2 - must : - *have an idea* : conversion of renewable energy sources in autonomous power supply systems, classification of thermal power plants - *know* : modern progressive technologies and technical means for operating energy supply systems in conditions of decentralization and autonomy, thermal engineering principles of operation and energy characteristics of thermal power plants - *be able to* : develop optimization solutions for the technological

		design of devices based on renewable energy sources - *have skills* : in use methods and tools for designing distributed devices based on renewable energy sources - *be competent* : in engineering projects in the field of development of decentralized energy supply systems with distributed renewable energy sources . Professional competencies PC3 - must : - *have an idea* : requirements for power supply systems using renewable energy sources and operation, maintenance and diagnostics of electrical equipment of renewable energy systems - *know* : layout of open and closed switchgear; features of power supply - *be able to* : draw up working documentation design of power supply systems based on renewable energy sources, - *have skills* : in selection of switching and protective electrical equipment for electrical substations and distribution devices - *to be competent* : in operation, maintenance and repair of electrical equipment for renewable energy sources. Professional competencies PC4 - must : - *have an idea* : design features and physical principles of construction of electrical networks and substations - *know* : basic requirements for the quality of electricity and methods of maintaining them in electrical networks, Basic operating modes of transformers and autotransformers. Operation of voltage regulation devices for power transformers. - *be able to* : calculation of short-circuit currents and selection of buses, busbars , switching devices and measuring transformers at transformer substations - *have skills* : V calculations of electrical loads at different voltage levels; methods of reactive power compensation, selection of power and instrument transformers - *be competent* : V fundamentals of energy generation, transmission and distribution, automation and relay protection for renewable energy systems and facilities
13	Learning outcomes	ON -1. Understand the methods of scientific research and academic writing, possess a broad range of lexical and grammatical structures, understand language skills in communication, understand social, legal, and ethical norms, and understand the key elements of an anti-corruption culture, and be able to apply these in professional activities. Develop and implement promising areas of intellectual, cultural, and physical self-development and self-improvement, and substantiate objective knowledge of the history of Kazakhstan. ON -2. Master the methodology and techniques of economic planning assessment, planning methods and techniques, personnel and investment management, production organization, and compliance with safety and environmental regulations. Master the ability to apply industrial and environmental safety standards and regulations, safety precautions when working with power plants, and electrical safety, industrial sanitation, fire safety, and occupational health and safety practices. ON -3. Use and apply basic mathematical, physical, chemical and other natural science knowledge, as well as the theoretical foundations of electrical engineering, electrical circuits and

		electromagnetic fields in electrical engineering calculations . ON -4. Acquire knowledge of modern computer and information technologies, software, programming fundamentals, and methods for building information technologies based on SCADA systems in renewable energy, work in computer networks, find, process, and transmit any type of data and information formats, use various Internet applications, and master the principles of information security. ON -5 Calculate and select semiconductor and converter devices for renewable energy systems, electrical measurement equipment, primary and backup types of protection for electric power systems based on complex relay protection devices, control systems and automation of microprocessor and digital systems. ON -6. Possess knowledge of the basic operating principles and parameters of electrical machines, digital and switching electrical devices, know the features of modern electrical materials, and know the features of modern insulating materials for thermal power equipment. ON -7. To study the basic operating principles, designs and characteristics of renewable energy power plants, energy conversion systems, the application of methods for monitoring and assessing wind energy and solar radiation, water resources based on climate data, hydrological calculations and the selection of key equipment for small hydroelectric power plants. ON -8. To study the thermal engineering principles of operation and energy characteristics of thermal power plants, production and technological modes of operation of heat and electric power facilities, the principle of developing autonomous systems based on renewable energy sources, energy storage systems for reserve capacity, and the calculation of modes of distributed generation systems. ON - 9 Perform installation, repair, adjustment , testing and operation electrical engineering equipment renewable energy facilities , installation and repair of cable and overhead lines lines For systems power supply on based on renewable energy sources; study the standards on technical examination , methods of prevention and diagnosis electrical equipment of renewable energy sources. ON -10. Understand the fundamentals of calculations in the design and operation of electrical networks, substations, and automation and relay protection for energy systems and renewable energy facilities. Understand electrical power supply systems and the properties of indoor and outdoor lighting systems.
14	Form of study	Daytime, distance learning.
15	Language of instruction	Russian, Kazakh, English.
16	Volume of loans	240
17	Awarded academic degree	Bachelor of Engineering and Technology
18	Availability of an appendix to the license for the direction of personnel training	№KZ80LAA00018161 from 05.05.2020
19	Availability of	Yes

	accreditation of the educational institution	
	Name of the accreditation body	Independent agency for accreditation and rating (IAAR)
	Validity of accreditation	31.05.2024 -30.05.2029
20	Information about disciplines	Information on the disciplines of UC/CC GED, BD, PD. Appendix 1.
21	Sphere of professional activity	A field of science and technology that includes a set of technologies, means, methods and techniques of human activity aimed at the design, production and operation of renewable energy facilities.
22	Types of professional activity	- design and calculation; - organizational and managerial; - production and technological; - service and operational; - installation and commissioning;
23	Modular curriculum	Provided in **Appendix 2**

2. Matrix of correlation of learning outcomes for the educational program as a whole with the developed competencies

No.	Name of disciplines	ON1	ON2	ON3	ON4	ON5	ON6	ON7	ON8	ON9	ON10
1	Module of the university component of the educational program (Economics, law, entrepreneurship and financial literacy)	v	v								
2	Wind energy and wind turbines							v			
3	Differential and Integral Calculus I			v							
4	Differential and Integral Calculus II			v							
5	Differential equations			v							
6	Artificial intelligence				v						
7	Linear algebra			v							
8	Fundamentals of Scientific Research and Academic Writing	v									
9	Big Basics Data				v						
10	Solar energy converters							v			
11	Power electronics					v					
12	Theoretical Foundations of Electrical Engineering 1			v							
13	Theoretical Foundations of Electrical Engineering 2			v							
14	Probability theory and elements of mathematical statistics			v							
15	Sustainable Development: Ethics, Inclusion, and Safety	v	v								
16	Physics 1			v							
17	Physics 2			v							
18	Physical principles of using renewable energy sources							v		v	
19	Electrical apparatus and measuring equipment						v				
20	Electric machines						v				
21	Electrical networks and systems										v

22	Electricity supply									v	v
23	Analysis of electrical circuits and electromagnetic fields			v							
24	Biomass, biogas technologies and installations							v			
25	Minor 1	v			v						
26	Minor 2	v			v						
27	Minor 3	v			v						
28	Small hydropower and water resources							v			
29	Mechanics			v							
30	Fluid and gas mechanics			v							
31	Fundamentals of Computer Graphics				v						
32	Fundamentals of relay protection of electric power systems										v
33	Basics of heat supply								v		
34	Own needs of thermal, nuclear and hydraulic power plants and substations										v
35	Automatic control theory					v					
36	Safety precautions in power plants		v								
37	Electric drive						v				
38	Electrical materials and products						v				
39	Introduction to the specialty							v			
40	Energy storage devices								v		
41	Fundamentals of microprocessor technology					v					
42	Fundamentals of SCADA systems in the electric power industry				v						
43	Basics of electrical installation									v	
44	Chemistry			v							
45	Autonomous renewable energy systems and distributed generation								v		
46	Analysis and forecast of renewable energy potential							v			

	using meteorological data										
47	Integration and operation of renewable energy systems									v	
48	Comprehensive assessment of renewable energy resources							v			
49	The main energy equipment of solar and wind power plants									v	
50	Occupational safety and health		v								
51	Design of solar and wind power plants							v			v
52	Design of power supply using renewable energy sources								v	v	
53	Industrial protection of personnel		v								
54	Clean Energy Project Management		v								