

**INSTITUTE OF RENEWABLE ENERGY OF THE NAS OF UKRAINE  
RESEARCH TOPICS COMPLETED IN 2022**

The name of the GDR	Terms use nanny	The name of the scientific direct (problems) from the main scientific directions had and the most important problems of fundamental of research	The obtained new theoretical results daddy*)	Received new knowledge practical results daddy*)	Place and form of implementation of results
1	2	3	4	5	6
<p>Explore especially-functioning and conditions of provision optimality of the combination new energy systems public supply to the new renewable ones different energy sources species taking into account random processes generation and consumption energy consumption (code"Complex-3"). <u>Supervisor</u> : Kuznetsov M.P., Ph.D.,s.n.s., deputy directorof scientific work</p>	<p>01.2018-12.2022</p>	<p>Fundamental sciences research on the mostimportant problem of the development of scientific technical, social economic, social socio-political, humanpotential for ensuring competition capacity of Ukraine food in the world and sustainabledevelopment of society and state  The most important fundamentals financial problems of scientific, mathematical and technical sciences.</p>	<p>A new solution to the problem of complex provision of electric and thermal energy was obtained, based on the use of renewable energy sources: wind, solar electric installations and other renewable energy means when they are used in an autonomous mode, as part of a local or combined energy systems, with a combined combination of various energy sources.</p> <ul style="list-style-type: none"> <li>• <u>Journalistic activity:</u> <ol style="list-style-type: none"> <li>a. 13 articles are included in the Scopus and WoSdatabases;</li> <li>b. 36 articles in professional journals indexed by professional international databases;</li> <li>c. 48 abstracts of international conference reports;</li> <li>d. 11 monographs (chapters);</li> <li>e. 3 training manuals. 1 doctoraland 1 candidate theses were defended.</li> </ol> </li> <li>• <u>Scientific consultations, preparation expert conclusions:</u>_____</li> </ul>	<p>A recommendation was developed dation regarding optimal a combination of infused and traditional of technologies in different energy systemslarge scale. Re- the results of the work sovani during execution farm contract works, development of technical and technological proposals statements regarding the combi- new energy systems.</p>	<p><u>Acts of implementation</u> Received 7 acts from: SE "NEK Ukraine nergo", SE "Ukr- Research and Development Project", Public union "Association of Engineers sustainable energy technologies of Ukraine", Energetic association "Ukraine-hydrogen council", Ukrainian Institutehere is the future.</p>

			<p>Provided expert opinions, analytical reports and proposals for: Ministry of Energy of Ukraine, State Energy Efficiency of Ukraine, NSDC, etc.</p> <ul style="list-style-type: none"> <li>• <u>Speeches with reports at the conferenceconferences, symposia, congresses:</u></li> </ul> <p>- XIX - XIII international scientific and practical conferences "Renewable energy and energyefficiency in the XXI century", Ukraine, Kyiv, 2018-2022;</p> <p>- Scientific and practical conference "Renewable and hydrogen energy-2018", Ukraine, Kyiv, May 18,2018.</p> <p>- Scientific reporting session "Fundamental aspects of renewablehydrogen energy and fuel cell technologies", Ukraine, Kyiv, December 7, 2018.</p>		
<p>Develop systems combined energy supply of objects of the social sphere using different types of renewablesenergy sources (code"<b>Complex-WITH</b>")</p> <p><u>Supervisor</u> : Kudrya S.O., member-cor. NASU, Ph.D., Prof., director of the institute</p>	01.2020-12.2022	<p><u>Energy and energy efficiency Technologies ofeffective energy saving cutting of buildings and structures.</u></p>	<p>A number of tasks have been solved to provide electric and thermal energy to social sphere objects, in particular, buildings, structures and complexes of publicappointment, by creation local energy systems, which are based on the use of renewable energy sources of various types. Variantsof the optimal composition and combination of various energy technologies, algorithms of their work are determined.</p> <ul style="list-style-type: none"> <li>• <u>Journalistic activity:</u></li> </ul> <p>a. 11 articles are included in the Scopus and WoSdatabases;</p> <p>b. 45 articles in professional journals indexed by professional international databases,</p>	<p>Developed recommended dation regarding buildings combined energy systems hybrid type whatrelate to private housing, gro- of Madian office buildings of the same type, complexes administrative buildings noble The results ro- bots applied at performance farm contractsdifferent works, developers technical proposals.</p> <p><u>Creation of OPIV:</u></p> <p>f. 1 the application has been submitted;</p> <p>h. 4 patents obtained</p>	<p><u>Acts of implementation</u> Received 5 acts from: Public union "Association of Engineers sustainable energy technologies of Ukraine", Energetic association "Ukraine-hydrogen council", Ukrainian Institutehere is the future.</p>

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			c. more than 40 abstracts of reports of international conferences; d. 3 monographs (chapters).		

<p>"Investigate the electro-floating processes in active solar surfaces them collectors, photo-batteries and photothermal of modules, taking into account the factors of inconsistencies and inhomogeneities their physical characteristics ristik" (code: "<b>Sun-NTR</b>").</p> <p><u>Supervisor</u> : Reztsov V.F. , member - cor. NAS of Ukraine, Ph.D., Prof., substitute director of scientific work</p>	<p>01.2018-12.2022</p>	<p>Fundamental sciences research on the most important problem of the development of scientific technical, social economic, social socio-political, human potential for ensuring competition capacity of Ukraine food in the world and sustainable development of society and state</p> <p>The most important fundamentals financial problems of scientific, mathematical and technical sciences</p>	<p>On the basis of the synergistic methodology of the formation of spatially heterogeneous structures due to the development of instabilities by I. Prigozhin, the criteria for the stability of electrothermal processes under the action of solar radiation were determined, models were built and the parameters that characterize the conditions for the reliable functioning of photo elements were analyzed.</p> <p>- solar energy equipment.</p> <p>Methods for analyzing the space-time distribution of electrothermal parameters of elements of photo-helioenergy equipment have been developed. The effectiveness of the application of the method of implementing numerical experiments for the analysis of the space- time distribution of charges in photoelectric converters is substantiated. The methods of modeling "photobattery - different types of load" systems have been improved based on the proposed fractional-linear approximation of the current-current characteristic, which is in good agreement with the experimental results. The conditions for achieving the maximum efficiency of systems with photobatteries in autonomous modes have been established.</p> <p><u>Journalistic activity:</u></p> <p>a. 1 article in a journal indexed by Scopus;</p>	<p>Scientifically developed technical recommendations regarding the increase of energetic effectiveness and reliability of solar collectors, photo- batteries, photothermal of solar energy system modules</p> <p>chanting</p> <p><u>Creation of OPIV:</u></p> <p>g. 2 applications have been submitted; h. 3rd patent received.</p> <p><u>Created by the state standards:</u> 10 states of Ukrainian standards on the safety of photovoltaic operation various modules.</p>	<p><u>Acts of implementation:</u></p> <p>NBS named after M.M. Gry-</p> <p>National Academy of Sciences of Ukraine: "Seasonal system hot water supply operation on the basis of a solar installation" (from 12/16/2019)</p> <p>NTUU "KPI named after Igor Sikorsky", faculty electricity company machinery and vehicles</p> <p>tics:</p> <p>- "Energy efficient designs owned by for converting solar energy technologies created on the basis of Ukrainian patents on useful models" (from 12.21.2018 r.);</p> <p>- "Improved mathematical models of electrothermal processes and developed analytical methods physical and numerical electrical analysis thermal processes in active elements of solar panels</p> <p>tors and photobatteries taking into account their nationality</p>
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<p>"Development and development completion of mathematics forecasting models and methods energy parameters wind power and modes of operation of wind hydropower plants andtri-electric cars nomic systems of small power" (code: "Wind-3").</p>	01.2018-12.2022	<p>Fundamental sciences research on the mostimportant pro-</p> <p>problem of the development of scientific technical, social economic, social socio-political, humanpotential for ensuring competition capacity of Ukraine food in the world and stable</p>	<p>Modern requirements regarding the attractiveness of investing in the development of wind energy in Ukraine were analyzed and existing mathematical models and methods were improved and new mathematical models and methods were developed to fulfill these requirements, the energy balance was simulated for stochastic optimization of energy supply decision options using wind generation, a system of computer programs was developed that provides</p>	<p>Methodical materials to optimize solutions regarding the implementation of the project of wind power plantssthis and the expediencyof investing in their construction; weekend can be used for the developmentof new car designs nominal wind turbines.</p>	<p><u>Acts of implementation:</u></p> <p>1. Act of implementation from 21.11.2018 "Mathematical model lution of processes in autonomous wind power ktric installation with electrodynamic pump drive";</p> <p>2. Act of implementation from 19.12.2019:</p>

<p><u>Supervisor</u> : Kudrya S. O., member- cor. National Academy of Sciences of Ukraine, Ph.D., prof., director</p>		<p>development of society and state The most important fundamentals financial problems of scientific, mathematical and technical sciences</p>	<p>hears the implementation of calculationsto justify the feasibility of investing in the construction of wind turbines, developedand improved mathematical models of rotor regulation systems with centrifugalregulators, passive rotor orientation systems and processes in wind-electric thermal installations and in autonomouswind turbines with an electrodynamic pump drive and pulse converter.</p> <ul style="list-style-type: none"> <li>• <u>Journalistic activity:</u> <ul style="list-style-type: none"> <li>a. 11 articles in journals indexedby WebofScience, Scopus;</li> <li>b. 46 articles in professional journals indexed by professionalinternational databases;</li> <li>c. 59 abstracts of international conferences;</li> <li>d. 10 monographs/chapters in collective monographs;</li> <li>e. 11 textbooks, manuals;</li> <li>f. 3 electronic scientific publications;</li> </ul> </li> <li>• <u>Scientific consultations,</u> <u>preparation of expert opinions:</u> <ul style="list-style-type: none"> <li>- 11 analytical reports of the State Energy Efficiency Agency of Ukraine;</li> <li>- 7 expert opinions commissioned by UkrINTEI for carrying out scientific and scientific and technical expertise;</li> <li>-18 response letters and proposals of the Presidium ofthe Academy of Sciences of Ukraine;</li> <li>- 4 response letters and proposals to the Cabinet of Ministers of Ukraine.</li> </ul> </li> <li>• Presentations with reports at conferences, symposia, congresses (list of reports indicating the name of the event and the dates of the event): XIX - XXIII</li> </ul>	<p>The results of scientific works will be used state during implementation institute of research jin in applied scientific works, conclusion of contractual agreements works, development of new ones technical and technological gic offers a will also be used cheap State Energy Efficiency tivity of Ukraine at formation of the state policies in the field of energy,educational programs in the archives of the Ministry of Education and Scienc them in the development of educational materials.</p> <ul style="list-style-type: none"> <li>• <u>Creation of OPIV:</u> <ul style="list-style-type: none"> <li>g. 22 applications have been submitted;</li> <li>h. 22 patents obtained mano</li> </ul> </li> </ul>	<p>"Development and development completion of mathematics system models topics of regulation of centrifugal tori auto regulators nominal wind turbines"; 3. Act of implementation from 07.12.2020: "Analysis of mathematical of models of passive of orientation systems tion of the rotors autonomously them WEU"; 4. Act of implementation from 11/16/2021: e of Ukraine mathematical model lution of processes heating at regarding the weather forecast hanic institutions wok"; 5. Act of implementation from 01.11.2022 "Analysis of mathematical them process models sat in autonomous wind-electric installations beginners with pulse converter".</p>
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			international scientific and practical conferences "Renewable energy and energy efficiency in the XXI century", 2018-2022.		
<p>"Development of scientific and technological foundations increase in energy efficiency activity of small hydro- power plants for hire environmental protection of restrictions on the use of water flow for the production of electricity three energies» (code: "Hydrore-surs"). Supervisor : Vasko P.F., Ph.D., s.n.s., head department of hydropower</p>	01.2018-12.2022	<p>Fundamental sciences research on the most important problem of the development of scientific technical, social economic, social socio-political, human potential for ensuring competition capacity of Ukraine food in the world and sustainable development of society and state</p> <p>The most important fundamentals financial problems of scientific, mathematical and technical sciences</p>	<p>Mathematical models and methods for calculating the energy efficiency of small hydroelectric power plants have been developed in the presence of environmental protection restrictions on the use of water flow for electricity production, based on the application of the laws of hydrostatics and a probabilistic approach to determining the volume of water consumption station and river flow on the basis of the differential density of the three-parameter gamma distribution of random variables in a wide range of changes in hydrological parameters of the flow. Determination of the energy indicators of hydroturbines under variable water flows and pressures was carried out on the basis of experimental dependences of hydromechanical characteristics.</p> <ul style="list-style-type: none"> <li>• <u>Journalistic activity</u>: 5 articles <ul style="list-style-type: none"> <li>a. in journals that are cited in Scopus;</li> <li>b. 28 articles in professional magazines indexed by professional international databases;</li> <li>c. 26 theses of international conferences;</li> <li>d. 2 sections in 2 teams. monographs;</li> <li>e. 1 chapter in 1 textbook;</li> </ul> </li> </ul>	<p>Tables are calculated values of the differential probability density three-parameter gamma distribution flow rate of river flow in an arbitrary range of changes in hydrological parameters, rhema around the poles of the gamma function.</p> <p>Developed on the basis of new methods of engineering methods of geometry defining provisions combinatorial theory laws of management of spending and often that rotation of hydro- turbines for boosting their energy effectivity</p> <p>Reasonably technical logical principles of increasing energy efficiency activity of small hydro- power stations upon availability environmental protection of restrictions on the use of water flow for the production of electricity trienergy of water through the use of batho aggregate structure station tours, selection rational design value of costs</p>	<p><u>Acts of implementation</u>: SE "SOUTH - alternative je- rela" State Energy effectiveness of Ukraine.</p> <ol style="list-style-type: none"> <li>1. Information base of small hydropower plants of Ukraine (2018). Act of implementation dated 26.11.2018</li> <li>2. Information base hydromechanical characteristics of hydration of small HPPs in the system of relative units prone. Act of implementation from 15.03.2019</li> <li>3. Management laws hydro turbines mallow power for ensuring maximum small effective transformation of the guide of energy of the potential of the watercourse with variable costs water into the mechanical one rotational energy movement Act of implementation from</li> </ol>

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			<p>f. 1 electronic scientific publication (United Nations Industrial Development Organization; International Center on Small Hydro Power).</p> <ul style="list-style-type: none"> <li>• <u>Scientific consultations, preparation of expert opinions:</u> <ul style="list-style-type: none"> <li>- 2 expert opinions for the Verkhovna Rada of Ukraine's Committee on Environmental Policy, Nature Management and Liquidation of the Consequences of the Chernobyl Disaster;</li> <li>- 2 expert opinions for the Cabinet of Ministers of Ukraine;</li> <li>- 1 expert opinion for the Committee on State Awards of Ukraine in the field of science and technology;</li> <li>- opposition to 3 Dr. and 3 candidates theses.</li> </ul> </li> <li>• <u>Presentations with reports at conferences, symposia, congresses:</u> <ul style="list-style-type: none"> <li>a total of 26 reports, in particular on: <ul style="list-style-type: none"> <li>- 2019 IEEE 6th International Conference on Energy Smart Systems (2019 IEEE ESS).</li> <li>- 2022 IEEE 3rd KhPI Week on Advanced Technology (KhPI Week)</li> <li>- 2022 IEEE 8th International Conference on Energy Smart Systems (ESS)</li> <li>- 1st International Conference on Artificial Intelligence and Data Science (ICAIDS-2022).</li> </ul> </li> </ul> </li> </ul>	<p>water stations with fish farming, application variable frequency cheap hydroelectric them aggregates. Reasonably energetic efficiency application of radio-linear-axial hydraulic turbines bin for creating low-pressure small HPP in the presence of environmental protection measures on the consumption of river runoff water for the production of electricity.</p>	<p>4. Mathematical methods deli loader them operating modes hydro units for variable costs and water pressure Act implementation from 23.06.2021 on 1 page 5. Justification design parameters energy efficient of them small hydroelectric fishing power stations ladies Act of implementation from 15.08.2022</p>
<p>"Development of scientific technological foundations creation of thermal and power stations based on research hydrodynamic and thermophysical</p>	<p>01.2018-12.2022</p>	<p>Fundamental sciences research on the most important problem of the development of scientific technical, social economic, social</p>	<p>Methodical provisions for the use of individual geothermal wells with the use of thermoelectric generators and electrolyzers have been substantiated, which allows to increase the energy efficiency of the use of geothermal wells.</p>	<p>Technologies have been developed circuits using an electrolyzer high pressure for increase in heat geothermic efficiency small wells,</p>	<p>Acts of implementation: 1. "Proposals regarding use of certain my wells for receiving heat and electric energy".</p>

<p>processes in systems mining and using geothermal resources", code: <b>"Geoterm-3"</b>.  <u>Supervisor</u> : Yu.P. Morozov, Ph.D., s.n.s., head of the department</p>		<p>socio-political, human potential for ensuring competition capacity of Ukraine food in the world and sustainable development of society and state  The most important fundamentals financial problems of scientific, mathematical and technical sciences</p>	<p>thermal energy sources and ensure their wide use by using conserved, liquidated and unproductive wells.</p> <p>For the first time, the thermal potential of the upper layers of the Earth on the territory of Ukraine was substantiated on the basis of the analysis of the hydrogeological and geothermal conditions of the upper layers of the Earth up to 300 m deep by using them for geothermal heat supply using heat pumps.</p> <p>The hydrogeological conditions of reverse injection of spent geothermal heat carrier into non-productive permeable layers are substantiated, which can significantly improve the technical and economic indicators of geothermal energy systems. The energy potential of near-surface aquifers of Ukraine was determined, which amounts to 2.7 million tpu. per year The effectiveness of the application of sorption heat pumps and thermoelectric generators using geothermal energy sources was determined, which showed the expediency of constructing autonomous GeoTES with a capacity of 10-100 kW based on separate geothermal wells. The construction of a pilot geothermal power plant with a capacity of 5 MW on the territory of a flooded gas field (Kachanivske field, Sumy region) has been substantiated.</p> <ul style="list-style-type: none"> <li>• <u>Journalistic activity:</u> _____</li> </ul>	<p>which allows significantly increase energy production indicator electricity generation geothermal electricity cash on delivery increase in the debit of the thermal drills  wine  Performed thermodynamic mechanical and hydraulic modeling technology production options electrical engineering energy into geothermal circulatory system circuit with the use of thermal, mechanical and chemical energy of the geothermal fluid deposits with abnormal high layered pressure  Carried out so far improving efficiency use of compresses solar heat pumps sat for heat and cold supply of premises with the help of funkoi-left</p> <p><u>Creation of OPIV:</u>  g. 9 applications have been submitted;  h. 9 patents were obtained.</p>	<p>Act implementation from 26.11.2018  2. "Revaluation of own geothermal activity of fluids (liquids) in extreme conditions for optimization tions of the future geothermal product new energy". Project framework program with scientific research and innovations Euro-peysky of the Union "Horizon 2020".  Act of implementation from 15.12.2020  3. "Analysis of the current heating system, condition and ventilation lations of production laboratory premises metrology department physical and geophysical them researches of VP UkrGRI SE "UGK".  Act of implementation from 11/17/2021  4. "Thermal from using yum geothermal wells that left sewed after contouring drilling of gas and oil wells".  Act of implementation from 27.10.2022</p>
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and. 4 articles in journals indexed by Web of Science, Scopus;

b. 24 articles in professional journals indexed by professional international databases;

c. – 59 theses of reports of international conferences;

d. - 4 monographs.

1 dissertation work for the degree of Ph.D.

- Presentations with reports at conferences, symposia, congresses:
  - XIX - XIII international scientific and practical conferences "Renewable energy and energy efficiency in the XXI century", Ukraine, Kyiv, 2018-2022;
  - Scientific and practical conference "Renewable and hydrogen energy-2018", Ukraine, Kyiv, May 18, 2018.
  - Scientific reporting session "Fundamental aspects of renewable hydrogen energy and fuel cell technologies", Ukraine, Kyiv, December 7, 2018.
  - XVIII International Scientific and Practical Conference "Heat Energy: Ways of Renovation and Development" Institute of Heat Energy Technologies of the National Academy of Sciences of Ukraine. November 26-27, 2022. Kyiv. 5 participants, 4 reports.
  - International scientific conference "Features of innovative development in the field of technology: the comparative experience of Ukraine and the European Union": conference proceedings, August 5-6, 2022. Riga, Latvia.

<p>"Develop scientific technical principles of raising energy efficiency sustainability and environmental friendliness transformation technologies recycling of biomass and bio-organic waste in electrical and thermal energy» (code: "organic 3").</p> <p><u>Supervisor:</u> V.P. Klyus, Ph.D., Assoc., S.N.S.</p>	<p>01.2018-12.2022</p>	<p>Fundamental sciences scientific research on the most important problems development of scientific and technical, social and economic, socially lithic, human potential for ensuring competitive opportunities of Ukraine in the world and sustainable development of society and the state.</p>	<p>A cluster method for determining the granulometric composition of solid biofuel has been developed, which, unlike existing standard methods, is based on the experimental and computational determination of equivalent lengths for all particles in pellets and the determination of the probability density of their distribution by length. The application of the proposed cluster method made it possible to establish that industrially produced straw pellets are characterized by the presence of clusters with shorter pellets compared to wood pellets.</p> <p>A mathematical model of the dynamics of biogas output was refined, which, unlike the existing ones, takes into account two stages of fermentation, hydrolysis and methanogenesis, which allowed to determine the indicators that characterize the dynamics of biogas output during the fermentation of food waste.</p> <ul style="list-style-type: none"> <li>• <u>Journalistic activity:</u> and. 5 articles in journals indexed by Web of Science, Scopus;</li> <li>b. 20 articles in professional journals indexed by professional international databases;</li> <li>c. 31 theses of reports of international conferences;</li> <li>d. 3 monographs/chapters in collective monographs;</li> <li>e. 1 study guide;</li> <li>f. 1 electronic publication.</li> </ul> <p>1 dissertation work for the degree of Ph.D.</p>	<p>Conducted experience so far pyrolysis of chicken litter, sewage-leg mud, bone waste, household waste, methane condensation fermentation gas generators installations, food and garden and park from-moves, process layer wood burning and straw pellets. The obtained results of the GDR give an opportunity to develop scientific forging and technical solutions to optimize the function of modern bioenergy facilities new products for different types of biomass at agro-industrial production facilities of science</p> <p><u>Creation of OPIV:</u> g. 4 applications have been submitted; h. 4 patents received.</p>	<p><u>Acts of implementation:</u> 1. NTUU "KPI named after Igor Sikorsky", Faculty of Electrical Engineering power engineering and automotive queens: "The results of the experiment rimental experiences yen emissions of solid particles when burning bathroom granular of biofuel in water heating boilers "Pellmax 25". Act implementation from 22.12.2020. 2. Public union "Association of Engineers sustainable energy of Ukraine technologies rains»: "The results of the experiment rimental experiences gen thermal pe- biomass processing, or ganic waste". Act exercise jinn from 24.11.2021. 3. NUBiP of Ukraine: "Optimal modes functioning of bio- power plants novices according to the criteria energy efficiency and environmental protection". Act implementation from 20.10.2022.</p>
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