**REPUBLIC OF AZERBAIJAN**

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# ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

# STIMULATION OF THE DEVELOPMENT OF ALTERNATIVE AND RENEWABLE ENERGY PRODUCTION ENTERPRISES IN AZERBAIJAN

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## GENERAL CHARACTERISTICS OF THE DISSERTATION

**Relevance and degree of study of the topic.** In the modern era, characterized by increasing demand for energy resources, it is crucial for every country not only to use existing traditional energy sources efficiently but also to increase overall energy production and ensure national energy security through the formulation of an appropriate energy policy. In this regard, alternative and renewable energy sources (ARES) offer extensive opportunities for diversifying energy supply and ensuring its continuity.

ARES, in addition to having superior potential compared to traditional energy sources, are also important for addressing ecological problems and ensuring environmental safety. This advantage makes it possible to mitigate global warming and its severe consequences. Therefore, the adoption of ARES is considered a priority task for countries, not only to ensure national energy security but also to maintain ecological balance.

In our country, although energy security is fully ensured, efforts are being made to ensure that the scope of energy policy is not limited solely to oil and gas, in line with global challenges. As the gradual depletion of traditional energy sources continues, the development of ARES is essential for our country, as it is for many others, to reduce dependence on hydrocarbon resources.

Therefore, the dissertation examines the current state of alternative and renewable energy production enterprises in Azerbaijan and investigates incentive mechanisms for the development of these energy sources based on international experience.

It should be noted that the use of renewable energy sources in Azerbaijan dates back approximately two centuries, to the early 19th century. For instance, the first hydroelectric power plants were constructed in 1880 to harness hydro energy. The utilization of other types of ARES, as well as scientific research in these areas, mainly pertains to the modern period. Although the study of this field and its efficient application is relatively recent, significant progress has been achieved in the country within a short period. Specifically, a

normative-legal framework has been established, structural improvements have been implemented and fundamental research of theoretical and practical significance has been conducted in scientific research institutes and higher education institutions, with numerous valuable scientific publications produced. Issues related to alternative regenerative energy systems, energy complexes, ecology, environment and human impact, alternative energy sources, the economics of natural resource use and the analysis of development directions of the industrial and fuel-energy complex have been reflected in the research of Azerbaijani scholars such as M.F. Jalilov, R. Gonagov, E.M. Hacizade, Sh. Aliyev, I. Ibrahimov, R. Jafarova, M.A. Mammadov, R.N. Nuriyeva and others. Moreover, topics concerning renewable energy sources, climate change, the development of the solar energy industry, renewable energy and hydrogen, alternative energy policy and its implementation have been investigated by foreign researchers, including V.E. Fortov, V.D. Gazman, N. Bach, M. Andejany, A. Celikkaya, M. Özbilgin, H.C. Lee and others.

The scientific works of the aforementioned researchers are of great significance for the study of ARES utilization. In this regard, the dissertation highly values the research conducted by these scholars and uses their works as important scientific sources. Based on the obtained data, the objectives set forth in the dissertation have been analyzed systematically and examined from a scientific perspective.

It should also be noted that the topic “Stimulating the Development of Alternative and Renewable Energy Production Enterprises in Azerbaijan” has not yet become an independent subject of scientific research. In this regard, the dissertation represents the first independent scientific study dedicated to the comprehensive investigation of this problem.

The sources and scientific literature used during the preparation of the dissertation indicate that the object of the studied topic has been scarcely explored. In this regard, the conducted research and the obtained results can be considered an important resource for the study of this field in Azerbaijan. It should also be noted that,

although nearly all aspects of stimulating the development of renewable energy production enterprises in Azerbaijan have been examined during the research, the relevance of the topic necessitates further extensive scientific investigations in this area in the future.

**Object and subject of the research.** The object of the research consists of business entities involved in ARES, while the subject encompasses the theoretical, practical and ecological-economic aspects of these enterprises.

**Purpose and objectives of the research** the purpose of the research is to develop incentive-based proposals aimed at increasing energy production and ensuring consumers' access to stable and sustainable energy through renewable energy production enterprises in Azerbaijan.

To achieve this purpose, the following tasks have been set:

- analysis of the position and significance of traditional energy sources in the global economy, as well as the systematization of established theoretical, methodological and practical approaches to their utilization;
- investigation of the environmental impacts of enterprises utilizing traditional energy sources, identification of the key factors shaping these impacts and scientific assessment of the main ecological shortcomings;
- identification of the economic and institutional incentive mechanisms applied in the development of renewable energy production enterprises and analysis of their effectiveness;
- study of the existing regulatory framework, legislative acts and strategic action programs in the organization of ARES utilization and analysis of their implementation mechanisms;
- study of the investment policies and financial incentive mechanisms implemented in the development of renewable energy production enterprises and assessment of their effectiveness;
- investigation of the organization of entrepreneurial activities in the field of renewable energy production and the economic impact of financial incentives;

- Analysis of the tax and customs policies applied in the activities of renewable energy production enterprises and evaluation of their impact on the sector;
- systematic investigation of the role and significance of scientific research activities in the development of renewable energy enterprises;
- scientific investigation of the formation of specialized personnel, organizational management and consumer awareness processes in renewable energy enterprises;
- Scientific investigation of selecting the most suitable solution and adapting to changing conditions by evaluating various alternatives using Multi Criteria Decision Making (MCDM) methods.
- analysis of the possibilities for the first-time application of the extended TOPSIS method based on Z-scores in the country and assessment of its effectiveness;

**Research methods.** The research considered the scientific perspectives of both foreign and domestic scholars on the use and development of ARES. In addition, the main sources of the study included the state's socio-economic, financial-credit and investment policies, the national energy strategy, scientific and methodological materials from leading enterprises and organizations involved in energy production, sectoral regulatory acts and the socio-economic development of regions. Furthermore, state programs aimed at ensuring energy security were also incorporated into the analytical framework of the research.

During the research process, a comprehensive approach and systematic analysis were employed, along with methods of statistics, generalization and grouping.

**Key provisions submitted for defense.** The following provisions have been submitted for defense in the dissertation:

- The necessity of energy sector diversification: While traditional energy sources have their advantages, they also present certain limitations. Therefore, the widespread application of renewable energy sources and the establishment of specialized enterprises in this field not only contribute to ensuring energy

security but also make a significant contribution to addressing environmental issues;

- Improvement of incentive policies: To accelerate the establishment and development of renewable energy enterprises, it is necessary to enhance the legislative framework, expand investment and financial incentives and simplify tax and customs procedures;
- Ensuring the development of scientific research and innovative technologies: Supporting scientific research, applying its results and developing specialized personnel are among the key strategic directions for ensuring technological advancement in energy enterprises. This approach promotes innovation in the energy sector and enhances its competitiveness;
- Training of specialized personnel and strengthening public awareness: Enhancing the effectiveness of enterprises operating in the energy sector requires the training of professional personnel and informing the public about renewable energy sources, their advantages and areas of application. In this regard, public awareness is a crucial factor that facilitates the sustainable development of enterprises and the adoption of new technologies in the energy sector;
- Development of optimal energy strategies: To ensure the development and operation of renewable energy enterprises, it is necessary to apply MCDM methods in selecting energy sources and to formulate effective strategies taking regional characteristics into account;
- Application of the extended TOPSIS method based on Z-scores: This method enables the optimal evaluation of the locations and technological choices of energy enterprises under uncertain and fuzzy conditions. Such an approach is of significant importance for the efficient utilization of renewable energy potential, strengthening energy security and ensuring ecological sustainability.

**Scientific novelty of the research.** A number of innovations have been achieved in relation to the problems investigated in the study:

- the efficiency of traditional energy sources and the operations of enterprises utilizing these sources has been analyzed; existing

theoretical and practical knowledge has been systematized and presented on a scientific basis, taking into account their economic and organizational characteristics;

- the main shortcomings in the operations of enterprises using traditional energy sources have been identified, including their harmful impacts on the environment;
- the incentive mechanisms applied to stimulate the development of specialized renewable energy production enterprises have been systematically investigated;
- the process of improving the organizational structure that ensures the effective operation of enterprises in the renewable energy sector, as well as the legal and institutional framework—including existing legislation, regulatory acts and operational programs—has been systematically analyzed and scientifically evaluated;
- the financial incentive process aimed at attracting investors to invest in the energy production sector to expand the activities of enterprises has been investigated;
- the economic impacts of financial incentives applied during the organization of entrepreneurial activities in the renewable energy sector have been studied and their role in the development of entrepreneurship has been scientifically justified and comprehensively evaluated;
- the tax and customs policies applied in enterprises operating in the renewable energy sector have been investigated and scientific conclusions have been substantiated based on a comparative analysis with countries possessing advanced experience;
- the significance of scientific research conducted to support the development of enterprises in the renewable energy sector has been determined and scientifically evaluated;
- the current state of the formation of specialized personnel, organizational management mechanisms and the awareness of energy consumers in renewable energy enterprises has been scientifically analyzed and the impact of these factors on the promotion of ARES has been substantiated and presented using a comprehensive approach;

- optimization and planning of decisions in enterprises operating in the renewable energy sector have been developed using MCDM methods;
- the optimal selection of renewable energy enterprises in two economic regions has been evaluated by applying the extended TOPSIS method based on Z-scores.

**Theoretical and practical significance of the research.** The theoretical significance of the research lies in the fact that the use of ARES in Azerbaijan can be considered an effective means for ensuring the sustainable development of enterprises, enhancing energy security and reducing dependence on traditional energy sources. The obtained scientific results can be applied in the teaching of specialized subjects at higher education institutions, in the development of curricula and methodological materials, as well as in scientific studies conducted in the field.

**Approval and application of the research.** The main provisions of the dissertation have been reflected in the author's 1 book and 21 scientific articles. Among these articles, 4 have been published in reputable international journals. The author has also participated in 6 national and international conferences with scientific articles and abstracts related to the topic of the dissertation.

**Structure and overall volume of the dissertation.** The dissertation consists of an introduction *(15 030 symbols)*, three chapters *(Chapter I – 81 618 symbols, Chapter II – 93 664 symbols, Chapter III – 27 903 symbols)*, a conclusion *(9 325 symbols)* and a list of 217 references. The dissertation includes 22 tables and 15 diagrams. The total volume of the work is 153 pages *(227 540 symbols)*.

## MAIN CONTENT OF THE DISSERTATION

In the **"Introduction"**, information is provided on the relevance of the topic, the object and subject of the research, its purpose and objectives, scientific novelty, theoretical and methodological foundations, theoretical and practical significance, approbation and structure.

The first chapter of the dissertation, entitled **"The theoretical and methodological foundations of the study of energy sources"** consists of 3 sections.

In the first section of the first chapter, entitled ***"The essence, organizational-economic characteristics and economic classification of traditional energy sources"*** the essence of traditional energy sources, their existing potential and regional distribution, organization and management at the enterprise level, economic efficiency, as well as their ecological and social impacts and role in the activities of energy production enterprises are examined.

It is noted that coal plays a significant role among traditional energy sources. The total global coal reserves amount to 1 074 108 mln.t. Currently, coal deposits are found in nearly 80 countries. In 2023, global coal production reached 9 095,6 mln.t, with China ranking first, accounting for 50% of total production.[1]

Among traditional energy sources, oil holds a dominant position, with the largest deposits primarily located in the Middle East. At present, the total proven global oil reserves amount to 1 732,4 bln. barrels. In 2023, the annual oil production reached 4 514,1 mln.t, with the United States leading the sector, accounting for 18,3% of global output.[2]

The high calorific value of natural gas ensures its widespread use as an efficient source of fuel. Globally, the total natural gas reserves are estimated at 188,1 tn.m³, with the largest deposits concentrated in Russia and Iran. In 2023, the global natural gas production amounted to 4 059,2 bln.m³, where the United States ranked first, accounting for 25,5% of total output.[3]

Nuclear energy produces higher energy output and is relatively

[1] The Energy Institute. Statistical Review of World Energy – 2024 | 73rd Edition. – London: UK: Energy Institute, - 2024. - p.49

[2] The Energy Institute. Statistical Review of World Energy – 2024 | 73rd Edition. – London: UK: Energy Institute, - 2024. - p.25

[3] The Energy Institute. Statistical Review of World Energy – 2024 | 73rd Edition. – London: UK: Energy Institute, - 2024. - p. 39

less harmful to the environment.[4] Currently, 413 nuclear reactors are in operation across 31 countries worldwide,[5] accounting for 10,8% of total global electricity generation.[6]

However, accidents that may occur during the use of nuclear energy pose a real threat to humanity. Notable examples include the "Three Mile Island" NPP, the "Chernobyl" NPP and the "Fukushima-1" NPP accidents.[7]

Azerbaijan possesses abundant hydrocarbon resources in the national sector of the Caspian Sea. Oil reserves in the Baku and Absheron archipelagos are estimated at 3,5–5 bln.t, while natural gas reserves are estimated at 2,7 tn.m³.[8]

According to the SOCAR report, the proven oil reserves in the currently operating fields amount to 82 419 k.t, while natural gas reserves total 112 786 mln.m³.[9]

To date, 38 agreements have been signed with international oil companies, of which 21 cover the Caspian Sea sector and 17 cover onshore fields. Currently, operations under 19 agreements are ongoing. In total, USD 100,3 bln. has been invested in Azerbaijan's oil industry so far.[10]

Significant steps have been taken to transport natural gas from the Shah Deniz field to global markets. For this purpose, the

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[4] Cəlilov, M.F. Alternativ regenerativ enerji sistemləri / M.F.Cəlilov. – Bakı: Təhsil, - 2009. - s. 11-15

[5] Operational & Long-Term Shutdown Reactors 2024: [Electronic resource] / URL:https://www.iaea.org/PRIS/WorldStatistics/OperationalReactorsByCountry.aspx

[6] International Atomic Energy Agency. Nuclear Power Reactors in the World – 2024. Reference data series No 2. – Vienna: IAEA, - 2024. – p. 8-16.

[7] Cəfərov, E.S. Radiobiologiya / E.S. Cəfərov. – Bakı: Elm, - 2014. - s.278; Касенов, К.М., Ким Д.С., Иркегулов А.Ш. Практическое применение дерева отказов для анализа аварий на ядерных реакторах / К.М. Касенов, Д.С. Ким, А.Ш. Иркегулов – Алматы: Вестник, КазНТУ им. К.И. Сатпаева – 2013. №5 (99), - с. 58, 61, 64

[8] Əliev Ş. Azərbaycan iqtisadiyyatı / Ş. Əliev. – Sumqayıt: SDU, - 2018. - s. 92

[9] Azərbaycan Respublikası Dövlət Neft Şirkətinin Davamli inkisaf haqqında Hesabatı / - Bakı: - 2023. - s. 10.

[10] Azərbaycan Respublikası Dövlət Neft Şirkətinin İllik Hesabatı / - Bakı: - 2023. - s. 60

Southern Gas Corridor pipeline has been constructed, ensuring gas delivery to Europe via Georgia and Turkey.[11] This project is implemented through the South Caucasus Pipeline, Trans-Anatolian Pipeline and Trans-Adriatic Pipeline.

Studies indicate that in the coming periods, the fuel and energy complex will continue to maintain its relevance. The main reason is that Azerbaijan possesses not only significant oil exports but also substantial natural gas potential.[12]

See the results obtained in the paragraph.[13]

The second paragraph of the first chapter, titled ***"Use of alternative and renewable energy sources: theoretical approaches, global experience and development prospects"*** examines the

[11] Əliev Ş. Azərbaycan iqtisadiyyatı / Ş. Əliev. – Sumqayıt: SDU, - 2018. - s.170-171; Adıgözəlov, Z. Azərbaycan Respublikasının Avropa İttifaqı ölkələri ilə siyasi əlaqələri (1991-2006) / Z. Adıgözəlov. – Bakı: CBS PP, - 2015. - s. 37

[12] Hüseynov, T. Azərbaycanın milli iqtisadi inkişaf modeli: nəzəriyyə və praktika / T. Hüseynov. – Bakı: Elm, - 2015. - s. 236

[13] Məmmədov, C.İ. Ənənəvi enerji mənbələri, onların müsbət və mənfi cəhətləri // AMEA-nın Xəbərləri İqtisadiyyat seriyası elmi-praktiki jurnalı, - Bakı: - 2016. №4 (iyul-avqust), - s. 116-124; Məmmədov, C.İ. Nüvə enerjisi, onun müsbət və mənfi cəhətləri // - Naxçıvan: Qeyrət, NDU-nin Elmi əsərlər, İctimai elmlər seriyası jurnalı, - 2017. №2(83), - s. 273-277; Mammadov, J. The Impact of Alternative and Renewable Energy on Global Climate Change // İnternational Edicational Center. «Eurasion Union of Scientists» İnternational Scientific-Research Journal, - Moscow: İSRJ, - 2020. – No. 2 (71)/2020, - Part 5, - P. 18-25; Mammadov, J. The Impact of Alternative and Renewable Energy on Global Climate Change // Forty fourth economic and legal discussions, Intenet-Conference, - Lvov: [con.org.], - 18 february 2020. - P. 3-16; Məmmədov, C.İ. Alternativ və bərpa olunan enerji mənbələrindən istifadənin qlobal iqlim dəyişikliyinə təsiri // AR Təhsil Nazirliyi yanında Peşə Təhsili üzrə Dövlət Agentliyinin Peşə təhsili və insan kapitalı elmi-praktiki, metodiki jurnalı, - Bakı: Letterpress MMC, - 2020. Cild 3, №1, - s. 16-25; Məmmədov, C.İ. Enerji təhlükəsizliyinin təmin olumasında karbohidrogen ehtiyatlarının rolu və əhəmiyyəti // AR Təhsil Nazirliyi yanında Peşə Təhsili üzrə Dövlət Agentliyinin Peşə təhsili və insan kapitalı elmi-praktiki, metodiki jurnalı, - Bakı: Letterpress MMC, - 2023. Cild 6, №3, - s. 48-54; Məmmədov, C.İ. Azərbaycanda ənənəvi enerji mənbələri və onlardan istifadə // AMEA İqtisadiyyat İnstitutu, AMEA-nın Xəbərləri, İqtisadiyyat seriyası elmi-praktiki jurnal, - Bakı: AMEA İqtisadiyyat İnstitutu, - 2019. №2019-4 (iyul-avqust), - s. 111-120; Məmmədov, C.İ. Siyasi-iqtisadi reallıqlar / C.İ. Məmmədov. – Bakı: Elm və təhsil, - 2022. - 188 s.

theoretical foundations related to the industrial-scale application potential of alternative and renewable energy sources, their production capacities, position in the energy balance and the organization and management of enterprises. Based on the experiences of leading countries, long-term development prospects have also been identified.

It is noted that global renewable energy reserves are estimated at 3 869 705 MW [14] and currently 30% of total worldwide energy production is provided by alternative and renewable energy sources.[15]

According to the classification of the International Energy Agency (IEA), alternative and renewable energy sources are divided into five groups: solar energy, wind energy, bioenergy, geothermal energy and hydro energy.[16]

Solar energy reserves *(1 418 969 MW)* are mainly located in the Asian part of the Earth. Specifically, 60.2% of total solar energy reserves are concentrated in Asia.[17]

Wind energy reserves are also mainly located in the Asian part of the Earth *(51.4%)*. The total global wind energy reserves amount to 1 017 199 MW.[18]

The total global geothermal energy potential is 14 846 MW.[19]

In 2023, a total of 29 924,8 TW/h of electricity was produced worldwide, of which 8 988,4 TW/h, approximately 30%, was generated from alternative and renewable energy sources.[20]

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[14] IRENA (International Renewable Energy Agency), Renewable Capacity Statistics 2024. – Abu Dhabi: İRENA, - 2024, - p. 12

[15] REN21 (renewable energy policy network for the 21st century) Renewables 2024, Global Status Report – Paris: REN21 Secretariat, - p. 18

[16] Official website of the International Energy Agency: [Electronic resource] / URL: www.iea.org

[17] IRENA (International Renewable Energy Agency), Renewable Capacity Statistics 2024. – Abu Dhabi: İRENA, - 2024, - p. 21

[18] IRENA (International Renewable Energy Agency), Renewable Capacity Statistics 2024. – Abu Dhabi: İRENA, - 2024, - p. 14

[19] IRENA (International Renewable Energy Agency), Renewable Capacity Statistics 2024. – Abu Dhabi: İRENA, - 2024, - p. 43

[20] The Energy Institute. Statistical Review of World Energy – 2024 | 73rd Edition. – London: UK: Energy Institute, - 2024. – p. 59

Solar energy holds particular importance in this field. High technologies are applied in the production of photovoltaic cells in the USA and Germany, with an efficiency of 12–14%. In these plants, the area required per 1 MW is 2 ha.[21]

In Azerbaijan, the potential of alternative and renewable energy sources is estimated at 27 000 MW onshore and 157 000 MW for wind energy in the national sector of the Caspian Sea, totaling 184 000 MW.[22]

In the Nakhchivan Autonomous Republic, the number of annual sunshine hours is 3 200, while in the Kura-Absheron region it is 2 500. The solar energy per 1 m² amounts to 2 200–2 600 kWh in Nakhchivan and 1 900–2 200 kWh in the Kura-Absheron region.[23]

The annual wind energy potential is close to 800 MW, which is equivalent to 2,4 bln. kWh of electricity. The most favorable areas are the Absheron Peninsula, the Caspian coast and the northwestern islands, where the average wind speed is 6 m/s.[24]

Energy production from biomass uses 500 000 t of waste annually to generate 200 mln. kWh of electricity, which is sufficient to supply 100 000 households.[25]

The hydro energy potential of the country is 40 bln. kWh, of which 4 bln. kWh comes from small-scale hydropower.[26]

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[21] Azərbaycan Respublikasında alternativ və bərpa olunan enerji mənbələrindən istifadə olunması üzrə Dövlət Proqramı / Azərbaycan Respublikası Prezidentinin 2004-cü il 21 oktyabr tarixli 462 nömrəli Sərəncamı ilə təsdiq edilmişdir. Azərbaycan Respublikasının Qanunvericilik Toplusu, – Bakı: - 2004. - №10, - maddə 838, - s. 2

[22] Azərbaycan Respublikası Nazirlər Kabinetinin 2023-cü ildə fəaliyyəti haqqında Hesabat / - Bakı: - 2024. - s. 115

[23] Azərbaycan Respublikasında alternativ enerji mənbələrindən istifadənin inkişaf perspektivləri // AMEA, Energetikanın problemləri jurnalı, – Bakı: [n.y.], - 2004. №1, -s. 17

[24] Azərbaycan Respublikasında alternativ və bərpa olunan enerji mənbələrindən istifadə olunması üzrə Dövlət Proqramı / Azərbaycan Respublikası Prezidentinin 2004-cü il 21 oktyabr tarixli 462 nömrəli Sərəncamı ilə təsdiq edilmişdir. Azərbaycan Respublikasının Qanunvericilik Toplusu, – Bakı: - 2004. - №10, - maddə 838. - s. 3

[25] "Təmiz Şəhər" Açıq Səhmdar Cəmiyyətinin rəsmi internet ünvanı: [Elektron resurs] / URL: https://tamizshahar.az/az/layiheler/2

[26] Sultanova, R.P. Azərbaycanda bərpa olunan enerji mənbələrindən istifadənin

The territory of the Republic is also rich in thermal waters, which cover extensive areas such as the Caucasus Mountains, the Absheron Peninsula, the Talish mountain-slope zone, the Kura depression and the Caspian coastal-Quba region.[27]

In 2023, a total of 29 305,9 mln. kWh of electricity was produced in the country, of which 2 122,5 mln. kWh *(8.4%)* came from alternative and renewable energy sources. Of this, 1 763,4 mln kWh was generated by hydro energy, 223 mln. kWh by bioenergy, 80,7 mln. kWh by solar energy and 55.4 mln. kWh by wind energy.[28]

See the results obtained in the paragraph.[29]

The third paragraph of the first chapter, titled ***"The impact of renewable energy enterprises on regional sustainable development in the liberated territories"*** outlines the extent of damage to the energy infrastructure during the occupation and substantiates that the establishment of new energy enterprises based on alternative and renewable energy sources in these areas will contribute to socio-economic and ecological rehabilitation, as well as ensure regional sustainable development.

According to calculations, the solar energy potential in Eastern Zangezur is 7 214 MW and in agricultural lands it exceeds 4 000 MW.[30]

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iqtisadi, ekoloji və sosial məqsədəuyğunluğunun müəyyən edilməsi // R.P. Sultanova, M.R. Əyyubov, N.V. Əhmədov [və b.]. – Bakı: AMEA-nın Xəbərləri jurnalı. Dünya iqtisadiyyatı, İqtisadiyyat seriyası, - 2019. (sentyabr-oktyabr), - s. 110

[27] Azərbaycan Respublikasında alternativ və bərpa olunan enerji mənbələrindən istifadə olunması üzrə Dövlət Proqramı / Azərbaycan Respublikası Prezidentinin 2004-cü il 21 oktyabr tarixli 462 nömrəli Sərəncamı ilə təsdiq edilmişdir. Azərbaycan Respublikasının Qanunvericilik Toplusu, – Bakı: - 2004. - №10, - maddə 838. - s. 6

[28] Energetika / Azərbaycan Respublikasının Dövlət Statistika Komitəsinin rəsmi internet ünvanı: [Elektron resurs] / URL: https://www.stat.gov.az/source/balance_fuel/

[29] Məmmədov, C.İ. Alternativ və bərpa olunan enerji mənbələrindən istifadə üzrə dünya təcrübəsi // BDU, Siyasi-iqtisadi sabitlik və ölkənin inkişaf perespektivləri mövzusunda Respublika səviyyəli elmi-praktik konfransın materialları, - Bakı: - 10-11 may 2017. - s. 385-392; Məmmədov, C.İ. Azərbaycanda alternativ və bərpa olunan enerji mənbələri və onlardan istifadə // NDU, Elmi əsərlər, İctimai elmlər seriyası, - Naxçıvan: Qeyrət, - 2017. №6(87), - s. 329-334

[30] İşğaldan azad edilmiş ərazilərdə bərpa olunan enerji üzrə dəqiq potensialın

The wind energy potential is estimated to be between 300-500 MW, with an average annual wind speed ranging from 7-10 m/s.

About 25% of the country's total local water resources, approximately 2,56 bln.m³, are concentrated in the Karabakh and Eastern Zangezur regions. Currently, the construction of the "Khudafarin" and "Giz Galasi" HPPs on the Aras river, as well as the "Tartar" HPP on the Tartar river, is underway.[31]

In total, 20 plants are currently operational, while construction continues at 12 others. In the near future, their number will reach 32, with a total capacity of 269,6 MW. Within the framework of the First State Program on the Great Return, by 2026, 60 HPPs are planned to be established, 37 of them new and 23 through restoration.[32]

Additionally, the Kelbajar district has geothermal energy resources of 3 093 m³/day, while the Shusha district has 412 m³/day.

See the results obtained in the paragraph.[33]

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hesablanması sahəsində görüləcək işlər müzakirə edilib / Azərbaycan Respublikası Energetika Nazirliyinin rəsmi internet ünvanı: [Elektron resurs] / URL: https://minenergy.gov.az/az/xeberler-arxivi/isgaldan-azad-edilmis-erazilerde-berpa-olunan-enerji-uzre-deqiq-potensialin-hesablanmasi-sahesinde-gorulecek-isler-muzakire-edilib

[31] Sazişlər / Azərbaycan Respublikası Energetika Nazirliyinin rəsmi internet ünvanı: [Elektron resurs] / URL: https://minenergy.gov.az/az/beynelxalq-muqavileler/sazisler

[32] Azərbaycan Respublikasının Energetika Nazirliyi və tabeli qurumlar tərəfindən görülmüş işlərə dair Hesabat / - Bakı: - 2023. - s. 23

[33] Məmmədov, C.İ. İşğaldan azad edilmiş ərazilərin mövcud enerji potensialı, yenidən bərpası və inkişaf perspektivləri // AMİU-nin Tikintinin iqtisadiyyatı və menecment elmi-praktiki jurnalı, - Bakı: Nəşriyyat – Poliqrafiya Mərkəzi, - 2021. №2, - s. 105-114; Məmmədov, C.İ. Qarabağ və Şərqi Zəngəzur bölgələrinin bərpası və sürətli inkişafında bərpa olunan enerji mənbələrinin rolu // - Bakı: AMEA Məruzələr jurnalı, - 2021. №1-2, - s. 71-77; Məmmədov, C.İ. İşğaldan azad edilmiş ərazilərin sosial-iqtisadi inkişafında bərpa olunan enerji mənbələrinin əhəmiyyəti // - Ağdam-Bakı: "Qarabağda yeni iqtisadiyyat quruculuğu: Ağdamdan inkişaf impulsları adlı I Beynəlxalq Elmi-praktiki Konfrans, - 16-17 sentyabr 2021. - s. 338-346; Məmmədov, C.İ. İşğaldan azad edilmiş ərazilərin sosial-iqtisadi inkişafında bərpa olunan enerji mənbələrinin əhəmiyyəti // AR Təhsil Nazirliyi yanında Peşə Təhsili üzrə Dövlət Agentliyinin Peşə təhsili və insan kapitalı elmi-praktiki, metodiki jurnalı, - Bakı: Letterpress MMC, - 2022. Cild 5, №4, - s. 47-55

The second chapter of the dissertation, titled **"Incentive policy for the development of alternative and renewable energy production enterprises"** consists of 5 paragraphs.

The first paragraph of the second chapter, titled ***"Expansion of renewable energy enterprises"*** Activities: Structural Reforms and Improvement of the Legislative Framework," analyzes the institutional structure and existing regulatory framework for the organization and management of enterprises operating based on alternative and renewable energy sources. It also substantiates the necessity of improving the legal and organizational framework based on international experience.

It is noted that in 2009, the State Agency for Alternative and Renewable Energy Sources was established in Azerbaijan to promote the implementation of ARES and increase the efficiency of energy resources.[34]

Additionally, a legal framework for the renewable energy sector has been established and a number of regulatory acts have been adopted.

For instance, the "State Program on the Use of Alternative and Renewable Energy Sources in the Republic of Azerbaijan" dated 2004 was approved and the significance of this program has been reflected in various laws.[35]

For example, laws such as "On the use of renewable energy sources in electricity generation",[36] and "On the efficient use of

[34] Azərbaycan Respublikası Sənaye və Energetika Nazirliyinin Alternativ və Bərpa Olunan Enerji Mənbələri üzrə Dövlət Agentliyinin yaradılması haqqında Azərbaycan Respublikası Prezidentinin Fərmanı. 16 iyul 2009-cu il. №123 // Azərbaycan qəzeti, - 2009. - 17 iyul. - №154. - s. 2

[35] Azərbaycan Respublikasında alternativ və bərpa olunan enerji mənbələrindən istifadə olunması üzrə Dövlət Proqramı / Azərbaycan Respublikası Prezidentinin 2004-cü il 21 oktyabr tarixli 462 nömrəli Sərəncamı ilə təsdiq edilmişdir. Azərbaycan Respublikasının Qanunvericilik Toplusu, – Bakı: - 2004. - №10, - maddə 838.

[36] Elektrik enerjisi istehsalında bərpa olunan enerji mənbələrindən istifadə haqqında Azərbaycan Respublikasının Qanunu. - 31 may 2021-ci il, №339-VIQ // Azərbaycan Respublikasının Qanunvericilik Toplusu. - 2021. - №7, - maddə 702; Azərbaycan qəzeti. - 2021. - 14 iyul. - №145. - s. 2

energy Resources and energy efficiency"[37] not only establish the legal and economic foundations for the use of ARES but also provide for incentive measures in this sector.

See the results obtained in the paragraph.[38]

In the second paragraph of the second chapter, titled ***"Formation and management of investment policy for enterprises operating in the alternative and renewable energy sector***" the main directions of investment policy for the development of enterprises in this sector, the need to increase investment attractiveness and the necessity of implementing incentive mechanisms to expand private sector participation have been substantiated.

It is known that the development of ARES is important for diversifying energy production and ensuring its continuity. This factor leads to an increase in investment flows and rapid development at the global level.

Thus, in 2023, a total of 623 bln. USD was invested globally in the ARES sector.[39] This figure was 33 bln. USD in 2004. Overall, over the past 20 years, total investments in this sector have exceeded 9,6 trln. USD.[40]

According to IEA forecasts, by 2030 this figure is expected to triple and by 2050 it is projected to quadruple.[41]

Investments in solar energy amount to 300 bln. USD, accounting for 60% of the total, while wind energy ranks second with

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[37] Enerji resurslarından səmərəli istifadə və enerji effektivliyi haqqında Azərbaycan Respublikasının Qanunu. 9 iyul 2021-ci il. №359-VIQ // Azərbaycan Respublikasının Qanunvericilik Toplusu. – 2021. - 31 avqust. - №8, - maddə 901. Azərbaycan qəzeti, – 2021. - 22 avqust. - №176. - s. 2

[38] Məmmədov, C.İ. Bərpa olunan enerji mənbələrinin idarəedilməsinin təkmilləşdirilməsinin istiqamətləri // AMİU-nin Tikintinin iqtisadiyyatı və menecment elmi-praktiki jurnalı, - Bakı: Nəşriyyat – Poliqrafiya Mərkəzi, - 2020. №3, - s. 108-119

[39] REN21 (renewable energy policy network for the 21st century) Renewables 2024, Global Status Report – Paris: REN21 Secretariat, - p. 28

[40] Bloomberg New Energy Finance. Report: Energy transition investment trends – 2024: Tracking global investment in the low-carbon energy transition. - London: Bloomberg NEF, - january 2024. - p. 8-12

[41] European İnvestment Bank (EIB). Report: Energy overview 2023. – Luxembourg: EİB, - 2023, - p. 1

174 bln. USD.[42]

In our country, to create a favorable investment environment in ARES, 140,3 mln. AZN was allocated from the 2023 state budget for 12 projects in this sector.[43]

Over the past 20 years, thanks to investments in this sector, installed capacity has increased from 4,4 k. MW to 8,3 k. MW and 54 new ARES-designated power plants have been commissioned. This accounts for 20,3 % of total production capacity. In the future, through cooperation with foreign investors, it is planned to increase renewable energy capacity to 10 GW.[44]

See the results obtained in the paragraph.[45]

The third paragraph of the second chapter, titled ***"Financial incentives and entrepreneurship development in renewable energy enterprises"*** examines the current state of renewable energy enterprises, the applied financial incentive policies and their effectiveness for enhancing energy security. It also emphasizes the importance of creating a favorable business environment and expanding financial support to entrepreneurial entities, particularly through concessional credit mechanism.

The paragraph notes that two main incentive policies are applied worldwide to promote the development of ARES: Financial incentives and Tax incentives.[46]

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[42] Statista. German online platform. Specializes in data gathering and visualization – Hamburg: Statista GmbH, - 2024. – 50 p.

[43] Azərbaycan Respublikası Nazirlər Kabinetinin 2023-cü ildə fəaliyyəti haqqında Hesabat / - Bakı: - 2024. - s. 138

[44] Azərbaycan Respublikası Nazirlər Kabinetinin 2023-cü ildə fəaliyyəti haqqında Hesabat / - Bakı: - 2024. – s. 103,106

[45] Məmmədov, C.İ. Dünyada alternativ və bərpa olunan enerji mənbələrinin inkişafında investisiya siyasətinin rolu // AMEA-nın Xəbərləri İqtisadiyyat seriyası elmi-praktiki jurnalı, - Bakı: AMEA İqtisadiyyat İnstitutu, - 2019. №2019-3 (may-iyun), - s. 122-131; Məmmədov, C.İ. Azərbaycanda alternativ və bərpa olunan enerji mənbələri və investisiya siyasəti // AMEA Naxçıvan Bölməsi, Xəbərlər jurnalı, İctimai və humanitar elmlər seriyası, - Naxçıvan: Tusi, - 2017. Cild 13, №3, - s. 330-337

[46] Çelikkaya, A. Yenilenebilir Enerjinin Teşvikine Yönelik Uluslararası Kamu Politikaları Üzerine Bir İnceleme / A. Çelikkaya – İstanbul: Eskişehir Osmangazi Üniversitesi, Maliye Dergisi, - Ocak-Haziran 2017. - №172, - s. 54

Financial incentives include the Feed-in Tariff (FiT) policy and the Quota policy. [47] The Feed-in Tariff policy supports electricity generation by providing investors with a 15–25 year guaranteed purchase.[48] Tariffs are determined based on investment risk, project cost and operational lifetime.

There are two main types of this model: [49] the fixed price model and the premium-added model. The fixed price model has 4 variants:[50] inflation-adjusted, long-term tariff, fixed price and spot market price models.

The premium-added tariff model, based on investment risk, adds a premium to the market price and is divided into three types: fixed premium, variable premium and fixed interest rate models.[51]

The quota policy requires that a certain percentage of electricity be produced from ARES and is based on allowing the market price to be determined freely.[52]

Tax incentives, on the other hand, are implemented as a complementary type of support policy.[53]

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[47] Çelikkaya, A. Avrupa Birliği Üyesi Ülkelerde Yenilenebilir Enerjiye Sağlanan Teşvikler Üzerine Bir İnceleme / A. Çelikkaya – İstanbul: T.C. Sayıştay Başkanlığı, Sayıştay Dergisi - ocak-mart 2017. - Sayı 104, - s. 2

[48] Çelikkaya, A. Yenilenebilir Enerjinin Teşvikine Yönelik Uluslararası Kamu Politikaları Üzerine Bir İnceleme / A. Çelikkaya – İstanbul: Eskişehir Osmangazi Üniversitesi, Maliye Dergisi, - Ocak-Haziran 2017. - №172, - s. 60; Çelikkaya, A. Avrupa Birliği Üyesi Ülkelerde Yenilenebilir Enerjiye Sağlanan Teşvikler Üzerine Bir İnceleme / A. Çelikkaya – İstanbul: T.C. Sayıştay Başkanlığı, Sayıştay Dergisi - ocak-mart 2017. - Sayı 104, - s. 4

[49] Couture, T., Gagnon, Y. An Analysis off Feed-in Tariff Remuneration Models: Implications for Renewable Energy Investment // Energy Policy Journal – Amsterdam: Elsevier, - 2010. Vol. 38, - P. 955-965

[50] Çelikkaya, A. Yenilenebilir Enerjinin Teşvikine Yönelik Uluslararası Kamu Politikaları Üzerine Bir İnceleme / A. Çelikkaya – İstanbul: Eskişehir Osmangazi Üniversitesi, Maliye Dergisi, - Ocak-Haziran 2017. - №172, - s. 62

[51] Çelikkaya, A. Yenilenebilir Enerjinin Teşvikine Yönelik Uluslararası Kamu Politikaları Üzerine Bir İnceleme / A. Çelikkaya – İstanbul: Eskişehir Osmangazi Üniversitesi, Maliye Dergisi, - Ocak-Haziran 2017. - №172, - s. 63

[52] REN21 (Renewable Energy Policy Network for the 21st century), Renewables 2024, Global Status Report – Paris: REN21 Secretariat, - P. 250

[53] Yong, Z., Tang, K., Wang, L. Do Renewable Electricity Policies Promote Renewable Electricity Generation? Evidence from Panel Data // Energy Policy

See the results obtained in the paragraph.[54]

The fourth paragraph of the second chapter, titled ***"Regulation of tax and customs policy in the activities of renewable energy production enterprises"*** emphasizes the role of tax and customs policies in the development of renewable energy enterprises, highlighting the importance of reducing tax burdens and implementing incentive measures.

In our country, significant reforms have been implemented in the tax and customs sectors to support the efficient use of ARES, providing exemptions from duties and VAT on equipment and materials, thereby enhancing the development and efficiency of the energy sector.

In international practice (e.g., Czech Republic, Philippines), renewable energy equipment is often fully exempt from customs duties. In China, an 82% exemption is applied to wind turbines and a 30% exemption to solar panels.[55]

One of the economic instruments used by the state for stimulation is the provision of tax incentives.

In international tax practice, incentives take various forms. These include tax holidays, tax credits, investment incentives, accelerated depreciation, reduction of tax rates and others.

A tax holiday is understood as a complete exemption from taxes for a certain period to allow a company to achieve higher profits.[56] Tax holidays are particularly used by developing countries as an

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Journal – Amsterdam: Elsevier, – 2013. – No. 62: - P. 887-897

[54] Məmmədov, C.İ. Alternativ və bərpa olunan enerji istehsalında maliyyə təşviqi siyasətinin rolu // AR Təhsil Nazirliyi yanında Peşə Təhsili üzrə Dövlət Agentliyinin Peşə təhsili və insan kapitalı elmi-praktiki, metodiki jurnalı, - Bakı: Letterpress MMC, - 2019. Cild 2, №2, - s. 38-44; Məmmədov, C.İ. Alternativ və bərpa olunan enerjinin inkişafında güzəştli kreditlərin rolu // AMİU-nun Tikintinin iqtisadiyyatı və menecment elmi-praktiki jurnalı, - Bakı: Nəşriyyat – Poliqrafiya Mərkəzi, - 2018. №4, - s. 17-23

[55] Çelikkaya, A. Yenilenebilir Enerjinin Teşvikine Yönelik Uluslararası Kamu Politikaları Üzerine Bir İnceleme / A. Çelikkaya – İstanbul: Eskişehir Osmangazi Üniversitesi, Maliye Dergisi, - Ocak-Haziran 2017. - №172, - s. 75

[56] İqtisadiyyatın stimullaşdırılması: vergi tətilləri / «Vergilər» qəzetinin internet portalı: [Elektron resurs] / URL: http://vergiler.az/art-view/1378/

incentive to attract foreign capital. The duration of a tax holiday typically ranges from 5 to 10 years.[57]

A tax credit is applied in both short-term and long-term forms, allowing the postponement of tax payments for a certain period.[58]

Additionally, in combating climate change, various economic measures are employed, including the use of a carbon tax.[59]

See the results obtained in the paragraph.[60]

In the fifth paragraph of the second chapter, titled ***"The role of scientific research and human capital in the development of renewable energy enterprises"*** the role and significance of scientific research in the development of renewable energy enterprises were examined. Additionally, the formation of specialized human capital in these enterprises, its impact on organizational management and the process of educating consumers were studied.

It is noted that scientific research is essential for the development of new technologies, improving efficiency and protecting the environment.

For this purpose, ongoing scientific practices are currently being conducted at research institutes and universities in Azerbaijan to accelerate the transition from traditional energy sources to ARES.[61]

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[57] Hasan, A. Vergi tatili (Tax holiday) nedir? Türkiyede vergi tatili uygulama örnekleri / A. Hasan – Ankara: [n.y.], - 2017. - s. 1-3

[58] Ulusoy, A. Yenilebilir enerji kaynaklarına yönelik vergisel teşviklerin değerlendirilmesi / A. Ulusoy, C. Bayraktar – Ankara: HAK-İŞ Uluslararası Emek ve Toplum Dergisi, - 1/2018. - Cilt 7. - Yıl 7. - Sayı 17. - s. 138

[59] KPMG Türkiye (Klynveld Peat Marwick Goerdeler), Yenilenebilir enerjiye yönelik vergi ve teşvikler. Araştırma – Ankara: KPMG, – 2016. - s. 2

[60] Məmmədov, C.İ. Azərbaycanda və dünyada alternativ, bərpa olunan enerji istehsalı müəssisələrinin inkişafında vergi və gömrük siyasətinin rolu // AR Təhsil Nazirliyi yanında Peşə Təhsili üzrə Dövlət Agentliyinin Peşə təhsili və insan kapitalı elmi-praktiki, metodiki jurnalı, - Bakı: Letterpress MMC, - 2019. Cild 2, №3, - s. 42-51; Məmmədov, C.İ. Azərbaycanda alternativ və bərpa olunan enerji istehsalında vergi siyasətinin rolu // AMEA İqtisadiyyat İnstitutu, Strateji iqtisadi islahatlar: aktiv vergi siyasəti və vergiqoyma problemləri mövzusunda Beynəlxalq səviyyəli elmi-praktik konfransın materialları, - Bakı: 12 oktyabr 2017. - s. 385-392

[61] Azərbaycan Respublikasında alternativ və bərpa olunan enerji mənbələrindən istifadə olunması üzrə Dövlət Proqramı / Azərbaycan Respublikası Prezidentinin

As an example, combined heat and hot water supply technologies, solar collectors and wind-solar systems have been developed, while automatic tracking systems and thin-film solar cells have been studied.[62] Additionally, a mathematical model has been developed for radiation calculation in mountainous regions.[63]

Additionally, within the framework of international cooperation, innovative technologies have been implemented to ensure the efficient use of ARES. Joint research has been conducted with domestic and foreign partners in the fields of thin-film solar cells, hybrid energy systems and biogas production.[64]

In addition, in accordance with the provisions of the State Program, close cooperation has been established with the country's leading scientific and educational institutions to develop human resources.[65] Thus, currently, several higher education institutions offer specialized courses on renewable energy at both bachelor's and master's levels.[66]

Master's theses are also being carried out in the field of

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2004-cü il 21 oktyabr tarixli 462 nömrəli Sərəncamı ilə təsdiq edilmişdir. Azərbaycan Respublikasının Qanunvericilik Toplusu, – Bakı: - 2004. - №10, - maddə 838

[62] Azərbaycan Milli Elmlər Akademiyasının 2023-cü ildəki fəaliyyəti haqqında Hesabat // – Bakı: Elm, - 2024. - s. 123-126

[63] Azərbaycan Milli Elmlər Akademiyasının 2024-cü ildəki fəaliyyəti haqqında Hesabat // – Bakı: Elm, - 2025. - s. 112-113

[64] Beynəlxalq təşkilatlarla əməkdaşlıq / Bərpa Olunan Enerji Mənbələri Dövlət Agentliyinin rəsmi internet ünvanı: [Elektron resurs] / URL: http://www.area.gov.az/page/7; Azərbaycan Milli Elmlər Akademiyasının 2023-cü ildəki fəaliyyəti haqqında Hesabat // – Bakı: Elm, - 2024. - 345 s.; Azərbaycan Milli Elmlər Akademiyasının 2024-cü ildəki fəaliyyəti haqqında Hesabat // – Bakı: Elm, - 2025. - 323 s.; Sənaye mülkiyyəti (İxtiralar, faydalı modellər və sənaye nümunələri) aylıq rəsmi bülleten. – Bakı: Azərbaycan Respublikası Əqli Mülkiyyət Agentliyinin Patent və Əmtəə Nişanlarının Ekspertizası Mərkəzi, - 2021. - №4. - s.6; Sənaye mülkiyyəti (İxtiralar, faydalı modellər və sənaye nümunələri) aylıq rəsmi bülleten. – Bakı: Azərbaycan Respublikası Əqli Mülkiyyət Agentliyinin Patent və Əmtəə Nişanlarının Ekspertizası Mərkəzi, - 2022. - №1. - s. 7

[65] Bərpa Olunan Enerji Mənbələri Dövlət Agentliyinin rəsmi internet ünvanı: [Elektron resurs] / URL: https://area.gov.az/az

[66] Azərbaycan Respublikasının Energetika Nazirliyi və tabeli qurumlar tərəfindən görülmüş işlərə dair Hesabat / - Bakı: - 2021, - s. 11

renewable energy use. At the same time, doctoral programs are active in scientific areas such as the utilization of alternative energy sources, energy conversion processes and the fundamental issues of environmentally friendly energy.[67]

In addition to the training of specialists in the field of renewable energy, consumer awareness is also one of the main priority directions.

For this purpose, awareness-raising trainings are conducted in enterprises, international events, the media and educational institutions on the necessity of transitioning to ARES and their advantages.[68] In addition, awareness activities are carried out with entrepreneurs regarding the benefits of utilizing geothermal water resources during the autumn-winter season.

See the results obtained in the paragraph.[69]

The third chapter of the dissertation, titled **"Perspectives on the formation and development of enterprises through the use of alternative and renewable energy sources"** consists of 2 paragraphs.

The first paragraph of the third chapter, titled ***"Application of Multi-Criteria Decision-Making (MCDM) methods at the enterprise level in the selection of energy sources"*** notes that MCDM methods enable the evaluation of multiple alternatives based on various criteria and priorities when enterprises select energy sources and are primarily based on mathematical programming approaches.

However, the models and solution procedures used here vary.

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[67] Azərbaycan Respublikasının Energetika Nazirliyi və tabeli qurumlar tərəfindən görülmüş işlərə dair Hesabat / - Bakı: - 2022, - s. 7-58

[68] Azərbaycan Respublikasının Energetika Nazirliyi və tabeli qurumlar tərəfindən görülmüş işlərə dair Hesabat / - Bakı: - 2023, - s. 5

[69] Məmmədov, C.İ. Alternativ və bərpa olunan enerjinin inkişafında elmi tədqiqatların rolu // AR Prezidenti yanında Dövlət İdarəçilik Akademiyasının Dövlət idarəçiliyi: nəzəriyyə və təcrübə elmi-praktiki jurnalı, - Bakı: Təhsil Nəşriyyat-Poliqrafiya, - 2018. №2(62), - s. 277-288; Məmmədov, C.İ. Alternativ və bərpa olunan enerjidən istifadə üzrə mütəxəssislərin hazırlanması və istehlakçıların maarifləndirilməsi // AR Təhsil Nazirliyi yanında Peşə Təhsili üzrə Dövlət Agentliyinin Peşə təhsili və insan kapitalı elmi-praktiki, metodiki jurnalı, - Bakı: Letterpress MMC, - 2018. Cild 1, №2, - s. 47-52

Specifically, the MCDM methods, implemented through different approaches, are represented by decision-making matrices based on experts' knowledge.[70]

Additionally, the study highlights how various MCDM methods are applied in the energy sector and outlines their strengths and weaknesses. The areas where MCDM methods are most frequently used include energy policy development, selection of energy resources, siting of energy facilities and other related issues.[71]

Among the methods mentioned in the study are TOPSIS, AHP, VIKOR, ELECTRE, ANP and PROMETHEE. Each method has its own strengths and weaknesses. The choice of method depends on the complexity of the problem, the requirements of the decision-makers and the data being used.[72]

Thus, MCDM methods ensure that multiple criteria are considered for making appropriate decisions in the energy sector and other fields. However, the selection and application of these methods should be carried out in accordance with the specific requirements of the problem.

See the results obtained in the paragraph.[73]

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[70] Kumar, A., Sah, B., Singh, A.R. [et al.]. A review of multi criteria decision making (MCDM) towards sustainable renewable energy development // Renewable and Sustainable Energy Reviews, - Amsterdam: Elsevier, - 2017. – No. 69(1), - P. 596-609

[71] Bohra, S.S., Anvari-Moghaddam, A.A. Comprehensive Review on Applications of Multi-Criteria Decision-Making Methods in Power and Energy Systems // International Journal of Energy Research. – New Jersey: Viley, - 2022. – Vol. 46, - No. 4, - P. 4088-4118

[72] Zardari, N.H., Shirazi, Sh. M., Ahmed, K. [et al.]. Eastern University Weighting Methods and their Effects on Multi-Criteria Decision Making Model Outcomes in Water Resources Management // Springer Briefs in Water Science and Technology, - Cham: Springer, - 2015. - P. 14-23; Kaya, I., Çolak, M., Terzi, F. Use of MCDM techniques for energy policy and decision-making problems: A review // International Journal of Energy Research, - Hoboken: John Wiley & Sons, - 2018. – No. 42(7), - P. 2344-2372

[73] Nuriyev, M., Mammadov, J., Mammadov, J., Renewable Energy Sources Development Risk Analysis and Evaluation: the case of Azerbaijan // İn: ICSRS 2019: International Conference on Recent Social Studies and Research. – Rome: ICSRS, – 25-26 october 2019. - P. 52; Nuriyev, M., Mammadov, J., Mammadov, J., Renewable Energy Sources Development Risk Analysis and Evaluation: the

In the second paragraph of the third chapter, titled ***"Identification of regional strategic priorities in the development of alternative and renewable energy enterprises"*** the role of renewable energy enterprises in economic development and energy supply is examined. In particular, the strategic importance of selecting energy sources in accordance with the geographical and climatic conditions of different economic regions is emphasized.

In the study, an extended TOPSIS method based on Z-numbers is applied to determine the optimal selection of energy sources such as solar, wind, hydro and bioenergy in 2 economic regions of Azerbaijan.[74]

This paragraph analyzes energy options for the Karabakh and Guba-Khachmaz economic regions, prioritizing energy sources based on the specific characteristics of each area. The study presents a ranking of the most suitable energy sources for each region. For example, in the mountainous parts of Karabakh, hydroenergy is dominant, while in the lowland areas, solar energy prevails. In the Guba-Khachmaz economic region, wind energy is identified as more efficient along the coastal zones, whereas solar and hydroenergy are preferred in the foothill areas.[75]

The research can make a substantial contribution to strategic decision-making in Azerbaijan's energy sector to ensure sustainable development and energy security.[76] In this regard, the application of the extended TOPSIS method based on Z-numbers holds significant importance for sustainable economic development and energy security in Azerbaijan.

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case of Azerbaijan // European Journal of Economics and Business Studies, – Tirana: EJEBS, – september - december 2019. – Vol. 5, - Issue 3, - P. 11-20

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See the results obtained in the paragraph.[77]

In the **"Conclusion"** section of the dissertation, the research is summarized and the obtained results are presented in the form of theoretical propositions:

1. Along with their positive impact on meeting society's energy demand and supporting socio-economic development, the significant negative effects of conventional energy sources on the environment are undeniable. Moreover, considering the limited availability of these energy sources, they cannot be regarded as a fully reliable form of energy.

The problem can be addressed through two possible approaches:

- Reducing energy consumption through the efficient and economical use of existing conventional energy sources;
- Minimizing dependence on conventional energy sources by using ARES and ultimately eliminating this dependence in the future.

2. It is known that currently the energy obtained from ARES is not sufficiently high, which does not allow for a complete abandonment of existing conventional energy sources. Overcoming such shortcomings is possible only through the development of the material and technical base in this sector, as well as the introduction of new and improved high technologies that meet modern standards. In addition, the application of advanced methods and large-scale, modern and successful innovative projects can play a decisive role in intensifying energy production and achieving high efficiency in this strategic field.

3. In Azerbaijan, it is important to further expand cooperation with countries that possess advanced experience and high

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technologies in order to develop the renewable energy sector and benefit from experience exchange. Effective collaboration in this field will provide broad opportunities for the full and efficient utilization of ARES. Such joint efforts can ensure the creation and development of new energy capacities based on the existing ARES in the country. As a result, significant outcomes can be achieved in ensuring the nation's sustainable energy security, as well as in promoting employment through the establishment of new energy production facilities.

4. The restoration of the territories liberated from occupation, as well as the socio-economic development of the region, can benefit from establishing cooperation with various reputable international organizations, actively involving them in the process and accelerating the implementation of adopted state programs. Additionally, it is important to attract highly qualified foreign experts recognized internationally to this field and utilize their theoretical and practical knowledge. In the future, there will be a need for more extensive scientific and practical research to determine the existing economic potential and prospective development directions of the liberated territories.

5. The improvement of the organizational structure in the efficient use of ARES, along with the adopted activity programs, regulatory legal acts and laws, is of significant importance for stimulating the development of energy production enterprises in this field. In particular, the State Program adopted in 2004 has played a decisive role in the development of this sector. According to this State Program, substantial work has been carried out in areas such as overall sectoral strategies, the increase of qualified personnel, the assessment of alternative and renewable energy resources and the determination of operational directions. In this regard, future draft laws should take into account not only international experience but also the specific needs and realities of the Republic. The main goal is to ensure the application of concessional loans and tax incentives, as well as to achieve a significant increase in the share of alternative and renewable energy within the overall energy sector.

Thus, the establishment of a regulatory and legal framework, the organization of a proper administrative management structure and

the efficiency of the management process will create favorable conditions for a conducive investment environment for investors in the country, significantly reducing existing shortcomings and promoting the development of this sector.

6. To expand the use of ARES and ensure its development, a modern financial incentive policy should be implemented to increase both domestic and foreign investors' interest in this sector and to promote entrepreneurship in the country. By reducing investors' financial costs and creating an investment environment that remains competitive against traditional energy production enterprises, the application of financial incentive measures can drive the sector's development. In particular, establishing renewable energy infrastructure in the territories liberated from occupation requires significant financial resources. Therefore, involving the private sector and foreign investors is essential. However, low electricity tariffs pose certain challenges for attracting investment to the energy sector. In this context, revising the tariffs can be implemented as one of the incentive measures to attract investors to this field.

7. In the future, in line with the international commitments supported by our country, the implementation of a carbon tax and directing the revenues directly toward the development of the alternative and renewable energy sector could be a positive step. At the same time, to promote the use of ARES, it is important to expand the application of tax exemptions and privileges and to implement new incentive projects. These measures will stimulate the adoption of modern equipment and new technologies in renewable energy production, intensify investment attraction and ensure the country's access to high-quality and sustainable energy. Additionally, considering the significant role of small and medium-sized enterprises, it would be appropriate to extend tax holidays not only to newly established enterprises but also to those that have launched new lines of activity. In particular, granting tax holidays to enterprises implementing innovations is of great importance.

8. In the renewable energy sector, the main goal of conducting research and implementing projects is to increase the share of energy obtained from renewable sources in the country's overall energy balance by utilizing local scientific and technical potential as well as

advanced international experience. Therefore, to promote the development of ARES, it is necessary to carry out research regularly and systematically, establish new experimental laboratories and research institutes and expand their material and technical base by increasing financial support for this sector.

9. In the Republic, developing a specialized workforce for the advancement of renewable energy is extremely necessary. Modern technical equipment imported into the country requires substantial funds for maintenance and calibration. Hiring qualified foreign specialists in this field is financially unfeasible for enterprises. Therefore, there is a greater need for local experts. In this context, training local specialists for the operation of technical equipment and facilities, as well as for the implementation of new technologies in the renewable energy sector, is of critical importance.

In this regard, vocational education institutions operating in our country should establish specialized training groups to prepare qualified personnel for the use of ARES. At the same time, the participation of specialists working in ARES production enterprises in advanced courses, specialized training programs and professional development at internationally recognized educational institutions and research centers should be increased.

10. The promotion of efficient use of ARES should be expanded. Raising public awareness about the positive effects of using ARES both on the national economy and the environment through energy conservation is extremely important for the future development of this sector.

11. The ability of MCDM methods to account for various criteria and weights makes them indispensable for providing reliable solutions under changing conditions. Therefore, the application of these methods in the energy sector can contribute not only to solving current problems but also to the development of future research and innovations.

12. The extended TOPSIS method based on Z-numbers is an effective tool for evaluating uncertain and fuzzy data. This approach can contribute not only to the development of the national energy

sector but also to regional development and the improvement of the investment climate. As a result, the efficient use of renewable energy potential strengthens the country's energy security, ensures ecological sustainability and supports economic growth.

**The following scientific articles covering the content of the dissertation have been published:**


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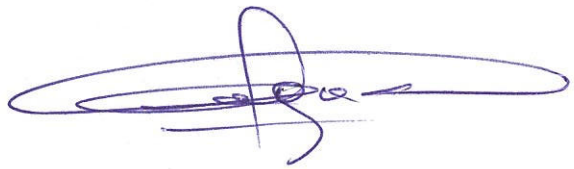

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