**"İQTİSADİ İSLAHATLAR"**
**elmi-analitik jurnal**

# ANALYSIS OF THE TRANSITION OF TRADITIONAL ENERGY SOURCES TO ALTERNATIVE SOURCES

№ 2 (3)

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**ABSTRACT**

The growing economic development of the world countries and high demand for energy resources as a main driver of modern society tempts states and businesses to provide urban and rural areas with these resources. Energy resources involved in many essential life processes of modern human being. Starting from electricity that humanity us on a daily basis and ending with fuel types that is used transportations energy resources are used in all fields of our life. This is well known fact that as much as energy resources are important in our life still they are the main causes for pollution of environment and climatic changes and cataclysms. Moreover, the depletion of energy resources that are not renewable tends to make them scarce and costly and people start to think how to cope with this global problem. The idea of this research is to investigate the current situation in the world countries according energy resources and how alternative energy resources are applied by countries, which policies are implemented. The research is based on applying Alternative Energy sources in our world and why modern world needs it. In this topic, the role of oil in modern society, what are advantages of using renewable energy sources and which states are use more green energy and which less was discussed. For the research quantitative and qualitative data was used. For collecting this data secondary data information has been collected. The information that used in research is taken from several main sources like books, articles, publications, news portals and electro-news portal. Also, some criteria as actuality, quality, credibility, accuracy of information; reliability of sources were applied when searching any information. After gathering all information, prediction was made about how it would develop in the future. After, the investigation moved to the cases of different countries with various stages of development. There were reviewed which alternative energy they use and the percentage of usage of it. States as Azerbaijan, Sweden, USA, Israel, India, Japan and China were considered. The graphs, charts, statistics, wanted to raise public awareness and show these simple but high-priority questions. In the paper the importance of switching to alternative energy and which states have already begun to save their country and the planet as a whole were described. At last, all points were summarized and references for the deep exploring were added.

***Keywords:*** *algae, alternative energy, biofuel, wind and solar energy*

## INTRODUCTION

Many believe that a person first got acquainted with oil only in the 19th century, which is partially true, because the first full-fledged industrial production was carried out precisely in 1847 at Apsheron. However, humanity has been using oil for over six thousand years. The first oil was used almost 6 thousand years ago by the inhabitants of the interfluve - the Sumerians. They

found petroleum bitumen, which they successfully mixed with clay and sand to make an extra strong brick. The oil industry of the most ancient oil country in the world, Azerbaijan, has come a long way in its 150-year history. Industrial oil production began in Azerbaijan in the middle of the 19th century. In 1848, an oil gusher in Baku, which hit from a borehole in the Bibiheybat field, laid the foundation for industrial production of "black gold" in Azerbaijan. Already in 1899, Azerbaijan came out on top in the world in the extraction and processing of oil, gave half of the world's oil production. Azerbaijan for the first time in the world that oil began to be produced industrially. This fact holds a special place in the world history of oil.

## ROLE OF OIL

The role of oil in the modern economy can hardly be overestimated. The important role of energy resources is evidenced by the fact that more than 70% of the world's minerals are energy sources. All possible types of fuel are obtained from oil - boiler, gasoline, kerosene, diesel, gas turbine fuels, lubricating and special oils, carbon black, greases, paraffin, bitumen, petroleum cokes. In addition, oil is a raw material for a number of organic synthesis products. Oil and petroleum products are used in the manufacture of the all types of fuel and plastic. This material contains refined petroleum products and synthetic fabric (such as nylon or acrylic). It is used to build pipelines and power lines or for the manufacture of solar panels and etc. Energy, defense, transport, agriculture, household needs of the population, the country's economy are directly dependent on oil. Oil is exhaustible and non-renewable natural resource and at the same time very necessary and in demand. Since oil is a non-renewable resource, it is inevitable that global production will peak someday. The theory of Hubbert consists in the fact that the same calculations that successfully predicted the US peak oil production are also applicable to other cases, such as the peak of world oil production. Various estimates of the time of the world peak have been published, both by Hubbert and others, with some of these dates already in the past. This led to criticism of his method and the predictions made with his help.

Despite the significant contribution to the world economy, the production of oil and oil products causes significant damage to the environment, both during the normal course of the process and as a result of various accidents. Thus, at all stages of production and transportation, more than 45 million tons of oil are lost annually. Having started the exploitation of oil and gas fields, a human being did not think about the consequences of intensive extraction of these natural resources. The great danger is fraught with the use of oil and gas as fuel. When these products are burned in the atmosphere, large quantities of carbon dioxide, various sulfur compounds, nitrogen oxide and etc. are released. A decrease in oxygen and an increase in carbon dioxide, in turn affects climate change. Molecules of carbon dioxide allow solar shortwave radiation to penetrate the Earth's atmosphere and trap infrared radiation emitted from the earth's surface. Various projects for the creation of engines operating on other types of fuel appear. The way out of the situation of permanent oil and gas crisis is the use of alternative types of energy.

## ALTERNATIVE ENERGY SOURCES

**Alternative energy sources** are natural phenomena that are converted into thermal or electrical energy by means of conversion in special installations. They are solar electromagnetic radiation, kinetic energy of movement of air masses (wind), kinetic energy of water flow (river), the energy of sea tides and thermal energy from hot springs. In a world where energy resources are in short supply, the necessity for biofuels as an alternative source of energy is becoming increasingly apparent. Biofuel is a type of fuel made from plant or animal raw materials - from the products of vital activity of organisms or organic industrial waste. Biofuels are different in terms of their state of aggregation. For example, liquid biofuels - mainly used for internal combustion engines - include: biodiesel, ethanol, methanol; solid biofuel - this includes straw, firewood, briquettes; gaseous biofuels - hydrogen, biogas and synthesis gas.

Chemists and microbiologists as early as the 19th century proposed the use of microalgae as

an alternative source of energy. Green microalgae are able to convert carbon dioxide into organic compounds, while having a cleansing effect on the atmosphere and hydrosphere. Such biofuel can be used in diesel engines: it is very close in composition to traditional motor fuels - refined petroleum products. A number of countries have started serial production of special bioreactors for growing microalgae. Japan and the United States have already successfully tested aircraft and vehicles powered exclusively by algae biodiesel. Algae are the fastest-growing plants on earth (their mass doubles per day), their growth requires readily available raw materials: sunlight, water, and carbon dioxide. According to the modern classification of biofuels, presented in the work of N.I.Chernov, the fuel obtained using microalgae is called third-generation biofuel. At the same time, in this work, the authors indicate that microalgae used to obtain biofuel should not be used to obtain a food or feed product, and should not be a waste of any production. Algae production is also attractive because carbon dioxide is absorbed from the atmosphere during biosynthesis. According to a number of authors, the possibility of using algae as a raw material for fuel production is determined by their high lipid content. Vorobyov V.V. notes that the composition of the lipids of algae and plants of oil crops are similar, and contain polyunsaturated fatty acids. Vorobiev V.V. indicate that the content of fatty acids in microalgae living in natural conditions is about 40% of the total mass, and under cultivation conditions it can reach 80 %. Different types of fuel made from algae rich in lipids - bio-oil, biodiesel. The most common is biodiesel, the production method of which is considered by Yu.V. Meshcheryakova: the trans-esterification of microalgae lipids with methyl alcohol carried out under mild conditions. Scientific coordinator, chemist Jaap van Hal says: "We have several good reasons to use seaweed more actively. Approximately the 70% of our planet is sea; we are already exploring the depths of the sea for the production of food and various materials. Algae need water, sunlight and the presence of nutrients for the development. In such conditions, they can grow very quickly, and we just need such a stable and unpretentious raw material to achieve our environmental goals by 2050". Ethanol and butanol currently made from various sugars, and seaweed has a lot of sugar that can be converted to alcohol. It has been demonstrated that it is technically possible to meet the fuel needs of a car with algae. Like in the case of wind energy, reducing costs on the production of fuel from algae spread over 25-30 years. During this time, it is possible to reduce production costs by a factor of one hundred. So far, biofuels are very expensive. With the intensification of algae production, with access to a larger scale, it will be able to reduce the cost by the same hundred times.

The US Department of Energy has researched high oil content algae under the Aquatic Species Program. The researchers concluded that California, Hawaii, and New Mexico are suitable for the industrial production of algae in open ponds. In 6 years algae grown in ponds contains area of 1000 m2. Bioking biochemical engineering company has started mass production of patented bioreactors for the cultivation of algae, suitable for immediate use, which includes fast-growing algae with high oil content. Spanish scientists have found one of the types of microalgae that are able to reproduce much faster than other biological counterparts under certain lighting conditions. Microalgae grow in a plastic cylinder with a diameter of 70 cm and a length of three meters. They divide every 12 hours, and gradually the water in the cylinder turns into a green dense mass. Once a day, the contents of the cylinder are centrifuged. The remainder is almost 100% biofuel. Part of this mass saturated with fats is converted into biodiesel, and hydrocarbons into ethanol. ExxonMobil has published a video about a project for the production of biofuels from algae. For 10 years, the company has been working with Synthetic Genomics to research a technology for the production of diesel fuel from algae with the high oil content. The goal is to create capacity by 2025 to produce 10,000 barrels of algal fuel per day The Aurus car, which runs on hydrogen fuel, was developed by the Central Scientific Research Automobile and Automotive Institute; this is the only premium car with a hydrogen-supported sample," said Denis Manturov, the Russian Federation's Minister of Industry and Trade, at the start of serial production of the Aurus Senat.

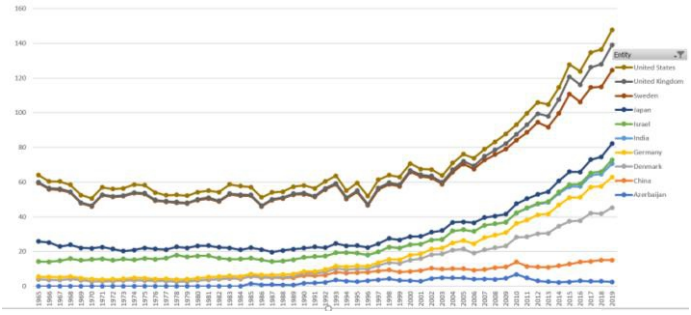
**China** collectively perceived as the world chief interest in clean energy innovations. The country is investing heavily in the construction of plants for sustainable energy sources as well as the development of environmentally friendly energy developments such as batteries and electric cars. China built 77 gigawatts of solar farms and 149 gigawatts of wind farms in 2016.A lot of the worldwide environmentally friendly power energy is relied upon to be 42% sunlight based, 35% hydropower and 40% breeze power by 2022.

**Denmark** is a pioneer on the planet in the improvement of wind energy. In 2017, the creation of power from wind set another precedent the wind ranches covered 43% of all power needs. Of all OECD nations, Denmark has the most noteworthy per capita power and wind creation over the most recent 15 years. Regardless of this, the Danes are creating by 2030 over half of power ought to be delivered by sustaining power plants, and by 2050 all 100%. Yet, the speed of environmentally friendly power energy development shows that the nation will accomplish these objectives quicker. As indicated by specialists' conjectures, in 2020 environmentally friendly power plants (wind, sun based and biomass) will cover over 80% of the power interest.

**Iceland** is prominent for its amazing regular scenes, yet it is additionally a country with perhaps the most noteworthy pace of sustainable power infiltration into the public energy balance on the planet and the most elevated among European nations. Presently, geothermal, hydro and wind power supplies 100% of Iceland's power needs. Practically hydroelectric force plants give 75% and the rest is given by geothermal sources. Over 90% of the nation's interest for high temp water and warmth is likewise met by geothermal energy.

**India** is a fast developing economy with 1.34 billion inhabitants. Furthermore, energy will be basic to the nation's turn of events. India is anticipated to require 1/4 of the world's energy. India appears to have chosen to cover the greater part of its requirements with clean energy. Coal actually represents 70% of the country's energy blend, yet India is attempting to build its sustainable power limit from the current 58 GW to 175 GW in 2022. With the presentation of green closeouts, India has made the most serious environmental friendly power market on the planet. Because of cost reserve funds, the state is getting ready to decommission coal-terminated force plants, which they intend to supplant with sunlight based and wind power plants. What's more, India intends to construct the world's first drifting sun oriented force plant and in any event 10 GW of sustainable power in the following three years.

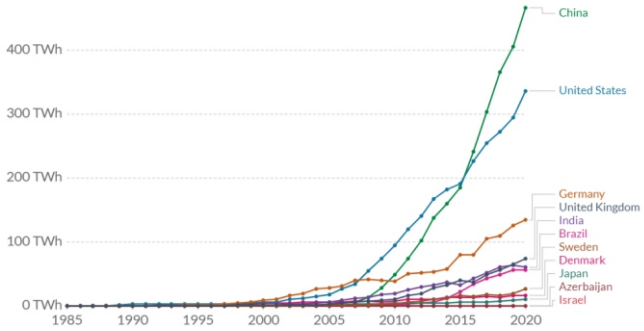
**Share of primary energy from renewable sources**



At the first glance at the chart, it should be noted that the world leadership is hold by the United States, England, Sweden. Wind, solar, biofuel and hydropower in the UK generated a total of 29.5 TWh in Q3 2019, compared to 29.1 TWh from fossil fuels. The share of wind and solar in the UK's electricity generation in 2020 was 29.2%. The country also plans to increase the capacity of wind farms from the current 8,500 MW to about 20,000 MW by 2025. And by 2030, the capacity of wind power plants, taking into account new projects, will be increased to 30,000 MW. By 2045, Sweden should be climate neutral, that is, the balance of greenhouse gas emissions should be zero or negative. By 2040, 100% of electricity should be generated from renewable energy sources. USA After successfully navigating the COVID-19 pandemic, the renewables industry has a promising outlook for 2021 and beyond, as many drivers endorse continued rapid

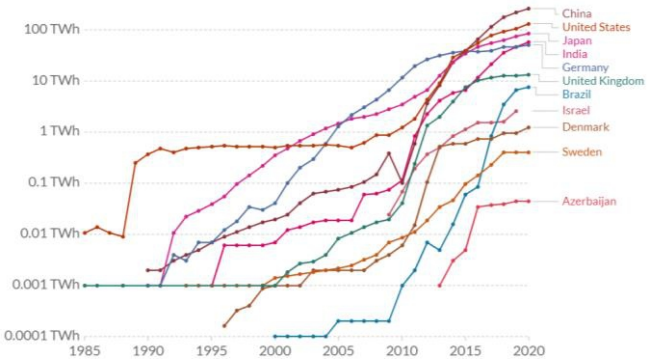
growth of wind, solar, and battery storage. There are currently 232 GW of wind and solar projects under construction in the United States. Over 21 GW of wind and nearly 15 GW of solar power are expected to be operational by the end of 2021. Energy storage capacity is expected to rise by 15,000 MW by 2024, compared to 1,500 MW in 2020. Energy storage growth, which was projected to be 1,500 MW in 2020, is expected to increase by 15,000 MW by 2024. Japan is rapidly increasing the share of renewable energy sources and strengthening its position. Japan is planning a large-scale expansion in offshore wind energy, which will lead to the creation of approximately 10 GW of capacity by 2030. By 2050, renewable energy sources will account for more than 75% of total electricity production, of which solar and wind generation will account for 32% each. For comparison, in 2019 the total share of RES is only 8%.

**Share of wind energy resources**




According to a new study by Wood Mackenzie, 114 GW of new wind capacity was added globally in 2020, an 82% increase over 2019. In 2030, wind farms will generate approximately 7,300 TWh, which by then will account for approximately 22% of projected global electricity consumption. Considering a graph of the share of wind power in different 10 countries, one can notice that the world leaders are China and the United States. Chinese wind energy had an installed capacity of more than 200 GW at the end of 2019, and it provided more than 5.5 percent of the country's electricity. According to the National Energy Administration, China's total wind energy potential was 281.5 GW at the end of 2020. The installed capacity of wind farms in the United States exceeded 90 GW at the end of the second quarter of 2018, indicating that wind has surpassed solar as the country's primary source of renewable energy. In December 2020, the United States set an hour record by delivering 82 Gigawatts of renewable power. In 2021, the US plans to commission 12.2 GW of new wind capacity. While Germany lags far behind China and the United States in terms of renewable energy sources, as seen in the graph, it is working to increase the share of renewable energy sources in its energy balance. Germany produced 40% of its electricity from renewable energy sources in the first quarter of 2021. At the end of 2017, the installed capacity was 55.6 GW, with 5.2 GW from offshore installations. Wind power provided a quarter of the country's total electricity in 2019, compared to an estimated 9.3 percent in 2010.

**Share of solar energy resources**



The graph of the share of solar energy in different 10 countries describes the situation related to the usage of solar energy in the world. As you can see in the graph, all 10 selected countries are rapidly increasing their share of solar power. Note that the leaders of solar energy are China, USA, Japan, India and Germany.

By 2030, the number of solar installations in the US is projected to quadruple. This sector would add 324 gigawatts (GW) of power over the next ten years. Solar energy installed capacity in the PRC will exceed 500-530 GW by 2021-2025. That is, on average, the Chinese can build more than 50 GW of solar power plants. Japan is now one of only five countries with a combined solar photovoltaic potential of 10 gigawatts. In August of this year, Japan's PV market surpassed the 10 GW mark, reaching 10.5 GW by the end of the month. Solar energy is a rapidly growing industry in India. As of November 30, 2020, the country's solar installed capacity was 36.9 GW. A total of 395.14 MW of solar energy capacity was added in February 2021. The Indian government set a target of 20 gigawatts of power for 2022, which was met four years ahead of time. By the end of 2019, Germany will have installed solar energy capacity of 50 GW. The next group can be called Brazil, Israel, Denmark, they are also strengthening their positions and increasing the pace of development in this type of energy. According to ABSOLAR's calculations, more than 4.9 gigawatts (GW) of installed power would be applied to the large plants and systems scattered around roofs, verandas, and small plots in Brazil. This represents a more than 68 percent increase over the country's total installed capacity of 7.5 GW. Around 887,000 grid-connected PV systems are expected to be deployed in Brazil by 2024 You can also note a sharp jump in Brazil in this energy industry in 10 years. Azerbaijan, having all the necessary resources to increase the pace of development in this energy sector, is also striving to increase the supply of sun energy. According to the AR's State Statistics Committee (SCS), power plants using solar panels generated 27.1 million kilowatt-hours of electricity in January-July 2020, up 5.4 percent from the same time last year.

## CONCLUSION

The conducted research was aimed at getting an answer to the question whether the world should switch to alternative energy. Through a long collection of information about alternative and traditional energy sources in the world, as well as analysis and processing of the collected data, graphs of the use of alternative sources in various countries the results were derived. According to the evaluation of results, the answer to the question whether the world should switch to alternative energy is unequivocal- yes.

As everyone knows and it was also mentioned in the study done, traditional energy sources are running out and in the near future there will be no chance to choose between traditional and alternative energy. It follows from this that those countries that will begin or have already begun the transition to renewable energy are very likely to benefit economically and even more importantly, environmentally. From an ecological point of view, the transition to renewable energy will prevent the currently threatening climate apocalypse and improve the state of the hydrosphere, atmosphere and biosphere. Therefore, we can conclude that starting the transition now, countries can save themselves not only from future economic problems but also environmental ones which in turn generally lead to improved public health and well-being.

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Günay QULİYEVA,
Xalidə SADIQOVA,
Fərhad ƏLİYEV

## XÜLASƏ

Dünya ölkələrinin artan iqtisadi inkişafı və müasir cəmiyyətin əsas hərəkətverici qüvvəsi kimi enerji resurslarına yüksək tələbat dövlətləri və müəssisələri şəhər və kənd yerlərini bu resurslarla təmin etməyə həvəsləndirir.

Enerji resursları müasir insanın bir çox vacib həyat proseslərində iştirak edir. Bu resurslar insanların gündəlik həyatda istifadə etdiyi elektrik enerjisindən başlayaraq, nəqliyyat da istifadə olunan yanacaq növlərinə qədər həyatımızın bütün sahələrində zəruridir. Digər tərəfdən enerji resursları həyatımızda nə qədər mühüm əhəmiyyət kəsb etməsinə baxmayaraq, yenə də ətraf mühitin çirklənməsinin, iqlim dəyişikliyi və kataklizmlərin əsas səbəbləridir. Üstəlik, bərpa olunmayan enerji resurslarının tükənməsi, onların qıt olması onları baha edir.

Bu tədqiqatın ideyası dünya ölkələrində enerji ehtiyatlarına görə mövcud vəziyyəti araşdırmaq və alternativ enerji resurslarının dövlətlər tərəfindən necə tətbiq edildiyini, hansı siyasətlərin həyata keçirildiyini araşdırmaqdır. Tədqiqat Alternativ Enerji mənbələrinin dünyamızda tətbiqinə və müasir dünyanın buna nə üçün ehtiyac duyduğuna əsaslanır. Bu mövzuda neftin müasir cəmiyyətdə rolu, bərpa olunan enerji mənbələrindən istifadənin üstünlükləri nələrdir və hansı dövlətlərin daha çox yaşıl enerjidən, hansının daha az istifadə etdiyi müzakirə edilmişdir. Tədqiqat üçün kəmiyyət və keyfiyyət məlumatlarından istifadə edilmişdir.

Məqalədə alternativ enerjiyə keçidin vacibliyi və hansı dövlətlərin artıq öz ölkələrini və bütövlükdə planeti xilas etməyə başladığı açıqlanıb.

***Açar sözlər:*** *yosun, alternativ enerji, bioyanacaq, külək və günəş enerjisi*

Məqalə redaksiyaya daxil olub: 26.05.2022
Təkrar işlənməyə göndərilib:10.06.2022
Çapa qəbul olunub: 30.06.2022