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FUTURE TRENDS OF OIL DEMAND IN LIGHT OF COMPETITION FROM ALTERNATIVE SOURCES

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Abstract:

There is a raging debate among specialists about the importance of oil and its future role, as well as competition for oil demand in light of the presence of multiple and varied alternatives. This is because oil, according to Hubert's theory, is a depleted substance, and there are those who believe the opposite. , Because technological developments will increase exploration and thus oil reserves, and some technologies contribute to reducing oil waste during various oil operations.

The research sheds light on the strategic importance of oil and its future position in the list of global energy sources and the role of alternative sources in competition and the acquisition of oil demand sources.

Other non-fossil sources will also be covered, in addition to gas and coal, and the research hypothesis compatible with oil will remain at the top of the list of energy sources for the next five decades.

Keywords:

INTRODUCTION:

The world is witnessing a continuous and accelerating movement in scientific and technological development, on different levels and in various aspects, especially in industrialized countries. As a result of this, vigorous efforts have emerged to replace energy sources that substitute for crude oil, and serious steps have been taken to use these alternatives in whole or in part and gradually for Reducing dependence on oil and providing the industry with increased energy at reduced prices in order to accelerate economic growth in these countries, and decision-makers and concerned with political aspects in industrialized countries have adopted programs that summarize the necessity of ending dependence on crude oil and moving towards available alternatives such as solar energy, wind energy, And hydrogen energy, and nuclear and others.

RESEARCH IMPORTANCE:

The research derives importance from the global position of oil, which is the basis for energy saving, as well as provides financial resources to oil-producing countries for the purpose of financing budgets, and contributes to moving the wheel of development, and with the presence of multiple alternatives to oil, the competition of crude oil has taken its lead and what the future prospects entail in this regard. And the research discusses in detail this important axis.

Research goal:

The research aims to find out the changes that occur in the order of leadership in energy sources with the availability of multiple alternatives and who will be the priority in the future during the coming decades, and will oil remain in the forefront of the situation?

Research problem:

The research problem lies in the quest of many industrialized countries to find alternatives to crude oil, and to take serious practical steps to reduce its use, for several reasons, the most important of which are political reasons, economic wars, and whoever owns energy sources will have a head start.

Research hypothesis:

The research starts from the hypothesis that oil will remain a basic and important source of energy, it ranks first in the world in the list of energy sources, and the demand for it increases despite the crowding out of alternative sources.

Duration of research:

The duration of the research is determined by setting a forward-looking outlook for the next five decades of oil demand.

Research Methodology:

The researcher adopted the descriptive approach, and the quantitative analysis of the information and data contained in the reports of organizations and institutions

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Specialized in energy affairs.

Research Structure:

To prove the hypothesis of the research, the research was divided into three main sections. The first section deals with the strategic importance of oil
Crude in terms of globally available reserves, production and consumption, while the second topic is devoted to discussing important alternatives to crude oil, and the third topic is devoted to discussing the impact of alternatives on oil demand.

THE FIRST TOPIC: THE STRATEGIC IMPORTANCE OF OIL

First: The importance of oil compared to some alternatives

Oil is at the top of the list of importance for producing and consuming countries alike, as it is an important source of wealth for producing countries, and a major source of financing on which the economies of these countries depend greatly.

As for the consuming countries that enter crude oil as a raw material in their various industries, and an important source for providing energy to operate factories and plants, as well as other uses in the transport sector, so it actively contributes to the economic growth of the industrialized countries that use the most or consuming oil, and the importance of oil is due at the level Global due to its multiple properties that gave it a competitive advantage to take center stage among other types of energy The demand for oil continued to increase continuously with the rapid technological progress globally, and it entered many strategic industries, due to its ease of transportation and relatively low costs, and many varied derivatives are extracted commensurate with the technical difference of machines and equipment, which contributed to the increase in human welfare, and oil derivatives were introduced as a raw material in industries. Petrochemicals, textiles, polymers, synthetic fibers, dyes, and more. (The Prince, 17,2005)

It should be noted that the capital returns achieved as a result of oil investment encouraged investors to invest in the oil sector, and the increase in investment led to a reduction in production costs compared to other sources.

Table (1) Electricity production costs depending on the fuel used

The details	Charcoal	Fuel oil	Nuclear energy
Generation efficiency	30-33	33	32
Capital expenditures	2-43	2-25	10-38
Total expenses	38-69	48-57	53-118
The time needed to starch	3-5	3-5	4-12
Effects on the environment	High	middle	**The difference between specialists did not determine the size of the effect**

Source: The table is from the researcher's work, depending on:
Hussein Abdullah, The Future of Arab Oil, Center for Arab Unity Studies, Beirut, 2006, p.57.

It is noted from Table (1) that the expenditures required to produce (KWh) of electricity in stations that use fuel oil ranges between (2-25) cents, and the expenses rise from (2 -42) in the stations that use coal as fuel, or the stations that operate using fuel Nuclear up to (10-38) cents, to produce the same amount. It can be seen that the total costs during the use of fuel oil are approximately (48-57), but when using coal material in electrical stations the total costs are from (38-69).

Whereas, this assignment increases to (53-118) if the stations use nuclear fuel. As for the completion and construction period of the stations, the period is higher in the nuclear plants, as it reaches (4-12) years and decreases to (3-5) years to establish fuel stations. Fuel oil or coal.

It can be referred to the extent of environmental pollution, as the electricity production stations operating with coal fuel have a very high pollution rate and the pollution percentage of stations operating with fuel oil is very low. Those countries are to reduce pollution and reduce the use of polluting fuels, and move towards the use of less polluting sources, and environmentally friendly sources, in addition to the high efficiency that characterizes electrical stations that use fuel oil

Second: global oil reserves

The quantities of global oil reserves vary in terms of distribution in the regions of the world, as it is present in some regions economically and actively invested, and in some places it exists but in non-commercial quantities, and it is distributed almost to most regions of the world and Table (2) shows a map of the distribution of global oil reserves for the largest Countries in terms of availability of reserves for the year 2021

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Table (2) The world's proven oil reserves for the world of 2021/ billion barrels

The state	Certain reserve	Ratio to world%
Venezuela	300.878	28.61
Saudi	266.545	20.39
Canada	169.7069	13.23
Iran	158.400	12.31
Iraq	145.000	11.62
Kuwait	101.500	8.13
UAE	97.800	7.34
Russia	80.000	6.21
Libya	48.36	5.31
United State	39.230	3.57
OPEC countries	953	76.4
OPEC countries	703.4	56.4
Total world	1248.1	-

Source: The table is from the researcher's work, depending on:
Organization of Arab Petroleum Exporting Countries (OAPEC) Annual Statistical Report 2019, Table 2, p.10.

It is noticed from the above table that there are proven crude oil reserves in the world estimated at about (1248) billion barrels, and OPEC countries own the largest percentage, as OPEC countries acquire (76.4%) of the global reserves, followed by the OPEC, which owns approximately (56.4%) With reserves of (703.4) billion barrels, and at the level of countries, Venezuela occupies the forefront in reserves, estimated at (300.8) billion barrels, followed by Saudi Arabia in second place, in which the proven reserves of crude oil reach (266.5) billion barrels, and then Canada, whose reserves contribute by a percentage (13%) of global reserves, and then Iran ranks fourth, with reserves of up to (158) billion barrels, at a rate of (12%) globally. As for Iraq, it ranks fifth in the global reserve scale, and its oil reserves reach (145) billion barrels With a rate of (11%) of the world's reserves, while the United States is at the end of the list of the ten most reserves, as its reserves amount to (39.2) billion barrels and a percentage of (3.5) of the world's reserves, and this proven oil reserve is subject to many changes, whether by decreasing through Increase production, or increase P, through new explorations, and it becomes clear that the reserve is large if other types of oil are added to it, such as shale oil, and can meet the requirements of the future world, and technological developments that reduce waste and increase production must be taken using modern technologies.

Third: crude oil production:

Increasing crude oil production in the world in general, due to the high demand for it due to the industrial movement and the high growth rates. The quantities produced vary in the regions of the world, and Table (3) shows the quantities produced by regions

Table (3) Global oil production for the year 2019 is one million barrels

The state	production volume	Relative to the world
United State	742	16.7
Russia	560	12.6
Saudi	546	12.3
Iraq	234	5.3
UAE	189	4.3
Kuwait	144	3.2
Brazil	145	3.3
Canada	265	6
Iran	146	3.3
China	132	4.3
Other countries of the world	1120	30

Source: The table was prepared by the researcher based on:
International Energy Agency statistics for 2019 are available in the information network story@m arabi21.com

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It is noted from the table that the largest country producing crude oil is the United States by (742) million barrels per year, (16.7%) of the world's production, and after that Russia comes with production up to (560) barrels / year, at a rate (12.6%) of the world's production, Then Saudi Arabia is in third place, with production reaching (546) million barrels / year, and the countries listed in the ten table acquire (70%) of the world's production, while other countries acquire (30%) of global production.

Fourth: Global Consumption:

The industrialized countries have the advantage of being the most in demand, and therefore the most consuming of crude oil, due to the multiplicity of uses in the industry

Crude oil is used as a raw material in the manufacture of many supplies and preparations, and it is used as fuel after the refining process, and the extraction of multiple derivatives from it. Table (4) shows global consumption

Table (4) World crude oil consumption for the period (2003-2030) Million barrels / day

Region	**2003 Actual**	**The ratio of the total**	**Predict 2030**	**The percentage of the grand total**
North America	24	28.7	33.9	28.2
Europe OECD inside	15.6	18.5	16.5	13.7
Asia is outside the OECD	14	16.7	29.5	24.6
Asia within the OECD	9	10.7	10.9	9
Middle east	6.5	7.7	8	6.6
Central and South America	6.5	7.7	9	8.5
Eurasia outside the OECD	5	5.9	7	5.8
Africa	3	3.5	5	4.1
Total world	83.5	100	119.8	100

Source :Energy Information Administration (EIA)International Energy outlook 2006 chapter 3 :world oil Market .

It is noted from Table (4), which includes the actual consumption of crude oil globally for the year 2003 as well as the future expectations of that consumption for the year 2030, and it is clear that North America is the most consuming region, which reaches (24) million barrels per day, rising to (33.9) million barrels in 2030. Which reaches (28%) in world consumption, meaning that consumption maintains the same level during the specified period.

As for Europe within, which includes the Organization for Economic Cooperation and Development, it ranked second in global consumption for the year 2003, up to (15.5) million barrels / day, at a rate of (18.5%). It is possible that consumption will decline during the specified period to (16.5) million barrels / day in 2030 and it will decline. To the third place, at a rate of (13.7%) As for the countries of Asia abroad, it ranks third among the world's regions in 2003, and consumption is expected to increase in 2030, to occupy the second place, with a rate of up to (24.6%) of world consumption, down from the percentage in 2003, which recorded (16.7%) of global consumption.

While it is ranked fourth in the countries of Asia entering the Organization (OECD), whose consumption in 2003 reached (9) million barrels / day, with a rate of up to (10.7%) of world consumption, and that consumption will be up to (10.9) in 2030 according to what is expected. According to studies, with a consumption rate of up to (9%) worldwide The central and southern regions of the United States will be ranked fifth in terms of global crude oil consumption, as in 2003 the consumption amounted to (6.5) million barrels / day, and by (7.7%) of the world's consumption, and it is expected to reach (9) million barrels / day in 2030. And according to the global total (7.5%) (Khadija, 22,2014)

As for the Middle East and Europe and Eurasia region outside the OECD and the Africa region in the sixth, seventh and eighth ranks, respectively, it is noted that the industrialized countries in North America, Asia and Europe within the OECD will have reduced consumption in the year 2030 from what it is in 2003 in the regions of Asia outside The Organization (OECD) would have increased its consumption from 2005 to 2030 through indicators of growth and the promising future affecting that region, especially China and India, which would contribute to increasing consumption of crude oil.

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The second topic: - Future prospects for alternative sources of oil

By alternative sources of oil, we mean energy sources that can be an alternative and replace oil through the possibility of extraction and abundance, as well as the technical and economic aspects associated with the uses, and although oil at the present time is the most important source among energy sources, but there is competition from some alternatives for economic, political and technical reasons that some seek Industrial countries to take to reduce the pressure of oil monopoly as a primary source of energy, and increase the diversity of alternatives.

During this discussion, the most important alternative sources will be discussed, and their current reality and future prospects will be discussed.

First: natural gas:

Characteristics and advantages of natural gas.

Natural gas occupies the second place after oil through its importance and rank in the ladder of energy sources in the world, due to its rapid flame and ignition and low indicators of environmental pollution for it, so it is an ideal fuel from an environmental point of view, and therefore it increased its household uses because the carbon it leaves behind is not It exceeds (0.63) tons, and compared to the ignition of a ton of oil that leaves (0.82) tons of carbon, while coal leaves behind (1.5) tons of carbon, and when a ton of carbon is reacted, up to (3.4) carbon dioxide (CO2) is produced. It is considered a major pollutant for the environment, and it is also characterized by the absence of sulfur and polluting compounds, as well as the decline in nitrogen oxide and gas levels as well, and it does not need transformational processes as it is carried out in repeated oil conversion processes to extract derivatives from it, and it enters in many petrochemical, plastic and fiberglass industries through the use of Methane Fee destock as raw material

Petrochemical demand is widespread, which is reflected in the increase in demand and the recovery of gas markets globally, as some car factories have tended to use gas as fuel for cars, and the use of gas in the transportation sector has expanded by various means (Maarouf, 3,2006).

2- Natural gas reserves, production and consumption:

A - Global reserves of natural gas:

The global reserves of natural gas are distributed over the different regions of the world in varying proportions, as the world owns, according to the statistics of 2020, approximately 198.8 trillion cubic meters, and the quantities of that reserve vary between the accompanying ones that exist with the oil fields, and the free, which is isolated, and it is mentioned that gas consists Three different main gases are methane, ethane, which represents the highest percentage that reaches (1-10%) of the weight of the gas, as well as propane gas, which is a small percentage, and natural gas is used in various uses such as chemical industries, cement industry, and household use. The caveats of its uses, such as the dangers that accompany the use, such as the speed of ignition and explosion, which threatens life at times. Table (5) shows a map of the distribution of the quantities of reserves in the various world.

Table (5) Natural gas reserves in the world 2020 Billion cubic meters

The state	Reserve	The percentage in the world%
Russia	38.94	18.3
Iran	31.93	17.1
Diameter	24.70	14
Pakistan	19.49	12.2
United State	11.89	4.4
Venezuela	6.34	3
China	6.07	2.9
UAE	5.94	2.5
Saudi	5.89	2.4
Nigeria	5.35	2.3
Canada	11.78	4.3
Norway	5.83	2.9
Australia	6.5	3.5
Algeria	2.23	1.81
Iraq	1.85	1.90

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Kuwait	0.88	0.9

Source: The table is from the researcher's work, depending on:
OPEC Statistical Report 2020 Table 8, p. 55

It ranks first in the world in terms of area that possesses (18.3%) of global reserves, followed by Iran and Qatar, which have (17.1%) and (14%), respectively, of the world's reserves.It is noteworthy that the Middle East captures (75.6%) of the world's reserves compared to Europe, whose reserves do not exceed (3.4%) of the world's reserves. (ESCWA, 31,2005)

B - Natural gas production:

Natural gas production varies among countries that have reserves of it. There are countries that have directed most of their investments towards natural gas to increase production because they have a competitive advantage in gas production, and some countries produce gas associated with oil, so the more oil they produce, the higher the natural gas production, taking into account the following factors: The quality of the oil and gas fields. Table No. (6) shows the production of the top ten countries in the world from natural gas production, which represents (70%) of the world's gas production.

Table (6) The top ten countries produce natural gas for 2019 Billion cubic meters

The state	production quantity	Percentage of production in% to the world
United States of America	955	24.4
Russia	750	18.3
Iran	232	5.7
China	178	4.4
Canada	177	4.3
Diameter	168	4.1
Australia	142	3.5
Norway	119	2.9
Saudi	98	2.4
Algeria	91	2.2

Source: The table is from the researcher's work, depending on the statistics of the International Energy Agency for the year 2019 .. @arabi21.com Story

It is noted from the table that the United States ranks first in the production of natural gas in the world, as production reached (955) billion cubic meters / year in 2019, which constitutes (23.4%) of the world's production, and Russia comes in second place, which produces approximately (750) One billion cubic meters per year, at a rate of (18.3%) of the world's production, and the third in the world in terms of Iran's share, which produces (5.7%) of the world's production, which amounts to (233) billion cubic meters / year.

China is in the fourth sequence, and Algeria comes last in the list of the ten most producing countries in the world, as it produces 2.2% of the world's production in the amount of (91) billion cubic meters / year, and it is noteworthy that the share of industrialized countries in gas production reaches (41.2) %) Of the total production of the world or the Middle East region produces about (19.8%) of the world's production in 2020.

When reviewing the reserve schedule, it is noticed that the Middle East region contains reserves (75%), but its contribution to global production is low and not commensurate with the existing reserves, and this gives an indication of the lagging behind of continuous investments in natural gas. (Al-Turki, 45,2013)

T - Natural gas consumption:

The quantities of gas consumption have escalated globally during recent decades, as it increased from (88) trillion cubic meters / year in 2003 to (150) trillion cubic meters / year in 2020, which gives an indication of an increase in global consumption, and table (6, 7) shows the increase in production rates. And consumption globally.

Table (7) Global production of natural gas 2003-2020 Trillion cubic feet / year

Region	03	10	15	20
Group of OECD countries	3	7	3	
Middle east		2	1	8

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A group of countries outside the OECD	9	4	7	5.6
Total world	2	5.1	40	9.6
The ratio of Middle East production to the world		2	7	2

Source :Energy Information Administration (EIA) international Energyoutlook.2006.chapter 4

As for consumption, Table (8) shows global gas consumption
Trillion cubic feet / year

Region	2003	2010	2015	2020
Total world	95	116	134	150
North America	28	29.5	33	35
Europe member states (OECD(	15.3	16.5	16.9	22
Asia Members (OECD(	5	5.5	6	6.5
Middle East and Africa	10	14.5	23	20.2
Central and South America	35.8	5.9	7	8.1

Source :Energy Information Administration (EIA) international Energyoutlook.2006.chapter 4

It is noticed from the two tables that there is no significant difference between production and consumption, due to the correspondence of production figures with consumption, which indicates directing investments to natural gas.

Second: Coal:

According to some theories, coal was formed from millions of years when the earth contained large areas of forests, as well as the oceans and when the land was flooded and the forests remained buried and due to intense pressure and heat the plants turned into carbon materials that formed coal blocks, and this process is called carbonization and coal is used. As a fuel through direct burning, it generates thermal energy and the most important types of anthracite are anthracite. It has many uses such as heating and home use for cooking, generating electrical energy and is used as an element in various industries such as steel and others.

1 - Global reserves of coal: the world's reserves of coal are distributed among the countries of the world, as shown in Table (9)

Table (9) The world's reserves of coal for the ten largest countries/ Million tons

The state	Lignite	sabBituminous	nthracitic ituminous	Total	The proportion of the world's reserves%
United State	30.176	98.618	108.501	237.295	22.6
Russia	10.450	97.472	47.088	157.010	14.4
China	18.600	33.700	62.200	114.500	12.6
Australia	37.200	2.100	37.100	76.400	8.9
India	4.500	0	65.100	60.600	7.0
Germany	40.600	0	99	40.500	4.7
Ukraine	1.945	16.577	15.35	33.873	3.9
Kazakhstan	12.100	0	21.500	33.600	3.9
South Africa	0	0	9	30.156	3.5
Serbia	13.400	361	6.366	13.770	1.6
Other countries total	-	-	-	-	7.6

Source: The table is from the researcher's work, based on WWW.El marifa / chorbon/inf.com

It is noted from Table No. (9) that coal reserves are distributed in different countries of the world in a different way, and the United States ranks first in terms of reserves, with a percentage (22.6%) of the world. In which there are different types of coal, while the second place came from Russia's share of 14.4%) of world reserves, Serbia comes at the end of the table with a reserve ratio (1.6%) of global reserves, and the other remaining countries together make up (7.6%) of Reserves of the world.

2- Charcoal production

Countries differ in terms of charcoal production and according to their need and use, according to Table (10)

Table (10) Coal production in the world for the year 2014-2015/ Million tons

Country	14	15	of the world %	Reserve lifetime / year

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China	73.9	47.0	7	
United State	7.2	2.8	9	2
India	3.1	75		
European Union	9.1	3.1		2
Australia	3.2	4.5		3
Indonesia	3.1	2.0		
Russia	74	3.3		2
South Africa	1.5	2.1		0
Germany	5.8	4.3		0
Poland	7.1	5.5		
Kazakhstan	4.0	5.5		5
Total world	06.0	61.1	0	4

Source: Prepared by the researcher based on: Statistics of the International Energy Agency, 2019 Report, Table 14, page 7

It is noticed from the production table that China is the largest producer of coal, then the United States, which together produce about (60%) of the year's production, and India ranks third in production, amounting to (7.4%) of the world's production, and it is closely related to Australia with production at a rate of (7.2%). At the bottom of the table is Kazakhstan, with a production rate of (1.2%).

3- Consumption:

Countries differ in terms of their coal consumption and according to the construction structure of electric power projects and stations, some means of transport and factories, and the following table explains that.

Table (10) Countries' Coal Consumption 2013-2014

Country	2013	2014	Its percentage of the world%
China	79	78	
United State	4	3	3
India	7	0	6
European Union	9	2	
Germany	2	4	
Russia	9	2	
Japan	3	0	
South Africa	3	1	
Poland	3	1	
South Korea	9	4	
Australia	4	0	
Indonesia		7	
Turkey		0	
Total world	13	07	0

Source: The table was prepared by the researcher based on:OAPEC, Annual Statistical Report, 2019, Table 8, p. 22.

It is noted from the table that China is the most consuming country of coal, as it alone consumes up to (50%) of global consumption, followed by the United States and India with (16.3%) and (10.6%), respectively, of global consumption, and Turkey is the least consuming coal. It consumes (0.9%) of global consumption.

Third: nuclear energy:

Nuclear energy was discovered in the forties of the twentieth century in 1940 when the scientist (Ferry) and his group of colleagues discovered that the introduction of a neutron into uranium and Kraft causes the nucleus to split into two nuclei.

This results in lighter elements and through which enormous energy is generated as a result of fission, and nuclear energy is currently used to generate electrical energy in many countries of the world, as nuclear reactors are distributed in the United States of America, Western Europe and other countries. Developed countries from Asia, such as Japan and Korea, as well as Iran and India, and the industry witnessed a boom in nuclear energy and the construction of reactors in the 1960s and 1970s of the

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twentieth century, and began to decline after the Chernobyl reactor accidents in the Soviet Union in (1986), and before that the Three Mile Island reactor accident (TMI) in the USA. The number of reactors operating until 2005 in total.

There are (440) reactors in the world, the capacity of which has reached (367,684) megawatts, and (23) reactors have been added to it and searched (17,431) megawatts in the sea (Chile, 54,2010)

It should be noted that nuclear energy depends on uranium that is extracted from energy, and slow fission to produce electricity or rapid fission.

There is a large number of countries that operate cargo in industrial oceans.

The decomposition of radioactive materials and waste takes thousands of years, which makes the disposal of waste and nuclear waste a major and serious obstacle.

1- Obstacles to expanding the use of nuclear energy.

A - Economic Obstacles:

Which is represented by the high capital costs, as the cost of a light water reactor reaches (70%), while the cost of a coal-fired plant is (35-65%), depending on the proximity to the mine and the size of the mine, and it also requires experience and training for engineers who need a long time to gain experience.(2009, 11, OAPEC)

B - Environmental constraints.

Which is the waste and the radiation produced and how to get rid of them.

C - political obstacles.

There are political challenges in obtaining nuclear fuel (uranium), as it is used in the manufacture of internationally banned weapons (Morris et al., 2007-23)

Fourth: Shale oil (shale oil) and oil gas sands.

Shale oil does not exist in liquid form, but is buried in sediments from sedimentary stones, and it is a heavy asphalt compound that resides inside the pores of ceramic rocks, called (Keogen) and through the heat, its particles break down and form light and medium hydrocarbon materials, which is called shale oil and the process of extraction This type faces technical and economic obstacles, and it goes through multiple stages and starts by extracting rocks and then exposing them to high temperatures, after which the oil is collected and the rocks are disposed of as waste away from the production sites, and it is worth noting that the production process (50) barrels of oil requires transportation and backfilling (66) Tons of rock waste, which requires large quantities of water (OAPEC, 2010-18).

The United States of America is one of the most important locations for shale oil reserves, as it alone owns (60%) of the world's reserves, followed by the Soviet Union, China and Brazil.

As for gas oil, it is heavy for viscosity and contains a large percentage of sulfur, and successive operations must be carried out to conduct the process of dilution and purification, and among the most important problems facing the production of this type of oil is its pipeline transportation, as well as the problem of environmental pollution and disposal of sediments and waste.

As the production of (100,000) barrels per day, oil and gas sand requires exceptional efforts, leaving it with deposits of up to (200,000) cubic yards, which must be disposed of after the extraction of oil in addition to large quantities of water required by the production process, and it is also concentrated in the United States of America and the Union. The Soviet and China, that economic and technical considerations prevent the development and commercial production of these types of oil, and perhaps the most prominent of these obstacles are mining and extraction, the high costs, and the environmental and pollution problems associated with the production process due to the large volume of waste.

Fifth: Renewable energy sources.

Under the list of renewable energy sources includes a group of sources, including solar energy, hydroelectric energy, geothermal energy, tidal energy, wind energy and hydrogen energy. Many studies and research have been conducted in order to use multiple technologies to replace renewable energy alternatives instead of Conventional Energy sources. (OAPEC, 32,2013)

With the increasing interest in this aspect, however, the replacement process has not reached advanced stages, due to the presence of many obstacles in every type of energy source, but in the Arab countries, the interest has remained and remains limited and concentrated in solar energy, wind and hydroelectricity, due to the presence of oil and gas in large quantities in the Arab world. Consequently, the economic feasibility in most Arab countries is in favor of oil and gas.

The limited use of renewable sources is behind the high costs and negative impacts on the environment, for example the use of wind energy generates turbine noise and the need for large areas of land at the expense of agriculture and tourism as well as the matter for other sources.

1- Solar energy

The use of solar energy began in the sixties of the nineteenth century, and because of the existence of political problems in 1973, the incentives increased to use alternatives to fossil energy, and thermonuclear methods were used to form solar energy, and include transformations of the hydrogen element in helium and the radiation of this energy to space. Use it as a source. Important energy and it is a successful alternative to other energy sources, and solar cells are

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used to generate household and other electricity, but the large costs prevent widespread commercial use at the present time (Moussa, 45,2014)

The amount of solar radiation that reaches the earth reaches 1.36 kilowatts per square meter, and the atmosphere (50%) is reflected from it, and (15%) is reflected from the earth's surface, and is absorbed by the air (35%). Water, soil, dry and sunny areas (Arab countries) are considered from The most important areas that can produce solar energy, as one square foot in these areas receives up to (750) thousand British thermal units (BTU) annually of solar radiation, which is equivalent to (55) gallons of diesel and the exploitation of solar energy requires large areas for the installation of cells. And transducers. If we want to produce (1000) megawatts, we must build a plant on an area of (16) kilometers, and this area is large, especially in agricultural countries such as Europe, in addition to the high costs of construction.

Table (12) Solar energy production for the world's largest producing countries for the year 2015

Country	Total capacity	Solar per capita (watts)	Solar energy utilization rate
Germany	39.700	491	4.9
Italy	18.920	308	1.0
Belgium	3.250	287	0.6
Japan	34.410	271	25.1
Greece	2.613	230	0.4
Australia	5.070	215	2.4
Czech	2.083	498	0.7
United States of America	25.620	79	16.0
China	43.530	32	28.3
India	50.50	4	1.6
European Union	94.570	-	6.5
The total capacity of solar energy in the world	256.000	-	1.4

Source: Table from the researcher's work based on: Mike Munsee LL (22january 2006) IEA pvp: 177Gw of pvinstalled IEA Annual Report.

It is noted in the above table that the largest countries that use solar energy are China by (28.3%), followed by Japan (25.1%), and the United States of America (25.1%). Of (16.1%), and that the largest share of per capita electricity production was in Germany, reaching (491) watts, while the lowest was in India (4) watts for the high proportion of the population compared to the production of solar energy. .

2- Hydropower:

Natural waterfalls are a result of natural movement and sufficient force, which may be industrial or natural, and this movement or potential force can be exploited by applying the force of flowing water to turbines that generate electricity and recycle it, and the energy generated from it. The least expensive source, but it needs conditions that require the availability of falling water. This is to move the turbines and it is considered one of the clean sources, and China is considered the highest in the exploitation of hydropower, with its production reaching 1046 terawatt / hour, followed by Canada and Brazil, and then the United States, respectively. Statistics of the International Energy Agency for 2015, as Canada produces 383 terawatt hours per hour and contributes 58.3% of the country's total electricity, 150 countries produce hydroelectric power, and the Asia-Pacific region is the largest in global production, and there are many factors that impede the development of this Type, such as transportation and storage, but the use of this type of energy is still limited and limited to some countries with suitable conditions

Table (13) The percentage of countries' hydropower use in global production/ Giga watts

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The state	The share of the total world
United States of America	13.5
China	4.3
Canada	9.6
France	3.4
Brazil	9.4
Austria	1.8
Mexico	1.3
Korea	0.5
OECD	58.5
Total world	730

Source: The table is from the researcher's work, based on: opec, Annual statistical Austria.2013

The above table shows the proportion of countries' use of hydropower to the proportion of the world, and the United States is the most and in the forefront, followed by Canada and Brazil, and Korea is the lowest on the list.

3- Geothermal energy

The earth contains in its interior a furnace with a tremendous temperature that can reach 4200 degrees Celsius, and part of this heat results from the stage of formation of the Earth and the other part results from the radioactivity of radioactive materials, and the thermal energy is either in the form of hot dry steam, or water in degrees High heat and it can be used directly by shedding heat exchangers or in the form of steam resulting from high heat in the ground, which leads to the evaporation of ground water and causes the rise of steam and generates energy capable of moving turbines generating electricity and the reserve of heat energy in the cavity is estimated The earth in a belt whose depth is (2000) meters below the surface of the earth is equivalent to producing 250 billion tons of coal, and this energy can extend for many decades, and production increased in 2008 for this type of renewable energy as the electric power reached (8000) gig watts. It is one of the clean sources and with the high yield of extracted energy and the low costs required for the production process, but the problem lies in the high costs of stations that use this type of energy, and the difficulty of drilling wells at depths of up to (5) km, and At high temperatures, the liquids extracted from the ground contain a mixture of carbon dioxide, sulfur sulfide (H2S), methane and ammonia, and these gases participate in global warming**.**

Table (14) Energy production from the ground (underground) in 2018/ Terawatt-hour

Country	Energy abstracted annually TJ / q	Average annual output power (GW)
China	45.373	1.44
Sweden	36.000	1.14
United State	31.239	0.99
Iceland	23.813	0.76
Turkey	19.623	0.62
Hungary	7.940	0.25
Italy	7.554	0.24
New Zealand	7.086	0.22
Brazil	6.622	0.21
Georgia	6.306	0.20
Russia	6.243	0.20
France	5.196	0.16
Japan	5.161	0.16
Total	208.157	6.60

Source: The table is from the researcher's work, based on. opec, Annual statistical Austria. 2018, p33, Table 19 .

It is noted from the table that China is at the forefront of producing this type of energy, followed by Sweden, then the United States, and with the growth in production and the increase in interest in it, it has not lived up to the level. Of alternative energy.

4 - Tidal energy

Tidal energy is an inexhaustible renewable energies, and it mainly depends on the movement of water in the seas and rivers and the movement of waves generated and affected by the action of the winds on the surface. For energy, it faces many technical problems and obstacles such as the difficulty of the storage process, and the transportation process for distances that may exceed (500) miles from the generation station, and the high costs are another obstacle to the development of this type. Energy and high power plant construction costs, and the fluctuation of water, waves and winds, which are natural factors that are not man-made and cannot be controlled. (Heinberg, 56,2006)

5- Wind Energy:

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Wind energy has been used since ancient times to spin wheels and windmills, but modern uses of this type of energy sources are to generate electrical energy, which is extracted from kinetic energy using wind turbines and it is one of the types of clean energy and does not lead to emissions and wind turbines (wind turbines) They are devices that convert wind into electrical energy, and most of these turbines are equipped with three blades of equal dimensions and shape and have high aerodynamics that rotate under the influence of wind speed.

This type faces obstacles that limit its development, which are the costs of turbines, the difficulty of transportation and installation, the difficulty of operating them in areas with high winds close to the ground, as well as the difficulty of their maintenance (Chile, 2010 61).).

And it witnessed a lot of development and modification of turbines, and large farms were established on land and in the seas, in order to make the most of the wind movement in open areas, and by 2018, the total cumulative capacity for generating electricity from wind reached (591,549) MW, an increase of (9.6) over the year The previous wind energy industry flourished in India and China, as China produced in 2015 up to 145 megawatts of wind energy, which constitutes 50% of the world's production, and Denmark is one of the countries that use wind energy and produces 39%, Portugal (18%) and Spain (16%), Ireland (14%) and Germany (9%) and with it the growing interest in this type of energy, the production quantities are small compared to the sums spent, as well as the limited use and due to the difficulties of storage, transportation, etc. To be a complete alternative to fossil fuels for its ease of use.

6 - Hydrogen Energy:

Hydrogen is one of the elements present in large quantities in the universe, but it is one of the elements that make up the sun, stars, and space contains a high percentage of it, and although it does not exist as an independent element, it is united with oxygen, and it is an ideal fuel in terms of technical and economic feasibility, or in terms of effects on Environment, and hydrogen can be provided from electrolysis of water, or thermal water decomposition by direct heating to about (3500) degrees Celsius or through the influence of sunlight, and liquid hydrogen is used as fuel for aircraft and it is also a source of fuel for some cars, but it is still under experiments and study with direction Some companies such as Mercedes BMW.

Hydrogen has multiple advantages. (Muhammad, 2014-20)

- An element that is combustible and has a high thermal content that does not generate any toxic or polluting gases.
- A source that is not depleted and available in large and renewable quantities.
- Easy to transport and store.

It has multiple uses and is used in the manufacture of steel and water purification, which is fuel for missiles.

Low energy required to start combustion compared to other sources.

It generates high thermal energy, more than 2.75 times that of oil derivatives.

The third topic / the impact of alternative sources on the global demand for oil

The transition from coal as an energy source to oil and gas was voluntary, due to technical and economic considerations, and was not due to a shortage of coal mines. Today, however, the search for energy alternatives aims to compensate for the shortfall in oil reserves resulting from the severe depletion of oil stocks. This shift at that time marked a shift from low-level sources and inflexibility of use to better-quality, economic-return energy sources. This also necessitated a shift to a world-friendly price policy as the oil industry was affected by the Marshall Plan, in which he called for the reconstruction of Western Europe, and a policy was adopted. Imposing extremely low prices by exploiting the large fields in the Middle East, and this policy led to a shift from coal to oil.

The current shift in energy sources aims to move from depleted sources to those available in greater quantities, and to renewable sources. Oil and gas form the basis of current energy sources, and the hopes placed on coal and nuclear energy are the fuel sources of transition to the development of renewable.

1 - The economic importance of natural gas:

With natural gas occupying a prominent position in energy alternatives and directing investments greatly, it is an ideal fuel for its properties, abundance in large quantities, ease of extraction and transportation, has uncomplicated chemical structures, high thermal energy, easy and complete combustion, and does not require treatment before use, waste and waste generated A few of it. (OPEC 32,2011)

And its versatility, including (Al-Turki, 55,2013)

Industrial uses in field sites and in many industries such as cement, aluminum, lime and iron.

Uses for generating electrical energy.

Making organic chemicals.

Household uses.

Fuel for automobile engines, an alternative to gasoline and diesel.

Despite the emphasis on the importance of gas as a basic alternative in the fields of energy production due to the technical revolution it is achieving in the fields of its stages of industry, it is not without some drawbacks because natural gas investment projects are among the most costly projects. Industrial projects from an economic point of view, and because of the capital

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spent on these investments, as most of them are concentrated in establishing pipeline networks for transporting gas, pumping stations and maintenance. Investments are characterized by flexibility, and gas prices are linked to them. The oil is subject to the same fluctuations and the demand for gas changes with the change of consumption seasons, and it is subject to a low-elastic pricing system as well as the need for purification operations from impurities, and this also contributes to raising costs, which requires the presence of energy storage that can absorb the surplus in the summer, which increases costs.

2- The economic importance of coal. (Musa, 22,2014)

Although coal is considered the third most important source of energy after oil and gas, especially in industrialized countries, and the presence of large reserves and contributes to many industries, its use is limited, especially in some developing countries, and its use has begun to decline, even though coal is a major fuel for power plants. However, it is noticed that its use is continuously declining for several reasons, including the high costs of extraction, difficulties of transportation from mines to areas of consumption, low calorific value compared to oil and gas, and that its use increases environmental pollution and modern industrial machines depend on oil and the difficulty of replacing coal as a source of energy without changing structures. It is for these reasons that the European Commission for Energy has adopted the policy of placing coal in the third place among its sources of supply after oil and natural gas.

3- The economic importance of nuclear energy:

With the increasing interest in nuclear research and studies to invest in nuclear energy, which coincided with the rise in oil prices in recent years, which led to a reconsideration of the importance of nuclear energy in some countries and the possibility of benefiting from it despite the crises of nuclear leakage, as happened in the Fukushima crisis in Japan in 2011 and some industrialized countries returned To build new reactors, including the Russian Federation, the United States of America and France, while raising safety standards and precaution about environmental pollution, and the interest of some developing countries has appeared in the acquisition of this technology for use in peaceful purposes, especially the production of electric power, and the civilian industries for nuclear energy are accompanied by advanced technology and financing and between importing countries. Technology has among these difficulties. (Morris et al., 2007-32)

A - The high costs required for investment to construct power plants compared to power plants from other sources.

B - The length of time between the initiation and construction of the nuclear reactor, from the stages of preparation and design to the end.

T - The limited use of civil nuclear energy, which is limited to the production of electricity, but is still far from transportation and other industries, and the use of it is still limited.

D - The danger of nuclear accidents, radiation, waste, and the danger of non-peaceful military construction and uses or terrorism.

C - Pollution resulting from disposal of radioactive waste and its dangers that last for long periods.

4 - The importance of alternative renewable energy sources.

A - Solar energy:

Despite the advantages that are available in the use of solar energy and its versatility in heating and cooling, generating electricity, cooking and moving water pumps, there are many obstacles associated with the use of solar energy that are difficult to avoid at the present time:

- The problem of the area needed by the facilities required to generate solar energy is large and vast, with the limited number of lands due to the variety of their use.

- The high costs and long time to establish solar energy, especially in developing countries with varying solar radiation and climate fluctuations.

-The difficulty of storing solar energy effectively, and the high costs of research, studies and experiments.

B - Hydropower (Tides).

It is considered one of the clean and less dangerous sources and is harmful to the environment and the process of generating electricity is highly cost-effective, and although this type of energy represents (19%) of global electrical energy production, but it is also facing great challenges represented by the high investments required for the production of electricity with storage problems, and the possibility of Long-distance transportation, and in many countries its main source is not available, which is water in rivers and seas (Muhammad, 11,2014)

T - Wind Energy.

With the abundance of wind energy and the increase in its use in some countries, the wind energy industry faces some difficulties, including the variation in wind speed and direction from time to time, and from place to place due to the movement of the earth, sun, geographical topography and other factors associated with it, as well as the high costs of electricity production, which are estimated. Four times the production costs from other traditional sources, and the need for large areas, for example, is required (50,000) mill diameter (56) meters to produce electrical energy equivalent to one million barrels of crude oil, and this type is not available in all regions

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and the difficulty of maintaining stability and the difficulty of storage. Abdul Karim, 61,2010)

W - Geothermal Energy

The use of underground energy, despite its availability in many countries, but its use is still below the level of its use as an alternative to other types due to the difficulties of dealing with the danger of dealing with the heat leaked violently to the surface of the earth, and the process of eroding the equipment and machinery used in drilling to reach the place of heat because it is generated in the form of water moisture steam, which greatly affects the machines used, and the low percentage of energy used from it, as the geothermal well system can extract (10%) of this amount, meaning the percentage of use reaches (1%) of the geothermal heat in a specific location

C - Organic Energy

The energy extracted from plant materials and waste after converting it into liquid or gas by means of chemical or thermal analysis or by direct burning, and the process of its use is very expensive and may affect the use of agricultural products and vital crops, and it needs large areas as well as the need for labor, and some countries may lack such production factors and it may also affect the areas of agricultural areas and forests and the difficulty and high cost of storage, and therefore this source remains limited and limited use in some areas.

H - Energy generated from hydrogen (EIA, 11,2006)

Although hydrogen is one of the most common elements in the universe, as previously mentioned, there are obstacles and difficulties the use of hydrogen

-Difficulty to use in the gaseous state, as it is explosive, and when mixed with air, it was replaced by helium.

-Liquid hydrogen needs refrigerated tanks for low temperatures, which increases storage costs. Although the scientists were able to get rid of this problem after its union with another chemical element, it can be easily separated through heating.

-Difficulty separating hydrogen from water because this requires great energy and with the many methods of separation being complicated and high costs.

Fifthly - the preference of oil over alternative sources: What is meant by alternative sources of energy are the sources that are depleted and currently in use, which can replace oil and which are discussed in previous research studies, and we know how their use at the economic and commercial level is still colliding with many problems and some technical, environmental, technical and economic difficulties, which led to the survival of the percentage of their contribution Covering the world's need for energy is limited and without the goals set for it. As for oil, although it is a source of depleted energy such as coal and gas, it was and still is the primary source of energy, and it will continue to enjoy this preference for the next fifty years and this is due to several reasons, namely: (opec 36,2018)

First: The lack of alternative energy for replacing oil, as Western industrialized countries have tried since the decades of the seventies and eighties to the present day to search for new alternatives to oil, due to the rise in its prices, according to their belief, and the issue of the economic and political dependence of the countries that own this resource, but all the results of the research were disappointing as experiments proved The failure of these sources to replace oil for several reasons:

1 - Economic reasons.

Most of the alternative energy sources are not economical due to the high financial costs, as is the case in the energy of using wind and tides (waves), which forced the postponement of research in the use of these sources to another time.

2 - Ineffectiveness.

There are some experiments that proved the ineffectiveness of some energy sources, such as the experiments conducted on alcohol used from corn and sugar cane as fuel for cars, which showed discouraging results, which stopped research in developing this type of energy in the near future.

3 - Risks and insecurities.

Some of the alternatives are among the most dangerous types of energy sources and it is not safe before the use of nuclear energy, as a source of energy and fuel in peaceful fields, if the nuclear disasters that occurred, such as the Chernobyl accident in the twentieth century and Fukushima in the twenty-first century, proved that nuclear energy still poses a threat to humans. Nowadays due to deadly radiation, waste and disposal methods.

4- Some alternative energy sources have become unsuitable for use, and the demand has increased, such as protecting the environment from pollution. The return to the use of coal is facing strong rejection from public opinion in all industrialized countries, which seek to provide a low-polluted environment.

Second: Oil enjoys technical and economic advantages and specifications, the most important of which are:

1 - The high calorific value compared to other sources through the amount generated from oil is higher and greater than other sources.

2- Lower production costs.

3 - It is available in large quantities despite the theory of depletion.

4 - Flexibility of movement, transportation and storage.

5 - The demand for oil is a derivative demand and it does not demand for itself. Rather, it is a source for many derivatives that represent important commodities

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and products in human life, especially the petroleum, chemical, oil, fuel and electric power industries.

6 - There are advantages to oil in terms of technical and technological aspects of the equipment used, and the efficiency of use, so the demand for oil is a demand that is inflexible or low in flexibility, because the process of converting to any alternative source commercially is not easy, but rather requires structural adjustment of equipment and factories, and so on and this requires A long time.

7- Demand for oil is a function of high economic activity, as the increase in economic activities increases the demand for oil, which gives an indication of the correlation of growth rates and the increase in production in a positive relationship with the demand for oil. Energy, at least in the short and medium term.

A quick comparison of energy sources for global consumption and thus oil demand can be made through the following table

Table (15) Global energy consumption by species and its ratio to the total 2009-2018

power source	Percentage of total Energy consumption %	The amount of energy consumed Thousand terra / watt
Oil	34.4	509.8
Charcoal	29.2	434.3
Gas	22.8	339.3
Hydropower	6.7	99.2
Nuclear Energy	4.6	68.8
Wind Energy	1.3	18.7
Geothermal energy	0.9	12.7
solar energy	0.4	5.7

Source: The table is from the researcher's work based on: Qusay Abdul Karim, the importance of oil in the global economy and trade, Syrian oil as a model, Ministry of Culture, General Book Authority 2010, Damascus.

It is noted from the table that oil is the most used, which is in the first place (34.4%), followed by coal (29.25%), then gas (22.8%). Solar energy is the lowest utilization rate (0.4%) of the total mentioned energy. Through all of the above, we know the importance of oil, its future role, and the demand for it during the coming decades will not decline quickly.

CONCLUSIONS AND RECOMMENDATIONS

FIRST - THE CONCLUSIONS

1- Through the course of research, the research hypothesis was proven, according to which oil will remain at the top of the list of energy sources over the five future decades and due to the various restrictions on the transition to alternatives.

2- Oil is considered one of the sources threatened with depletion according to the theories of depletion due to the scarcity of reserves and the increasing dependence on it as a main source of energy and an accelerated increase in production.

3- The process of moving to other energy alternatives, with the global costs and the required investments, and the efforts of the countries of the world to expand energy sources, will take a long time, and it will take technologies, equipment, machinery and factories. Manufacturing must be adapted in proportion to other alternatives.

4- Some energy sources face obstacles such as nuclear energy, the problem of radiation, environmental pollution, hydropower, difficulty of storage, and the need for large areas of solar energy. These obstacles will delay making these sources an alternative to oil.

5- Each energy source has conditions, both renewable and non-renewable, which differ according to the place of production, production costs, and the harm achieved (cost and social environment). All energy sources face different problems and obstacles, but the current source, which is oil, is the least expensive, least harmful to the environment, and has the ability to be transported. And storage.

6- The demand for oil will continue to increase during the coming decades due to high population rates, increased rates of economic growth, and industrial and technological developments that have made oil a basic material from which many important products are extracted.

SECOND - RECOMMENDATIONS

1 - All countries of the world are called to accelerate the development of alternatives and solve the problems facing the production of other sources, especially renewable and environmentally friendly energy sources, to reduce the phenomenon of pollution and its negative effects.

2 - Striving to reduce the negative effects of various energy sources and increase investment in scientific research is an important matter that contributes to the world avoiding an energy crisis in the future.

3- Oil states should take practical steps to reduce oil losses and reduce the dependence of their economy on oil, bearing in mind that the world will leave oil energy in the future, either based on Hubert's theory or because of substitution of alternative sources. The economies of these countries must be protected and economic diversification increased.

4 - Increasing the movement of exploration and search for oil in unexplored geographical areas to increase global reserves.

5- The oil-producing countries must take into account the decline in oil reserves, and work in the same way

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in which the United States of America takes depletion measures through strategic reserves, and intervenes in oil pricing, and the index is reviewed periodically. Depending on conditions, ups and downs.

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