International Journal of Innovation, Creativity and Change. www.ijicc.net
Volume 13, Issue 6, 2020

The Role of Technology in Shaping the Future of Oil Production and Consumption

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This study aims to explore the impact of modern technological innovations in the field of oil on the levels of global production and consumption of oil through the use of a descriptive and analytical approach. The results show that oil technologies led to a real revolution in changing the course of events during the past few years, especially in the field of production and consumption of oil squarely on the throne of energy, through increasing oil reserves, using three-dimensional exploration techniques (D3 and D4) that reduced the failure rate in drilling wells up to limits (8/10). In addition, it helped to find other oil basins, as well as in the discovery of oil reserves in the Atlantic Ocean and the coasts of Mexico, Brazil and West Africa, such as the Republic of Guinea and others, as well as reservoirs in deep waters. The technology is merited with increasing production from existing fields, through the development of drilling and production techniques, and enhanced production that added new energy estimated at two thirds (2/3) of the primary production capacity of the well, and the technologies helped in the production of unconventional oils, such as shale oil, shale oil and bottoms oil oceans. In addition, technology also is greatly credited with reducing oil consumption, by improving the efficiency of engines in energy production and reducing the level of fuel consumption, as it brought the car to run at 57.1 kilometres / gallon.

Key words: *Oil production, oil consumption, energy market, energy technology.*

Introduction

Technology plays an important role in developing saturated energy technologies for the needs of human societies. Burning wood has been providing global energy needs for the period from 1805 to 1895. From 1895, coal took the lead in producing and consuming energy instead of wood, using steam technologies and its driving engines for ships and trains. However, in 1913 the success of internal combustion engines dependent on oil and its derivatives was declared successful, revolutionizing energy production and consumption, turning the table on the recovery of coal, and keeping billions of tons of reserves in its mines (Almusawi, Almagtome, & Shaker, 2019; Kbelah, Almusawi, & Almagtome, 2019). Since then, the oil revolution and the techniques of extracting it take an important place in the application, until the oil crisis came in the year 1973, and it awoke the western world, and prompted them to think seriously about providing an alternative to cheap oil. From here, the convoy of advanced technologies for production, exploration and alternative provision of oil began, and one of the tasks of the International Energy Agency established in 1974 was to sponsor these efforts. These included the exploration of fields away from the lands of OPEC producing countries, and the creation of new methods and technologies for deep water exploration, the conversion of tar sands and bitumen into traditional oil reserves, and made their production within the acceptable commercial scale (Ali, Almagtome, & Hameedi, 2019; Almagtome, Shaker, Al-Fatlawi, & Bekheet, 2019). The current research aims to explore the effect of technology on developing extraction technologies and stabilising the oil supply. In addition to that, the research aims to show its effect on reducing oil consumption and converting to other forms of energy.

Technology and Future of Oil Supply

With the aid of advanced technologies, the quest for and development of oil has intensified, decreased effort, reduced costs and gained time. It has had an effect, changing the map of international oil relations between parties to a dialectical relationship between the oil-producing and oil-consuming countries, through the following:

The Role of Technology in Oil Field Detection

Technology provided the solutions to most of the problems in oil field detection, and saved a lot of time, effort and money. The most important finding of technical progress in this field is the three-dimensional seismic survey which successfully reduced costs and raised success rates uncovering layers with high oil potentials (Al-Wattar, Almagtome, & AL-Shafeay, 2019; Kelanic, 2016). Technology provided geologists with a three-dimensional picture more clearly for deeper formations, and helped them determine the network of development wells. Moreover, it reduced the drilling of dry and useless wells to a minimum, so this percentage decreased in the United States of America in 2006 to 12% of total exploration wells, where it was 37% in 1973, 32% in 1983 and 31% in 1993 (Korotayev, Bilyuga, Belalov, & Goldstone, 2018). The time period for putting the field into production was reduced after this took many months and may extend to years. A new type of 4D survey has also emerged, to give a more accurate picture of the oil stock produced, and the remaining stock. At this point, the owner of the investment decision has a clear and accurate picture of the oil field. In recent years, scientists have developed more effective technologies that have allowed the tracking of the movement of oil, gas and water during the progress of production operations from wells dug, tracking the depleting stock of underground layers of these fluids. Also, modern technology has gone beyond the production of new software that allows for the evaluation of all data related to the old oil reservoirs (Bryant, Straker, & Wrigley, 2020). These modern technologies helped to explore new basins, at the width of the seas up to a thousand metres, and increased the depths discovered to a depth of (2000) metres in the year 2007. In 2010, this depth exceeded more than 2500 metres. After that, four huge sections along the Atlantic borders were discovered in the deep waters off the Gulf of Mexico, and the "Campos" and the "Santos" basins off the Brazilian coast. The reserves found in these sections are estimated at more than 25 billion barrels, as well as sections of the West African coasts off the Congo, Angola and Niger basins. These reserves are estimated at more than 10 billion barrels of oil (Park, 2017).

The accumulated oil reserves in the deep oil basins are estimated at about 150 billion barrels, of which about 40 billion barrels were found in shallow waters whose depth does not exceed 400 - 1500 meters off the coast of Mexico, Niger and Angola in West Africa until the year 2012. After this year, about 50 billion barrels were discovered in deep water 1500-3000 meters. This stage is considered the stage of the golden age of marine discoveries from marine sources of traditional oil, which in turn led to an increase in oil production from deep water sources. Production during this period of time is estimated to be about 7.5 million barrels per day, and it is expected to increase to more than 11.5 million barrels per day during the period from 2020 to 2025 (Huber & McCarthy, 2017).

Development of Drilling Techniques for Oil Wells

Modern technologies in the oil industry have also reduced the cost of production, as tremendous progress and technological booms have raised oil production rates in the world to more than 10%. Today, wells that deviate by about 90 degrees have spread due to the development of motors capable of operating in the depths of the earth to help the digger twist the entire drill pipe to control the direction of the deviation (Ali, Hameedi, & Almagtome, 2019; Gaede & Meadowcroft, 2016). The directional drilling became a feature of the times, which helped increase the oil seepage section from the saturated layer towards the well, and this method considered a technical revolution in the oil industry, which allowed better investment of heavy and high viscosity oil, and provided twice as much production as the vertical wells (Y. Liu et al., 2019). It is possible to restore the vertical wells that have been suspended because it will find other productive areas other than the productive area that has been depleted, and may find another productive area in another depth. Thus, the oil well performs production from the two producing regions, three or even four, depending on the circumstance of the field and from one tree. This type of drilling is one of the improved production methods, as it has been possible to re-open windows in the lining tubes. Hence, it is re-drilled by wave drilling within the producing layer to increase the leaching area of the layer saturated by penetrating it horizontally, instead of the traditional vertical method where the well is drilled along the production layer and not only penetrated. These technologies have found their way for application since the year 2000 in the Gulf region, especially in the re-drilling of previous wells where depletion has ceased (Freifeld et al., 2016). Moreover, the industry of drilling heads used in this method of drilling has witnessed remarkable technical progress in the past years, which contributed to reaching great depths during an acceptable period. It helped to reach oil formations that were difficult to dig using conventional heads.

Improved Oil Recovery Operations Using Advanced Technologies

Reservoir production stops due to reservoir depletion, so additional reservoir energy must be added to increase its oil return. The use of one of the methods of development, will lead to an increase in the cumulative production of the reservoir. Increasing the number of production wells, or increasing the density of the well network, acidification or hydraulic cracking operations, in addition to water effluent for treatment or injection of gases such as CO_2, N_2, and exhaust. There is also the bacterial method, as a last stage resort, which depends on the release of certain bacteria in the producing layer. This method relies on feeding them with special materials where bacteria can do all of the above, and the heat resulting from fermentation decreases the wife's oils, and leads to increased productivity (Sen, 2008). In addition to that, there are other modern methods, such as pulsed electronic ejaculation - using lasers, and this technology is used to stop the worn-out fields and restore life to those that are stalled, as this technology is very necessary for field repair operations, especially since 25% of oil reserves can be produced via initial production, with the help of the initial reservoir pressure. As for 20% of the remaining oil reserves, it can be extracted by flooding water or recycling gases, horizontal drilling. The remaining oil reserves, which constitutes 10%, can be produced using thermal methods or chemical and other methods, which is called tertiary production (Kisman, Nzekwu, & Lau, 1995). Pulse electronic ejaculation has increased research, and the development of means of exploration and technology used in extraction. North America is the forerunner in building three major variables in the oil industry. The first variable is exploration and production from deep water areas, while the second variable is production and refining of oil from the sands of shale. The third variable currently is the production of oil and shale gas, which caused a violent shock in the level of global oil supply.

It plays an important role in influencing the level of oil prices, so prices in the last quarter of 2014 fell a lot in 2012-2013. As a result, revenues from countries producing traditional oil have been significantly affected.

Production and Consumption of Shale Oil in the World

North America is the main producer of shale oil globally, and its development enjoys the support of American strategic policy in its attempt to achieve oil self-sufficiency (Aguilera & Radetzki, 2013). The shale revolution in the United States was embodied in two oil-producing states, Texas and North Dakota, which witnessed a significant increase in production since 2009, and are now the main source of about 90% of the growth of oil reserves in the United States (Qian, Wang, & Li, 2008). Shale oil production has escalated in the world since 2012, reaching about 3.63 million barrels per day. The United States' share of it was 2.20 million barrels per day, at a rate of 83.7%. Its quantities began to escalate, until in the year 2018 when it reached about 7.5 million barrels per day. The use of advanced technology has raised the capacity of the United States of America to produce conventional oil, as well as expand production of shale oil. As a result, the total oil production of the United States increased from 5 million barrels per day in 2008 to approximately 11.6 million barrels per day in 2017, including approximately 4.2 million barrels of shale oil. This reduced the oil imports for the United States of America to about 6.4 million barrels per day in 2015, and made it a state suspicious of oil, wanting to convert to a country that exports it (Sieminski, 2014). Future estimates indicate the contraction of net imported oil, for the account of the American domestic market, by about 0.5% annually, and it is hoped that it will reach 6.1 million barrels per day (b/d) in 2025. This is due to the increase in domestic production to 14.4 million 2025 b/d, compared to 12.5 million b/d in 2015. This is due to the increase in the US domestic oil supply of fossil and shale oil, and factory production fluids from natural gas from 4.5, 4.8 and 3. 2) One million barrels per day in the year 2025, to 5.0, 5.3 and 4.1 million barrels per year in the year 2025, respectively.

Extraction and Refining of Oil Sands (Shale)

Technical developments made extracting and refining oil sands economically feasible, which made Canada the first country to carry out its production and export. Its sand oil production rate in 2014 exceeded two million barrels per day, and the Canadian Energy Council estimates Canada's sand oil reserves at 174 billion barrels (MacArthur, Hoicka, Castleden, Das, & Lieu, 2020) Table 2 shows that sand oil production is increasing, while Canada's oil production was 1.32 million barrels per day in 2007, and in 2014 it reached about 2.28 million barrels per day, exceeding its production of traditional fossil oil, which in the year 2013, reached about 1.30 million barrels, due to technological advances that reduced costs and increased the quantities produced.

Table 1. Canada's production of conventional and shale oil (2007-2014)

The years	2007	2008	2009	2010	2011	2012	2013	2014
Conventional oil	1,17	1,15	1,09	1,09	1,13	1,25	1,30	1,35
Sand oil	1,32	1,31	1,49	1,62	1,74	1,93	2,09	2,28
Total	2,49	2,46	2,58	2,70	2,87	3,18	3,38	3,63

Source: (Zhu et al., 2016)

The advanced technology applied helped to treat the petroleum clusters and tar sands, and reduced the costs of producing these clusters and pushed them to the forefront of competition with conventional oil. Therefore, the quantities of heavy oil and other forms of shale oil in Venezuela, asphalt sands in Canada, and bitumen formations and shale oil in the United States are of legendary size. With advanced oil technologies, it can produce conventional oil, which is practically equivalent to all known oil reserves in the Middle East. In the foreseeable future, about 600 billion barrels of this type of oil can be produced in terms of principles, which is equivalent to 15% of the known reserves of conventional oil. This means adding 20-25 additional years of available oil on a paced basis to the current consumption (Kaiser & Narra, 2019). Technologies have narrowed the gap in production costs between oil producers in the Persian Gulf and western regions such as the Gulf of Mexico in the United States of America and the North Sea. While the lack of experience and insufficient investment led to raising the cost of producing a barrel of oil in the Gulf states from 0.10-0.5 USD in the 1970s to 2-3 USD now. While the cost of production in the fields of the United States and Britain fell to 4-7 USD after it was 12-15 USD in the past decade, due to experience and technology, according to what was reported by the International Energy Studies Centres (CGES) and the Energy Information Group (Mohtadi & Orimo, 2016). It is clear from the above that the technology produced by scientific minds has changed the map of oil domination of OPEC countries over the past decades, and removed the spectre of oil depletion heralded by Hubert's theory in the seventies of the last century.

The Role of Technology to Reduce Oil Demand

Energy consumption is in many places, but the most energy-consuming sectors are the industrial and commercial sectors, the transportation sector and the electric power generation sector. Therefore, we will focus our research on these sectors. We will also try to show the impact of technology on reducing oil consumption and changing the approach to oil consumption in three main sections.

Reducing the Levels of Oil Used to Provide Energy in the Industry and Trade Sector

The industrialised countries managed to reduce the final energy consumption level in the industrial sectors by 15% annually between 1990-2007 (Ang & Goh, 2018). In powerplants, generation efficiency has improved to more than 65%, after being within 30% as a result of the use of the combined cycle technology of gas turbines, which led to reduced energy, and the use of advanced materials in building factories increased from the efficiency of industries is limited to 30%. In the iron and steel industry, the cost of energy consumption reached about 40% of the total cost, and it was reduced to 30% (An, Yu, Li, & Wei, 2018). The rate of specific energy consumption in the industrial sector of European countries decreased during the period 1980-1990 by 28% in Austria, 34% in Germany and 28% in Italy, while in Japan the efficiency improved to 35% (Guo, Lu, Lee, & Chiu, 2017). High-efficiency lighting technologies have reduced energy consumption in commercial buildings, homes and streets, and industrial countries who attach great importance to the energy efficiency component. It is a promising measure that can reduce consumption by up to 65% by 2030 (Xu, Chen, & Chen, 2017). These programs aim to reduce their dependence on fossil oil.

Increasing the Efficiency of Fuel Consumption in the Transportation Sector

The fuel used in road transport represents about 75% of the total energy consumed in the world, and gasoline and diesel together represent 97% of the energy used in the transportation sector. The air transport sector depends on oil with 99.9% used for jet engine fuel, and marine transportation uses oil derivatives at a rate of approximately 100%. As for the rail sector, it was more successful in getting rid of oil, thanks to the use of electricity to operate the trains. Nevertheless, the global transportation sector is still dependent on 71% of it on diesel to cover its energy needs, and electric energy from oil consumption only covers 29% of it (Fontaras, Zacharof, & Ciuffo, 2017). The Energy Information Administration expects to increase the share of car sales of these types to 49% in 2035 compared to 13% for the year 2008. Since 1980, fuel efficiency has improved in all countries of the International Energy Agency (EIA) group, increasing by 20% in car stocks as a whole (Craglia & Cullen, 2019). Policymakers around the world are working to increase their energy efficiency standards. In the United States of America, they made the car run 35.5 mpg. Car production engineers make their best efforts to reduce energy consumption, through a set of steps, including designing more modern engines than those currently in service, to reduce fuel consumption by 10%, and can reach 15%. More recent designs are being made in the engines to win fuel consumption (10-15%). The level of efficiency improvement in gasoline engines may reach 20-30% and diesel engines from 10-15% (Barba, Dyckmans, Förster, & Schnekenburger, 2017). The innovation of a hybrid engine that uses batteries in addition to fuel will reduce gasoline consumption per mile by 150% and will undoubtedly lead to a fundamental change in the consumption of gasoline.

Investing in Alternatives to Oil to Reduce the Need for It in Electricity Production

Depleted or Depleted Sources

Depleted or depleted sources include gas, coal, nuclear energy and shale oil (i.e. oil sands).

Natural Gas

Natural gas occupies an increasing role in securing the world's energy needs, as 14% of gas consumption in the United States of America is used to generate electricity. There are 272 laboratories that do not produce electricity. They are in the construction phase and are planned to run on gas fuel, because generating companies prefer them over coal, oil, and nuclear fuel because the capital employed in them is less than others, the construction period is shorter and generators are more effective (Holladay & LaRiviere, 2017). It is clear that natural gas will be the dominant energy source in the twenty-first century because it is compatible with the technologies of the advanced generation of mixed-cycle gas turbines. Its use in electric power has doubled, at the expense of reducing the quantities of oil in the charge. Technology has changed the levels of oil used to produce electrical energy. Oil represented 25% of the fuel produced for electric energy in 1973, and it decreased to 6% of the fuel responsible for producing electric energy in 2017. It constituted a rate of decline of 19%, which is very high, in favour of natural gas, which has increased to twice as it constituted 12% in 1973. It increased to 21% in 2017, i.e. 11% more than it was in 1973.

Coal

Coal is still used to generate about 40% of the total electricity globally despite environmental concerns. It remains one of the main energy sources due to the availability of its reserves and the continuation of modern technologies to raise its efficiency in generating electricity (Kasap, Şensöğüt, & Ören, 2020). The use of coal allows the United States of America to cover 23% of its need for primary energy (Orsi, Muratori, Rocco, Colombo, & Rizzoni, 2016). Currently 55% of the energy produced in this country comes from coal-fired power plants.

Nuclear energy

The industrialised countries are at the forefront of the energy producing countries from this source, their production may reach 85% of the total energy produced from it. Thus, the percentage of nuclear energy in the global energy mix increased from 3% in 1973 to 4.9% in 2016 (Horvath & Rachlew, 2016). It turns out that there is a significant decline and a clear decrease in the contribution of oil in the global energy mix, as the oil contribution decreased in it from 44% in 1980 to 31.3% in 2016. Moreover, there is an increase in the share of renewable energies in the energy mix Worldwide from 11% in 1980 to 13.1% in 2016, an increase of 2.1%. While there is a slight increase in the participation of coal in the energy mix, its participation rate increased from 25% in 1980 to 28.6% in 2016, i.e. an increase in capacity 3.6%. As for nuclear energy, its participation in the global energy mix increased by 1.8%. Its participation in 1980 increased by 3% and turned to 4.8%. All these increases occurred at the expense of fossil oil.

Renewables

They are clean energy sources that do not produce any emissions such as renewable energies such as sun, wind, subterranean energy, tides, and alternatives to biomass fuel such as alcohol from sugar and corn. Brazil is the largest country in the world in the production and use of bio-ethanol, and its production is about 4.5 billion gallons annually, when it used fuel for cars after mixing gasoline in different proportions and after that was possible due to the technological development in the engines industry. Out of every ten cars that are now running on the streets of Brazil, eight of them are powered by ethanol fuel, so that the proportion of these cars has reached 62% of the total new car sales since 2005 (Palmer, Tate, Wadud, & Nellthorp, 2018). Renewable energy contributes about 13% of the volume of global energy consumption in 2016. It is a high proportion compared to the decade of the seventies of the last century. That 72% of the total renewable energies are used in the production of electrical energy, as well as for heating purposes (Nastasi & Basso, 2016). The hydroelectric energy contributes to the generation of more than 87% of the total electrical energy generated by renewable energies, followed by wind (6.3%) and biomass (4.7%) and the rest of the other sources in very modest proportions. As for heat from renewable energies, biomass contributes in the largest part, i.e. 65.5% of the total heat released by renewable energies, followed by solar heat at 26.2%, then geothermal by 8.3% (Inayat & Raza, 2019). As a result, the effect of technologies has become evident in the quantities produced from this type of renewable energy.

Technology and the Future of Energy

The Effect of Technologies on Reducing Demand for Crude Oil

It does not seem that there is a real danger that will affect the quantities of demand for energy produced by fossil resources (oil and gas) until the year 2040. New technologies will be a brake on the increasing demand for oil and gas, especially from traditional fossil sources. Because of the high efficiency of machines as a result of technological progress, energy efficiency will improve production needs. One million US dollars of gross domestic product will drop from 122 tons of energy equivalent in 2016 to about 77 tons of energy equivalent in

2040 due to scientific and technological progress. For example, the electric car in 2040 will be more efficient than the available car in 2000 at a rate of 70%, and the number of electric cars (hybrid, i.e. electricity, fuel, or battery only) will increase to 300 million cars in 2040 world-wide (Dane, Wright, & Montmasson-Clair, 2019). This will negatively affect the increasing demand for fossil fuels. Moreover, technology will drive the growth of renewable energies, which will negatively affect energy demand as well.

The Energy Demand Mix from Different Sources

According to the aforementioned report, oil will remain the first in the global energy resources collection, despite its decline from 33% in 2016 to 27% for the year 2040. While the demand for gas will grow more quickly than oil, it will come in second place after oil in meeting energy demand by 26% in 2040, instead of the 24% that it was in 2016. Although the demand for coal will not change in terms of the quantity, its contribution to the formation of energy sources will also decrease from 28% in 2016 to about 21% in 2040. Despite complaints about environmental pollution, it will remain the largest contributor to electricity generation. As for renewable energies, they will also develop due to technology at an annual rate of 7%, to occupy the fourth position in contributing to meeting the global demand for energy, after their production increases to be 503% in 2040 from what it was in 2016. Its contribution will be limited to 14 % of the world's energy sources. Moreover, solar energy will grow by about 150% of what it was in 2016, and its production cost will decrease to become a competition in the market for other energy sources, without the need for support. The largest increase in this energy will be from China and India. China will remain the world's largest energy consumer. It is expected that China's energy consumption will reach 4319 million tons of equivalent oil annually, while the US consumption will be about 2299 million tons. India's consumption will be 1921 million oil equivalent tons and the European Union 1460 million tons of oil equivalent. China will also become the largest producer and consumer of renewable energies, and it will produce about 30% of the world's renewable energies. It will be the largest consumer of oil and the second largest gas consumer after the United States.

Current oil producers are facing other pressures to reduce demand for oil and will do so with the help of technology including the production of energy alternatives that are used in machinery and equipment that runs on oil. Electric cars and cars operating on biofuels currently constitute more than 60% of the cars operating in the streets of Brazil. In addition to that, there is an increase in the number of cars operating with natural gas in the world, in addition to the fact that hybrid cars have entered production and wide spread use. These cars are powered by fuel cells, and laboratory experiments predict that their production will be economical and safe, and that they will be the cars of the future (Overland, 2019). As for trains, the experiments of high-speed electric trains started to invade the countries of the

Western world, Japan, China and others, and enter into actual work. As for aeroplanes, kerosene oil remains the backbone of their feeding. In the field of electric energy production, scientists have drawn a global map that first monitored in detail the potential of wind energy at the planet level. It has been found by these scientists that utilising only 20% of this energy may provide more than eight times more electrical energy than the whole world consumed in the year 2000. The main result of this study confirms that low-cost wind energy is more abundant than previously thought (Ram et al., 2017). From comparing traditional energy prices with wind energy, we find that they are the closest to equivalence with these prices, knowing that the current cost of wind energy ranges between 10-25 cents. It is expected that the cost of wind energy production will decrease to about 2 cents per kilowatt hour (C. Liu, Wang, & Zhu, 2017). This prompted Denmark to produce about 62% of its electricity in 2014 via wind turbines, and plans to fully produce via this energy source in the year 2035. Portugal and Spain also produced 20% of their total electrical energy from wind energy, as well as successful experiments in Australia and Britain both producing 17% of their total electrical energy from wind. Moreover, the US state of Iowa and Dakota produced (26%) of wind electricity.

Conclusions and Discussion

Technology was important in increasing production from existing yields, through the development of drilling and production techniques. It has enhanced production by adding new energy estimated at 2/3 of the primary production capacity of the well, and the technologies helped in the production of unconventional oils, such as shale, shale and oil ocean bottoms. In addition, the technology helped produce alternative commodities for oil, and its competition began to save energy and reduced its proportion in the energy mix, such as gas conversion in energy production, solar energy production, and energy production from windmills. By doing so, the availability of oil in the oil markets decreased and customer options decreased. Technology is also credited with reducing oil consumption by improving the efficiency of engines. In addition, technology increased the efficiency of power generation and production plants to more than 65% than they were during the past few years, as a result of using the combined cycle and gas turbines. Technology also helped to produce goods and equipment with modern technologies that are less energy wasted, thus reducing the level of consumption, and this was reflected in the low level of oil demand, and curbing the increase in oil prices. Technology is expected to develop promising technologies such as fuel cells and micro turbines, at which time there will be a change from the level of dependence on oil in favour of other technologies unrelated to oil, such as a shift to production of electronic programs and communications programs in the future, which may affect the level of dependence on oil and leave the courtship to the oil countries. The results indicate that heavy water will save about 100 billion barrels at a cost ranging between 20 -30 US dollars and they are within reasonable costs. The Arctic and Southern regions can grant 200 billion barrels at a cost ranging between 20- 60 US dollars and can be reduced through future technologies to become reasonable. Enhanced production technologies will produce up to 300 billion barrels of oil at reasonable costs and advanced technologies will convert approximately 1,000 billion barrels of unconventional heavy oil in Canada, Venezuela, America, and other areas into conventional oil products at an extraction cost ranging between 20-40 US Dollars which are within the commercial limits. Because of technology, oil sands in Canada have also become economically productive, with limits of 25 US dollars, which will add an enormous amount of oil to the oil supply.

Technology has changed the map of oil domination of OPEC countries over the past decades, and removed the spectre of oil depletion heralded by Hubert's theory in the 1970s. In the foreseeable future, about 600 billion barrels of types of oil (deep and shale oil) can be produced in principle, which is equivalent to 15% of known reserves of conventional petroleum. This means adding 25-20 additional years of oil, available based on current consumption. Technologies have narrowed the gap in production costs between oil producers in the Persian Gulf and western regions such as the Gulf of Mexico in the United States of America and the North Sea. While the lack of experience and insufficient investment led to raising the cost of producing a barrel of oil in the Gulf states from 0.10-0.5 US dollars in the 1970s to 2-3 US dollars now. While the cost of production in the fields of the United States of America and Britain fell to 4-7 US dollars after it was 12-15 dollars in the past decade. Most of the current means of transportation will shift to other types of energy feeders for these means as a substitute for the current main oil for these means such as electric and hybrid cars and fuel cell cars. Current technologies will make the success of these mechanisms a tangible reality after reducing their manufacturing costs, which reduces the importance of oil in providing energy and generates pressure on decision makers in producing countries. Gas and renewable energies, especially wind and solar energy, will have a clear impact on electricity production, the provision of alternative energy and reduced dependence on fossil energy, which creates financial pressures and burdens on oil production countries as a result of the declining importance of oil in the global energy mix.

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