



Future of Oil and Renewable Energy

Yusof Gholipour

¹Department of Engineering, N.I.O.C (National Iranian Oil Company), Tehran, Iran
y.gholipour@yahoo.com

Abstract. Energy is one of the most important elements for every Government in the world, and we have seen struggles for energy between some countries or governments and their people. Energy is a strategic element for countries especially industrial countries, and oil has been one of the oldest and most important sources of energy in the world, since the 19th century, after coal and other kinds of energy. We want to investigate status of oil as an old energy resource and renewable energy and what will happen in the future for users and producers of it.

Keywords: Renewable energy, Oil, Petroleum, Oil countries, Clean energy, Environment.

Introduction

The modern history of petroleum started by Scottish chemist James Young in the 19th century (in 1847 AD). The subject of Young patent dated 17 October 1850 was refining of paraffin from crude oil and other production of oils and solid paraffin wax from coal formed. In 1851 Young & Meldrum and Edward William Binney completed the first oil refinery in the world [1] it was the start of new energy for those days and we can name that a revolution of energy. The amount of oil energy was significant compared to other sources, and this increased the number of oil fans.

On base of definition by U.S. Internal Revenue Service, a BOE (barrel of oil equivalent) as equal to 5.8 million BTU (5.8×10^6 BTU equals 6.1178632×10^9 J, about 6.1 GJ, or about 1.7 MWh) [2].

After discovering and refining oil changed style of life, and some countries that had oil became rich, some advanced countries became more industrial and other countries became poor.

Table 1. After the discovery and exploitation of oil

Oil Country	Advanced Country	None of them
increase revenue	increase advancement and welfare	increase poverty and needs

During this period, competition between countries intensified and every country had tried to get more oil and energy resource till second world war that access to oil as a very important source of energy was (and it still is) a major factor in many military wars, oil facilities as a major strategic asset were widely bombed [3, 4]. Gradually oil became more popular and became the first and most important source of energy in the world.

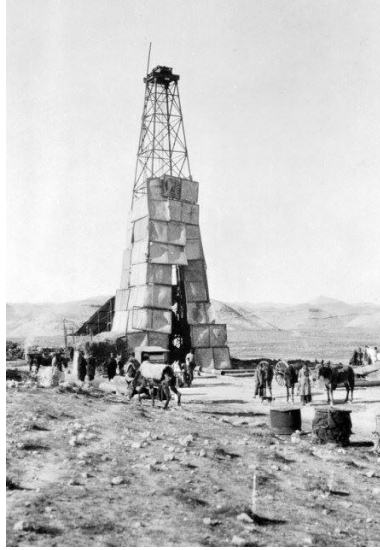


Figure 1. Oil well Masjid Soleyman- Iran in 1908

Oil as the Main Source of Global Energy

At the beginning of the twentieth century, oil became the most important and valuable source of energy in the world, and dependence to it rapidly increased, oil provided lighting, fuel for vehicles, lubricant, industrial usage and etc. Now near 90% of vehicular fuel needs are met by Petroleum and 40% of all kinds of energy consumption in the United States, and 2% of electricity energy is generated by it. Petroleum's worth as a portable, dense energy source and as the base of many industrial chemicals and powering the vast majority of vehicles makes it one of the world's most important commodities.

Environmental Problems

In 2018 about a quarter of annual global greenhouse gas emissions was the carbon dioxide from burning petroleum (plus methane leaks from the industry). The largest contributor to the increase in atmospheric CO₂ is the burning of coal and petroleum combustion [5, 6]. Atmospheric CO₂ has risen over the last 150 years to current levels of over 415 ppm, from the 180–300 ppm of the prior 800 thousand years. On base of satellite measurements that started since 1979 the rise in Arctic temperature has reduced the minimum Arctic ice pack to 4,320,000 km², it means a loss of almost half Arctic ice packs [7].

Ocean acidification is the increase in the acidity of the Earth's oceans caused by the uptake of carbon dioxide (CO₂) from the atmosphere. This increase in acidity inhibits all marine organisms and has a greater impact on smaller organisms as well as crustaceans.

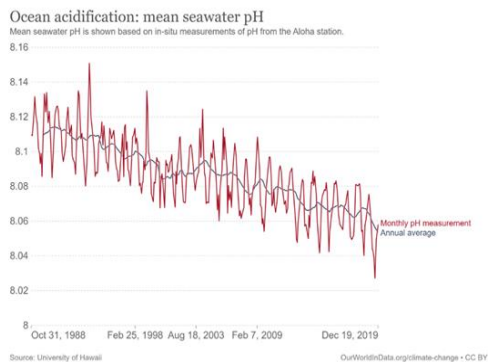


Figure 2. Changing seawater pH

Another problem is oil spills, unfortunately the amount of oil spills during accidents varies from a few hundred tons to several hundred thousand tons. Oil spills at sea are generally much more damaging than those on land, since they can spread for hundreds of nautical miles in a thin oil slick which can cover beaches with a thin coating of oil [8].



Figure 3. Environmental problems and beach cleaning after oil spill

Renewable Energy

Renewable energy is an energy that gains from some resources that they can be renewed free like sunlight, tides, wind, waves, rain and geothermal heat that are naturally and rapidly replenished on a cycle. This type of energy in opposite of fossil fuels, replenished much faster, easier and without pollution [9].



Figure 4. Wind turbine and solar cell

Renewable energy will play the most important and growing role in the future of the world energy system.

Many countries in the world have renewable energy contributing more than 20% of their energy supply, they are generating over half their electricity from it. There are some countries like Iceland and Norway that get most of their electricity from renewable energy sources [10]. Renewable energy, unlike fossil fuels, which exist only in some countries and is limited, has unlimited resources and can be extracted and accessible everywhere, and the most important feature is, compatibility with the environment [11].

Europe's strategy by 2030 is to supply at least 32% of its energy consumption from renewable energy sources. This strategy includes a variety of energy in the field of cooling and heating, transportation and electrical energy.

The amount of renewable energy in all EU member states has grown significantly since 2004. according to the latest reports the leading state was Sweden (54.6%) with more half of its energy provided by renewable energy in 2018 in terms of gross final energy consumption, and the second is Finland (41.2%), and other rankings respectively Latvia (40.3%), Denmark (36.1%), Austria (33.4%). The Netherlands has the lowest proportions of renewable energy in 2018 (7.4%), Malta (8.0%), Luxembourg (9.1%) and Belgium (9.4%) [12, 13].

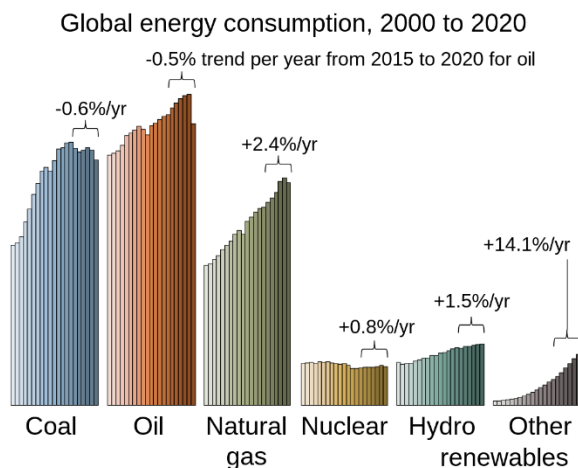


Figure 5. Global Energy Sources, Renewables are growing rapidly

Investment in Renewable Energy

Since 2004 capacity of renewable energy for many technologies has increased by 10 to 60 percent per year. Global investment in renewable energy increased by 5% in 2015 to \$ 285.9 billion, breaking the previous record in 2011 by \$ 278.5 billion. 2015 was also the first year that renewable energy, with 72 gigawatts of wind and 56 gigawatts of solar photovoltaic, accounted for the majority of all new electricity capacity (134 gigawatts, 54% of total energy) of all renewables. Dedicated to themselves, both numbers are record-breaking and have increased sharply compared to 2014 (49 GW and 45 GW, respectively). Financially, solar accounts for 56% of total new investment and wind for 38%.

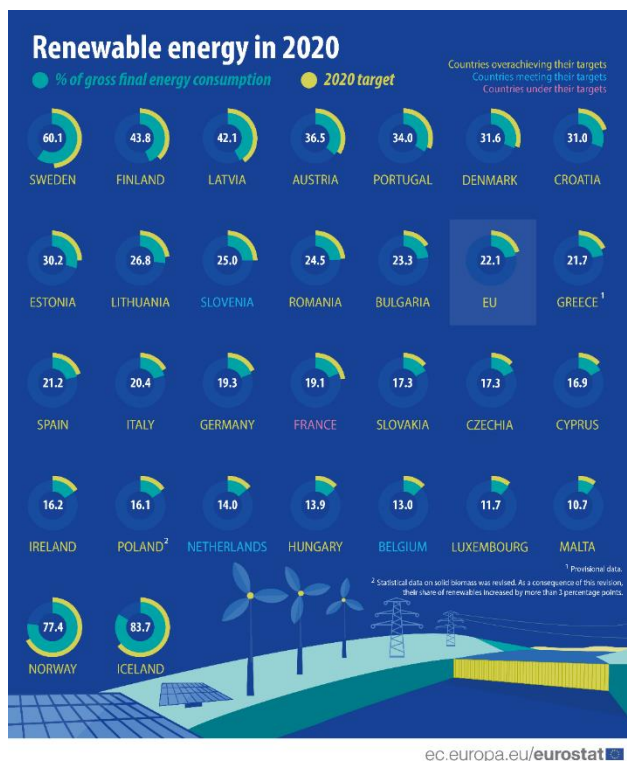


Figure 6. Status of renewable energy in Europe

From 2010 to 2019, global investment in renewable energy excluding large hydropower plants amounted to US \$ 2.7 trillion, of which China's top \$ 818 billion, \$ 392.3 billion Japan, \$ 210.9 billion Germany, US share have been \$ 183.4 billion, and the United Kingdom \$ 126.5 billion. This increase was about three or four times the amount of investment in the 2000-2009 decade [14]. According to what we see in Figure 4, we must accept the energy revolution, we are at the forefront, and the developed countries will achieve energy independence, and this independence will accelerate their progress.

Table 2. Investment countries in new renewable energy [15]

Year	Investment	Countries
2008	182	79
2009	178	89
2010	237	98
2011	279	118
2012	256	138
2013	232	144
2014	270	164
2015	285	173
2016	241	176
2017	279	179
2018	289	169

Year	Investment	Countries
2019	302	172
2020	304	165

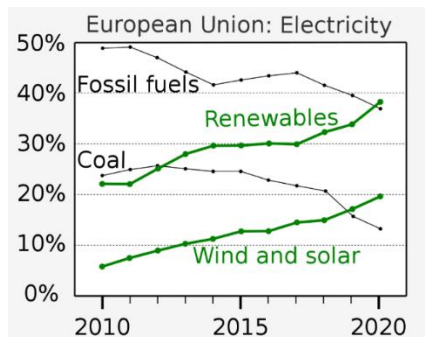


Figure 7. The main source of electricity in the EU

What Will Happen to Oil and Renewable Energy in the Future?

We want to investigate this section in two parts, one is the oil countries that export oil and receive and spend oil money, and other is some countries that are investing on renewable energy for next generation and energy independency.

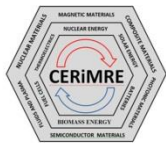
1. Oil Country

Oil countries traditionally sell their crude oil and spend it on public spending, which is more common in the Middle East and Africa, but among these countries some have spent more for the welfare of their people and some have resorted to dictatorship and war, some created a better infrastructure, and some are still seeking dictatorship and spending money for war. Even these countries on the oil golden era could not join the ranks of the developed world, and by the development of renewable energy we are almost at the end of the oil age and absolute dependence to it. When consumption of fossil fuels reduces (especially oil) oil countries as a producer and exporter have to sell their resources (as one of the most important sources of income) inexpensive and gaining by this method for some of them maybe will not affordable and it's a sadly end if they don't have a plan those days.

2. Non-oil Country

Some of non-oil countries are advanced and other are poor and need to help, in Oil era, developed countries made optimal use of oil and could to increase their progress by enacting oil laws and taxes but from the other side poor countries have become needed more help, in other word they became poorer than before. Following this trend, developed countries will achieve energy independence by increasing investment in renewable energy, and the value of oil as an old energy source will decline.

Under these circumstances, the oil countries, if they have no alternative for their income, will face huge problems such as the spread of poverty, dissatisfaction and chaos, which may lead to regime change and mass migration to other developed and rich countries. It is an obvious phenomenon that with the increase of poverty, we are witnessing an increase in migration, especially in the elite society. In other words, if the oil countries do not change their plan and



strategy, they will become poor after a cycle of wealth. Poor does not only mean lack of money, but also because of the loss of the elite society and the lack of infrastructure and this element intensify poverty to these countries.

3. Solution for Oil Country

Oil countries need to change their strategies and describe new goals for investing (in parallel with their oil projects) in renewable energy as a clean energy and save environment. It is necessary that they provide some of the energy they need in this way and gradually move towards clean energy. If these countries do not make these reforms, what happened to coal-exporting countries in the 19th century, will happen to them in the 21st century. We are now in a period of changing energy sources.

Conclusions

In this paper we investigated briefly history and usage of oil, and introduced renewable energy and increasing usage and investment in the world on it, and the last step we answered to, "what will happened to oil and renewable energy in the future?" And described what happen in the future and presented a solution to it, especially for oil countries in this limited period of time with noticed to advanced countries targets and warned to them if these countries don't change their strategies, they will get immense damage. Another subject as an obvious result of renewable energy usage is reduction of fossil fuels consumption and this change makes reduction of demand and price of oil.

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