The overview of the development of future energy

Ruidi Li
School of North China Electric Power University, Baoding, China
*Corresponding author e-mail: liruidi@ncepu.cn

Abstract. The development and utilization of energy have greatly promoted the development of world economy and human society, but the development and utilization of traditional energy have caused environmental problems and human health problems. After reasonable development, it will bring great benefits to human society and impact on the existing energy structure. In the future, the world energy structure will change from traditional energy consumption to new energy consumption.

1. Overview of energy
Energy is the basis of human survival and social development. The development and utilization of energy is an important symbol to measure the progress of human society, national economic development and the level of science and technology. With the development of society and the advancement of technology, traditional energy sources: coal, oil, natural gas, hydropower, and nuclear power have all exposed a series of problems. At present, the exploitation methods of petroleum and other fossil energy can not reach the maximum utilization, which causes a great waste of resources. At the same time, the traditional way of energy use has caused environmental problems and human health problems.

In the future, human energy consumption will gradually realize the transformation from traditional energy to renewable new energy. New energy sources, including solar energy, wind energy, ocean energy, hydrogen energy and biomass energy, are environmentally friendly and inexhaustible. The most important thing is that in the process of using new energy, reducing the use of traditional energy can reduce the emission of carbon dioxide and other pollutants to a certain extent.

2. Development and prospect of traditional energy
Traditional energy usually refers to oil and coal. The traditional energy based on oil and coal has accelerated the development of world economy and the progress of human civilization. However, with the rapid economic growth, the environment has been damaged and human health has been threatened. The emission from fossil fuels accounts for about two-thirds of global greenhouse gas emissions, which is the most significant factor affecting climate change so far. Therefore, people are not optimistic about the development prospects of traditional energy.

2.1. Development and utilization of traditional energy
In the last few hundred years, the traditional energy based on oil and coal has accelerated the development of world economy and the progress of human civilization.
2.1.1. **Oil.** Oil plays a very important role in the national economy and is known as the "Black gold" and "Industrial blood". The use of oil has brought human society to an extraordinary stage of development. Today, 90 percent of transportation energy is derived from oil. Petroleum is the most important transport-driven energy because of its convenient transportation and high energy density. There are now more than 1208.2 billion barrels of oil in the world, but the oil is unevenly distributed, with the Middle East holding more than half of the world's oil. The distribution of world oil reserves in 2019 is shown in Figure 1.

![Oil production in six regions of the world in 2019](Image)

**Figure 1.** Oil production in six regions of the world in 2019.

2.1.2. **Coal.** Coal is the most abundant and widely distributed fossil fuel in the world. By the end of 2006, the proven recoverable reserves of coal in the world were 909 billion tons [2]. The distribution of coal in various countries is shown in Table 1.

| Country            | Reserves (million tons) | Proportion of total amount (%) |
|--------------------|-------------------------|-------------------------------|
| United States      | 246643                  | 27.1                          |
| Russia             | 157010                  | 17.3                          |
| China              | 114500                  | 12.6                          |
| India              | 92445                   | 10.2                          |
| Australia          | 78500                   | 8.6                           |
| South Africa       | 48750                   | 5.4                           |
| World              | 909064                  | 100                           |

2.2. **Prospects of traditional energy**
As the main energy materials, oil and coal play an extremely important role in all aspects. However, the exploitation and utilization of oil and coal have seriously polluted the environment on which people live. The continuous burning of hydrocarbons and the emission of carbon dioxide have contributed to the increasing global temperature, and the potential long-term impact on the earth must not be ignored. Given the demands of time, the world will continue to rely on the burning of hydrocarbons for the foreseeable future, but carbon dioxide emissions may need to be captured and stored in response to global warming. At the same time, we need to attach importance to the development and utilization of new energy.

3. **Development and prospects of new energy**
Affected by the oil crisis in the 1970s, the United States has strengthened the development of renewable energy and energy conservation since the late 1970s. Renewable energy materials mainly include the
following six types: biomass, hydro energy, geothermal energy, wind energy, Marine energy, and solar energy.

3.1. Development and utilization of new energy
Affected by the oil crisis in the 1970s, the United States has strengthened the development of renewable energy and energy conservation since the late 1970s. Renewable energy materials mainly include the following six types: biomass, hydro energy, geothermal energy, wind energy, Marine energy, and solar energy. At present, the use of renewable energy has become a consensus, between 2008 and 2009, the world's total installed wind power growth of 70%, solar power generation (PV) growth of 190%. Total investment in renewable resources grew from $100 billion in 2007 to more than $150 billion in 2009. In 2009, China added 37GW of renewable energy, and its total installed capacity of renewable energy reached 226GW, equivalent to four times the peak power consumption of the UK and twice that of the whole of Africa. In Europe and the US, more than half of all new electricity capacity installed in 2009 came from renewable sources. More than 70 million homes around the world use solar water heaters [2].

3.1.1. Solar energy. Solar photovoltaic power generation is one of the fastest growing energy sources in the world. The utilization of solar energy mainly includes the utilization of solar heat and solar light. Solar heat is widely used, such as solar hot water, heating, and cooling; Solar desalination seawater, solar thermal power generation, etc. Solar light utilization is mainly solar photovoltaic power generation and solar hydrogen production. With the support of governments around the world, solar energy, the main source of renewable energy, will play an increasingly important role in the global energy supply due to the increasing shortage of conventional energy. But wind energy also has unpredictable disadvantages: it doesn't blow when you want to use electricity, and it doesn't stop when you don't want to use electricity. But for these problems, there are feasible solutions: integrate wind power generation into the traditional energy system, when the wind power is insufficient, it will be supplemented by traditional energy. In the vast area of wind power generation network, when there is no wind in a region, it can be supplied by the windy area. And with the progress of computer technology and artificial intelligence, these problems will be properly solved.

3.1.2. Wind energy. Wind energy is an important resource, which is safe, clean, and abundant in reserves. If we could replace fossil fuels with wind power, it would also mitigate the greenhouse effect. Especially for coastal islands, remote areas with inconvenient transportation, vast grassland and pasture with few people, and rural areas and border areas far from the power grid, as a reliable way to solve the problem of production and domestic energy, it has a very important significance. The earth is rich in wind energy resources. According to the estimate of the World Energy Council, 27% of the land area of $107 \times 10^6$ square kilometres of the earth has annual average wind speed of more than 5m/s (10m above the ground) [2].

3.1.3. Hydrogen energy. Hydrogen energy is regarded as the most promising clean energy in the 21st century. It can be seen from the characteristics of hydrogen that hydrogen is an ideal new energy source. As early as world War II, hydrogen was used as A liquid propellant for A-2 rocket engines. Liquid hydrogen was first used as a space power fuel in 1960. The launch rockets used by the U.S. Apollo moon landings in 1970 also ran on liquid hydrogen. Because hydrogen has a high energy density, three times that of regular gasoline, that means the fuel can lose two-thirds of its weight, which would be extremely beneficial for the shuttle. In terms of transportation, the United States, Germany, France, Japan and other automobile countries have long launched hydrogen as fuel for demonstration vehicles, and carried out hundreds of thousands of kilometres of road test. However, the large-scale commercial application of hydrogen energy still has some problems to be solved: First, cheap hydrogen production technology. Hydrogen production needs to consume a lot of energy, and the efficiency of hydrogen production is very low at present, so it is an urgent problem to seek for large-scale and cheap hydrogen production technology. Second, safe, and reliable hydrogen storage and transport methods. Since hydrogen is
Gaseous at room temperature and has a large volume per unit weight, liquid hydrogen is easy to vaporize, and it is easy to leak, catch fire, explode and other safety reasons, so how to properly solve the storage and transportation of hydrogen energy is also the key to the successful development of hydrogen energy.

Third, terminal equipment for large-scale utilization of hydrogen in universities. Although hydrogen energy is an ideal energy for power generation and transportation, the terminal equipment for large-scale and efficient use of hydrogen is not mature enough and needs further study.

3.1.4. Biomass energy. Biomass refers to non-living fossils and biodegradable organic materials. Biomass energy is the fourth largest energy source in the world after coal, oil and natural gas, and it is recognized as an important renewable energy source. Globally, nearly $224 \times 10^9$ tons of dry biomass can be produced annually due to photosynthesis. Although less than 15% of biomass energy can be utilized at present, it can meet nearly 35% of the energy needs of developing countries [3]. At present, the global energy supply is mainly through the combustion of fossil fuels (the energy generated is $388EJ/a$), among which nuclear energy provides a small part of energy, $26EJ/a$, $28EJ/a$ and $45\pm10EJ$ of biomass, which makes biomass energy become an important renewable resource. On average, biomass accounts for less than 10 percent of total energy supply in industrialized countries, but as much as 20 to 30 percent in developing countries. In some poor and backward countries and regions, biomass energy can meet up to 50 to 90 percent of energy needs. In the past, biomass energy was often associated with poor families, but now it is becoming a very important resource in both developed and developing countries.

3.2. The prospect of new energy

Since the industrial revolution, the consumption of fossil energy has increased dramatically, leading to the release of a large amount of greenhouse gas carbon dioxide into the earth's atmosphere, which is the main factor directly causing "global warming", an extremely serious environmental problem. Global carbon dioxide emissions have been increasing year by year and are expected to rise to 36 billion tons per year by 2100. A large amount of carbon dioxide emissions will lead to climate warming, sea level rise, flooding of coastal areas, and will greatly affect the distribution of rainfall and change the earth's ecological environment. Countries around the world have realized the traditional energy sources of carbon emissions to the destruction of the ecological environment, and actively develop new clean and renewable energy, with mature technology, new energy in countries around the world energy consumption structure in the proportion is more and more big, in China, for example, in 2009, according to new energy proportion in the national primary energy consumption structure is only 0.3%, which means that new energy in China is almost in an undeveloped state, but in 2018, according to new energy ratio has reached 4.4%, in the past ten years, the rapid development of new energy in China, The status in the national energy consumption structure rises sharply. The consumption structure of China's primary energy in 2009 and 2018 is shown in Figure 2.

![Figure 2. The consumption structure of China's primary energy in 2009 and 2018.](image-url)
Energy is the driving force of economic development. It not only affects the political structure of the world, but also concerns the peace of the world. The rapid consumption of fossil energy leads to the increasingly prominent problem of energy shortage, and the energy crisis will come sooner or later. At current energy reserves and the rate of human exploitation, the earth's oil reserves will be exhausted in a few decades, and coal will be exhausted in more than 200 years. If there is an energy shortage, the economic and social life related to energy will be greatly impacted. Therefore, the development and utilization of new energy has a good prospect. New energy is abundant and widely distributed in the world. Accelerating the development of new energy is conducive to the coordinated development of economy, society and environment, and the adjustment of energy structure of all countries in the world and the realization of sustainable development.

4. Conclusion
Climate change has become one of the hot issues in the field of international politics, economy, and environment. The environmental problems caused by more fossil energy have been paid more and more attention by mankind. Countries around the world have begun to turn their attention to the renewable energy system which is conducive to the sustainable development of society.

At present, the world's energy development has entered a new period, and the energy structure will present a diversified development trend, that is, the world energy structure is undergoing a transformation from fossil energy consumption to renewable energy. In the future energy structure, the development and utilization technology of renewable energy will be vigorously developed, the proportion of oil and coal will gradually decrease, and the proportion of natural gas, nuclear energy and renewable energy will gradually increase.

References
[1] Liu Guanjun, Li Yongfeng, Chen Hong, Green Energy, Halbin University of Technology Press, Harbin, 2012.
[2] Huang Suyi, Wang Xiaomo, Energy and Energy-saving Technology, second ed., China Electric Power Press, Beijing, 2008.
[3] Trevor M. Letcher, Future Energy: Improved, Sustainable and Clean Options for our Planet, China Machine Press, Beijing, 2011.