Forum: Environmental Commission

Issue: Promoting sustainable energy sources with a focus on hydrogen energy

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Introduction

Since they were first exploited for industrial purposes during the 19th century, fossil fuels have been the primary source of energy for mankind. Fossil fuels, which are natural fuels derived from the decomposition of plants and animals, have been essential to human development because they are easily burned and converted into heat energy and electricity, which was essential for the development and commercialization of fossil fuel-powered factories, machines, and transportation in the 19th century when the industrial revolution took place. Today, according to the U.S. Energy Information Administration (EIA), about 15 million metric tons of fossil fuels are consumed annually, making up more than 80% of domestic energy production and consumption. The energy produced from coal, crude oil, and natural gas became an inseparable part of human civilization and our life. However, fossil fuel extraction and consumption cause significant negative externalities: environmental harm and depletion. The primary source of global warming, according to the Intergovernmental Panel on Climate Change (IPCC), is fossil fuels. Massive amounts of greenhouse gases are released into the atmosphere through the use and manufacture of fossil fuels, and this has played a substantial role in the approximately 1°C rise in global temperature over the past 200 years. As global warming continues, people's lives will be threatened by increasingly frequent extreme weather events and rising sea levels caused by global warming. Furthermore, it appears to be a great concern that the Earth's reserves of coal, natural gas, and petroleum are estimated to be exhausted in this century, so future generations would not be able to fulfill their needs.

Sustainable energy, which can meet global demand without depleting resources or damaging the environment, is recently gaining attention as a solution to the World's problem with fossil fuels. Especially, considering the level of current scientific development and its efficiency of it, hydrogen energy seems to be a practical and realistic energy source that can replace fossil fuels in the near future. International cooperation is required to guide this movement in the appropriate direction as the world is facing an imminent and dramatic shift toward clean, safe, and inexhaustible energy.

Definition of Key Terms

Sustainable energy

Sustainable energy refers to the energy that can meet the world's energy demand without danger of exhaustion. The consumption and production of sustainable energy are clean and renewable, generating minimal or no damaging impact on the environment and the ecosystem. Examples of sustainable energies are solar energy, wind power, geothermal energy, and hydrogen energy.

Hydrogen energy

Hydrogen energy is one type of sustainable energy that can be used to generate electricity, power, or heat in various applications such as cars, houses, and even factories. Unlike non-renewable energy sources such as petroleum which emit pollutants damaging the environment, hydrogen energy sources only create water during its process. It can be produced in clean ways, including electrolysis.

Climate change

Climate change refers to a long-term alternation in usual weather patterns and conditions. Although it can be caused by natural factors, human activities such as the exploitation of fossil fuels have accelerated global warming (=rise in global temperature) and have resulted in more rapid climate change and more frequent extreme weather events. Climate change is causing numerous damages to humans and the ecosystem currently, so it is necessary to restrict human activities inducing climate change, one of which is the usage of fossil fuels.

Background Information

Fossil Fuels

The most common fossil fuels used in domestic industries are coal, crude oil, and natural gas. Most fossil fuel resources are located underground or below the ocean, so they are extracted in various ways, such as mining, drilling, and fracking. After the extraction, fossil fuels can be burned to produce heat, power engines, or generate electricity. This transferred energy is used in essential industries including transportation, food, and housing. Because fossil fuels are readied to be burned in their natural state, they have been preferred and consumed by humans for the whole industrial period from the 19th to the 21st century in human history. Fossil fuels are the main source of energy until now, as the data in 2019 shows that 84% of worldwide energy consumption was from fossil fuels. However, the consumption of fossil fuels is creating vast environmental damages, detailly described in the next section.

Environmental Impacts

When fossil fuels are burned and transferred into heat energy or electricity, a large amount of carbon dioxide is released into the atmosphere. Nearly 35 billion tons of carbon dioxide are released annually, accounting for over 80% of global carbon dioxide emissions. The increased emissions of carbon dioxide cause a rapid size increase in greenhouse gases, mainly composed of carbon dioxide, methane, and nitrous oxide. The greenhouse gases that occupy one layer in the Earth's atmosphere trap heat inside the Earth and the global temperature increases as the heat constantly circulars without leaving. As more carbon dioxide is added to greenhouse gas layers and they become thicker, global warming will be accelerated and become a more difficult problem to solve. Because global warming is causing numerous extreme climate events and producing negative externalities to the whole population, the environmental impacts of fossil fuels are an urgent crisis to solve.

Another major problem is severe air pollution caused by noxious gases produced during fossil fuel combustion. According to the study published by Environmental Research in April 2021, fossil fuel combustion was responsible for 8.7 million deaths globally in 2018. This death toll is even higher than the total deaths of HIV, AIDS, and malaria patients per year, demonstrating that the exploitation of fossil fuel does not only cause climate crisis but also cause health crisis.

If the exploitation of fossil fuels continues, these considerable damages to the environment and humans are inevitable. Thus, energy transfer from fossil fuels to sustainable energy should be the main target of the world.

Sustainable Energy

sAs the environmental problem of fossil fuels emerges more extreme, movements toward sustainable energy are rapidly evolving. Sustainable energy is defined as the energy “derived from resources that can maintain current operation without jeopardizing the energy needs or climate of future generations,” as suggested by Johns Hopkins University. Some of the most common examples of sustainable energy include solar, wind, geothermal, and hydropower energy.

Examples of Sustainable Energy

All of the following sustainable energy does not create damage to the ecosystem; however, the productivity and efficiency of the energy sources vary. First, solar power is a form of energy that is converted from the heat and radiant light of the sun which is captured by solar panels. Due to the extremely high cost of solar panels and the fact that they can only produce during the day, this energy source has cost inefficiency issues. Wind power, which generates energy using wind turbines, is another sustainable energy source, but its use is restricted due to its high cost and

significant locational reliance. The location is also crucial for geothermal energy, which uses thermal energy from beneath the Earth's crust to generate electricity. As demonstrated, the majority of these renewable energy sources demand expensive, sophisticated infrastructures and are not time and cost-efficient. As a result, hydrogen energy is proposed as a feasible energy source to replace fossil fuel due to its simplicity and high efficiency.

Hydrogen energy

Hydrogen energy is mainly produced in two ways: extraction from methane and electrolysis of water. Hydrogen can be extracted from methane by chemical reaction, but this is not suggested in most countries because greenhouse gases, contributors to climate change, are also emitted during this process. Hydrogen can also be separated from water molecules by running electricity through water, through a process called electrolysis. The electrolysis of water is cost-effective and simple, so a large amount of hydrogen can be created easily. Moreover, a tremendous amount of hydrogen in the universe can be provided when space technology is further developed. After hydrogen is generated in these ways, it can be transferred to energy by reacting it with oxygen. This chemical reaction composes water and releases energy, which can replace the energy from fossil fuels. Hydrogen energies are generally transferred to electricity, and vehicle industries are the guiding business of hydrogen energy. Led by global companies like Tesla, sustainable energy-fueled vehicle industries are expected to grow on a large scale soon.

Due to the efficiency and non-damaging of hydrogen energy, research and development on hydrogen energy seem to continue. IEA analysis predicts that the cost of hydrogen energy will drop by 30% in 2030, and these changes will make sustainable energy transformation possible.

Major Countries and Organizations Involved

Intergovernmental Panel on Climate Change

IPCC is an intergovernmental body created by World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988 with 195 member states. It is responsible for assessing scientific knowledge of climate change and its implications to provide appropriate information to countries and organizations. It publishes reports on the impacts, adaptation, and vulnerability of climate change every year.

International Renewable Energy Agency (IRENA)

Having 168 member countries, IRENA plays a leading role in renewable energy development and application. It provides necessary financial and technological support for the assessment of the energy

system in the country. IRENA aims to promote renewable energy globally through international cooperation and advancing knowledge.

Transportation Industries and Regarding Companies

As the interest in sustainable energy is steadily increasing, the trends in transportation industries are also changing. Led by global car companies such as Tesla and Mercedes Benz, the source of energy for transportation is mostly shifting from fossil fuels to electric and hydrogen. Already, the XCIENT hydrogen truck developed by Hyundai NEXO is commercially used in the Europe transport industry. Moreover, large benefits provided by governments are highly encouraging consumers to purchase sustainable energy-fueled cars. Based on these recent trends and international cooperation, the potential of transportation industries toward sustainable energy seems extremely bright if development continues.

Timeline of Events

Date	Description of event
September 16th, 1987	Montreal Protocol signed by 46 countries
June 14th, 1992 – June 19th, 1993	United Nations Framework Convention on Climate Change (UNFCCC) signed by 165 countries
December 11th, 1997	Kyoto Protocol signed by 84 countries
April 22nd, 2015	Paris Agreement signed by 195 countries

Relevant UN Treaties and Events

The UN 2030 agenda for sustainable development includes a detailed description of the goal of achieving SDG 7: Ensure access to affordable, reliable, sustainable, and modern energy for all.

- Global Target 7.a - By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.
- Innovative Pathways to Achieve Sustainable Consumption and Production, 28 March 2019 **(UNEP/EA.4/Res.1)**

Previous Attempts to solve the Issue

Because fossil fuels have created disastrous damage to humans for a long period, there have been many attempts to tackle reducing fossil fuel usage. Since the Montreal Protocol in 1987, 4 major international agreements about climate change have been signed. Montreal Protocol required the nations to stop producing ozone-depleting substances, and it succeeded in eliminating 99% of the production. In 1992, United Nations Framework Convention on Climate Change (UNFCCC) was ratified by 197 countries. This treaty focuses on addressing climate change, such as stabilizing greenhouse gas concentrations. The Kyoto Protocol required nations to reduce carbon and greenhouse gas emissions by 5%, but it failed to compel China and India to take action. In Paris Agreement, the most recent and significant agreement required all the nations to create emission reduction pledges to deal with climate change problems effectively. It aims for global net-zero emissions and the prevention of a global temperature increase of 2°C.

On a national scale, Norway, Brazil, and New Zealand are the world leader in sustainable energy. Particularly in Norway that 45% of the national energy supply is from renewable energy sources, which is the highest share of renewable energy in the world. This is achieved through gradual systematic and social change for decades. Also, there has been a large number of business efforts to use and promote sustainable energy sources. Led by multinational companies such as Orsted A/S and Iberdrola SA, a lot of global companies are constantly developing both renewable and sustainable energy sources that can be used in people's daily life. They engage generations, distributions, and trading of electricity and renewable energy. Individual promotions of sustainable energy and propaganda about the damages of using fossil fuels are also made through social media types.

Possible Solutions

- An entire transformation to sustainable energy from fossil fuels should be the ultimate goal for the UN and the world. However, it will take a few decades to fully achieve this goal, so plans and policies should be taken step by step to make a gradual shift. Reducing fossil fuel usage and greenhouse gas emissions as well as increasing energy efficiency should be taken as a first step. Since most of the carbon dioxide and greenhouse gases are emitted from global businesses and large factories, policies and management should be at the international and national level while research and development for increasing energy efficiency should also be carried out. For the individual levels, the amount of carbon dioxide emission is relatively smaller than business levels, but increasing awareness about the environmental harms of fossil fuel usage is essential. Education and environmental campaigns will be needed to remind the importance of conserving energy and how it can be attained. Also, sustainable energy can be promoted through education and media.

- UN can encourage governments to subsidize firms that develop sustainable energy and provide incentives to consumers who use sustainable energy. For example, 17 European Union (EU) member states already provide incentives such as tax reductions and exemptions for electric car purchasers. According to IRENA, 70% of global subsidies in energy sectors were provided to fossil fuel industries, and only 20% were sustainable and renewable energy subsidies. As the global aim is to promote sustainable energy, subsidies on fossil fuels should also be transferred to sustainable energy as soon as possible.

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Appendix or Appendices

https://www.seforall.org/

This website gives general information on sustainable energy and the world's provision of perfectly clean energy usage.