Committee: ENVIRONMENT

Topic: The Question of Nuclear in a Low Carbon Economy

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Summary

It has been calculated by the UNECE (United Nations Economic Commission For Europe) that without nuclear power, the UN's climate goals will not be reached. Currently, in the UNECE region, nuclear only provides roughly 20% of the power, which makes up 43% of the low carbon options. However, nuclear power does come with considerable risk if an event such as the Chernobyl Nuclear disaster is repeated. While nuclear waste has little carbon by-products it is important to note the extremely toxic waste created by generating nuclear power has significant impacts on the ecosystem it is stored in. Nuclear power is already being looked into and prototyped in SMRs to provide clean, reliable energy to areas without secure energy. While this is a solution, it is also possible that in the near future nuclear fusion will be the best option for nuclear power as it has no dangerous by-products and can produce far more power than modern nuclear reactors can. This is not to say that the development of Nuclear is without its risks as this information could be used to further a nation's nuclear weapons program, however in most cases of nuclear development the benefits of a low carbon economy far outweigh the risk of the development of nuclear weapons. Nuclear power can help us reach the environmental SDG's as well as providing clean and reliable energy to more of the globe. There are many possible solutions to implementing nuclear power into a modern low-carbon economy and how viable it is in implementation. Overall, while nuclear power provides a large opportunity to create carbon, neutral energy and help achieve SDG7 it poses threats such as the large amounts of nuclear waste created and the potential for catastrophic meltdowns.

Definition of Key Terms

Low Carbon Economy (LCE) - or decarbonised economy is an economy based on energy sources that produce low levels of greenhouse gas (GHG) emissions. Shifting to a low-carbon economy on a global scale could bring substantial benefits both for developed and developing countries. Many countries around the world are designing and implementing low-emission development strategies (LEDS).

Nuclear Fission - In nuclear fission the nucleus of an atom breaks up into two lighter nuclei. The process may take place spontaneously in some cases or may be induced by the excitation of the nucleus with a variety of particles (e.g., neutrons, protons, deuterons, or alpha particles) or with electromagnetic radiation in the form of gamma rays. In the fission process, a large quantity of energy is released, radioactive products are formed, and several neutrons are emitted. These neutrons can induce fission in a nearby nucleus of fissionable material and release more neutrons that can repeat the sequence, causing a chain reaction in which a large number of nuclei undergo fission and an enormous amount of energy is released. If controlled in a nuclear reactor, such a chain reaction can provide power for society's benefit.

SMR (Small Modular Reactor) - A smaller version of existing Nuclear reactors designed to be created within a factory and shipped out to other places to be put into operation in order to provide reliable and clean energy to LDCs and areas of the world without a consistent energy supply. SMR will generally produce less than 300 MW however will be equipped with Passive Safety Features. SMR are currently in the prototyping phase with an operational plant (Akademik Lomonosov) located in East Russia.

LEDC - Lesser Economically Developed Country

Nuclear Meltdown - when a nuclear power plant's spent fuel rods begin to melt and emit extremely toxic radiation to everything around them. This is caused because when a nuclear fuel rod exceeds 2830 degrees Celsius it begins to melt and will emit radiation so they are stored in refrigerated water tanks which cold water is pumped into. When a major natural disaster or any other cause destroys the power plants energy supply, the water flowing into these cooling pods stops flowing and the water level begins to drop eventually the spent fuel rods are above the water level in these pods and because of the intense radiation begin to rapidly heat and go above the 2830-degree threshold and melt, irradiating the areas around them completely.

Background Information

Currently nuclear reactors only provide around 10% of global energy, and nuclear power is only a significant proportion of energy in 13 countries (above 30%) which, excluding South Korea, are only located in Europe. Nuclear power has proven that it can be a significant contributor to a country's overall power generation. This can be seen when looking at France who produces over 3 quarters of its energy

from nuclear power. Nuclear power is currently generated through nuclear fission which also produces a highly hazardous by-product namely the fuel rods used by the reactor. The chemicals produced in this reaction have a half-life of 24000 years through-out, they are toxic to humans and must be stored far away from any settlements. Currently, Nuclear waste from France's 56 reactors is processed: “La Hague first cools down the rods in one of their cryo-pools as they can reach 2811 degrees Celsius in a reactor during the fission process. The cooling process at “La Hague" can take over 7 years at which point it is partially recycled into usable by-products. France has announced a plan to bury the by-products 500 metres beneath ground in clay. This is one of the major issues associated with nuclear power. However, there are many others that must be addressed to create a successful resolution that will please both nations and the public. There are major safety concerns associated with nuclear power plants which, while not completely grounded, in reality make sense when viewing either the Chernobyl or Fukushima disasters and thousands of families had to abandon their homes in a matter of hours and can never return. However, these worries could be taken even further when looking at SMR reactors. New Nuclear power plans have been announced to create SMR reactors which can be produced in a factory and then moved to a location that is lacking in other power sources. SMR reactors produce less than 300 MW which is not enough to power a country. However, they would be able to provide power to small settlements and villages. So far, a plan has not yet been announced on how the SMR reactors will dispose of nuclear waste. There have been relatively few nuclear disasters. However, nuclear disasters that have happened have been significant and irradiated surrounding areas almost completely destroyed. Nuclear power has not been instituted in a large majority of countries to a major degree. Nuclear power stations are cosrtly, which may not be easily afforded by all LEDC’s. However, with recent research breakthroughs, nuclear fusion may also be an option the UN will be able to look into and provide funding to make nuclear fusion a viable option for most nations.

Major Countries and Organisations Involved

France

France is currently the world leader on nuclear energy, over 75% of France’s energy comes from nuclear power and it has over 56 working nuclear power plants with a power capacity of 61 gigawatts.

Ukraine

Currently, Ukraine is not receiving much nuclear power due to the on-going conflict. However, Ukraine has historically got over 50% of its power from nuclear energy. There is significant concern that the Russian military has put explosives on top of the Zaporizhian nuclear power plant. It is unclear why however it could be compared to that of a hostage on a very large scale.

IPCC (Intergovernmental Panel Climate Change)

The IPCC is the UN's most prominent organisation on the topic of climate change and renewable sources of energy, it has promoted nuclear power before and has acknowledged its large benefits to a low carbon economy

IAEA (International Atomic Energy Agency)

The IAEA is the leading agency in atomic energy as its purpose is to investigate atomic energy options and increase the safety of atomic energy. It first signed an agreement with the UN in 1957.

Timeline of Events

1945 - The creation of the first nuclear device. The atomic bomb. Codenamed the Manhattan project by the American government, this project aimed to develop and then weaponize nuclear energy in order to win the second world war.

1954 - The Obninsk Nuclear power Plant in the USSR becomes the first nuclear power plant generating electricity for a power grid. It produces around 5 Megawatts of energy.

1956 – "Calder Hall was the world's first industrial-scale nuclear power. Built in Cumbria and costing £35m, it started operating in 1956 and was only decommissioned in 2003.The power plant had four reactors, and a total capacity of 194 MW."

1957 - The signing of the agreement by the IAEA. Making the IAEA work towards the goals of the UN and providing Funding for the IAEA.

April 26, 1986 - The catastrophic failure of the nuclear power plant in Chernobyl widely considered to be the largest nuclear disaster ever. This happened as due to inadequate safety protocols and bad design as there was a power surge which damaged the 4th reactor in turn causing an explosion and meltdown.

March 11, 2011 - A large scale atomic disaster in the reactor of Fukushima as a large tsunami hit the plant, damaging all of the active reactors, cutting off back-up power and causing an evacuation of the area due to wide scale radiation poisoning.

September 24 2021 - High Level Dialog on Energy

2022 – Nuclear Harmonization and Standardization Initiative. This initiative aims to promote the use of SMR reactors and to design new SMR reactors to improve efficiency and make energy more standardised across the globe.

December 13, 2022 – An experiment at the National Ignition Facility at the Lawrence Livermore National Laboratory (LLNL) in California produced more energy from fusion that was first put in.

Relevant UN Treaties and Events

High-level Dialogue on Energy:

In this dialogue, over 130 global leaders pledged to help move towards SDG 7 while decreasing their carbon emissions to net-zero. “In support of these objectives, more than US$400 billion in new finance and investment was committed by governments and the private sector in the form of Energy Compacts announced during the Dialogue and multi-stakeholder Energy Action pre-events on 22 and 23 September.”

The IAEA safety standards:

After the explosion in Chernobyl, the IAEA issued safety standards across the world to prevent an accident such as Chernobyl from ever happening again. “The Safety Standards consists of three sets of publications: the Safety Fundamentals, the Safety Requirements, and the Safety Guides. “These guidelines protect the workers' health and ensure that conforming nuclear power plants have sufficient safety protocols.” This makes sure that every worker has a decent amount of protectant to make sure that no worker should be subject to large amounts of radiation poisoning that could lead to disfigurement or death.

COP 26:

This is a climate conference organised every year by the UN in order to help achieve sustainability in all nations including developing nations by providing funding and necessary means for all nations to decrease their CO2 output. The COP conferences are held every year in order to discuss new means of climate neutral energy and how to reduce global CO2 through agreements and treaties made throughout the conference. While most major countries agreed to a plan to reduce CO2 output last year, China and Russia bloc backed out of the agreement at the last second.

Previous Attempts to solve the Issue

ECE/ENERGY/GE.5/2021/1

This meeting, hosted in Geneva in 2021, aimed to help show delegates the facts of the UN’s goal to achieve carbon neutrality. It outlined the problems presented in achieving sustainable development and presented a solution by increasing funding into nuclear and hydrogen energy sources and finding better ways to produce carbon neutral energy. This resolution solidified plans for the 18th sessions to be held

in Geneva and came up with a plan for what a panel of experts was to do for the meeting which included the reliability of hydrogen energy and more plans on achieving carbon neutrality. This resolution overall planned more about the upcoming conference which would address most of the major issues raised in the resolution rather than solving them.

A_RES_75_6-EN

This resolution aims to make nuclear energy and research safer overall and reduce the investment into the research of nuclear weapons while reaffirming the UN's position on nuclear power and nuclear weapons. It mainly aims to make sure that all nations are aware of the UN's position on nuclear weapons and will refrain from researching them instead of nuclear energy which will be more beneficial to humanity in the long run.

Possible Solutions

Standardised Nuclear Waste Disposal

1. The designation of a specific area of earth for nuclear waste. This would greatly reduce the amount of separate areas destroyed by nuclear radiation and help to dispose of the extra nuclear waste by-products created by and increased use of nuclear power across the globe to have a more permanent sustainable alternative to fossil fuels and other carbon powered energy options. This has significant drawbacks however, as it would render an area of earth uninhabitable for most life. However, this would mean that earth's radiation is concentrated into one area reducing the overall area of effect.

Nuclear Fusion

2. The increased investment into the research of nuclear fusion and the implementation of nuclear fusion on a large scale. Nuclear fusion has no dangerous by-products unlike nuclear fission. As well as these recent breakthroughs in producing more energy that put in with nuclear fusion, this option is becoming increasingly viable in a modern world and could be integrated instead of nuclear fission for a global zero carbon economy. Its two main ingredients are easily obtainable and can be found abundantly. However proper safety precautions must be taken as nuclear fusion can reach heats of 100 million degrees Celsius. Nuclear Fusion however is still in the process of development and the practical safety has not yet been tested properly and should be considered by delegates if a solution along this vein is proposed.

Small Modular Reactors Distribution

3. A large-scale distribution of SMR reactors. This could be funded by the UN and would put a global initiative into place to increase the amount of SMR reactors worldwide. This would provide reliable energy to small communities in villages across the globe and would help achieve multiple SDG goals by increasing energy security across the globe as well as progressing towards the environmental SDG goals. As mentioned in Nuclear Fusion there is a significant lack of testing and optimization when talking about SMR reactors as they have yet to be fully tested for industrial scale use.

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