The International Atomic Energy Agency (IAEA)

The Safety and Feasibility of Nuclear Energy

B: Radioactive Waste Disposal

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Background of Committee:

The discovery of uranium in 1789 by German chemist Martin Klaproth helped open the field of nuclear power. Since the discovery of uranium, scientists have struggled with developing safe methods to harness the potential energy of this powerful element. It was not until 1935 that scientists developed the first methods of using nuclear power and, during World War II, nuclear energy was used for war-related purposes. The evolution of nuclear energy has led to thousands of possibilities and numerous potential benefits for development, productivity, and more. The advantages of nuclear energy include lower greenhouse gases emissions, electricity costs, and fuel costs, among others. However, it has also inspired a strong and deep-rooted fear of how nuclear technology could harm the world. It was both the prospect of potential benefits and rising fear of potential disaster that prompted the United Nations (UN) to create the International Atomic Energy Agency (IAEA) and approve its Statute on 23 October 1956. The IAEA was established as an independent international organization, although it is closely related to the UN. The relation between the IAEA and the UN is guided by an agreement signed by both parties: "The Agency undertakes to conduct its activities in accordance with the Purposes and Principles of the United Nations Charter to promote peace and international co-operation, and in conformity with policies of the United Nations furthering the establishment of safeguarded worldwide disarmament and in conformity with any international agreements entered into pursuant to such policies." The UN and the IAEA work closely together on issues concerning nuclear technology, informing each other of developments and actions concerning nuclear energy. When the IAEA Statute entered into force on 29 July 1957, the agency could not implement any sanctions among countries, and with limited powers, it soon became clear that the political climate of the time was going to limit the agency's ability to act on a global scale. It was not until after the Cuban Missile Crisis in 1962, which drew international attention to the proliferation of nuclear weapons, that the IAEA truly began to execute its duties as outlined in its Statute. This increase in productivity was furthered by the 1968 passage of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). Today the IAEA is fully operational and works towards fulfilling all of its goals as outlined in the Statute, working with programs related to nuclear safety, nuclear medical technology, and nuclear science for food security, as well as focusing on preventing

nuclear disasters like Chernobyl or Fukushima. The main goal of the IAEA is to help promote "safe, secure and peaceful uses of nuclear science and technology" through means such as inspections as well as to ensure that states are complying with commitments and safety standards. These operational goals are carried out with the support of the 159 member states under three main pillars: promoting safeguards and verification, safety and security, and science and technology. The first pillar is fulfilled by the IAEA's inspectorate team, which verifies that safeguarded materials are not being used for military purposes. Also, it is responsible for monitoring all nuclear activities in countries that the UN Security Council deems in need of further investigation. The second pillar, safety and security, conveys a responsibility for the IAEA's work to help protect people and the environment from nuclear radiation as well as to provide assistance to countries to prevent nuclear accidents. This is done by assisting with nuclear installations and the transportation and securing of waste. This branch of the IAEA also helps prevent terrorist attacks or attacks by those with malicious intent by helping to update security systems. Finally, the IAEA fulfills the third pillar's goals of promoting science and technology by encouraging technical cooperation between countries in order to safely develop ways to use nuclear technology to combat global problems like poverty and disease. It also helps countries by planning and outlining ways to meet their energy needs. Today, the IAEA is active around the world promoting safe use of nuclear power and technology and helping to ensure the safe storage and containment of all of the world's nuclear resources and waste. It is guided by the "interests and needs of member states" and reports regularly to the UN General Assembly and Security Council when necessary.

Goals of the Committee:

Topic A: *The Safety and Feasibility of Nuclear Energy*

As climate change continues to degrade the environment, the international community is increasingly pressed to find a politically and economically sound solution to increasing global energy dependence. Consequently, nuclear energy has become an attractive option over the past couple of decades. Some studies suggest that the international community could run out of fossil fuels by 2088, making it especially critical for countries to develop an expedient and sustainable solution. Nevertheless, fears associated with nuclear accidents and nuclear proliferation pose as obstacles to increasing the global use of nuclear energy. In this context, the International Atomic Energy Agency (IAEA) has the task of ensuring that nuclear energy is as safe as possible. Specifically, the IAEA acts as an integral link between countries around the world in promoting international nuclear safety. The IAEA's action plan, research publications, and safeguards help countries around the world implement safe practices when using nuclear energy. Moving forward, the IAEA's goal is to continue developing and implementing these safety standards. The committee is tasked with minimizing the potential environmental, health, and political hazards of nuclear energy. While safety standards will be a critical tool in limiting health and environmental problems, members of the IAEA must come together to address the social, cultural, and political barriers to the peaceful use of nuclear energy, including building trust amongst the international community and ensuring global nuclear peace. However, there remain outstanding problems with nuclear safety. With the looming fear of another nuclear accident, some countries have phased out their nuclear energy programs, having decommissioned their nuclear facilities and no longer using nuclear energy. This is especially concerning for the

international community because nuclear energy can serve as an efficient form of environmentally friendly energy, which is increasingly being viewed as the solution to global warming. By some estimates, the international production of nuclear energy eliminates the emissions of about 2.5 billion metric tons of carbon dioxide per year. For this reason, it is imperative that the IAEA continue to improve its work in nuclear safety.

Topic B: *Radioactive Waste Disposal*

Like all types of energy, nuclear energy generates waste that, if not managed properly, may be extremely hazardous to people and the environment. The goal of managing nuclear waste is to protect people and the environment from its harmful effects. In order to do this, countries must isolate and dilute nuclear waste to prevent large amounts of radionuclides from escaping the disposal site and contaminating the environment. Though the concept behind managing nuclear waste may seem straightforward, the variety of radioactive waste that countries must manage and the different options for disposal that countries have complicate the issue. As of today, there is no single agreed upon method to process or discard of radioactive waste. Nevertheless, the IAEA and its member states have conducted vast amounts of research for potential solutions to this problem. Still, countries around the world uphold different policies towards processing and discarding nuclear waste, and no singular solution has yet been agreed upon. Managing spent fuel, which is highly radioactive waste, is a controversial topic amongst many governments. Radioactive waste is a pressing issue because it can continue to be dangerous for hundreds of thousands of years and, the more nuclear power that is used, the more waste is produced. This waste poses the danger of causing substantial health problems if it is improperly managed and comes into contact with humans or animals, destroying the environment if it is not properly stored or recycled. If these materials fall into the wrong hands, it can become a target for terrorists to release radioactive materials into their surrounding environment as a means of achieving their aims. Nuclear waste is an issue that has existed for less than a century, and much of the international community is still unaware of its potential long-term repercussions. In this regard, the IAEA is not only responsible for ensuring the safe use of nuclear energy in the present but also the safe disposal of radioactive waste for future generations.

Background of Topic A *The Safety and Feasibility of Nuclear Energy:*

Nuclear energy, though potentially useful to society (when used in medicine or as a power source), has always been problematic as nuclear energy may be a potential gateway towards the development of nuclear weapons. The first nuclear weapon was was tested on July 16th, 1945 in New Mexico. With a payload of 20,000 times the power of TNT, the United States now had access to a weapon that would put a decisive end to World War 2. Since the detonation of the nuclear bomb in Hiroshima on August 6th, 1945, politics from then on have been dictated by the ever present threat of the atomic bomb. Launched into fear of being nuked by the West, the Soviet Union began deploying spheres of influence in surrounding countries, only to be met at every turn with the United States' anti-communist fervor. The resulting era was known as the Cold War, a time when science leaped exponentially forward and peaceful uses for nuclear technology began to spring forth. However, the nuclear bombs remained. The Hydrogen bomb and other weapons of mass destruction were being stockpiled in masses by a few technologically superior countries. Nations which lacked such means to defend themselves feared an impending

nuclear war in where they would be caught in the crosshairs. Therefore, the Non-Proliferation Treaty was created. The intent of the Non-Proliferation Treaty is to promote non-proliferation, disarmament, and "the right to peacefully use nuclear technology". The NPT, considered by many to be fallible and insufficient, is in dire need of reformation. Gaping loopholes, unenforced rules, and hidden motives are in need of revision. The IAEA sends investigators to NPT signatory nations regularly to observe any nuclear activity and to verify that it is not harmful. In the past, many nations have successfully evaded IAEA observers by merely putting off their nuclear work until investigators left. To combat this, in 1997 the IAEA passed the "Additional Protocol", a new set of regulations and powers that IAEA inspectors would now have. The Additional Protocol managed to solve the above stated problem, but unfortunately not all states have signed on it. It is critical that all signatories of the NPT also adopt the Additional Protocol. According to the International Campaign to Abolish Nuclear Weapons, at around 2014, the countries of the world collectively owned 16,400 nuclear warheads. 1800 of these warheads were prepared to launch at any given time. Other treaties such as the Nuclear Test Ban Treaty and Intermediate-Range Nuclear Forces Treaty (1987) have, alongside the Non-Proliferation Treaty, tried to prevent the continued spread of nuclear weapons around the world.

There are certain countries, such as North Korea, that demonstrate just how important it is for us as the global community to be monitoring access to nuclear energy. North Korea withdrew from the Non-Proliferation Treaty on January 10th, 2003, in order to duck IAEA nuclear inspectors. According to Article 10 of the NPT signatories may choose to withdraw from the NPT "if it decides that extraordinary events,…have jeopardized the supreme interests of this country". Evidently the article not only gives the withdrawing nation the ability to determine what constitutes as an "extraordinary event", but it doesn't even verify whether the "event" even exists. Therefore, North Korea, declaring the US made a "hostile move" against DPRK, managed to legally ditch the NPT. Even with the IAEA "Additional Protocol" in full swing, North Korea still has no real obligation to fulfill any commitments to the IAEA. This sets the precedent for nations in the future to follow; DPRK has essentially paved a road for other "developing nuclear nations" to follow for their path to attaining nuclear capability. Iran similarly withdrew from the Non-Proliferation Treaty in 1984 during the Iran-Iraq war to begin developing a nuclear program, prompting the US to impose sanctions upon them in 2013. It was only until recently that Iran agreed to UN inspections of its nuclear facilities. It is important that we show nations such as Iran the importance of these safety inspections, not only to reduce proliferation, but also to protect their own citizens and the surrounding community's well being.

Key Questions:

- Does your country already have nuclear power plants? If so, what safety measures are in place already?
- If your country doesn't have nuclear power plants, is it looking to acquire nuclear energy?
- How will Middle Eastern nations and others who produce oil for international export be affected by the spread of nuclear energy?
- What safeguards are in place to prevent the weaponization of the reactors in developing nuclear weapons?
- How dependent (if at all) is your country on nuclear energy? Does your country currently have the funds and infrastructure in place to build a nuclear power plant?

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Background of Topic B ***Radioactive Waste Disposal:***

The issue over radioactive waste management has sparked controversy throughout the world. While it is simple enough to package waste in tanks and bury them underground, environmentalists argue that the world community isn't doing enough truly prevent radioactive wastes from contaminating the environment. Many countries have developed different tactics for storing nuclear waste. A common tactic is underground burying, which is cited as potentially hazardous to underground water sources and furthermore adds 25 parts Terabecquerel (TBq) per trillion of radioactivity to the buried waste. Others cite nuclear reprocessing as a viable way of reducing the volume of nuclear waste. This however is seen as dangerous as many countries may instead use reprocessed waste to create nuclear weapons. Wherever waste is stored, there is the constant fear of leaks or radiation contamination. Furthermore, radioactive waste produces carbon dioxide as a by-product and requires constant cooling to remain stable. It is absolutely imperative that the international community be able to reach a consensus in safe, efficient methods for the disposal of radioactive waste.

Basic methods of radioactive waste disposal involve storing waste underground in containers that are supposed to be able to prevent radiation from spreading. These containers should be lead-lined and placed under stable rock structures. Just in case these containers crack, it will be important for officials to inspect the area for disposal ahead of time to be able to determine whether or not an accidental leakage would affect the local water supply. Waste with high levels of radiation should be stored away with insoluble matrices made of borosilicate glass. The Synroc method, developed by Professor Ted Ringwood of the Australian National University in 1978, involves the injection of a primarily Hollandite, Zirconolite, and Perovskite substance that solidifies the nuclear waste inside of a storage vessel, preventing potential harm to the environment should the container crack. The process combines the waste with the titane substance and once superheated will be compressed into a hard, black substance dubbed "Synroc" by it's creator. The United States currently uses this method to safely dispose of military nuclear waste.

Nuclear transmutation can also be used to make nuclear waste less harmful. By transmuting nuclear waste into a different isotope, we can rid waste of the radiation it produces. While this method requires more research, many Western nations are actively promoting research in this area and investing in innovative research projects such as these are what is necessary for us to come up with better solutions for tomorrow. There are also various innovative designs of fission reactors that produce considerably less radioactive waste than standard reactors. The integral fast reactor, another American invention, was established under the Clinton administration and has been shown to significantly reduce the amount of nuclear waste produce. However, fast reactors are extremely expensive to produce so more funding should go into researching how we can make these devices cheaper to make and operate. The use of above-ground dry cask storage tanks, which, though quite expensive, are the most suitable form of storage that prevents any sort of radioactive contamination, proves a promising development that has already begun to be implemented. Dry cask tanks typically are made of concrete and steel, which are surrounded by inert gas, not only preventing radiation leaks but also maintaining safe temperatures within the casks.

Former Director-General Dr. Mohamed Elbaradei proposed establishing international repositories in countries such as Australia where nations could deposit their radioactive waste as these countries would have more barren land for there to be safe areas to store waste. There are issues here in the potential for widespread contamination resulting from an accident during which vast amounts of nuclear waste is transported. The European Repository Development Organization (ERDO) created such a repository and has allowed the cooperation of the EU nations to achieve a workable program with which member states could send their waste all to one, safe location.

Nuclear reprocessing is somewhat of a risky solution as countries could easily reprocess nuclear waste and use it to develop nuclear weapons, so many countries may be against nuclear reprocessing despite it being cost efficient.

Key Questions:

- What waste disposal methods are the easiest to use? Most efficient? Safest?
- If your country deals with radioactive waste, what disposal methods do you use?
- Are there safeguards in place to prevent the weaponization of nuclear waste?
- Should the UN involve themselves in regulating radioactive waste, or is that a country's responsibility?
- If a country improperly disposes their waste and an accident occurs within a neighboring country, would the aforementioned country be held accountable and how?

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