

Cerritos Advanced Conference 2020

International Atomic Energy Association (IAEA)



**Topic A: Improving Infrastructure for
Nuclear Facilities**

Topic B: Nuclear Waste Management

Director: Alexander Sim

POSITION PAPERS DUE on October 17th by 11:59 pm to Committee Email

October 24-25, 2020

To Delegates of CHSMUN Advanced 2020

Dear Delegates,
Welcome to CHSMUN Advanced 2020!

It is our highest honor and pleasure to welcome you all to our 2020 online advanced conference here at Cerritos High School. On behalf of the Cerritos High School Model United Nations program, we are proud to host our very first advanced conference, where you will become more knowledgeable on international issues, participate in intellectually stimulating discussions, and create new and everlasting friendships.

The CHSMUN program continues to compete around the world as a nationally ranked MUN program. Our delegates utilize diplomacy in order to create complex solutions towards multilateral issues in the global community. Our head chairs are selected from only the best seniors of our program, undergoing a rigorous training process to ensure the highest quality of moderating and grading of debate. Furthermore, all the topic synopses have been reviewed and edited numerous times. We strongly believe that by providing each and every delegate with the necessary tools and understanding, he or she will have everything they need to thrive in all aspects of the committee. We thoroughly encourage each delegate to engage in all of the facets of their topic, in order to grow in their skills as a delegate and develop a greater knowledge of the world around them.

Although this wasn't what we expected, our advisors and staff have put in countless hours to ensure delegates have an amazing experience at the online conference. Our greatest hope is that from attending CHSMUN 2020, students are encouraged to continue on in Model United Nations and nevertheless, inspired to spark change in their surrounding communities. With this strong circuit consisting of 6 schools and over 500 delegates, CHSMUN Advanced 2020 will provide a quality experience for intermediate delegates to enhance their speaking and delegating skills.

If you have any questions, comments, or concerns, please contact us! We look forward to seeing you at CHSMUN Advanced 2020!

Sincerely,

Anjali Mani and Karishma Patel

sg.cerritosmun@gmail.com

Secretary-Generals

A Note From The Director

Delegates,

My name is Alex Sim and it is my deepest pleasure to be serving as your Director for the International Atomic Energy Agency (IAEA) Committee. This is my 4th year in the MUN program here at Cerritos and without a doubt, I can say that being a part of this program has truly been a life-changing experience. From traveling to New York for the Nationals conference to making some of my closest friendships, I truly cherish all my time in this program. On campus, I am involved in the Red Cross Club and the National Honors Society as well being a part of the track and basketball team here at Cerritos. Outside of Model UN, I volunteer at an academy to tutor and aid students with both academics and fun activities. In addition, I have pursued my interest in psychology by interning for a professor at Cal State University of Long Beach where I analyzed models to find how animals' eating patterns correlated to their daily cognitive functions. In my free time, you can catch me watching anime, raging on Valorant, playing basketball, and eating KKBQ with the boys. With all that being said, I look forward to watching you guys all debate and collaborate on these pressing issues. I'm hopeful you guys will be able to grow as delegates while having a good, memorable time. Feel free to email me if you have any questions regarding the committee and the topics. See you guys in committee!

Sincerely,

Alexander Sim

laea.CHSMUNadv@gmail.com

Director, IAEA

Committee Introduction

In response to the boom of nuclear technology in the 1950's, the International Atomic Energy Association (IAEA) was created in 1957. Specifically, the initial idea of the IAEA was proposed by President Eisenhower to the UN General Assembly in December 1953 and following that, the U.S. Ratification of the Statute, ratified on July 29, 1957, had marked the beginning of the IAEA. Created as an entity independent from national governments, the IAEA serves as a global forum for nuclear cooperation, nuclear safety standards, nuclear application, and many more. Since its founding, the IAEA has made huge strides to guarantee the peaceful and secure use of nuclear energy, power, and more. For example, as a direct response to preventing nuclear accidents such as Fukushima and Chernobyl where thousands of lives were lost due to the mishandling of nuclear power, the IAEA International Emergency Preparedness and Response (EPR) framework was created in order to strengthen effective emergency response measures to nuclear emergencies on both a national and international level. As a part of the IAEA EPR framework, the IAEA Incident and Emergency System also came into fruition, which focuses on assisting member states to efficiently prepare for nuclear accidents and developing safety standards for nuclear energy use. To this day, the IAEA consists of 171 member states and

has played a key role in the signing and ratification of around 50 nuclear treaties by the member states of the United Nations.

TOPIC A: Improving Infrastructure for Nuclear Facilities

Background:

Known for its reliability and efficiency, nuclear power has become a pivotal contributor to the world's functions. In response to the increased usage of this resource, the need for infrastructures regulating the development and functioning of nuclear facilities is of utmost importance. When it comes to launching a nuclear power program and maintaining a nuclear facility, the urgency of careful preparation in addition to investments in time, finances, and resources is essential. Specifically, the development of nuclear facilities can range from anywhere of 10-15 years of preparatory work and a commitment of 100 years to maintain it. In order to successfully ensure the security of these nuclear facilities, the implementation of infrastructures must be seen through, especially for lesser developed nations. It is currently estimated that around 30 countries are considering, planning, or potentially starting nuclear power programs in addition 20 more countries that are taking in consideration beginning construction for nuclear facilities. However, these lesser developed nations lack the proper resources when it comes to nuclear facilities whether it be starting up one or maintaining one. For instance, when starting up a nuclear facility, the facility must be properly designed and have its design licensed. However, emerging countries generally do not have the expertise to do this and therefore, rely on more developed countries such as the UK or United States for design licensing. While the developed countries take care of the licensing process, the lesser developed countries focus on building stability to license the actual operation of the facility. As defined by the IAEA, a sustainable infrastructure "provides governmental, legal, regulatory, managerial, technological, human resource, industrial, and stakeholder support" in the span of a nuclear facility's life. Components such as the establishment of legal and regulatory frameworks, development of human assets and strategies, and construction of national institutions all play a significant role in ensuring a stable infrastructure for facilities to follow. Within this committee, countries will be focusing their attention to improving the infrastructure of these nuclear facilities, including the development of new ones, in order to ensure the safety of nuclear power taking into consideration that its use will only increase as years pass. By the year 2040, it is estimated that energy consumption will be 50% higher than the current consumption rate. As the need to accommodate these increases grows everyday, the commitment to devising and implementing infrastructures for these nuclear facilities is even greater. Nuclear power may have its benefits but as many know, with great power comes great responsibility. Tragic events such as Fukushima and Chernobyl are instances where flawed design within nuclear facilities contributed to nuclear accidents totaling up to around 20,000 deaths. Chernobyl occurred due to

having a flawed reactor design along with inadequately trained personnel to monitor operations within the plant. Even with a flawed reactor design, the situation at Chernobyl could have very well been handled if the facility contained capable and experienced personnel. Similar to this, the Fukushima Daiichi nuclear disaster was as bad as it was because of faulty infrastructure. Although the Fukushima accident was mainly caused due to an extreme earthquake with a magnitude of 9.0 and a 15 meter tsunami, it is important to take into consideration the reactors at Fukushima were proved to be built robust seismically but extremely vulnerable to tsunamis. Specifically, Fukushima reactors were built to withstand tsunamis up to 5.7 meters high but the tsunami that struck the plant that day was 15 meters high. This means that the overall infrastructure at the facility was weak and because of “holes” like this within the infrastructure, it made these nuclear accidents way worse than they should have been. Had the infrastructure of the Fukushima facility been better built and equipped for tsunamis, it could have possibly lessened the effects and been preventable. Disasters like this have spurred the IAEA into improving nuclear safety measures, specifically through the integration of nuclear infrastructures. A main form of how these infrastructures have guided member states is through frameworks. Frameworks are created and implemented in order to ensure that nuclear energy operations are done both efficiently and safely. They set out guidelines and regulations for member states to follow when utilizing the services of nuclear energy. Currently, the framework of the IAEA calls upon the need to make constant changes in order to accommodate to changes in nuclear law. However, the issue is that some countries participating in nuclear energy operations do not adhere to the guidelines within these frameworks. That is why the need to implement frameworks to monitor and guide these member states is so crucial. One of the IAEA’s most reliable frameworks is its “Nuclear Security Series” which essentially lays out objectives for the IAEA, recommendations for member states, and technical guidance for nuclear security measures. The Nuclear Security Series is the basis of nuclear safety assessment through all departments of the IAEA and even has measures mentioned in it in the event of a nuclear emergency. In addition to frameworks, another issue to address when it comes to improving infrastructure for nuclear facilities is assisting lower developed countries with the process that comes along with nuclear facilities as a whole. As previously stated before, emerging countries in the nuclear facility process lack the proper resources to both build and maintain. These resources can range anywhere from human personnel to technology. In regards to the human resources, one of the main methods that has been utilized to help these countries gain trained, capable personnel is through the United States Nuclear Regulatory Commission’s Power Plant Engineering Course Manual. This is one of the main methods the United States has utilized in order to aid these emerging countries in constructing infrastructure for nuclear facilities. The NRC’s training courses comprises a Power Plant Engineering Course Manual, Site Access Training, Welding Technology & Codes, NRC Reactor Concepts, and many more. Anything that needs to be addressed when building infrastructures for lesser developed countries can be found here. Frameworks like the Nuclear Security Series and aid resources like the Nuclear Regulatory Commission’s Training Courses are pivotal to the development of infrastructures for nuclear facilities and have been effective in ensuring the safe construction of power plants.

United Nations Involvement:

Seen as a potential contributor to sustainable development, nuclear facilities have been recognized by the United Nations as a key component that must be properly handled and assisted. Events during the Second World War, such as Hiroshima and Nagasaki, initially brought attention to nuclear issues and since then, the UN has strived to ensure the proper and secure use of nuclear energy. For instance, the United Nations along with the IAEA have collaborated to provide guidance, advice, and review services to countries desiring to launch nuclear power programmes. Together, they have created the Milestones Approach, which is a comprehensive method that assists a country in understanding the commitments and obligations that come along with developing nuclear power programmes in nuclear facilities. Essentially, the Milestones Approach comprises of three phases that facilitate the development of a national infrastructure for nuclear power. Phase 1 encompasses the basic considerations that need to take place before a decision to launch a nuclear power program is taken. Phase 2 involves the preparatory work needed for contracting and construction of a nuclear facility after the decision has been made. Lastly, Phase 3 is the action that needs to be taken to construct the nuclear power plant. In total, the Milestones Approach includes 19 nuclear infrastructure issues that helps guide countries to work in a systematic way to promote secure nuclear facilities. In addition to these measures taken, the UN has adopted numerous resolutions in the past to assist the IAEA in its efforts to promote secure nuclear power use within member states' facilities. For example, Resolution A/72/221 was adopted to primarily target strengthening international collaboration in the fields of nuclear science, energy, technology, transport, and waste safety. Moreover, the GA/11449 was passed in 2013 in which the GA acknowledged the IAEA's commitment on nuclear safety and further encouraged them to continue their endeavors. Following that, in 2014, the UN passed GA/11578 whose main goals were to increase nuclear safety and maintain the peaceful, secure use of nuclear technologies internationally. The United Nations' relationship with the IAEA is overseen by an agreement signed in 1957 which states, "The Agency undertakes to conduct its activities in accordance with the Purposes and Principles of the United Nations Charter to promote peace and international cooperation, and in conformity with policies of the United Nations furthering the establishment of safeguarded worldwide disarmament and in conformity with any international agreements." However, it is important to note that while bodies residing in the UN and the IAEA do have the power to set standards and guidelines, they do not have powers to enforce them upon member states. On top of UN efforts to promote improving infrastructures within nuclear facilities, non-governmental organizations such as the World Association of Nuclear Operators (WANO) have made strides in assisting member states in maintaining their nuclear facilities. Specifically, WANO offers services such as peer review, performance analysis, member support, and even training and development on a global scale. Post-Fukushima, WANO performs a four-year frequency for peer reviews with a follow-up at the two-year point. Currently, WANO has offices in Atlanta, London, Moscow, Paris, and Tokyo. What sets aside WANO from the rest of the NGO's is that they are recognized by the IAEA and have collaborated with programs within the IAEA, both past and present, on operations pertaining to strengthening infrastructure in facilities. Organizations such as WANO are prime examples of those who positively provide to the cause of improving infrastructure in nuclear facilities and their continued collaboration with the IAEA has moved mountains in the field of nuclear services.

Case Study: Fukushima Daiichi Nuclear Accident

As a result of an earthquake of magnitude 9.0 along with a 15 meter tsunami, the accident at Fukushima Daiichi, considered the second worst nuclear accident in the history of nuclear power generation, occurred in Japan in 2011. The earthquake would be known as the Great East Japan Earthquake and had a duration of three minutes. It was reported that 11 operating reactors at 4 nuclear power plants were shut down immediately as soon as the earthquake hit. Not to mention, the tsunami flooded around 560 square kilometers and caused great damage to surrounding coastal ports and cities, killing approximately 19,000 people. The tsunami alone was able to cause 3 out of 11 reactors to lose power on top of 12 out of 13 backup generators losing their power as well. Without the help of 3 reactors to control water circulation, the reactors were not able to efficiently and properly cool themselves off. Workers attempted to cool and stabilize these cores by pumping seawater and boric acid into them but to no avail. Within the next three days, the affected reactors' cores fully melted which rendered them useless. Taking into mind the possibility of getting exposed to radiation, government officials issued a 30-km (18 mile) no fly zone around the facility and a land area of 20-km (12.5 mile) radius surrounding the plant. All of these precautions and evacuations zones covered almost 600 square km (232 square miles). In regards to the infrastructure of the nuclear reactors at Fukushima, it was found that these reactors had been robust seismically, meaning that they were able to handle earthquakes pretty well. However, these reactors were not as durable against tsunamis. Specifically for the Fukushima Daiichi nuclear plant, it was designed to withstand only a 5.7 meter tsunami but the one that struck the plant was almost three times as high at around 15 meters. As exemplified by the three reactors along with twelve backup generators losing power due to the tsunami, it can be easily seen that Fukushima reactors were not well equipped to handle tsunamis, meaning that its infrastructure was not the best it could've been. The nuclear meltdowns that occurred may have even been preventable. In total, the IAEA has conducted four reports on the Fukushima Daiichi nuclear accident and these reports include advisory points that aim to help Member States understand how to strengthen their nuclear infrastructures so that their reactors do not fail in the event of a natural disaster such as this.

Bloc Positions:

Western Bloc: For nations residing within the Western bloc, the idea of nuclear power is widely supported, therefore the need for infrastructures is significant. The main leaders of these western nations for nuclear power are the United States, Canada, and Europe. As of last year, the United States was reported to have 96 operating nuclear reactors along with 58 nuclear power plants within 28 states. The United States also accounts for more than 30% of global nuclear energy

production. For Canada, it has been a leader in nuclear research and technology and 15% of Canada's electricity stems from its nuclear facilities. Within the European Union, nuclear power plays a significant role as well. Europe depends on nuclear energy for a quarter of its electricity and even higher proportions for its base-load power. Like other western nations, Europe focuses on nuclear energy as the key to a future of reliable energy and power. For the Western Bloc, nuclear power continues to play a key role within nations and the development of secure infrastructures is crucial to these residing nations.

Latin America and the Caribbean Bloc: The nuclear situation within the Latin America and Caribbean bloc is a fragile one. Currently, there are seven nuclear power reactors operating in Latin America - 3 in Argentina, 2 in Brazil, and 2 in Mexico. These countries are the leaders within the bloc when it comes to nuclear power and reactors and have strict regulations when it comes to monitoring these facilities. However, the acquiring, possessing, developing, testing, or use of nuclear weapons is completely prohibited within Latin American states. This was due to the ratification of the Treaty of Tlatelolco. Therefore, countries within this bloc are not associated whatsoever with nuclear weapons at the moment.

African Bloc: For the African bloc, Africa, in regards to continents, is at the bottom of nuclear power with South Africa being the only African country that has nuclear power. Specifically, there are two nuclear reactors in Koeberg, which is near Cape Town, and the infrastructure within these facilities are not the strongest due to the low amount of attention given to nuclear activities itself. These two nuclear reactors produce approximately 5% of the country's electricity. Although many countries within the African bloc have not made use of nuclear power/energy yet, many are considering its use seeing as how nuclear energy's efficiency is extremely efficient and reliable. However, before they do so, many African countries need to properly assess the pros and cons of nuclear energy and take measures to understand the obligations that come with developing infrastructures for nuclear facilities.

Asian-Pacific Bloc: A handful of countries within the Asian-Pacific Bloc are leaders in nuclear power and reactor production. For example, Japan and South Korea are leaders in nuclear power output housing approximately 20 functioning plants each. India is a prime example of a country whose government is committed to growing its nuclear power output as a part of its infrastructure development program. Electricity generating capacity in addition to nuclear development is the fastest within the continent of Asia and from December 2007 to 2017, the amount of operable reactors in Asia had increased from 106 to 131. Currently, there are 130 operable nuclear reactors in Asia with many more in the works. In order to properly manage these facilities, the IAEA started offering the Integrated Nuclear Infrastructure (INIR) missions in 2009 to help evaluate the status of countries' nuclear infrastructures. In Asia alone, countries such as Indonesia, Malaysia, the Philippines, Thailand, and Vietnam have taken these missions in hopes of improving their nuclear facilities.

Basic Solutions:

In regards to improving infrastructure for nuclear facilities, delegates should focus on solutions that pertain to the establishment of legal and regulatory frameworks for monitoring, devisement of financial strategies and review services for nuclear facilities, and the promotion of increased transparency within the international community when it comes to nuclear facility operations. In order to have a solid framework for nuclear facilities and member states to follow, frameworks should consist of proper regulations, guidelines, and management programs for safety. Take, for example, the Convention on Nuclear Safety. Essentially, this treaty establishes basic fundamental safety regulations for member states that operate land-based nuclear power plants to follow. The parties signed under this treaty are obligated to send mandatory reports on their nuclear energy operations for peer review at meetings at the IAEA headquarters. This, in turn, promotes not only the strengthening of the nuclear facilities' infrastructure but also transparency because participating parties are aware of which parties are practicing safe nuclear energy operations and ensures that no one is fabricating any information. In addition to this, delegates should also consider methods on how to assist countries that are interested in developing nuclear facilities. An example of this is the Integrated Regulatory Review Service (IRRS). This is a service provided by the IAEA to its member states in order to strengthen the infrastructure of nuclear facilities. Adhering to the IAEA Safety Standards, representatives from the IAEA are able to analyze member states' nuclear infrastructures and from there, provide assistance, whether it be through developing tools or methodologies to these parties. IRRS missions conducted by experts and technical advisors from the IAEA have been one of the main ways that the IAEA has been able to promote safe nuclear energy practices among its member states. Similar to the IRRS, is the Integrated Nuclear Infrastructure Review (INIR). This is also a peer review system where upon request by a member state, the IAEA will conduct an INIR mission. This team consists of international experts who are fully knowledgeable within specialized nuclear infrastructure fields. Post-mission, INIR experts have in-depth conversations with IAEA member state representatives which not only promotes the use of review services to improve infrastructures but also transparency between parties.

Questions to Consider:

1. How can countries ensure that other countries follow the nuclear guidelines in frameworks to improve infrastructure?
2. How can countries incentivize countries, who are not open to peer reviews, to allow review services to be performed in their facilities? What will be done in the event a country is not following the suggested infrastructure guidelines?
3. How can more developed and experienced countries assist newer countries in the beginnings of nuclear facility and power development?
4. How much has your country played a role in devising and implementing infrastructures in the international community? Has shown to not support infrastructures?

5. How can countries ensure that proposed measures to improve infrastructures do not fail like previous ones?

Sources:

1. "Atomic Energy." *United Nations*, United Nations, www.un.org/en/sections/issues-depth/atomic-energy/index.html.
2. "Convention on Nuclear Safety." *IAEA*, IAEA, 20 Oct. 2014, www.iaea.org/topics/nuclear-safety-conventions/convention-nuclear-safety.
3. "Department of Nuclear Safety and Security." *IAEA*, IAEA, 26 July 2016, www.iaea.org/about/organizational-structure/departments-of-nuclear-safety-and-security.
4. "Fundamentals." *Nuclear Energy Institute*, www.nei.org/fundamentals.
5. "History." *IAEA*, IAEA, 9 Feb. 2016, www.iaea.org/services/technical-cooperation-programme/history.
6. "Nuclear Energy Could Hold Key to Sustainable Development Gains, Delegates Tell General Assembly, as It Considers International Atomic Energy Agency Report | Meetings Coverage and Press Releases." *United Nations*, United Nations, www.un.org/press/en/2017/ga11972.doc.htm.
7. "Nuclear Installations." *IAEA*, IAEA, 8 June 2016, www.iaea.org/topics/nuclear-installations.
8. "Nuclear Power in Latin America: Argentina Leads the Way but More Nations Have Reactor Plans." *NS Energy*, 25 Dec. 2019, www.nsenergybusiness.com/features/nuclear-power-latin-america/.
9. "Why Nuclear Energy Should Be Part of Africa's Energy Mix." *Phys.org*, Phys.org, 17 Sept. 2018, phys.org/news/2018-09-nuclear-energy-africa.html.
10. 10. "Resolutions Adopted to Strengthen Nuclear Safety, Security, Science and Technology: IAEA 61st General Conference Concludes." *IAEA*, IAEA, 22 Sept. 2017, www.iaea.org/newscenter/news/resolutions-adopted-to-strengthen-nuclear-safety-security-science-and-technology-iaea-61st-general-conference-concludes.
11. 11. "Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (LANWFZ) (Tlatelolco Treaty)." *Nuclear Threat Initiative - Ten Years of Building a Safer World*, www.nti.org/learn/treaties-and-regimes/treaty-prohibition-nuclear-weapons-latin-america-and-caribbean-lanwfz-tlatelolco-treaty/.
12. "United Nations, Main Body, Main Organs, General Assembly." *United Nations*, United Nations, www.un.org/en/ga/72/resolutions.shtml.
13. "Infrastructure Development." *IAEA*, IAEA, 13 Apr. 2016, www.iaea.org/topics/infrastructure-development.
14. "Integrated Nuclear Infrastructure Review (INIR)." *IAEA*, IAEA, 15 July 2016, www.iaea.org/services/review-missions/integrated-nuclear-infrastructure-review-inir.
15. "Licensing and Building New Nuclear Infrastructure." *NAE Website*, www.nae.edu/7557/LicensingandBuildingNewNuclearInfrastructure.

16. "Milestones Approach." *IAEA*, IAEA, 13 Oct. 2017, www.iaea.org/topics/infrastructure-development/milestones-approach.
17. "Nuclear Energy: Infrastructure." *JGC HOLDINGS CORPORATION*, www.jgc.com/en/business/infrastructure/nuclear-generation/.
18. "Nuclear Power in Latin America: Argentina Leads the Way but More Nations Have Reactor Plans." *NS Energy*, 25 Dec. 2019, www.nsenergybusiness.com/features/nuclear-power-latin-america/.
19. "Nuclear Power Plants as Critical Energy Infrastructure." *Defender*, 2 Apr. 2020, defender-project.eu/the-engineering-of-today/.
20. "Nuclear Safety and Security Review Missions." *IAEA*, IAEA, 21 July 2020, www.iaea.org/newscenter/multimedia/videos/nuclear-safety-and-security-review-mission.
21. "Performance Analysis." *WANO*, www.wano.info/services/performance-analysis.
22. "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." *U.S. Nuclear Industry - U.S. Energy Information Administration (EIA)*, www.eia.gov/energyexplained/nuclear/us-nuclear-industry.php.

TOPIC B: Nuclear Waste Management

Background:

Nuclear waste management is defined as the storage of excess nuclear material from places such as nuclear power plants, facilities, and even hospitals. It is estimated by the IAEA that around 200 million tons of nuclear waste is generated annually, yet only 4.3 million of it is actually hazardous. There are 3 classifications for nuclear waste and it is measured by their radioactivity. These levels are low, intermediate, and high. Low-level nuclear waste includes items that have been contaminated or been exposed to low levels of radioactivity during cleanups or maintenance activities. For example, this waste can consist of contaminated protective shoe covers, clothing, syringes, filters, and more. Typically, low-level waste is stored on-site of nuclear facilities until the radioactivity in it has decayed away to the point where it can be discarded as ordinary trash. Low-level waste disposal specifically takes place at commercially operated low-level waste disposal facilities that have to be licensed by either the NRC or Agreement States, which are States that have expressed interest in integrating programs under the guidance of NRC regulatory authority. Of course, these facilities have to meet safety standards and operators of these kinds of facilities must constantly analyze the performance of the facility, even calculating its potential performance hundreds of years in the future. Although low level waste accounts for 90% of the total volume of nuclear waste, it only contains 1% of radioactivity. Real life examples of these low-level waste disposal facilities can include caverns below ground that are at depths of tens of metres. Next, is the intermediate level. Intermediate level radioactive waste is more radioactive due to the fact that it contains long-lived radioisotopes. Usually this type of waste is stored in geological repositories and later disposed of in near-surface disposal facilities. Intermediate level waste can take the form of used filters/components from within nuclear reactors and takes up 7% of total volume of nuclear waste and contains 4% of radioactivity. Lastly, there is high-level nuclear waste. High-level nuclear waste is the radioactive material that is produced as a byproduct of the reactions that take place from within nuclear facilities. Fuel that is removed from a nuclear reactor is still highly radioactive and contains long-lived radioactivity that produces a tremendous amount of heat. With high level nuclear waste, licensees must store this fuel at their own facilities until a permanent disposal repository is constructed. Since the only way to dispose of waste is through decaying, which for high-level nuclear waste can take as long as up to hundreds to thousands of years to do so, it must be stored in permanent repositories away from the public. Although high-level waste takes up only 3% of total volume of nuclear waste, it contains an astonishing 95% radioactivity within it. Overall when it comes to the disposing of nuclear waste, geographical location plays a huge role. People have to take into account both the safety of people and the environment along with utilizing resources around the area when disposing radioactive waste. For example, the United States designated Yucca Mountain, which is located in the remote Nevada desert, as its sole repository for spent fuel, specifically high-level nuclear waste from its nuclear power programs. This was done by amending the Nuclear Waste Policy Act. Essentially, this repository would be located 300 metres (984 feet) underground within an

unsaturated layer of welded volcanic rock to reduce the radioactivity of the waste. Specifically, this high level waste would be stored in highly corrosion-resistant double-shelled metal containers whose outer layer was made of a highly corrosion-resistant metal alloy and inner layer composed of strong stainless steel. To protect these containers from both potential debris falling and water percolation, drip shields composed of corrosion-resistant titanium are placed on top of these containers. Although the Department of Energy proposed a motion to withdraw this site's license application, the experts in the Nuclear Regulatory Commission were able to release a response to the Department of Energy's statement saying that after deep assessment, they were able to establish that the repository would be able to remain functional and safe for one million years taking into account environmental factors and such. As one can tell, taking geographical location and the surrounding environment is crucial to successfully managing nuclear waste. Moreover, one very important aspect to note of nuclear waste management is cost. For the Yucca Mountain repository, it had cost the government \$15 billion to start up the site over there and a report from the Energy Department projected that the cost for long-term nuclear waste cleanup overseen by the Department of Energy to rise up to \$100 billion in just a year. The management of nuclear waste is a costly one, something that poses an issue to even developed countries, leaving lesser developed countries with nuclear reactors and waste even further behind and unable to manage. Within this committee, countries will be focusing on adopting solutions that ultimately strengthen nuclear waste management efforts. Main problems that arise with the management of nuclear waste is not only finding ways to store and monitor it over time, but to also keep its effects away from the environment and public. A prime example of radioactive waste having a big impact was post-Chernobyl. For workers who survived, due to the high levels of radiation in the area, 28 of the 600 site workers died in the first four months after the event. Not to mention, another 106 workers received acute radiation sickness due to high exposure to nuclear waste. Even during the cleanup, 200,000 cleanup workers received doses of between 1 to 100 rem, and these workers were found to have a statistically higher risk of solid cancer incidence and mortality. Due to the poor handling of nuclear waste in the area, Chernobyl cleanup activities eventually required around 600,000 workers. As you can see, if nuclear waste is not managed correctly, then detrimental effects will follow. The management and disposal of nuclear waste is one of the fundamental principles addressed within the IAEA's Safety Standards. As stated by the IAEA, "Activities such as the medical uses of radiation, the operation of nuclear installations, the production, transport and use of radioactive material, and the management of radioactive waste must be subject to standard of safety."

United Nations Involvement:

The United Nations, in collaboration with the IAEA, has made huge strides when it comes to the management of nuclear waste. Director general of the IAEA, Yukiya Amano, has even encouraged member states with advanced nuclear waste disposal programs to assist smaller countries who wish to pursue nuclear power programmes in order to ensure both safe nuclear usage and nuclear storage. Currently, the IAEA has 53 active projects that pertain to managing nuclear waste. In June 2015, the International Conference on Management of Spent Fuel from Nuclear Power Reactors was held in order to shine light on the importance of devising a long-term approach to handle spent fuel from nuclear facilities. This specific conference is held

every 3 to 5 years with participants ranging from policymakers to representatives from regulatory bodies to ensure that measures are being taken to manage nuclear waste. Specific aspects that were discussed were the decommissioning of nuclear facilities in addition to improving geological waste deposits to further strengthen radioactive waste management. Additionally, the UN has worked with IAEA and its Department of Nuclear Security and Safety to create the Waste Technology Section. The Waste Technology Section's purpose is to assist Member States to identify and apply solutions to managing all forms of radioactive waste as well as fostering knowledge transfer and information exchange. This can range anywhere from predisposal management to waste minimization strategies and essentially, the Waste Technology Section improves Member States' capability to handle the implementation of safe methods for the storing and disposing of radioactive waste substances. On top of these measures taken, the UN has also adopted resolutions in the past to facilitate radioactive waste disposal. One of the most prevalent ones is A/RES/56/24 which was adopted by the UN on January 10, 2002. Essentially, one of the main points of this resolution was to "appeal to all Member States that have not yet taken the necessary steps to become a party to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management to do so in time to attend the 1st Review Meeting of the Contracting Parties." The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management was the IAEA's first legal instrument that addressed the situation of what to do with spent fuel and radioactive waste on a global scale. Similar to the Convention on Nuclear Safety, it establishes basic safety principles in addition to a "peer review" process for Member States to follow. All Member States under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management have to address the management of radioactive waste in the areas of civilian application, military/defense programs, and nuclear reactors. An example of a notable NGO that has contributed greatly to the cause of nuclear waste management is the MKG, which is the official Swedish NGO Office for Nuclear Waste Review that was founded in 2004 to tackle radioactive waste problems. The interesting thing is that the MKG actually consists of multiple NGOs such as Nature and Youth Sweden, Friends of the Earth Sweden, and many more. The main objective of MKG and its member organizations is to analyze the effectiveness of long-term solutions, such as copper canisters to contain radioactive waste, and to report their findings to the Swedish government. The MKG receives funding from the Swedish Nuclear Waste Fund in order to carry out operations regarding waste disposal projects. What sets aside MKG from other NGOs is that it is the official Swedish NGO Office in the area of nuclear waste review, which allows it to communicate directly with the Swedish government to implement new ideas and changes when it comes to nuclear waste management.

Case Study: Ukraine's Chernobyl Cleanup

The infamous nuclear accident at Chernobyl left 2 dead at ground zero with the accident's severe radiation effects killing 28 more workers within the next 4 months. Cleanup efforts eventually required 600,000 workers with many workers receiving small doses of radiation, capable of causing terminal illnesses like cancer, causing death. It is estimated that it will take another 28 year before radiation at Chernobyl returns down to acceptable levels and

that it won't be until 2065 that all the reactors and debris at the site will be completely dismantled and cleaned up. The Chernobyl disaster cost the Soviet Union greatly in cleanup costs amounting up to billions and also exposed their lack of openness to the international community. With Chernobyl located in northern Ukraine, the Ukrainian government has the most responsibility when it comes to managing the cleanup at Chernobyl. Despite the nuclear incident, Ukraine has continued to allow the operation of plant reactors in the middle of the area's irradiated disaster zones due to the fact that its nation relies on nuclear power to produce a little less than half of the country's electricity. Currently, the Ukrainian government is trying to handle the construction of a solar farm, investing up to 100 million Euros, in hopes of revitalizing the 2000km of land surrounding the plant and creating a renewable energy source for the country that was similar to Chernobyl. Long lasting radiation within the area of Chernobyl has made it impossible for the Ukrainian government and its people to perform activities such as farming and forestry development. Even the government had dropped rent rates on state property surrounding Chernobyl by as much as 85%. With the introduction of this solar farm, Ukraine hopes to not only produce electricity similar to what Chernobyl used to produce and revitalize the land but also to curb their dependence on Russia for nuclear fuel, natural gas, and other forms of energy. The Ukrainian government is relying on the services of the European Bank for Reconstruction and Development for aid seeing as how solar farms require careful planning following strict management. The European Bank for Reconstruction and Development which has also financed the Vektor Complex, which is Chernobyl's main liquid wastewater radioactive treatment plant meant to handle 22,000 tons of irradiated water around the area within the next 20 years. If Ukraine manages to give birth to this solar farm, it would bring a revolution of an altogether different kind to the area of Chernobyl.

Bloc Positions:

Western Bloc: The United States, however, has made little effort to manage its nuclear waste. Currently, there are 90,000 metric tons of nuclear waste that require disposal across the United States and this waste is only in temporary storage as of now. This is largely due to the fact that the U.S. has yet to devise a long-term storage solution and put it into action, leaving the nuclear waste susceptible to dangerous weather conditions such as hurricanes, wildfires, and rising sea levels. Canada, on the other hand, has been handling its share of nuclear waste fairly well. As a part of the Nuclear Waste Act, the Nuclear Waste Management Organization of Canada was established to help manage Canada's used nuclear fuel. One of Canada's main approaches to handling waste is the Adaptive Phased Management (APM) Plan, which was created after a three-year dialogue with the public and specialized experts and utilizes long-term management practices from nuclear programs derived from countries such as Finland, France, United Kingdom, and many more. Within the European Union, nuclear waste management is something nations take very seriously. The EURATOM treaty along with the "Waste Directive" serve as the EU's legal basis for handling radioactive waste management. Many European nations adhere to this treaty and its principles to properly carry out safe nuclear waste disposal along with the safe decommissioning of nuclear facilities.

Latin America and the Caribbean Bloc: Although fairly new in the field of nuclear waste management, countries within the Latin American and the Caribbean bloc have made strides towards achieving safe and successful nuclear waste disposal. In September 2015, regulatory bodies and operators in the Latin American and the Caribbean region collaborated with the IAEA to devise a project that would help countries in this bloc overcome the difficulties that come along with managing nuclear waste. Specifically, this project had focused on strengthening regulatory frameworks in nuclear facilities as well as policies regarding member states participating in the disposal of nuclear waste. Additionally, it had addressed limiting the public's exposure to this waste and setting up environmental monitoring protocols. Because of this, countries in the Latin American and Caribbean region are now much better equipped to tackle the nuclear waste residing in their respective territories. So far, 20 Latin American countries have been able to strengthen their response to this waste through on-the-job training and workshops that train young staff.

African Bloc: Currently, South Africa is the only African country that has nuclear power. As of right now, the Vaalputs Radioactive Waste Disposal facility is the only radioactive waste disposal facility in South Africa and is operated by the NECSA. The storage of high-level nuclear waste is a major environmental concern for those residing in the South African region. Africa's only nuclear facility, Koeberg, produces approximately 32 tons of nuclear fuel a year and this fuel contains radioactive materials such as uranium and plutonium that have life spans for over thousands of years. South Africa is managing its nuclear waste disposal through the Vaalputs Radioactive Waste Disposal facility where it cools these radioactive materials for a decade in water in spent fuel pools.

Asian-Pacific Bloc: Because many countries in the Asian-Pacific bloc are leaders in nuclear power, the responsibility is even greater for them to handle the management of their nuclear waste. As reported by the World Nuclear Association, the Asian countries who currently have nuclear waste management facilities are Australia, India, Japan, Kazakhstan, and Pakistan. Other countries such as Korea have strived to establish and integrate nuclear waste disposal sites for safe management and even have their own respective radioactive waste management agencies, such as the Korea Radioactive Waste Agency (KORAD). Many countries in this bloc are a part of the Asian Nuclear Safety Network (ANSN). The main objective of the ANSN is to share nuclear safety information to participating countries and provides a platform for member states to create a knowledge network to promote the enhancement of not only nuclear safety infrastructures but also improving emergency preparedness and response to radioactive waste management.

Basic Solutions:

In order to promote and regulate nuclear waste management in countries, delegates should focus on solutions that are not only sustainable and long-term but also are environmentally and public friendly. One of the main ways that nuclear waste has been stored is by putting it under water for long periods of time. The radioactivity within the waste decays as time passes, and even the highest levels of waste can take up to 50 years before disposal. Usually, the waste is placed in deep geological deposits because it is the most secure option that prevents radiation exposure to the people and environmental pollution as well. These deposits can range anywhere from ponds to dry casks within reactor sites. Of course, the periods of which the waste is contained depends on the levels of radioactivity in it since the more it has, the longer it would take for the radioactivity and heat to decay.

Other than sustainable solutions such as storing this nuclear waste, delegates should also focus on improving transparency amongst countries. A prime example of this is the international project known as the GEOSAF project. Essentially, the GEOSAF project was launched by the IAEA in order to help oversee the licensing of a geological disposal facility and its operations for nuclear waste disposal. The first part of GEOSAF was undertaken from 2008 to 2011, where a safety case was devised and reviewed for the geological disposal of nuclear waste. From 2012 to 2015, GEOSAF focused on promoting collaboration among member states in the areas of operational safety for geological disposal and the potential of its long-term safety. It did so by taking into consideration the viewpoints of regulatory authorities during the licensing process and the development of the safety case. The last and third part of the project, which took place in 2017, mainly addressed the practical applications of their safety measures and also had member states, who possessed suitable safety programs, to contribute their resources to this phase. As a result, the GEOSAF project was not only able to address the safety concerns with geological disposal facilities but also increase communication amongst countries as well.

Lastly, another aspect to address in the management of nuclear waste is both assessing the effect human-related activities have on radioactive waste and how to prevent human-related casualties. Taking this into consideration, the HIDRA project was founded in order to analyze human actions that potentially disrupt areas around radioactive disposal facilities that contained nuclear waste. Parties under the HIDRA project were able to develop a plan in order to assess certain scenarios and from there, construct protective measures to reduce the potential of an event that involved the public and nuclear waste. Not to mention, this project also was able to foster communication through information sharing between Member States. This project contained two phases with the first phase mainly pertaining to the analysis of potential scenarios and the second phase, which concentrated on feasibility of implementing these measures.

Questions to Consider:

1. How much has your country contributed to strengthening management efforts for nuclear waste? Is it responsible for managing its own waste?
2. How can countries guarantee that proposed solutions to store nuclear waste are not only feasible but leave minimal room for casualties to the environment and human population?
3. What are obstacles that can potentially rise down the road when attempting to manage nuclear waste?

4. What measures can be taken to efficiently handle nuclear waste in the event of a nuclear accident?
5. What are proper ways to assess that a geographical location is appropriate for nuclear waste disposal?
6. How can countries make it easier on one another to handle the high cost of managing radioactive waste?
7. How are countries able to ensure that repositories for nuclear waste are not only secure but also sustainable for potentially thousands of years?
8. What are potential methods to prevent nuclear waste cleanups costs from rising as years pass?

Sources:

1. *A/RES/56/24 - E - A/RES/56/24*, undocs.org/A/RES/56/24.
2. “Analysing the Development of Nuclear Power across Southeast Asia.” *NS Energy*, 5 Aug. 2019, www.nsenergybusiness.com/features/development-nuclear-power-southeast-asia/.
3. *Asia's Nuclear Energy Growth | Nuclear Power Developments in Asia - World Nuclear Association*, www.world-nuclear.org/information-library/country-profiles/others/asias-nuclear-energy-growth.aspx.
4. “Convention on Early Notification of a Nuclear Accident.” *IAEA*, IAEA, 17 Oct. 2014, www.iaea.org/topics/nuclear-safety-conventions/convention-early-notification-nuclear-accident.
5. “Disposal.” *IAEA*, IAEA, 8 June 2016, www.iaea.org/topics/disposal.
6. “Forum on the Safety of Near Surface Disposal.” *IAEA*, IAEA, 8 July 2019, www.iaea.org/services/networks/forum-on-the-safety-of-near-surface-disposal.
7. “Human Intrusion in the Context of Disposal of Radioactive Waste (HIDRA).” *IAEA*, IAEA, 18 Mar. 2019, www.iaea.org/topics/disposal/human-intrusion-in-the-context-of-disposal-of-radioactive-waste-hidra.
8. “International Project on Demonstrating the Safety of Geological Disposal.” *IAEA*, IAEA, 7 Feb. 2019, www.iaea.org/topics/disposal/international-project-on-demonstrating-the-safety-of-geological-disposal.
9. “Javascript Required!” *Chernobyl | Chernobyl Accident | Chernobyl Disaster - World Nuclear Association*, www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/chernobyl-accident.aspx.
10. *National Radioactive Waste Disposal Institute*, www.nrwdi.org.za/.
11. “Radioactive Waste Issues in Major Nuclear Incidents.” *Energy.gov*, www.energy.gov/ehss/downloads/radioactive-waste-issues-major-nuclear-incidents.

12. Roelf, Wendell. "Waste Storage at Africa's Only Nuclear Plant Brimming." *Reuters*, Thomson Reuters, 25 Nov. 2019, www.reuters.com/article/us-safrica-eskom-nuclearfuel/waste-storage-at-africas-only-nuclear-plant-brimming-idUSKBN1XZ0MI.
13. says:, James Simpson, et al. "Looking for a Trash Can: Nuclear Waste Management in the United States." *Science in the News*, 4 Sept. 2018, sitn.hms.harvard.edu/flash/2018/looking-trash-can-nuclear-waste-management-united-states/.
14. team, FPFIS. "Nuclear Waste Management and Decommissioning." *EU Science Hub - European Commission*, 10 June 2020, ec.europa.eu/jrc/en/research-topic/nuclear-waste-management-and-decommissioning.
15. "UN Nuclear Chief Encourages 'Cradle-to-Grave' Plans for Managing Spent Fuel and Radioactive Waste | | UN News." *United Nations*, United Nations, news.un.org/en/story/2015/06/501692-un-nuclear-chief-encourages-cradle-grave-plans-managing-spent-fuel-and.
16. "Waste Technology Section." *IAEA*, IAEA, 8 June 2016, www.iaea.org/about/organizational-structure/department-of-nuclear-energy/division-of-nuclear-fuel-cycle-and-waste-technology/waste-technology-section.
17. *What Is Nuclear Waste and What Do We Do with It? - World Nuclear Association*, www.world-nuclear.org/nuclear-essentials/what-is-nuclear-waste-and-what-do-we-do-with-it.aspx.
18. "What Is the Difference between Low Level Intermediate Level and High Level Waste: NWMO." *What Is the Difference between Low Level Intermediate Level and High Level Waste | The Nuclear Waste Management Organization (NWMO)*, www.nwmo.ca/en/More-information/You-Asked-Us/2015/11/06/11/03/What-is-the-difference-between-low-level-intermediate-level-and-high-level-waste.