Vancouver Youth Model United Nations 2021

IAEA

Background Guide

VANCOUVER YOUTH MODEL UNITED NATIONS 2020

International Atomic Energy Agency
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Dear delegates,

My name is Pierre Collet and it is my pleasure to be your director of the International Atomic Energy Agency for VYMUN 2021. As your director, I hope to foster a comprehensive educational experience, replete with stimulating debate. This year, we will examine two topics: The Rise of Nuclear Power and Safeguards and Verifications around Nuclear Weapons

Our first topic, The Rise of Nuclear Power, reflects on a longstanding and prevalent issue in the international community. With the inevitable coming of climate change, it's necessary that non-fossil fuel sources become the forefront of energy production. While many western nations are slowly integrating nuclear energy in their countries, others have refused to be anywhere near nuclear power. It's vital that IAEA comes together to determine the right response to the rise in nuclear power: to support/fund this alternative energy source or to limit it.

Our second topic, Safeguards and Verifications around Nuclear Weapons, is a broad one. With ever-increasing technologies making nuclear weapons more accessible to many rogue nations wanting a strong deterrent, nuclear development is almost inevitable in the near future. In addition, the slowing of disarmament poses a threat to the efficacy of current regulations, suggesting that certain guidelines are in need of review. Actions by specific countries, namely North Korea, Pakistan, and Iran, have also brought up the question of certain views and morals. All delegates must keep an open mind during this topic, and keep in mind the policies for IAEA as a nuclear committee.

If you have any questions or concerns, please don't hesitate to contact me at iaea@vymun.com I look forward to seeing everyone in October.

Sincerely,

Pierre Collet
Director of IAEA | VYMUN 2021

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The Rise of Nuclear Power

Questions to Consider

1. How can we address possible risks that arise from nuclear power?
2. How can we mitigate damages in case of natural disasters and nuclear reactor meltdowns?
3. Can the international community trust rogue nations to generate and hold nuclear power?
4. Can Uranium isotopes that are used for energy production be also used in weapons of mass destruction?
5. Are there certain nations that should not have nuclear power due to the geographical region they are located in (ie. The Ring of Fire)?

Overview

The International Atomic Energy Agency (IAEA) is an intergovernmental organization founded in response to the discovery of nuclear energy. The 35 representatives of IAEA member states meet five times each year to discuss pertinent issues relating to nuclear energy and weapons. According to Article 2 of the IAEA, it aims to enlarge the presence of atomic energy for peaceful purposes rather than warfare. The IAEA currently has over 168 member states.

After the discovery of uranium by Martin Klaproth in 1789 and the proof for nuclear fission by Hahn and Strassmann in 1938, many leading scientists started to research the power of nuclear elements. With a long series of development (see timeline), nuclear power plants were created with the capacity to generate gigawatts of power. For instance, the Kashiwazaki-Kariwa power plant could generate the same amount of energy as 945 tons of coal (7695 MW).

Due to its high efficiency and mitigatory greenhouse gas release, the number of countries using nuclear energy has been rising. In fact, nuclear energy accounts for 11% of the world's energy[1]. Furthermore, a number of countries (the most notable being France, Slovakia, and Ukraine)use nuclear energy as their primary source. “As of today, there are 449 operational nuclear power reactors in 30 countries, with 56 others under construction in 15 countries"[2]

That being said, the waste products of nuclear energy are long lasting and toxic. Despite the existence of many remediation processes, areas that were once used for power plants are often left barren due to incredibly high concentration of radioactive elements. The products of nuclear fission, when in contact with humans, can cause higher risks of skin burn, cardiovascular disease, and cancer.

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[1] Nunez, Christina. “What Is Nuclear Energy and Is It a Viable Resource?” *Environment*, National Geographic, 3 May 2021, https://www.nationalgeographic.com/environment/article/nuclear-energy.

[2] “IAEA Releases Country Nuclear Power Profiles 2017.” *IAEA*, IAEA, 15 Mar. 2018, https://www.iaea.org/newscenter/news/iaea-releases-country-nuclear-power-profiles-2017.

Even when taken care of properly, nuclear waste can still be an issue to surrounding communities due to leaching of heavy metals and the risk of natural disasters breaking containment zones. In addition, in the chance that a natural disaster does occur, even the most advanced reactors such as the one in Fukushima can be decimated causing it to release tons of radioactive elements into the environment. The WHO estimates that the total deathtole due to nuclear power radiation is close to 4000.[3]

Timeline

1789: Martin Klaproth discovered Uranium and named it after Uranus.[4]

1895: Wilhelm Rontgem discovered the concept of Ionising radiation by passing electricity through an evacuated glass tube, producing continuous X-rays[5]

1932: Cockcroft and Walton discovered nuclear fission by colliding protons with atoms.

1938: Hahn and Strassmann provided proof of nuclear fission by showing that the product (Barium) was half the mass of Uranium

1939: Frisch calculated that the energy released from nuclear fission is 200 million electron volts

1939: Heisenberg discovered that the rare isotope Uranium-235 could be used as a weapon due to its explosive potential.

1940: Scientists discovered that nuclear fission can lead to chain reactions (important for the future of nuclear power). Furthermore, Kurchatov led the development of the Committee for the Problem of Uranium.

1940: MAUD Committee discovered that controlled fission of Uranium can produce a lot of energy through heat.

1942: The United States army took over the development, engineering, and collection of Uranium.

1951: The first functional nuclear power plant was created in Idaho, USA, known as the Argonne National Laboratory.

1953: Eisenhower directed research efforts towards Uranium's capability to generate electricity rather than its capacity to kill millions.

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[3] "Sources – How Many People Did Nuclear Energy Kill?" *Sources – How Many People Did Nuclear Energy Kill?*, https://sites.google.com/view/sources-nuclear-death-toll/.

[4] "Javascript Required!" *History of Nuclear Energy - World Nuclear Association*, https://world-nuclear.org/information-library/current-and-future-generation/outline-history-of-nuclear-energy.aspx.

[5] "Javascript Required!" *History of Nuclear Energy - World Nuclear Association*, https://world-nuclear.org/information-library/current-and-future-generation/outline-history-of-nuclear-energy.aspx.

1955: The Bystyr Reaktor (BR) was developed as a fast neutron reactor. Although it didn't directly produce electricity, it allowed for future models to use this technology for more efficient generation.

1960: Westinghouse created the first commercial pressurized water reactor that could be sold to companies.

1983: Br-10 was created with a capability of generating 8 MWt.

1990: Kashiwazaki-Kariwa 6 was developed, creating an incredibly efficient and compact nuclear reactor. This proved nuclear energy to be a viable option

2004: 1600 MWe European pressurized water reactor was built in Finland and in the middle of construction in France. Western world is moving towards nuclear power.

Historical Analysis

Discovery of Nuclear power
Since the discovery of Uranium in 1789 by Klaproth, humanity has been fascinated by nuclear energy and radioactivity. Most of the leading scientists and mathematicians in the 20th century have spent time indulging themselves in the world of nuclear power. That being said, most of the knowledge we know relating to radioactivity was discovered after1939, Heisenbergfound out that Uranium-235 could be used as a weapon due to its explosive potential. From then on, the US government heavily invested in uranium research and development throughout the war. Between 1939 and 1945, the US military took over uranium development, engineering, and collection and spent 23 billions dollars, employing 130,000 people, to develop the first atomic bomb.

After Pearl Harbor, a military strike by the Japanese air force, the US joined the war effort and responded by selecting two sites to drop atomic bombs (Hiroshima and Nagasaki). The bomb dropped on Hiroshima ("Little Boy") had an explosive potential equal to 15,000 tonnes of TNT. It ultimately caused the death of 140,000 individuals. The bomb deployed on Nagasaki ("Fat Man") killed 80,000 individuals. Due to the immense devastation caused by the weapons, the UN took action and created a nuclear energy resolution. Although the resolution's purpose was to ensure that nuclear elements be used for peaceful energy purposes, many countries continued to develop their nuclear energy throughout the cold war. Countries that successfully developed nuclear weapons include: the United States, Russia, France, China, the United Kingdom, Pakistan, India, Israel, and North Korea.

Development of Nuclear Power
The rise of nuclear weapons led to By the 1950s, with the immense amount of research being done, nuclear energy became a viable and profitable energy alternative. During this time, Canada, the United Kingdom, France, and other smaller countries started to use nuclear technology. At first, these power plants would only generate 5-8 MWt.or comparison, modern power plants can now generate upwards of 5,000 MWt.

The IAEA formed in response to rapid nuclear power usage. Politicians and the scientific community acknowledged that nuclear technology held immense power that could not be completely controlled. Many were fearful that unforeseen errors in power plants could lead to unimaginable catastrophes. In 1954, Eisenhower, who launched the Atoms for Peace program, supported the creation of the IAEA with the purpose of ensuring safe usage of nuclear power. Since its establishment, the IAEA has operated separately from the UN and has published several guidelines to promote nuclear safety. Since its inception, the IAEA has been successful at attracting member nations with its total member count at 173. In 1972, the IAEA published its Recommendations for the Physical Protection of Nuclear Material, which was revised and published as an Information Circular of the IAEA as INFCIRC/225 in 1975.[6]

The guidelines, published by the IAEA, serve as a body of information pertinent to nuclear safety. This allows for newer nations that want to explore nuclear energy to easily access information for better nuclear safety. Most of the information offered by the IAEA seeks to analyze historical failures and prevention mechanisms.

Despite the IAEA's creation in the 1950's, there have been several large catastrophes due to nuclear power in recent years: Fukushima Daiichi nuclear disaster (2011), the Chernobyl disaster (1986), the Three Mile Island accident (1979), and the SL-1 accident (1961). Furthermore, several nuclear powered submarines also had incidents: K-19 (1961), K-11 (1965), K-27 (1968), K-140 (1968), K-429 (1970), K-222 (1980), and K-431 (1985).

The most destructive disaster by far was Chernobyl (1986). Chernobyl led to $7 billion in property damages and 4,000 cancer deaths. Chernobyl turned from a peaceful and lively city into a desolate wasteland. The several other disasters listed above have all led to billions of dollars in damages and many deaths.

Past Action

Nuclear Safety

There have been a wide array of actions taken by the international community in response to the proliferation of nuclear weapons. From the inception of the United Nations in 1945, the UN had a goal to ensure that Nagasaki and Hiroshima would not happen again. Even in its first resolution, the UN General Assembly called for nuclear technology to be used solely for peaceful purposes. Despite this, due to high tensions between the USSR and the United States, most countries decided to ignore the United Nations and continue nuclear proliferation.

The first major treaty was the nuclear Non Proliferation Treaty. The Non Proliferation Treaty was created in 1968 and is seen as the most important treaty in controlling nuclear proliferation. "Its three pillars are disarmament, nonproliferation, and peaceful uses of nuclear energy.[7]" Currently, 191 countries are a part of the treaty.India, Israel, Pakistan, and South Sudan have not signed it. If signed to the treaty, countries that own nuclear weapons must slowly disarm and countries that do not have nuclear weapons must not develop them.

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[6] https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1481_web.pdf - IAEA, 3 May 2021

[7] U.S. NRC. "Treaties and Conventions." *U.S. NRC*, https://www.nrc.gov/about-nrc/ip/treaties-conventions.html#npt.

Another action taken, with the same goal in mind was the IAEA safeguards Agreement. The IAEA Safeguards Agreement was created in 1993 and regulates the atomic protocols of 180 countries. In this agreement, the IAEA sends professionals to verify that governments around the world are honouring their obligation to only use nuclear power for peaceful purposes. In addition to the Safeguards Agreement of 1993, additional protocol was implemented later on to expedite such a process of inspection.

Furthermore, The Convention of Nuclear Safety (CNS) is another large treaty that promotes safe usage of nuclear energy. Unlike the others, the "CNS is a legally-binding international treaty under which 80 contracting parties commit to maintain a high level of safety at civilian, land-based nuclear power plants by setting international benchmarks to which the contracting parties subscribe."[8] Afterwards, members of the CNS create a report every three years pertaining to nuclear safety.

In addition to the CNS, the Convention of Early Notification of a Nuclear Accident was created to maintain safe usage of nuclear powers. This convention was created in 1986 following Chernobyl. The Convention of Early Notification of a Nuclear Accident created a system where information from a nuclear accident is shared with all countries that could be affected. Since the convention works closely with the IAEA, the notifications are transmitted from the IAEA to member nations. Countries in the IAEA are obligated, under these conventions, to report any accidents.

Moreover, for waste management, the Joint Convention on the Safety of Radioactive Waste Management was created. This convention forces nations using nuclear power to have " a legislative and regulatory framework for the safety of spent fuel and radioactive waste management and to ensure adequate protection against radiological and other hazards, among other things, by appropriate siting, design, and construction of facilities, as well as during operation and after closure."[9] This convention works similar to the CNS as they meet every 3 years to revise protocol and ensure everything is working correctly.

Lastly, there's the Code of Conduct on the Safety and Security of Radioactive Sources. This code of conduct is implemented by the IAEA and serves as a guideline for safe usage of nuclear powers. In addition to this guideline, the IAEA also created the Supplementary Guidance on the Import and Export of Radioactive Sources. 140 member states of the IAEA have already made legislative actions to comply with the IAEA guidelines. The United States also holds an important role within the IAEA as it cooperates with other member nations to help them maintain radioactive source registries.

Current Situation

Nuclear power has gone up and down throughout the 20th century. During the latter half of the century, many countries and private corporations were investing heavily in reactor development. In the 50s, BR-1 (Byrstry Reaktor) was developed into the BR-5 which had a capacity of generating 5 MWt. This reactor was not necessarily efficient in energy generation but was developed for research purposes. The BR-5 was then upgraded in the 70s to the BR-10 generating 10MWt. During the same timeframe, the Mark 1 reactor (shippingport demonstration PWR reactor) generated 60 MW of energy.

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[8] U.S. NRC. "Treaties and Conventions." *U.S. NRC*, https://www.nrc.gov/about-nrc/ip/treaties-conventions.html#npt.
[9] U.S. NRC. "Treaties and Conventions." *U.S. NRC*, https://www.nrc.gov/about-nrc/ip/treaties-conventions.html#npt.

As various companies and countries around the world witnessed the possibility of energy generation from nuclear sources, they started to invest in it. From Westinghouse's design of the first fully commercial pressurized water reactor generating 250 MW to development of Boiling Water reactor units of more than 1000 MWe, nuclear energy development was rising quickly. However, nuclear power reached its peak in the 1990s from the creation of Kashiwazaki-Kariwa with a capacity of 6795 MW throughout it's 7 reactors.

Unlike many other types of energy, Nuclear power's golden age was a decade ago.
Nuclear energy generation was rising in the late 1990s and hit a vertex of 2,660 terawatt-hours (TWh) in 2006. In 2013, this number was only 2,359 TWh. Furthermore, nuclear power's world percentage fell from 17.6 percent to 10.8 percent. Finally, the number of functioning nuclear reactors fell from 438 to 390.

After a series of unfortunate events in the '80s, including Chernobyl and The Three Mile Island, many countries were skeptical about developing nuclear power. Furthermore, the Kashiwazaki Kariwa plant shut down due to several errors at the plant: a burst tube delayed runs, smoke came out of the machinery, and a lot of the safety data was found to be fabricated/manipulated. Also, more research came out concerning the risks of nuclear energy and possible radiation side effects. This caused the public to be against nuclear power. Finally, countries such as Germany decided to phase out their nuclear power program after Fukushima in 2011.

Although nuclear energy production plateaued since the 1990s due to concern caused by several devastating disasters, the future is bright for nuclear power. From 2013 to 2020, the number of nuclear reactors maintained was around 440. That being said, there are currently 50 reactors under construction and more on the way.

With the rise of attention given to climate change, a new alternative to fossil fuels is necessary. "In 2018, 64% of the world's electricity was generated through the burning of fossil fuels". Carbon dioxide and other greenhouse gasses released through fossil fuels lead to more heat being trapped in the atmosphere causing global warming. Even though it's well known that greenhouse gas levels are positively correlated with global warming, countries are unable to replace fossil fuels as they're the most cost efficient option.

Since nuclear energy is a possible alternative to fossil fuels, some countries are deciding to focus on nuclear power rather than other alternatives (ie: wind, solar). In recent years, many countries developed their own nuclear power programs: Canada, Mexico, USA, Argentina, Brazil, Belgium, Finland, France, Germany, Netherlands, Spain, Sweden, Switzerland, United Kingdom, Armenia, Belarus, Bulgaria, Russia, Czech Republic, Hungary, Romania, Slovakia, Slovenia, Ukraine, Turkey, China, Japan, India, Bangladesh, South Korea, Pakistan, South Africa, Iran, United Arabs Emirates, and more all use nuclear power in some form. Furthermore, there are more than 30 nations that are considering nuclear power.

The status quo is looking bright for nuclear power. With the rise of safety mechanisms and efficacy, nuclear power may be the new future for non-fossil fuel energy.

Nuclear power is still facing several challenges. There is a list of countries that completely oppose the form of energy. including Australia, Austria, Denmark, Greece, Ireland, Italy, Estonia, Latvia,

Liechtenstein, Luxembourg, Malaysia, Malta, New Zealand, Norway, Philippines, Portugal and Serbia.

These countries bring up several notable concerns:

a) Nuclear power has a very high startup cost and takes years to pay back. In fact, most nuclear power plants cost between $6 and $9 billions dollars.
b) Nuclear power plants can take years to build and plan. This means the return on investment is very slow
c) Rogue nations developing nuclear power can use the enriched uranium for experiments increasing the risk of weapon proliferation
d) The mining of radioactive elements can cause miners to develop cancer and other deadly diseases
e) Natural Disasters or Errors in the cooling system can lead radioactive elements leaching to nearby environments causing irreparable damages for years to come. Historically, they have caused billions of dollars in damage and thousands of deaths..

Possible Solutions

There are several possible pathways delegates can choose, depending on their country's stance, when debating the future of nuclear power.

Sharing of technology and economic support for nuclear power proliferation

With the increased demand for energy sources as an alternative for fossil fuels, some nations may want to support nuclear power proliferation. Furthermore, in many cases, nuclear disasters may be caused by lack of safety mechanisms developed. If countries work together and share their knowledge, safer and more efficient nuclear power plants can be developed. The IAEA could establish different alliances which support the sharing of information such as NATO. Through this solution, safer and more efficient nuclear power plants may be developed.

Strong safety regulations for countries seeking to develop nuclear power

Most nuclear incidents occur due to poor planning or forseeable engineering mistakes. For instance, Chernobyl was caused by a flawed reactor design that was inadequately operated. The IAEA could create rules forcing member nations to submit detailed plans and timeline for nuclear power production. In addition, they could create a committee of physicists and engineers to oversee the plans to make sure no design errors are made. Although this would make the process of proliferation slower, it would ensure disasters will not occur.

Banning of Nuclear Proliferation for countries in high risk zones

Geographically, some areas in the world are more prone to natural disasters. For instance, Japan is in a zone called the “Ring of Fire” which is where 90% of earthquakes occur. Earthquakes are common in this area due to the high amounts of tectonic plate interaction surrounding the ring of fire. In these areas, nuclear power plants can be incredibly dangerous as natural disasters can decimate the reactors.

In the case of Fukushima, a tsunami caused 1.25 million tonnes of radioactive water to be released[10]. If high risk zones no longer use nuclear power plants, risks of nuclear disasters fall.

Updating and Improving Previous Legislations
Many guidelines published by the IAEA were created years ago when less knowledge on nuclear power was available. Even according to IAEA reports, "Some caution is needed when using [historical IAEA guidelines], as they might be obsolete or inaccurate". Having guidelines that aren't up to date can cause countries to follow faulty practices that could cause numerous safety risks. Having scientists research previous disasters, prevention mechanisms, and update the guidelines could allow member nations to make better decisions when developing nuclear power. Furthermore, removing unnecessary guidelines could save time and expedite the process of nuclear proliferation.

Maintenance and Checkups of Old Nuclear Power Plants
The IAEA could also set up a committee in charge of regulating current power plants. This committee could perform regular inspections of power plants to make sure the materials/designs aren't faulty. This could be implemented in a similar way to the United Nations Monitoring Verification and Inspection Commission (UNMOVIC) in that the IAEA will force all participating countries to allow UN inspectors to work on nuclear power plant sites. By implementing an inspection committee, errors like Chernobyl can be prevented.

Bloc Positions

Increased Regulations:
Nations that are skeptical of nuclear power generally support increased regulation of nuclear power. Although the regulations implemented can be effective (ie: higher safety regulations and a board that oversees plans), regulations make the process of nuclear energy slower and more expensive. This could deter nations from entering nuclear power causing them to use fossil fuels or other harmful sources instead. Countries in this bloc likely support: Strong safety regulations for countries seeking to develop nuclear power, the banning of Nuclear Proliferation for countries in high risk zones, and the maintenance and checkups of old nuclear power plants. These countries aren't necessarily against nuclear power; however, they would prioritize safety rather than quick proliferation.

Tech Regulation intensive countries:
These are countries that may already use nuclear power within their borders; however, they support heavy regulations when it comes to other countries developing nuclear power. This could also be countries that have faced nuclear disasters in the past and don't want to repeat the same mistake.

Geographical Regulation intensive countries:
These are countries that may find nuclear power safe in certain geographical spaces. For instance, some nations may be against constructing nuclear power plants within the ring of fire or in rogue nations.

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[10] Al Jazeera. "Explainer: The Toxic Water at Japan's Fukushima Nuclear Plant." *Environment News | Al Jazeera*, Al Jazeera, 13 Apr. 2021, https://www.aljazeera.com/news/2021/4/13/explainer-the-toxic-water-at-japans-fukushima-nuclear-plant.

Countries: Australia, Austria, Denmark, Greece, Ireland, Estonia, Latvia, Liechtenstein, Luxembourg, Malaysia, Malta, New Zealand, Norway, Philippines, Portugal and Serbia

Increased Proliferation/Development:
Nations that support nuclear power plant development and strongly believe in its importance likely support fast proliferation. Although these nations want quick development of nuclear power, they're still likely to support regulations (to a lesser extent). Many of the countries fitting under this boat are concerned about climate change and want a solution to rule out fossil fuels. They're likely to still support checkups and inspections done by the IAEA but not harsher rules such as geographical regulations.

Non-Regulatory Nations:
These are member nations that don't want to actively promote proliferation, but they also don't want to create regulations to slow it down. For instance, they might not want to share information about nuclear development with others.

Active Proliferation States:
These are countries that want the IAEA to actively encourage nuclear power. They may advocate for the creation of separate committees to share information and improve nuclear technology. They don't support high amounts of regulation as they want nuclear power to be as advanced as possible.

Countries: Canada, Mexico, USA, Argentina, Brazil, Belgium, Finland, France, Netherlands, Sweden, United Kingdom, Armenia, Belarus, Bulgaria, Russia, Czech Republic, Hungary, Romania, Slovakia, Slovenia, Ukraine, Turkey, China, Japan, India, Bangladesh, South Korea, Pakistan, South Africa, Iran, United Arabs Emirates

Reformist:
Some countries take an alternative approach to combating this issue and focus on metrics. Reformist nations could support a variety of stances more notably the phasing out of nuclear power. Several large European nations have already started to phase-out nuclear power in their own country and they may want to promote that within the IAEA. This follows similar actions to Italy as they recently closed down all functioning nuclear power plants. Because reformism is a relatively small bloc, countries in this bloc may want to team up with the Increased Regulations bloc.

Countries: Italy, Germany

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Safeguards and Verifications around Nuclear Weapons

Questions to Consider:

1. How can we address possible risks coming from nuclear weapons?
2. How can we prevent unstable nations from acquiring nuclear weapons?
3. How can we ensure that nuclear weapons are not used?
4. Can uranium isotopes that are used for energy production be also used in weapons of mass destruction?
5. Could nuclear weapons be used by nations for nefarious purposes?
6. What's your country's stance on nuclear weapons?

Overview:

Ever since the discovery of uranium by Martin Klaproth in 1789 and the proof for nuclear Fission by Hahn and Strassmann in 1938, the world has been fascinated by nuclear elements. In the midst of the war effort, Heisenberg discovered that the rare isotope Uranium-235 could be used as a weapon due to its explosive potential. Because of this discovery, the US military spent billions of dollars to develop nuclear weapons through the manhattan project.

With the nuclear weapon developed, the US decided to use these weapons of mass destruction on Japan as a retaliation to pearl harbor. Countries that witnessed the sheer power of atomic bombs raced to develop nuclear weapons for themselves. From it's first usage in world war 2, the amount of countries that possess nuclear weapons constantly rose: the United States, Russia, France, China, the United Kingdom, Pakistan, India, Israel, and North Korea have all developed them.

There have been several treaties created to regulate the usage, development, and creation of atomic weapons including the UNODA, IAEA, and TPNW. However, as our society advances and nuclear weapons become more and more obtainable, it's inevitable that other rogue nations start discovering this power. Because of this, it's incredibly important that world leaders slow down/intervene in the creation of these deadly weapons. Historically, when atomic bombs were first used, nearly 200,000 people died, with more advanced technology and denser cities, millions could perish in a matter of seconds.

Furthermore, despite the push for non-proliferation from the global community, during the cold war, the United States and Soviet Russia continued to develop their nuclear arsenal. The US and Russia were in a perpetual cycle where they attempted to outdo each other. In the race, over 60,000 warheads were created (each with the capacity to destroy entire cities).

With all that being said, promising steps have been taken towards non-proliferation.

Timeline:

1789 - Martin Klaproth discovered Uranium and named it after Uranus. [11]

1895 - Wilhelm Rontgem discovered Ionising radiation by passing electricity through an evacuated glass tube, producing continuous X-rays.

1932 - Cockcroft and Walton discovered nuclear fission by colliding protons with atoms.

1938 - Hahn and Strassmann proved nuclear fission by showing that the product (barium) was half the mass of Uranium.

1939 - Frisch calculated that the energy released from nuclear fission is 200 million electron volts.

1939 - Heisenberg discovered that the rare isotope Uranium-235 could be used as a weapon due to its explosive potential.

1939 - Roosevelt forms the committee on uranium based on Einstein's insights.

1940 - Scientists discovered that nuclear fission can lead to chain reactions (important for the future of nuclear power). Furthermore, Kurchatov led the development of the Committee for the Problem of Uranium.

1941- Roosevelt approves the development of atomic weapons.

August 1942 - US army took over the development, engineering, and collection of uranium.

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[11] "Javascript Required!" *History of Nuclear Energy - World Nuclear Association*, https://world-nuclear.org/information-library/current-and-future-generation/outline-history-of-nuclear-energy.aspx.

August 1942 - Manhattan's Engineering District (Manhattan Project) was established for atomic bomb production.

December 1942 - First controlled nuclear fission performed at University of Chicago.

April 1945 - Manhattan Project selects four cities for atomic bomb targeting (Kyoto, Hiroshima, Kokura, and Niigata.

August 1945 - Japan rejects Potsdam Declaration (unconditional surrender of Japan), Little Boy is dropped killing 100,000 people.

October 1945 - Oppenheimer refuses to help develop the hydrogen bond.

1957 - International Atomic Energy Agency is formed[12]

1961 - USSR detonated the Tsar bomb, the most powerful nuclear weapon ever.

1967 - US provides Iran with a 5 - Mw reactor with enriched uranium

1968 - Non-proliferation treaty is signable (189 countries have signed it): India, Pakistan, Israel, and North Korea do not sign it.

1990 - US creates the Radiation Exposure Compensation Act for victims of nuclear radiation.

1993 - North Korea rejects IAEA inspections.

2003 - North Korea withdraws from Non proliferation treaty and announces it has nuclear explosives.

Historical Analysis:

Because nuclear technology is quite novel, its history happened over a short period of time. The development of the first atomic bomb was made possible by Hahn and Meitner's discovery of nuclear fission in 1938. Their discovery, that radioactive atoms split to lighter atoms by releasing energy, is the mechanism taken advantage of by nuclear weapons.

After the discovery of fission, many scientists speculated that certain types of radioactive isotopes could be used as a weapon; However, it wasn't until Heisenberg's discovery of Uranium-235 that weapons of mass destruction became attainable. After word of Uranium-235 spread, president Roosevelt created the Advisor Committee on Uranium to determine whether nuclear chain reactions were possible.

After discovering that nuclear fission can cause chain reactions which release enormous amounts of energy, president Roosevelt ordered the development of atomic weapons. The United States military

[12] "Javascript Required!" *History of Nuclear Energy - World Nuclear Association*, https://world-nuclear.org/information-library/current-and-future-generation/outline-history-of-nuclear-energy.aspx.

helped enforce the order by taking over uranium development, engineering, and collection. In August 1942, after collecting a large stockpile of uranium, the government launched the Manhattan Project[13].

The Manhattan Project itself was a feat of organization, leadership, and efficiency. Over the span of its development, 130,000 people were employed, $22 billions dollars were spent, and the Manhattan engineering district was created.[14] The Manhattan project was also backed by Canada and the United Kingdom and allowed for the development of the first atomic bomb.

After the Manhattan Project created the first atomic bomb on July 16th, 1945, it decided to use it in the war effort. The board members of the project decided to target Japan as a means of punishment for the attack on Pearl Harbor. On August 6th and 9th, Hiroshima and Nagasaki were respectively bombed with atomic weapons. The impacts were devastating causing 210,000 deaths, billions of dollars in damages, and lasting effects on the environment. No one was prepared for the deadliness of nuclear weapons.

Following Nagasaki and Hiroshima, the world developed a stance against nuclear weapons. Even in its first resolution, the UN General Assembly called for nuclear technology to be used solely for peaceful purposes. Furthermore, Oppenheimer, the leader of the Manhattan project, refused to participate in creating the hydrogen bond. Unfortunately, after the USSR witnessed the unusually destructive force of nuclear weapons, they began to feel threatened. To level the playing field, Stalin made it his top priority to bring atomic bombs to the Soviet Union. On August 29th, 1949, the USSR successfully completed their first nuclear weapons test. From 1949 to 1991, the USSR and US would be in an constant arms race to develop the most destructive weapons.

Similarly, North Korea also wanted to develop nuclear weapons as it felt threatened by the west. Although the USSR refused to help North Korea develop atomic weapons, they sent scientists to develop the Yongbyon Nuclear Scientific Research Center. With infrastructure that could handle uranium, North Korea started developing facilities to convert uranium isotopes. Afterwards, in the late 90s, Pakistan was accused of giving North Korea Nuclear Technology. Finally, by 2005, North Korea admitted to having nuclear weapons and announced its withdrawal from the Nuclear Non-Proliferation Treaty.

Other countries that have also developed nuclear weapons include the United States, Russia, United Kingdom, France, China, India, Pakistan, and North Korea. The last of these nations to develop nuclear weapons is North Korea which launched their first test in 2006.

United States: tested their first nuclear weapon in 1945 following the Manhattan Project. They are the only nation to use the technology on the battlefield (Hiroshima and Nagasaki)

Russia: tested its first nuclear weapon in 1949. The project was made possible through espionage of American technology. Russia made it its top priority to access nuclear weapons as it felt threatened by the US.

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[13] "From Treasury Vault to the Manhattan Project." *American Scientist*, 3 Feb. 2018, https://www.americanscientist.org/article/from-treasury-vault-to-the-manhattan-project.

[14] "Manhattan Project." *Encyclopædia Britannica*, Encyclopædia Britannica, Inc., https://www.britannica.com/event/Manhattan-Project.

United Kingdom: tested its first nuclear weapon in 1952. They helped supply researchers and funds for the Manhattan Project and had access to a lot of the technology used by the US.

France: France tested its first nuclear weapon in 1960. They developed weapons of mass destruction through their strong nuclear research labs. France spent billions of dollars developing atomic weapons as they felt threatened by the Suez Crisis and Soviet Union.

China: China tested its first weapon in 1964. They were in an incredibly volatile region with possible enemies in the west and east. The bombs were created to deter the USSR and US from invasion.

India: India tested its first nuclear weapon in 1974. Since India never signed the Nuclear Non-Proliferation Treaty (as the government stated it would "create a world of haves and have-nots"), they continued to develop their nuclear program.

Pakistan: Similarly to India, Pakistan never signed the Nuclear Non-Proliferation Treaty. They started their nuclear program in the late 70s and continued until they launched their first test in 1998.

North Korea: North Korea tested its first nuclear weapon in 2006.

Past Action:

Ever since the United States military used atomic weapons on Nagasaki and Hiroshima, the international community has acted strongly against weapons of mass destruction. Ever since its creation, the United Nations aimed to eradicate such weapons.

In the first resolution passed from the general committee, they "established a commission to deal with problems related to the discovery of atomic energy among others. The commission was to make proposals for, inter alia, the control of atomic energy to the extent necessary to ensure its use only for peaceful purposes.[15]" Furthermore, the same commission aimed for "the elimination from national armaments of atomic weapons and of all other major weapons adaptable to mass destruction."

Other treaties have also played a role in nuclear disarmament. The first major treaty was the nuclear Non Proliferation Treaty. "It's three pillars are disarmament, nonproliferation, and peaceful uses of nuclear energy" Currently, 191 countries are a part of the treaty (India, Israel, Pakistan, and South Sudan have not signed it). If signed to the treaty, countries that own nuclear weapons must slowly disarm and countries that do not have nuclear weapons must not develop them.

The Partial Test Ban Treaty was another treaty that went into effect in 1963. This treaty banned all non-underground test detonations of atomic weapons. This treaty was put in place due to rising fears of the increase in nuclear testing. Furthermore, countries acknowledge the magnitude of nuclear waste

[15] "Nuclear Weapons – UNODA." *United Nations*, United Nations, https://www.un.org/disarmament/wmd/nuclear/.

released from atomic weapons. This treaty led to “a substantial decline in the concentration of radioactive particles in the atmosphere”[16]. 136 member nations have already signed the treaty.

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) was the successor of the Partial Test Ban Treaty. Created in 1996, The CTBT seeked to ban all nuclear tests regardless of purposes. As the cold war ended, tensions were decreasing and nuclear disarmament was in effect. The CTBT was signed by 185 member nations.

The Treaty on the Prohibition of Nuclear Weapons has the most extensive prohibitions of nuclear weapons. Its rules include “undertakings not to develop, test, produce, acquire, possess, stockpile, use or threaten to use nuclear weapons.” The TPNW also forces member nations to offer support to individuals affected by nuclear weapons. Furthermore, member nations must also remediate the environmental damages caused by prior nuclear testing. In the UN conference, the TPNW had 122 votes in favor and one vote against it. “In accordance with article 15, it entered into force on 22 January 2021.”[17]
Other smaller treaties include Nuclear Suppliers Group, the Missile Technology Control Regime, the Hague Code of Conduct against Ballistic Missile Proliferation, and the Wassenaar Arrangement.

Current Situation:

Even with numerous nuclear non-proliferation treaties implemented several decades ago, nuclear stockpiles are still large. Globally, there are 13,890 warheads that could be deployed. Although weapons of mass destruction are still largely relevant, global leaders have done a great job limiting proliferation: in 1986, there were over 70,000 active warheads. That being said, there are several nations developing their nuclear weapons program regardless of NPT regulations and pressure from other countries.

While the Nuclear Non Proliferation Treaty was created in 1986, the numbers of countries owning nuclear weapons have increased greatly. Between the NPT and now, India, Pakistan, Israel, and North Korea are thought to have developed nuclear weapons. Furthermore, South Africa, Belarus, Kazakhstan, and Ukraine formerly possessed nuclear weapons but successfully disarmed their program after joining the NPT.

In addition to the NPT, the TPNW (Treaty on the Prohibition of Nuclear Weapons) is incredibly relevant to the Status Quo. Created in 2017, the TPNW’s goal is to eliminate nuclear weapons around the world. Delegates are incentivized to research the TPNW to better understand their countries stance.

With our advancing technology, accessing nuclear technology is becoming easier and easier. Many terrorist organizations are already attempting to acquire nuclear weapons. For instance, Al-Qaeda has

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[16] Greene, Benjamin (2006). *Eisenhower, Science Advice, and the Nuclear Test-Ban Debate, 1945–1963*. Stanford, CA: Stanford University Press.

[17] “Treaty on the Prohibition of Nuclear Weapons – Unoda.” *United Nations*, United Nations, https://www.un.org/disarmament/wmd/nuclear/tpnw/.

attempted to purchase stolen nuclear materials and weapons for over two decades. Having nuclear weapons would help bolster the image of terrorist organizations as legitimate threats. If a terrorist group receives access to nuclear weapons, it would be incredibly difficult to prevent detonation. “As demonstrated by the leakage of illegal drugs into the United States, closing U.S. boundaries to the entry of nuclear weapons is essentially impossible”[18]. A terrorist group accessing nuclear weapons could demand billions in ransome, kill millions of innocent civilians, or deliberately damage world preservation sites.

Equally dangerous, several rogue nations are in the midst of developing their nuclear weapons program. North Korea, for instance, has repeatedly ignored efforts from the international community to stop development of nuclear weapons. In fact, they withdrew from the Nuclear Non-proliferation Treaty in 2003 after refusing IAEA inspections of their nuclear sites. Furthermore North Korea developed ballistic missile technology allowing them to send atomic warheads to the United States. North Korea is incredibly difficult to control as they refuse any inspections of their nuclear weapons and have their borders closed off. North Korea has also made it clear that they have no intention to participate in nuclear disarmament. According to U.S. intelligence, "North Korea will be a Weapons of Mass Destruction threat for the foreseeable future, because [Kim Jong Un] remains strongly committed to the country's nuclear weapons, the country is actively engaged in ballistic missile research and development, and Pyongyang's (chemical and biological) efforts persist"[19]. North Korea has an active incentive to develop nuclear weapons as they’re regularly ostracized due to their mistreatment of citizens. It’s said that their nuclear weapons program serves as a deterrent for other nations, such as the U.S. or Russia, to invade them.

Other nations that are not part of the NPT include India, Israel, and Pakistan. Respectively, they have 150, 90, and 160 nuclear warheads. India was the first nation to actively refuse the NPT with the president stating that the NPT creates nuclear “haves and have nots”. Since India and Pakistan have a longstanding unstable relationship, Pakistan also developed their nuclear program after India’s first nuclear test. Similar to the USSR-US competition, India and Pakistan were competing on nuclear weapon capabilities in the late 90s. Up to date, Pakistan and India have not signed the NPT.

Israel has also not signed the Non-Proliferation Treaty stating that it was “flawed and hypocritical”. Furthermore, Israel is in a conflict heavy area of the world with many enemies surrounding the nation. The country is facing constant attack and threat of extinction and developed nuclear weapons as a means for deterrence. Although Israel has not conducted any tests nor admitted to having developed nuclear weapons, it is believed that they have access to weapons of mass destruction.

Failure of nuclear disarmament is also a relevant issue. Although the NPT was incredibly successful at preventing many first and second tier nations from developing nuclear weapons (ie: Canada, Germany, Japan, South Korea, Egypt, Saudi Arabia), the treaty showed that it had no ability in controlling non-abiding nations. In reality, the NPT’s only power comes from diplomatic actions from

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[18] Panofsky, Wolfgang K. H. “Nuclear Proliferation Risks, New and Old.” *Issues in Science and Technology*, 5 Apr. 2021, https://issues.org/panofsky-nuclear-proliferation-risks/.

[19] Dilanian, Ken, et al. “North Korea Has More Nuclear Weapons than Ever. What Should Biden Do?” *NBCNews.com*, NBCUniversal News Group, 17 Apr. 2021, https://www.nbcnews.com/politics/national-security/north-korea-has-more-nuclear-weapons-ever-what-should-biden-n1263983.

member nations. That being said, many of the nations developing nuclear weapons cannot be severely impacted by the diplomatic actions as they're already ostracized (ie: North Korea). The IAEA has also had a long record of incompetency when it comes to uncovering nuclear weapons programs. Usually, nuclear programs are only discovered after testing occurs: far past the point of no return. "In terms of promoting nuclear disarmament, The NPT cannot claim to be successful. Even after 50 years of its existence, there is a long way to go to achieve the goal set out in Article VI of the treaty."[20]

Possible Solutions:

Diplomatic actions can be an incredibly effective deterrent for nuclear weapon development. This could take effect in a few different ways
Coercive Diplomacy: The international community could punish nations developing nuclear weapons through various means. One direct solution would be to implement sanctions. Sanctions would decrease the resources of the target nation. This would slow down nuclear proliferation as the country would have less money to buy nuclear stockpiles and hire scientists. Unfortunately, many of the rogue nations developing nuclear weapons are already ostracized for other reasons (ie: North Korea and the mistreatment of citizens), sanctions would not be effective in those instances. Another form of coercive diplomacy is to punish nations that are selling nuclear technology. For instance, in the past, Russia helped North Korea build its first nuclear power plant. Larger countries with nuclear capabilities would be deterred from helping rogue countries like North Korea if they were punished for it.
Diplomatic Friendship: Another way to prevent nuclear proliferation is to build connections with non NPT countries. All the countries that are currently developing their nuclear weapons program have one thing in common: they are directly threatened by other nations. For instance Pakistan is in conflict with India, North Korea is in conflict with the world, Israel is in conflict with Palestine and other middle eastern nations. The main incentive behind nuclear proliferation is the deterrence brought by nuclear weapons. If larger nations develop friendships with these at risk countries, they might slowly disarm.

Another solution could be to increase inspections by the IAEA. The IAEA has been notoriously slow when it comes to identifying nuclear powers. In most historical examples, the IAEA only discovered nuclear programs after nuclear testing had already occured. The lack of active inspections has made it very hard for the international community to respond to nuclear proliferation. If the IAEA created a commission that would require yearly inspection of member nations, many would not consider nuclear weapon development as they know they will be caught early on. That being said, some nations may refuse IAEA inspections such as North Korea in 2003. In those instances, intelligence collections could work.

Finally, there could be an increase in Tracking and Security for the shipment of nuclear materials. The IAEA could implement the creation of a database of all nuclear elements mined and all nuclear weapons in existence. This database could be regularly maintained and inspected for irregularities. This solution would make it almost impossible for rogue nations to acquire nuclear weapons as the database would catch if a nuclear weapon is missing or if large amounts of nuclear elements enter a particular nation. This would deter nations from trading nuclear technology as they would be caught

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[20] authors, All, et al. "The NPT at Fifty: Successes and Failures." *Taylor & Francis*, https://www.tandfonline.com/doi/full/10.1080/25751654.2020.1824500.

and face the repercussions from the world. Furthermore, this database could be used to regulate if any terrorist organizations or individuals acquire weapons of mass destruction. In addition, this solution could work with the second solution on increased inspections. With this added database, experts could determine which nations have the ability to develop nuclear weapons based on nuclear stockpiles

Bloc Positions:

Nations that are a part of the NPT are against nuclear proliferation. However, these nations want to support nuclear disarmament to different extents. These countries are definitely against new nations developing nuclear powers, but they don't necessarily want strict regulations forcing requirements on member nations. For instance, some of these nations may be large trading partners with rogue nations that are developing nuclear weapons and may not want to implement sanctions. Within this bloc there might be several separate groups

Nations supporting heavy regulations: These are countries that are completely in favor of non-proliferation at all costs. They would support the creation of the database, inspection committee, and strong diplomatic nations. Nations supporting heavy regulations may also be willing to implement sanctions. The countries under this bloc likely feel threatened by nuclear power and may even have enemies that access this technology. Heavy regulations would make them feel safer.

Nations against heavy regulations: Although within the Non-Proliferation Treaty, some nations may prioritize sovereignty and economic prosperity over non-proliferation. These nations would likely reject coercive diplomatic actions as the rogue nation targeted may be a major trade partner. Even though these nations are against nuclear proliferation, they likely feel indifferent towards the issue with the belief that it doesn't affect them. Nations against heavy regulations may also be strongly against inspections and databases as they believe it goes against their sovereignty. They may be planning on developing nuclear energy or are selling nuclear materials to non NPT nations so they would rather this information be private.

Nations against complete disarmament: Many nations that are a part of the NPT are against proliferation but do not want to ban nuclear weapons. Many nations including (Albania, Australia, Belgium, Bulgaria, Canada, Czech Republic, Denmark, Estonia, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Montenegro, Poland, Portugal, Republic of Korea, Romania, Slovakia, Slovenia, Spain and Turkey)[21] have stated that they don't believe it's the right time to strive for a ban on nuclear weapons. According to their shared explanation "We are concerned that to start a process towards a nuclear weapon prohibition treaty now, without the support of nuclear weapon states and a large number of other countries with specific security interests, would be premature.[22]" These nations may support heavy regulation against countries developing nuclear weapons programs but may want little to no action when it comes to nuclear disarmament.

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[21] "Full Voting Result on UN Resolution L.41." *ICAN Archived Page*, https://www.icanw.org/campaign-news/results/.

[22] Hariharan, Hamsini. "A New Nuclear Treaty?" *Medium*, Indian National Interest, 27 Mar. 2017, https://nationalinterest.in/a-new-nuclear-treaty-d613d0c51f03?gi=2499cf17f6a2.

Another bloc would be nations that refused to sign the NPT. These nations actively support proliferation and are against any regulations or acts for disarmament. This includes the four countries that never signed the Non-Proliferation Treaty: India, Israel, Pakistan, and South Sudan as well as North Korea who withdrew in 2003 after IAEA threatened inspections. These nations require nuclear weapons for self defence and believe it's unfair that the Non-Proliferation Treaty creates haves and have-nots. Although some of these nations are not a part of the IAEA (North Korea and South Sudan), the other nations that are a part of the IAEA would be strongly against database creations and inspections.

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