McKENNA MUN

COMMISSION ON SUSTAINABLE DEVELOPMENT

CLAREMONT MCKENNA COLLEGE
APRIL 20 - 21, 2024

Letter from the Chair

Dear Delegates,

My name is Kit Kumar, and I am excited to be directing McKenna MUN 2024's Commission on Sustainable Development (CSD). I'm a sophomore at Claremont McKenna College studying Government and Economics. I'm also a faculty research assistant for the Keck Center for International and Strategic Studies, studying civilian sentiments on the usage of nuclear weapons. I am the Director of External Affairs for Claremont McKenna's MUN team and a General Assembly Delegate.

My interest in this topic stems from my research into nuclear weapons; while the destructive potential of nuclear power can't possibly be understated, there are significant peacetime uses for atomic energy. With much of the US being plunged below freezing while temperatures in the rest of the world soar, the effects of climate change are immediately significant and tangible. The need for more sustainable and reliable energy sources is self-evident, and it is time to reevaluate global sentiments on implementing nuclear power, specifically its costs and benefits. I hope this committee catalyzes your interest in the issue and your passion for MUN as a whole! Please contact me with at akumar26@cmc.edu with any questions about the committee or MUN procedure!

Kit Kumar

Chair of CSD for McKenna MUN 2024

Overview of the Commission on Sustainable Development

The United Nations Commission on Sustainable Development (CSD) is a body that was established by the UN in 1992 to evaluate the follow-up to the United Nations Conference on Environment and Development (UNCED)[1] and advise policy changes. The CSD has 53 members, a third of whom are elected yearly. The CSD meets annually in New York to advise the Johannesburg Plan of Implementation (JPOI)[2]. The CSD operates in two-year cycles, with each cycle focusing on a thematic cluster that falls under the theme of sustainable development[3].

The CSD is the high-level forum facilitating discussion surrounding more significant sustainable development between governmental bodies and nongovernmental groups within the United Nations system. The commission has a holistic approach to development that considers the economic and environmental vectors of developmental policy changes and the potential social implications of policies[4].

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1 UN Department of Economic and Social Affairs, "CSD :: About the CSD," accessed January 18, 2024, https://www.un.org/esa/dsd/csd/csd_aboucsd.shtml.
2 "Commission on Sustainable Development (CSD) .:. Sustainable Development Knowledge Platform," accessed January 18, 2024, https://sustainabledevelopment.un.org/csd.html.
3 "CSD Multi-Year Programme of Work .:. Sustainable Development Knowledge Platform," accessed January 18, 2024, https://sustainabledevelopment.un.org/index.php?menu=1483.
4 "CSD Multi-Year Programme of Work .:. Sustainable Development Knowledge Platform."

McKenna MUN XI Sensitivity Statement

Claremont McKenna College's McKenna MUN conference is committed to promoting inclusivity, respect, and diversity among its participants. We recognize that participants come from a variety of backgrounds and experiences, and we are dedicated to creating an environment that is welcoming and safe for all. We also strive to ensure that our conference is accessible to everyone regardless of ability, race, ethnicity, gender, sexual orientation, religion, or nationality.

For these reasons, McKenna MUN has a conference-wide zero-tolerance policy for any forms of discrimination or bigotry, including but not limited to homophobia, sexism, racism, and xenophobia. We insist that all delegates adhere to our zero-tolerance policy, even when representing characters whose beliefs would not fall in line with that policy. If you have any questions about how you can represent the policies of your allocated position with integrity while maintaining our conference-wide commitment to inclusivity, please ask your Chair, who will be more than happy to help you navigate that challenge.

When navigating General Assembly, ECOSOC, and Crisis Committees, the following restrictions will be imposed:

1. In light of COVID-19, any attempts to use biological warfare is expressly prohibited. Arc or policies that deny real world events or facts such as COVID-19, genocides, or exoduses are expressly prohibited.

2. Arcs or policies involving the exploitation or oppression of historically marginalized communities, the invocation of ethnic cleansing, or the use of human trafficking are strictly prohibited.
3. Anything else that is deemed inappropriate, insensitive, or offensive by the conference staff will not be a part of proceedings.

We appreciate your cooperation in maintaining a safe and respectful conference environment, and thank you for your commitment to upholding our policies and values. We welcome feedback regarding our efforts to maintain an inclusive environment at McKenna MUN XI at Advisor Feedback sessions.

Rules of Procedure for General Assembly

Scope

The rules of procedure outlined below are offered as a framework for both delegates and conference staff. These rules are not perfect, nor absolute. In the event of confusion or conflict of information in this guide, ultimate discretion is given to the dais for their respective committee.

Plagiarism

McKennaMUN XI has a zero tolerance policy for plagiarism of any kind. This includes plagiarism in position papers, working papers, and draft resolutions. McKennaMUN also has a strict policy against the prewriting of clauses. If it is discovered a delegate has prewritten clauses, they will be disqualified from awards.

Electronics

Electronic devices including laptops, cell phones, and tablets may not be used at any point during the course of committee. All working papers and draft resolutions must be written on paper, and will be typed up by the chairs once all papers and resolutions have been written. Electronics are not permitted during moderated or unmoderated caucuses, and should not be out during committee sessions at any time. Please print any research or notes you may need during committee, and we will provide paper and pens to write the working papers and draft resolutions.

Decorum

Delegates and conference staff must present themselves with respect and decorum throughout the entirety of the conference. This includes appropriate dress, restraint from interrupting other delegates, and interacting in a courteous manner. Conference staff and Secretariat reserve the right to penalize or disqualify delegates who do not adhere to decorous manners.

Working Outside Committee

Delegates in all committees are *not* permitted to work outside committee. The writing of working papers and draft resolutions and meetings to make alliances and cooperate must all be conducted during committee time. This is to ensure that delegates are able to put in the same amount of time into committee, and that all delegates are able to take the time they need to take care for themselves outside of committee.

Sponsors and Signatories

Working papers and directives must be supported by a minimum number of sponsors and signatories to be specified by the dais of each committee in order to be accepted by the dais and introduced in committee.

Points:

- Point of Personal Privilege:

- At any point, delegates may rise to a point of personal privilege to signal to the chair they have a personal concern
- Point of Order:
  - A delegate may rise to a point of order to correct an error in parliamentary procedure during the course of debate. A point of order may not interrupt a speaker unless it pertains to the speaker's right to speak. A point of order is not appealable.
- Point of Parliamentary Inquiry:
  - A point of parliamentary inquiry may be raised at any time the floor is open to points or motions. Delegates may rise to this point to ask a question about parliamentary procedure, and should never interrupt the speaker.

Motions:

- Motion to Open Debate
  - Requires a simple majority
- Motion to Set the Agenda
  - Triggers two speeches in favor and two speeches against, with 30 second speaking time
  - Requires a simple majority

- Motion to Open the General Speakers List
    - Requires a simple majority
    - Has a default speaking time of 30 seconds
- Motion to Enter an Unmoderated Caucus
    - Requires a simple majority
- Motion to Enter a Moderated Caucus
    - Requires a simple majority to pass
    - Motions must specify the total caucus time and the speaking time for each individual speaker
- Motion to Extend a Caucus
    - Requires a simple majority to pass
    - Must contain a specific time for extension, not to exceed ½ of the original length of the caucus
    - Each caucus can be extended a maximum of one time
- Motion to Introduce Working Papers
    - Requires a simple majority
    - This will trigger Author's Panel, per the discretion of the dais
- Motion to Introduce Draft Resolutions/Directives
    - Requires a simple majority
    - This will trigger Author's Panel, per the discretion of the dais (for GA)

- Motion to Enter Voting Bloc
    - Requires a ⅔ vote from committee
- Motion to Divide the Question
    - Requires a ⅔ vote from committee
- Motion to Introduce Amendments
    - Requires a simple majority
    - Prompts the dais to introduce all entertained amendments that have been submitted
    - All friendly amendments are automatically added to the draft resolution/directive in question
    - All unfriendly amendments are debated and then delegates take a substantive vote on the clauses
- Motion to Suspend Debate
    - Requires a simple majority
- Motion to Adjourn Debate
    - Requires a simple majority

Yields During Formal Speeches

- Yield to Comments

- A speaker may designate their remaining time to be used for other delegates of the dais selection to make comments on their speech. Delegates will be allotted the time left in the speech

- Yield to Questions
  - The speaker may designate the time remaining in their speech to be used to answer questions from other delegates as selected by the dais. Question time is not counted in the speaker's time.
- Yield to Another Delegate
  - The speaker may designate the time remaining in their speech to be used by another delegate, as specified by the speaker
- Yield to the Chair
  - Speakers may at any time during their speech choose to yield the remaining time to the chair

Right of Reply

The right of reply allows delegates to respond to a specific statement made against their person via motion, and approved speech. The right of reply is not intended to allow delegates to respond directly to an offensive statement about their country. Rather, it is intended to be used to respond to insults against the delegates themselves. Petitions for right of reply are left entirely to the discretion of the chair.

General Precedence of All Motions

When more than one motion is presented, they are voted on in order from most to least disruptive. That order is:

1. Right of Reply
2. Extensions (longest extension first)
3. Unmoderated Caucus (longest first)
4. Round Robin (longest speaking time first)
5. Moderated Caucus (longest first, then by most number of speakers)

In voting procedure, motions have the following precedence:

1. Reordering of the Draft Resolutions
2. Voting by Acclamation
3. Division of the Question
4. Voting by Roll Call

Flow of Debate

1. Roll Call
    a. At the beginning of every committee session, the dais will take the roll of the delegates
    b. Delegates may respond with “present” or “present in voting”

c. If a delegate indicates they are "present in voting" they may not abstain from any substantive vote

2. Debate is opened
    a. A delegate may motion to open or resume debate once roll call has been taken
    b. This must be passed by a simple majority of the committee
3. The General Speakers' List is Opened
    a. A delegate may motion to open the speakers' list once debate has been opened
    b. The motion must be passed by a simple majority of the committee
    c. The delegate who made the motion is offered the opportunity to be the first speaker on the speakers' list
    d. The speakers' list has a default time of 1 minute, unless otherwise stipulated in the motion that is passed
4. The agenda is set
    a. A delegate may motion to set the agenda to one of the topics listed in the background guide
    b. If there is only one topic in the background and committee materials, the agenda is automatically set to that topic
5. Moderated Caucus
    a. A motion to enter a moderated caucus may be made by any delegate whenever motions are entertained, debate is open, and the committee is not in voting bloc

b. If multiple motions are presented, motions will be voted on by most to least disruptive. This applies to moderated and unmoderated caucuses.
c. A motion for a moderated caucus must be passed by a simple majority
d. The delegate who made the motion is offered the opportunity to speak first or last in the caucus
e. The motion to enter a moderated caucus must specify a total time for the caucus, a maximum speaking time for each speaker, and a specific topic of discussion
f. The total time for the caucus must be divisible by the specified speaking time
g. A motion to extend the moderated caucus may only be made once the caucus has elapsed, have to specify a time for the extension that does not exceed ½ of the original time, and passes by a simple majority

6. Unmoderated caucus
   a. A motion to enter an unmoderated caucus may be made by any delegate whenever motions are entertained, debate is open, and the committee is not in voting bloc
   b. A motion for an unmoderated caucus must pass by a simple majority
   c. The motion to enter an unmoderated caucus must contain a total time for the caucus
   d. A motion to extend the unmoderated caucus may be made once the caucus has elapsed, must specify a time that does not exceed ½ of the original time, and must pass by simple majority

7. Author's Panel

    a. A motion to introduce working papers and draft resolutions may be made by any delegate once all working papers have been accepted by the dais and motions are being entertained

    b. Papers will be presented in the order of submission to the dais unless otherwise specified by the motion that is passed

    c. An Author's Panel for working papers will be left to the discretion of the dais based on the time left in the conference, but Author's Panel on draft resolutions are mandatory

    d. A motion to introduce working papers and draft resolutions must pass by a simple majority

    e. Author's Panel will consist of an allotted amount of sponsors to present their paper and resolution to the committee, followed by an allotted amount of time for committee to ask questions, to which sponsors will answer

    f. The duration of presentations and Q&A sessions are determined by the discretion of the dais

    g. The time delegates take to ask questions will not be counted towards the timing of the Q&A

    h. The number of representatives from each bloc allowed to present and answer questions are determined by the discretion of the dais

8. Voting bloc
    a. A motion to enter voting bloc may be made by any delegate after draft resolutions or directives have been formally accepted by the dais and and motions are being entertained
    b. A motion to enter voting bloc must be pass by a ⅔ majority of committee
    c. In crisis committees, a motion to introduce directives is often combined with a motion to enter the voting bloc. Such a motion should specify the procedure for
    d. the combined introduction and voting bloc, and such a motion constitutes a suspension of the rules which must pass by a ⅔ majority of committee
    e. The default speakers for/against each directive is two for, two against with 30 second speaking time
    f. The delegate who makes the motion to enter voting bloc may specify a non-default order or for/against structure in their motion
    g. No person other than the authorized conference staff may pass notes, talk to other people in the room, enter the room, or leave the room during voting bloc unless directed to do so by a member of the Secretariat
    h. A delegate may motion to leave voting bloc, or the chair may move out of voting bloc at their discretion after all draft resolutions/directives have been voted on
9. Dividing the Question

a. A motion to divide the question may be made at any point during voting bloc before the draft resolution/directive in question has been voted on
b. Divided the question is the process by which one or more clauses of a draft resolution/directive may be voted on separately from the body of the draft resolution/directive
c. The motion first must pass by a ⅔ majority, and is not a substantive vote
d. If the vote passes by a simple majority to divide the question, that clause will be substantively voted on
e. Preambulatory clauses may not be altered by division of the question
f. Multiple motions on specific divisions may be accepted by the dais

10. Amending a draft resolution/directive
    a. At any point when the floor is open after a draft resolution/directive has been introduced and before it has been voted on, a delegate may make a motion to introduce an amendment to the draft resolution/directive
    b. Time permitting, the amendment is then read out by the dais
    c. If the amendment in question has been submitted to and entertained by the dais, a procedural vote on the motion to introduce the amendment takes place
    d. All amendments must garner a sponsor threshold determined by the dais

e. An amendment with the support of all sponsors of the draft is a “friendly” amendment, and all other amendments are considered unfriendly and require a vote of ⅔ to pass

f. For unfriendly amendments, for/against speeches are triggered in which two speakers speak for and against, for a default speaking time of 30 seconds

11. Suspend debate
    a. This motion may only be entertained at the end of a committee session
    b. Passes by a simple majority of committee
12. Adjourn debate
    a. This motion may only be entertained at the end of the conference
    b. Passes by a simple majority of committee

Voting

- Procedural Voting
    - All votes on motions are procedural unless otherwise stated
    - All delegates present must vote on procedural matters
- Substantive Voting
    - Voting on draft resolutions, directives, specific divisions of the question, and amendments is considered substantive

  - All delegates must indicate a yes vote, no vote, or abstention during substantive voting
  - The dais may ask for a re-vote if the total number of votes is less than the total number of delegates present
  - Delegates who indicated they were “present and voting” at the beginning of the session must vote “yes” or “no”
- Voting by Acclamation
  - During a substantive vote with for/against speakers, the floor may be eligible to pass by acclamation
  - In such a case, the dais must remind the committee that if no delegate speaks against the matter, it will automatically pass by acclamation
  - The dais must ask the committee once more, and if no delegate speaks against, it is automatically passed
  - A delegate may motion to pass any matter that calls for a substantive vote by acclamation
- Roll Call Voting
  - Immediately preceding a substantive vote, a delegate may motion for a roll call vote

- If entertained by the dais, a roll call vote will commence in which each delegate's allocation will be called out by the dais and they must either say yes, no, abstain, yes with right, or no with rights
- All those who vote "with rights" indicate they wish to explain why they voted the way they did. The dais determines if they have the right to speak, and for how long

Any questions? Clarifications? Totally confused?

Please route all questions to zkhera58@students.claremontmckenna.edu, and we will get back to you as soon as possible.

Topic A: Creating and Retrofitting Nuclear Infrastructure

History of Nuclear Power

The first significant discovery in the history of nuclear power was that of nuclear fission, discovered by Otto Hahn and Fritz Straßmann in 1938[5]. Nuclear fission is the process by which an atom is split, releasing tremendous energy as one atom decays into smaller, lighter atoms[6]. Artificial nuclear fission occurs when a neutron impacts a 'heavy' atom (typically Uranium), causing it to split into lighter atoms and neutrons[7] – This can cause a chain reaction, where the neutrons produced by the first instance of nuclear fission can impact other atoms, causing them to undergo fission as well.

With the advent of WWII, nuclear fission's potential was considered in the scope of its destructive potential[8]. Germany, Britain, Russia, and, most notably, the United States of America[9] were the four countries that led the charge in militarizing nuclear energy. The United States' infamous Manhattan Project was undertaken in secrecy in 1942, led by American scientist Robert Oppenheimer. By 1945, the United States had crafted a nuclear bomb

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[5] "The Discovery of Nuclear Fission," accessed January 19, 2024, https://www.mpic.de/4469988/die-entdeckung-der-kernspaltung.
[6] "Nuclear Explained - U.S. Energy Information Administration (EIA)," accessed January 19, 2024, https://www.eia.gov/energyexplained/nuclear/.
[7] "Nuclear Explained - U.S. Energy Information Administration (EIA)."
[8] "History of Nuclear Energy - World Nuclear Association," accessed January 19, 2024, https://world-nuclear.org/information-library/current-and-future-generation/outline-history-of-nuclear-energy.aspx.
[9] "History of Nuclear Energy - World Nuclear Association."

(codenamed "The Gadget) and would detonate it during the Trinity Test in the New Mexico desert[10], the first successful test of a nuclear bomb in history.

Three weeks later, the United States dropped atomic bombs on Hiroshima and Nagasaki, the first and only use of nuclear weapons in conflict. The bombs killed an estimated 200,000 people, many of whom were civilians[11]. Both of the bombs dropped were detonated before they hit the ground to cause maximum damage through the production of a devastating pressure wave that would level buildings and vaporize organic matter (though it would limit the amount of radioactive fallout produced by the blast)[12]. Both American and Soviet efforts to develop atomic weaponry led to significant advancements in uranium enrichment, the process used to increase the proportion of the Uranium-235 isotope within a sample[13]. A higher proportion of Uranium-235 within a sample is associated with higher levels of fissile potential and reactivity and, therefore, is important for both nuclear weaponry and nuclear power generation. While both the Soviets and the Americans continued their nuclear arms race, a portion of their attention was directed to peaceful usages of nuclear power. In the 1950s, American and Soviet scientists developed their first nuclear-powered energy generators – in the US, the Experimental Breeder Reactor, EBR-1, and in the Soviet Union, the Atom Mirny (Peaceful Atom), AM-1[14].

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[10] US National Park Service, "Manhattan Project - Manhattan Project National Historical Park (U.S. National Park Service)," accessed January 19, 2024, https://www.nps.gov/mapr/learn/manhattan-project.htm.
[11] Thomas Gaulkin, "Counting the Dead at Hiroshima and Nagasaki," *Bulletin of the Atomic Scientists* (blog), August 4, 2020, https://thebulletin.org/2020/08/counting-the-dead-at-hiroshima-and-nagasaki/.
[12] "The Atomic Bombings of Hiroshima and Nagasaki (U.S. National Park Service)," accessed January 19, 2024, https://www.nps.gov/articles/000/the-atomic-bombings-of-hiroshima-and-nagasaki.htm.
[13] "History of Nuclear Energy - World Nuclear Association."
[14] "History of Nuclear Energy - World Nuclear Association."

In 1957, the International Atomic Energy Agency (IAEA), an independent organization within the UN, was founded. The IAEA was created to oversee and advise on peacetime uses of nuclear energy. In 1968, the UN passed the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), which focuses on the non-proliferation of nuclear weaponry, nuclear disarmament, and the right to use nuclear technology peacefully.

By 1970, 90 nuclear reactors were operating in 15 different countries across the world[15], but the 70s marked a reduction in the enthusiasm for nuclear power. The Ramadan/Yom-Kippur war resulted in oil embargoes on nations that supported Israel during the war, which caused a marked economic slowdown [16], decreasing the energy demand overall but demonstrating the necessity for alternative energy sources.

In March 1979, an accident at Three Mile Island shook the public's faith in nuclear power. The IAEA noted that positive sentiments towards nuclear power had been gradually diminishing due to the association of nuclear energy with destructive potential, as well as the dangers of radiation[17]. This caused a great deal of fear surrounding the potential negative effects of nuclear energy upon the population, leading to a marked reduction in the growth of nuclear energy projects worldwide as media and politicians began to rally around the public's fear of nuclear energy.

However, Three Mile Island was interpreted by scientists as a potentially catastrophic but ultimately harmless and educational moment[18]. The growth of nuclear energy worldwide, while

[15] N L Char and B J Csik, "Nuclear Power Development: History and Outlook," *IAEA BULLETIN*, March 1987.
[16] Char and Csik.
[17] Char and Csik.
[18] Char and Csik.

markedly slower than in the early 1970s, marched on, increasing from 6 new connections of nuclear power plants to the grid in 1970 to 34 in 1985[19]. However, this growth would take a stark dive in light of the events of 1986.

In April 1986, Reactor 4 at the Vladimir Ilyich Lenin Nuclear Power Plant (often called Chernobyl, due to its proximity to the city) underwent a series of human and mechanical failures that caused the RBMK-1000 reactor to explode, launching radioactive material high into the atmosphere. Over 600,000 people received more than significant exposure to radiation as a result of the Chernobyl disaster[20]. While it is difficult to directly attribute the causes of numerous diseases to radiation exposure from Chernobyl, experts have identified marked increases in lethal thyroid cancer amongst children in the fallout zone and acute radiation syndrome mortality, as well as an increase in the incidence of cataracts and a worsening of heart and lung issues amongst those within the contamination zone[21].

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[19] Char and Csik.
[20] The Chernobyl Forum, "Chernobyl's Legacy: Health, Environmental and Socio-Economic Impacts," 2003.
[21] The Chernobyl Forum.

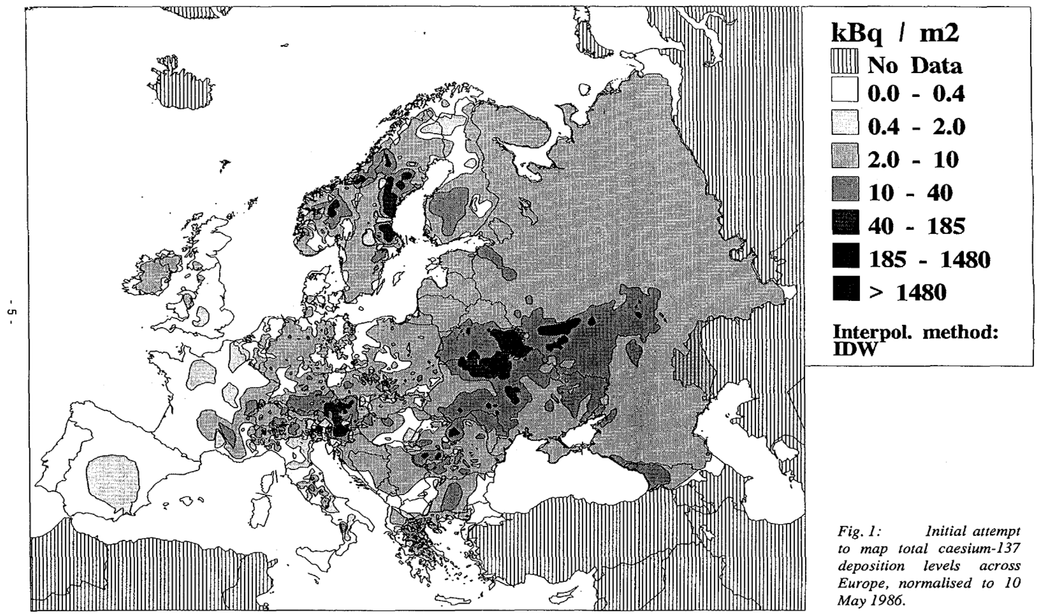

Fig. 1.1: Radioactive fallout map from the Chernobyl Accident

Aside from the adverse health effects as a result of the radioactive fallout, there were numerous other implications as a result of the Chernobyl disaster. Over 5 million people were thought to live in areas contaminated by the disaster, and 336,000 people were relocated by the Soviet government. The collapse of the Soviet Union has made it difficult to measure the long-term fiscal effects of the Chernobyl disaster, but experts estimate it to be in the range of hundreds of billions of dollars in the long term[22].

The Chernobyl disaster had numerous results: the IAEA's sub-group focused on regulating safety, the International Nuclear Safety Advisory Group (INSAG), published innumerable documents analyzing the causes of the Chernobyl accident, the aftermath, and

[22] The Chernobyl Forum.

lessons to be taken from it. INSAG-7 identified numerous reasons that facilitated the disaster at Chernobyl: a lack of safety culture, insufficient training, economic stressors, faulty reactor design, and inadequate information sharing.

While tragic, the world's attention on Chernobyl resulted in numerous advancements to reactor design and safety, as well as much more stringent protocols in how to operate a nuclear reactor safely. Due to these findings, there were no major nuclear accidents until the Fukushima Daiichi disaster in 2011. Though there had been numerous advancements in reactor design, information sharing, and oversight, the Fukushima disaster demonstrated that there was still significant room for growth.

On the morning of March 11, 2011, an earthquake of magnitude 9.0 on the Richter scale occurred off the Eastern coast of Japan. This earthquake disrupted Fukushima Daiichi's connection to the energy grid, causing it to rely on backup generators[23]. While less than ideal, this situation was manageable – however, the subsequent 50-foot-tall tsunami breached the 18-foot-tall tsunami-protection barrier and damaged the nuclear reactor core cooling units and backup energy production generators[24]. This caused core temperatures to rise and necessitated core coolant to be vented, causing potentially irradiated water to enter the environment.

The comprehensive safety measures instituted by Tokyo Electric Power Company (TEPCo), the Japanese government, and the guidance from the IAEA helped limit the harm that resulted from the accident. However, over 50000 people had to be evacuated due to potential

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[23] Internationale Atomenergie-Organisation, ed., *The Fukushima Daiichi Accident*, STI/PUB (Vienna, Austria: International Atomic Energy Agency, 2015).
[24] Internationale Atomenergie-Organisation.

concerns about radioactive contamination and damage from the Tsunami. Additionally, there were 2000 disaster-related deaths, though none of those deaths are attributable directly to nuclear radiation[25].

Though the safety measures recommended by the IAEA were effective in preventing loss of life due to radiation, Fukushima revealed the vulnerability of nuclear power to natural disasters. Following the Fukushima accident, Japan paused operations at 92% of its nuclear power plants[26]. Other countries also took note of the incident; Germany committed to phasing out nuclear power entirely by 2022, and Spain and Switzerland decided not to build new nuclear plants[27].

Modern State of Nuclear Power

The United Nations has identified significant concerns about the energy sector and its emissions, directly affecting the global climate[28]. Given that the power sector is responsible for a significant portion of worldwide emissions[29], the power sector must be overhauled if global society intends to achieve the UN's goal of reaching net zero emissions by the year 2050.

[25] Internationale Atomenergie-Organisation.
[26] "Nuclear Power 10 Years After Fukushima: The Long Road Back," Text (IAEA, March 11, 2021), 10, https://www.iaea.org/newscenter/news/nuclear-power-10-years-after-fukushima-the-long-road-back.
[27] "Nuclear Power 10 Years After Fukushima," 10.
[28] "Climate Change and Nuclear Power 2022," Text (IAEA, August 19, 2020), https://www.iaea.org/topics/nuclear-power-and-climate-change/climate-change-and-nuclear-power-2022.
[29] "Climate Change and Nuclear Power 2022."

Currently, 10% of the global power supply comes from nuclear power[30], a result of the capacity additions that increased nuclear energy productivity by 40%[31].

One important distinction between nuclear power and hydropower (the second and largest sources of renewable energy worldwide, respectively[32]) is that hydroelectric power is far more efficient in strict energy production capacity, but nuclear energy produces heat[33]; one strategy that the UN suggested to curb emissions was by replacing fossil fuels with nuclear energy for nonelectric applications (such as heating, desalination, and hydrogen production)[34].

Mechanism of Energy Production Within a Nuclear Power Plant

A nuclear power plant is similar to many traditional forms of power generation but differs in the mechanism used to generate heat. In a nuclear power plant, fission (rather than combustion) is used to generate heat. Fission is the process of a fissile nucleus (that is, a nucleus of an atom that is atomically unstable enough to undergo fission) being impacted by a neutron, causing the nucleus to split into 'lighter' nuclei. This process produces neutrons and a great deal of energy. The neutrons produced impact other fissile nuclei, creating a chain reaction[35].

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[30] "Nuclear," IEA, accessed January 20, 2024, https://www.iea.org/energy-system/electricity/nuclear-power.
[31] "Nuclear."
[32] "Hydropower," IEA, accessed January 20, 2024, https://www.iea.org/energy-system/renewables/hydroelectricity; "Nuclear."
[33] "Hydropower."
[34] "Climate Change and Nuclear Power 2022."
[35] "What Is Nuclear Energy? The Science of Nuclear Power," Text (IAEA, November 15, 2022), https://www.iaea.org/newscenter/news/what-is-nuclear-energy-the-science-of-nuclear-power.

Somewhat unintuitively, faster neutrons result in a reduction in the rate of fission – if neutrons are moving too fast, they tend to glance off of nuclei instead of imparting their kinetic energy and causing a fission reaction. To increase the rate of reaction, many nuclear power plants utilize ‘enriched’ fuel, that is, a sample of fissile material that contains a higher proportion of U-235 relative to naturally occurring samples.

The difference between a nuclear power plant and a nuclear power plant is the degree of control of the rate of fission reactions: in a nuclear bomb, the rate of fission is uncontrolled or ‘unmoderated’. This creates a thermal runaway chain reaction, where every fission reaction causes a cascade of other fission reactions, culminating in the destructive potential of a nuclear bomb. In comparison, there are multiple features of a nuclear power plant that aim to control the rate of reaction in the core of a nuclear reactor: Most reactors utilize rods consisting of neutron-absorbing materials, such as cadmium, hafnium, or boron, often called ‘control rods’. The degree of insertion and the number of control rods allow nuclear plant operators to fine-tune the degree of reactivity within a nuclear reactor core. By capturing neutrons, the rate of reaction can be controlled. Additionally, water is used as a coolant (to avoid a nuclear meltdown) for the fissile material and as a moderator that slows down the neutrons produced by fission reactions, enabling a higher reactivity within the core.

The energy produced during fission is released as heat. This heat energy is used to boil the coolant water, turning it into steam. In a traditional fission reactor, this steam is channeled through a cool-air turbine, which rotates a shaft connected to a dynamo, creating an alternating current. The steam then enters a cooling tower, where it condenses back into water and can be reused. More advanced nuclear power plants use multiple methods of harnessing steam to generate electricity, as shown in Fig. 1.2 below.

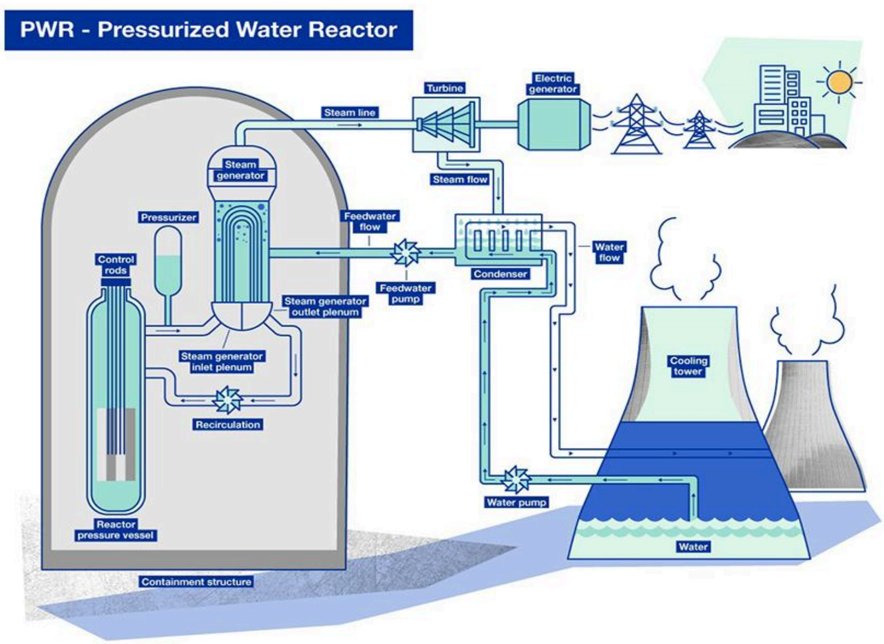

Fig 1.2: A diagram of a dual mechanism nuclear fission powerplant

Arguments For and Against Nuclear Power

The main arguments in favor of nuclear power deal with emissions, efficiency, renewable energy sources, and safety. Major proponents of nuclear energy are scientists, environmentalists, Government employees in the energy sector, and some politicians [36].

[36] “Voices for Nuclear Energy,” Nuclear Energy Institute, accessed January 20, 2024, https://www.nei.org/voices-for-nuclear-energy.

Emissions from nuclear power plants are an aspect championed by backers of nuclear energy: As a result of energy production, nuclear power plants reduce nearly zero negative gaseous emissions compared to traditional carbon-based energy sources of a similar energy output[37]. This includes the harmful greenhouse gasses that trap solar radiation within the Earth's atmosphere, worsening climate change. Aside from carbon emissions, carbon-based fuels (particularly coal) release far more (up to an estimated 10,000% increase) radioactive material into the atmosphere than nuclear-based fuels to produce a comparable amount of energy output[38]. Even contrasted to other forms of renewable energy (such as solar and wind power), nuclear power produces far less hazardous waste from the production and manufacturing of power plants themselves[39].

The efficiency of nuclear power plants also makes a strong case for nuclear being the premier choice of renewable energy. Compared to coal, nuclear power plants require as little as 0.000034% as much fuel to produce an equivalent amount of energy[40]. Other renewable energy formats, such as wind and solar, would require significant land area and are significantly more expensive in terms of upkeep and maintenance than not only traditional fossil fuels but nuclear as well.

Compared to other forms of renewable energy, nuclear power is incredibly energy-dense; a 1000 MegaWatt nuclear power plant requires 12 cubic meters of nuclear fuel per year (which can be further reduced if recycled nuclear fuel is used)[41]. In comparison, wind and solar would

[37] Richard Rhodes and Denis Beller, "THE NEED FOR NUCLEAR POWER," *IAEA BULLETIN*, n.d.
[38] Rhodes and Beller.
[39] Rhodes and Beller.
[40] Rhodes and Beller.
[41] Rhodes and Beller.

require hundreds of thousands of square miles of space, produce significant amounts of noise pollution, and produce an inconsistent supply of energy[42]. Even compared to the preeminent form of renewable energy (hydroelectric power), nuclear energy is far more accessible for countries that may lack the infrastructure and natural resources to harness equivalent energy, to say nothing of the potential implications of damming natural waterways[43].

Safety during normal operations is also a reason why nuclear power is often proposed as a solution to the quest for net zero emissions. Environmental pollution from traditional fuel sources kills far more people per year during the course of normal operations than nuclear power does[44]. Additionally, the level of health and safety precautions in many modern nuclear reactors are significantly more stringent and comprehensive than those found in any other form of electrical power generation[45]. Furthermore, given that no form of electricity generation is ever truly resistant to accidents beyond the intended design or the power plant, it is irrational to single out nuclear power as especially susceptible to these issues.

On the other hand, nuclear power's history has been plagued by numerous issues that are deserving of attention. Public perception of nuclear energy is incredibly poor; disposal of nuclear material has been plagued with numerous issues and is a result of significant harm to the population at large, the infrastructure investment necessary to properly manage nuclear power

[42] Rhodes and Beller.
[43] Rhodes and Beller.
[44] Rhodes and Beller.
[45] Rhodes and Beller.

plants, to say nothing of the high profile accidents involving nuclear power plants that have caused harm on an international scale.

While public support for nuclear power has been increasing in recent years[46], fervent support of nuclear power is restricted to those who are "very well-informed" about nuclear power[47]. Given that 86% of the population sampled stated that they were "not at all informed" about nuclear power[48], it is important to realize that public perception is a significant roadblock to the implementation of nuclear power. Disposal of nuclear material continues to be a problem; nuclear waste from power plants continues to be radioactive.[49] Irradiation has significant long-term effects on the environment and the health of civilians, much of which is difficult (or, in some cases, impossible) to treat[50]. Furthermore, while some waste products of nuclear power plants have relatively short half-lives

of around 30 years, spent fuel cells consisting of plutonium or uranium byproducts can have half-lives in excess of 24,000 years[51]. Furthermore, the most radioactive and harmful of this waste, termed 'high-level waste' is incredibly harmful, being lethal with just a short exposure[52]. This issue is compounded by the fact that many nations that currently use nuclear power lack the

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[46] Gallup Inc, "Americans' Support for Nuclear Energy Highest in a Decade," Gallup.com, April 25, 2023, https://news.gallup.com/poll/474650/americans-support-nuclear-energy-highest-decade.aspx.
[47] "Public Support for Nuclear Stays at Record Highs, but Misconceptions Remain a Problem," accessed January 20, 2024, https://www.ans.org/news/article-5070/public-support-for-nuclear-stays-at-record-highs-but-misconceptions-remain-a-problem/.
[48] "Public Support for Nuclear Stays at Record Highs, but Misconceptions Remain a Problem."
[49] "Backgrounder on Radioactive Waste," NRC Web, accessed January 20, 2024, https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radwaste.html.
[50] OAR US EPA, "Radiation Health Effects," Overviews and Factsheets, November 12, 2014, https://www.epa.gov/radiation/radiation-health-effects.
[51] "Backgrounder on Radioactive Waste."
[52] "Backgrounder on Radioactive Waste."

facilities to adequately handle and store such materials[53] – notably, the United States lacks *any* high-level waste storage facilities[54].

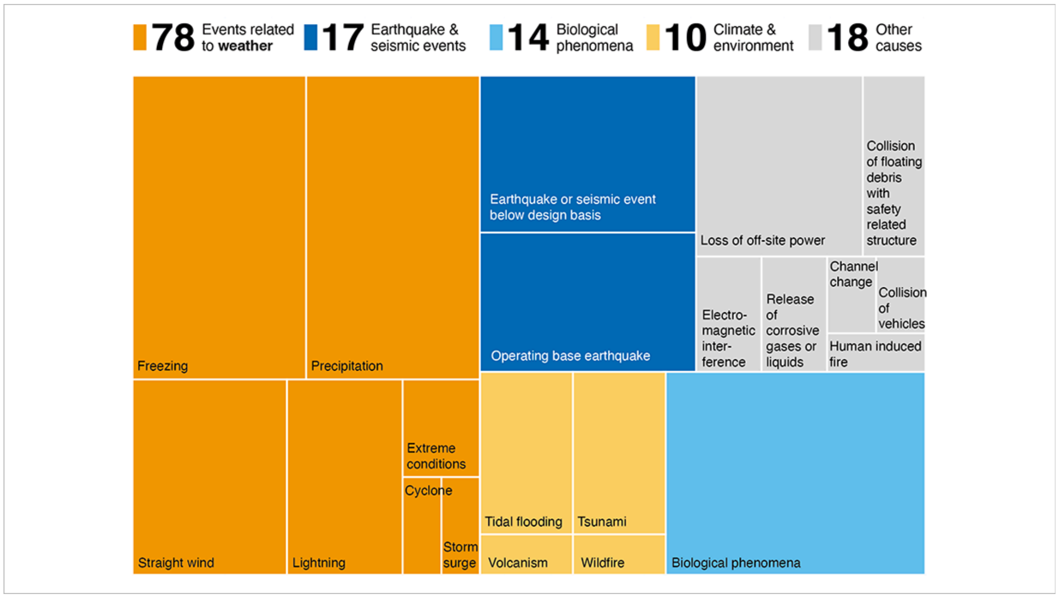

Fig 1.3: the number of natural phenomena that affected nuclear power plants since 2000

While operating costs of nuclear power plants are relatively low, the start-up costs for nuclear power plants mean that they must have a significantly long lifetime in order to reduce the cost of electricity produced[55]. Additionally, the expertise necessary to construct a nuclear power

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[53] U. S. Government Accountability Office, "Nuclear Waste Disposal | U.S. GAO," February 15, 2017, https://www.gao.gov/nuclear-waste-disposal; "Radioactive Waste and Spent Fuel - European Commission," accessed January 20, 2024, https://energy.ec.europa.eu/topics/nuclear-energy/radioactive-waste-and-spent-fuel_en.
[54] "The Nuclear Fuel Cycle - U.S. Energy Information Administration (EIA)," accessed January 20, 2024, https://www.eia.gov/energyexplained/nuclear/the-nuclear-fuel-cycle.php.
[55] John Mecklin, "Why Nuclear Power Plants Cost so Much—and What Can Be Done about It," *Bulletin of the Atomic Scientists* (blog), June 20, 2019, https://thebulletin.org/2019/06/why-nuclear-power-plants-cost-so-much-and-what-can-be-done-about-it/.

plant that is resistant to the number of natural disasters that often plague them (see infographic below) is significant and can pose a prohibitive cost in both hiring experts as well as materials.

Introduction to Delegate Roles

Western Nations: Western nations were some of the first to develop the capacity for nuclear power due to their early research into nuclear fission. As a result, they have a long history of implementing nuclear power for peacetime use. Currently, the state of nuclear power amongst different Western nations is at significantly different levels of development: In the US, about 19% of electricity is provided by nuclear power sources[56], about 15% in the UK[57], in Germany Nuclear Power was phased out completely in 2023[58] (an initiative that began in 2011 in the aftermath of Fukushima), and 70% in France[59]. There are 93 reactors operating in 53 power plants in the United States[60], making it the country with the highest number of nuclear power plants in the world (and, with a 93% utilization capacity, those plants are being used to practically their maximum potential) – it operates as 45% of the total carbon-free energy production methods in the United States.

[56] "U.S. Nuclear Industry - U.S. Energy Information Administration (EIA)," accessed January 20, 2024, https://www.eia.gov/energyexplained/nuclear/us-nuclear-industry.php.
[57] Alan Walker and Chris Matthew, "Nuclear Energy in the UK," January 21, 2024, https://post.parliament.uk/research-briefings/post-pn-0687/.
[58] "Nuclear Power in Germany - World Nuclear Association," accessed January 21, 2024, https://world-nuclear.org/information-library/country-profiles/countries-g-n/germany.aspx.
[59] "Nuclear Power in France | French Nuclear Energy - World Nuclear Association," accessed January 21, 2024, https://world-nuclear.org/information-library/country-profiles/countries-a-f/france.aspx.
[60] "U.S. Nuclear Plants," Nuclear Energy Institute, accessed January 21, 2024, https://www.nei.org/resources/fact-sheets/u-s-nuclear-plants.

Asian Nations: China leads Asia in terms of nuclear power development, but only 5% of its power comes from nuclear power sources[61], Japan with 8% (approximately 30% before the Fukushima Daiichi accident)[62], South Korea with 27%[63], India with only 1.5% (but with ambitious plans to expand that to 9% by 2047)[64], and Pakistan with 9% (a point of note is that all of their reactors are supplied by China)[65]. China and India are relatively independent regarding nuclear infrastructure development, with the vast majority of their reactor designs being homegrown[66].

African Nations: There are only two countries with short-term nuclear power within Africa: Egypt and South Africa. Egypt currently has no active reactors but is building four reactors of Russian origin[67]. 5% of South Africa's power is produced from nuclear sources, but has significant plans to expand it going forward[68].

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[61] Xin-Jian Xiao and Ke-Jun Jiang, "China's Nuclear Power under the Global 1.5 °C Target: Preliminary Feasibility Study and Prospects," *Advances in Climate Change Research* 9, no. 2 (June 2018): 138–43, https://doi.org/10.1016/j.accre.2018.05.002.
[62] "Asia's Nuclear Power Plans - Nuclear Engineering International," accessed January 21, 2024, https://www.neimagazine.com/features/featureasias-nuclear-power-plans-11145067/.
[63] "Asia's Nuclear Power Plans - Nuclear Engineering International."
[64] "Asia's Nuclear Power Plans - Nuclear Engineering International."
[65] "Nuclear Power in Pakistan - World Nuclear Association," accessed January 21, 2024, https://world-nuclear.org/information-library/country-profiles/countries-o-s/pakistan.aspx.
[66] "Asia's Nuclear Power Plans - Nuclear Engineering International."
[67] "Nuclear Energy in Egypt: Egyptian Nuclear Electricity - World Nuclear Association," accessed January 21, 2024, https://world-nuclear.org/information-library/country-profiles/countries-a-f/egypt.aspx.
[68] "Nuclear Power in South Africa | South African Nuclear Energy - World Nuclear Association," accessed January 21, 2024, https://world-nuclear.org/information-library/country-profiles/countries-o-s/south-africa.aspx.

Russia: 19% of Russia's power comes from nuclear sources, and they prolifically export their reactor designs[69], with them, in fact, being a world leader in exporting reactors. While most of their power comes from natural gas, their posture on exporting power designs places them in front of even China's efforts to export infrastructure development through the Belt and Road Initiative [70].

Questions to Consider

- What is your country's current division of power generation sources? As the UN has committed to net-zero power generation by 2050, does it make sense for your country to develop nuclear capabilities?
- As part of the CSD, does nuclear power have significant advantages over other forms of renewable energy? Consider the benefits and detriments of implementing nuclear power, especially compared to more conventional forms of renewable energy (i.e. Hydropower or Geothermal energy)

[69] "Nuclear Power in Russia | Russian Nuclear Energy - World Nuclear Association," accessed January 21, 2024, https://world-nuclear.org/information-library/country-profiles/countries-o-s/russia-nuclear-power.aspx.
[70] "Russia's Nuclear Energy Exports: Status, Prospects and Implications," February 2019, https://www.sipri.org/publications/2019/eu-non-proliferation-and-disarmament-papers/russias-nuclear-energy-exports-status-prospects-and-implications.

- How should the UN perceive the unique danger of nuclear energy as compared to alternative forms of energy production? How can nuclear policy and management curb this danger?
- How should public opinion factor into the UN's decision to promote nuclear energy as a carbon-neutral and efficient form of energy production?

Further Reading

All of the sources cited in the footnotes of this document contain valuable and pertinent information on the issues discussed. I especially recommend seeking information published by the IAEA – The International Atomic Energy Agency is the preeminent authority on atomic energy and nuclear safety. Material published by them is, for the most part, easily accessible. However, their material is fairly dense and inaccessible to those without a thorough understanding of nuclear history – The specific documents listed below are good summaries of nuclear history that are relatively approachable and incredibly informative on the issue of peaceful nuclear power. However, feel free to explore their other publications.

For the sake of brevity and palatability, I especially recommend the following resources:

- "Terrorism and Nuclear Energy: Understanding the Risks."
- "Why Nuclear Power Plants Cost so Much—and What Can Be Done about It."
- "Nuclear Power 10 Years After Fukushima: The Long Road Back."

- “History of Nuclear Energy - World Nuclear Association.”
- “Counting the Dead at Hiroshima and Nagasaki.”
- “Climate Change and Nuclear Power 2022.” Text. IAEA, August 19, 2020.
- “Nuclear Power Development: History and Outlook.” *IAEA BULLETIN*
- “THE NEED FOR NUCLEAR POWER.” *IAEA BULLETIN*
- “INSAG-7 The Chernobyl Accident: Updating of INSAG-1,”

Topic B: Regulating Nuclear Power Sources

History of Nuclear Power Source Regulation, Usage, and Management

Discovery

Ionizing radiation was discovered in 1895 by Wilhelm Conrad Roentgen[71]. He observed that cathode ray tubes produced rays that could pass through opaque objects and create images on photographic plates. This breakthrough laid the foundation for medical radiography and diagnostic imaging. Henri Becquerel discovered radioactivity in 1896 when he observed that uranium salts emitted rays without any external stimulus. This discovery represented the first instance of natural radiation emission[72]. Marie Curie and her husband Pierre Curie furthered this research and isolated the radioactive elements polonium and radium. The Curies' pioneering work earned them the Nobel Prize in Physics (1903) and Chemistry (1911)[73]. Ernest Rutherford identified alpha and beta particles emitted during radioactive decay[74]. Meanwhile, Paul Villard discovered gamma rays, which are electromagnetic waves emitted alongside alpha and beta

[71] "The History of Radiation," Mirion, accessed January 21, 2024, https://www.mirion.com/discover/knowledge-hub/articles/education/the-history-of-radiation?token=NRQkUDjMJB6Rk89624V7feFQUk0hmYOM.
[72] "The History of Radiation."
[73] "The History of Radiation."
[74] "The History of Radiation."

particles[75]. This classification deepened the understanding of the different types of ionizing radiation, as well as their potential applications.

Applications

The first documented case of radiation therapy occurred in 1896 when Emil Grubbe used X-rays to treat breast cancer[76]. Over time, radiation therapy became a crucial component of cancer treatment. As the use of ionizing radiation increased in various fields, concerns arose regarding its potential health hazards. Radiological protection measures and safety standards were developed to minimize exposure to ionizing radiation. Organizations like the International Commission on Radiological Protection (ICRP) were established to set guidelines for radiation safety[77]. As the implementation of nuclear power became more prevalent during the mid-20th century, concerns about nuclear accidents and radioactive waste disposal increased. The Chernobyl nuclear disaster in 1986 and the Fukushima Daiichi nuclear disaster in 2011 highlighted the catastrophic consequences of nuclear accidents. These incidents underscored the importance of strict safety measures and raised public awareness about the risks associated with ionizing radiation[78]. Ionizing radiation continues to be crucial in medical fields, with advancements in computed tomography (CT), positron emission tomography (PET), and

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[75] "The History of Radiation."
[76] "The History of Radiation."
[77] "ICRP," accessed January 21, 2024, https://www.icrp.org/page.asp?id=210.
[78] Dr Ananya Mandal MD, "Radiation Poisoning History," News-Medical, March 14, 2011, https://www.news-medical.net/health/Radiation-Poisoning-History.aspx.

radiation therapy techniques. Ongoing research aims to enhance the efficacy of these technologies while minimizing patient exposure.

Modern Issues Surrounding Nuclear Power Sources

Regulation

The supply of nuclear power sources has been an incredibly contentious issue for its entire history due to the short supply and incredibly damaging potential of fissile material. Though it is impossible to militarize the reactor core of a nuclear power plant due to the nature of safe reactor design[79], the same material that is used to power controlled nuclear materials can also be used for militarization[80], and therefore pose a security risk to other nations.

One of the earliest attempts to provide a multilateral solution to this issue was the creation of the Nuclear Supply Group (NSG); The NSG created official channels for obtaining fissile material whilst also advocating for the nonproliferation of nuclear weapons through greater oversight[81].

Considering the current conflicts involving nuclear-armed states that have not signed the Nuclear Non-Proliferation Treaty (NPT), such as Israel[82] and the Russian Federation[83], difficulties in proper regulation of nuclear power source acquisition and management should be

[79] "Terrorism and Nuclear Energy: Understanding the Risks," Brookings, accessed January 21, 2024, https://www.brookings.edu/articles/terrorism-and-nuclear-energy-understanding-the-risks/.
[80] Both nuclear bombs and power plants utilize U-235 and Pu-239 as power sources
[81] "NSG - Homepage," accessed January 21, 2024, https://www.nuclearsuppliersgroup.org/index.php/en/.
[82] "Israel," *The Nuclear Threat Initiative* (blog), October 20, 2021, https://www.nti.org/countries/israel/.
[83] "Russia Blocks NPT Conference Consensus Over Ukraine | Arms Control Association," accessed January 21, 2024, https://www.armscontrol.org/act/2022-09/news/russia-blocks-npt-conference-consensus-over-ukraine.

centered in discussions on how to overhaul previous institutions dealing with regulation and management of nuclear materials.

Disposal

Issues surrounding the disposal of nuclear material fall into one of two main categories: Industrial waste disposal and orphan source incidents. Industrial waste disposal is not an issue unique to nuclear power, but the high level of threat posed by radioactive material warrants significantly more attention and concern than is currently being provided. For example, the US (the country with the most active nuclear reactors in the world) does not currently have a disposal and waste management for high-level nuclear waste produced from nuclear power plants, instead requiring this waste to be stored at the plants or at designated Department of Energy facilities[84]. Considering the significant environmental harm that can be caused by radiation leaks, as well as the relatively high level of maintenance required to upkeep spent nuclear fuel, as well as the worldwide history of administrative failures and lack of safety culture in nuclear energy production leading to disastrous consequences[85]. A more practical long-term approach than juggling nuclear material between power plants is not only practical and efficient from a management perspective but necessitated to reduce points of failure in an already stressed system.

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[84] "Incident Waste Decision Support Tool (I-WASTE DST)," accessed January 21, 2024, https://iwaste.epa.gov/guidance/radiological-nuclear/high-level-waste.
[85] International Nuclear Safety Advisory Group, "INSAG-7 The Chernobyl Accident: Updating of INSAG-1," Safety Series, no. 75 (1992): 148.

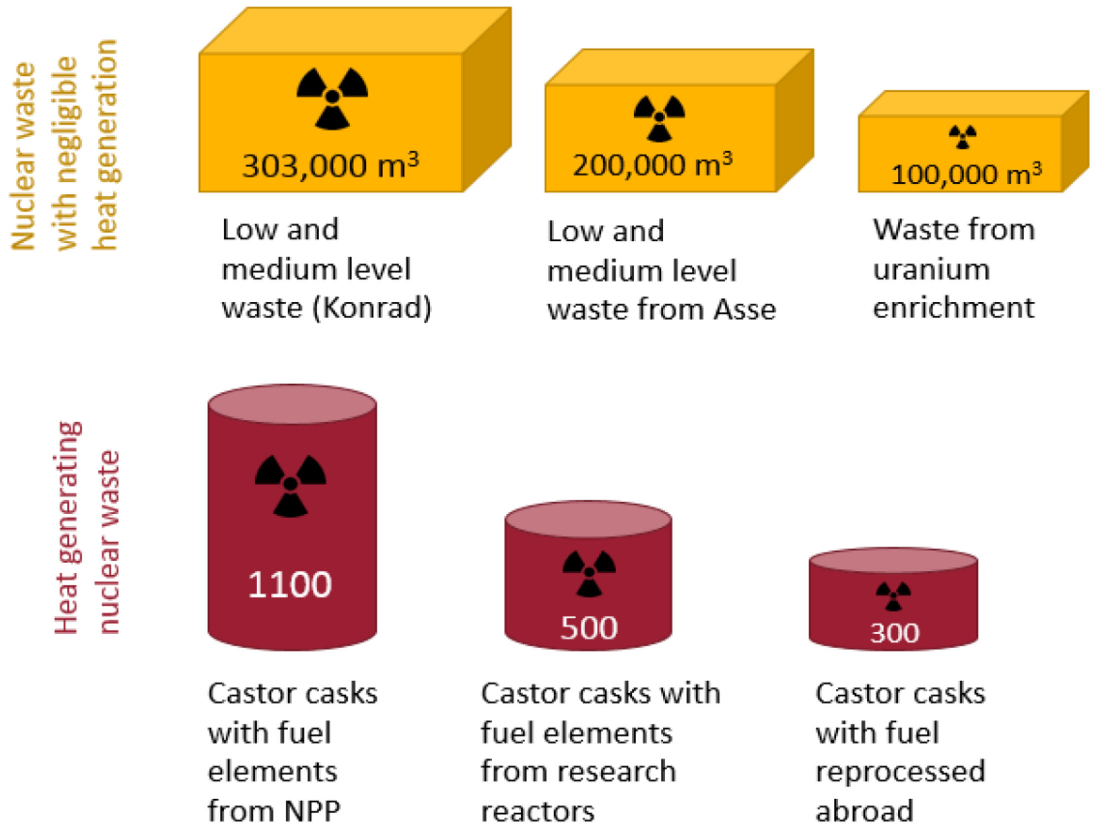

Fig 2.1

An orphan source is a radioactive source that is hazardous enough to require regulatory control and remains unregulated either because it has never been under such control or because it has been abandoned, lost, misplaced, stolen, or transferred without proper authorization[86]. As of 2001, 266 civilians were exposed to radiation as a result of 60 different orphan source incidents,

[86] International Atomic Energy Agency, "Strengthening Control over Radioactive Sources in Authorized Use and Regaining Control over Orphan Sources," IAEA-TECDOC, no. 1388 (2004).

and 39 of those individuals died as a result[87]. Though lower in terms of sheer casualties than the catastrophic failures of nuclear power plants, orphan source incidents represent a failure of government oversight, due diligence, and the ability to regulate nuclear power sources in non-industrial applications. Additionally, it is hypothesized that the incidence of orphan source incidents is significantly underreported due to local law enforcement and government being unable to handle the threats posed by dangerous radiological exposure[88] – unfortunately, orphan source incidents are far more prevalent in countries that lack the governmental controls and expertise to adequately manage and control the disposal of radioactive material (as happened in Goiânia, Brazil). Public scrutiny surrounding orphan source incidents is at an all-time high media coverage[89], meaning that governmental failures to address them adequately could have significant adverse effects in the court of public opinion.

Introduction to Delegate Roles

Western Nations: Western nations have had relatively few orphan source incidents arising from commercial failures; However, there have been numerous incidents surrounding the misplacement and mishandling of nuclear weapons and industrial nuclear material. Of particular

[87] "Backgrounder on Radioactive Waste."
[88] "Addressing Radiological Risks Posed by 'Orphan Sources,'" *The Nuclear Threat Initiative* (blog), June 19, 2017, https://www.nti.org/atomic-pulse/addressing-radiological-risks-posed-orphan-sources/.
[89] See Youtuber Kyle Hill's "Half Life Histories" video series, where videos have received in excess of 10 million views in aggregate

note are the six unaccounted-for nuclear weapons within the United States[90], many of which are a remnant from Operation Chrome Dome and associated programs[91]. It should be noted that the relatively lax handling of nuclear material by the American military, as well as the sheer volume of material being handled directly, led to this incident. Many European countries, as well as Australia, have experienced orphan source accidents as a result of industrial accidents[92]. It is important to know that along with technological development, the industrial and commercial uses of nuclear material have increased[93], leading to a greater number of incidents.

Asian Nations: The former USSR's influence in much of Central and Eastern Asia led to multiple radioactive sources being abandoned after the fall of the Berlin Wall[94]. Due to the lack of previous experience handling nuclear material, these countries often lack protocols for proper disposal and handling of nuclear material. Even countries with ties to Western nations suffer the same issues of small, relatively untraceable nuclear sources being used for industrial applications, the number of which is increasing proportionally with the level of development.

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[90] "Broken Arrows: Nuclear Weapons Accidents | Atomicarchive.Com," accessed January 27, 2024, https://www.atomicarchive.com/almanac/broken-arrows/index.html.
[91] "The Perils of Chrome Dome," Air & Space Forces Magazine, accessed January 27, 2024, https://www.airandspaceforces.com/article/0811dome/.
[92] "Orphan Sources," NRC Web, accessed January 27, 2024, https://www.nrc.gov/materials/miau/miau-reg-initiatives/orphan.html.
[93] "Industrial Applications," Text (IAEA, April 13, 2016), https://www.iaea.org/topics/industrial-applications.
[94] "Uranium Tailings in Central Asia: The Case of the Kyrgyz Republic," *The Nuclear Threat Initiative* (blog), October 15, 2009, https://www.nti.org/analysis/articles/uranium-tailings-kyrgyz-republic/.

Latin American Nations: Governmental oversight is crucial in ensuring proper handling and regulation of nuclear power sources. However, Latin American nations are often dependent on imported nuclear material, meaning that they have a heavily restricted supply chain of fissile material. Additionally, a lack of government oversight has led to a number of orphan source incidents, contamination of residential areas, and improper handling of nuclear material. However, stronger involvement between the IAEA and regional governments has gone a long way towards preventing further incidents.

Former Soviet Nations: Due to the centrally planned structure of the USSR, former Soviet Bloc nations found themselves dealing with nuclear material that they were unable to adequately handle after the rapid and disorganized dissolution of the USSR. This has led to a significant issue of nuclear material smuggling[95], which has concerned many of their neighbors. Additionally, foreign involvement in the region has often served to heighten conflict and lead to a degradation in the supply chain. Additionally, a large amount of the world's supply of fissile material can be found within the Middle East and Central Asia[96], meaning that these nations have the added difficulty of regulating the mining and distribution of fissile material across borders.

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[95] James L. Ford, "Nuclear Smuggling: How Serious a Threat?:" (Fort Belvoir, VA: Defense Technical Information Center, January 1, 1996), https://doi.org/10.21236/ADA385778.

[96] "Where Our Uranium Comes from - U.S. Energy Information Administration (EIA)," accessed January 27, 2024, https://www.eia.gov/energyexplained/nuclear/where-our-uranium-comes-from.php.

African Nations: Africa is rich in fissile material[97], and, with the rapid rate of economic development of many African nations, understanding their entry into the global nuclear trade and handling of fissile material is imperative. Furthermore, collaboration with international agencies to create a robust safety culture with government oversight over the handling of nuclear material is feasible, given that many African Nations' nuclear programs are in their infancy.

Questions To Consider

- What is your country's history with managing nuclear material? What are the major pitfalls of historical approaches, and how have they been rectified through reforms and intervention?
- As part of the CSD, how does your country's stance on nuclear development impact its infrastructure in dealing with nuclear material? Is your country capable and willing to cooperate internationally?
- How should public opinion factor into the UN's decision to promote nuclear energy as a carbon-neutral and efficient form of energy production?

[97] "Uranium in Africa - World Nuclear Association," accessed January 27, 2024, https://world-nuclear.org/information-library/country-profiles/others/uranium-in-africa.aspx.

- How can CSD legislation increase safety and efficiency in domestic matters? In dealing with an issue that intertwines so closely with national security, how much information is your country willing to share? Furthermore, how much reliance on foreign nations is feasible for your country?

Further Reading

Much of the information surrounding the regulation of nuclear power sources is restricted to government officials or engineers with sufficient security clearance. However, I do recommend that you read the following sources specifically, as they provide

- "Backgrounder on Radioactive Waste."
- "Orphan Sources."
- "Radiation Health Effects."
- "Incident Waste Decision Support Tool (I-WASTE DST)."
- "Radioactive Waste and Spent Fuel - European Commission."
- "Strengthening Control over Radioactive Sources in Authorized Use and Regaining Control over Orphan Sources," IAEA-TECDOC, no. 1388 (2004).

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"Commission on Sustainable Development (CSD) .:. Sustainable Development Knowledge Platform." Accessed January 18, 2024. https://sustainabledevelopment.un.org/csd.html.

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Ford, James L. "Nuclear Smuggling: How Serious a Threat?:" Fort Belvoir, VA: Defense Technical Information Center, January 1, 1996. https://doi.org/10.21236/ADA385778.

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IEA. "Nuclear." Accessed January 20, 2024. https://www.iea.org/energy-system/electricity/nuclear-power.

Inc, Gallup. "Americans' Support for Nuclear Energy Highest in a Decade." Gallup.com, April 25, 2023. https://news.gallup.com/poll/474650/americans-support-nuclear-energy-highest-decade.aspx.

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