International Atomic Energy Agency (IAEA)

Chairs:
Madeleine Li
Sophia Li

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Dear Delegates,

Welcome to the 2020 MIT Model United Nations Conference (MITMUNC)! We are excited to have you on our committee, the International Atomic Energy Agency (IAEA). We are Madeleine Li and Sophia Li (no relation), and we will be your chairs for this conference.

Madeleine is a sophomore pursuing a degree in both Mathematics and Political Science. This is her first time involved in Model UN, but has always been passionate about international relations and policy and is excited to chair for the first time. Madeleine is interested in computational approaches to studying political science and public policy, and discussing the merits of her dorm room layout, which she changes approximately once every few weeks.

Sophia is a sophomore pursuing a degree in Mechanical Engineering. This is her second year chairing for MITMUNC, and second year chairing for IAEA! She is excited to be back to this committee as a chair. Sophia is interested in nuclear propulsion systems for spacecraft, ocean documentaries, and taking care of her few plants in college. She looks forward to hearing all the approaches to resolve the topics!

Our topics for this conference are as follows:

- Modifying IAEA Policy and Practice to Prevent NPT Breaches
- Approaching Emerging Nuclear Technology - Small Modular Reactors

We expect that you will use the information presented in this background guide as a starting point for your own research on these issues. Take your time to understand your delegation's position on these topics, since a deeper understanding of these topics will only make the conference more enjoyable for yourself and your fellow delegates. We also expect that each of you will submit a single page position paper to mitmunc-iaea@mit.edu.

Good luck in your research and preparations, and we look forward to hearing your great ideas at the conference!

Sincerely,

Madeleine Li and Sophia Li
MITMUNC 2020 IAEA Chairs

Topic I: Modifying IAEA Policy and Practice to Prevent NPT Breaches

Background

The International Atomic Energy Agency (IAEA) was established in 1957 to facilitate peaceful uses of nuclear technology while ensuring that this technology will not be used for military purposes. The IAEA subsequently outlined a safeguards system in order to fulfill this objective.[1] However, the statute that established the IAEA in 1957 had no method to verify if its safeguards system was being adhered to. Furthermore, that statute had only the United States as the depositary government, and without the backing of the Soviet Union, the only challenger to the United States in terms of nuclear ability, the IAEA's safeguards system was not enforced.[2] Soon after, however, the Treaty on the Non-proliferation of Nuclear Weapons (NPT) entered into force in 1970 with the competing Cold War rivals, the United States and the Soviet Union, as well as the United Kingdom, as depositary governments. Importantly, the NPT included Article III, which called upon non-nuclear-weapon states to accept safeguards and negotiate agreements with the IAEA "for the exclusive purpose of verification of the fulfilment of its obligations… to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices."[3] [4]

Today, the IAEA continues to act as the agency that verifies compliance with its own safeguards system, as well as investigates potential breaches of the NPT. However, the IAEA was established during the Cold War, with the United States and the Soviet Union being the two superpowers that were at odds with one another but both incentivized to prevent other states from gaining nuclear weapons. After the Cold War, it seemed for a while that discussion of potential nuclear weapons programs was moot. In fact, President Obama in his 2009 "Prague Speech"[5] alluded to the idea of a world without nuclear weapons. However, more recent developments in North Korea, India and Pakistan, and the Middle East have reignited discussion about the prevention of the spread of nuclear weapons.

The IAEA is authorized to establish and administer safeguards to ensure the resources and information it provides are not used to further military purposes, as it sees fit. In essence, the NPT is an agreement in which non-nuclear-weapon states that have signed the agreement will receive assistance in using nuclear research and technology for peaceful purposes in exchange for agreeing

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[1] https://www.iaea.org/newscenter/focus/npt/chronology-of-key-events
[2] https://www.iaea.org/about/statute
[3] https://www.un.org/disarmament/wmd/nuclear/npt/text
[4] https://www.un.org/en/conf/npt/2015/pdf/NPT%20CONF2015%2013_E_Activities%20of%20the%20IAEA%20relevant%20to%20art%20III%20of%20the%20NPT.pdf
[5] https://obamawhitehouse.archives.gov/the-press-office/remarks-president-barack-obama-prague-delivered

to not purpose nuclear weapons programs. As a result, however, this means countries that did not sign the NPT do not have to submit to IAEA inspection and verification.

This committee is committed to this objective of preventing peaceful nuclear technology from being used for military purposes. This committee will discuss what changes to the IAEA safeguards system can further this objective, including alterations to inspection policies and practices. This committee will also discuss potential changes to IAEA structure and objectives that can be proposed to promote its commitment to preventing peaceful nuclear technology from being used for military purposes.

Key Terms

Non-Nuclear-Weapon State

A non-nuclear-weapon state is defined to be a state that signed the NPT and was not one of the five states designated as a nuclear-weapon state under the NPT. The NPT defines a nuclear-weapon state as a state that has "manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967,"[6] and includes Russia (formerly the Soviet Union), the United States, China, the United Kingdom, and France. This is an important distinction, as there exist states that did not sign the NPT; most notably India, Pakistan, and Israel. For the purposes of discussion, we will refer to these states that did not sign the NPT as non-NPT states. As an example, North Korea was a non-nuclear-weapon state from 1985 when it signed the NPT to 2003 when it withdrew, and is now considered a non-NPT state as it is no longer a signatory of the NPT. [7]

Nuclear Fuel Cycle

The nuclear fuel cycle is the progression of nuclear fuel from creation to disposal. The stages of the cycle can essentially be broken down into three major parts: the conversion and enrichment of materials to make fuel, the use of fuel in reactors, and the reprocessing of spent fuel.[8] Currently, in order to make a nuclear weapon, a state must either be able to perform all three major parts of the nuclear fuel cycle or be able to find nuclear fuel that has already been processed. While the IAEA does deal with instances of loose nuclear fuel not under the control of any legal state, it is more concerned with controlling who has access to each part of the fuel cycle in its pursuit of preventing breaches of the NPT.

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[6] https://www.un.org/disarmament/wmd/nuclear/npt/text

[7] https://www.ipinst.org/wp-content/uploads/2010/04/pdfs_koreachapt2.pdf

[8] https://www.nrc.gov/materials/fuel-cycle-fac/stages-fuel-cycle.html

Key Issues

Information and Intelligence

The first way in which the IAEA implements its safeguards system is in the collection and evaluation of safeguards-relevant information.[9] However, with no investigative abilities of its own,[10] the IAEA relies primarily on the intelligence agencies of state actors to give the IAEA information in order to trigger investigations into potential breaches. This can result in a significant information gap, as states have their own agendas in terms of intelligence, and thus make it harder for the IAEA to fulfill its objectives in terms of investigating potential NPT breaches.

This committee should discuss potential incentives for both states and other individuals to come forward with information that is relevant to the IAEA. This committee could also discuss the creation of an investigative arm of the IAEA, and how that would fit into its establishing statute and what privileges it would be given.

Inspection Procedures

The IAEA currently uses an annual cycle with four main processes to implement its safeguards. This involves collecting and evaluating relevant information, developing a safeguards approach, planning, conducting, and evaluating safeguards activities and following up on inconsistencies in those activities, and drawing a safeguards conclusion. However, because these investigations happen only on an annual basis, the IAEA almost never conducts special inspections with regards to suspicious states. There is potential for the IAEA to discover NPT breaches months after they happen.

This committee should discuss the merits of this inspection system, including both the policy outlines for inspections and the practices that the IAEA engages in to conduct these investigations. Naturally, this committee should also discuss potential change to these procedures and practices.

Withdrawals from the NPT

Currently, there is little that prevents countries from signing the NPT, gaining peaceful nuclear technology under the direction of the IAEA, and withdrawing from the NPT and using that nuclear knowledge to build their own weapons program. In fact, North Korea used this exact method to gain its nuclear weapons program, having signed the NPT in 1985, received assistance in building a peaceful nuclear energy program, legally withdrew from the treat in 2003, and conducted its first nuclear weapon test in 2006.[11]

With unstable conflict in regions of the world with nuclear tendencies, including the Middle East and South Asia, there is little preventing other countries from following in the footsteps of

[9] https://www.iaea.org/topics/safeguards-explained
[10] https://www.nytimes.com/2004/06/13/magazine/the-netherworld-of-nonproliferation.html
[11] https://www.ipinst.org/wp-content/uploads/2010/04/pdfs_koreachapt2.pdf

North Korea. The IAEA currently attempts to control this risk by limiting states to be able to obtain only one, and at most two, of the three major parts of the fuel cycle, making it harder for non-nuclear-weapon states to be able to follow North Korea's path. This committee should look for more ways to control this risk, including further restrictions on the control of the nuclear fuel cycle, restrictions on the types of technical knowledge that non-nuclear-weapon states have access to, and new incentives models for states to adhere to the NPT and its measures.

Major Parties Involved

International Atomic Energy Agency (IAEA)

The International Atomic Energy Agency is tasked with two primary functions: to facilitate the spread of peaceful uses of nuclear energy, and to ensure that the spread of nuclear technology does not result in the proliferation of nuclear weapons. The IAEA has 171 member states, all of which are involved in the policy-making process. With regards to ensuring that the spread of nuclear technology does not result in the proliferation of nuclear weapons, the IAEA has investigative and reporting duties to the UN General Assembly and the UN Security Council.

Nuclear-Weapon States: United States, Russia, France, United Kingdom, China

The nuclear-weapon states, consisting of the United States, Russia, France, the United Kingdom, and China, practically act as a block with regards to preventing NPT breaches. All five of these states are permanent veto states on the UN Security Council, which is one of the organizations the IAEA is mandated to report to. These five states are the only states legally allowed to own nuclear weapons under the NPT, and to an extent have an incentive to limit the number of other nuclear states, whether legal or illegal, to maintain their status.

However, there also exist sub-blocs within these five countries:

The United States, France, and the United Kingdom are strong allies, with all three countries having close economic ties and incentives with regards to influencing world affairs. All three countries also have similar economic interests in the Middle East, and thus are concerned with the power struggles between Middle Eastern states. In the past, the United States has lead the charge with regard to pursuing these interests, such as negotiating the Iran Nuclear Deal.[12]

Russia also has interests in the Middle East, as well as in East Asia due to its proximity to those two regions.

China is more concerned with developments in East Asia as well as South Asia. China also in the past has been at least complicit in questionable behavior regarding IAEA rules and regulations, such as the exchange of nuclear materials and information between Pakistan and North Korean that happened over Chinese airspace.[13]

[12] https://www.bbc.com/news/world-middle-east-33521655
[13] https://www.nytimes.com/2006/04/16/world/asia/16chron-khan.html

North Korea

North Korea is a state that did not sign the NPT, and is therefore not subject to IAEA inspections and rules, but is known to hold illegal nuclear weapons. North Korea is the example case of using the IAEA's help with peaceful nuclear energy technology to develop its own nuclear weapons program. North Korea also has certain incentives with regards to proximity to South Korea, China, and Japan.

Pakistan and India

Pakistan and India are both states that did not sign the NPT, and are therefore not subject to IAEA inspections and rules. These two states are both known to hold illegal nuclear weapons. However, Pakistan and India are in perpetual conflict, and tensions between the two countries have made them prone to potential nuclear weapons usage.[14] Both countries could be concerned with potential changes to IAEA structure, inspection policies, and investigation practices.

Israel

Israel is the last of the four states that have nuclear weapons and did not sign the NPT. Similarly, Israel is not subject to IAEA inspections and rules, and also holds illegal nuclear weapons. Israel, being a small state located in the Middle East, has a strong incentive to keep watch on changes to the nuclear landscape, with many rivals surrounding with potential nuclear intentions.

Iran

Iran has been involved in many discussions surrounding nuclear policy, including the recent withdrawal from the Iran Nuclear Deal. Similar to Israel, Iran rests in the Middle East, a famously disputed area, and has many incentives regarding the use of nuclear technology.

South Africa

South Africa is the only country to have had nuclear weapons and chosen to disarm themselves after the end of their apartheid regime.

Libya

Libya is a country that had a nuclear weapons program, was discovered to have that program, and subsequently gave it up.

Recommended readings

Objectives of the IAEA Statute
https://www.iaea.org/about/statute#a1-21

[14] https://www.nytimes.com/2019/03/07/opinion/kashmir-india-pakistan-nuclear.html

Article III of the NPT
https://www.un.org/disarmament/wmd/nuclear/npt/text

Nuclear Strategy in the Modern Era - Vipin Narang
https://www.jstor.org/stable/j.ctt6wq00j

- Note: this book breaks down the history and nuclear stances of several important countries, and was written by an MIT political science professor

Topic II: Approaching Emerging Nuclear Technology - Small Modular Reactors (SMRS)

Background

In August 2019, Russia deployed a floating pressurized water reactor that produced 35MW(e). It was designed to supply areas disconnected from the grid.[15] Small modular reactors (SMRs) are defined by the International Atomic Energy Agency as advanced reactors that produce electricity up to 300MW(e) per module. Many of these reactors are designed to be built in factories, shipped to locations as demanded, and are deployable in either single or multi-module plants.[16] The need for SMRs stems largely from the growing demand for energy in the developing world. Small modular reactors, although not completely new technology, is still an emerging and novel technology that has a unique set of concerns and considerations. This committee is invested in encouraging and assisting research, development, and practical use of safe atomic energy technology for peaceful purposes in the world, as well as fostering further use of atomic energy. This committee will approach the novel technology and determine policies and considerations in the context of the emergence and potential increase of SMRs.

Key terms

Small Modular Reactors

Small Modular Reactors (SMR) are nuclear fission reactors that produce electricity up to 300 MW(e) per module. In contrast, the AP-600 light water reactor produces 600 MW(e).[17] SMRs are designed to be built in factories and shipped to utilities for installation. Very Small Modular Reactors (vSMR) or Micro-Modular Reactors (MMR) are types of SMRs, and are defined to generate around 15MW(e).[18] They are designed to be deployed in remote communities. Overall, SMRs are important to meet the growing demand for cleaner energy, and are viewed as an energy source that will bridge current energy technology to future clean energy technology.

Energy Security

The International Energy Agency defines energy security as "the uninterrupted availability of energy sources at an affordable price".[19] Energy security is important to maintaining a stable economy and society, as lack of energy security through either physical lack of energy, or prices that are not

[15] https://www.ft.com/content/2edadf02-b538-11e9-8cb2-799a3a8cf37b
[16] https://www.iaea.org/topics/small-modular-reactors
[17] https://aris.iaea.org/PDF/AP-600.pdf
[18] https://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-power-reactors/small-nuclear-power-reactors.aspx
[19] https://www.iea.org/topics/energysecurity/whatisenergysecurity/

competitive or volatile are linked to negative impacts. Ensuring access to affordable, reliable, sustainable, and modern energy is part of the United Nations' Sustainable Development Goals (SDGs), and therefore is a goal of this committee as well.

Key issues

Regulation and Safety

Currently, SMRs follow safety and regulation standards as full sized nuclear reactors. However, with a decreased size and energy output, as well as different deployment methods and safety concerns, SMRs are unique enough that the regulations and infrastructure surrounding them should be adjusted to reflect an emerging nuclear technology. Additionally, since SMRs have lower capital in the Western world, SMR development is led by private investment and small companies, shifting away from government led and funded research and development. The shift in who owns the technology also warrants a discussion of adjusting the status quo.

The IAEA is responsible for establishing basic requirements for legal, governmental, and regulatory infrastructure for nuclear power. When new technology for nuclear energy emerges, the IAEA looks toward the Safety Standards[20] that Member States are expected to follow; individual governments of the Member States should review their current policies with guidance from this committee. Additionally, the IAEA has the responsibility of regulating the distribution of SMRs within its Member States. This committee should outline any additions or changes to the current requirements, guidelines, and standards to accommodate SMRs, keeping in mind that it is new technology.

International Cooperation

The IAEA is committed to assist in research and development of atomic energy and transferring nuclear technology to Member States. Through the Technical Cooperation Program[21], the Agency helps the sharing of knowledge to help meet Member State energy needs. SMR technology, emerging to address the rising demand of energy, can benefit others through the sharing of the technology, and SMR technology can benefit and improve from the sharing of knowledge.

A trait of SMRs are that they can be built in factories and shipped to where they may be demanded. Although the transportation of nuclear fuel is not new[22], and is often done to support countries with nuclear power but no ability to produce the fuel, the transportation of a whole nuclear reactor is a new cooperative challenge that needs to be addressed.

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[20] https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1273_web.pdf
[21] https://www.iaea.org/services/technical-cooperation-programme/about
[22] https://www.world-nuclear.org/information-library/nuclear-fuel-cycle/transport-of-nuclear-materials/transport-of-radioactive-materials.aspx

Energy Security and Climate Change

SMRs were developed to address the need for low cost clean energy. Due to the high capital costs of traditional nuclear power plants, there is a move to develop smaller units, with the capacity to scale up by having more modules. Smaller units are seen as more manageable investments, especially for remote locations. SMRs also have value in the ability to move onto brownfield sites, or property whose use may be complicated by the presence of hazardous substances, and provide energy readily. For instance, retired coal fire plant sites are brownfield sites, and SMRs could be put on the land that otherwise would be very costly to clean.[23] Having more SMR sites could potentially decrease the cost of energy, and would supply communities with continuous energy. Regarding climate change, nuclear power is one of the lowests emitters of greenhouse gases, and makes a significant contribution to reducing greenhouse gases.[24] This committee should look toward taking advantage of the versatility of SMRs and explore options that will provide energy security to all people as well as combat climate change.

Major Parties Involved

International Atomic Energy Agency (IAEA)

The IAEA was created in 1957 to respond to the fear and expectations stemming from the discoveries and development of nuclear technology.[25] The objective of the Agency is to "accelerate and enlarge the contribution of atomic energy to peace, health, and prosperity throughout the world". Among its many functions, the IAEA encourages and assists research and development of atomic energy, fosters the exchange of scientific and technical information on peaceful uses of atomic energy, encourages the exchange of scientists and experts, and establishes and administers safeguards.[26] All 171 Member States are involved in decision and policy making.

Organisation for Economic Co-operation and Development - Nuclear Energy Agency (OECD-NEA)

The OECD is a forum where 35 governments work together to address economic, social, and environmental challenges of globalisation. The NEA comprises of 31 countries to assist its membership to maintain and further develop nuclear energy with international cooperation, and to provide authoritative assessments to understand key issues to help develop broader policies and give input to government decisions.[27] The OECD is an observer of the United Nations, and has

[23] https://energynews.us/2016/07/13/midwest/nuclear-advocates-eye-former-coal-plant-sites-for-small-reactors/
[24] https://www.iaea.org/topics/nuclear-power-and-climate-change
[25] https://www.iaea.org/about/overview/history
[26] https://www.iaea.org/about/statute
[27] https://www.oecd-nea.org/ndd/pubs/2016/7213-smrs.pdf

endorsed and collaborates on SDGs.[28] The NEA works closely with the IAEA and the European Commission. The NEA comprises of Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Poland, Portugal, Korea, Russia, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

In the 2018 publication *Deployment Indicators for Small Modular Reactors* by the IAEA[29], the following ten countries were pointed out to have SMR designs under development:

Argentina

Argentina is constructing the CAREM-25 SMR, a 32 MW(e) pressurised water reactor (PWR). It is under the responsibility of the National Atomic Energy Commission (Comisión Nacional de la Energía Atómica — CNEA). CAREM-25 is the first nuclear power plant project fully designed and constructed by Argentina.[30]

China

ACP100 is an SMR developed by the China National Nuclear Corporation (CNNC) and passed the general reactor design review by the IAEA in 2016. It was the first SMR to pass this review. The PWR unit will generate 125 MW(e). Construction started in July 2019 and is expected to take 65 months. [31]

France

In September 2019, the French Alternative Energies and Atomic Energy Commission (CEA), EDF, Naval Group and TechnicAtome announced the Nuward, an SMR with a capacity of 300-400 MW(e). The CEA and EDF have started discussions with Westinghouse of the USA to explore potential cooperation.[32]

India

16 of India's Pressurized Heavy Water reactors (PHWRS) meet the SMR definition with approximately 220 MW(e) capacity.[33]

[28] http://www.oecd.org/global-relations/Active-with-UN.pdf
[29] https://www-pub.iaea.org/MTCD/Publications/PDF/TE-1854web.pdf
[30] https://cnpp.iaea.org/countryprofiles/Argentina/Argentina.htm
[31] https://cnpp.iaea.org/countryprofiles/China/China.htm
[32] http://world-nuclear-news.org/Articles/French-developed-SMR-design-unveiled
[33] https://wiseinternational.org/nuclear-monitor/872-873/small-modular-reactors-introduction-and-obituary

Italy

Italy is the only G8 country without its own nuclear power plants.[34] Hydromine and the Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile (ENEA) jointly proposed lead-cooled fast reactor-transportable long lived-5, 10, 20 MW(e) (LFR-TL-X) vSMR.[35]

Japan

Japan has 5 concepts for SMRs, with GTHTR300 in experimental phase. The Japan Atomic Energy Agency (JAEA) is developing it for commercialization in the 2030s. The IMR is an integral PWR design proposed by Mitsubishi Heavy Industries and in cooperation with the Japan Atomic Power Company (JAPC).[36]

Republic of Korea

South Korea SMR technology System-integrated Modular Advanced Reactor Technology (SMART) has been developed for 22 years. It is an integral PWR able to generate 100 MW(e), and in September 2019, Saudi Arabia and South Korea have agreed to work together to refine the reactor, license it for use in Saudi Arabia, and build a prototype.[37]

Russian Federation

In August 2019, the floating reactor KLT-40S, which generates 35 MW(e), launched. Russia has 5 other SMR designs. The Russian Federation has the most proposals for SMRs.

South Africa

South Africa is conducting research to determine whether high temperature gas cooled reactor technology, based on the Pebble Bed Modular Reactor (PBMR) technology, could be included in the energy supply system. The HTMR-100 reactor produces 35 MW(e), and is being developed by Steenkampskraal Thorium Limited (STL) .[38]

United Kingdoms

The United Kingdom Government has undertaken several initiatives to explore small modular reactors. The Nuclear Sector Deal was established in 2017, driving competitiveness in the nuclear sector, and setting a new framework to support the development and deployment of SMRs.[39] Rolls-Royce has submitted a detailed design to the government for a 220 MWe SMR unit, but the details are not public.

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[34] https://cnpp.iaea.org/countryprofiles/Italy/Italy.htm
[35] https://aris.iaea.org/Publications/SMR-Book_2018.pdf
[36] https://www.sciencedirect.com/science/article/pii/B9780857098511500194#bb0020
[37] http://www.globalconstructionreview.com/news/south-korea-signs-deal-develop-small-modular-react/
[38] http://www.nuclearafrica.co.za/companySTL.htm
[39] https://cnpp.iaea.org/countryprofiles/UnitedKingdom/UnitedKingdom.htm#Footnote10

United States of America

The Office of Advanced Reactor Technologies in the Department of Energy (DOE) promotes next generation nuclear energy technologies, with focus on SMR technology.[40] Nuscale Power's integral PWR Nuscale is in near term deployment, and foresees the first SMR to go into operation in 2026.[41] Nuscale has also partnered with other countries to help them access SMR technology. A USA based company USNC submitted the first SMR licence application to Canada in response to the Canadian Nuclear Laboratories (CNL) invitation to propose SMR projects.[42]

Recommended readings

Advances in Small Modular Reactor Technology Developments
https://aris.iaea.org/Publications/SMR-Book_2018.pdf

Small Modular Reactors: Nuclear Energy Market Potential for Near-term Deployment
https://www.oecd-nea.org/ndd/pubs/2016/7213-smrs.pdf

[40] https://www.energy.gov/ne/nuclear-reactor-technologies/advanced-reactor-technologies
[41] https://www.nuscalepower.com/technology/licensing
[42] http://world-nuclear-news.org/Articles/First-Canadian-SMR-licence-application-submitted