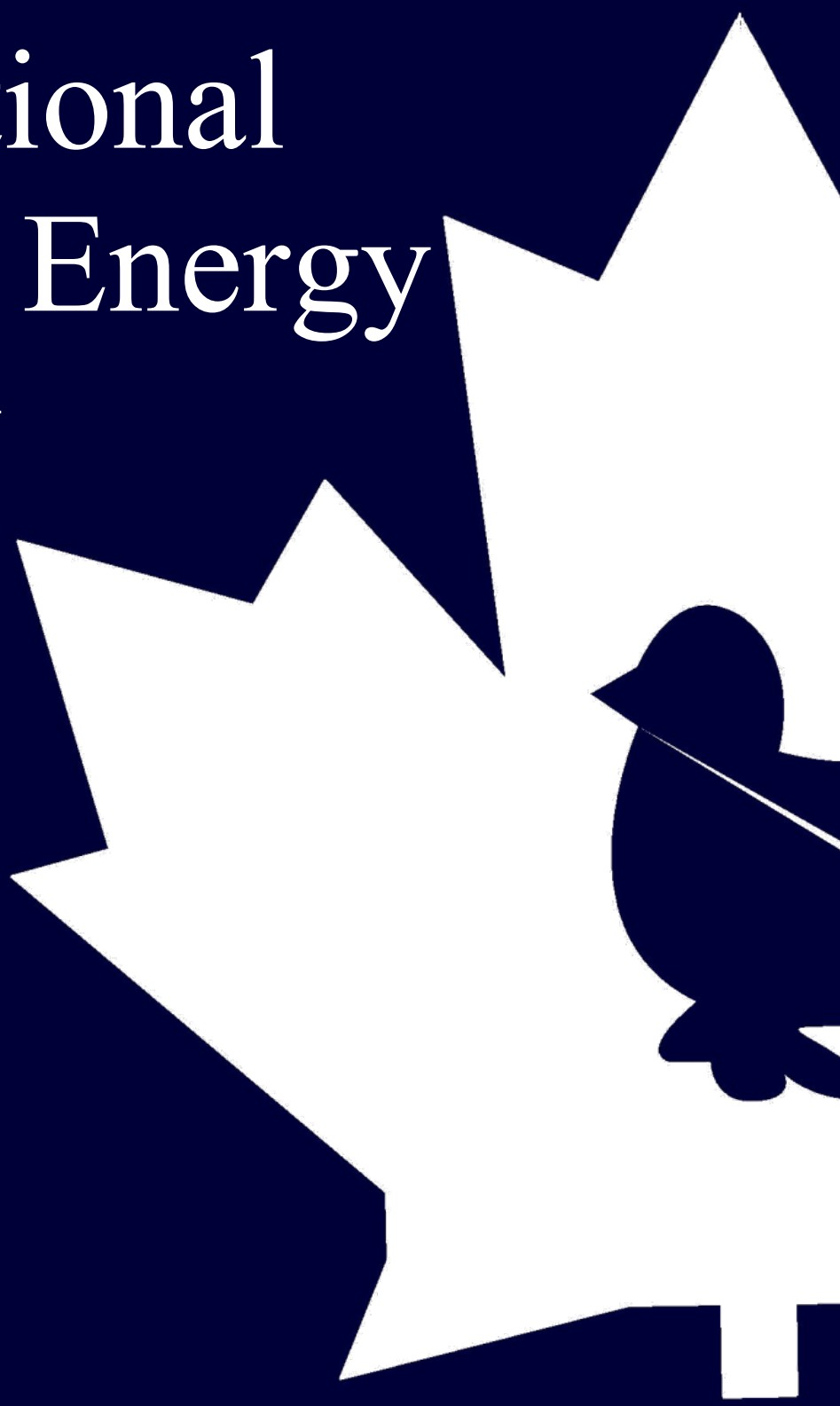


International Atomic Energy Agency

Chair:
Ginny Tan

Vice Chairs:
Will Cleveland
Saad Shahid
Michelle Jiyun Ha





International Atomic Energy Agency

Dear delegates,

Welcome to the International Atomic Energy Agency (IAEA). My name is Ginny Tan, and I am pleased to serve as your Chair for SSUNS 2016. Born in the United States but raised in Panama, I am currently a fourth year student at McGill University pursuing a degree in economics and international development with a minor in marketing. I started doing Model UN during my freshman year in high school and I have loved it ever since. I currently serve as the Secretary-General on the Secretariat of our university-level conference, McMUN, and compete with McGill's Model UN team. Joining me as your vice-chairs are Will Cleveland, Saad Shahid, and Michelle Ha.

William Cleveland, is one of the vice-chairs for this years' IAEA committee. Born and raised in a small town in New Jersey, Will is in his fourth and final year at McGill. He studies International Development and Political Science with a minor in Molecular Biology. Will has been passionately involved in McGill's Model UN program for the past two years and is looking forward to a productive, informative, and interesting debate on the merits and intricacies of the IAEA and the potential of nuclear power.

Joining Will is Saad Shahid. He is currently majoring in economics and mathematics going into his second year at McGill. He has participated in Model UN conferences ever since his junior year at high school and have gone on to represent both his former school and McGill as part of the traveling delegations team. He looks forward to meeting you all and listening to your well researched opinions come November.

Last but not least is Michelle Ha and she is delighted to serve one of the vice-chairs of the 2016 IAEA committee. Born and raised in South Korea, Michelle is currently in her third year at McGill University pursuing studies in International Development and minors in Politics, Law, and Society. Michelle has participated in McGill's Model UN program since her freshman year and has become much more passionate about Model UN since. She is thrilled to meet you all and anticipate an engaging, innovative, and fun IAEA session.

This committee aims to tackle the challenges that have long been affecting the future of nuclear energy. The topics that the committee will be addressing are: addressing threat of nuclear terrorism, nuclear energy as an alternate source of energy, and measures to implement and enforce the nuclear program in Iran. As a member of the IAEA, you are expected to come up with comprehensive and sustainable solutions that take into consideration political, economic, and social objectives and are in line with your country's policies and interests. Happy researching!



Best regards,

Ginny Tan



Introduction

Founded on July 29, 1957, as an autonomous organization, the International Atomic Energy Agency (IAEA), also recognized as the world's "Atoms for Peace", is an international organization reporting to the United Nations with the purpose of promoting and accelerating the contribution atomic energy makes to peace, health, and prosperity throughout the world and serve as a global platform for collaboration. Headquartered in Vienna, the IAEA has a total of 168 member states and counts the support and contribution of multiple partners and stakeholders. The current Director General of the organization is Mr. Yukiya Amano.¹

The IAEA was originally created in response to the great fears and expectations incited by the role that nuclear energy played in political events in the 1950s. Such fears and expectations have changed and evolved overtime and so has the role of the organization.² In this day and age, IAEA's activities can be broadly classified into three main pillars: "science and technology, safety and security, and safeguards and verification."³ As part of their mandate, the IAEA has the authority to establish safety standards and safeguards, encourage the exchange of technical information amongst member states, perform the role of an intermediary for material transactions, and foster the

¹ "About Us", IAEA, Accessed on May 20, 2016, <https://www.iaea.org/about/>

² David Fischer, introduction to *History of the International Atomic Energy Agency: The First Forty Year, 1*

³ "International Atomic Energy Agency", United Nations System Chief Executives Board for Coordination, <http://www.unsceb.org/content/iaea> (May 20, 2016)



research and peaceful development of nuclear energy.⁴ The IAEA reports on an annual basis to the United Nations General Assembly and to the United Nations Security Council whenever pertinent.⁵

The agency is also in charge of making sure that the treaties drafted by the international community in relation to the usage and safety of nuclear energy are respected and implemented. These treaties include: The Nuclear Non-Proliferation Treaty (NPT), the Treaty of Tlatelolco (the Latin American Nuclear Weapon Free Zone), the Treaty of Pelindaba (the African Nuclear Weapon Free Zone), the Treaty of Bangkok (the ASEAN Nuclear Weapon Free Zone), the Treaty of Rarotonga (the South Pacific Nuclear Free Zone) and the Central Asian Nuclear-Weapon Free Zone (CANWFZ) Treaty. It is important to note that as an inter-governmental agency, the IAEA does not act as a regulatory body. The organization only has the authority to make recommendations.⁶

Over the years, through scientific research and experimentation, the usage of nuclear energy has evolved and has become incredibly multifaceted. Initially developed to produce a weapon of mass destruction, nuclear energy has progressed to become not only a source of energy that power countries but also a tool that is utilized in human health and nutrition, food security and agriculture, and other uses. Due to its tumultuous history, the world's stance on the usage of nuclear energy is markedly polarized. With recent nuclear

⁴ Ibid

⁵ “International Atomic Energy Agency”, Nuclear Threat Initiative, <http://www.nti.org/learn/treaties-and-regimes/international-atomic-energy-agency/> (May 20, 2016)

⁶ “International Atomic Energy Agency”, United Nations System Chief Executives Board for Coordination, Accessed on May 30, 2016, <http://www.unsceb.org/content/iaea>



disasters such as the incident at Fukushima Daichii and constant nuclear threats made by the Democratic Republic of Korea and terrorist organizations, the world's view on nuclear energy continues to fluctuate. The topics that will be discussed in this committee touches upon three legitimate concerns that the international community has in relation to the usage of nuclear energy: the threat of nuclear terrorism, nuclear energy as an alternate source of energy, and the nuclear program in Iran.



Topic 1: Addressing the Threat of Nuclear Terrorism

Background Information

The threat of nuclear terrorism has continuously evolved since nuclear weapons were first produced in the Manhattan Project in 1945. From the threat of nuclear war during the Cold War to the proliferation of nuclear warheads to non-state actors, the UN along with other international entities have worked to ensure that nuclear weapons are only used as a deterrent – that is, not used at all. They have since enacted countless treaties to make sure the breakout of nuclear war is prevented. While terrorism has replaced conventional warfare as the biggest security threat faced by many nations, it has been seen as an issue in which the world community seems to work in unison. Most countries around the world recognize organizations such as ISIS or Al-Qaeda as terrorist groups and so the war against terrorism - while controversial in the manner of which it has been fought - is generally supported by a concerted effort by all nations, making nuclear terrorism less of a threat in the process. Terrorist attacks, while devastating for those of are unfortunate enough to be effected by them, have been unable to do damage on the scale that would be possible if terrorists had possessed weapons of mass destruction. Compounding the threat that nuclear terrorism poses on the world is that modern nuclear warheads have a much higher yield than those used in Hiroshima and Nagasaki and with the exponential increase in the world's population, any possible terrorist nuclear attack is likely to be much worse than anything that the world has ever seen.

What is nuclear terrorism?



According to the 2005 United Nations International Convention for the Suppression of Acts of Nuclear Terrorism, nuclear terrorism is any act that “uses in any way radioactive material ... with the intent to cause death or serious bodily injury; or with the intent to cause substantial damage to property or to the environment; or with the intent to compel a natural or legal person, an international organization or a State to do or refrain from doing an act”⁷. The act can essentially be divided into acts of terrorism carried out by state or non-state actors. Recent events such as the use of chemical warfare on civilians in Syria and the development of North Korea’s nuclear program has increased the perceived threat by state-actors from nuclear terrorism. However, the risks from both remain central to the policy decisions of the United Nations.

Threats:

Attacks on Nuclear Facilities:

One of the most commonly discussed threats is that of attacks on nuclear facilities. While most, if not all, nuclear facilities are guarded extremely well, many terrorist groups see these facilities as ideal targets due to the wide radius of damage an attack would cause. Currently, the IAEA conducts security checks on most nuclear facilities⁸ with the exception of countries like Israel –who many suspect of having nuclear weapons but do not declare them and hence do not open their facilities to the IAEA for inspection. Furthermore, recent

⁷ "International Convention for the Suppression of Acts of Nuclear Terrorism - Article 1" (PDF). United Nations. 2005. Retrieved 13 April 2012.

⁸ "IAEA Safeguards Overview." International Atomic Energy Agency. Accessed July 20, 2016. <https://www.iaea.org/publications/factsheets/iaea-safeguards-overview>.



events such as the attacks in Europe and the 9/11 attacks have led some to believe that no place is safe and that an attack concentrating on nuclear facilities could be successful. Nuclear facilities are at threat from both a commando-type assault from the ground or external threats such as missile or cyber-attacks. Attacks on these facilities could result in both an explosion and the dispersion of nuclear material into civilian areas.

There have been multiple attacks on nuclear facilities, some of which are been listed below:

- September 1980, Iran Bombed the Al Tuwaitha nuclear facility in Iraq⁹
- June 1981, Israel bombed Iraq's Osirak nuclear facility¹⁰
- Between 1984 and 1987, Iraq bombed Iran's Bushehr nuclear plant six times¹¹
- 1991, the U.S. bombed three nuclear reactors and an enrichment pilot facility in Iraq¹²

Attacks using nuclear weapons/weapons accumulation:

One of the biggest threats that the world faces from nuclear terrorism is that of attacks using nuclear weapons. While nuclear weapons have only been used twice in a military context, the threat of a nuclear attack is an ever-present concern. Non-state actors

⁹ "Osiraq / Tammuz I 33°12'30"N 44°31'30"E." Osiraq - Iraq Special Weapons Facilities. Accessed July 20, 2016. <http://fas.org/nuke/guide/iraq/facility/osiraq.htm>.

¹⁰ "Israel Bombs Iraq's Osirak Nuclear Research Facility." WRMEA. Accessed July 20, 2016. <http://www.wrmea.org/1995-june/israel-bombs-iraq-s-osirak-nuclear-research-facility.html>

¹¹ "IRAN: Eyes on the Skies Over Bushehr Nuclear Reactor." North America Inter Press Service. Accessed July 20, 2016. <http://ipsnorthamerica.net/news.php?idnews=3229>.

¹² "The Legacy of Iraq's Bombed Nuclear Plant." Public Radio International. Accessed July 20, 2016. <http://www.pri.org/stories/2011-06-12/legacy-iraqs-bombed-nuclear-plant>.



pose a particular threat, as some people suggest that unless countries with nuclear weapons safeguard their nuclear secrets, nuclear weapons will eventually become available on the black market. While currently no terrorist group has access to nuclear technology, some believe that as more and more countries proliferate their nuclear arsenals the risk of the weapons falling into the wrong hands increases. In 2005 for instance, M15 – British secret intelligence – warned that al-Qaida had been planning nuclear attacks on cities in the United Kingdom by purchasing bombs via illegal means¹³. As newer terrorist organizations such as ISIS accumulate more wealth, they too will increasingly look to buy or develop their own nuclear weapons.

Weapons delivery:

While it is important that nuclear weapons stay away from terrorist organizations, it is also important that the methods for delivering these warheads also stay out of the hands of these groups. Two of the most common ways to deliver a nuclear warhead is through a plane or through a ballistic missile. Most countries in the world, let alone terrorist organizations, lack the former. As of now, planes with the capability of carrying out a nuclear strike belong only to states. Moreover, most countries have measures in place to

¹³ Vikram Dodd, "Al-Qaida Plotting Nuclear Attack on UK, Officials Warn," The Guardian, November 14, 2006, accessed July 1, 2016, <https://www.theguardian.com/uk/2006/nov/14/alqaida.politics>.



detect and intercept planes so they aren't generally seen as a method to deliver nuclear warheads anymore.

Risk:

While the initial damage caused by a nuclear terrorist attack is significant, much of the resultant damage is a result of the radiation that is released by the weapon. Both the initial and residual radiation cause damage. Initial radiation is what causes the immediate damage to the area. The residual radiation can leave that same area inhabitable for years and also might release radiation into areas that weren't previously damaged. To put the effect of the residual radiation into perspective, only about 3 percent of the total radiation of an atomic bomb is released in the initial radiation¹⁴. Even with that 3 percent the resultant destruction would be devastating, with those living near the site of the blast with little to no hope of surviving. The threat from nuclear terrorism is very real, and the nature of this weapon means that even one attack could be more devastating than any act of terrorism we have seen before.

The Evolution of Use of Nuclear Weapon:

The Cold War:

As mentioned before, nuclear terrorism can be divided into two large groups, terrorism by state and by non-state actors. America, in conjunction with Canada and

¹⁴ "Nuclear Radiation." Atomicarchive.com: Exploring the History, Science, and Consequences of the Atomic Bomb. Accessed July 14, 2016.
<http://www.atomicarchive.com/Effects/effects14.shtml>



Britain, was the first country to develop nuclear weapons and has been the only country to use them. While the Americans had begun developing nuclear weapons in 1939 it wasn't until 1942 when the Manhattan Project was started that they were anywhere close to completing their development. The first nuclear test was conducted on 16th July 1945. The Soviet Union, in response to the alleged weapon development by the USA, Britain and Canada, started its nuclear program during World War II as well. It tested its first nuclear weapon on August 29th 1949 at Semipalatinsk, Kazakh SSR. Subsequently, during the Cold War in the late 1970's the USSR had the largest stockpile of nuclear weapons. The escalation of hostilities during the Cold War was seen by some as the closest the world ever came to nuclear warfare. Although the world never experienced an escalation of hostilities in the Cold War turn into a nuclear war, it was, at that time a very real threat with both countries preparing themselves for possible nuclear attacks.

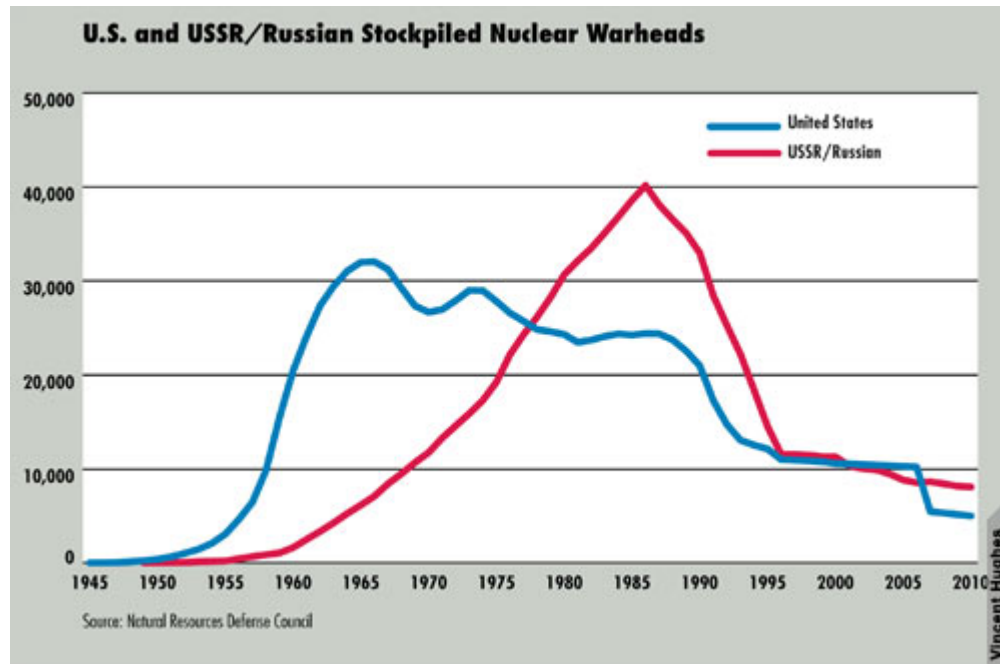


Figure 1: US and USSR/Russian Stockpiled Nuclear Warheads

States Particularly Exposed to the Threat of Nuclear Terrorism:

Pakistan

Pakistan started its nuclear program in January 1972 in response to growing Indian power and suspicion of the existence of their own nuclear program. Pakistan, despite international sanctions and threats, tested its first nuclear weapon in 1998 under the leadership of Nawaz Sharif. Despite Pakistan being a relatively new nuclear power, it is suspected to have a stockpile of around 120 warheads and is projected to accumulate the 3rd largest stockpile in the world within a decade. Pakistan's nuclear program is especially troubling because, along with a hostile relationship with its neighbour and nuclear power India, the country also faces a terrorist insurgency within its borders. Questions have been



raised about Pakistan's ability to protect its nuclear weapons from falling into the hands of terrorist organizations. Terrorist organizations such as the Pakistani Taliban have been known to operate and even control land in Pakistan's troubled North Western province. Pakistan has experienced militant attacks on military bases, political figures and airports. These worries have been compounded by the fact that Pakistan is not a signatory of the Non-Proliferation Treaty and isn't obliged to let the IAEA carry out inspections on its military bases. Pakistan's continued pursuit of more nuclear weapons, some argue, is a result of the threat of the fast growing Indian army. The key to deescalating both countries nuclear capabilities may thus lie within peace between both countries.

India

India's nuclear weapons program was a result of Pakistani hostilities and the increasing power and influence of China – both nuclear powers with which India has historical disputes. India first tested its nuclear weapon in 1974 calling it the “Smiling Buddha”. India, like Pakistan, faces indigenous insurgencies and has experienced attacks on important military installations. While it is considered more stable than Pakistan, activities by Maoist Naxalite and other terrorist groups continue to worry some that nuclear warheads can fall in the wrong hands. India is also not a member of the Non-Proliferation Treaty (NPT) and such is not obligated to let the IAEA inspect its nuclear facilities.

North Korea

North Korea is a country that seems determined to resist foreign influence at whatever cost. North Korea currently has one of the smallest known stockpiles of nuclear weapons; while the exact number of nuclear warheads is unknown, it is estimated that



North Korea only has enough fissile material for 12-23 nuclear warheads¹⁵. North Korea conducted its first nuclear weapons test on October 9th 2006. It claims that it has subsequently developed a hydrogen bomb although most experts believe this to be false. North Korea has developed nuclear weapons despite being under heavy sanctions from the international community and has hence ostracized itself from most of the world. Its continued provocations – missile and rocket launches, rhetorical threats, and others –and threats to South Korea continue to be a threat for that country, a close American ally. North Korea continues to worry the international community and is generally seen as the most likely country to use nuclear weapons.

Militant Groups

Militant groups around the world have for a long time sought to acquire nuclear weapons. Terrorist groups like Al-Qaeda and more recently ISIS have been actively pursuing the acquisition of nuclear weapons. If they are to succeed, the consequences for the world would be catastrophic. The biggest fear is that one of these groups will be able to procure a small crude weapon from the black market since developing one indigenously is extremely expensive. The proliferation of these weapons in countries that do not adhere to the NPT has been a cause of concern and any nuclear weapon on the black market would have to be the result of inside action by a country with nuclear capabilities. While no such

¹⁵ "Nuclear Weapons: Scroll through the Scale Comparison." Curious about NUCLEAR EXPLOSIONS. Accessed July 14, 2016.

<https://curiousabouthnukes.wordpress.com/tag/nuclear-weapons-weapon-explosion-coldwar-history-radiation-yield-bomb-military-security-disarmament-nonproliferation-armscontrol-wonk/>.



organization has ever had access to nuclear weapons, there has been a steadily growing threat. In October 2015 it was reported that Moldovan authorities working with the FBI have stopped four attempts to stop gangs from selling radioactive material to ISIS¹⁶. The United States governments along with other organizations have often pointed to Pakistan as the most vulnerable to weapons theft by terrorist groups due to the instability in the country. The increasing wealth of these terrorist organizations has led to the possibility of smuggling nuclear weapons to become a more lucrative opportunity. While the world is currently united in its stand to prevent these groups gaining that technology, further instability in certain regions as well as the consolidation of power and finances by terrorist groups mean that this threat is expected to grow in the coming years.

Case study: The A.Q. Khan network

Dr. Abdul Kadir Khan is a Pakistani physicist and is known as a central figure in the Pakistani nuclear program. He also founded and established the Kahuta research facility in 1976 and managed it until 2001¹⁷ when he retired. In January 2004 after being questioned by the Pakistani government for his role in proliferating nuclear secrets to other countries, he admitted to selling nuclear secrets. Between 2004 and 2009 he was restricted from travelling internationally.

¹⁶ "Nuclear Smuggling Deals 'thwarted' in Moldova." BBC News. 2015. Accessed August 14, 2016. <http://www.bbc.co.uk/news/world-europe-34461732>.

¹⁷ "IIP Digital | U.S. Department of State." Us Embassy. 2010. Accessed August 14, 2016. <http://iipdigital.usembassy.gov/st/english/publication/2010/02/20100222190335ebysessedo3.511554e-02.html#axzz4HKi7gP72>.



Khan allegedly started his illicit business while he was working in the Netherlands for a country that manufactured centrifuge equipment. After learning that India had successfully developed nuclear weapons, Khan offered assistance to the Pakistani government to develop its own warhead and he was quickly invited to begin work on the project. He had stolen blueprints for centrifuges from the Dutch company and returned to Pakistan. When the United States pushed for the arrest of Khan the Pakistani government – despite being a close ally to the US – refused to arrest him.

Despite some evidence against Khan, Western powers could not do much to arrest him. Moreover, they were unaware that Khan had started building a nuclear black market, abusing the government protection he had gotten from Pakistan. At that time Pakistan claimed to only be working on nuclear energy so the matter wasn't pursued as actively as it would have been had Pakistan openly stated it was developing nuclear weapons. While Western intelligence agencies were suspicious, they could not definitively prove the Khan was selling nuclear secrets to other countries. However, in 2004 a ship was intercepted that was headed to Libya and it was found to have centrifuge components – linked to Khan – on board. The scientist was subsequently punished for his actions once evidence was available.

The case of A.Q. Khan is important because it represents a failure of both the international community and a nuclear state in protecting nuclear secrets. In a time when terrorist organizations have huge amounts of resources the sale of these weapons cannot be ruled out. This shows that sometimes even countries that declare their nuclear weapons and are subject to IAEA, regulations can fail to protect their secrets. While A.Q. Khan was



caught, there remains no mechanism in place to systematically prevent and counter such activities.

Recent Progress

While it is true that the world no longer faces the same level of threat from nuclear warfare that it once did, different countries have had different approaches to get to this goal. One such argument is that the fewer countries have nuclear weapons, the less the risk of nuclear terrorism is. This view is backed by a large number of countries, whereas some oppose this as they are only willing to give up their nuclear weapons if every other country gives them up. While a global and complete de-armament seems elusive and might not even be desirable, it seems reasonable to argue that there needs to be a decrease in the stockpile held by some of the countries. The most progress to that end has been made by the United States and Russia, largely because they are the two countries with the most nuclear warheads by far. The Strategic Arms Reductions treaty (START 1), new START and the Strategic Offensive Reductions Treaty have gone a long way in decreasing both the countries stockpiles and deliverance capabilities. While efforts to decrease stockpiles are underway and many hail them a success, there are also efforts to prevent new countries from acquiring nuclear weapons. The Non-Proliferation Treaty and the Comprehensive Test Ban Treaty prohibit new countries from testing and subsequently developing nuclear weapons. However, the main problem with most of these treaties is that they are voluntary and states often do not want to join them. Some states hold the view that these treaties help in maintaining the West's control on the world and argue that by them signing the treaty



while other countries still have nuclear weapons would decrease their self-defense capabilities. Countries such as India, Pakistan and North Korea are often not part of any of these treaties and continue to defend their right to independently develop a nuclear program. Moreover, countries like Iran and Israel continue to be secretive in their nuclear programs which continue to hinder more progress.

Future actions

One of the main goals of the NPT is gradual global disarmament. To be sure that this goal is reached, the IAEA and other international organizations need to make sure that there is updated and correct information about nuclear stockpiles. Currently, while some countries do voluntarily publish the number of warheads they possess, some countries such as Russia and China choose to not to disclose the size of their stockpiles. This has proven contentious as many of the countries without nuclear weapons relinquished their right to develop nuclear weapons so that the nuclear-armed countries would disarm. By not reporting the number of warheads a country has, there is no clear indication as to whether the country is actually making progress on the goals and hence makes the other countries' sacrifices diminish in value. Another problem is the lack of funding for any actions the committee might wish to take on this issue. The IAEA's budget for this year was roughly 370 million euros¹⁸. Any expansion of IAEA service will require more money, and the IAEA does not generate any income so funds would have to come from countries. This

¹⁸ "IAEA Regular Budget for 2016." International Atomic Energy Agency. 2016. Accessed July 14, 2016. <https://www.iaea.org/about/budget>.



would also possibly result in political blowbacks and an unwillingness to carry out operations that might in fact be beneficial.

Questions to Address:

- 1. What are the threats from nuclear terrorism?**
- 2. What are the risks from nuclear terrorism?**
- 3. How has nuclear terrorism evolved and how it will continue to do so?**
- 4. What measures can be taken to increase security of nuclear material?**
- 5. What are possible recourses to properly address actions of nuclear terrorists?**
- 6. How can the mandate of the IAEA be expanded to further regulate nuclear material?**
- 7. How can the IAEA persuade more countries to sign and adhere to nuclear weapons treaties?**
- 8. How would the IAEA push countries to increase transparency?**
- 9. How can the IAEA fund possible future initiatives?**



Topic 2: Nuclear Energy as an Alternate Source of Energy

History and Development

Ernest Rutherford conducted the first development of nuclear fission technology as a possible source of energy in 1932. Rutherford discovered that lithium atoms, when bombarded by a proton accelerator, split and produced immense amounts of energy. While neither he, nor other early nuclear physics, including Niels Bohr and Albert Einstein, believed this discovery would have any practical applications in the near future, this first step towards nuclear power was a truly significant one. By 1945, the same year the nuclear bombs Little Boy and Fat Man were dropped on Japan, the practical applications of nuclear power were heralded across the US including the possibilities of nuclear powered hearts, cars, space shuttles, and more.¹⁹ Electricity was finally generated on December 20, 1951 in Arco, Idaho after years of experimentation and development in Canada, the USSR, and the US. While only 100 kilowatts were generated, the achievement made headlines as the beginning of the nuclear age.²⁰ Only a few years later, the US declassified the US reactor technology in the 1954 Amendments to the Atomic Energy Act as a means for other countries and the private sector to develop similar technology.²¹

¹⁹ Benjamin K. Sovacool, *The National Politics of Nuclear Power*, Routledge, pg. 68

²⁰ "Reactor Makes Electricity". *Popular Mechanics*, March 1952, pg. 105

²¹ Peters, Gerhard "Dwight D. Eisenhower: "Statement by the President Upon Signing the Atomic Energy Act of 1954." August 30, 1954" The American Presidency Project, University of California



Nuclear technology progressed over the next few years till the development of the first commercially viable nuclear power station's creation in 1956 at Calder Hall in Windscale, England. The previous year, the first Geneva conference – a group of engineers and scientists – met to address this growing technology and its future. The conference also only set the stage for the development of the European Economic Council, which would eventually grow to become the European Union, and the launch of the International Atomic Energy Agency (IAEA).²² This agency would grow to become the world's central intergovernmental organization on the development and maintenance of nuclear technology.

The Life Cycle of Nuclear Fuel

Uranium is the key element in the process of nuclear fission. As such, production of uranium fit for use in a nuclear reactor is key to the continued use of nuclear fission as a means of alternative energy. While uranium is produced in a number of countries worldwide, 70% of uranium is produced in Kazakhstan, Canada, and Australia. Furthermore, with the increase of the use of in situ leaching – a mining process – as a means of production, especially in the US and Canada, uranium production has steadily increased since 1993 while global demand has increased by 90%.²³

²² Kragh, Helge. "Quantum Generations: A History of Physics in the Twentieth Century". 1999. Princeton NJ: Princeton University Press. pg. 265-286.

²³ "World Uranium Mining Production". World Nuclear Association. May 19th, 2016



There are two main means of producing uranium: standard underground mining methods and in situ leaching. Conventional mining practices involve collecting unrefined ore, crushing, grinding, and leaching the ore with sulfuric acid to extract the uranium oxides. In situ leaching (ISL) on the other hand, has a slightly more complex method of extracting the purified ore but costs less, involves little surface disruption, and does without the massive amount of waste rock generated by conventional mining practices.²⁴ ISL is achieved by leaving underground materials where they are and instead digging boreholes into the earth, dissolving the minerals, and pumping the pregnant solution back to the surface. The minerals are most often dissolved in a solution of sulfuric acid, as in conventional mining refinement, but many mining operations for both conventional practices and ISL, especially in the US, are moving to a carbonate solution depending on the ore body. From there, the solution is separated in similar methods to the conventional extraction practices. It is important that this process takes place where no solution pumped into the uranium deposits has any chance of contaminating groundwater reserves or pathways. The uranium is then separated via ion exchange, is dried and packaged, and often takes the form of U_3O_8 .²⁵

²⁴ Ibid.

²⁵ Ibid.

The vast majority of the 500 nuclear reactors operating worldwide today require an enriched isotope of uranium, referred to as U-235, to function. Enrichment is achieved through a number of different methods but only two have been found to be commercially

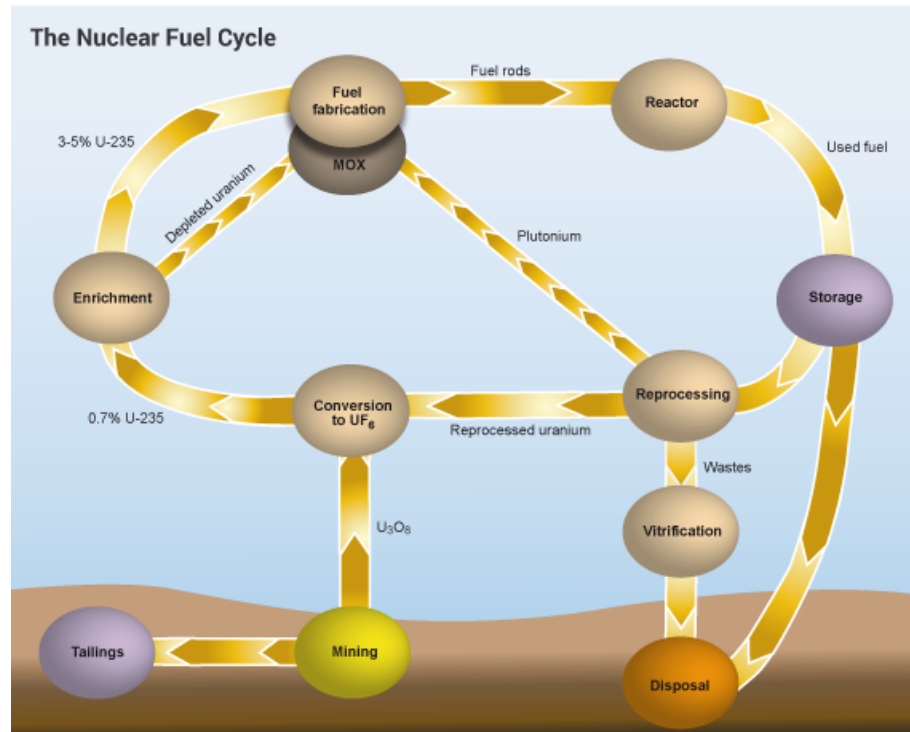


Figure 2: The Nuclear Fuel Cycle

Source: World Nuclear Association

viabl

cess

of developing a new Australian process called global laser enrichment.²⁶ Enrichment is a costly process that makes up about half the cost of the nuclear fuel and involves uranium oxide being converted to a fluoride to reach a gaseous state at a lower temperature. Both methods take advantage of the fact that, while U-235 and U-238, the two components of uranium oxide, are incredibly similar isotopes U-238 is heavier. For example, in the

²⁶ “Uranium Enrichment” World Nuclear Association. May 2016

centrifuge process the gaseous uranium is placed in a centrifuge, which allows for the U-238 to move towards the edge of the centrifuge while the lighter U-235 remains nearer to the center. This enriched uranium in the center is then drawn off. In nature, the prevalence of U-235 is around 0.7% of uranium ore. By the end of enrichment, this percentage has risen to 3-5%, which is useable in most reactors.²⁷

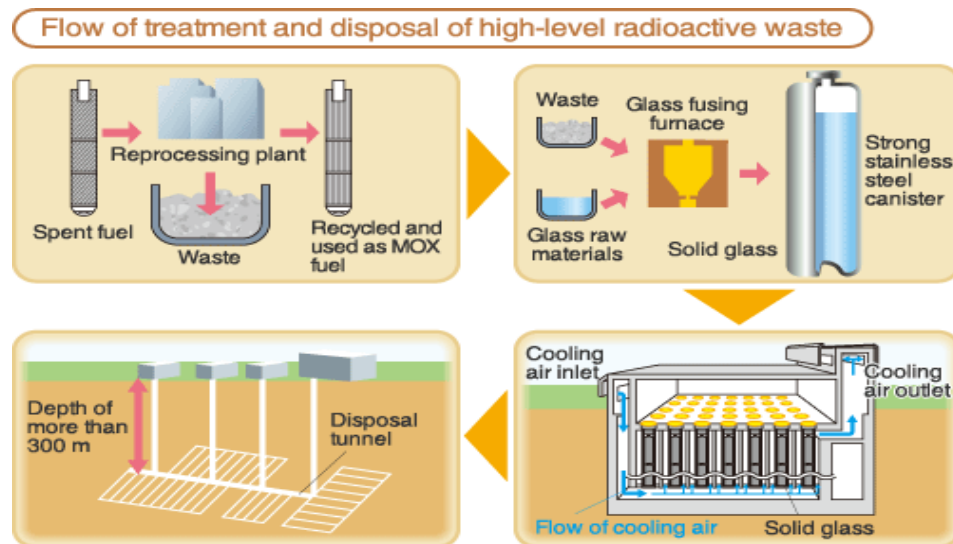


Figure 3: Treatment and Disposal of Radioactive Waste

SOURCE: CHUO ELECTRIC POWER

many,

Netherlands, UK, USA, and Russia, though smaller plants are common elsewhere. The IAEA, in conjunction with the US-led Global Nuclear Energy Partnership (GNEP) and Russia, have proposed plans to establish international uranium enrichment centers.²⁸ This is in line with the IAEA's goal of multilateral nuclear approaches and with work to minimize proliferation of nuclear weapons. The goal of this proposal would be to bring all

²⁷ Ibid.

²⁸ Ibid.



enrichment eventually under international control as a non-proliferation measure. The possibilities of nuclear proliferation and nuclear weapon creation through enrichment will be covered later.

Nuclear waste has been a hot topic in the scientific and political environment for quite some time. This comes from the fact that while nuclear energy is a safe, clean, and relatively efficient means of producing energy, storage of nuclear waste has proven incredible difficult. Nuclear waste is radioactive and contains poisonous plutonium. Reprocessing of nuclear waste has seen some technological progress in the last decade but remains difficult and many reactors don't have the ability to use reprocessed uranium or plutonium as fuel. Furthermore, there is not a clear storage option yet for nuclear waste as it degrades to a safe level in some tens of thousands of years.²⁹ Most countries including France, Belgium, the Netherlands, and Germany have no feasible plan on how to handle their nuclear waste. Currently they handle nuclear waste by placing it in large onsite pools, concrete boxes, or copper and steel canisters. Eventually they ship this waste to a site near The Hague. Finland is the only country currently disposing of their nuclear waste at all. The Finnish solution to this problem has been by placing it at the bottom of a deep tunnel in the granite hills of Onkalo far from population centers and geological activity. The US has a similar plan for the Yucca Mountain in Nevada but public outcry has limited plans for the project.³⁰ There is however a silver lining to this very dark cloud. While storage of nuclear waste has proved difficult, reactors do not create as much waste as one might

²⁹ "Management of Nuclear Wastes" World Nuclear Association. April 2016

³⁰ Hallett, S. (2011). *Life After Oil*. New York: Prometheus Books; pg. 166



expect. Generating enough electricity for one person for a year only creates 30 grams of used fuel. This used fuel is most radioactive and proves most difficult to store but only makes up 10% of the total volume of waste. The remaining 90% – low-level waste, such as clothes and tools exposed in a reactor facility – can be stored in facilities similar to municipal waste facilities and is much less radioactive.³¹

Transportation of nuclear materials including waste actually makes up one of the cheaper aspects of nuclear power generation. Over 20 million consignments of varying sizes of nuclear material are transported every year, all under the purview of IAEA regulations. This transportation may occur by public road, ship (in specifically designed containers), or railway and while accidents have occurred, no container has ever been breached or leaked. A study published in 2015 actually claims that there may be too much control and overregulation of the transport of nuclear materials, which has caused increases in costs of transportation. However, this regulation has ensured safe transport of over 80,000 tons of used fuel and millions of packages of other nuclear materials.³²

Nuclear Power Reactors and Safety

Safety has been of the utmost importance in nuclear power generation, but a few accidents still have managed to have occurred. There have been 3 major accidents in nuclear power's history: Chernobyl, Three-Mile Island, and Fukushima. Each have dramatically changed the way that we view the safety of nuclear power. For example,

³¹ "Management of Nuclear Wastes" World Nuclear Association. April 2016

³² "Transport of Nuclear Materials" World Nuclear Association. January 2016



following the Three Mile Island incident in Pennsylvania, the US nuclear industry formed a self-auditing association called the Institute of Nuclear Power Operations (INPO). This group, similar to the IAEA, inspects the 64 American nuclear power stations and the 104 reactors within these stations. They then grade these stations, which can lead to the closure of any failing stations and firing of management. Restrictions become more strenuous each year and are done without any lobbying or publication of scores.³³ On the world stage, nuclear power is the safest form of generating power based on deaths per energy unit generated per year. Furthermore, despite public fears, a nuclear reactor is incapable of exploding similar to how a nuclear bomb would. Nuclear fuel is never enriched past 5% and the fuel of a nuclear weapon must be enriched far beyond this level. In terms of a possible terrorist attack, the US, UK, Japan, and Switzerland all tested what the effects would be of a large commercial or fighter jet striking on of their reactors. The results found unanimously that while some damage would be incurred, no structural damage would be plausible and no radiation leak would be possible.³⁴ Further tests would be necessary for other plants.

One of the chief goals of the IAEA is to maintain safe working conditions for workers within nuclear plants and to gauge the safety of the plants themselves. Since 1957, they have maintained this goal by vigilantly ensuring safety standards inspecting plants worldwide, suggesting improvements on reactor designs, calling for reports of all incidents,

³³ Kalicki, J. H., & Goldwyn, D. L. (2013). *Energy and Security: Strategies for a World in Transition*. Washington, D.C.: Woodrow Wilson Center Press; pg. 113

³⁴ "Safety of Nuclear Power Reactors" World Nuclear Association. January 2016



minor and major, among other measures. Nuclear reactors are designed to be safe but with any industrial operation, some risks exist. However, due to the vigilance of countries, the IAEA, and nuclear plant employees, nuclear power remains the safest means of generating electricity.³⁵

Concerns regarding the safety of plants are warranted in regards to radiation due to the substance's danger but steps are continuously taken to ensure no harmful effects of radiation upon any citizen or worker. Foremost, numerous procedural safeguards effectively guarantee that no radiation leak could ever affect the public. Even in the case of the Fukushima disaster, which included an uncommon natural disaster and mistakes within the plant and reporting by the government, the IAEA and WHO have both reported no health effects have been found as a result of radiation.³⁶ In terms of worker safety, continuous improvements have been made to ensure the safety of workers. These steps include remote handling of equipment in many operations, physical shielding and minimal exposure time in areas with significant quantities of radiation, and constant monitoring of an individual's radiation level to guarantee compliance with IAEA standards.³⁷

Improvements to guarantee safety are continuously made and organizations do exist to help other countries improve their safety. In 1989, the World Association of Nuclear Operators was formed to exchange operating experience and tips for safer plants. The IAEA –independently of their mandatory inspections of plants – also offers design safety

³⁵ Ibid.

³⁶ Ibid.

³⁷ Ibid.



reviews at the request of states to check safety levels at their plants. Furthermore, advanced reactor designs have begun to be produced, with the first debuting in Japan in 1996. These new designs – beyond infrastructure safety improvements common in Western nations – also include passive safety systems so no human operator need intervene in the case of a meltdown. Additionally, these designs are one to two degrees of magnitude less likely to suffer a core meltdown, the most dangerous of accidents in a reactor.

Nuclear Energy as a Sustainable Source of Energy

Nuclear Energy and Climate Change Mitigation

Nuclear energy's impact on the environment has been debated for almost as long as nuclear power has been accessible. However, with current concerns in relation to climate change and the contribution of oil and coal to this change, more and more scientists have begun to back nuclear power as a means of cutting down our greenhouse gas emissions and hopefully mitigating some of the effects of climate change. NASA has calculated that nuclear power so far has prevented “64 gigatonnes of CO₂-equivalent (GtCO₂-eq) greenhouse gas (GHG) emissions that would have resulted from fossil fuel burning.” To view from a different perspective, this equates to preventing an estimated 1.84 million deaths that would have resulted from air pollution.³⁸ Further estimates from NASA predict that by midcentury, depending on new technologies, nuclear power could prevent an additional 420,000–7.04 million deaths and 80–240 GtCO₂-eq emissions due to fossil

³⁸ Kharecha, P. A., & Hansen, J. E. (2013). Prevented Mortality and Greenhouse Gas Emissions from Historical and Projected Nuclear Power. *Environmental Science & Technology Environ. Sci. Technol.*, 47(9), pg. 4889-4895.



fuels.³⁹ While nuclear power is not the best environmental alternative to fossil fuels, improvements in the storage of nuclear waste, the safety of nuclear power, and the current financial constrictions of renewable energy, have made it one of the best options for mitigating the effects of climate change for the near future.

Nuclear Energy Country to Country

Despite how prevalent nuclear power is in the media and in discussions regarding energy, its input on the global energy share is small at around 11%.⁴⁰ However, this statistic masks nuclear energy's real imprint, especially in more developed countries. Chief among current major users of nuclear energy is France who generates around 74% of its power from nuclear energy. France generates enough nuclear power that they actually are major exporters of electricity to surrounding states. There are even a number of states that without housing a reactor in their own country use a significant amount of electricity that was generated by nuclear power, including Italy and Denmark, where nuclear power accounts for less than 10% of total energy consumption. There are in total 16 countries that rely on nuclear energy for at least a quarter of their electricity.⁴¹

Developing states are not without their own share of nuclear technology, but still lag behind most developed countries in terms of percentage of nuclear power to total energy needs. The World Nuclear Association predicts that as the trend of urbanization continues to grow in developing nations, nuclear power may be a viable solution to

³⁹ Ibid.

⁴⁰ "Nuclear Power in the World Today" World Nuclear Association. January 2016

⁴¹ Ibid.



increased demands for energy. Some top examples for less developed countries building their first reactors include the United Arab Emirates, Turkey, Vietnam (with assistance from Russia and Japan), Belarus, and Poland.⁴² One issue for developing countries looking to introduce nuclear power into their country is that of grid size. Many smaller, less developed countries don't have grid sizes or the infrastructure to handle the introduction of a nuclear reactor. The IAEA suggests that it is not reasonable to introduce a nuclear reactor to a grid system where the power generated would make up over 10% of the power in the grid due to reactors having to occasionally be shut down for maintenance or unforeseen events. Unfortunately, due to these infrastructure issues, many less developed countries would not gain the same benefits from nuclear power as more developed countries. For this reason, it is expected that most nuclear growth will occur in more developed nations, as well as developing nations who have pre-existing infrastructure for the transportation and use of nuclear power.

Public Perceptions of Nuclear Energy

Debate on Nuclear Energy as an Alternate Source of Energy

Since the advent of nuclear energy, a debate has existed on the safety, efficiency, and possibilities of nuclear power. Public sentiment on the technology usually improves during times of technological breakthroughs, and fall after accidents like those of Three Mile Island, Chernobyl, and Fukushima. One argument often made is that mining for the uranium necessary for nuclear power is detrimental to the environment. While this is true,

⁴² "Emerging Nuclear Energy Countries" World Nuclear Association. May 2016



studies have shown that it is no more damaging to the environment than coal and that nuclear energy production has drastically smaller space requirements in comparison to wind or solar power.⁴³

For a number of reasons, the public perception of the safety of nuclear power, especially in terms of possible core meltdown, malicious intent or terrorism, and possible radiation leakage, is quite negative. However, work done by the IAEA, individual countries – especially those with large reactors – and improvements in reactor and plant design leave little room for any of these possibilities to occur. Both the IAEA and the World Nuclear Association provide constant updates on the safety of reactors and mandate new reactors to meet constantly upgrading design requirements.⁴⁴ These updates as mentioned earlier include safety from jet impacts, automatic reactor cooling and shutdown in the case of an event that threatens the safety of the core, and strict guidelines to ensure that the possibility of radiation escaping is at its minimum point. While events like Three Mile Island, Chernobyl, and most recently, Fukushima can create public and political fear of nuclear power, it remains the safest form of generating electricity.⁴⁵

One of the great detractors to arguments for nuclear power is the overall cost. When the public sees price tags of around \$6 billion to \$10 billion, many are reasonably wary of how long it will take for that return on investment to come – even if nuclear power is safer

⁴³ Kalicki, J. H., & Goldwyn, D. L. (2013). *Energy and Security: Strategies for a World in Transition*. Washington, D.C.: Woodrow Wilson Center Press; pg. 487

⁴⁴ “Safety of Nuclear Power Reactors” World Nuclear Association. January 2016

⁴⁵ Ibid.



and decreases reliance on some more harmful non-renewables.⁴⁶ While there are many variables to return on investment for a nuclear plant – including whether the energy market is regulated and how other markets will grow – one study in the US showed that a return usually occurs around 60 years after construction.⁴⁷ Despite these discouraging figures, recent trends have shown uranium costs steadily falling and, with increased efficiency during the enrichment process and within the reactor itself, the costs of actually producing electricity once the capital costs of construction are met, are incredibly low.⁴⁸

One of the other main fears involving nuclear power is its possibility in nuclear weapon proliferation. Through the process of repurposing and re-enriching used nuclear materials it is possible for groups to use this waste for “dirty bombs” or, outside of international sanctions and purview, enrich uranium to the point capable of creating a nuclear weapon. Along with the IAEA proposal for international control of enrichment centers, Jan Kalicki in “Energy and Security; Strategies for a World in Transition” offers a few options for this dilemma⁴⁹:

Policy options:

- Enhance safeguards, monitoring, and detection capabilities for fissionable materials and for fuel-cycle operations

⁴⁶ Kalicki, J. H., & Goldwyn, D. L. (2013). *Energy and Security: Strategies for a World in Transition*. Washington, D.C.: Woodrow Wilson Center Press; pg. 400

⁴⁷ “Economics of Nuclear Power” World Nuclear Association. March 2016

⁴⁸ IAEA; Climate Change and Nuclear Power; 2015

⁴⁹ Kalicki, J. H., & Goldwyn, D. L. (2013). *Energy and Security: Strategies for a World in Transition*. Washington, D.C.: Woodrow Wilson Center Press; pg. 405



Representative Technology Pathways:

- System design of fuel-cycle facilities that integrates proliferation resistance (safeguards by design)
- Development of advanced remote detectors for fissionable materials and associated fuel-cycle activities, including environmental monitoring
- Deploy nuclear fuel cycles that minimize proliferation risks.

Representative Technology Pathways:

- Research, development, and demonstration of proliferation-resistant reactors, fuels, and fuel cycles
- Spent fuel waste management

Possibility of Nuclear Power as a Future Energy Option

The possibility of nuclear power as an energy option for the future is a complex debate. Supporters claim that nuclear power is not only the safest for both people and the environment means of generating electricity but also has many possibilities for supporting socioeconomic growth in developing countries with growing urbanization. Furthermore, estimates claim that with current uranium reserves, nuclear power can continue to grow at the pace predicted by the IAEA and conservatively have enough uranium to last the next 120 years. Even within the nuclear power community, 120 years is beyond the length that many predict it will remain a reasonable mode of electricity production. Detractors claim



that without proper storage facilities for spent fuel, the chance of accidents and disasters, and with the possibilities of nuclear proliferation existing at all, nuclear power cannot be a risk we continue to take. As numerous countries move away from coal and oil dependence towards more environmentally friendly, cheaper, and safer means of energy production a vacuum will form in the global energy market. Will nuclear be the one to fill that vacuum? With new breakthroughs in technology and safety every year including advanced reactor designs, new enrichment methods, and the possibilities of thorium reactors that could use a fraction of the fuel and generate multitudes more energy – this might be possible.⁵⁰⁵¹

Questions to address:

1. **What is your country's stance on nuclear power?**
2. **What are your country's energy needs?**
3. **How would your country deal with some of the issues with nuclear power listed above?**
4. **What other options does your country have for energy production?**
5. **How does your country plan to work with the international community on nuclear non-proliferation and support of nuclear power?**

⁵⁰ Kalicki, J. H., & Goldwyn, D. L. (2013). *Energy and Security: Strategies for a World in Transition*. Washington, D.C.: Woodrow Wilson Center Press; 403-404

⁵¹ "Thorium" World Nuclear Association. September 2015



Topic 3: Measures to implement and enforce the nuclear program in Iran

Background

After decades of anxiety, of constant negotiations and threats, on July 14, 2015, an international agreement on the nuclear program of Iran was reached between Iran and the P5+1 (China, France, Germany, Russia, the United Kingdom, and the United States). Known as the Joint Comprehensive Plan of Action (JCPOA), this agreement hopes to ensure that Iran's nuclear program will be used solely for peaceful purposes. The JCPOA



was officially adopted and came into effect on October 18, 2015. Shortly after its adoption, the IAEA verified that Iran has implemented the main stipulations in the JCPOA. Iran's commitment to change has resulted in the United States and the EU lifted their nuclear-related sanctions.⁵² Although the current state of affairs is an amicable one (regarding Iran's nuclear program at least), the road to this arrangement was tumultuous and this is only the first step of a very long road towards ending Iran's desire to pursue nuclear weaponry. The success of this agreement will pave road to future non-proliferation programs and increased collaboration with Iran. Alternatively, if the JCPOA falls apart, Iran will be a lot more technologically capable to acquire its own nuclear weapons and further destabilize the region.⁵³ In order to fully understand the JCPOA and its future implications, it is important to first understand the history of Iran's Nuclear Program.

History

Launched in the late 1950s, the Iran nuclear program was part of the United States' Atoms for Peace Program. As part of the program, United States supplied the newly established Tehran Nuclear Research Center at Tehran University with a small 5MWt research reactor. During the 1970s, the Shah established the Atomic Energy Organization of Iran (AEOI), which was charged with the task of expanding Iran's nuclear program that

⁵² "Joint Comprehensive Plan of Action", U.S. Department of State, Accessed on May 30, 2016, <http://www.state.gov/e/eb/tfs/spi/iran/jcpoa/>

⁵³ Ilan Goldenberg, Elizabeth Rosenberg, Avner Golov, Nicholas A. Heras, Ellie Maruyama, and Axel Hellman "After the Joint Comprehensive Plan", *Center for New American Security*, Accessed on May 30, 2016, <http://www.cnas.org/game-plan-after-the-jcpoa#.V7nSI5N96qQ>



included the construction of 20 nuclear reactors. Iran's program was supported by nations from the West including the United States, France, and Germany. In that period of time, Iran signed contracts with the German firm Kraftwerk Union to build reactors and invested heavily in the French firm Eurodif to ensure that they acquire the uranium they needed for the reactors. In a matter of two decades, Iran's nuclear program expanded significantly, establishing a solid foundation for future nuclear technology expansion.⁵⁴

Although on the surface, Iran's nuclear program seems to be tailored for peaceful purposes; however, in reality, the Shah always kept the possibility of developing nuclear weapons on the table. "According to Geoffrey Kemp, a leading Iranian expert now at the Nixon Center, the Shah's nuclear program was motivated partly by potential nuclear threats from Israel, Iraq, Pakistan, India, and the Soviet Union."⁵⁵ Iran's nuclear program came to halt when the Shah's regime was overthrown in 1979. The new regime initially stopped the program, but it was reinitiated in the early 1980s. This time around, the program was vastly different; without the support of Western powers, Iran turned towards Russia and China for assistance. During the 1980s, China was Iran's primary supplier of nuclear technology. With China's assistance, Iran was able to build a reactor at Esfahan.⁵⁶ In addition to helping Iran build reactors, China also provided the country with uranium, with in "1991, Iran secretly [importing] from China approximately 1 metric ton of uranium

⁵⁴ "Iran's Nuclear History from the 1950s to 2005", Institute for Science and International Security, Accessed on May 30, 2016,

http://www.isisnucleariran.org/assets/pdf/Iran_Nuclear_History.pdf

⁵⁵ Ibid

⁵⁶ "The Iranian Nuclear Program", The Clarion Project, Accessed on May 30, 2016, <https://www.clarionproject.org/sites/default/files/Iranian-Nuclear-Program.pdf>



hexafluoride (UF₆), a compound used in uranium enrichment. Neither country reported the transfer to the IAEA.”⁵⁷ After the fall of the Soviet Union in 1991, Russia began to increase relations with Iran. This cooperation consisted of a joint research program in which both nations will share their nuclear intelligence as well as Russia’s assistance in reinitiating the construction of the Bushehr reactor that was begun but never completed by German companies and had been badly damaged by the war with Iraq.⁵⁸ Towards the end of the 1990s, the United States began to see Iran’s nuclear development as a substantial security threat and began imposing sanctions aimed at curbing the country nuclear program.

On August 14, 2002, it was revealed by a revolutionary group in Iran that there were two undeclared nuclear facilities in Iran. These nuclear plants were capable to enrich uranium and produce plutonium—raw materials that could be used to make nuclear weapons. This occurrence caused the international community to question Iran’s credibility and incited a dispute that persisted for many years. Subsequently, Iran became one of the key focuses of the IAEA: the organization would conduct periodic checkups to ensure that Iran is following the safeguards of the organization and attempt to piece together Iran’s nuclear history. In 2005, IAEA discovered that Iran was not compliant with the Nuclear Non-Proliferation Treaty (NPT) and was hiding their nuclear activities. Upon this discovery, the IAEA called Iran to stop their uranium enrichment process, however, Iran

⁵⁷ “Iran's Nuclear History from the 1950s to 2005”, Institute for Science and International Security, (May 30, 2016)

⁵⁸ The Clarion Project



did not comply with the organization's request which prompted the IAEA to introduce this concern to the United Nations Security Council. The council decided to take punitive actions and imposed four rounds of sanctions to pressure Iran to suspend their uranium enrichment activities and cooperate with the IAEA. Nevertheless, Iran continued to enrich uranium, defying the council's orders.⁵⁹

The environment of hostility continued until President Hassan Rouhani came into office 2013. Under his leadership, Iran entered into negotiation with the P5+1. These negotiations concluded with the drafting and implementation of the Joint Comprehensive Plan of Action in which Iran agrees to restrict their nuclear activities and increase their cooperation with the IAEA in exchange of sanctions relief.⁶⁰

Joint Comprehensive Plan of Action (JCPOA)

Provisions

The Joint Comprehensive Plan of Action (JCPOA) was the product of negotiations between the Islamic Republic of Iran and the six E3/EU+3 countries (China, France, Germany, the Russian Federation, the United Kingdom, and the United States with the High Representative of the European Union for Foreign Affairs and Security Policy), also known as P5+1. Though a step-by-step approach, the JCPOA includes reciprocal commitments between Iran and the E3/EU+3, endorsed by the United Nations Security Council. The general provisions of the JCPOA are that:

⁵⁹ "Iran and the IAEA", The Iran Primer, <http://iranprimer.usip.org/resource/iran-and-iaea>, Accessed on May 30, 2016

⁶⁰ Ibid.



- I. The JCPOA ensures the exclusively peaceful nature of Iran's nuclear program;
- II. Iran reaffirms that under no circumstances, Iran will seek, develop, or acquire nuclear weapons;
- III. The JCPOA enables Iran to fully enjoy its right to nuclear energy for peaceful purposes;
- IV. The JCPOA produces the comprehensive lifting of all UN Security Council sanctions, and multilateral and national sanctions related to Iran's nuclear program;
- V. The E3/EU+3 and Iran reaffirm their commitment to the principles and purposes of the United Nations as set out in the UN Charter;
- VI. The E3/EU+3 and Iran acknowledge that the nuclear Non-Proliferation Treaty remains the cornerstone of the nuclear non-proliferation regime;
- VII. The E3/EU+3 and Iran commit to implement the JCPOA in good faith;
- VIII. A Joint Commission of the E3/EU+3 and Iran is established to carry out JCPOA functions;
- IX. The International Atomic Energy Agency(IAEA) monitors and verifies the voluntary nuclear-related measures as detailed in the JCPOA;
- X. All provisions contained in the JCPOA are only for implementation between E3/EU+3 and Iran;
- XI. Technical details of the JCPOA are dealt with in the annexes to its document;
- XII. The EU and E3+3 countries and Iran cooperate in the field of peaceful uses of nuclear energy;



- XIII. The E3+3 submit a draft resolution to the UN Security Council endorsing the JCPOA affirming that conclusion of the JCPOA marks a fundamental shift in its consideration of this issue and expressing its desire to build a new relationship with Iran;
- XIV. The JCPOA provisions are implemented for their respective durations as detailed in the annexes and;
- XV. The E3/EU+3 and Iran meet at the ministerial level every 2 years, or earlier if needed, to review and assess progress and to adopt appropriate decisions by consensus.

Negotiations

During the development of JCPOA, negotiations including nuclear enrichment, arak reprocessing, transparency, sanctions, implementation plan, and the dispute resolution mechanism were discussed. Iran and E3/EU+3 are required to take voluntary measures within the timeframe as detailed in the JCPOA and its Annexes.

Further Aspects to Consider of the JCPOA

Enrichment, Enrichment Research and Development, Stockpiles

Iran's long term plan includes certain agreed limitations on all uranium enrichment and specific research and development activities for the first eight years, to be followed by a gradual evolution of its enrichment activities under exclusively peaceful purposes. During that period, Iran is to keep its enrichment capacity at Natanz Enrichment Facility



at up to a total installed uranium enrichment capacity of 5060 IR-1 centrifuges – far below the number needed to create nuclear weapons. Excess centrifuges and enrichment related infrastructure at shall be stored under continuous IAEA monitoring.

Abiding by Iran's voluntary commitments, enrichment research and development is allowed to be conducted only in a manner that it does not accumulate enriched uranium. Based on its own long-term plan, for 15 years, Iran may carry out its uranium enrichment-related activities – including safeguarded research and development exclusively in Nantanz. During the 15-year period, excess uranium stockpiles are to be sold based on international prices and delivered to the international buyer in return for natural uranium delivered to Iran, or are to be down-blended to natural uranium level. The Joint Commission is to support assistance to Iran, including through IAEA technical cooperation as appropriate, in meeting international qualification standards for nuclear fuel produced in Iran.

Arak, Heavy Water, Reprocessing

Iran plans to keep pace with the trend of international technological advancement in relying on light water reactors – which use normal water as opposed to heavy water (which has an additional nuclear moderator)⁶¹ – for its future power and research reactors with enhanced international cooperation, including assurance of supply of necessary fuel. Based on an agreed conceptual design, Iran is to rebuild a modernized heavy water research reactor in Arak in a form of an international partnership. The reactor is to support peaceful

⁶¹ “Type of Reactors”, Canadian Nuclear Association, accessed August 21, 2016, <https://cna.ca/technology/energy/types-of-reactors/>



nuclear research and radioisotope production for medical and industrial purposes. The international partnership shall include participating E3/EU+3 parties, Iran, and such other countries mutually determined. There will be no additional heavy water reactors or accumulation of heavy water in Iran for 15 years. All excess heavy water will be made available for export to the international market.

Transparency and Confidence Building Measures

Consistent with the respective roles of the President and Majlis (Parliament), Iran is to provisionally apply the additional protocol to its comprehensive safeguards and fully implement the "Roadmap for Clarification of Past and Present Outstanding Issues" agreed with the IAEA, containing arrangements to address past and present issues of concern relating to its nuclear program as raised in the annex to the IAEA report of November 2011. Iran shall allow the IAEA to monitor the implementation of the voluntary measures for their respective durations, as well as to implement transparency measures, as set out in the JCPOA and its annexes. These measures include: a long-term IAEA presence in Iran; IAEA monitoring of uranium ore concentrate produced by Iran from all uranium ore concentrate plants for 25 years; containment and surveillance of centrifuge rotors and bellows for 20 years; use of IAEA approved and certified modern technologies including on-line enrichment measurement and electronic seals; and a reliable mechanism to ensure speedy resolution of IAEA access concerns for 15 years.

Sanctions Related Commitments



The UN Security Council resolution, in endorsing the JCPOA, is to terminate all provisions of previous UN Security Council resolutions on the Iranian nuclear issue simultaneously with the IAEA. The EU is to terminate all provisions of EU regulation implementing all nuclear-related economic sanctions and to terminate all EU proliferation-related sanctions eight years after adoption of JCPOA, or when the IAEA has reached the broader conclusion that all nuclear material in Iran is used with peaceful aims. The EU shall refrain from re-imposing sanctions terminated under the JCPOA without prejudice to the dispute resolution process. The EU shall further explore possible areas for cooperation between the EU, its member states and Iran, and in this context consider the use of available instruments to facilitate trade, project financing and investment in Iran. The E3/EU+3 is to take adequate administrative and regulatory measures to ensure clarity and effectiveness with respect to lift sanctions and good faith.

Dispute Resolution Mechanism

If Iran believed that any or all of the E3/EU+3 were not meeting their commitments under this JCPOA, Iran may refer the issue to the Joint Commission for resolution; similarly, if any of the E3/EU+3 believed that Iran was not meeting its commitments under this JCPOA, any of the E3/EU+3 could do the same. The Joint Commission is given 15 days to resolve the issue, unless the time period was extended by consensus. After Joint Commission consideration, any participant may refer the issue to a council of the Ministers of Foreign Affairs of involved nations for 15 days, if it believed the compliance issue has still not been resolved. After Joint Commission consideration, in parallel with review at the ministerial level, either the complaining participant or the participant whose



performance is in question could request that the issue be considered by an advisory board, consisting of three members (each appointed by the participants in the dispute and a third independent member).

The Advisory Board provides a non-binding opinion on the compliance issue within 15 days. If the issue is still not resolved, the Joint Commission considers the opinion of the Advisory Board for no more than 5 days. If the issue still has not been resolved to the satisfaction of the complaining participant, and if the complaining participant deems the issue to constitute significant non-performance, then that participant could treat the unresolved issue as grounds to cease performing its commitments under this JCPOA in whole or in part and/or notify the UN Security Council that it believes the issue constitutes significant non-performance. Upon receipt of the notification from the complaining participant, including a description of the good-faith efforts the participant made to exhaust the dispute resolution process specified in this JCPOA, the UN Security Council, in accordance with its procedures, shall vote on a resolution to continue the sanctions lifting.

If the resolution described above has not been adopted within 30 days of the notification, then the provisions of the old UN Security Council resolutions would be re-imposed, unless the decided otherwise. The UN Security Council, expressing its intention to prevent the reapplication of the provisions if the issue giving rise to the notification is resolved within this period, intends to take into account the views of the states involved in the issue and any opinion on the issue of the advisory board.

Implementation Plan



Iran and the E3/EU+3 are to implement their JCPOA commitments. The sequence of implementation is to be set forth without prejudice to the duration of JCPOA commitments stated in this JCPOA. The milestones for implementation are:

- Finalization Day: the date on which negotiations of the ICPOA are concluded among the E3/EU+3 and Iran.
- Adoption Day: the date 90 days after the endorsement of the JCPOA by the UN Security Council or an earlier date determined by mutual consent of JCPOA participants.
- Implementation Day: the date on which the EU and the United States take the actions of the JCPOA.
- Transition Day: the date eight years after Adoption Day or the date on which the Director General of the IAEA submits a report stating that the IAEA has reached the conclusion that all nuclear material in Iran remains in peaceful activities, whichever is earlier.
- UN Security Council Resolution Termination Day: the date on which the UN Security Council resolution endorsing the JCPOA terminates according to its terms, which is to be 10 years from Adoption Day, provided that the provisions of previous resolutions have not been reinstated.

Evaluation of Previous Actions

In November 2013, the Joint Plan of Action (JPA), a six-month long confidence building agreement was signed by Iran and the E3/EU+3. The main elements focused on



Iran's ability to produce nuclear weapons, mechanisms for verifying Iran's compliance with the JPA, and incentives for Iran's agreement to the JPA. Past E3/EU+3 proposals have sought no uranium enrichment in Iran, under the mantra of "stop, shut, ship," to stop enriching uranium, shut down the enrichment plants, and ship its enriched uranium abroad.

However, evidence presented by the IAEA shows that Iran had pursued all three elements: with sufficient quantity of fissile material, the weapon design needed to create a nuclear reaction using the fissile material, and a delivery vehicle to get the weapon to its target. Iran has been enriching uranium for more than ten years and was currently constructing a heavy water reactor (Arak) to produce plutonium, and had experimented with explosives technology that has little use other than for a nuclear weapon, as well as having an ongoing ballistic missile program.

A constant phenomenon over the last decade of diplomatic efforts with Iran has been that as Iran's nuclear program has advanced, international demands have continually revised downward. In 2003, the EU+3 sought to halt Iranian enrichment. By 2009, with Iran producing 3.5 percent enriched uranium for several years, the E3/EU+3 only asked that Iran reduce its uranium stockpile. And once Iran had started producing uranium enriched up to 20 percent in 2011, negotiations mostly focused on limiting that activity, largely ignoring its enriched uranium production and stockpile.

In the meantime, Iran's demand has remained the same: recognition of its right to enrich radioactive materials. This series of negotiations, and their failure to accomplish their goal for at least the first part of the negotiating process, demonstrates the difficulty of rolling back technological advancement. Despite the terms set out in the JCPOA, Iran will



maintain the knowledge and technical abilities to pursue a covert nuclear program or to restart its facilities once a comprehensive deal lapses, should it decide to do so.

Future Actions

A negotiated solution is then not to be understood as taking away Iran's ability to seek a nuclear weapons capability. It is better described as seeking to put in place conditions that affect the logic of Iran's decision-making about whether or not to make the use of the capabilities it continues to retain. A comprehensive deal can impact Iran's nuclear intentions both through obstruction and by providing incentives. Ultimately, it is this metric, how the comprehensive deal affects Iranian intentions to pursue a nuclear weapons capability, that should be used as a measure of the success of the JCPOA.

Breakout Time and Inspections

Proof that the JCPOA is effective deal to restrain Iran's nuclear ambitions would include mechanisms that allow involved parties to detect breakout with sufficient time to act and prevent the production of sufficient fissile material to fabricate a weapon. In addition to breakout detection, inspections are an integral part of this agreement. Without a robust inspections regime of the IAEA over sites related to nuclear activities, it is difficult to recognize whether Iran is compliant with restrictions imposed on its nuclear program (which were imposed in order to achieve a longer breakout window). By ensuring that a potential breakout will be detected early enough to allow international powers to respond decisively, a proper inspections regime is thus required to create strong incentives to abide



by the deal. The IAEA plays a crucial role in this process, and its role can be strengthened to ensure that the deal is properly enforced.

Providing and Preserving Incentives

In past nuclear programs, Iran has made clear that it expects relief from the sanctions that have slowed its economy in return for such concessions. To receive the most and quickest economic benefit, Iran is pushing to have the most sanctions lifted. The quicker such measures are removed, however, the less incentive Iran will have to comply with future deals. Nations will now have to find a way to guarantee that all the parties hold to their end of the agreement.

Funding

The initial implantation and future inspections are expected to come at a high cost. The IAEA has calculated that the successful implementation of the JCPOA will cost close to 9.2 million euros per year. Additional costs will also be necessary for the future verification and monitoring. Presently, the regular budget of the IAEA did not factor in the additional costs. Therefore, in order to successfully implement the program, member states will have to make extra-budgetary contributions. Delegates in this committee will need to come up with ways in which the IAEA can garner funds to successfully implement this agreement in the long run.⁶²

Enforcement and Vigilance

⁶² “Introductory Statement to the Board of Governors”, IAEA, Accessed August 21, 2016, <https://www.iaea.org/newscenter/statements/introductory-statement-board-governors-64>



Iran's nuclear program is a long term issue that requires continued enforcement and vigilance from the E3/EU+3 and its partners. In part, vigilance is achieved through monitoring Iran's compliance, and will require continued support for the IAEA's inspections efforts. It is also incumbent upon the international community to demonstrate credibility to Iran's leaders the consequences of reneging on the agreement.

Questions to address:

1. What happens to Iran's nuclear program after the deal's first decade?
2. How does the deal address concerns about the possible military dimensions of Iran's part nuclear work?
3. Iran's reputation on the world stage has been quite negative in the past couple of years, how can Iran improve its reputation and create goodwill amongst the nations?
4. Nations such as Israel and Saudi Arabia are unhappy with this agreement and believes that this will encourage Iran to be more aggressive in the region, what can the member states of the agreement do to assuage these concerns?
5. Is IAEA access to sensitive sites timely enough?
6. What is the significance of restrictions on conventional arms transfers and ballistic missile activities?
7. What are the implications of sanctions relief?

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