Forum: Nuclear Security Summit

Issue: Evaluating the Development of Nuclear Energy Technologies as a Method to Substitute Fossil Fuels

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Introduction

Ever since the industrial age over a century ago, the world has had a large variation and increase in energy requirements and resources. A significant aspect of this is due to the rapid global industrialization, with some nations having shifted their interests from social and environmental development to economic development. While the positive effects of the industrial revolution still resonate, such as better quality of life, increased wealth, etc. its negative effects have recently become one of the world's greatest worries for the future. Society today uses 18.2 TWh (18 billion kWh) per annum according to the International Atomic Energy Agency, and that is set to increase even further, with a 2.3% increase since 2019. Meeting such energy needs is now a problem because different energy sources pose different threats and opportunities. However, a solution that could very well play a major substitution and replacement of fossil fuels is Nuclear energy.

The idea of nuclear power was formed in the nuclear 1930s when physicist Enrico Fermi first discovered and demonstrated that neutrons could split atoms. Under this knowledge, Enrico Fermi led a group in 1942 which had achieved the first-ever nuclear chain reaction. This was a significant milestone as in the mid-1950s, the concept of nuclear energy was being tested, alongside designs for a plant. This was proven in 1957 that it could be used commercialized and began the popularization of nuclear energy, with the first one being built less than a year later known as the "Shippingport Atomic Power Station" in the United States.

nuclear energy opens many opportunities and can be considered a feasible alternative to fossil fuels. Many people are already predisposed to the idea that nuclear energy is too great a risk, and that it can potentially have catastrophic effects. But it is also important to acknowledge that nuclear energy leaves no carbon footprint and has no environmental effects if treated sufficiently. It also provides a steady source of electricity, with little to no shortages. nuclear energy already accounts for 20% of the energy in the United States of America, and with depleting fossil fuel resources, this number is likely to increase. Though nuclear energy is non-renewable, at its current use rate, it is estimated that the nuclear resources are more economically viable to gather will last the world over two decades. nuclear energy has a lot of potentials, but it comes with a lot of economic, social, and environmental conflict. In the words of Ban Ki-Moon, former Secretary-General of the United Nations, “Sustainable development is the pathway to the future we want for all.” Overall, it is important to discuss the actual implications of nuclear energy, with an emphasis on what opportunities it presents for the future.

Definition of Key Terms

Fossil Fuels

An energy source made from the compressed remains of dead organisms, which releases carbon dioxide when burned.

IAEA

The International Atomic Energy Agency. An organization of the UN that controls and governs nuclear technology, resources, and weaponry. The IAEA’s objective is to promote the safe development and usage of nuclear energy and to discourage the proliferation of nuclear weaponry.

Kilowatt-hours (kWh)

A watt-hour is a measurement of how much energy is used by an appliance relative to the time it takes for an appliance to use 1 watt of energy for an hour.

LEDC

Less Economically Developed Country. A nation that is less developed on average such as Kenya, Afghanistan, and India

MEDC

More Economically Developed Country. A nation that is more developed on average such as The United States of America, United Kingdom, and Japan

Greenfield

Sites that have not been built on before. Often rural or/ and countryside areas.

Brownfield

A site that has been built on before. Normally associated with urban areas.

Millisievert

1/1000 of a sievert. A sievert is a measure of the potential effect of radiation on the body. 4- 5 sieverts can potentially kill a person, which is 4000 to 5000 millisieverts.

Renewable

The rate of consumption of a resource is lower than the rate of replenishment. This means that the resource virtually cannot run out

Non-Renewable

The rate of consumption of a resource is higher than the rate of replenishment, which can ultimately result in the depletion of the resource

Nuclear

Relating to the nucleus of an atom, or the energy released by splitting it.

Nuclear Meltdown

A widespread release of radiation over hundreds of kilometers as a result of a failure in the systems of a nuclear power plant. Is the worst-case scenario event of a nuclear power plant.

Radioactive

The state of having atoms that release energy in the form of radiation.

Non-Proliferation Treaty (NPT)

An international treaty whose objective is to prevent the spread of nuclear weapons and weapons technology, to promote cooperation in the peaceful use of nuclear energy, and continue efforts towards nuclear disarmament.

Key Issues

Health and Safety Concerns

It is a well-known fact that nuclear energy poses various major threats. One of which must be considered is the health and safety of citizens and workers that are always within the range of damage from a nuclear powerplant. Many fear the effects of radiation poisoning as well as the consequences of a nuclear reactor explosion. The chances of any of these fears to occur are highly unlikely, but still possible. There are two main ways health and safety can be compromised as a result of a nuclear power plant; the first is through contact with radioactive material due to improper waste management or a worker not using safe equipment while the other involves the disastrous event of an explosion in the power plant. The explosion can potentially cause massive damage to infrastructure and the surrounding environment and this is because of how potent nuclear resources are, such as highly enriched uranium. Compared to fossil fuels that release emissions every day, the mismanagement of nuclear waste can be more hazardous than greenhouse gasses.

Secondly, exposure to radioactive material can lead to both mild and life-threatening symptoms. The most likely way that people can be directly exposed to radioactive material is through contact with radioactive waste that has not been treated carefully, and the work conditions of those who work in the power plants. Radiation sickness occurs in three stages. Firstly, there is the prodromal stage, where the patient experiences nausea, vomiting, and diarrhea. Next, comes the latent stage, where the patient appears to be recovering. Following that, it is the overt stage, where the patient may experience a variety of serious symptoms, which can cause problems anywhere in the body, depending on the type of exposure, such as the cardiovascular system, where blood cells may die at a rapid rate, or the central nervous system, where neurons lose connection to one another. Lastly, the patient will either die or will make a slow recovery.

Nuclear Disasters

Though very improbable, the chances are still present of a nuclear explosion or failure within a nuclear power plant. There are two famous examples of such an event which resulted in many health and safety issues. Firstly, due to a lack of proper maintenance and infrastructure, as well as poor training of staff, the Chernobyl disaster occurred in 1986. The catastrophe resulted in many fires, explosions, and radiation leakage of approximately 6000 mSv (millisievert) to the workers in the Chernobyl plant, resulting in the instantaneous death of over 30 civilians, as well as thousands of cases of cancer and birth defects over the coming years. Aside from the Chernobyl disaster, due to both an earthquake, as well as the following tsunami, Japan's Fukushima nuclear Power Plant experienced a partial nuclear meltdown in 2011. This resulted in the displacement and evacuation of 100,000 people, as well as the death of 3 power plant workers. The two examples show how nuclear accidents can be a result of human error and ignorance, or the threat of a natural disaster, both of which can easily be avoidable through investment but have still caused large amounts of public fear and reluctance towards nuclear energy. nuclear disasters are far more disastrous compared to coal plants, which may lead to more casualties depending on maintenance and security.

Investment into Nuclear Energy

Whenever the plan for a nuclear power plant is introduced, a major issue is funding and investment. nuclear energy is significantly more expensive mainly due to the specific safety requirements, cost of nuclear material as well as specialized workforce required to maintain and monitor the plant for safety and optimal energy output. Ever since the development of nuclear energy technology, investors have found it difficult to finish the building of just the plant itself, let alone all the other costs that come with its construction. Throughout the mid 1900s, almost half of the nuclear power plants that were in the process of construction were abandoned. Recently, with more and improved efficient construction methods and more advanced technology, the plants have become a lot more affordable for governments, however, as of 2019, this still results in a loss of 6.6 billion dollars per nuclear power plant. At these cost levels, it has become extremely unlikely that the private sector is able to finance the plants, therefore it is the government's duty to either finance it fully or subsidize firms to do it instead. Since nuclear power plants can cost up to 9 billion dollars, governments will have to use resources meaning that they are not available for other activities, such as developing renewable energy technology.

Maintenance

The major economic concerns regarding the functioning of a nuclear power plant is ensuring its quality and proper maintenance. 28% of operational costs go towards the acquisition of uranium, which is the primary material used for energy in a nuclear reactor. As of 2018, uranium costs around 63.40 dollars per kilogram. One kilogram of uranium contains 24 million kWh (kilowatt-hours) of energy, but only produces 45 thousand kWh of electricity. On average, a nuclear power plant produces electricity at a rate of 1.86 cents per kWh, including fuel and maintenance costs, whereas electricity has a sale value of 13.19 cents per kWh. The annual operational cost of an average nuclear power plant is approximately 40 million dollars, which is much smaller than the original fixed cost of construction. This means that the maintenance costs post-construction may vary in price due to more efficient yet more expensive technology. Despite this, the cost of the maintenance of a nuclear power plant is surprisingly cheaper than coal plants, whereas the cost of its initial construction is a large investment which is hard to generate the funds for.

Precautionary Measures in a Nuclear Power Plant

The majority of the precautionary measures implemented in a power plant is covered during construction. As mentioned previously, the flawed design and terrible conditions of the Chernobyl nuclear reactor is what resulted in the most disastrous nuclear incident of all time. Learning from this, all nuclear power plants need to have built-in precautionary systems and routines in order to ensure that health and safety are maintained, both by the public and the power plant workers.

The reason why this is an issue is that the precautionary measures may seem extensive and unnecessary to investors, and they will be reluctant to invest based on the high costs. For example, proper automatic failure fuses must be implemented in order to avoid reactor explosions and meltdowns. Water cooling systems should be set in place in order to be able to safely discard radioactive material. Cooling towers cost an average 125 thousand US dollars to construct, and between 50 to 200 thousand dollars to repair after serious wear. As well as this, the training of staff in order to ensure the health and safety needs to be regular and cohesive. The IAEA has a 6-9 weeklong basic nuclear safety course, which is not only for regular workers but also more specialized technicians etc. While this has its benefits, removing a portion of the workforce for such a period costs the power plant working hours. Power plants need to be under constant supervision, as otherwise they could be compromised. Therefore, the sessions will influence the output of the plant.

Response to a Nuclear Accident

As nuclear energy becomes a more widespread and popular form of energy, then no matter how safe nuclear energy technology will become, the threat of a nuclear accident will forever be present. If nuclear energy becomes a major part of the world's future, then governments need to be prepared in order to be prepared for the unlikely event of a nuclear accident. As a result, resources will have to be put on standby, and funding needs to be put into the implementation of such resources. Training a part of the fire department, or even a whole new section of the government takes on a much greater portion of the government's resources, which again takes away resources from addressing other issues. Taking UN funding will also result in the same consequences. Additionally, the response also must be trained for non-state actor situations, as nuclear power plants may become a likely target for them.

Non-state actors who seek the use of nuclear material for warfare can be divided into three different sections. The first one, being the creation of dirty bombs (conventional explosives or incendiary devices that disperse radioactive materials) is the easiest one to accomplish but will have the fewest casualties. The second category of danger is the attacks on nuclear-weapon or nuclear-energy facilities. This would be far harder for terrorists to achieve but could create considerably higher casualties. The impact of such an attack could involve thousands of immediate fatalities depending on location, and even more delayed deaths from radiation-induced cancers, and immense economic damage from the contamination of the region. The last section, which is the most dangerous, but the hardest one to achieve is the acquisition and use of nuclear-explosive weapons. To prevent any of the mentioned issues from occurring, additional safeguards, and proper psychological and physical training must be provided to reduce the risk of such actions.

Public Perception of Nuclear Energy

Nuclear energy is already instinctively thought of as an unstable, unreliable energy source that is scarce and volatile. An issue is that activist groups, such as the Clamshell Alliance and Green America, which is actively against the use of nuclear energy over other renewable energy sources, and lead protests and promotes petitions for the suspension of nuclear energy programs. Tied to that, a lot of unaware members of the public rely on sentiment from the Fukushima and Chernobyl disasters, as well as the ideas shown by comic books and television on what radiation can do to the body. While it is very easy for people to dismiss these as simply works of art, it still leaves people with the perception that nuclear energy could change the human body drastically and cause all sorts of horrifying symptoms. This is largely true, but what also is true it that there is little to no chance of this happening to anyone, let alone to the extent seen in western media. Public perception is important as it at the core of the UN to respect the choices of the populace.

Government Support

As for most global governments, it is evident that the world is split into three separate stances when it comes to nuclear energy. Many countries such as the USA, Russia, India, and

China are in favor of implementing nuclear energy resources due to the economic opportunities provided. Another group of countries, such as Germany, Switzerland, France, Spain, Australia are not in favor of the use of nuclear energy, due to its hazards and potential consequences. Some countries do not have any plants like Switzerland, whereas others are actively trying to abandon their plants and switch to other resources, an example being Germany. All the other member states, mainly LEDCs, fall under the third bracket. These are the countries that are unable to afford nuclear energy, and thus are undecided as to whether it should be implemented or not. In this instance, MEDC support is vital as it essentially is what allows for the implementation of nuclear power facilities.

Alternative Energy Sources

While nuclear energy is a clean alternative to fossil fuels that currently account for 81% of the world's energy sources, there are other effects that the transition can have. Most different types of energy sources have their own advantages and disadvantages. To summarize that of nuclear energy, it is cheap to maintain, clean for the environment, and long-lasting however it is expensive to initiate and can result in a meltdown or any other catastrophic event. It is important to assess other types of energy sources as compared to nuclear energy as if others are deemed better, then nuclear energy could be considered a less than ideal solution.

Renewable Sources

Renewable energy is the best possible alternative to fossil fuels and nuclear energy in terms of environmental damage. This is because of its less damaging and depleting extraction; renewable energy resources could mean indefinite amounts of energy for the future. Some of the benefits of renewable energy sources is that they do not have to continuously require resources to function, they are a healthy alternative to the carbon-producing fossil fuels, and they are much safer to use as compared to nuclear energy, with absolutely no risk of fatality. Because of this, more countries prefer the renewable energy route than the nuclear energy route. However, renewable energy is extremely expensive to implement on a global scale, much more than nuclear energy, gives varying output based on weather conditions and climate, such as how the same weather turbine in a city performs 50% better if put in the countryside, and require high amounts of maintenance Renewable energy is the ideal solution to meet the world's infinite energy needs, and nuclear energy can be the pathway that brings the future towards this.

Non-Renewable Sources

While non-renewable sources of energy are significantly more inefficient, currently, the world has been designed and oriented around it. This is due to the pre-existing infrastructure that supports the collection, transportation, and usage of non-renewable energy. Fossil fuels are generally cheaper to work with than renewable forms of energy and produce a steady, stable amount of electricity with little to no disruptions. There are 3 main forms of non-renewable energy, excluding nuclear energy. These are coal, oil, and natural gas. Oil currently takes up most of the world's energy sources. This is due to the advantages, and many LEDC governments will be unable to make any form of transition. However, oil resources have been rapidly decreasing, along with all other fossil fuels. As a result, even though the infrastructure still exists for the usage of fossil fuels as an energy source, it needs to be kept in mind that they are unsustainable, therefore other alternatives need to be discussed, and implemented for the future.

Major Parties Involved and Their Views

United States of America

The United States of America is one of the few countries globally that largely supports the use of nuclear weaponry as a form of defense. The country has the largest nominal GDP of 21 trillion as of 2019 and is also one of the world's largest known users of nuclear energy and weaponry. Currently, The United States of America has 98 operation power plants, which generates about 20% of the United States' electricity. The country has also made an economic benefit from the implementation of nuclear energy.

Since all the basic infrastructure and facilities for nuclear energy has been present there for over 60 years, the operating costs are low (as mentioned previously) and all power plants have turned a profit. The US plays an important role in securing nuclear energy as a viable choice for the future over fossil fuels as its support and investment into other countries can allow them to also be able to harness nuclear energy for their own economic benefit. A stable source of power allows LEDCs to become more developed, thus fostering economic growth, and encouraging international trade, which large economies like the US can benefit from. From an environmental standpoint, the United States of America will be preserving the resources that are part of its economy and increase the living standards for all its citizens.

China

As of December 2019, China has around 46 operating nuclear power plants, along with 14 more under construction. China is the most populated country in the world with 1.43 billion people, its main energy sources are currently coal, which has a 73% usage rate. Due to this, it makes China the 6th most polluted country in the world. Due to all the pollution that China faces, both the government and the public are open to the use of nuclear energy sources. The country is an industrial and economic powerhouse, with a large portion of its capital springing from factories and manufacturing. Due to this, energy needs are a lot higher than the world average. Luckily, the Chinese government has the resources to develop nuclear power plants and are financially independent in the construction and operation of nuclear power plants. At its current rate, China is estimated to have 8-10% of its energy needs fulfilled by nuclear energy in 2030 alongside the Three Gorges Dam, which already accounts for 10% of the country's energy needs.

India

Nuclear power in India is the fourth-largest source of electricity after thermal, hydroelectric, and fossil fuels (non-renewable energy). As of 2019, India has 22 nuclear reactors operating in 8 nuclear power plants, with 7 more under construction, making the total installed capacity (excluding the 7 under construction) of nuclear power in India to a large 6780 MW. Though nuclear energy accounts for 3.2% of India's electrical outputs, whereas fossil fuel energy consumption at 72.64 % in 2019 the nuclear arsenal is much larger. Though the country has not listed their current numbers and total number tested, in 2017 the country had possession of over 150 nuclear weaponry, making it the second strongest non-NPT Powers, and 6th most overall.

European Union (EU)

Globally, nuclear energy use is approximately 5%, however, in the EU, it accounts for over 30% of the Union's electrical demands. Though the country heavily relies on it, many countries are opposed to the use of nuclear material as a source of energy. Some of the European countries against it are Germany, Spain, France, Italy, and Switzerland. The reason why the percentage of nuclear energy usage is much higher than the rest of the world is that Europe invested heavily in nuclear power plants in the late 1900s, but countries such as Germany and Switzerland have been in the process of suspending their nuclear energy programs interest in renewable energy, while smaller European countries never had nuclear energy to begin with. This means that the European Union will begin to use less and less nuclear energy, and rather switch to renewable energy.

With the 13% economic loss post-Brexit, the EU is in a fragile economic state, and since renewable energy is expensive and somewhat unreliable, the EU's stance may change. The European Union is involved heavily in the issue as other MEDC countries around the globe are largely for the use of nuclear energy, and thus the extent to which the European Union supports the use of nuclear weaponry is pivotal in the actual implementation of the technology.

African Union

Though many MEDC states feature nuclear power plants, the majority of LEDCs cannot afford a single reactor. In Africa, the only nation that has a nuclear power plant is South Africa, which itself is an MEDC. All other African countries do not have the financial means to implement nuclear energy thus resorting to non-renewable energy. The African Union stands to gain a lot from the rapid development of nuclear technology. The steady, less environmentally damaging, source of energy will bring African countries to a greater stage of development, boosting their economies and increasing the standard of living. Many African countries such as Kenya are interested in nuclear energy, but due to its high initial investment requirements, they are unable to support its development financially. Overall, their view is mixed and largely undecided, but the African Union can potentially benefit greatly from nuclear energy.

IAEA

The International Atomic Energy Agency is the governing body for all global matters regarding nuclear technology. The organization mainly focuses on the encouragement of the safe use of nuclear technology and the disarmament of nuclear weaponry. The IAEA has a pro-nuclear energy stance and strongly supports the development of sensible safety precautions and practices. It is the IAEA's business to monitor such a transition into the future, and thus the IAEA has plenty of importance in the issue. The IAEA's support is extremely vital due to its role as part of the world's governing body, and IAEA policies and regulations influence the extent to which such a change can take place. However, the transition implies a lot of work and effort on behalf of the IAEA, which presents the recurring issue of having resources taken away from addressing other conflicts.

NIRS

The Nuclear Information and Resource Service is an anti-nuclear energy activist group. They are the largest of all nuclear activist groups and are strongly against the use of nuclear energy. If a change and further implementation of nuclear energy were to occur, the NIRS would be heavily involved in going against the change, based on its core principles. The group is not affiliated with any country but shares the beliefs of many other countries such as Germany, Spain, and France. Additionally, the NIRS works with another group known as the World Information Service on Energy (WISE). WISE is very similar to the NIRS, and both are working together to persuade governments and citizens of the dangers of nuclear energy.

Development of Issue/Timeline

Date	Event	Outcome
1942	Enrico Fermi led a group in 1942 which had achieved the first-ever nuclear chain reaction, showing the proof and idea of nuclear energy to supply the world.	This was a significant milestone, as over the coming years, the concept of nuclear energy was being tested, alongside designs for a plant in the USA.
1946	The first resolution passed pertaining to nuclear energy, which was to create a commission that addressed the problems caused by the discovery of atomic energy. The commission had to send reports to the security council and had the purpose of ensuring that nuclear energy is only used for peaceful circumstances.	The resolution helped resolve some of the doubts about nuclear energy and how it could negatively impact the world, and the commission helped regulate and control nuclear energy in terms of safety.

1957	The formation of the International Atomic Energy Agency, a UN body that governs all matters related to nuclear energy.	The entity put the first policies and regulations in place regarding both nuclear energy and nuclear weaponry.
1979	The Three Mile Island accident was a partial meltdown of the second nuclear reactor in the plant. Located in Dauphin County, Pennsylvania, it is the most significant nuclear power accident in U.S history.	The meltdown released a large quantity of radiation over the island, which has linked to cancer cases that have significantly increased in the years following the accident.
1986	The infamous Chernobyl nuclear disaster occurred as a result of poor maintenance and infrastructure, directly killing 30 individuals and resulting in the death of thousands of others in the surrounding areas who died of cancer that was caused by the radiation.	The entire City of Chernobyl was abandoned. The UN and the IAEA redesigned and refined the safety standards, especially in regard to the protection of surrounding civilians to prevent such a catastrophe.
2009	The European Union initiates the Renewable Energy Directive, which sets the goal for the EU to have at least 20% of its energy needs fulfilled by renewable energy, as opposed to nuclear energy and fossil fuels. The Renewable Energy Directive	This resulted in the EU to make the shift towards renewable energy at a faster rate, such as the EU delegating funds of 5.4 billion dollars to the development of renewable electricity in Italy.

	also hopes that by 2030, the EU will use 32% renewable energy.	
2011	The Fukushima nuclear accident was caused by a 9.0 magnitude earthquake, which was followed by a Tsunami. The plant had leaked radioactive material; therefore, the people were subsequently evacuated, leading to the displacement of many.	The IAEA developed and implemented the IAEA Action Plan for Nuclear Security, which had a focus on international collaboration in order to ensure health and safety when it comes to nuclear energy.
2018	The Federal Energy Regulatory Commission (FERC) unanimously rejected Trump's proposal to invest in nuclear energy companies through the NIRS.	NIRS submitted 25,371 comments to the United States government alongside active protests outside the parliament building.

Previous Attempts to Solve the Issue

International Project on Innovative Nuclear Reactors and Fuel Cycles

The IAEA has begun their new initiative on what is known as the International Project on Innovative Nuclear Reactors and Fuel Cycles or INPRO for short. The project has the goal of encouraging the sustainable development of nuclear energy to reduce fossil fuels and its effect on the world. The initiative began in early 2000 and is still an ongoing project. INPRO has slowly but gradually been paving the way to a future powered by nuclear energy, as it promotes technological development and efficiency. INPRO has an agenda to ensure that nuclear energy becomes cheaper and more cost-effective, especially with the aid of newer technologies designed to enhance this in a cost-effective manner. The project is mainly oriented toward providing LEDCs the opportunity to invest in nuclear energy by subsidizing research and development programs. While the project has been active, it has not been emphasized enough by the UN, and it has fallen short of what it could do for the world, with not many major successes.

Investment into Nuclear Energy over Fossil Fuels

From the early 1960s, a lot of attention was turned towards the substitution of fossil fuels with nuclear energy. It had extremely low variable costs and could supply the world with a stable source of energy. As a result, nuclear energy received a lot of investment, in order to meet the fixed costs. Since the technology was relatively new, a large amount of investment went toward research and development. In the 1980s, around 11 billion dollars were put into R&D globally. This was the result of the Chernobyl nuclear Disaster, which shocked the world. The research was in order to find safer methods to extract energy from nuclear power plants. The funding per annum slowly decreased as the interest slowly died out and by 1990, only 5 billion dollars were spent globally for R&D. At the same time, the building of new nuclear power plants exponentially decreased, and some countries have started to suspend the use of nuclear energy. The solution was correct, but based on the events that occurred, skepticism and general public fear led to many of these projects being shut down.

Possible Solutions

Sustainable Replacement of Fossil Fuel Plants

As mentioned previously, fossil fuels account for over 82% of the world's energy use but is said to reduce by 2% (78%) by 2040. Though the estimated change may be low, the result can be achieved quicker by the proper swapping of fossil fuel plants to nuclear energy. By building over Brownfields, the total environment damage from construction will be significantly less. The fossil fuel plant workers will slowly be trained and taught on nuclear energy (mentioned later) to make the transfer smoother. After a certain time (dependent on country and total plant), the fossil fuel plants can be reduced by over 10% at a large-scale implementation. While the UN should not be responsible for all of the funding, this idea can be used by all countries who are financially stable to create nuclear power plants. Though fossil fuels and nuclear energy are both terrible for the environment, if disposed of properly, nuclear energy can have the upper hand both economically and environmentally in the long term.

Further Education on Nuclear Energy

Despite the increase and further appearance of nuclear energy as a clean alternative to the fossil fuels that power today's world, many still view this as a threat, and less of an opportunity which can be taken. nuclear energy is often misinterpreted based on what has been shown by the manipulative media, disaster films to fictional books. In most western curriculums, children are not taught about the mechanisms of a nuclear power plant until high school, and while younger children are taught about renewable energy and its benefits, nuclear energy is largely ignored. In order to further educate the youth, governments should include education about the basics of nuclear energy to 12 - 15-year old's, but without mentioning the more complicated chemistry and physics behind it (which can be taught in high school or college based on students' subject choices).

Along educating the younger children, it is a valid idea to target those who are much older, governments could encourage scientific research and publications to investigate nuclear energy, hopefully drawing media attention. These small yet impactful changes are a necessity for governments to gain public favor for their nuclear investment. In terms of LEDCs, such efforts do not need to take place, as it is mainly the government that plays the role of determining whether nuclear energy should be considered as an energy source.

Additionally, with the increase in nuclear energy, governments can further encourage and invest in the education on nuclear energy and power plants for young adults and blue-collared workers to reduce job losses from other forms of energy and to increase the dependency on nuclear energy.

Further Investment into Research and Development (R&D)

Though there was a reduction in total spent in R&D, in order to optimize the efficiency and the cost of nuclear energy to ensure its worldwide use, a heavy emphasis should be placed on research and development. R&D is something that can take place in an MEDC country, and its discoveries can be implemented in LEDC states in order to make nuclear energy more accessible. While the UN should not be expected to provide the full funding of research and development, subsidies of up to 30% should be provided at least in order to make it easier for researchers to get the best equipment and infrastructure required. Unfortunately, this is a lot easier to implement in MEDCs, meaning that the research should be shared by UNESCO to LEDC governments for their nuclear energy program. The reason why R&D is such an important investment to make is that it has the potential to put an end to any of the concerns put forward by nuclear energy. Techniques and equipment can be developed to minimize the risk of injury and radiation poisoning; more cost-effective practices and infrastructure can be built upon to make nuclear energy a more viable option for LEDC states.

Agenda to Further Improve the Security of Plants Against Non-State Actors

With the rapid global development of nuclear energy, comes the threat of non-state actors. While safety is always a priority for nuclear power plants, there is always the possibility that a non-state actor could infiltrate a nuclear power plant and us it as leverage for their own agenda against a government. As of now, there have been no examples of such an occurrence, but it remains a threat nonetheless, due to the potential chaos that could occur. While this is highly unlikely to occur, it is a possibility that cannot be dismissed. In order to combat this, nuclear power plants should all have clearance databases that are linked to the IAEA, in order to allow them to monitor the threat of non-state actors. As well as this, measures should be put in place to stop the intentional destruction of a nuclear reactor, such as a layered security system, or strengthening the infrastructure of the reactor. Additionally, non-state actors will also want to access the uranium storage or transportation for an increase in illegal armed weapons output. Similar security measures should be in place as well, such as identification for who can access the supplies. The people who can access must be undergone both phycological tests and a workshop on how to securely access any potentially dangerous materials.

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Appendices

I. The New Fire (Documentary on Nuclear energy): https://www.newfiremovie.com/

II. IAEA Website: https://www.iaea.org/

III. Types of Energy and Examples: https://www.thoughtco.com/main-energy-forms-and-examples-609254