Integrating safe uranium energy into National Domestic Infrastructures,

Encouraging Equal Nuclear Energy Capability into all Nations, in a Safe and Diplomatic Manner.

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In order to address the environmental consequences of our global energy system, consideration of the availability of alternative energy resources may need to be scrutinized. An increase in the world population per capita energy demand is expected to cause an immense rise in the amount of energy used around the world. IAEA scientists have predicted that current world energy usage will increase 50-70% by the year 2020. Currently, only 17% of the world's power is generated by nuclear energy. The suggestion of using nuclear energy as a noncarbonated-based replacement has been a topic of discussion for many years. It is hypothesized that this solution would decrease the amount of green house gases outputted, especially in developing countries. Developing countries are responsible for about 67% of net carbon emission from fossil fuel burning and land use (deforestation). Ecologists believe that developing countries could drastically decrease their percentage of net carbon emission by using alternative sources of energy.

For example, if China and India were to use nuclear energy as an alternative instead of burning coal and oil, the amount of green house gases would decrease, resulting in the gradual decrease of global temperatures. Supporters of nuclear energy argue that radioactive metallic elements such as uranium are perfect for nuclear energy. It is the chemical composition of uranium that has convinced supporters that uranium is the answer to alleviate global warming. Although uranium seems to be the answer to nuclear energy supporters, it stirs signs of worry and doubt in others. Non-supporters seem to hesitate about the idea of using uranium as nuclear

energy for two main reasons: concerns of safety and fear of misusage. Some worry that the production of uranium is not safe enough to use as nuclear energy, since not enough information about this chemical is known. Others fear that once a nation begins to use uranium as nuclear energy they will then in turn use it for nuclear weapons, since there is no exact way to ensure that nations use uranium for its intended purpose.

For years now, the IAEA has worked towards the implementation of safe production and mining of uranium. Scientists state that uranium mining pollutes the air, water, and soil with radioactive chemicals and heavy metals. These heavy metals are often absorbed in the water and soil making it almost impossible to clean up polluted areas. In addition to the environmental hazards, uranium mining is also related with radiation hazards, and poisonous processed chemicals. Ecology researchers are concerned with both short and long term effects of uranium mining. Nuclear waste is a major concern in countries where safe uranium mining is not enforced by supervisors of mine sites. This nuclear waste sometimes moves away from the mine site and begins to move into the regions and neighborhoods of local residences. The health issues that have been reported by people who live near uranium mine sites where nuclear waste contamination has occurred cite higher incidents of cancer, birth fault, high infant mortality, and chronic lung, eye, skin, and reproductive illnesses.

The molecular composition of uranium makes it a good candidate for the production of nuclear power, since it is a heavy, metallic, enriched in uraninite and carnotite. However, it is this same chemical composition of uranium that makes it a key component in the production of nuclear weapons. The news of North Korea's nuclear missiles and rumors that Iran has nuclear missiles of their own has increased the fear that approval for uranium use as nuclear energy will result in the production of nuclear weapons. As the demand for nuclear power seems to increase

the demand for safety precautions in the production and mining of radioactive metals has increased. Incidents such as the Three Mile Island accident of 1979 and Chernobyl in the 1980s showed that nuclear power plants might not be as safe as the world presumed. In order to ensure that safe production, mining, and disposal of uranium occurs, the IAEA created the Uranium Production Site Appraisal Team (UPSAT). The purpose and objective of UPSAT is to assist member states in improving the operational and safety performance of uranium production facilities throughout all phases of the uranium production.

UPSAT conducts a peer review by which nations are reviewed for months by teams of experts from a variety of countries. These teams consist of renowned international experts whose job is to review whether member states are operating within the safety procedures of the IAEA regulations. When the team of international experts review a member state, they evaluate the state on the following criteria: organization and management, general safety, mining and processing engineering, waste management, radiation protection, monitoring systems, environmental impact assessment, and security. UPSAT is also responsible for facilitating the transfer of knowledge and information from states with extensive experience in uranium mining and production to "newcomers" of the sector. The purpose of this program is to help share best practices with one another to help make sure that every state is in compliance with the IAEA safety standards.

Conversations about nuclear energy are often complicated by the notion of nuclear weapons. The U.N. recognized the possibility of an increase in nuclear weapons production given the use of nuclear energy and created the Treaty on the Nonproliferation of Nuclear Weapons (NPT). The objective of this treaty is to "prevent the spread of nuclear weapons and weapons technology, to promote co-operation in the peaceful uses of nuclear energy and to

further the goal of achieving nuclear disarmament and general and complete disarmament."

The Nonproliferation Treaty entered into effect in 1970, when a total of 187 states joined the treaty, five of which were nuclear weapon states. In the non-proliferation treaty, a safeguard system was established and the IAEA was named as the responsible party. The purpose of the IAEA safeguards is to verify that nuclear material is not diverted to nuclear weapons or other explosive devices. Deterrence is created by the risk of timely detection and international notice of any attempted diversion. If the safeguards find any country in violation of the IAEA regulations, then the IAEA's Board of Governors can notify the UN Security Council, whose members can impose economic, political, or military sanctions on the violator. These safeguards have been agreed to by more than 145 states and are considered to be the center of the NPT.

Although the concept of using radioactive elements such as uranium for nuclear energy is a good idea, there is still more work that needs to be done. Despite the fact that mining companies and military officials have not made any official statements yet, it has been reported that plutonium nuclear weapons are still active and hidden in some countries. A nuclear weapons expert reported that, "although it is more than ten years since the cold war, thousands of weapons are still on hair trigger alert ten." This concept of level ten nuclear weapons is in relation to the yield of each nuclear weapon. The yield (kilotons) of a nuclear weapon is the amount of energy that is discharged when a nuclear weapon is detonated. So, when a nuclear weapon is referred to as being a level ten it discharges 10 kilotons of energy when detonated. This is an immense amount of energy seeing as how the bomb "little boy," which hit Hiroshima on August 6, 1945,discharged 12 kilotons of energy.

These weapons need to be removed and need to be deactivated so that the fear of

contamination, health issues, and birth defects can be put to rest. The notion that nuclear weapons are active and still hidden in some countries is daunting and worrisome. The global community must take a stand against the ignorance that continues to cause nuclear accidents. Some have suggested that the IAEA safeguard teams should be sent to areas where it is suspected or known that nuclear weapons are hidden so that they can be properly discarded.

Furthermore, organizations and radioactive experts are teaming up to combine proposals in hopes of creating a complete solution to some of the issues associated with using radioactive elements in nuclear energy production. For example, the World Nuclear Association (WNA) and UPSAT have combined some of their ideas and created an official policy document entitled "Sustaining Global Best Practices in Uranium Mining and Processing." This document is a guide towards the principles of managing radiation, health, safety, waste, and the environment.

In this document, it is suggested that workshops and regular conferences be held to make sure that member states are indeed using uranium for nuclear energy and not for nuclear weapons. These workshops/conferences would also be the ideal time for member states to inquire about questions or concerns they have about the safety or guideline procedures of uranium mining. During these meetings, the WNA documents are read and reviewed and uranium symposiums are held.

It is imperative that as a global community the correlation between the rise in the global population and the rise in greenhouse gases be acknowledged. Although some believe that uranium is the answer and solution to this problem, others still believe that there are various areas that need to be researched and studied. One of these areas of concern is the health risk factors associated with radioactive elements. Radiation exposure from nuclear power plants can

sometimes be a side affect when dealing with radioactive chemicals. Radiation exposure can typically be controlled in countries where buildings are properly designed to minimize radiation exposure, but in countries where resources are not available for such buildings radiation exposure can be a deadly problem.

The need and demand for alternative energy sources is a great one. Is nuclear energy the solution? Many scientists and nation-states are still debating the issue. Radiation exposure, possible meltdowns, waste storage, and efficient global safeguards are just some of the issues that need to be addressed. Is "clean" nuclear energy worth the risk of more countries with nuclear power? Would other alternative energy sources be just as efficient as nuclear energy?

Questions:

Uranium as an alternative energy source seems like a great idea, but does it have any negative affects? And if so, how could those negative affects be overcome?

Is uranium considered to be a renewable or non-renewable energy source? If it is a non-renewable source, then what research or progress has been made in the hopes of finding a renewable energy source?

Has research on solar energy as an alternative energy source instead of nuclear energy been explored? If so, what are some of the pros and cons of this option?

Resources:

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"http://www.iaea.org" www.iaea.org

"http://www.un.org" www.un.org

www.desipundit.com/ashutosh/2008/10/15/uranium-problems-and-indias-future\"http://www.wise-uranium.org/umkkr.html" www.wise-uranium.org/umkkr.html

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http://www.iaea.or.at/OurWork/ST/NE/NEFW/documents/RawMaterials/UPSAT2008Brochure.pdf

"http://www.worldwide.edu/ci/tunisia/schools/51210.html"
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International Atomic Energy Agency (IAEA)
Reviewing the Principles of the Nuclear Non-Proliferation Treaty as New Elements and Divisions Appear in the Current International Community

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Introduction/Main Ideas:

The Treaty on the Non-Proliferation of Nuclear Weapons was signed in triplicate in the cities of Washington, London, and Moscow on 1 July 1968 and was entered into force on March 5, 1970. The Treaty on the Non-Proliferation of Nuclear Weapons (hereafter referred to as the Treaty) sought to eliminate the use of nuclear weapons and nuclear explosive devices for all purposes that are contradictory to the efforts of peace. To date, one hundred eighty nine countries have signed the Treaty, only five of which are nuclear weapon states according to the Treaty. These states, the Security Council Permanent Five Members (China, France, Russian Federation, United States, and the United Kingdom) received this status by having manufactured and detonated any nuclear weapon or other nuclear explosive device before January 1, 1967.

The pre-ambulatory clauses of the Treaty affirm the benefits of the peaceful applications of nuclear energy, but recall the ban on nuclear weapons testing in the atmosphere, in outer space, and under water. The Articles of the Treaty outline "that nuclear-weapon State Parties to the Treaty should not transfer to any recipient nuclear weapons or other nuclear explosive devices or control over such weapons; each non-nuclear-weapon State Party to the Treaty should not receive the transfer of nuclear weapons or other nuclear explosive devices; non-nuclear-weapon State Parties to the Treaty must submit to IAEA safeguards to ensure all nuclear

discovery is used for a peaceful purpose; no State Party to the Treaty shall provide any fissional material or equipment to produce fissional material to any non-nuclear-weapon State Party to the Treaty unless internationally monitored and subject to IAEA safeguards; safeguards shall not hamper economic or technological advancements of Parties to the Treaty; all benefits to peaceful nuclear energy should be made available without prejudice to all non-nuclear-weapons State Parties to the Treaty; cessation of nuclear arms race; declares United States, Russian Federation, and United Kingdom of Great Britain and Northern Ireland as Depository Governments; and sets up a timeframe whereby every five years, the Parties to the Treaty will gather to review the operation on the Treaty." These conditions allow all parties to the Treaty to regulate one another and to set forth specific and detailed accounts of what is not acceptable conduct concerning the use, transfer, and expansion of all nuclear weapons or nuclear explosion devices.

The issue at hand is the weight of the Treaty and its relevance to modern times, given North Korea's withdrawal from the Treaty and establishment of a nuclear program in that country. Additionally, the Islamic Republic of Iran's nuclear program is under observation from the international nuclear community over concerns of the nation's adherence to the safeguards established by the Treaty. It is the actions of these two United Nations Member States that have captured the attention of the nuclear powers and those worried about the threat of a nuclear crisis.

The risk of nuclear proliferation increases as developing nations use the technology provided to them by nuclear-weapons nations. Conversely, as the benefits of nuclear power become more widespread, changes to the Treaty will be necessary for the protection of society. Also, should the Treaty be revised or amended, it should seek to define what exactly a peaceful

purpose of nuclear energy is. As technology advances, it will become more ambiguous as to which uses of nuclear energy are beneficial to society, given that there are so many.

As a result of the Islamic Republic of Iran's continually expanding nuclear program, varying opinions have emerged, leaving the United States of America, Canada, the European Union, and China squaring off with the Islamic Republic of Iran, Cuba, and other non-allied member states. As a result, specific Security Council Resolutions that relate directly to the Iranian Nuclear development program have been passed. Until approximately 2006, Iran was a signatory state on the Treaty, claiming that the nuclear program run by the nation was one run by civilians, but after an investigation by the IAEA, Iran was found non-compliant with safeguards, and as a result was ordered by the Security Council to suspend its nuclear program.

Past Policies

It has been necessary during the last five years for the United Nations Security Council and the IAEA Board of Governors (made up of thirty five Member States elected by the General Committee) to intervene in the Islamic Republic of Iran's nuclear program because of non-compliance along with the violation of established safeguards. To date, there have been four major Security Council resolutions directly regarding Iran's Nuclear Proliferation Program and violations of the Treaty. These resolutions, (S/RES/1835, S/RES/1803, S/RES/1747, S/RES/1737), each require that Iran comply immediately with the IAEA guidelines and safeguards, as well as respond to all claims made by the IAEA Board of Governors regarding non-compliance with these standards.

Additionally, the resolutions listed above seek to reaffirm the authority of the IAEA and call for, if necessary, further steps to ensure that Iran is compliant with the International Atomic

Energy Agency's standards on nuclear development programs and the uses of nuclear energies. These resolutions give the IAEA the authority to verify all parts of the nuclear program to ensure that all safeguards are being followed. They alert all states to be vigilant in their observations of Iran, including stopping the transfer of any nuclear related substances by any member of another nation using both private and public means to do so.

Each of the aforementioned resolutions endorses the proposal put forth by China, France, Germany, the Russian Federation, the United Kingdom, and the United States, with European Union support for a long-term agreement allowing for the development of relations with Iran. This dual-track approach is one that would offer financial and technological support to Iran if they agree to cooperate with the IAEA Board of Governors while voting in favor of Security Council imposed sanctions if Iran refuses. This approach is one that provides incentives for Iran to cooperate because of the significant trading relationship between the European Union and the Islamic Republic of Iran.

In conjunction with the UN Security Council, the IAEA Board of Directors has issued several statements and plans of its own. In the document entitled "Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council Resolutions 1737 (2006), 1747 (2007), 1803 (2008), and 1835 (2008) in the Islamic Republic of Iran", the Director General concludes that Iran is in violation of the order of the Security Council by not suspending its enrichment or heavy water related activities as required. The final conclusion of the report is that Iran has, in general, been non-compliant with the IAEA and the Security Council.

Risks and Possible Solutions:

While dealing with a member state that has the capacity to engage in nuclear combat with any of its neighbors, there is an immediate threat to global safety since the total effects of nuclear explosions are still not fully understood. Therefore, in all dealings with Iran there is a risk that there will be some unforeseeable and devastating outcome. But, the IAEA and Security Council have worked to overcome these risks by exploring alternatives that don't involve infringing on the sovereignty of the member state.

As a result of any action taken within Iran, there is a possibility for some type of amendment to the Treaty, establishing further rules and consequences for any non-compliant member state. In an effort to observe the rights of member states to their sovereignty, a set of guidelines that will protect citizens of the globe but also allow a nation to develop and assume all the rights of other member states should be considered. One like this would be necessary so as to remain a United Nations entity, respecting the sovereignty of a nation while still seeking to protect societies. In conjunction with the Security Council, the IAEA seeks to expand the peaceful use of nuclear energy and nuclear capabilities while protecting the global citizens from any threats, with the continued mission of complete disarmament.

Questions:

With nuclear weapons nations growing their arsenal of weapons, how should the Treaty be amended to allow for certain nations to expand their programs while forcing others to shut down?

Is the dual-track approach proposed by the European Union and other nations a good policy? Why or why not? Should other nations begin using this policy with non-compliant members as well?

How should peaceful uses of nuclear energy be defined in the Treaty and what implications would a textual definition have on the International Nuclear Community?

What role should the Security Council and the IAEA play in each state's expansion of their own nuclear program?

How successful has the Treaty been at achieving disarmament? What could be changed to make it more successful?

In situations with non-compliant member states, what are some possible steps that could be taken by the IAEA in conjunction with the Security Council that would persuade states to be compliant?

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The Effects of Routine Use of Nuclear Energy on the Environment and Agriculture

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Nuclear Energy and Agriculture

Despite the great progress that has been made since the 1996 World Food Summit towards the 2015 Millennium Development Goal (MDG) goal of halving the number of undernourished people, there is still a global crisis when it comes to the number of people, 800 million, who are still impoverished to a point that prevents them from enjoying basic necessities like food. Nuclear energy in the form of radiation has sought to assist member nations and UN bodies in achieving the 2015 goal. Improving agricultural productivity is one of the central goals of the UN and specifically the Food and Agriculture Organization and the International Atomic Energy Association. In conjunction, these two UN bodies have worked to enhance infrastructure at a national and international level by facilitating the adoption of nuclear and related biotechnologies. Worldwide, there are over 100 countries working together through the joint division to increase their harvests, combat animal and plant diseases, and pests, to protect the lands, water resources, and environments on which food and agriculture depend. The primary focus of member states is on improving productivity in agriculture through soil management practices, efficient crop nutrition, and control of insect pests.

According to the FAO, as much as 40 percent of the world's food is grown using irrigation with large amounts of water lost to leakage in the irrigation system itself. With the impending threat of climate change due to global warming, there are several regions of the world that are at great risk of exhausting resources, and being unable to cultivate on the same soil. With respect to crops, IAEA researchers have used "tags" to monitor how plants use isotopes at

the molecular level. The IAEA is using nuclear technology to try to increase crop production, particularly in regions where water is becoming a scarce resource. The program is currently underway in West African countries: Burkina Faso, Mali, Niger, and Senegal. The strategy in these four nations is (1) sustainable agricultural intensification; (2) conversion of marginal lands to appropriate land uses, and (3) eliminating the extensive overgrazing of some land. Nuclear energy is being used in cooperation with multiple organizations as a means of improving agriculture. As a whole, the seven challenges for food security are, feeding more people, conserving lands and water, achieving higher yields of productivity, protecting animals and crops, adapting to climate changes, balancing food and fuel needs, and responding to higher costs according to the IAEA.

Nuclear energy is quickly becoming one of the most widely considered modern sources from which to draw energy. Advancements in nuclear technologies have drastically improved what can be achieved. More specifically, the use of radiation as a means of preserving food resources has helped in the preservation of cultivated foods. More than 40 countries around the world have approved the use of radiation to help preserve different varieties of foods. With a focused regard to its application, radiation has been useful in the process of irradiation. The irradiation process exposes food to gamma rays that are produced through electron beams. In the United States, the USDA has approved the use of food irradiation for fruits, vegetables, red meat, poultry, and spices. The process of food irradiation kills bacteria, insects and parasites that cause food-borne illness. This process has been especially useful in the prevention of the spread of diseases like salmonella, trichinosis, and cholera. Although radiation is an important component of this process, the most important thing to consider is that this preservation tactic does not make the food radioactive. The governments of the United States, Denmark, Sweden, the United

Kingdom, and Canada have reaffirmed the safety of food irradiation. Even though food irradiation helps in removing some of the dangerous bacteria that can be found in food, it must be stated that the process does not result in sterile produce. The changes that the food undergoes are almost the equivalent of the changes made during the canning or freezing process. The irradiation of food has been approved in over 37 countries for dozens of products. The largest marketers of irradiated foods are Belgium and France who irradiate 10,000 pounds of produce a year, and the Netherlands, who irradiates 20,000 pounds respectively. Likewise, radiation also helps to breed new seed varieties that return higher yields like the "miracle" rice that has greatly expanded rice production in Asia. Radiation has proven itself as a great means of eliminating harmful entities in agriculture. By the end of the 1980's radiation had eradicated approximately 10 percent of species of pests in wide areas. In agricultural research, radiation has been used to develop several varieties of more disease resistant crops including peanuts, tomatoes, onions, rice, soybeans, and barley. Nuclear energy in the form of radiation has also been used to improve the nutritional value of some crops, including contributing to a reduction in cooking time. Nuclear sciences offer some of the most promising results with regard to preserving the resources that are becoming scarce, and cultivating new agriculture at higher levels.

The FAO/IAEA also has undertaken the task of allowing nations interested in applying nuclear techniques with assistance in meeting the needs of their food and agricultural sector. In theory, the techniques will enable farmers, food processors, and government agencies to provide people with a greater amount of safer foods while conserving the soil and water resources that they depend on. The foundation of these developments is safe utilization of nuclear science. The FAO and IAEA only take into account regions in which the sustainability of this energy will not only have a significant contribution, but also only when it is determined to be safe. This new

work comes only as success from the application of nuclear energies to sustainable environmental projects. The economic benefits from the savings in the price of fertilizer per year are estimated at 6 billion dollars. Nuclear energy is used to determine how much nitrogen plants can capture from the atmosphere within a cropping rotation. In addition these technologies have furthered the development of more disease and drought resistant soil.

Nuclear Energy and the Environment

On an environmental level nuclear technology could help contribute to the construction of energy efficient infrastructure, and more eco-friendly transportation. As reported by the IEA - International Energy Agency - change in global infrastructure could reduce the world's projected energy needs by 1/3 by the year 2050. The IEA concluded that we should, on a global level, make greater use of low-energy technologies for electron generation and transport like nuclear power. Although developing nations are encouraged to reduce their global greenhouse emissions, they are not bound, like developed nations, by the Kyoto Protocol. The Kyoto Protocol is a protocol to the United Nations Framework Convention on Climate Change. The intent of the UNFCCC is to achieve the goal of the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent irreversible consequences to the atmospheric system. Like most environmental treaties, there are separate requirements for both developed and developing nations. While developed nations often are able to form committees, and delegate funds toward the achievement of these environmental goals, developing nations often lack the infrastructure and the funding to adequately address the task at hand. As a result there exists a schism between the requirements between the developed and developing World. In addition to the aforementioned reasons, developing countries also have other concerns to address within limits of their resources like reducing the levels of poverty, disease, and increasing levels

of education. All responsibility, however, is not relinquished as "developed countries should help developing countries deploy low-energy technologies" according to Claude Mandil, former executive director of the IEA. Furthermore, the Nuclear Energy Agency nuclear power plants aid the compliance with Clean Air Act of 1970, which set standards specifically to improve air quality in the United States. According to the Nuclear Energy Agency, modern nuclear energies are capable of improving air quality because they generate heat from fission, rather than the burning of fuel, producing none of the greenhouse gases that would be associated with environmental catastrophes like acid rain or smog. Partnership with the United Nations Environmental Programme and GEMS has given the IAEA the capability to properly manage limited water resources. As these agencies have the intent of preserving the environmental resources that we utilize, the collaboration encourages a greater knowledge that the resources being cultivated are being used responsibly, and sustainably.

Conclusion

The contemplation of the future of nuclear energy comes with an understanding of what it is capable of. Insect pests threatening high value fruit and vegetable production are now being more widely controlled in more environmentally friendly ways. The IAEA and FAO have achieved developmental milestones in several ways. Among these include increases in crop production, agricultural pest control, animal health and productivity, environmental protection, and food safety. In Northern Africa, the screwworm fly was eradicated using the sterile insect technique benefitting the value of livestock by over 300 million. At the current time 95 countries use isotopic and nuclear techniques to identify land and water management practices to improve nutrient and water use efficiency for crop productivity and environmental sustainability. 100 countries are currently using radiation- based plant breeding techniques to improve food, and

industrial crops. 64 countries are using isotope discrimination techniques to assess crop genotypes for tolerance to draught and salinity, and to evaluate the accumulation and storage of organic carbon in soils.

With nuclear energies becoming increasingly important to the preservation of food resources there are several concerns that should be addressed. In addition to the number of ethical considerations, questions should also be considered of whether or not all nations in regions in which the soil is deemed rich enough should be allowed to develop nuclear energies to preserve and enhance their agricultural systems? Few have forgotten the Chernobyl accident, or the consequences that this beneficial, but in this case detrimental energy resource caused to the generations who remain on that land. Even with the development of more manageable nuclear technologies, is it safe? Furthermore it becomes a question of beyond whether or not the nuclear technology itself is safe, but what are the best means of disposal of nuclear waste?

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