Forum: General Assembly 2nd Committee

Issue: The Question of Management of Radioactive Wastes

Student Officer: North Carpenter

Position: Deputy Chair

Introduction

In April of 2017, 30 countries worldwide operated over 449 nuclear reactor facilities. These facilities provided 11 percent of global power needs in 2014.[1] Nuclear energy therefore is an integral part of many nations' infrastructure but has one major major drawback. To produce nuclear energy, a highly dangerous byproduct, radioactive waste, is created. Radioactive waste is a highly toxic byproduct of the fission process that can easily kill those exposed to it. Waste also poses a danger to the environment as a leak into the ecosystem could quickly spread and irradiate a much larger area.[2] This dangerous material will often last thousands of years and, if not treated properly, could hurt many. Nuclear energy does have some upsides to help discount the problem of waste. Compared to other industries, nuclear energy produces very little byproduct. Along with producing little waste, nuclear plants produced much more energy for much less material than traditional energy sources. In fact, compared to coal or oil, one kilogram of natural uranium contains two to three million times more energy.[3] These facts must be taken into account when considering the future of the treatment of radioactive waste.

Today most radioactive material is stored on-site at reactor facilities waiting to be moved to deep storage units. Once in deep storage, the waste is left until such time as it can be reintegrated into the environment.[4] Nuclear waste cannot all immediately be moved to safe facilities, and imperfections in nuclear power plants and storage facilities have lead to a plethora of accidents. For example the Chernobyl accident caused many to question the efficacy of using nuclear power. It displaced over 200,000 people and made over 10,000km^2 of land unusable. The Three Mile Island accident in the United States also had many negative health consequences for those living in the area.[5] These disasters

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[1] "World Statistics." World Statistics - Nuclear Energy Institute. Accessed November 26, 2017. https://www.nei.org/Knowledge-Center/Nuclear-Statistics/World-Statistics.

[2] "Backgrounder on Radioactive Waste." United States Nuclear Regulatory Commission - Protecting People and the Environment. April 3, 2015. Accessed November 26, 2017. https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radwaste.html.

[3] "Fuel comparison." Fuel comparison. Accessed November 26, 2017. https://www.euronuclear.org/info/encyclopedia/f/fuelcomparison.htm.

[4] "Used Nuclear Fuel Management." Used Nuclear Fuel Management - Nuclear Energy Institute. Accessed November 26, 2017. https://www.nei.org/Issues-Policy/Used-Nuclear-Fuel-Management.

[5] "Dirty, Dangerous and Expensive: The Truth About Nuclear Power." Physicians for Social Responsibility. Accessed November 26, 2017. http://www.psr.org/resources/nuclear-power-factsheet.html.

prove that, without well thought out policy and industrial practices, nuclear reactors can be very dangerous. Nuclear energy has benefits apart from being efficient per kilogram; the energy source also produces no greenhouse gases.[6] This has caused it to be pushed as a widespread alternative to carbon heavy fossil fuels. It has been estimated that nuclear energy has prevented the production of 64 gigatonnes of CO_2 equivalent greenhouse gases saving 1.84 million air pollution-related deaths in the process.[7] Some argue this fact far outweighs the disadvantage of small amounts of nuclear waste produced. Nevertheless, the handling of nuclear waste must be done safely and held to high standards if the industry continues to expand.

Definition of Key Terms

Radioactive Waste:

The byproduct from nuclear reactors, fuel processing plants, hospitals, research facilities or the dismantling of nuclear plants. It is created by the process of Nuclear fission.[8]

Low-Level Waste (LLW):

Items that have become contaminated with radioactive material or have become reactive themselves due to this exposure. Low-level waste is never meant to be recovered but is safe enough to be stored on-site in repositories or be disposed of with normal trash. The level of radiation associated with low-level waste can range from background levels found in nature to parts of the reactor itself that have been repeatedly exposed to radiation.[9]

Intermediate-Level Waste (ILW):

Intermediate level waste is waste that is more radioactive than LLW but produces less than <2 kW/m^3 of heat energy. It is not sufficiently radioactive that it needs to be disposed of geologically but its radioactivity demands some shielding. Common types of ILW are residues, chemical sludges, metal fuel cladding, and contaminated materials from reactor decommissioning.[10]

High-Level Waste (HLW):

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[6] "FAQ About Nuclear Energy." FAQ About Nuclear Energy - Nuclear Energy Institute. Accessed November 26, 2017. https://www.nei.org/Knowledge-Center/FAQ-About-Nuclear-Energy.

[7] Hansen, E. James, and Pushker A. Kharecha. "Prevented Mortality and Greenhouse Gas Emissions from Historical and Projected Nuclear Power." ACS Publications. March 15, 2013. Accessed November 26, 2017. http://pubs.acs.org/doi/abs/10.1021/es3051197?source=cen&.

[8] "Backgrounder on Radioactive Waste." United States Nuclear Regulatory Commission - Protecting People and the Environment. April 3, 2015. Accessed November 26, 2017. https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radwaste.html.

[9] Ibid

[10] "Radioactive Waste Management." Radioactive Waste Management | Nuclear Waste Disposal - World Nuclear Association. June 2017. Accessed November 27, 2017. http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-wastes/radioactive-waste-management.aspx.

Typically defined as uranium waste that is sufficiently radioactive (>2 kW/m^3) as to increase the temperature of itself and the surrounding material. HLW is very dangerous and can provide lethal levels of radiation. It is mostly comprised of used fuel and separated waste from reprocessing used fuel. It makes up less than 3% of the volume of produced waste but comprises 95% of the total emitted radiation.[11] Two things occur during fusion that explain this: one uranium atom splits, creating energy that is used to produce electricity, and two uranium atoms capture neutrons produced during fission. These atoms form heavier elements such as plutonium which has a half life of 24,000 years. This means this highly radioactive material takes 24,000 years to reduces its radioactivity by half.[12]

Nuclear Fission:

When atoms' nuclei are split. Concerning the production of electricity this refers to the splitting of uranium atoms to produce energy.[13]

Renewable Energy:

Refers to a method of producing power that relies on an infinite supply of fuel. Nuclear energy is often called a sustainable energy source, because there is enough uranium in the world to fuel reactors for 100 years or more.[14]

Radiation:

When concerning nuclear waste radiation, it is alpha, beta, or gamma particles emitted by the nucleus of an atom due to the fission process.[15]

Geological Disposal:

Regards placing HLW deep underground in permanently sealed facilities capable of housing said material for an indefinite period of time. The waste can be removed once it is no longer considered dangerous.[16]

Geological repository:

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[11] Ibid
[12] "Backgrounder on Radioactive Waste." United States Nuclear Regulatory Commission - Protecting People and the Environment. April 3, 2015. Accessed November 26, 2017. https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radwaste.html.
[13] Ibid
[14] "FAQ About Nuclear Energy." FAQ About Nuclear Energy - Nuclear Energy Institute. Accessed November 26, 2017. https://www.nei.org/Knowledge-Center/FAQ-About-Nuclear-Energy.
[15] Ibid
[16] "Background information." Background information - West Cumbria MRWS Partnership | Advisory body for higher activity nuclear wastes | Advice on long-term solution for nuclear waste. Accessed November 27, 2017. http://www.westcumbriamrws.org.uk/page/111/Background-information.htm.

An underground facility which is designed to permanently store and secure HLW.[17]

Reactor:

Facilities that split uranium atoms using fusion to create heat; this heat is then used to create steam that pushes turbines and creates electricity.[18]

Nuclear Fuel:

Fissionable material that has been enriched to the point at which it can sustain a chain reaction. This material is then used to power nuclear reactors.[19]

Depleted/Enriched Uranium (DU/EU):

Uranium in nuclear reactors is either depleted or enriched. Enriched uranium is uranium that has been enriched to the point at which it can be used for the production of electricity in nuclear reactors.[20] Depleted Uranium is uranium byproduct that refers to the isotope U-238. It is extremely dense and therefore has engineering applications; it can also be used to dilute highly enriched uranium such as the type in warheads

Background

Radioactive Waste

Radioactive waste has a myriad of negative effects; it can kill people, cause cancer, and irradiate large areas of land.[21] Its handling and treatment must therefore be taken very seriously. Waste is produced in a variety of situations and not all kinds of waste are created equal. LLW, ILW, and HLW all can and should be treated very differently when put in storage. When addressing the problem of nuclear waste, their differences should be taken into account. Obviously the most important and threatening of these kinds of waste is HLW. While LLW and even some ILW may be discarded with little to no treatment, disasters throughout history have proven that HLW must be taken care of with delicate precision.[22]

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[17] Ibid
[18] "FAQ About Nuclear Energy." FAQ About Nuclear Energy - Nuclear Energy Institute. Accessed November 26, 2017. https://www.nei.org/Knowledge-Center/FAQ-About-Nuclear-Energy.
[19] "Nuclear fuel." United States Nuclear Regulatory Commission - Protecting People and the Environment. April 10, 2017. Accessed November 27, 2017. https://www.nrc.gov/reading-rm/basic-ref/glossary/nuclear-fuel.html.
[20] Ibid
[21] "Dirty, Dangerous and Expensive: The Truth About Nuclear Power." Physicians for Social Responsibility. Accessed November 26, 2017. http://www.psr.org/resources/nuclear-power-factsheet.html.
[22] "Backgrounder on Radioactive Waste." United States Nuclear Regulatory Commission - Protecting People and the Environment. April 3, 2015. Accessed November 26, 2017. https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radwaste.html.

Disasters

There have been several accidents through the history of nuclear power production; the most memorable of these serve as an example and reminder of the dangers related to these substances. One of the most dangerous accidents in the history of HLW is the chernobyl accident. It caused thousands of deaths, irradiated huge swaths of land, and displaced over 200,000 people. This accident shows the dangers of mismanaging a radioactive facility.[23] Safety standards today are much higher and it is unlikely such an accident would happen now, however the waste produced in nuclear facilities is still considered to be a danger in the future.[24]

Another important lesson of history is found in the Soviet disaster of Lake Karachay. This lake sat near a facility producing weapons-grade uranium. HLW was stored the nearby lake and few precautions were taken to ensure the safety of workers or the surrounding area. This culminated in a large explosion that, while not a large as the Chernobyl disaster, also caused substantial damage.[25] These failures show the dangers of HLW and its importance in being handled correctly. Most modern facilities are built to avoid these pitfalls, but without long term storage solutions there will always be danger in storing HLW.[26] For more related nuclear disasters visit: http://www.world-nuclear.org/information-library/safety-and-security/safety-of-plants.aspx.

Dangers in the Long Term

The long lifespan of HLW concerns many nations for two main reasons. The first of these is that future societies and governments may have arisen to replace current systems. As HLW lasts for many thousands of years this could happen many times. In the future these governments may be much less careful when handling HLW. This could lead to horrific disasters and puts pressure, especially on unstable nations, to secure their HLW. Concerns of this nature are partly why it may cost so much to build geological storage. Any geological facility constructed will have to be secure enough to not be accessed by future governments.[27] The other main concern governments have over the lifespan of HLW is that of terrorism. If terrorists ever got access to HLW or military grade HLW they could use it to viciously attack any nation. This means any storage facility will also have to be secure to current mining techniques as to avoid being penetrated by seditious modern and future forces.[28]

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[23] "Backgrounder on Radioactive Waste." United States Nuclear Regulatory Commission - Protecting People and the Environment. April 3, 2015. Accessed November 26, 2017. https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radwaste.html.
[24] "FAQ About Nuclear Energy." FAQ About Nuclear Energy - Nuclear Energy Institute. Accessed November 26, 2017. https://www.nei.org/Knowledge-Center/FAQ-About-Nuclear-Energy.
[25] "Mayak Production Association." Nuclear Threat Initiative - Ten Years of Building a Safer World. May 13, 2014. Accessed November 29, 2017. http://www.nti.org/learn/facilities/894/.
[26] "FAQ About Nuclear Energy." FAQ About Nuclear Energy - Nuclear Energy Institute. Accessed November 26, 2017. https://www.nei.org/Knowledge-Center/FAQ-About-Nuclear-Energy.
[27] "Dirty, Dangerous and Expensive: The Truth About Nuclear Power." Physicians for Social Responsibility. Accessed November 26, 2017. http://www.psr.org/resources/nuclear-power-factsheet.html.
[28] Ibid

Key member states and NGOs

Countries that have reactors

Radioactive waste concerns countries that produce LLW, ILW, and HLW, but only HLW is stored in geological facilities. HLW is only produced by nuclear reactors and so these few countries have the most responsibility when it comes to storing nuclear waste.[29] According to the International Atomic Energy Agency, in December of 2016 there were 448 operational reactors and 61 under construction.[30]

Country	Number of Plants in Operation	Number of Plants Under Construction	Country	Number of Plants in Operation	Number of Plants Under Construction
Argentina	3	1	Mexico	2	0
Armenia	1	0	Netherlands	1	0
Belarus	0	2	Pakistan	3	0
Belgium	7	0	România	2	0
Brazil	2	1	Russian Federation	35	7
Bulgaria	2	0	Slovakian Republic	4	2
Canada	19	0	Slovenia	1	0
China	36	21	South Africa	2	0
Czech Republic	6	0	Spain	7	0
Finland	4	1	Sweden	10	0
France	58	1	Switzerland	5	0
Germany	8	0	Taiwan, China	6	2
Hungary	4	0	Ukraine	15	2

[29] "Backgrounder on Radioactive Waste." United States Nuclear Regulatory Commission - Protecting People and the Environment. April 3, 2015. Accessed November 26, 2017. https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radwaste.html.
[30] "Nuclear Power Reactors in the World." Www-pub.iaea.org. 2017. Accessed November 28, 2017. http://www-pub.iaea.org/books/IAEABooks/12237/Nuclear-Power-Reactors-in-the-World-2017-Edition.

India	21	6	United Arab Emirates	0	4
Iran	1	0	United Kingdom	15	0
Japan	43	2	United States	99	4
Republic of Korea	25	3			

[31]

International Atomic Energy Agency (IAEA)

The International Atomic Energy Agency is a body founded by the United Nations to accelerate and enlarge the contribution of atomic energy to peace, health, and prosperity throughout the world. It must do this while in every way possible avoiding the development of nuclear weapons. The organization is authorized, in order to reach its goal, to: encourage and assist research, help fund research, facilitate the exchange of training of scientists, foster international technology sharing, create and deploy safeguards to ensure nuclear research is not put to military purposes, create international safety standards, and acquire any facilities or technology needed to fulfil its goals.[32] The agency has been working towards these goals since 1957 and has been partially successful. The IAEA has several nuclear research facilities and has passed an international treaty on the management and disposal of nuclear waste.[33]

China

China, unlike many other nations, is rapidly expanding its nuclear program. It has 36 nuclear reactors in operation and 21 under construction.[34] As they are constructing so many reactors, China is heavily invested in nuclear power's future. They are a major player in nuclear research and run some of the most well funded nuclear research facilities in the world. China is one of the only nations pushing to develop newer and safer types of nuclear reactors such as thorium reactors. This makes them important in demonstrating the effectiveness of new technologies as they have demonstrated they are willing to invest in them.[35]

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[31] Idib
[32] "The Statute of the IAEA." IAEA. June 02, 2014. Accessed November 28, 2017. https://www.iaea.org/about/statute#a1-2.
[33] "History." IAEA. June 08, 2016. Accessed November 28, 2017. https://www.iaea.org/about/overview/history.
[34] "Nuclear Power Reactors in the World." Www-pub.iaea.org. 2017. Accessed November 28, 2017. http://www-pub.iaea.org/books/IAEABooks/12237/Nuclear-Power-Reactors-in-the-World-2017-Edition.
[35] "Asgard's Fire" The Economist. April 12, 2014. Accessed November 27, 2017. https://www.economist.com/news/science-and-technology/21600656-thorium-element-named-after-norse-god-thunder-may-soon-contribute.

Nuclear Energy Agency (NEA)

The Nuclear Energy Agency is a group of nations that work under the auspices of ECOSOC to seek excellence in nuclear safety, technology, science, environment, and law.[36] The organization's mission statement is “To assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally sound and economical use of nuclear energy for peaceful purposes. It strives to provide authoritative assessments and to forge common understandings on key issues as input to government decisions on nuclear energy policy and to broader OECD analyses in areas such as energy and the sustainable development of low-carbon economies.".[37]

The NEA has 33 members, accounting for approximately 84% of the world's installed nuclear capacity. These members are: Argentina, Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, Norway, Poland, Portugal, Switzerland, Romania, Russia, Slovak Republic, Slovenia, Sweden, Turkey, United Kingdom, United States of America, and Spain.[38]

Timeline of Events

This history of the nuclear waste is heavily related to that of the development of nuclear weapons.

Date	Description of event
29 July, 1957	The International Atomic Energy Agency (IAEA) is created.[39]
13 February, 1960	France conducts its first nuclear test explosion, becoming the world’s fourth nuclear-armed state.[40]
4 December, 1961	The UN General Assembly unanimously approves Resolution 1665.[41]
16 October, 1964	China conducts its first nuclear test explosion and becomes the fifth nuclear power.
1 July, 1968	The nuclear non-proliferation treaty (NPT) is signed.[42]
5 March, 1970	The NPT enters into force with 46 states’ signatures.[43]
1988	The Board on Radioactive Waste Management, with experts from around the

[36] "The Nuclear Energy Agency." Nuclear Energy Agency - About us. October 15, 2017. Accessed November 28, 2017. https://www.oecd-nea.org/general/about/.
[37] Ibid
[38] Ibid
[39] "History." IAEA. June 08, 2016. Accessed November 28, 2017. https://www.iaea.org/about/overview/history.
[40] “Timeline of the NPT,” *Arms Control*, https://www.armscontrol.org/system/files/NPT_Timeline.pdf.
[41] Ibid
[42] Ibid
[43] Ibid

	globe, discusses U.S. policies and programs for managing the nation's spent fuel and high-level waste.[44]
1990	The meeting called by The Board on Radioactive Waste Management produces *Rethinking High-Level Radioactive Waste Disposal*.[45]
11 May, 1995	The NPT is extended indefinitely.[46]
1995	The NEA publishes a report criticising current storage techniques and other safety issues related to HLW.[47]
22 May, 2000	The NPT states-parties agree to a 2000 review conference.[48]
10 January, 2003	North Korea announces its withdrawal from the NPT after a decade long delay.[49]
24 September, 2005	The IAEA finds Iran to not be in compliance with the NPT and three sanctions are implemented on Iran.[50]
9 October, 2006	North Korea conducts its first nuclear test explosion.[51]
24 September, 2009	The UN Security Council unanimously approves Resolution 1887 calling for nations to follow their obligations under the NPT.[52]

UN Involvement, Relevant Resolutions, Treaties and Events

The United Nations (UN) has continually been concerned with the treatment of all kinds of nuclear waste. The UN has been involved for two main reasons, one because peaceful nuclear programs are often linked with military uses of nuclear technology, and two because HLW is a global problem due to its long lasting nature and dangerous properties.[53] In the past the UN has consistently done three main things regarding nuclear development and waste: they have created organisations for monitoring and developing of peaceful nuclear technology,[54] they have produced safety guidelines to

[44] "Read "Disposition of High-Level Radioactive Waste Through Geological Isolation: Development, Current Status, and Technical and Policy Challenges" at NAP.edu." National Academies Press: OpenBook. 1999. Accessed November 28, 2017. https://www.nap.edu/read/9674/chapter/2.
[45] "Timeline of the NPT," *Arms Control*, https://www.armscontrol.org/system/files/NPT_Timeline.pdf.
[46] Ibid
[47] "Read "Disposition of High-Level Radioactive Waste Through Geological Isolation: Development, Current Status, and Technical and Policy Challenges" at NAP.edu." National Academies Press: OpenBook. 1999. Accessed November 28, 2017. https://www.nap.edu/read/9674/chapter/2.
[48] "Timeline of the NPT," *Arms Control*, https://www.armscontrol.org/system/files/NPT_Timeline.pdf.
[49] Ibid
[50] Ibid
[51] Ibid
[52] Ibid
[53] "Timeline of the NPT," *Arms Control*, https://www.armscontrol.org/system/files/NPT_Timeline.pdf.
[54] "History." IAEA. June 08, 2016. Accessed November 28, 2017. https://www.iaea.org/about/overview/history.

ensure safe disposal of HLW and protect worker safety,[55] and finally the security council has enforced its policies on the peaceful use of nuclear technology with sanctions.[56]

- Treaty on the Non-Proliferation of Nuclear Weapons (NPT), 1 July 1968 INFCIRC/140
- Resolution 1373, 28 september 2001 S/RES/1373
- Resolution 1540, 28 april 2004 S/RES/1540
- Prohibition of the dumping of radioactive wastes, 9 January 1995 A/RES/49/75
- Statute of the IAEA, 23 october 1956[57]
- Relationship between disarmament and development, 7 January 1994 A/RES/48/75
- Prohibition of the dumping of radioactive wastes, 11 December 2013 A/RES/68/53
- Report of the International Atomic Energy Agency, 3 November 2013 A//69/L.7/Add.1
- Report of the International Atomic Energy Agency, 4 August 2014 A/69/255
- Resolution 1665, December 1961 A/RES/1665
- Resolution 1887, 24 september 2009 S/RES/1887

Possible Solutions

Expanded Geological Disposal

It is clear HLW must be safely stored in long term geological repositories. In future some organizations and new governments may not handle this waste with proper care, and, as HLW can last for thousands of years, this is a major concern. It would therefore be a good idea, in the long term, to increase the number and availability of large, collective, permanent geological repositories in order to reduce risks.[58]

Availability of Resources

[55] "Read "Disposition of High-Level Radioactive Waste Through Geological Isolation: Development, Current Status, and Technical and Policy Challenges" at NAP.edu." National Academies Press: OpenBook. 1999. Accessed November 28, 2017. https://www.nap.edu/read/9674/chapter/2.

[56] "Timeline of the NPT," *Arms Control*, https://www.armscontrol.org/system/files/NPT_Timeline.pdf.

[57] "Statute." IAEA. June 08, 2016. Accessed November 29, 2017. https://www.iaea.org/about/overview/statute.

[58] Background information." Background information - West Cumbria MRWS Partnership | Advisory body for higher activity nuclear wastes | Advice on long-term solution for nuclear waste. Accessed November 27, 2017. http://www.westcumbriamrws.org.uk/page/111/Background-information.htm.

Increasing financing and access to expertise is a major barrier for some nations in creating effective long term storage of HLW. It would therefore be ideal to make available or mobilize more resources towards creating long term storage solutions.

Increase International Cooperation

For some nations, it can be very expensive to create their own storage facilities. Some international treaties and organizations permit the transfer and sale of HLW but it is generally heavily regulated.[59] Increasing the availability of other nations' storage facilities to those nations lacking such facilities could be an effective way to increase the proper storage of HLW.

Investment in Thorium Reactor Technology to Replace Uranium Reactors

The thorium reactor is a type of nuclear reactor which relies on thorium as a fuel instead of uranium. It produces electricity via a slightly different fission process but is still as, if not more, effective. Thorium reactors are more expensive than current nuclear technology but have two major upsides. The first of these is that HLW produced by thorium reactors only lasts for a few hundred years in comparison with uranium's thousands. This drastically reduces the problems associated with long term storage. The second and perhaps even more important factor is that, while the HLW of uranium reactors can be used to create nuclear fusion and fission weapons, the HLW of thorium reactors has high levels of gamma particles. Gamma particles fry all kinds of electric circuits and this means any HLW of thorium reactors is very difficult to use when producing nuclear weapons. Together these two upsides make thorium a very attractive energy source in comparison to uranium. On the downside, however, thorium reactors do cost more and these reactors are of yet untested on a large commercial scale.[60]

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[59] Picot, Cynthia, Hans Riotte, and Jorge Lang-Lenton Leon. "Sustainable solutions for radioactive waste." OECD Observer. 2001. Accessed November 27, 2017. http://oecdobserver.org/news/fullstory.php/aid/531/Sustainable_solutions_for_radio.

[60] "Asgard's Fire" The Economist. April 12, 2014. Accessed November 27, 2017. https://www.economist.com/news/science-and-technology/21600656-thorium-element-named-after-norse-god-thunder-may-soon-contribute.

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Picot, Cynthia, Hans Riotte, and Jorge Lang-Lenton Leon. "Sustainable solutions for radioactive waste." OECD Observer. 2001. Accessed November 27, 2017. http://oecdobserver.org/news/fullstory.php/aid/531/Sustainable_solutions_for_radio.

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"Mayak Production Association." Nuclear Threat Initiative - Ten Years of Building a Safer World. May 13, 2014. Accessed November 29, 2017. http://www.nti.org/learn/facilities/894/.

Picot, Cynthia, Hans Riotte, and Jorge Lang-Lenton Leon. "Sustainable solutions for radioactive waste." OECD Observer. 2001. Accessed November 27, 2017. http://oecdobserver.org/news/fullstory.php/aid/531/Sustainable_solutions_for_radio.

"FAQ About Nuclear Energy." FAQ About Nuclear Energy - Nuclear Energy Institute. Accessed November 26, 2017. https://www.nei.org/Knowledge-Center/FAQ-About-Nuclear-Energy.