Environmental Committee

Topic A:

The Question of the safe disposal of Uranium

I. Introduction:

For about a century humanity has gained great interest in nuclear power because of its great production of electricity. It is produced through nuclear reactors, which release nuclear energy. In 2013 the International Atomic Energy Agency (IAEA) stated in one of its reports that there are 437 operational nuclear reactors in 31 countries. But not all reactors are used for electricity, as nuclear energy can also be deployed to create nuclear weapons. In addition, there are 140 naval vessels that use nuclear power as their main power source. Now, nuclear reactors provide over 11% of the world's electricity as continuous, reliable base-load power without carbon dioxide emissions. However, nuclear power has some disadvantages. There have been several accidents in nuclear power plants as well as in submarines. These accidents include the Chernobyl disaster, the Three Mile Island accident and the Fukushima Daiichi nuclear disaster. These accidents are fatal not only to the country's economy but also for the country's flora and fauna, as nuclear radiation is highly toxic and it can thus render an entire area uninhabitable for a really long period of time. Of course, it should be noted that nuclear accidents had occurred less times compared to accidents in other major sources of energy generation and this fact keeps these fatalities per unit of energy ratio low; nonetheless, the impact of nuclear accidents is much more severe and deadly than other kinds of accidents. Another disadvantage is that by the production of nuclear energy, nuclear waste is also created. This waste contains radioactive materials and because of that it is hazardous to most forms of life, as well as the environment. That is why many organisations, including the UN, have sought to protect the environment and find solutions in order to support the flora and fauna, and still use nuclear power as it is such a convenient energy source.

II. Definition of key terms:

Nuclear waste: radioactive waste material, for example from the use or reprocessing of nuclear fuel.

IAEA: The International Atomic Energy Agency (IAEA) is an international organization that seeks to promote the peaceful use of nuclear energy, and to inhibit its use for any military purpose, including nuclear weapons.

Cask: A cask is a strong, heavily-shielded, double-walled container

Fuel cycle: The nuclear fuel cycle is the series of industrial processes that involve the production of electricity from uranium in nuclear power reactors.

Deep geological disposition: A deep geological repository is a radioactive waste repository excavated deep within a stable geologic environment (typically below 300 m or 1000 feet).

Uranium: the chemical element of atomic number 92, a dense grey radioactive metal used as a fuel in nuclear reactors.

III. Background information:

Ever since the commercialization of nuclear power plants for the production of electricity for household use, the question of the disposal of nuclear waste has been coming up.

All parts of the nuclear fuel cycle produce some radioactive waste (radiate). Radioactivity naturally decays over time, so radioactive waste has to be isolated and confined in appropriate disposal facilities for a sufficient period until it no longer poses a threat. This study guide will focus on the technical aspects of nuclear waste disposal and the different mechanisms and frameworks already in place. High-level radioactive wastes are the highly radioactive materials produced as a by-product of the reactions that occur inside nuclear reactors. High-level wastes take one of two forms:

- Spent (used) reactor fuel when it is accepted for disposal
- Waste materials remaining after spent fuel is reprocessed

Used nuclear fuel produces ionizing radiation. This type of radiation has a strong ability to penetrate matter, so shielding against the radiation is required. Since used nuclear fuel contains significant quantities of radionuclides with long half-lives, it requires.[1] Intermediate level waste contains higher radioactivity levels than low-level waste. It requires shielding when handled. Intermediate level waste generated during the operation of a nuclear power plant consists mostly of ion exchange resins used to clean the water circulating through the reactor.[2] Low-level waste contains small amounts of radioactivity. This type of waste is generated from hospitals, laboratories, and the industry as well as in every stage of the nuclear fuel cycle, which refers to the series of steps to produce fuel for generating electricity. It can include many kinds of material: paper, rags, tools, clothing, shoe covers, and filters. It can also include fireproof fabrics and protective plastic sheeting used in maintenance, long-term management, and isolation.[3]

Nuclear waste management

United States Nuclear Regulatory Commission Canadian Nuclear Safety Commission International Atomic Energy Agency

When addressing the issue of management of nuclear waste management, countries need to consider both the transport and storage of radioactive waste. Like all industries, the thermal generation of electricity produces wastes. Whatever fuel is used, these wastes must be managed in ways that safeguard human health and minimize their impact on the environment.

Transport

The methods of transportation vary between the different member states. For instance, these are the different components used to transport used nuclear fuel in the United States. Transporting nuclear waste requires a sturdy container that can shield from radioactivity. A specially designed container called a cask is used. There are different cask types for different purposes, but they all have a similar overall design to maximize the containment of radioactivity[4]

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[1] International Atomic Energy Agency International Atomic Energy Agency, and Iaea. “Official Web Site of the IAEA.” *International Atomic Energy Agency (IAEA)*, International Atomic Energy Agency (IAEA), 14 Oct. 2019, www.iaea.org/.

[2] International Atomic Energy AgencyInternational Atomic Energy Agency, and Iaea. “Official Web Site of the IAEA.” *International Atomic Energy Agency (IAEA)*, International Atomic Energy Agency (IAEA), 14 Oct. 2019, www.iaea.org/.

[3] Canadian Nuclear Safety Commission

[4] Nuclear Regulatory Commission (USA) “Radioactive Waste.” *United States Nuclear Regulatory Commission - Protecting People and the Environment*, www.nrc.gov/waste.html.

Nuclear Regulatory Commission (USA)

A cask is a strong, heavily-shielded, double-walled container. The outer structure is of several inches of high-strength steel. The inner structure is usually made of steel as well. Casks meant to transport used nuclear fuel assemblies have a rack of square openings in this inner structure to provide support for those assemblies. If the cask is being used for transporting used nuclear fuel assemblies, the rack may also contain neutron-absorbing materials to safeguard against the unlikely event of a nuclear chain reaction. For transporting used nuclear fuel assemblies, the inner canister is dried and filled with an inert gas (usually helium) to prevent long-term corrosion of the fuel assemblies. The casks also usually feature several inches of lead or depleted uranium (which is not radioactive) between the inner and outer structures to provide gamma-ray shielding. The inner canister is then sealed, preventing any release of radioactive material. Large honeycomb structures made of wood, foam, or aluminum are placed on the ends of the casks to absorb the force the cask would experience in the event of a drop.[5] The International Atomic Energy Agency (IAEA) has clear standards of compliance for the transport of such material. Regulations for the Safe Transport of Radioactive Materials (SSR-6) are applicable to the national and international carriage of radioactive material by all modes of transport.[6]

Near-surface disposal

The International Atomic Energy Agency (IAEA) definition of this option is the disposal of waste, with or without engineered barriers, in:

Near-surface disposal facilities at ground level. These facilities are on or below the surface where the protective covering is of the order of a few meters thick. Waste containers are placed in constructed vaults and when full the vaults are backfilled. Eventually, they will be covered and capped with an impermeable membrane and topsoil. These facilities may incorporate some form of drainage and possibly a gas venting system.

Near-surface disposal facilities in caverns below ground level. Unlike near-surface disposal at ground level where the excavations are conducted from the surface, shallow

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[5] Center for Nuclear Science and Technology Information

[6] Nuclear Regulatory Commission (USA) “Radioactive Waste.” *United States Nuclear Regulatory Commission - Protecting People and the Environment*, www.nrc.gov/waste.html.

disposal requires underground excavation of caverns but the facility is at a depth of several tens of meters below the Earth's surface and accessed through a drift.

Deep geological disposal

The long timescales over which some of the waste remains radioactive led to the idea of deep geological disposal in underground repositories in stable geological formations. Isolation is provided by a combination of engineered and natural barriers (rock, salt, clay) and no obligation to actively maintain the facility is passed on to future generations. This is often termed a multi-barrier concept, with the waste packaging, the engineered repository and the geology all providing barriers to prevent the radionuclides from reaching humans and the environment. In addition, deep groundwater is generally devoid of oxygen.

IV. Previous attempts at solving the issue:

Treaty on the prohibition of the dumping of radioactive wastes:
Requests the Conference on Disarmament to take into account, in the negotiations for a convention on the prohibition of radiological weapons, radioactive wastes as part of the scope of such a convention; also requests the Conference on Disarmament to intensify efforts towards an early conclusion of such a convention and to include in its report to the General Assembly at its 58th session the progress recorded in the negotiations on this subject; appeals to all Member States that have not yet taken the necessary steps to become party to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management to do so in time to attend the 1st Review Meeting of the Contracting Parties.[7]

V. Agencies involved:

The International Atomic Energy Agency works with its member states and multiple partners worldwide to promote the safe, secure and peaceful use of nuclear technologies. The IAEA's relationship with the United Nations is guided by an agreement signed in 1957. It stipulates that:

[7] DISEC and 'Final Document' 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (2010) NPT/CONF.2010/50

“The Agency undertakes to conduct its activities in accordance with the Purposes and Principles of the United Nations Charter to promote peace and international cooperation, and in conformity with the policies of the United Nations furthering the establishment of safeguarded worldwide disarmament and in conformity with any international agreements entered into pursuant to such policies

VI. Main countries involved:

Total Membership: 168 (as of February 2016)[8]

In the list below, the year denotes the year of membership. The names of States are not necessarily their historical designations.

• 1957: Afghanistan, Albania, Argentina, Australia, Austria, Belarus, Brazil, Bulgaria, Canada, Cuba, Denmark, Dominican Republic, Egypt, El Salvador, Ethiopia, France, Germany, Greece, Guatemala, Haiti, Holy See, Hungary, Iceland, India, Indonesia, Israel, Italy, Japan, Republic of Korea, Monaco, Morocco, Myanmar, Netherlands, New Zealand, Norway, Pakistan, Paraguay, Peru, Poland, Portugal, Romania, Russian Federation, Socialist Federal Rep. of Yugoslavia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Tunisia, Turkey, Ukraine, United Kingdom, United States, Venezuela, Viet Nam
• 1958: Belgium, Ecuador, Finland, Iran, Luxembourg, Mexico, Philippines, Sudan
• 1959: Iraq
• 1960: Chile, Colombia, Ghana, Senegal
• 1961: Lebanon, Mali, Democratic Republic of the Congo
• 1962: Liberia, Saudi Arabia
• 1963: Algeria, Bolivia, Côte d'Ivoire, Libya, Syria, Uruguay
• 1964: Cameroon, Gabon, Kuwait, Nigeria
• 1965: Costa Rica, Cyprus, Jamaica, Kenya, Madagascar
• 1966: Jordan, Panama
• 1967: Sierra Leone, Singapore, Uganda
• 1968: Liechtenstein
• 1969: Malaysia, Niger, Zambia
• 1970: Ireland
• 1972: Bangladesh

[8] IAEA list of members as of 2019 iaea.org/about/governance/list-of-member-states

• 1973: Mongolia
• 1974: Mauritius
• 1976: Qatar, United Arab Emirates, Tanzania
• 1977: Nicaragua
• 1983: Namibia
• 1984: China
• 1986: Zimbabwe
• 1992: Estonia, Slovenia
• 1993: Armenia, Croatia, Czech Republic, Lithuania, Slovakia
• 1994: The former Yugoslav Republic of Macedonia, Kazakhstan, Marshall Islands, Uzbekistan, Yemen
• 1995: Bosnia and Herzegovina
• 1996: Georgia
• 1997: Latvia, Malta, Moldova
• 1998: Burkina Faso
• 1999: Angola, Benin
• 2000: Tajikistan
• 2001: Azerbaijan, Central African Republic, Serbia
• 2002: Eritrea, Botswana
• 2003: Honduras, Seychelles, Kyrgyzstan
• 2004: Mauritania
• 2005: Chad
• 2006: Belize, Malawi, Montenegro, Mozambique
• 2007: Cabo Verde
• 2008: Nepal, Palau
• 2009: Bahrain, Burundi, Cambodia, Congo, Lesotho, Oman
• 2011: Lao People's Democratic Republic, Tonga
• 2012: Dominica, Fiji, Papua New Guinea, Rwanda, Togo, Trinidad and Tobago
• 2013: San Marino, Swaziland
• 2014: Bahamas, Brunei Darussalam, Comoros*
• 2015: Djibouti, Guyana, Vanuatu, Antigua and Barbuda, Barbados
• 2016: Saint Lucia, Saint Vincent and the Grenadines, The Gambia, Turkmenistan[9]

[9] IAEA list of members as of 2019 iaea.org/about/governance/list-of-member-states

Works Cited List

Berlin Information-center for Transatlantic Security, NATO Nuclear Sharing and the NPT-Questions to be Answered (PENN Research Note 97.3 1997) < http://www.bits.de/public/researchnote/rn97-3.htm>

Dupont P, 'Compliance with Treaties in the Context of Nuclear Nonproliferation: Assessing Claims in the Case of Iran' (2013) Journal of Conflict and Security Law

D Joyner, 'The Security Council as a Legal Hegemon' (2012) Georgetown Journal of International Law

EU Non-Proliferation Consortium, The NPT Review Process and Strengthening The Treaty: Peaceful Uses (Non-Proliferation Papers No. 11 2012) <https://www.sipri.org/sites/default/files/0000116074EUNPC_no -11.pdf>
un.org

'Final Document' 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (2010) NPT/CONF.2010/50
'Statement by The Islamic Republic of Iran on Nuclear Disarmament and Negative Security Assurances' 2010 NPT Review Conference (7 May 2010) at 4 < http://www.nti.org/media/pdfs/2010_iran.pdf?_=1316720364>

'Final Document' 1995 Review and Extension Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (1995) NPT/CONF.1995/32
'Challenges of non-proliferation non-compliance' Preparatory Committee for the 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (3 May 2007)

Fuhrmann M, 'Do Arms Control Treaties Work?' (2015) International Studies Quarterly < file:///C:/Users/Lomakovych/Downloads/Fuhrmann%20Lupu%2 0NPT. pdf>

Hard Copy: Council on Foreign Relations, Strengthening the Nuclear Nonproliferation Regime (Council Special Report No.54 2010)

International Atomic Energy Agency, and Iaea. "Official Web Site of the IAEA." *International Atomic Energy Agency (IAEA)*, International Atomic Energy Agency (IAEA), 14 Oct. 2019, www.iaea.org/.

International Atomic Energy Agency, and Iaea. "Official Web Site of the IAEA." *International Atomic Energy Agency (IAEA)*, International Atomic Energy Agency (IAEA), 14 Oct. 2019, www.iaea.org/.

Pillars-of-theNuclear-Non-proliferation-Regime-09.12.pdf>

“Radioactive Waste.” *United States Nuclear Regulatory Commission - Protecting People and the Environment*, www.nrc.gov/waste.html.

Siracusa S, ‘The Eight Pillars of the Nuclear Non-Proliferation Regime and the Search for Global Security’ (2012) Global Policy Essay file:///C:/Users/Lomakovych/Downloads/Siracusa-Eight-

Wissenschaft und Politik < http://www.swpberlin.org/fileadmin/contents/products/arbeitspapiere/mro_wp_ NVV_October2015.pd f>