-STUDY GUIDE-

Y-MUN TRAINING DEVELOPMENT CONFERENCE

IAEA

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1. Letter from the Secretary-General

Esteemed delegates of International Atomic Energy Agency,

It is with great pleasure that I welcome you all to the 10th edition of Yeditepe Model United Nations Training and Development Conference as the Secretary-General. Organized by the oldest Model United Nations Club in Turkey, every year we try to use our knowledge to provide our participants with an exceptional MUN experience.

Being aware of the current issues that our world is facing, Y-MUN 2017 will simulate 16 different committees. Most of the committees aim to give our participants a demonstration of the world's most urgent problems while some special committees will take you to the past to simulate some crucial events. With our brilliant Academic Team, we are working to provide you the finest academic experience.

In IAEA, the delegates will focus on an issue that gets more important every day with the growing importance of nuclear matters. I would like to thank Mr. Cengizhan Gergef who worked very hard for this committee. Lastly, I would like to give my thanks to my Deputy Secretary-General Mr. Uygar Berk Edebali who supported me greatly during this process and also Mr. Onuralp Acar and his deputies Ms. Dilruba Akçınar and Mr. Ömer Cem Sipahi for their work in creating this amazing conference.

Welcome where the journey begins!

Ege SÜREK
Secretary-General of Y-MUN 2017

2. Letter from the Under Secretary-General

Most esteemed participants,

To start with, it is my utmost pleasure to welcome you all to Yeditepe Model United Nations Training and Development Conference and also to the International Atomic Energy Agency committee. My name is Cengizhan Gergef, I am a junior student at Marmara University, studying Political Science and International Relations. I am honoured to serve as the Under Secretary-General responsible for the International Atomic Energy Agency committee in this edition of Yeditepe Model United Nations Training and Development Conference. International Atomic Energy Agency is an intergovernmental organization that was created with the aim of creating an environment of cooperation in the field of usage of nuclear means. In this simulation of International Atomic Energy Agency committee, the delegates will discuss the management of the radioactive waste and spent fuel with the aim of creating a common basis that will benefit the whole world in the age of globalization.

To end my letter, I would like to wish you the best of luck during the committee, with the hope that I succeeded in creating the best possible guidelines for you in the study guide. When the first day of the conference, you will have the duty to finish the work that I started. As a last remark, I would like to thank our Secretary General Ms. Ege Sürek and her deputy Mr. Uygar Berk Edebali for giving me the chance to serve as an Under Secretary-General.

Best Regards,

Cengizhan Gergef

Under Secretary General responsible for IAEA

3. Introduction to Agenda Item: Management of the radioactive waste and spent fuel

a. What is “radioactive waste?”

Radioactive waste can be simply defined as the type of waste which contains materials that are radioactive. Since it includes radioactivity, it is easy to say that radioactive wastes are hazardous. This kind of waste is considered to be dangerous and unsafe simply because it may cause severe damage to individuals or furtherly, the environment. Hence, it is crucial to keep radioactive waste in appropriate facilities to an extend that it will not cause any harm or threat to the environment or the individuals. However, a universal code has not been successfully found for the disposal of such wastes. Therefore, International Atomic Agency has established the Joint Convention on the Safety of Radioactive Waste Management which will be introduced later in this paper. Management of the radioactive waste is the point of discussion for International Atomic Energy Agency. It holds utmost importance to dispose of those wastes in such conditions that they will not harm the environment and/or will not possess any radioactivity to the place that they are contained in. As a last point for the introduction, it can be useful to quote a local from Braunschweig, Germany:

“Nobody wants to have the waste, but everyone wants energy.”

b. Types of radioactive waste

World Nuclear Association defines and categorizes the types of radioactive as:

The term, "radioactive waste” is any material that is either intrinsically radioactive, or has been contaminated by radioactivity, and that is no longer usable. Governments are the ones that create policies regarding the decision of whether some materials – such as used nuclear fuel and plutonium – should be categorized as waste.

Every radionuclide has a half-life – the time taken for half of its atoms to decay, and thus for it to lose half of its radioactivity. Radionuclides with long half-lives tend to be alpha and beta emitters – making their handling easier – while those with short half-lives tend to emit the more penetrating gamma rays. Eventually, all radioactive waste decays into non-radioactive elements. The more radioactive an isotope is, the faster it decays. Radioactive waste is typically classified as either low-level (LLW), intermediate-level (ILW), or high-level (HLW), dependent, primarily, on its level of radioactivity.

Low-level waste

Low-level waste (LLW) has a radioactive content not exceeding four giga-becquerels per tonne (GBq/t) of alpha activity or 12 GBq/t beta-gamma activity. LLW does not require shielding during handling and transport and is suitable for disposal in near-surface facilities. LLW is generated from hospitals and industry, as well as the nuclear fuel cycle. It comprises paper, rags, tools, clothing, filters, etc., which contain small amounts of mostly short-lived radioactivity. To reduce its volume, LLW is often compacted or incinerated before disposal. LLW comprises some 90% of the volume but only 1% of the radioactivity of all radioactive waste.

Intermediate-level waste

Intermediate-level waste (ILW) is more radioactive than LLW, but the heat it generates (<2 kW/m3) is not sufficient to be taken into account in the design or selection of storage and disposal facilities. Due to its higher levels of radioactivity, ILW requires some shielding.ILW typically comprises resins, chemical sludges, and metal fuel cladding, as well as contaminated materials from reactor decommissioning. Smaller items and any non-solids may be solidified in

concrete or bitumen for disposal. It makes up some 7% of the volume and has 4% of the radioactivity of all radioactive waste.

High-level waste

High-level waste (HLW) is sufficiently radioactive for its decay heat to increase its temperature, and the temperature of its surroundings, significantly. As a result, HLW requires cooling and shielding. HLW arises from the 'burning' of uranium fuel in a nuclear reactor. HLW accounts for just 3% of the volume, but 95% of the total radioactivity of produced waste. There are two distinct kinds of HLW: Used fuel that has been designated as waste and separated waste from reprocessing of used fuel. HLW has both long-lived and short-lived components, depending on the length of time it will take for the radioactivity of particular radionuclides to decrease to levels that are considered non-hazardous for people and the surrounding environment. If short-lived fission products can be separated from long-lived actinides, this distinction becomes important in management and disposal of HLW.HLW is the focus of significant attention regarding nuclear power and is managed accordingly.

Very low-level waste

Exempt waste and very low-level waste (VLLW) contains radioactive materials at a level which is not considered harmful to people or the surrounding environment. It consists mainly of demolished material (such as concrete, plaster, bricks, metal, valves, piping, etc.) produced during rehabilitation or dismantling operations on nuclear industrial sites. Other industries, such as food processing, chemical, steel, etc., also produce VLLW as a result of the concentration of natural radioactivity present in certain minerals used in their manufacturing processes. The waste

is therefore disposed of with domestic refuse, although countries such as France are currently developing specifically designed VLLW disposal facilities. [1]

c. What is "spent fuel?"

Spent fuel can be simply defined as the fuel that was exposed to radiation in a nuclear reactor, making it "spent" because it will not be useful as a resource to power up nuclear reactors. Likewise, with the works of IAEA on radioactive waste, there is the Joint Convention on the Safety of Spent Fuel Management.

d. Differentiation between "spent fuel" and "radioactive waste."

Although the two terms, spent fuel and radioactive waste, are used interchangeably quite often. This usage can be problematic because the main difference between the two terms is the fact that although spent fuel is the most common type of radioactive waste, the term "radioactive waste" contains many more types of waste within itself. This differentiation is crucial for finding proper solutions and ways for the disposal of radioactive waste

e. What is the importance of radioactive waste disposal/management?

Radioactive waste and spent fuel are simply, as their name stand, radioactive. Hence, since radioactivity is a harm to nature or individuals, their disposal must have nearly perfect regulations and controls. With regards to this matter, a universal code has not been found to regulate every country or company to hold conditions for their disposal processes likewise. The

[1] Types of Radioactive Waste <http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-wastes/radioactive-waste-management.aspx>

duty of IAEA is to find common ground that will benefit all of the member states upon this management matter, especially those who are developing and are in struggle.

f. Radioactive Waste – the question of storage and disposal[2]

Waste Type	Disposal Option	Examples
LLW and short-lived ILW	Near-surface disposal	Czech Republic, Finland, France, Japan, Netherlands, Spain, Sweden, UK, and USA
Long-lived ILW and HLW (including used fuel)	Deep geological disposal	Canada, France, Sweden, Finland, and UK and USA

As the table suggests, there are two common options of disposal, first one being near-surface disposal, applicable for LLWs and short-lived ILWs and the second one being the deep geological disposal that is more useful for long-lived for ILWs and HLWs, including used fuel. The first disposal option can be defined in two types, near-surface facilities at ground level and near-surface disposal facilities in caverns below ground level.

4. Past Efforts and Works of IAEA

a. The Disposal of Radioactive Waste on Land (1955)

In September 1955, there was a conference which was held at Princeton to discuss the question of "How should the disposal of radioactive waste be?" was addressed between representatives of AEC, members of the Department of Sanitary Engineering of Johns Hopkins, representatives of the U.S. Geological Survey, industry and many individual scientists competent

[2] Storage and Disposal of Radioactive Waste <http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-wastes/storage-and-disposal-of-radioactive-wastes.aspx>

in relevant fields. The meeting resulted in the conclusion of the relevant plan was to elaborate the possibilities of disposing of radioactive waste materials on land, alongside the indication of research needed to determine the feasibility.[3]

b. Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (1997)

The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management was adopted in Vienna on 5 September 1997. It is the first legal entity to mention the problem of the safety of spent fuel and radioactive waste management, at least the one that surpasses its border more than the regional ones. It does that by setting international benchmarks and establishing a likely "peer review" process to the Convention on Nuclear Safety.

The Convention applies to spent fuel resulting from the operation of civilian nuclear reactors and to radioactive waste resulting from civilian applications. It also applies to spent fuel and radioactive waste from military or defense programmes if such materials are transferred permanently to and managed within exclusively civilian programmes, or when declared as spent fuel or radioactive waste for the purpose of the Convention by the Contracting Party concerned. [4]

c. Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS)

ARTEMIS is a service that is for reviewing the programmes of radioactive waste and

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[3] Report on Disposal of Radioactive Waste on Land <https://www.ncbi.nlm.nih.gov/books/NBK208700/>

[4] Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management <https://www.iaea.org/topics/nuclear-safety-conventions>

spent fuel management, decommissioning and remediation of facility operators and organizations that are responsible for aforementioned programmes of member-states.

ARTEMIS reviews offer many benefits to the Member State and its organizations:

- Improvement in organizational performances;
- Furthered safety, optimal operations, and lower costs;
- More transparency and stakeholder confidence, including with the general public
- Enhanced credibility of decision-making procedures from expert technical and programme perspectives.[5]

As can be seen, ARTEMIS is a brilliant programme that is designated for the members of IAEA to enable them to check the organizations that are responsible for its programmes, on the basis that is based on expert opinion. Therefore, ARTEMIS can be furthered into something more than it is, perhapsively with new decision-making processes.

d. Radioactive Waste Management Advisory Programme (WAMAP)

WAMAP is an initiative that is taken in 1987 for helping the developing countries for radioactive waste management processes of theirs. Within WAMAP, IAEA advises member-states that are seeking assistance for furthering their radioactive waste management systems. Work of WAMAP for the developing countries is shown in Table 1.1.

[5] Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS) <https://www.iaea.org/services/review-missions/integrated-review-service-for-radioactive-waste-and-spent-fuel-management-decommissioning-and-remediation-artemis>

Technical assistance to Member States in radioactive waste management				
	Expert assistance of project officer	Advice on assignment of experts	Advice on equipment procurements	Fellowships/ scientific visits
Algeria	X	X	X	X
Bangladesh	X	X	X	X
Bulgaria	X	X	X	X
Chile	X	X	X	X
China	X	X	X	X
Cameroon	X	X		X
Egypt	X	X	X	X
Indonesia	X	X	X	X
Republic of Korea	X	X	X	X
Peru	X	X	X	X
Philippines	X	X	X	X
Portugal	X	X		
Syria	X	X	X	X
Thailand	X	X	X	X
Turkey	X	X	X	X

Table 1.1[6]

5. Radioactive Waste Management Case Studies

In some countries that are developing, there are many issues that can be addressed and solved by IAEA, especially for infrastructural and financial means.

a. Case of India

As for the nuclear power missions and radioactive waste management programmes of India, as a summary, India has achieved establishing self-reliance regarding its aforementioned programmes, but the main problem for India is the financial part of it. To further upgrade its technological infrastructure, India lacks the necessary monetary means.

b. Integrated Nuclear Infrastructure Review (INIR) Missions

IAEA Deputy Director-General Mikhail Chudakov has stated that INIR missions are the

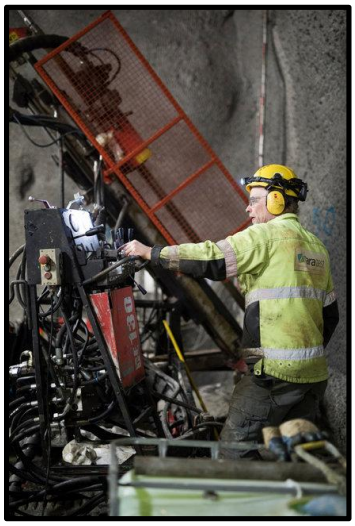
[6] Radioactive waste management in developing countries <https://www.iaea.org/sites/default/files/publications/magazines/bulletin/bull31-4/31404683236.pdf>

best option for the member-states that are wishing to enhance their nuclear infrastructure. Since 2009, there were 17 INIR missions in 13 different countries, which are shown in Table 1.2. As can be imagined, INIR missions are providing comprehensive reviews to member-states that are more or less developing, to enable them to enhance their know-how in the nuclear infrastructure.

No.	Country	INIR mission	Year
1	Jordan	Phase 1&2	2009
2	Indonesia	Phase 1	2009
3	Vietnam	Phase 1	2009
4	Thailand	Phase 1	2010
5	UAE	Phase 2	2011
6	Bangladesh	Phase 1&2	2011
7	Jordan	Follow-up	2012
8	Vietnam	Phase 2	2012
9	Belarus	Phase 1&2	2012
10	South Africa	Phase 2	2013
11	Poland	Phase 1	2013
12	Turkey	Phase 2	2013
13	Jordan	Phase 2	2014
14	Vietnam	Follow-up	2014

Table 1.2

c. Case of Finland (Burying the Waste)



In the case of radioactive waste management, Finland is basically centuries ahead of other nations. The main feature of Finland's waste management programme is the fact that they literally bury the waste in the ground, with a protection layer of 2-inch-thick copper. Another nice feature of their programme was the fact that consensus was searched among each community that was living near to the repository

locations. This exercise was a result of the experience of the ones that are responsible for the selection process of sites, leading to the exercise of consulting to the locals.

d. Ocean Dumping

Ocean disposal of radioactive waste has been a mean of disposal that was used by fourteen different countries, between 1946 and 1993 debates upon the rightfulness of ocean disposal were there, focusing on whether the disposal was safe or not. In 1993, ocean dumping was banned with several treaties, but there still are suspicions upon some countries on their probability of using ocean disposal as a mean of radioactive waste management.

6. Conclusion

In conclusion, International Atomic Energy Agency is expected to come up with possible resolutions that will lead the member-states, especially for the developing ones, to further the cooperation among them. Also, IAEA must come up with terms that will lead to a regulation of a strong balance among the member-states to decrease the harm that the developing member-states suffer from. Most importantly, the representatives of member states must come up with resolutions that will lead the member-states to have and possess better means regarding the radioactive waste and used fuel management.

7. Questions that a resolution should answer

- How shall be the disposal and management of radioactive wastes and spent fuel be done?
- Can the disposal and management of radioactive wastes and spent fuels have a regulatory basis between the member states of IAEA?
- If there is a strict regulatory basis for the disposal and management of radioactive wastes and spent fuels, what shall be the rules?
- If there is a strict regulatory basis for the disposal and management of radioactive wastes and spent fuels, what will be done to check and regulate the programmes of member states?
- If there is a strict regulatory basis for the disposal and management of radioactive wastes and spent fuels, what can be done if a member state does not comply with the regulations?
- How can the work of WAMAP be altered/furthered? What will be the financial basis of further help to developing member states?
- How can the Joint Conventions be ensured/assured?
- Can the work of ARTEMIS be altered/furthered?