



Dear Delegates,

Welcome to the committee for United Nations Environment Programme of the 10th MIT Model United Nations Conference. In the midst of an international atmosphere full of tension and controversy, we are excited to debate some of the most pressing issues of global energy policy. Hydraulic fracturing in the arctic is the source of major environmental concerns and political controversies, while the use of nuclear power continues to be a heated topic across the globe.

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See you in Cambridge!

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1 Topic A: Nuclear Power as a Sustainable, Non-Renewable Source of Energy

Global energy consumption has been rising steadily since 1971. The rate of increase is slowing down, still, it is projected to expand by 30% between today and 2040. (International Energy Agency) The proportion of non-renewable sources — oil, coal, and natural gas — is decreasing but they are responsible for the majority (over 80%) of energy production (International Energy Agency) and will do so in the next three decades. (International Energy Agency) Renewable energy use is rising fast, capturing two-thirds of all investment in power plants and 40% of the rise in global energy demand. (International Energy Agency)

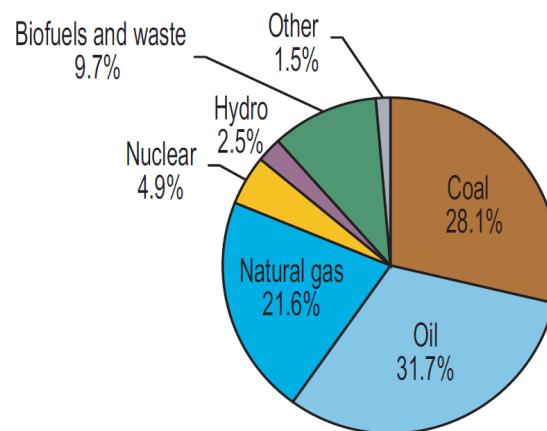


Figure 1 Fuel shares of world Total Primary Energy Supply in 2015

Nuclear power is generally considered a non-renewable source of energy; however, it is one of the most efficient and sustainable methods of electricity generation. It accounts for almost 5% of the total primary energy supply (International Energy Agency), and while nuclear energy consumption decreased between 2006 and 2012, it has been increasing again since then. (BP) It's projected to expand further in the next 30 years, with China overtaking the United States as the world's largest producer of nuclear electricity by 2030. (International Energy Agency) With recent developments, such as the Fukushima catastrophe (<http://www.bbc.com/news/world-asia-pacific->

12720219) and the radioactive leak in the Russian Federation (Luxmoore and Cowell), now it is more important than ever to reconsider the implications of the use of nuclear energy.

2 Definition of Key Terms

2.1 Energy Consumption and Supply

Total Final Energy Consumption (TFC) is understood to mean the total amount of energy used by humanity (or the entity being referred to), including all industrial and technological sectors. It is usually a measure of end-use energy. Direct biomass (food) consumption by humans is not included in it. (International Energy Agency)

Total Primary Energy Supply (TPES) is understood to mean the total amount of energy produced by power plants across the world (or the entity being referred to), taking into account the change in the amount of stored energy. It is closely related to TFC, but it doesn't account for conversion efficiency; therefore, it gives larger weight to energy sources with low conversion efficiency such as coal, and smaller weight to sources that are accounted for in already converted forms, like hydroelectricity. (International Energy Agency)

2.2 Nuclear Power

Nuclear Power is the use of nuclear reactions to produce energy. Current power plants are almost all based on nuclear fission with some using nuclear decay (radioisotope thermoelectric generators), and convert the released thermal energy into electricity. Geothermal energy, which harnesses the thermal radiation from the Earth's crust has nuclear decay as one of its sources, but it is normally not considered part of nuclear power, rather, interestingly, renewable energy.

3 Overview of the Issue

3.1 Nuclear Power Generation

Nuclear energy is considered one of the cleanest sources of electricity. At 12 g CO₂/year (median), it causes lower greenhouse gas emissions throughout its lifecycle than any of the commercially available non-renewable or renewable energy sources (except for onshore wind turbines). (Schlömer, Bruckner and Fulton) Nuclear plants are also able to provide stable, continuous power, opposed to many renewable sources, like wind, solar (photovoltaic), or (part of) hydroelectric, which are intermittent sources.

3.2 Storage of Radioactive Waste

One of the main concerns related to nuclear power generation is the radioactive waste generated as by-product. Part of it is created during the processing of uranium ores into nuclear fuel; depleted fuel cells comprise the rest. While these substances contain isotopes that emit radiation for hundreds of thousands, or even millions of years, there exist technologies which can be used to recycle them (convert them to usable nuclear fuel), e.g. breeder reactors and reprocessing plants.

3.3 Nuclear Accidents

There have been numerous accidents involving nuclear power plants and other related facilities. The most severe incidents to date have been the Chernobyl and the Fukushima nuclear reactor core meltdowns. The former was caused by human error, the latter by a natural disaster (the 2011 earthquake and tsunami in Japan). While continuous effort is made to improve the security and resilience of nuclear plants, concern about the wide negative effect of nuclear accidents releasing large amounts of radioactive contaminants remains.

3.4 Production of Nuclear Weapons

Since many of the facilities used to produce fuel for the nuclear reactors can also be used to produce materials required for nuclear explosives, there has been an effort to restrict their operation. Such efforts are the International Framework for Nuclear Energy Cooperation (formerly Global Nuclear Energy Partnership) (International Framework for Nuclear Energy Energy Cooperation) and the EURODIF (EURODIF Production: Natural Uranium Enrichment).

3.5 Future of Nuclear Power

While there are many ongoing efforts to improve the current reactors, there are also promising new technologies. One of these are fourth generation fission reactors (Hansen), hybrid fission-fusion (Gerstner), and pure fusion reactors (Hamacher and Bradshaw).

4 Major Parties Involved and their Views

4.1 European Union

The nuclear energy policy of the European Union (EU) is defined and represented by the European Atomic Energy Community (Euratom), which is a legally separate entity from the EU but is governed by EU's institutions (Nuclear Energy). At the same time, making decisions about many aspects of energy policy remain in the power of individual member states. Germany is looking to phase out nuclear energy entirely by 2022. In France, nuclear power accounts for more than 75% of the country's electricity production; however, in 2015, the French National Assembly voted that by 2025 only 50% of France's electricity will be provided by nuclear power plants (World Nuclear News). On the contrary, the United Kingdom is planning to expand its nuclear plants and build new ones, potentially raising the share of this source in the national electricity production from around 20% to a quarter by 2035 (National Audit Office). (Following a referendum in 2016 about leaving the EU, the British government notified Euratom of its intention to withdraw from the organization.)

4.2 The United States of America

In the USA, most nuclear power plants are operated by private companies, however, the government is heavily involved in civilian use by establishing policies and requirements. The USA is steadily expanding its nuclear power generation capacity, as an effort to diversify its energy portfolio and move away from non-renewable sources with high carbon footprint.

4.3 China

China has one of the fastest-growing networks of nuclear power plants. 37 are in operation, about 20 are under construction, and more are planned to start construction (World Nuclear Association).

4.4 Russian Federation

The Russian Federation aims to reduce the use of fossil fuels by doubling the nuclear power generation, which currently provides just over 15% of its total power supply.

4.5 India

India aimed to increase the total amount of electricity 8-fold by 2032 (relative to the 2016 level), however, this plan met widespread resistance following the Fukushima disaster.

4.6 Iran

In Iran, nuclear power is only a minor component of the energy production, providing around 4%. However, it has been a continuing concern that Iran is using its uranium enrichment facilities for the development of nuclear weapons.

5 Previous Actions Taken

Nuclear power policy is subject to continuous debate among governments and international organizations. Both the UN Environment Programme and the International Atomic Energy Agency (which signed a Practical Arrangement on collaboration in November 2014) have published a substantial amount of research and recommendations on the issue.

Major conferences about energy policy and climate change also generally address the issue of civilian nuclear power production. The United Nations Climate Change Conference 2015 in Paris (COP21) underlined the importance of nuclear energy as one of the major tools to reduce CO₂ emission globally. (Conca)

6 Relevant UN Documents

1. The United Nations' 17 Sustainable Development Goals:

<http://www.un.org/sustainabledevelopment/>

2. UN General Assembly resolution supporting IAEA's work on nuclear safety:

<https://www.un.org/press/en/2013/ga11449.doc.htm>

3. The IAEA Action Plan on Nuclear Safety:

<https://www.iaea.org/sites/default/files/actionplanns.pdf>

7 Topic B: Hydraulic Fracturing

Humanity's demand for all types of energy is growing. Even under more conservative scenarios, the IEA projects that global energy needs would still expand by 30% between today and 2040. Although investment in renewable energy is growing extremely fast (more so than all other sources), oil, natural gas and coal will remain the major sources of energy. Energy is a key pillar upon which most economic activity depends, and thus our reliance on it and our ever-growing needs push people both to seek new sources and to discover new methods of extracting resources in more cost-efficient ways. In particular, when non-renewable resources are trapped in the earth's crust, people invent newer, safer, or cheaper ways for their harvesting. Hydraulic fracturing is one of the innovative ways that is growing in popularity, which calls for an in-depth analysis to assess its benefits as well as its negative externalities.

Though the Arctic Circle may seem a remote place of inactivity that will never affect us, it is a big territory of unexplored assets. Nonetheless, we have to think about the environment and how such extraction might affect our lives. Climate change has been a hot topic of debate over the past decades and its impacts are present in our daily lives. Unfortunately, unsafe hydraulic fracturing, especially in a region as susceptible to harm as the Arctic, may lead to some catastrophic global consequences.

8 Definition of Key Terms

8.1 Sustainable Development

Sustainable development is frequently defined as meeting our present needs in a way that does not prevent future generations from doing the same (UN General Assembly). To accomplish this goal, we need ways in which to achieve both economic progress and social well-being, while at the same time preserving the environment. While drafting its 17 Sustainable Development Goals, the UN recognizes that we must balance the three dimensions of sustainable development: the economic, social and environmental. Since obtaining energy to meet demand is an issue of increasing priority, whenever there is lack of affordable energy supply, corporations and governments from all corners of the world alike seek innovative methods of energy extraction. However, very often this activity (with its positive effect on GDP growth) is prioritized over its negative consequences for our environment.

8.2 Hydraulic Fracturing

Hydraulic fracturing is a technology where drilling vertically down to sedimentary rocks is followed by horizontal drilling where high pressured water, sand and chemicals fracture the rocks and allow fluids to escape. Though in theory this is a cleaner energy source, “if the methodologies used are dirty, or environmentally harmful, then some of the beneficial impacts are significantly eroded” (Thompson). Hydraulic fracturing may be considered a “cleaner” technology because on the one hand it requires less energy to extract the resources from very deep and otherwise inaccessible locations and on the other hand because it results in the extraction of natural gas, which does not need the heavy refinement of petrol and also produces half as much carbon dioxide as coal and about 30% less than oil. Some environmental consequences include: (1) using huge quantities of fresh water (especially relevant in areas such

as Texas and Colorado) and resulting in same huge quantities of polluted water due to the chemicals mixed in with the sand to help the fracking process; (2) contaminating underground drinking water supplies(3) increasing seismic activity in the region; and (4) methane gas escaping during the extraction process and causing higher greenhouse effect than carbon dioxide of similar quantities. While items one, two and three are less relevant for the Arctic, the release of methane, as well as the increase of human activity near the ice sheets of the North Pole, might turn out to be significant contributors to climate change.

8.3 Arctic Circle

The region in the North hemisphere above 66° 33' latitude, where the average temperature in the warmest month of July is below 10°C, is considered to be the Arctic region. It encompasses parts of the Arctic Ocean, Greenland, Baffin Island, other smaller northern islands, and the far northern parts of Europe, Siberia, Alaska and Canada (Arctic).

Although the North Pole and its surrounding areas are not owned by any country, current international law allows for 200 nautical miles (230 miles) from a country's coast to be "exclusive economic zones". Thus, five countries have territorial claims within the arctic circle: Canada, Norway, Russia, Denmark (via Greenland), and the United States. These countries are of particular importance when it comes to any activity related to the Arctic. If there is no international agreement and cooperation, these countries might be tempted to enter a race for fishing, shipping, and (what is relevant for us) oil and natural gas extraction.

The Arctic Circle is a frontier for oil and gas extraction with substantial reserves, estimated at "90 billion barrels of oil, 1,669 trillion cubic feet of natural gas, and 44 billion barrels of natural gas liquids may remain to be found in the Arctic, of which approximately 84 percent is expected to

occur offshore” (Circum-Arctic). Most of these are within territories claimed and recognized by a particular country.

8.4 Climate Change

The Arctic ice mass is melting because of the higher amount of CO₂ (and other greenhouse gasses) in the atmosphere, resulting in a raise in the global mean temperature and impacting the global maritime system. The loss of ice in recent years has made possible the exploration and drilling for fossil fuels. The only reason oil companies such as Gazprom are able to access the oil is because the Arctic sea ice is melting at an alarming rate. Hydraulic fracturing allows for a more efficient extraction of these resources, but it also poses environmental threats to the fragile region as well as a feedback loop via the release of greenhouse gasses (methane, CO₂, NO_x, etc.).

8.5 Arctic Environmental Protection Strategy (AEPS) and the Arctic Council

The Arctic environmental protection strategy, or the Finnish Initiative, is a non-binding agreement which aims to protect the Arctic region. It was adopted in 1991 by Canada, Denmark, Finland, Iceland, Norway, Sweden, the USSR, and the United States. The program had five major goals: The Arctic Monitoring and Assessment Program (AMAP), The Conservation of Arctic Flora and Fauna program (CAFF), Protection of the Arctic Marine Environment working group (PAME), Emergency Prevention, Preparedness and Response working group (EPPR), and Sustainable Development and Utilization (SDU) (Ministerial Direction). These five goals were appropriated by the Arctic Council established in 1996 by the same eight countries as means to cooperate. More information on the actions taken by the council can be found here:

<https://oaarchive.arctic-council.org/>.

8.6 Exclusive Economic Zone and Extended Continental Shelf Territory

Exclusive economic zones are lawful parts of a country's territory from which the country can extract oil (200 nautical miles from shore). The extended continental shelf territories are off-shore regions in the Arctic region claimed by nations and are not officially part of a country's territory. The sea bed and the extended continental shelf territories are considered to be the "heritage of all mankind" and thus administered by the UN International Seabed Authority. However, countries can claim resources on or below the seabed within recognized extended continental shelf territories if they submit such claims and get them approved within 10 years of ratifying UNCLOS.

8.7 The United Nations Convention on the Law of Sea (UNCLOS)

The UNCLOS is an international agreement that resulted from the United Nations Conference in 1973 and 1982. The Law of the Sea Convention sets guidelines, defines terms, and establishes responsibilities for nations regarding the use of the world's oceans, including natural resources located within. The full text of the convention can be found here:

http://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm. This document defines the rights of nations owning exclusive economic zones in the Arctic territory and outlines the responsibilities of these nations concerning the environment and the management of natural resources. The U.S. has not yet ratified UNCLOS (objecting to Part XI and having several other demands).

9 General Overview

9.1 Territorial distribution

The territorial distribution of Arctic land is important since a country is not allowed to extract oil unless a region is part of their legitimate territory. Due to the abundance of natural resources, even countries with no proximity to the Arctic attempt to claim territory in it though by international law it is not owned by any country. The jurisdiction over arctic territory has become a contentious issue, being as some territories of the Arctic are more copious with fossil fuel reserves than others. However, there are still regions of the polar sea which have neither been claimed or legally belong to a country rendering them UN territory. Potential military interference to claim territory can become a threat to international peace.

9.2 Effects of climate change on the Arctic

The warming temperatures mean that glaciers lose a lot of their ice mass to water which in turn leads to increasing ocean levels and reduced ability to reflect back the solar radiation. Less ice sheets in the region means that more violent storms can form due to the open warm water.

Another major effect is the thawing of some permafrost in the Arctic region. Permafrost holds large quantities of frozen methane which is now released into the air. The greenhouse gas contributes to Global Warming at an even faster rate and creates a cycle of increasing temperature.

There are many ecosystems in the Arctic that may be very susceptible to human activity, which until recently was hardly present in most areas – e.g., tundra, peat, bogs, fens in Canada. A slight disruption caused by a malfunction in the instruments used can cause much damage to the otherwise feral delicate wildlife.

9.3 Risks related to hydraulic fracturing

The Arctic region is very fragile due to its shallow water and ice cover, but it can affect the global environment. Maritime is especially prone to be affected by hydraulic fracturing since an oil spill would cause much damage. The unique climate of the region hosts flora and fauna not found anywhere else and can be endangered to extinction. Offshore oil drillings and exploration can disturb the fish and animals that are cornerstones to the subsistence and cultural livelihood of the indigenous people living in the Arctic.

Local populations are most affected; however, less populated regions do not have the governmental capabilities or the basic infrastructure to assess fracking feasibilities or any eventualities.

Oil spills result in time consuming clean ups, exorbitant harm to the wildlife and long-term environmental impairments. A clean-up action is much more difficult in the hostile temperatures of the arctic than in regions with moderate or sub-tropic climate. The lower temperatures of the water additionally prevent oil from naturally dispersing thus meaning that it would remain longer and harm marine life.

The drilling season in the Arctic is limited to a narrow window of a few months during the summer when icebergs have melted and cannot block access to resources. However, reconstructing a well which is leaking is nearly impossible for such a short period of time.

Unfinished wells over the winter will leak and oil trapped underneath large bodies of ice suggests that its toxic traces will remain. To overcome some of these challenges, infrastructure must be strengthened but “improving the durability of these structures involves increased engineering and

construction thereby driving up the operating costs” (Johnston) which makes businesses less interested.

9.4 Consequences of Arctic wildlife loss

Climate change is an omnipresent issue which has many repercussions. The overall increase in the average global temperatures has led to ice, much of which is located in the Arctic region, to melt. This in turn makes extraction of resources from underneath the thinning ice sheets easier. However, the extraction of these resources also has many negative consequences.

Most prominently, the loss of wildlife due to oil spills (and water contamination). The “feedbacks from the Arctic are increasing global sea levels, they are predicted to change global climate and precipitation patterns, and the effects of climate change on Arctic species are likely to be felt globally” (Climate Change). While one can profit from the decrease of ice on the Arctic, its high albedo has kept ocean temperatures very cool. Thus, it is important that the agenda is not only economically beneficial but also takes into consideration sustainability and protects the Arctic.

Many of the world’s fishing grounds are in the Arctic, supplying people in various countries with fish. But the wildlife of these areas changes as species migrate to find water of appropriate temperatures or are replaced by other (often invasive) species. The loss of fish will also affect many migratory birds which fly to the Arctic every year and feed on the fish.

10 Major Parties Involved and their Views

10.1 Arctic Council

The Arctic Council is an intergovernmental forum that attempts to protect the indigenous people living in the Arctic and preserve its environment. The eight member countries are Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the USA. To achieve the goal of protecting the Arctic, the participating states created the AEPS. Although the Arctic Council intends to protect, its member states voted in favor of gaining profit in form of resources from the ice mass due to its economic potential which cannot be overlooked.

10.2 European Union

The European Union is a permanent observer of the Arctic Council as of 2013 and has three Arctic Council states amongst its members. In order to emphasize its environmental concerns, the European parliament created an Arctic Policy with three main objectives: (1) promoting a more sustainable use of natural resources, (2) addressing the effects of climate change, and (3) calling for international cooperation on the issues.

10.3 Greenpeace

Greenpeace is a non-profit organization dedicated to reducing global warming and ensuring the welfare of the environment. Greenpeace has formed several activist groups, heavily protesting against drillings in the Arctic, recognizing the impact of such actions and the environmental threats posed. Some protests were held in front of the Arctic shore, attempting to attract media attention to the issue and prevent further drillings.

10.4 The Russian Federation

Russia has been a supporter of drilling for oil in the Arctic. According to international law, if the geological structure of oil-rich deposits are similar to the type found on Russia's ECS, the area under the Arctic Ocean will be considered to be part of Siberia and thus belong to Russia. This would make the Russian territory in the Arctic the largest and the most oil-saturated one. The Russian Federation has claimed the largest Extended Continental Shelf, however, the Russian territory does not cross the Russia-US Arctic Sector demarcation line (the border between the American and Russian Arctic territories).

10.5 Norway

Norway is one of the world's largest exporters of fossil fuels. The extraction of resources from Norwegian waters has become an essential part of the country's economy. In 2010 an agreement between Norway and Russia enabled the two countries to begin drilling in the Barents Sea, which holds a large amount of undiscovered oil. The Barents Sea Agreement ended a 40 year dispute between Russia and Norway over borders in the Arctic. Norway has recently awarded drilling permission to drill in the area of the Norwegian and Barents Sea to 26 companies including Statoil, Total, Exxon Mobil and Conoco Phillips.

10.6 The United States of America

The United States of America has tried to begin drillings in the Arctic, especially in the Arctic National Wildlife refuge area, however the majority of United States citizens oppose interfering with wildlife in the Arctic. Former president Obama attempted to issue a permanent ban on fuel production occurring in the Arctic but as of recently due to political changes, the US is determined to "use all available fuel reserves for energy self-sufficiency" (U.S.) which includes being open about offshore drilling in the Arctic region.

10.7 Canada

Canada has also attempted to restrict drilling in the Arctic with Prime Minister Trudeau aligning with Obama on a policy that limits offshore drilling. Nonetheless, Canada has a few companies with leases allowing Arctic exploration. The expectation is that if safe drilling is possible, these companies will be granted extensions and extract the valuable fuels.

11 Relevant UN Documents

1. http://eeas.europa.eu/arctic_region/index_en.htm

A summary and explanation of the arctic policy by the European Union.

2. <http://www.ohchr.org/Documents/Issues/Business/ForumSession4/FrackingAndUNGPs.pdf>

Reviews the UN environmental guiding principles through the lens of hydraulic fracturing.

3. http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E

A General Assembly resolution setting and agenda for sustainable development by 2030.

4. <https://oaarchive.arctic-council.org/handle/11374/65>

Protection of the Arctic Marine Environment (PAME) held workshop that summarizes problems with offshore drilling and identifying viable safety precautions.

12 Previous actions taken

Both the territorial distribution and the environmental preservation of the Arctic are major aspects when considering a policy to protect the region's environment. While some nations clearly see the environmental threat, others are more interested in the economic value of the arctic resources.

There have been several conferences, treaties and agreements concerning border distribution and environmental guidelines. However, these rarely caused improvement. The UNCLOS addressed the territorial distribution, since it gave exclusive rights to nations regarding the ownership of natural resources yet the United States has not ratified it yet.

The EU Arctic Policy focuses on the indigenous people of the Arctic and promotes international cooperation in order to improve cooperation between the arctic partners regarding climate change and sustainable development.

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