2013

UNEP 2013
Background Guide

MIT Model United Nations Conference V

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Letter from the Dais

Dear Delegates,

Welcome to MITMUNC 2013! We are excited to have you participating as delegates in the United Nations Environmental Programme. I am Matt DeCross, your head chair of UNEP for this year and a freshman pursuing physics and mathematics. My co-chair, Antonio Moreno, is a sophomore studying electrical engineering and computer science. We look forward to meeting you in committee and hearing your innovative ideas and compromises!

The United Nations Environmental Programme was founded in 1972, with the stated mission of "To provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations."

In our committee discussion this year, we have chosen the topics of "Climate Change Mitigation and Sustainable Energy" and "International Regulation and Public Conception of Nuclear Energy." These topics are clearly unified by the theme of energy. Scientific studies show a strong correlation between energy consumption and quality of life. Enabling nations to maximize their energy output tends to increase net GDP and allow implementation of infrastructure that promotes education, employment, health, and safety.

This infrastructure may improve many people's quality of life, but it is worthless if we cannot secure the same quality for future generations. Technology that today seems efficient for energy production may in the long term take a turn for the worse, encouraging climate change and increasing the potential for environmental disasters. Current research, however, aims at developing sustainable energy solutions that will negate the risk of such disasters and redefine public conception of widely-used energy sources

As you read this background guide and do your own research for your position papers, we encourage you to abandon your preconceptions regarding alternative energy sources. Take the opportunity to enrich yourself, and shape your country's position in light of your newly-gained knowledge. Part of our committee's goal is to improve public environmental education; outside of MITMUNC, we hope you will continue to share what you learn with those around you. Whether you ultimately pursue international relations, scientific research, or a career wholly unrelated to the goals of UNEP, you can always advocate personally for public acceptance of scientific developments vital for our environmental future.

If at any point during your preparation before the conference you have questions or otherwise want to contact me or my co-chair, feel free to reach us at the email provided below.

Have fun!

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Topic 1:

Climate Change Mitigation and Sustainable Energy

Introduction

In recent history, scientists have become increasingly aware of the detrimental effects on the environment associated with industrialization. Gases commonly emitted by industrial processes, such as carbon dioxide, sulfur oxides, nitrous oxides, mercury, and water vapor, tend to congregate in the troposphere. When the Earth isotropically reemits absorbed solar radiation in the infrared spectrum, these so-called "greenhouse gases" absorb energy and pass it to non-IR-active molecules like oxygen, nitrogen, and argon, ultimately causing energy to be passed back down towards the Earth. This process is fundamentally responsible for the phenomenon commonly known as global warming, which drives climate change. In our discussion in UNEP, we aim to address the root causes of the problem—the lack of industrial regulations, widespread public disregard for the environment, but most importantly the primitive technologies that allow emissions of harmful gases to occur.

A wide array of energy technologies ranging from the completely primitive to the most innovative have been utilized throughout history. It is an unfortunate circumstance that some of the most easily obtainable resources for these technologies have been some of the most damaging for the environment. If we encourage development of alternative, renewable energy resources—namely, sources such as wind, solar, geothermal, and nuclear fusion power, society may be able to undo the rapidly accumulating environmental effects associated with industrialization.

History of Energy

In order to understand the relevance of developing sustainable energy technologies to mitigating climate change, it is important to be aware of the development of energy dependence and why we rely on our current energy sources. The following timeline succinctly summarizes the step-by-step progression of energy technologies throughout history.

770,000 B.C.

Humans first discover how to reliably produce fire.

2000 B.C. – 1 A.D.

Chinese discover coal and petroleum and use them as resources for daily needs.

200 A.D.

Europeans begin to build paddle wheels to harness hydropower.

1000 A.D.

Persian windmills begin utilizing wind power.

17th -18th c.

Advances in coal technology by the British allow for mass production of usable coal and intensive mining, triggering the Industrial Revolution in Europe.

1820s

Natural gas resources discovered and exploited in New York.

19th c.

Faraday's practical discoveries and Maxwell's theoretical foundations of electromagnetism combined with Tesla's development of alternating current lead to macroscopic usage of the electric generator, AC motors, etc.

1850s

Pennsylvanians discover and begin drilling for oil deposits.

1860

The first solar energy generator is built in France by using mirrors to focus sunlight to make steam.

1892

Geothermal energy is first used on an industrial scale in Idaho.

1950

Nuclear (fission) power developed simultaneously in the U.S.S.R. and in the U.S. Fission plants supply U.S. with 20% total energy output.

1970s

U.S. oil production declines, heavy dependence on Arab League nations for oil resources. Temporary embargo causes price shock and recession, but dependence continues afterward.

1979

Three Mile Island nuclear disaster in Pennsylvania ceases fission power development in the U.S.

2000s

Increasing industrialization in formerly impoverished countries threatens further depletion of energy resources that are already at alarmingly low levels. Efforts to develop alternative energy technologies become controversial but important on an international scale. (see: HowStuffWorks).

Current Energy Technologies and Their Effects on the Environment

Coal

Coal is a combustible sedimentary rock essentially formed from condensed ancient plant matter. It is one of the historically most easily found and thus most common energy resources. It is responsible for 44% of the electricity generated in the U.S., and its combustion generates nearly ten billion tons of CO_2 annually (EIA, UCS).

Natural Gas/Petroleum

Deposits of these resources are often found in close proximity deep underground in rock formations. Natural gas consists primarily of methane, while petroleum is a mixture of several complex hydrocarbons. Both are produced via high heat and pressure applied to organic substances, and are recovered via invasive drilling processes [The particularly controversial process of hydraulic fracturing or "fracking" is one such process; we will not address it in further detail as it is an extensive enough discussion to merit its own separate topic.] Natural gas burns particularly cleanly, especially in comparison to coal or petroleum, but it is difficult to obtain without extensive local environmental damage.

Wind

Wind power is commonly generated by constructing large turbines which generate electricity when air currents pass across and cause rotation of large blades attached to the turbines. Storing the electricity generated in significant quantities is a concern with this technology. Furthermore, wind power faces mild public disapproval due to the intrusive appearance of wind farms.

Solar

The most common methods of solar power use photovoltaic cells to generate electricity from sunlight. These cells utilize specialized semiconductors like silicon or indium alloys that exhibit the photovoltaic effect in order to produce energy. Solar power has the obvious downside that it is not fully operational at all hours of the day, since the cells mostly rely on visible light to produce energy.

Hydropower

Hydropower technologies often use the power of water currents to rotate blades that in turn rotate the turbine of a generator and produce electricity by the usual methods. While clean and effective as a supplemental source of energy, hydropower is not particularly suitable as a source of energy for widespread distribution simply due to problems of quantity.

Geothermal

Geothermal energy essentially harnesses the thermal energy created at the core of the Earth. In the mantle, magma convection results in extreme heating of crust minerals. Geothermal technologies often use water currents to bring the energy of this heat into useful form. In countries with natural hot springs, such as Iceland, this technology is widespread as it is quite economical to develop.

Nuclear Fission

Nuclear fission power refers to the massive amounts of energy produced by splitting atoms, particularly those of uranium or plutonium. Fission is commonly anathematized in the public view, particularly due to the disasters of Three Mile Island, Chernobyl, and most recently Fukushima, as well as due to the high background radiation levels near reactors. However, as a power generation method nuclear fission is remarkably safe and clean; generating only steam. Unfortunately, the issue of dealing with highly radioactive spent reactor rods still must be addressed effectively.

Nuclear Fusion

Nuclear fusion, obtaining energy via a nuclear reaction between two atoms [often isotopes of hydrogen], is one of the most promising energy technologies for the future. It is one of the cleanest possible technologies, with no harmful byproducts whatsoever and zero possibility of a catastrophic accident. However, with our current technological capabilities there are difficulties getting a positive net energy output from nuclear fusion. Potential methods for the process include magnetic and inertial confinement fusion, with intensive efforts currently being put forth on the international scale toward the International Thermonuclear Experimental Reactor [a magnetic confinement facility] in recent years.

History of Climate Change

Having reviewed in large part the history of energy and the status of current technologies, we turn now to the development of our current problems regarding climate change. Unfortunately, a large portion of the history of climate change has concerned humanity turning a blind eye to its effects on the environment. We must emphasize that climate change and specifically global warming are certainly not myths. Though the issue has become highly politicized, it is a display of gross negligence to ignore the well-established scientific rigor documenting the reality of climate change and global warming.

In the previous two centuries, discoveries by physicists, chemists, and climatologists alike have unveiled the increasingly concerning reality regarding humanity's effects on the environment. The following timeline traces the major events of the past few centuries in climate change, with a considerable emphasis on the recurring theme of policymakers disregarding the warnings of scientists.

1824

Physicist Joseph Fourier first characterizes the greenhouse effect, noticing the importance of the atmosphere in reducing the penetrance of solar radiation.

1861

Physicist John Tyndall shows that the greenhouse effect is due to "water vapour and certain other gases" and further notes that plants could not survive without it.

1896

Swedish chemist Svante Arrhenius publicizes the idea that burning coal can add carbon dioxide to the atmosphere and cause the greenhouse effect. Arrhenius' models of average temperature increase are remarkably similar to current data, but he is ignored at the time.

1938

British Engineer Guy Callendar uses weather station records to show that average global temperature has increased over the previous century and that the increase is strongly correlated with CO2 emissions increase, but he is dismissed by meteorologists.

1960s

Experiments by Gilbert Plass, Roger Revelle, Hans Suess, and Charles David Keeling show that global CO2 concentrations are rising, the gas is becoming concentrated in the atmosphere rather than seawater, and that it strongly absorbs in the infrared spectrum.

1972

UNEP founded, but climate change not a central focus in lieu of side issues like chemical pollution and nuclear testing.

1987

Montreal Protocol ratified, aiming to phase out substances that were believed to cause ozone layer depletion, specifically halogenated hydrocarbons e.g. CFCs. The Protocol is largely hailed as a success of international policymaking.

1988

Intergovernmental Panel on Climate Change founded, produces groundbreaking reports over next two decades essentially admitting to existence of global warming.

1997

Kyoto Protocol established, aiming to reduce greenhouse gas emissions by approximately 5% in industrialized nations and to assist underdeveloped nations in developing sustainable infrastructure. U.S. refuses to ratify the Protocol, greatly diminishing its effectiveness since the U.S. is the highest emitter per capita in the world.

2009

Copenhagen Summit results in drafting of Copenhagen Accord by U.S., China, India, Brazil, and South Africa. The Accord includes pledges by the signatories for emissions reductions and affirms an international goal to restrict average global temperature increase under 2°C. However, the Summit is used as a battleground of political maneuvering and widely considered a failure. (American Institute of Physics, BBC)

Even in the past decade, despite obvious and irrefutable scientific evidence to the contrary, "distrust of the climate experts [has been] encouraged by corporations and political interests that oppose any government interference in the economy" (American Institute of Physics). Climate change has been repeatedly tossed aside as an irrelevant issue for the sake of economic benefit. What industry doesn't seem to realize, however, are the potential economic effects of climate change. Economist Nicholas Stern predicted in a 2006 report that an investment of 1% of the world's GDP per annum could successfully mitigate climate change while ignoring the problem could results in devastating losses around 20% of the world's GDP (Guardian/Stern).

Completely revising the energy-production sector seems infeasible as a solution, however. If industry is so resistant to recognizing the reality of climate change, why should they take any measures to adapt and increase use of alternative energy technologies? Part of the necessary drive for this to occur is a change in public opinion.

Fortunately, the past few years have seen an increase in worldwide support for alternative energy technologies. The potential still remains to apply pressure at the source of the problem and leverage the weight of public opinion in the international political arena to force a reorganization of the energy sector.

UNEP Involvement

Development of sustainable energy resources and technologies, especially in impoverished areas, is a major goal of the UNEP. For instance, one major program currently run by the UNEP is the Rural Energy Enterprise Development [REED] program, which at the moment has projects operating in Mali, Ghana, Senegal, and Tanzania with the main goals of reducing coal use, reducing deforestation, and implementing wind and biofuel technologies (UNEP).

In particular, however, the UNEP is spearheading the campaign introduced by Secretary-General Ban Ki-moon in 2010 titled "Sustainable Energy for All." This initiative has three objectives to accomplish by 2030, namely: "[to] ensure universal access to modern energy services, [to] double the global rate of improvement in energy efficiency, and [to] double the share of renewable energy in the global energy mix" (UNEP). 2012 was in fact designated the "International Year of Sustainable Energy for All" under U.N. General Assembly Resolution 65/151 (General Assembly).

Currently, the UNEP is striving to make tangible efforts toward achieving reliance on sustainable energy resources, particularly where attempts to reduce climate change are concerned. The Intergovernmental Panel on Climate Change, founded by UNEP, believes that 60-80% of carbon dioxide emissions reductions will come from the energy and industry sectors, and that by mid-century up to 80% of the world's energy supply could come from renewable energy sources (UNEP). The Programme believes that increasing the economic competitiveness of sustainable energy sources would be the best incentive for adoption by national governments. However, it also supports incentives such as cost reductions, public investments, tax subsidies, emissions reduction subsidies, electric power restructuring policies, and more. In the long run, the UNEP is optimistic that good policy and effective practice may succeed in mitigating climate change.

Country Blocs

North and South America

National Renewable Energy Laboratory *<www.nrel.gov/>*

Environmental Protection Agency *<www.epa.gov/>*

U.S. Department of Energy *<energy.gov/>*

European Union

Renewable Energy and Energy Efficiency Partnership
<www.reeep.org/>

Johannesburg Renewable Energy Coalition
<http://ec.europa.eu/environment/archives/jrec/index_en.htm>

Asia

Asian Development Bank
<www.adb.org/>

Sustainable Energy Association of Singapore
<www.seas.org.sg/>

African Union

South African Renewables Initiative
<sarenewablesinitiative.wordpress.com/>

Arab League

International Renewable Energy Agency
<www.irena.org/>

Important Questions to Consider

How can the UNEP influence public opinion regarding alternative energy?

What incentives can national governments provide industries to pursue adoption of alternative energy technologies?

Likewise, what incentives can the international community offer industrialized countries to comply with international environmental regulations without allowing such countries undue political leverage?

How can the international community enforce compliance with ratified multilateral agreements?

How can national governments effectively implement and enforce regulations on industries that exceed permissible levels of gas emissions or pollution via other hazardous chemicals?

How can national governments that rely on imported energy resources develop self-sufficiency and simultaneously encourage use of clean energy?

What measures can be taken in underdeveloped countries to encourage adoption of alternative energy technologies?

How can the UNEP help establish a more efficient and less political international forum for discussion of climate change?

Sources and Suggestions for Further Reading

Union of Concerned Scientists:
<http://www.ucsusa.org/clean_energy/coalvswind/c01.html>

<http://www.ucsusa.org/clean_energy/our-energy-choices/a-short-history-of-energy.html>

Energy Information Administration:
<http://www.eia.gov/countries/>

Research and Education Association:
"Modern energy technology: nuclear, coal, petroleum, solar, geothermal, fuel cells, oil shale, tar sands, organic wastes, Volume 1." New York City, 1975.

The Franklin Institute:
<http://www.fi.edu/learn/case-files/energy.html>

HowStuffWorks:
<http://science.howstuffworks.com/environmental/energy/timeline-energy-history.htm>

<http://science.howstuffworks.com/probing-the-history-of-climate-change-info.htm>

LiveScience:
<http://www.livescience.com/1292-history-climate-change-science.html>
American Institute of Physics:
<http://www.aip.org/history/climate/summary.htm>

EPA:
<http://www.epa.gov/climatechange/science/causes.html>

BBC:
<http://news.bbc.co.uk/2/hi/science/nature/8285247.stm>

Astrobiology Magazine:
<http://www.astrobio.net/index.php?option=com_retrospection&task=detail&id=3530>

The Guardian/Nicholas Stern:
<http://www.guardian.co.uk/environment/2008/jun/26/climatechange.scienceofclimatechange>

UNEP:
<http://www.unep.org/publications/ebooks/foresightreport/Portals/24175/pdfs/Foresight_Report-21_Issues_for_the_21st_Century.pdf>

<http://www.areed.org/index.php/en/News/>

<http://www.sustainableenergyforall.org/>
General Assembly:

<http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/65/151>

Topic 2:

International Regulation and Public Conception of Nuclear Energy

Introduction

In order to establish effective regulation of nuclear energy facilities, we need to understand the nature of nuclear energy production methods. In the public conception, there is general ignorance regarding methods of producing energy via nuclear reactions. Too often, it is assumed that all nuclear resources are essentially the same. However, the underlying science is fundamentally quite different. Fission reactions typically proceed by bombarding a fissile element like Uranium-235 or Plutonium-239 with neutrons, decomposing the fissile element to several lighter elements and releasing neutrons, gamma rays, and massive amounts of energy.

Fusion reactions, on the other hand, combine two isotopes of hydrogen [often deuterium and tritium] under conditions of high temperature and pressure to produce energy. Notably, fusion reactions release minimal dangerous radiation in comparison with fission at the cost of some energy output. However, fission also leaves highly radioactive materials in the spent fuel rods of a nuclear reactor that must be treated or stored. The presence of such materials on-site at a reactor certainly poses a safety risk, but it is challenging to locate a secure storage facility isolated from population sites. Dealing with radioactive byproducts is as of yet an open question.

Furthermore, in order to create effective regulations on nuclear reactors, one must fully realize exactly how a nuclear reactor functions. The reactor itself can be approximately the size of a small house. It is housed in a containment facility—essentially a meter-thick concrete shell. The reactor core at the center houses the uranium/plutonium fuel, neutron source, moderator, coolant, control rods, steam generator, and pressure tubes. The moderator is usually water, heavy water, or graphite, and it slows down neutrons from the source as they bombard the fuel so that more fission occurs, in order to produce more energy. The pressure tubes convey the coolant around the fuel to absorb the huge amounts of excess heat generated by the reactions. A secondary coolant system conveys water to the steam generator; the immense heat converts the water to steam to drive the generator. Control rods may be used to slow or stop the reaction entirely; they are made of a neutron-absorbing material like cadmium or boron and can be raised or lowered to insulate the fuel from the neutron source (World Nuclear Association).

Historical Considerations

Why is it important to understand the difference between fission and fusion and the structure of a nuclear reactor? One of the most pressing environmental challenges of the last fifty years has been containment of man-made disasters caused by attempts to harness energy resources. This includes disasters such as the recent Deepwater Horizon accident

[BP Oil Spill], and the Fukushima Daichii nuclear disaster.

The severity of these incidents points to the lack of proper preparation and safety regulations surrounding the relevant facilities. More importantly, however, it suggests deliberate oversight on the part of the coordinators of said facilities, most likely motivated by cutting costs on equipment or manpower. Even with the stringent regulations enforced by many national governments, it is impossible even with responsible oversight to address every foreseeable problem. Analyzing historical nuclear accidents may provide insight as to the common sources of such problems and ways to prevent them from occurring. We address three famous major accidents in the history of nuclear power: the Fukushima Daichii, Chernobyl, and Three Mile Island nuclear disasters.

Three Mile Island

The Three Mile Island nuclear power station was and is located in Harrisburg, PA, USA. In March 1979, a malfunction in the secondary coolant system raised temperature in the primary coolant, triggering shutdown. A faulty valve in the shutdown circuit released coolant, exposing the core, which partially melted. Radioactive gas was released to the surrounding environment. Though injuries and sickness were nonexistent, the chain of inexcusable negligence in the reactor control center was cause for serious concern. Cleanup lasted twelve years and cost approximately $973 million (World Nuclear Association). Public perception of nuclear fission dropped devastatingly and expansion of the nuclear power industry in the United States wholly reversed.

Chernobyl

The former Chernobyl complex was located north of Kiev, Ukraine, near the border of Ukraine with Belarus. In 1986, prior to a routine shutdown, the incompetent and poorly trained personnel prepared to run a test of the shutdown mechanism on the reactor. Automatic shutdown mechanisms were disabled and the reactor became unstable. Inserting the control rods caused a power surge that ultimately exposed fuel to coolant, causing intense pressure which ruptured the reactor and caused two explosions. Approximately 5% of core material was released into the air, at least thirty people died, and risk for thyroid cancer increased as radioactive material spread in the air across Europe (World Nuclear Association).

Fukushima Daichii

In the instance of the Fukushima disaster in March 2011, a natural disaster—namely, a tsunami, caused an unexpected loss of power and loss of coolant supply at the Japanese reactor site. This loss of power subsequently led to explosions and leaking of radioactive material to both the air and the ocean. In the first three days, all three reactor cores entered meltdown. However, an unprecedented effort to control the meltdown by the Japanese government via evacuation of over one hundred thousand citizens prevented any illness from radiation poisoning. Unfortunately, as a result, many people are still displaced from their homes (World Nuclear Association).

Clearly, there are some pervasive themes regarding these three incidents. At Three Mile Island and Chernobyl, we see the recurrent presence of incompetence and negligence in the reactor control room as the root cause of the major disaster. The response time and skill level at Fukushima was significantly higher, but the scale of the disaster was also higher. While systems engineers might not be able to account for every eventuality, it is likely that it would have been possible to create a system more insulated given the possibility of natural disaster.

Both of these problems seem to lead to the same solution: better regulation and oversight of reactor construction and maintenance. In the best case, more effective engineering of reactors to reduce the scale of accidents; in the worst, legislative restrictions on reactor operation would be necessary. These two methods clearly would have drastically different consequences on the future of nuclear energy, so it is extremely important to distinguish between the two. There has been a steady growth in public support for building nuclear reactors over the past decade; nearly 70% of the populace currently supports it, so it is advisable to implement regulations that do not hamper the future of the industry (Nuclear Energy Institute).

Fusion Technologies

Promoting construction of and research in fusion reactor technology is another option.

Currently, there are two main methods of producing energy via fusion reactions—inertial confinement and magnetic confinement technologies. The former is divided into indirect and direct drive inertial confinement fusion. In the direct drive process, lasers are split, amplified, and directed at a deuterium-tritium pellet. The pellet implodes, causing massive temperatures [significantly hotter than the sun] and intense pressure, inducing fusion and creating a plasma temporarily. Indirect drive is a nearly identical process—however, the lasers are instead focused on a gold-plated cavity called a hohlraum which encases the pellet. When the lasers hit the gold, the gold radiates X-ray radiation onto the pellet—a higher-frequency wave which contains more energy and thus might result in higher energy output. In magnetic confinement fusion, a strong magnetic field is used to confine a plasma while the electric conductivity of the plasma is manipulated in order to achieve fusion. The magnetic-confinement method is currently being implemented large-scale via a project called the International Thermonuclear Experimental Reactor in France. To date, unfortunately, fusion reactors have not been able to produce enough energy for mass production.

UNEP Involvement

In general, nuclear regulation has not been a particularly pressing issue for the UNEP in recent years, at least until 2011. Now, however, the UNEP has unfortunately largely seized the opportunity to promote ceasing development of nuclear technology. In a report sponsored by the UNEP, a German representative [Ernst von Weizsäcker] advocates for increasing our energy productivity instead of seeking more references. In general, the UNEP casts aspersions as to the future of both fission and fusion power, citing the lack of uranium as a resource and improbability of gaining net energy output from fusion. In its 2012 annual yearbook, the UNEP prefers instead to address the challenges of decommissioning reactors, i.e. dealing with spent and active fuel sources, and safely shutting down reactors (UNEP). While these are certainly valid and pertinent concerns, this is not the direction in which we would like to lead our committee.

Country Blocs

See International Atomic Energy Agency, World Agency of Nuclear Operators for global efforts; nuclear regulation occurs far more often as a result of international efforts.

Europe and the United States

Note that Germany and Switzerland are phasing out nuclear power as of last year, but France, Belgium, and Slovakia use nuclear power as their primary sources of electricity.

Institute of Nuclear Power Operations
<http://www.inpo.info/>

International Association for the Environmentally Safe Disposal of Radioactive Materials
<http://www.edram.info/>

Nuclear Regulatory Commission
<http://www.nrc.gov/>

Asia
Japan Nuclear Technology Institute
<www.gengikyo.jp/english/>

Electricity Generating Authority of Thailand
<www.egat.co.th/en/>

Korean Atomic Energy Research Institute
<www.kaeri.re.kr:8080/english/>

Arab League

Cooperation Council for the Arab States of the Gulf
<http://www.gcc-sg.org/eng/>

African Union

South African Nuclear Energy Corporation
<www.necsa.co.za/>

Important Questions to Consider

What protocols can national governments implement to minimize the impact of natural disasters on nuclear reactor operation?

What regulations can national governments implement to prevent the leadership of untrained or incompetent personnel at reactor control centers?

How can the UNEP further promote public education regarding nuclear energy resources and encourage support for current research such as innovative fusion reactor designs?

How can the UNEP dissipate the still-pervasive public perception of fission reactions as an unsafe method of power generation?

How can the international community support implementation of safe nuclear reactor facilities in countries with minimal regulations that pose a risk?

How can the UNEP encourage national governments to show support for research in both fusion and fission technologies via funding, etc.?

Sources and Suggestions for Further Reading

National Nuclear Security Administration: *<http://nnsa.energy.gov/aboutus/ourhistory/timeline>*

U.S. Nuclear Regulatory Commission: *<http://www.nrc.gov/about-nrc/emerg-preparedness/history.html>*

Cato Institute: Can Nuclear Power Compete?: *<http://www.cato.org/pubs/regulation/regv15n1/reg15n1-rothwell.html>*

Nuclear Energy Institute: *<http://www.nei.org/resourcesandstats/documentlibrary>*

Nuclear Energy Agency: *<http://www.oecd-nea.org/nsd/>*

University of Wisconsin Nuclear Reactor Tour: *<http://reactor.engr.wisc.edu/tour/fission.htm>*

World Nuclear Association: *<http://www.world-nuclear.org/info/inf32.html>*

<http://www.world-nuclear.org/info/inf36.html>

<http://www.world-nuclear.org/info/chernobyl/inf07.html>

<http://www.world-nuclear.org/info/fukushima_accident_inf129.html>

UNEP: *<http://www.unep.org/yearbook/2012/pdfs/UYB_2012_CH_3.pdf>*

<http://www.unep.org/ourplanet/imgversn/123/weiz.html>

<http://www.unep.org/publications/ebooks/foresightreport/Portals/24175/pdfs/Foresight_Report-21_Issues_for_the_21st_Century.pdf>