The Pros and Cons of Nuclear Power Energy Source-An Analysis

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Abstract

This paper provides focused fresh attention on nuclear power's key role in keeping world's lights on and pros and cons of it. In the late 16th century, when the increasing cost of firewood forced ordinary Londoners to switch reluctantly to coal, Elizabethan preachers railed against a fuel they believed to be, literally, the Devil's excrement. Coal was black, after all, dirty, found in layers underground — down toward Hell at the center of the earth — and smelled strongly of sulfur when it burned. Switching to coal, in houses that usually lacked chimneys, was difficult enough; the clergy's outspoken condemnation, while certainly justified environmentally, further complicated and delayed the timely resolution of an urgent problem in energy supply.For too many environmentalists concerned with global warming, nuclear energy is today's Devil's excrement. They condemn it for its production and use of radioactive fuels and for the supposed problem of disposing of its waste. In my judgment, their condemnation of this efficient, low-carbon source of baseload energy is misplaced. Far from being the Devil's excrement, nuclear power can be, and should be, one major component of our rescue from a hotter, more meteorologically destructive world.

Like all energy sources, nuclear power has advantages and disadvantages. What are nuclear power's benefits? First and foremost, since it produces energy via nuclear fission rather than chemical burning, it generates baseload electricity with no output of carbon, the villainous element of global warming. Switching from coal to natural gas is a step toward decarbonizing, since burning natural gas produces about half the carbon dioxide of burning coal. British prime minister Tony Blair, an enduring critic of nuclear power, this spring signaled his government's support for expanding nuclear -energy production.

Today, it is the global climate change argument that clinches the case in favor of nuclear power. If, as Gore asserts, combating climate change is our highest priority, and if the future of civilization itself is at stake, then nuclear power must play a significant and expanded role not just in energy mix but in the world's. For all of nuclear energy's apparent advantages (even when weighed against its risks), its renaissance faces several challenges.

Key words: nuclear energy, carbon dioxide, natural gas, energy sources, chemical burning.

Introduction

Nuclear power plants operate at much higher capacity factors than renewable energy sources or fossil fuels. Capacity factor is a measure of what percentage of the time a power plant actually produces energy. It's a problem for all intermittent energy sources. The sun doesn't always shine, nor the wind always blow, nor water always fall through the turbines of a dam.

In the United States in 2014, nuclear power plants, which generated almost 20 percent of U.S. electricity, had an average capacity factor of 92.3 percent, meaning they operated at full power on 336 out of 365 days per year. (The other 29 days they were taken off the grid for maintenance.) In contrast, U.S. hydroelectric systems delivered power 38.2 percent of the time (138 days per year), wind turbines 34.5 percent of the time (127 days per year) and solar electricity arrays only 25.1 percent of the time (92 days per year). Even plants powered with coal or natural gas only generate electricity about half the time for reasons such as fuel costs and seasonal and nocturnal variations in demand. Nuclear is a clear winner on reliability. Third, nuclear power releases less radiation into the environment than any other major energy source. This statement will seem paradoxical to many readers, since it's not commonly known that non-nuclear energy sources release any radiation into the environment. They do. The worst offender is coal, a mineral of the earth's crust that contains a substantial volume of the radioactive elements uranium and thorium. Burning coal gasifies its organic materials, concentrating its mineral components into the remaining waste, called fly ash. So much coal is burned in the world and so much fly ash produced that coal is actually the major source of radioactive releases into the environment.

The country's reactors have accumulated 55,000 metric tons of nuclear waste in temporary storage, and many are running out of space. Failure to open Yucca Mountain or otherwise solve the waste question could force some reactors to shut down and discourage investors from supporting new nuclear -plants.

Meanwhile, the nuclear licensing process must be improved. Last year's energy bill streamlined procedures somewhat, but the Nuclear Regulatory Commission must get serious about processing license applications in a timely manner. Delays caused by red tape and bureaucratic -foot--dragging could send private investment -elsewhere.

The 21st century will be marked by a near-insatiable thirst for energy around the world, particularly in the large and growing economies of the United States, China, and India, and among the -large--scale consumers of industrial Europe. At the same time, the developing world will greatly benefit if granted access to cheap, reliable sources of energy. According to the United Nations, 2.4 billion people lack access to modern energy service for cooking and heating. Roughly 1.6 -billion—-about a quarter of the world's population, including most of -sub--Saharan -Africa—-have no access to electricity at -all. Nuclear power alone is positioned to help meet the world's burgeoning energy demand and supply electricity to the -power--starved areas of the world in a manner that safeguards the environment. It alone can raise standards of living on every continent while emitting no pollutants or greenhouse gases. It is the best candidate among many to help raise more than a billion people out of darkness and grinding poverty, and to do so in a way that does no harm, but only -good.

Objective:

This paper intends to study participating states are mapping out and collaborating on the research and development of future nuclear energy systems. Taking deeper look at positive and negative impact.

Kashmiri feminist literature historical perspective

The explosion and subsequent burnout of a large graphite-moderated, water-cooled reactor at Chernobyl in 1986 was easily the worst nuclear accident in history. Twenty-nine disaster relief workers died of acute radiation exposure in the immediate aftermath of the accident. In the subsequent three decades, UNSCEAR — the United Nations Scientific Committee on the Effects of Atomic Radiation, composed of senior scientists from 27 member states — has observed and reported at regular intervals on the health effects of the Chernobyl accident. It has identified no long-term health consequences to populations exposed to Chernobyl fallout except for thyroid cancers in residents of Belarus, Ukraine and western Russia who were children or adolescents at the time of the accident, who drank milk contaminated with 131iodine, and who were not evacuated. By 2008, UNSCEAR had attributed some 6,500 excess cases of thyroid cancer in the Chernobyl region to the accident, with 15 deaths. The occurrence of these cancers increased dramatically from 1991 to 1995, which researchers attributed mostly to radiation exposure. No increase occurred in adults. "The average effective doses" of radiation from Chernobyl, UNSCEAR also concluded, "due to both external and internal exposures, received by members of the general public during 1986-2005 [were] about 30 mSv for the evacuees, 1 mSv for the residents of the former Soviet Union, and 0.3 mSv for the populations of the rest of Europe." A sievert is a measure of radiation exposure, a millisievert is one-one-thousandth of a sievert. A full-body CT scan delivers about 10-30 mSv. A U.S. resident receives an average background radiation dose, exclusive of radon, of about 1 mSv per year.

The statistics of Chernobyl irradiations cited here are so low that they must seem intentionally minimized to those who followed the extensive media coverage of the accident and its aftermath. Yet they are the peer-reviewed products of extensive investigation by an international scientific agency of the United Nations. They indicate that even the worst possible accident at a nuclear power plant — the complete meltdown and burnup of its radioactive fuel — was yet far less destructive than other major industrial accidents across the past century. To name only two: Bhopal, in India, where at least 3,800 people died immediately and many thousands more were sickened when 40 tons of methyl isocyanate gas leaked from a pesticide plant; and Henan Province, in China, where at least 26,000 people drowned following the failure of a major hydroelectric dam in a typhoon. "Measured as early deaths per electricity units produced by the Chernobyl facility (9 years of operation, total electricity production of 36 GWe-years, 31 early deaths) yields 0.86 death/GWe-year)," concludes Zbigniew Jaworowski, a physician and former UNSCEAR chairman active during the Chernobyl accident. "This rate is lower than the average fatalities from [accidents involving] a majority of other energy sources. For example, the Chernobyl rate is nine times lower than the death rate from liquefied gas… and 47 times lower than from hydroelectric stations."

Nuclear energy produces radioactive waste

A major environmental concern related to nuclear power is the creation of radioactive wastes such as uranium mill tailings, spent (used) reactor fuel, and other radioactive wastes. These materials can remain radioactive and dangerous to human health for thousands of years. Radioactive wastes are subject to special regulations that govern their handling, transportation, storage, and disposal to protect human health and the environment. The U.S. Nuclear Regulatory Commission (NRC) regulates the operation of nuclear power plants.

Radioactive wastes are classified as low-level waste or high-level waste. The radioactivity of these wastes can range from a little higher than natural background levels, such as for uranium mill tailings, to the much higher radioactivity of used (spent) reactor fuel and parts of nuclear reactors. The radioactivity of nuclear waste decreases over time through a process called radioactive decay. The amount of time it takes for the radioactivity of radioactive material to decrease to half its original level is called the radioactive half-life. Radioactive waste with a short half-life is often stored temporarily before disposal to reduce potential radiation doses to workers who handle and transport the waste. This storage system also reduces the radiation levels at disposal sites.

By volume, most of the waste related to the nuclear power industry has a relatively low level of radioactivity. Uranium mill tailings contain the radioactive element radium, which decays to produce the radioactive gas radon. Most uranium mill tailings are placed near the processing facility, or mill, where they come from. Uranium mill tailings are covered with a sealing barrier of material such as clay to prevent radon from escaping into the atmosphere. The sealing barrier is covered by a layer of soil, rocks, or other materials to prevent erosion of the sealing barrier.

The other types of low-level radioactive waste are the tools, protective clothing, wiping cloths, and other disposable items that become contaminated with small amounts of radioactive dust or particles at nuclear fuel processing facilities and nuclear power plants. These materials are subject to special regulations for their handling, storage, and disposal so they will not come in contact with the outside environment.

High-level radioactive waste consists of irradiated, or spent, nuclear reactor fuel (i.e., fuel that is no longer useful for producing electricity). The spent reactor fuel is in a solid form, consisting of small fuel pellets in long metal tubes called rods.

Spent reactor fuel storage and reactor decommissioning

Spent reactor fuel assemblies are highly radioactive and, initially, must be stored in specially designed pools of water. The water cools the fuel and acts as a radiation shield. Spent reactor fuel assemblies can also be stored in specially designed dry storage containers. An increasing number of reactor operators now store their older spent fuel in dry storage facilities using special outdoor concrete or steel containers with air cooling. The United States does not currently have a permanent disposal facility for high-level nuclear waste. When a nuclear reactor stops operating, it must be decommissioned. Decommissioning involves safely removing from service the reactor and all equipment that has become radioactive and reducing radioactivity to a level that permits other uses of the property. The U.S. Nuclear Regulatory Commission has strict rules governing nuclear power plant decommissioning that involve cleanup of radioactively contaminated power plant systems and structures and removing the radioactive fuel.Energy is life, as life on this planet depends upon a fixed amount of energy (citation) . Modern industrialized energy sources, such as coal and petroleum, were originally utilized for their seeming promise of high energies yielded per unit volume. Now, there is a much cleaner source of energy, it is called Nuclear power. It originates from the splitting of uranium atoms in a process called fission (The Nuclear Energy Institute (2012). Power plants use fission processes to generate heat for producing steam, which is used by a turbine to generate electricity (The Nuclear Energy Institute (2012). This electricity is consumed by people. This essay will firstly discuss the environment as for cause for nuclear energy, and then detail its subsequent negative biological and environmental effects.

To begin with there are many causes of nuclear power, but the key focus is that nuclear power does not emit carbon dioxide; it is reliable and is very efficient compared to other sources of power such as fossil fuel and coal. No carbon emissions this the big selling point to environmentalists about nuclear power plants are that they are said to emit almost no carbon dioxide. Some prominent environmentalists have embraced nuclear power because they see the imminent threat of global warming outweighing the potential threat of localized nuclear meltdowns. But how true is the claim.

Reliability of nuclear power plants need little fuel, so they are less vulnerable to shortages because of strikes or natural disasters. International relations will have little effect on the supply of fuel to the reactors because uranium is evenly deposited around the globe. As stated by The Nuclear Energy Institute 2012 one disadvantage of uranium mining is that it leaves the residues from chemical processing of the ore, which leads to radon exposure to the public. Safety the results of a compromised reactor core can be disastrous, but the precautions that prevent this from happening prevent it well. Nuclear power is one the safest methods of producing energy. As stated by The Nuclear Energy Institute 2012 each year, 10,000 to 50,000 Americans die from respiratory diseases due to the burning of coal, and 300 are killed in mining and transportation accidents.

Transition

However, Nuclear Power Plants also have negative characteristic. Specifically, Nuclear Power Plants use uranium, one of the rarest elements in nature and a non-renewable source. Secondly, Nuclear power plants are also very expensive to build. Furthermore, failures in the cooling system can cause potentially hazarders steam explosions. Lastly, too much exposure to radiation can be fatal or cause cancer, and even exposure to small amounts radioactive waste can be lethal.

On the other hand, nuclear power negatively effects the environment as it is a catalyst for the devastation of nature resulting from meltdowns and waste disposal. Meltdowns occur when there is a loss of coolant water in a fission reactor, the rods would overheat. The rods that contain the uranium fuel pellets would dissolve, leaving the fuel exposed. The temperature would increase with the lack of a cooling source. As stated by Apikyyan and Diamond 2009. "When the fuel rods heat to 2800°C, the fuel would melt, and a white-hot molten mass would melt its way through the containment vessels to the ground below it." Thus would lead to grammar-rays being exposed in the air which travel, if any living thing around the radius of three hundred and twenty one kilometres would get affected.

Waste Disposal the biggest stumbling block in support of nuclear power is the question of what to do with 20-30 tons of radioactive waste that each reactor accrues annually. Currently, waste is stored at nuclear plants across the country as new waste storage schemes are devised – then fought over, scrapped, revised and fought over again. Stated by the daily green 2012.The Nuclear Regulatory Commission has said "that waste can continue to be stored at plants almost 60 years after they shut down."

The energy of nuclear detonation effects the environment in three ways, which are: blast radiation, nuclear radiation and thermal radiation. The distribution of radiation depends on the kind of nuclear weapon and the place of a blast. As stated by Weart (year) "For a low altitude atmospheric detonation of a moderate sized weapon in the kiloton range, the energy is distributed roughly as follows: 50% as blast; 35% as thermal radiation; and 10% as residual nuclear radiation." The second main kind of nuclear weapon is based on the fusion reactions. Thanks to these reactions a large amount of energy is produced. These kinds of bombs can be several times more powerful than fission bombs. This is explained by the fact that the fusion reaction can produce a larger amount of energy per same mass. The bombs which are based on the use of fusion reaction are named hydrogen bombs, thermonuclear bombs or fusion bombs. Only several countries in the world possess this kind of nuclear weapon. The fission mechanism is used in order to start the process of fusion in these kind of bombs, according to Rhodes "When the fission bomb is detonated, gamma and X-rays emitted at the speed of light first compress the fusion fuel, then heat it to thermonuclear temperatures"

STAKEHOLDER INVOLVEMENT IN THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The EIA addresses many issues of practical concern to stakeholders because it provides transparency and ensures that interested parties with insights and concerns have the opportunity for meaningful participation in a broad range of issues. Therefore, the EIA is regarded as one of the mechanisms for stakeholder involvement. Sharing information on the development of a nuclear power programme starts with the involvement of the government and the nuclear energy programme implementing organization (NEPIO) when the overall expectations for the nuclear power programme and the purpose of the EIA are established. Information sharing should be continual, developing further the ability of the general public to understand the EIA process.

Part of this information dissemination during the early stages is to reassure stakeholders that further information will be gathered as the process progresses, and that it will be analysed before firm decisions are made. When a specific site and an owner, or operator, are identified, then responsibility for stakeholder involvement in the EIA generally becomes the obligation of the owner or operator. Stakeholder participation facilitates the overall EIA process and improves the comprehensive nature of the environmental assessment. Various stakeholders have different roles in the process. A useful distinction is between 'statutory' and 'non-statutory' stakeholders. Statutory stakeholders, primarily government agencies, are considered to be those organizations and bodies that, by law, are required to be involved in any planning, development or operational activity. The purpose of the EIA process is to support project decision making with the help of environmental and socioeconomic information and analyses. In order to use this information in decision making, it should naturally be available before any significant decisions are made (e.g. selection of site, plant size or technology). It is common that an EIA report is required prior to a definitive decision on the site or nuclear power technology. This implies that the EIA process in its various phases always involves assumptions and generalizations because sufficient information on environmental or socioeconomic conditions or technical parameters is rarely available at key decision making points.

This information accumulates during the process and enables well grounded decisions to be made in each step (e.g. selecting the candidate sites from the potential sites or selecting between direct and indirect cooling). In spite of this, however, the information is not exact or complete. Consequently, the EIA process becomes based on accumulating, but deficient, information. To address the specific issue of uncertainty in the final design of the plant technology, including that the vendor may not be identified at the time of the EIA report preparation, the plant parameter envelope (PPE) concept was developed. The PPE addresses all technologies under consideration and attributes a value for each technology for the aspects identified to lead to a potential environmental impact.

The PPE includes the important physical and chemical parameters that may affect the environment (e.g. water requirements, land use and emissions) for the considered plants, and identifies the parameters with the highest impact value or range of values for each parameter. These 'bounding parameters' which are included in the PPE are then used for environmental analysis in the EIA process. When the final design is known, a comparison is made between the actual value for each aspect and the bounding value initially identified. If the ranges of actual values for the parameter are lower than, or equal to, values on which the environmental analysis is based, then further environmental assessment is not required.

Conclusion

To conclude the effects of nuclear power is to dangerous in the long term as it will affect the environment and the people. The danger caused by the use of nuclear energy is the main argument of the opponents of this use. At the present moment nuclear energy is one of the most dangerous and destructive energies in the world. Nobody can guarantee that it will be used only for peaceful goals. Distressing facts from our history, such as Hiroshima and

Nagasaki bombing or Chernobyl tragedy prove this. Antagonist of the nuclear energy use note that solar, wind or other renewable fuels are more effective and less dangerous types of fuels if to compare them with nuclear energy.

World energy consumption has developed dramatically over the past few decades. This growth in energy demand will be driven by large increases in both economic growth and world population coupled with rising living standards in rapidly growing countries. This proceeding examines the status and future of nuclear power because of a belief that this technology is an important option for the regional and the world countries to meet the future energy needs without emitting carbon dioxide and other atmospheric pollutants. The objectives, addressed to government, industry, and academic leaders, discusses the interrelated technical, economic, environmental and political challenges facing a significant increase in the global nuclear power utilization over the next half century and what might be done to overcome those challenges. Electricity drives the world economy. It powers our homes, offices, and industries; provides communications, entertainment, and medical services; powers computers, technology, and the Internet; and runs various forms of transportation. Electricity and the many technologies that it powers enhance the quality of life for our customers and contribute to the progress and success of our nation.

Even as electric utilities and power suppliers work hard to meet the increasing demands of consumers, they are strongly committed to reducing the environmental impact of electric generation. As an industry, the electric power sector has implemented flexible and cost-effective voluntary programs to mitigate greenhouse gas (GHG) emissions for several years.

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