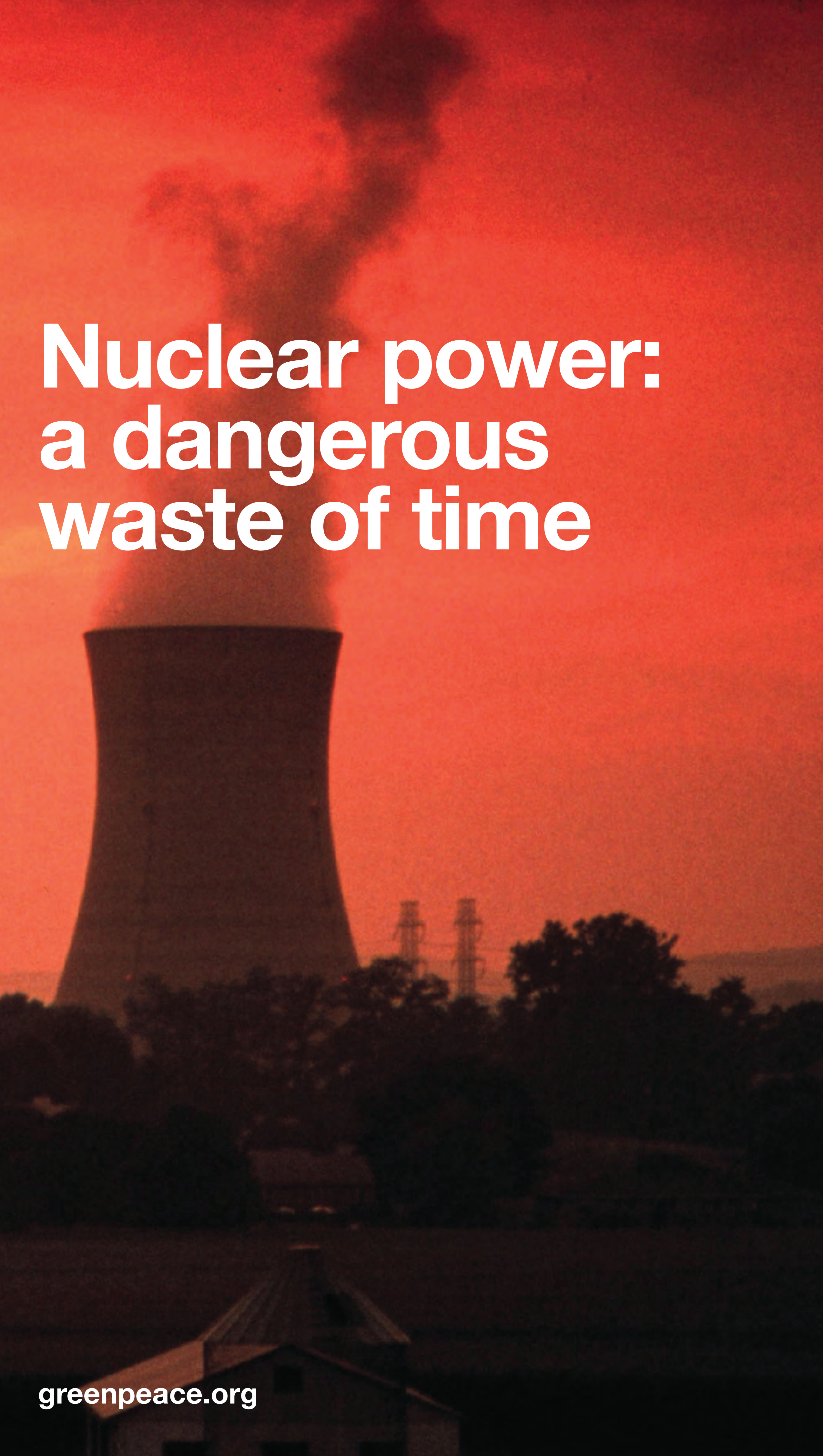
Nuclear power: a dangerous waste of time



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Catalysing an energy revolution

Nuclear power:
a dangerous waste of time

Introduction

The nuclear power industry is attempting to exploit the climate crisis by aggressively promoting nuclear technology as a "low-carbon" means of generating electricity. Nuclear power claims to be safe, cost-effective and able meet the world's energy needs. But nothing could be further from the truth.

In fact, nuclear power undermines the real solutions to climate change by diverting urgently needed investments away from clean, renewable sources of energy and energy efficiency. As this briefing outlines, nuclear power is expensive, dangerous and a threat to global security. And, when it comes to combating climate change, it cannot deliver the necessary reductions in greenhouse gas emissions in time; any emissions reductions from nuclear power will be too little, too late and come at far too high a price.

This briefing outlines why nuclear power is a woefully inadequate response to the climate crisis and how, in contrast, renewable energy and greater energy efficiency can deliver in time to tackle climate change, without any of the dangers posed by nuclear power. It also explores the key environmental, health and security issues affecting every stage of the nuclear process: the unsolved problem of radioactive waste; the risk of catastrophic accidents; and the dangers posed to global security. As a typical example, the briefing highlights fundamental problems with the very latest generation of nuclear plants known as the "European Pressurised Reactor".

In defiance of logic, nuclear power has benefited for over half a century from massive financial support in the form of taxpayers' money. Yet it is barely possible to conceive of a more complex and risky way of heating water to produce steam and generate power. It is now time to give priority to simpler, cheaper and more reliable ways of meeting consumer demands for electricity.

The unresolved legacy of nuclear power:
radioactive materials – a continuing threat

When atoms are split, a lot of energy is released. Put simply, this is what nuclear energy is. It sounds innocent enough, but nuclear processes produce dangerous radioactive materials. These materials emit radiation that can be very harmful for people and the environment, not only now but also for hundreds of thousands of years to come. Exposure to radioactivity has been linked to genetic mutations, birth defects, cancer, leukaemia and disorders of the reproductive, immune, cardiovascular and endocrine systems.

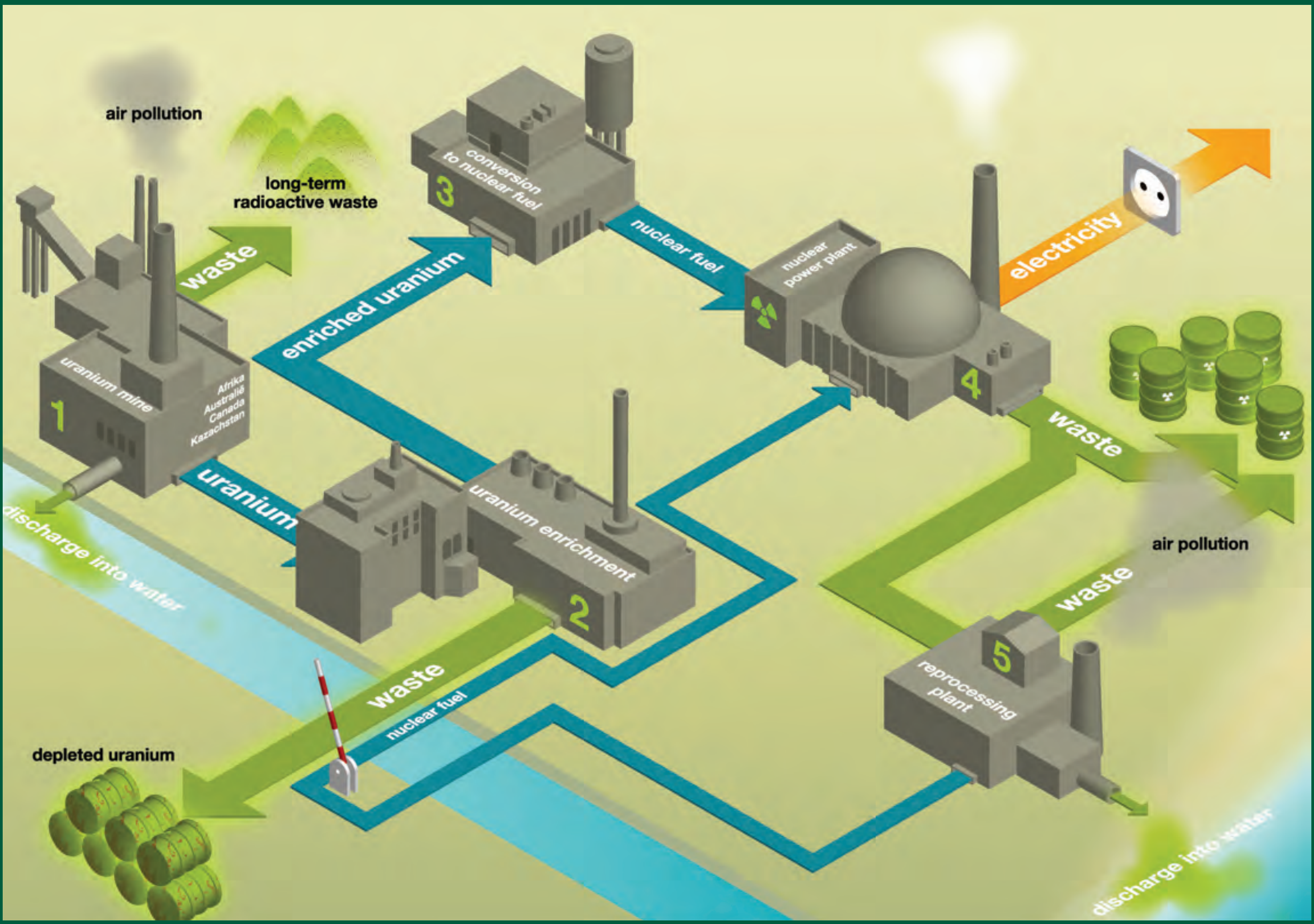
Commercial nuclear reactors use uranium as fuel. Even before it is ready to be used as fuel, a series of processing steps causes serious environmental contamination (see figure 1). When a uranium atom is split, it produces not only energy but also highly dangerous radioactive waste.

On average, uranium ore contains only 0.1% uranium. The overwhelming majority of the materials extracted during uranium ore mining is waste containing other hazardous radioactive and toxic substances. Most nuclear reactors require one specific form of uranium, uranium-235 (U-235). This form represents only 0.7% of natural uranium. To increase the concentration of U-235, the uranium extracted from ore goes through an enrichment process, resulting in a small quantity of usable 'enriched' uranium and huge volumes of waste: depleted uranium, a toxic radioactive heavy metal (see Box 1). Enriched uranium is then put into fuel rods and transported to nuclear reactors where electricity is generated. Nuclear power plant operation transforms uranium fuel into a rich, highly-toxic and dangerous cocktail of radioactive elements, such as plutonium. Plutonium is the manmade element used in nuclear bombs, lethal in minute quantities and dangerous for about 240,000 years.

In contrast to nuclear power, renewable energy is both clean and safe. Technically-accessible renewable energy sources are capable of producing six times more energy than current global demand.

image Sellafield Nuclear Reprocessing Plant, Cumbria, UK (c) Greenpeace / Nick Cobbing

Figure 1:



Box 1: Depleted Uranium (DU) – a dangerous by-product of nuclear power

Depleted Uranium (DU) is a by-product of uranium enrichment. Currently a worldwide stock of more than 1.2 million tonnes is stored without any foreseen future use. Britain and the United States used it to provide armour for tanks and piercing tips for munitions in the Gulf War.

Despite contravening health physics guidelines, the British and American governments waited years before starting to screen soldiers following their exposure to DU. In 2004, Gulf War veteran Kenny Duncan won a landmark court case against the British government. After years of repeatedly denying that Duncan's ill-health was the result of exposure to DU, the government was forced to recognise the impacts DU had actually had on his health and award him a war pension. Duncan's three children, born after his exposure to DU, suffered health problems similar to those experienced by many Iraqi children. These included immune system suppression and deformed toes.[1] DU continues to be used in arms despite there being no full understanding of its impact on human health and the environment.[2]

Hazardous for hundreds of thousands of years

Nuclear waste is categorised according to both its level of radioactivity and how long it remains hazardous. The International Atomic Energy Agency (IAEA) estimates that, every year, the nuclear energy industry produces the equivalent of about 1 million barrels (200,000m^3) of what it considers 'Low and Intermediate-Level Waste' (LILW) and about 50,000 barrels (10,000m^3) of the even more dangerous 'High-Level Waste' (HLW).[3] These numbers do not even include spent nuclear fuel, which is a high-level waste too.

Low and Intermediate-Level Waste includes parts of dismantled nuclear power plants (concrete, metals), but also disposable protective clothing, plastics, paper, metals, filters and resins. Low-level and intermediate waste remains radioactive for periods ranging from minutes to thousands of years and needs to be maintained under controlled conditions for these durations. Even so, large volumes of radioactive waste are discharged in the air and the sea every day.

Extremely dangerous **High-Level Waste** includes materials containing highly-radioactive elements. High-level waste can be radioactive for hundreds of thousands of years and emits large amounts of hazardous radiation. Even a couple of minutes of exposure to high-level waste can easily result in fatal doses of radiation. It therefore needs to be reliably stored for hundreds of thousands of years. Putting this into perspective, humankind has been on Earth for the last 200,000 years, yet it takes 240,000 years for plutonium to be considered safe (figure 2).

The safe and secure storage of the dangerous waste needs to be guaranteed throughout this period, which potentially spans many Ice Ages. It's no wonder that a solution for dealing with nuclear waste has still not been found.

Figure 2:

Plutonium is one of the highly radioactive elements in nuclear waste. Used to make nuclear bombs it is also a security risk. It takes 240,000 years to become safe.

Today	4,000 BC	6,000 BC	8,000 BC	10,000 BC
	First monument at Stonehenge	Invention of wheel	First settlements in Turkey	Introduction of agriculture

image Checking levels of radioactive waste at Buryakovka dump, Russia (c) Greenpeace / Clive Shirley

No solution to radioactive waste

"Reprocessing" creates even more hazardous waste

Some spent nuclear fuel is reprocessed, which means that plutonium and unused uranium are separated out from other waste, with the intention to reuse it in nuclear power plants. A limited number of countries – France, Russia and the UK – conduct reprocessing on a commercial scale. Consequently, dangerous nuclear waste and separated plutonium are repeatedly transported across oceans and borders and through towns and cities.

However, the term "reprocessing" is misleading. The process actually leads to more hazardous waste flows. Only part of the radioactive material is recovered and further processed as nuclear fuel; the rest results in large volumes of various types of radioactive waste that is often difficult to store. Nuclear reprocessing plants discharge large volumes of radioactive waste on a daily basis with serious environmental impacts. A study published in 2001 showed an increased incidence of leukaemia among under-25 year olds living within 10 kilometres of La Hague nuclear reprocessing plant, in northwest France.[4] According to a 1997 study in the UK, there was twice as much plutonium in the teeth of young people living close to the Sellafield nuclear reprocessing plant than in the teeth of those living further away.[5]

Reprocessing of nuclear waste endangers our health and does not decrease the radioactive waste problem. It has been estimated that, over the next 40 years, the radioactive discharges of the Rokkasho reprocessing plant, to be started in Japan, will be very large relative to other nuclear operations and will lead to exposure of members of the public to radiation equivalent to half of that released during the Chernobyl catastrophe.[6] (See Accidents page 6)

Burying the problem?

The nuclear industry wants to bury the problem of radioactive waste by storing it in deep geological repositories. However, not a single one has yet been built. It appears to be impossible to find suitable locations where safety can be guaranteed for the timescales necessary.

Construction of the Yucca Mountain waste site in Nevada, in the United States, began in 1982, but the date for start of operation has been postponed from 1992 to beyond 2020. The US Geological Survey has found a fault line under the planned site[7] and there are serious doubts about the long-term future movements of underground water that can transport deadly contamination into the environment. Proposals for an underground dump in Finland suffer from similar concerns (see Case Study, page 11).

Given the immense difficulties and risks associated with the storage of dangerous nuclear waste, it's not surprising that the nuclear industry tries to dump it out of sight. One such example is Russia – during the Soviet era, nuclear facilities were built in closed cities (in, for example, the Urals and Siberia), resulting in a history of nuclear disasters, environmental contamination and public health scandals, all of which were kept secret by the Soviet government. One of these cities, Mayak, may now be the most radioactively contaminated place on Earth. Despite its appalling record of managing nuclear waste, Russia wants to import foreign nuclear waste for storage and/or reprocessing at Mayak, as well as other sites.

Despite the billions already invested in research and development for dealing with radioactive waste, new experiments are still being presented as 'solutions'; methods that will not be ready for a long time, may never be commercially viable or do little to solve the long term waste problem.

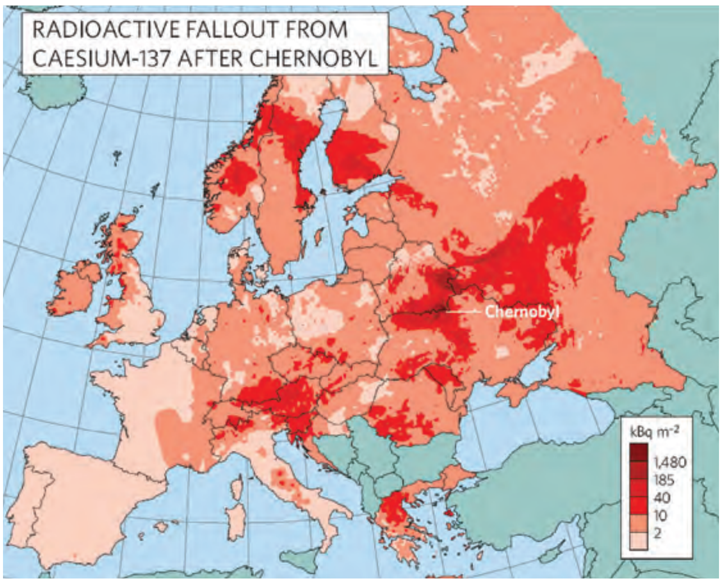
Measures to improve energy efficiency are available now. According to Amory Lovins of the US-based Rocky Mountain Institute, *"Each dollar invested in electric efficiency displaces nearly seven times as much carbon dioxide as a dollar invested in nuclear power, without any nasty side effects"* [8]

30,000 BC		40,000 BC		50,000 BC	57,000 BC
Earliest Cave Paintings in Chauvet Cave, France		*Homo sapiens* migrate to Europe and Australia		*Homo sapiens* migrate to South Asia	First ships used, New Guinea

Accidents:
A complex and uncontainable risk

On 26 April 1986, an accident at the Chernobyl nuclear plant in the Ukraine caused a meltdown in the reactor, resulting in the release of more radioactivity than that spread when the atom bombs were dropped on Hiroshima and Nagasaki. Chernobyl is marked in history as the world's worst civilian nuclear disaster. During the disaster, 56 people died and about 600,000 people were exposed to significant levels of radiation. Radioactive contamination spread to places as far away as Lapland and Scotland[9] (figure 3). Hundreds of thousands of people in contaminated regions had to abandon their homes.

Figure 3: Deposits of radioactive caesium-137 from Chernobyl fallout. The contamination will impact several generations. Higher levels impacted areas as far apart as Scandinavia, UK, Alps or Greece.



Radioactive pollution has long-term impacts on health. The precise death toll from Chernobyl will never be known but it may exceed 90,000 people.[10] As former UN Secretary General Kofi Annan was reported as saying on the twentieth anniversary of the accident, "seven million people are still suffering, everyday". Three million children require treatment and many will die prematurely.[11] (See Box 2)

The nuclear industry argues that the Chernobyl catastrophe was only the result of old technology and mismanagement within the old Soviet bloc. Yet nuclear accidents and "near misses", in which the fuel rods at the core of a reactor come close to melting down, continue to occur in nuclear plants around the world. Since Chernobyl, there have been nearly 200 "near misses" in the US alone, according to the US Nuclear Regulatory Commission (NRC).[12] Another example involved a serious technical failure in the Forsmark nuclear power plant in Sweden, in 2006, which forced four of the country's six reactors to shut down. A former director of the plant said, *"It was pure luck that there was not a meltdown…it could have been a catastrophe."*[13] Also in 2006, one-third of the control rods in a pressurised water reactor at the Kozloduy plant, in Bulgaria, failed to operate during an emergency shutdown.

Plutonium still not safe

70,000 BC

Homo sapiens migrates from Africa to Near East

100,000 BC

Flint blades used in Africa and Near East

In 1999, workers failed to follow guidelines at the Tokaimura nuclear fuel plant in Japan, leading to an uncontrolled nuclear chain reaction. Two workers received lethal doses of radiation, and the neighbourhood had to be evacuated. The IAEA concluded that serious breaches of safety principles were the cause of the accident.[14] Operational shortcuts had been taken to make the process quicker and cheaper.[15]

Even if technology never failed and human operators never made errors, natural disasters still present significant risks. In 2003 the French nuclear safety agency activated its emergency response centre following torrential rainfall along the lower Rhone River, which threatened to flood two nuclear reactors at the Cruas-Meysse power plant.[16]

In 2007, an earthquake in Japan caused a fire at the Kashiwazaki-Kariwa nuclear power plant. The earthquake caused its seven reactors to shut down, releasing cobalt-60 and chromium-51 into the atmosphere from an exhaust stack and leading to 1,200 litres of contaminated water leaking into the sea.[17] A year later all seven reactors were still inoperable.

Nuclear power gambles with our lives, health and environment, while a sustainable energy future without these risks is at hand. Greenpeace and the European Renewable Energy Council (EREC) commissioned the DLR Institute (German Aerospace Centre) to develop a global sustainable energy pathway to 2050. The resulting "Energy [R]evolution" blueprint[18] shows that if, intelligent policy and infrastructure choices are made now, renewable energy and energy efficiency could provide half of global energy requirements by 2050 and reduce use of fossil fuels to 30%. The scenario clearly shows that the necessary reduction in CO_2 emissions can be obtained without nuclear power.

Box 2: Chernobyl – Annya's Story: Certificate no. 000358

At just four years old, Annya Pesenko would often pass out and fall flat on the table when she was trying to sit up straight and eat her food. Her mother, Valentina, took her to the doctor. He discovered a tumour in her head. The cancer was removed, but Annya never regained her health. She has seen so many doctors that just the sight of a white coat terrifies her. The tumour returned when she was nine. Annya has been in and out of hospital ever since.

Annya's father, Vyacheslav, was from a village highly contaminated by the Chernobyl meltdown. At night Valentina and Vyacheslav sleep on the floor next to their daughter's bed. Annya has to be turned every fifteen minutes to prevent bed sores. Nobody gets much sleep. Vyacheslav has to leave first thing in the morning for his chauffeuring job and Valentina drinks coffee all day to stay awake.

Annya wasn't even born when the Chernobyl accident happened. She has been given a "Chernobyl Certificate" by a committee of doctors who offer Chernobyl victims access to certain healthcare. Certificate no. 000358.

From "Certificate no. 000358, nuclear devastation in Kazakhstan, Ukraine, Belarus, the Urals and Siberia- 2006" Robert Knoth (photographer) Antoinette de Jong (text) Metz & Schilt, Amsterdam.

Plutonium – a manmade product from nuclear power, in existence for 50 years – takes 240,000 years to become safe. Longer than modern man (*homo sapiens*) has been on Earth.

200,000 BC
Origin of *homo sapiens* in Africa

230,000 BC
Homo hiedelbergensis, homo erectus (Asia) and Neanderthals on Earth

240,000 BC

A threat to global security

Nuclear power evolved from the atomic bomb, and the two have remained connected ever since. One of the most fundamental and insoluble problems of nuclear power is that the enriched uranium it burns, and the plutonium it produces, can be used to construct nuclear weapons. Other radioactive products formed in nuclear reactors can be used to produce dirty bombs.

A typical nuclear power plant produces sufficient plutonium every year for 10-15 crude nuclear bombs.[19] Former UN Secretary-General Kofi Annan warned, in 2005, that using such nuclear bombs *"would not only cause widespread death and destruction, but would stagger the world economy and thrust tens of millions of people into dire poverty."* [20]

Experiments by the US government have shown that several nuclear weapons can be built in a matter of weeks using ordinary spent fuel from light water reactors (the most common type of reactors). One study revealed that a country with only a minimal industrial base could quickly and secretly build a small plant, just 40 metres long, capable of extracting about a bomb's worth of plutonium every day.[21]

This relationship between bombs and electricity generation is reinforced by the dual roles of the IAEA in both policing nuclear technology to halt the spread of nuclear weapons and promoting nuclear power. Dominique Voynet, French Senator and former Minister for the Environment, points out: *"The IAEA acts as a true promoter for the nuclear industry worldwide. By deliberately ignoring the interlink between civil and military nukes, it contributes to the proliferation of fissile materials."*[22] We do not need to look far for examples of how this approach has failed to stop the spread of nuclear weapons. China, India, Iraq, Israel, North Korea, Pakistan and South Africa have all used their nuclear power industry to covertly develop nuclear weapons programs.

Forty other countries, currently without nuclear weapons programmes but which have experimented with or developed nuclear power, have access to the nuclear materials and technology needed to make a nuclear bomb.[23]

Vulnerable to terrorists

Despite extensive treaties and political efforts, effectively safeguarding nuclear materials and technology against terrorist threats remains an impossible task. Mohamed El Baradei, head of the IAEA and the man responsible for the safeguards and security regime, admitted in 2005 that, *"Export controls have failed, allowing a black market for nuclear material to develop, a market that is also available to terrorist groups."*[24]

Nuclear facilities, as well as the radioactive waste transports that regularly cross countries, are also potential targets for terrorists. For example, reactors have not been built to withstand the impact of a large aircraft; nuclear waste transports are even more vulnerable. A study, written by nuclear expert John Large, evaluated scenarios involving terrorist attacks on, or the crash of, a plutonium shipment from France's La Hague reprocessing plant to the Marcoule reactor. The report estimates that 11,000 people would die from the effects of radiation exposure.[25] A similar study by Dr. Edwin Lyman of the Union of Concerned Scientists finds that a potential terrorist attack on the Indian Point nuclear plant in the US could lead to 518,000 long-term deaths from cancer and as many as 44,000 near-term deaths from acute radiation poisoning.[26]

Nuclear power increases the risk of nuclear weapons capabilities spreading to other countries, of terrorists gaining material to make nuclear bombs and of potential terrorist attacks on nuclear facilities or transports. Renewable energy carries none of these safety or proliferation concerns. It does not require complex safeguards, international bodies, or treaties to police its trade and use. Renewable energy technologies and skills can be easily and safely exported around the world.

image In cooperation with UPLINK, a local development NGO, Greenpeace offered its expertise on energy efficiency and renewable energy and helped to install renewable energy generators at a coastal village in Aceh, Indonesia, one of the areas worst hit by the tsunami in December 2004.
(C) Greenpeace / Hotli Simanjuntak

Nuclear power is expensive

Nuclear power is often described as "the most expensive way to boil water." Despite its proponents now claiming it to be cost-effective, cost estimates for proposed projects have consistently proved inaccurate. A look at current and past experiences of the anticipated and real costs of nuclear projects reveals an industry in which overspends are prevalent and which is propped up by subsidies.[27] The ratings agency, Moody's, has made it abundantly clear that, even with massive government subsidy, nuclear power is not a sound investment.[28]

The cost of building a nuclear reactor is consistently two to three times higher than the nuclear industry estimates. In India, the country with the most recent experience of nuclear reactor construction, completion costs for the last 10 reactors have, on average, been 300% over budget. In Finland, the construction of a new reactor is already €1.5 billion over budget (see Case Study, page 11).

Over the years, billions of dollars worth of taxpayers' money has been poured into nuclear energy, compared to trifling sums that have gone towards promoting clean, renewable energy technologies. In the case of the US, where not one new reactor has been ordered in 30 years, the government tries to tempt private investors with tax credits, federal loan guarantees and contributions to risk insurance.

Nuclear reactors present too large a liability for insurance companies to accept. One major accident, costing hundreds of billions of euros (the total Chernobyl cost is estimated at €358 billion) would bankrupt them. Governments, and ultimately their taxpayers, are forced to shoulder this financial liability. The cost of clean-up after a nuclear power plant closes and the safe management of nuclear waste for many generations are also largely carried by the states instead of the companies themselves.

With a fairer legal and political framework, green electricity can keep the lights on with cleaner, safer, cheaper electricity. Germany's renewable energy industry and the wind industry in Texas are two successful examples that have led to market competitiveness without additional subsidies.

Global investment in renewable energy has already doubled in the past three years and there is a corresponding downward trend in cost that makes renewable energy a comparatively cheaper long-term investment.

Renewable energy is the cheaper option. To produce double the current amount of nuclear energy would require building 500 Gigawatts (GW) of new capacity taking into account retiring nuclear power plants This could cost USD 4,000 billion [29]. Generating the same amount of electricity (5,200 TWh per year) from renewable sources would require construction of 1,750 GW at the investment of USD 2,500 billion assuming their current costs.[30] This means that nuclear power is 50% more expensive than renewable to build, plus additional costs related to fuel and waste disposal would be avoided

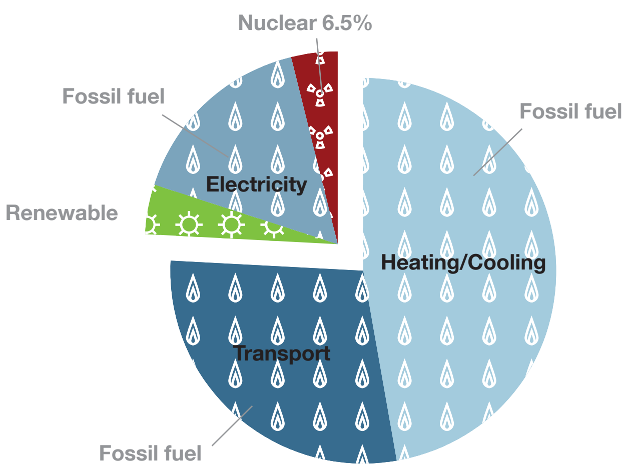
A risk for climate change and energy security

Though some people talk of a 'nuclear renaissance' it exists only on paper. Pretentious words and high expectations are not matched by orders for new reactors or by interest from the investment community. Only at nuclear power's peak in 1985 and 1986, the equivalent of 30 new reactors (30 GW) of additional capacity was built per year. In the last decade the average construction rate was just four new reactors (4 GW) per year.

The declining nuclear industry is attempting to latch on to the climate crisis and concerns about energy security, by promoting itself as a "low carbon" solution. Today's world is hooked on coal, oil and gas. Burning these fossil fuels releases carbon dioxide, the main cause of global warming and climate change. Furthermore, oil and gas are finite and concentrated in a limited number of locations around the world, often in unstable regions. This concerns policy makers keen to ensure sufficient and secure supplies of energy for the future.

But, for the simplest of reasons, nuclear energy cannot be a part of a solution: Nuclear power can only deliver too little, too late.

Figure 4: Energy use by sector – global



As nuclear power can only provide electricity, it cannot meet our transport or heating energy needs.

Avoiding the worst impacts of the climate change means that global greenhouse gas emissions need to peak by 2015 and be cut by at least half by 2050, compared to their 1990 levels. This calls for fundamental changes in the way we generate and use electricity.

Even in countries with established nuclear programmes, planning, licensing and connecting a new reactor to the electricity grid typically takes more than a decade.

The Energy Scenario produced by the International Energy Agency shows that, even if existing world nuclear power capacity could be quadrupled by 2050, its share of world energy consumption would still be below 10%. This would reduce carbon dioxide emissions by less than 4%.[31]

Implementation of this scenario would require that one new reactor to be built every 10 days from now until 2050. Investment costs for 1,400 new reactors needed would exceed USD 10 trillion at current prices.[32]

Nuclear power cannot meet concerns about energy security either. The 439 commercial nuclear reactors[33] in operation generate around 15% of the world's electricity. This is just 6.5% of the world's total energy supply. Nuclear power only generates electricity. Any contribution to hot water and central heating supply would be marginal, and it does not meet our transport needs at all, as Figure 4 shows.[34]

Nuclear power plants depend on uranium for fuel, an ore found in only a handful of countries. 88% of world production in 2005 was supplied from Australia, Canada, Kazakhstan, Niger, Namibia, Russia and Uzbekistan. Pursuing the so-called "nuclear option" therefore means dependence on a limited source of supply, not contributing to a country's energy independence.

Renewable energy technologies and energy efficiency measures are available now and forever. Construction time for installing a large wind turbine has fallen to only two weeks, with an associated planning period of between one and two years. Harnessing domestic natural resources, a decentralised mix renewable energy and energy efficiency could really provide for more CO_2 reduction and energy security without the hazards of nuclear power.

image View across a field of the 115 metre (377 foot) high tower at the PS10 Concentrating Solar Power Plant, in Seville, Spain. Below this tower 624 large movable mirrors called heliostats concentrate the sun's rays to the top of the tower where a solar receiver and a steam turbine are located. The turbine drives a generator, producing electricity. (C) Greenpeace / Markel Redondo

Case Study: The Finnish reactor – the nuclear industry's brave new world

The European Pressurised Water Reactor (EPR) is supposed to be the flagship of the so-called "nuclear renaissance". Presented by its French supplier Areva, as significantly safer, more reliable, cheaper and faster to build than previous reactor designs, the first experience of construction, at the Olkiluoto-3 (OL3) reactor, in Finland, is proving a disaster.

Safety:

In August 2008, three years into the project, the Finnish nuclear safety authority, STUK, had reported 2,100 quality and safety defects.[35] Many of these safety failures can increase the risk of a severe accident.[36] In August 2008, STUK had to further admit that the safety culture in OL3 had not met the standards and need to improve.[37]

Cost Overruns and Construction delays:

With expected construction delays of three years, the reactor is at least €1.5 billion (USD 2.34 billion) over budget.[38] Yet, the Finnish public were bullied into accepting OL3 because the government told them it would cost € 0.5 billion more than the originally budgeted cost of the reactor to invest in alternative energy sources.

More expensive electricity:

Elfi, the Finnish consortium of large electricity users, calculates that this will lead to €3 billion of indirect costs to electricity consumers[39] – around €600 extra per person.

Reliance on taxpayers' money:

OL3 was promised to be a "market-financed private investment".[40] But most investment is coming from the government. 60% of direct investment in OL3 comes from companies controlled by the Finnish State and its municipalities.[41] The involvement of French and German public banks means that taxpayers in these countries may also shoulder some of the costs.

Failing on climate change:

A scenario[42] of carbon dioxide emission reductions, commissioned by the Finnish energy industry, shows emission reductions due to OL3 to be only one-third of the forecasts that were provided to the government in 2002. What's more, the three year delay in construction means that the reactor will not contribute to Finland's Kyoto Protocol emissions reduction target at all.

Finnish Prime Minister Matti Vanhanen said in 2008, "I don't see that (more) nuclear plants can be a global answer," adding that reducing energy consumption, especially from cars, would do more to fight climate change.[43]

Blocking the real solutions to climate change:

OL3 has had a disastrous impact on Finland's renewable energy industry. Prior to the decision to build the new reactor, the Finnish renewable energy industry was thriving. Today, the renewable market has stagnated as 85% of planned investments in new power generation between 2006 and 2010 have been eaten up by OL3.[44] Leading international business advisors, Ernst & Young have ranked Finland as the third least-attractive among 25 countries for investments in renewable energy.[45]

No solution for waste

A company called Posiva studies the possibility of burying highly radioactive nuclear waste permanently underground. No permission to build a nuclear waste storage site has been granted and at least five years of more research is needed before the company is even ready to apply for a permit. There are some serious concerns about this project:

- All research is conducted by the waste disposal company itself without independent review.
- Once the storage site is full and closed there are no plans or money set aside for monitoring the site or dealing with any leakages.
- The bedrock in the studied site is full of cracks and less stable then originally believed. The site has been chosen for political rather than geological reasons – people living locally are less likely to oppose it.
- Recent research published in Science magazine shows that copper canisters could be corroded in a century.

Conclusion

The OL3 debacle shows that nuclear power remains expensive, unsafe and undermines true solutions to climate change. The second construction site for a EPR, in Flamanville, northern France, follows a similar course to OL3. It should serve as a stark warning to governments considering investing in nuclear power.

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