7 Reasons to Oppose Nuclear Power Plants
1 Nuclear power plants are extremely dangerous

The propensity for human error is high in the operation of a nuclear power plant. Nuclear power plants use massive amounts of radioactive elements that are naturally dangerous to people and the environment. Inside a nuclear reactor, the uranium that undergoes heat-producing fission has to be constantly cooled down. The risk of a meltdown is ever present.

Other concerns include the...
means of storing the nuclear waste. The disposal of uranium rods poses particular risks. These rods need to be changed approximately 18 months after setup due to fission slowdown. The irradiated rods are stored in a water-filled pool within the reactor building or in an adjacent building. After a few years, the rods may be placed in steel-lined concrete casks outside the building, to await shipment to a still-nonexistent permanent repository.¹

Whilst this happens, radiation is emitted across the site, neighbouring villages and countries. Such emissions can cause cancer, birth defects and environmental damage. There is no substantial way of disposing of the rods safely. There have been suggestions that the rods be buried deep within the ground, but this would only further contaminate the soil and cause devastating health hazards, including ground and water contamination. The waste would also take millions of years to decay.

Nuclear waste is the spent nuclear fuel from a reactor. The fuel is considered spent when the fission by-products — the atoms left over from the splitting process — prevent free neutrons from splitting more uranium or turning into plutonium. It takes three to four years to get to this point in the process. The waste is highly radioactive, so it must be stored in
steel-lined concrete pools or in dry caskets.

As of 2003, nuclear reactors in the United States had created about 49,000 tons of waste, according to the Department of Energy.\(^2\)

2 People living near power plants are falling sick

The chances that people living near nuclear power plants will fall sick are “unequivocally high”. This is due to the high radiation exposure even on a daily operations basis. The worst-case scenario is, of course, of an accident in the power plant, because there is no safe exposure to radiation.

There are well-documented studies that link cancer to radiation. The most common risks are skin disease, birth abnormalities, leukaemia and brain tumours. These were the illnesses recorded following nuclear disasters in Kyshtym, Chernobyl and Three Mile Island.

A scientific study, published in the *European Journal of Cancer Care* in 2008, revealed that leukaemia death rates in children living near nuclear power plants in the United States have risen sharply in the past two decades. The greatest increases
in mortality rates occurred near the oldest plants, whereas declining rates were observed near plants that were closed permanently in the 1980s and 1990s. The 13.9% rise in deaths near older power plants suggests a potential effect of greater radioactive contamination near nuclear reactors.

In a 2007 meta-analysis of 17 research papers, covering 136 nuclear sites in the United Kingdom, Canada, France, the United States, Germany, Japan and Spain, the incidence of leukaemia in children under nine, living close to the sites, showed an increase from 14% to 21%, while death rates rose from 5% to 24%.

A German study, published in
Victims of the Chernobyl nuclear disaster, 1986.
In 2008, the *International Journal of Cancer* found a 60% increase in cancers and a 117% increase in leukaemia among young children living near all 16 large German nuclear power plants between 1980 and 2003. The most striking finding was that children living within 5 km of nuclear power plants were more than twice as likely to get cancer as those living further away. This finding has been accepted by the German government.

Another German study in 2011 showed that nuclear activity has detrimental effects on the reproductive system. More female babies were born in the area surrounding the Chernobyl disaster site than male babies. These findings show a long-term, dose-dependent impact of radiation exposure on human sex ratios.

**3 Impacts on environment are far-reaching and long-lasting**

Nuclear power plants require a lot of water to feed their operations. Water is used to cool the reactors that heat up to produce steam that runs the turbines generating electricity. The fact that these plants need water makes their location next to large bodies of water crucial.
Water is drained from rivers, seas or lakes in order to constantly cool the reactors.

As a result of this, water scarcity can occur. However, the bigger problem relates to the disposal of used water from the reactors that is discharged back into the waterways. The water is highly contaminated with radioactive substances and often it is not treated before being discharged. This act not only contaminates waterways but also poisons the marine life and wildlife that feed from it and, subsequently, the humans who consume them. The chain of reaction triggered by nuclear power plants on the environment has far-reaching implications that will negatively impact life on earth for centuries.

Mutagenic studies have found that an agent, such as a chemical, ultraviolet light, or a radioactive element, can induce or increase
the frequency of mutation in an organism.\textsuperscript{4} Radioactive waste can emit elements that contaminate the life forms surrounding it. This process can, in turn, create mutations in organisms, inevitably altering the original gene composition in living things.

\textbf{4 Nuclear power plants are expensive to build, maintain and decommission}

Power plants are often built with the cooperation of private companies and, therefore, huge subsidies from the state are common. These plants can begin with a certain budgeted sum, but by the time construction begins, such budgets are likely to have quadrupled to tens of billions of dollars. The construction of nuclear plants never commences immediately. Several issues may crop up during the pre-construction process, such as planning, approval, research and development on new technologies, land acquisition, environmental impact assessments and from affected persons and the concerned public. All these take years to deal with, from the time of the initial planning process and
introduction period. While this happens, the proposed budget grows due to increases in price of building materials, and inflation generally, continuous planning and constant tightening of safety procedures.

In addition, whilst construction of nuclear plants costs billions, the operation of these plants also consumes money. The cost of maintaining these plants spirals up every year, and it is the government that will have to foot the bill. This does not take into account accidents, including minor slip-ups, that can translate into astronomical figures to repair the damage. The money that the government uses to pay for the plants comes from taxpayers.

The public therefore ultimately not only foots the bill, but the cost for each kilowatt translates into an increase in the electricity bill.

Decommissioning nuclear plants also costs billions. Proper methods need to be adopted to dispose of the contaminated materials. However, the non-existence of a nuclear waste repository makes this process not only dangerous but expensive because armed guards have to be employed to secure the area from the public. Thus, the building and materials remain in place with no safety mechanism activated to protect people and
Cleanup at Three Mile Island.
other life forms from the ever-present danger of radiation.

Consider the costs of a disaster. Belarus, a state in the erstwhile USSR, suffered the maximum damage as a result of the 1986 Chernobyl nuclear disaster. According to a report by the International Atomic Energy Agency, between 1991 and 2003, Belarus spent $13 billion on disaster-related expenses. It has estimated its losses over 30 years at $235 billion. Ukraine, where Chernobyl is located, still allocates 6-7% of total government spending for disaster rehabilitation programmes. Radiation fallout from the disaster has contaminated more than 200,000 square kilometres, mostly in Russia, Belarus and Ukraine.

In Fukushima, just closing down and safely dismantling the Dai-Ichi nuclear plant will take 30 years and cost between $12 billion and $19 billion. This does not include the costs of health monitoring, evacuation and social security, remediation of contaminated environment, the economic losses arising from loss of agriculture and fisheries income, or the foreign trade lost due fear of radiation contamination.\textsuperscript{5}
Cleanup at Chernobyl.
Actual cases of radiation exposure unknown

It is difficult to locate statistics of reported cases of regular exposure incidents because of the highly secretive nature of nuclear operations. Even the facts surrounding reported cases of major disasters/meltdowns are not easily obtained, with the truth about the ones that do become public knowledge sometimes remaining unclear. For instance, the actual number of persons who died as a result of radiation following the Chernobyl disaster remains unknown. The estimates of the number of dead run from 300,000 to nearly one million.\textsuperscript{6}

Workers are exposed to high doses of radiation even from used fuel rods that are placed in dry-steel casks. The rusting rods emanate penetrating gamma rays that affect workers, placing them at a high risk of developing some form of cancer years later. The risk is further compounded when workers are made to clean, change or repair parts in the reactor plant.
Risks of transporting radioactive materials/waste

Again, because human error is unavoidable, the chances of accidents happening when transporting radioactive materials are high. And accidents have been common although not readily reported. Radiation emitted from spent fuel casks, uranium transportation tanks and used fuel rods in the reactor vessel can spread across a wide radius. Bearing in mind that there is no ‘safe’ level of exposure to radiation, the implications on humans and other living things are unimaginable.

Nuclear plants are not clean or green

Nuclear energy is, by and large, used for electricity. Contrary to popular belief, however, nuclear energy is neither safe nor clean. The proliferation of greenhouse gases in the atmosphere causes global warming. Nuclear power reactors release carbon dioxide (CO$_2$), a major cause of global warming, and other noxious gases that harm the environment.
Things you should know about nuclear power

What is “nuclear”?  
Nuclear is the energy that is created from fusion or fission to generate power. Nuclear fission was discovered at the turn of the 20th century, but only became evident in the late 1930s.

What is fission?  
Fission is a process when an atom is split into two. This process occurs naturally on a daily basis. Uranium, in particular, constantly undergoes spontaneous fission but at a slow rate.

How does a nuclear power plant work?  
A nuclear power plant is basically a steam power plant that is fuelled by a radioactive element, like uranium. The fuel is placed in a reactor and the
individual atoms are allowed to split apart. The splitting process, known as fission, releases great amounts of energy. This energy is used to heat water until it turns to steam. From here, the mechanics of a steam power plant take over. The steam pushes turbines, which force coils of wire to interact with a magnetic field. This generates an electric current.

**What is uranium?**
There are several varieties of uranium, an element found naturally in the earth, of which uranium-235 (U-235) is one of the most important in terms of the production of both nuclear power and nuclear bombs.

Another element that helps the fission in nuclear reactors is plutonium-239. Plutonium-239 is created by bombarding U-238 with neutrons, a common occurrence in a nuclear reactor.

U-235 and U-238 are both naturally found in the earth, but U-235 is seen as a naturally occurring fissile isotope, while U-238 is fissionable by fast neutrons, and is fertile, meaning it can be transmuted to fissile plutonium-239 in a nuclear reactor.
Where are the raw materials sourced from?
Uranium is sourced mostly from Kazakhstan, Canada and Australia, among other countries. They provide 63% of the world’s uranium supply. Plutonium is not mined. It is a by-product of nuclear fission in reactors. Some of the neutrons released by fissioning convert uranium-238 nuclei into plutonium.

What can nuclear power do?
Nuclear power is used in various ways – in reactors or power plants, bombs, propelling submarines and aircraft, and in the medical field (X-rays and radiotherapy).

Which countries have nuclear power?
Presently, there are 443 nuclear reactors in the world. The United States has a quarter of this figure with 104, while France’s energy needs are primarily met by nuclear power.
In the wake of the Fukushima nuclear disaster in Japan, German Chancellor Angela Merkel announced that her country would close all of its 17 existing reactors by 2022. Other nations, including Japan, Italy, and Switzerland, have announced plans to pare back nuclear power.

**Where have nuclear power plant disasters occurred?**

Besides the better-known disasters at Kyshtym (1957), Three Mile Island (1979) and Chernobyl (1986), at least 76 other nuclear accidents resulting in a total of $19.1 billion in damages occurred between 1947 and 2008. Fifty-six of these accidents happened after the Chernobyl disaster. This translates to one serious nuclear incident every year causing $332 million in damages annually. Between 2005 and 2055, at least four serious nuclear accidents are likely to occur, according to calculations by an interdisciplinary study titled “The Future of Nuclear Power” conducted by the Massachusetts Institute of Technology (MIT) in 2003. The 2011 Fukushima disaster is the first of MIT’s prophetic estimates.
MAJOR NUCLEAR ACCIDENTS

United Kingdom (1957) — Reactor fire at Windscale facility contaminates 35 workers, sends radioactive cloud over northern Europe.

Soviet Union (1957) — More than 100 killed in explosion at a secret nuclear reprocessing site in Chelyabinsk; 270,000 evacuated from 217 cities and villages.


Scotland (1967) — Fuel element melts, catches fire at Chapelcross reactor.

Switzerland (1969) — Coolant leak in underground reactor in Lucens causes explosion and severe contamination.

U.S.A. (1975) — Alabama’s Browns Ferry plant catches fire and burns for 7.5 hours with two GE reactors operating at full power. Meltdown feared as one reactor goes “dangerously out of control.”

Three Mile Island, 1979: The worst nuclear accident in the USA, caused by technical malfunctions and human error.
United Kingdom (1981) — Radiation leak from Sellafield (née Windscale) contaminates dairy pastures. Local leukemia rates soar to triple the national average.
U.S.A. (1981) — California’s San Onofre plant closes for 14 months for repairs to 6,000 leaking steam tubes. During restart, plant catches fire, knocking out one of two back-up generators.
Argentina (1983) — Engineer killed by radiation exposure at research reactor; 17 others injured.
United Kingdom (1983) — Sellafield fallout contaminates coastline and ocean.
Russia (1986) — Chernobyl: world’s worst nuclear accident to date. Number of dead remains unknown; estimates run from 300,000 to nearly 1 million.
Germany (1986) — Fuel accident releases fallout up to two kilometres from plant.
Japan (1997) — Explosion at Tokaimura plant leaves 35 workers exposed to high levels of radiation.
Chernobyl, 1986:
World's worst nuclear accident.
Japan (1999) — Uncontrolled nuclear reaction at Shika reactor. Incident covered up by plant operators.
Japan (1999) — Two workers killed at Tokaimura during unplanned chain reaction that exposes 116 workers to radiation.
Germany (2001) — Failure in emergency cooling system of Philippsburg reactor.
Germany (2001) — Heavy hydrogen explosion in Brunsbüttel boiling water reactor.
Sweden (2006) — A catastrophic core meltdown of the Forsmark reactor is barely averted after an external short circuit causes a failure of the emergency power system.
Germany (2007) — Transformer fire results in failure of emergency power supply.

Japan (2007) — Transformer fire following earthquake triggers radioactive leak at the Kashiwazaki-Kariwa plant. Quake shuts down the 8,000-MW reactor in 90 seconds. Seven reactors damaged by quake.

France (2008) — A major leak at the Tricastin nuclear facility in southeastern France spills 30 cubic metres of uranium-rich water onto the plant’s grounds.

Russia (2009) — The Leningrad Nuclear Power Plant is shut down after a crack is discovered in a pump, threatening a “potentially catastrophic technical malfunction.”

France (2009) — A “significant” incident causes the evacuation of the reactor unit in the Gravlines nuclear plant in northeastern France—the fifth “level-1” emergency in three years.

Japan (2011) — Six coastal reactors at Fukushima disabled by earthquake and tsunami. Cooling system failure leads to explosions, partial meltdowns and massive release of radiation.

Additional significant accidents have occurred at the following U.S. plants: Shoreham, Seabrook, Nine Mile Point, Midland, Zimmer, Marble Hill, WPPSS, Byron, Braidwood, Grand Gulf, Comanche Peak, South Texas and Diablo Canyon
CONCLUSION

What is the scenario in Malaysia?

In 2010, the federal government announced that it intends to build two 1,000 MW nuclear power plants by 2022 to cater to the growing energy needs in the country. The government has approved in principle the construction of the country’s first nuclear power plant by 2021.

Although there has since been little talk or announcements made by the government, there have been mixed responses from Malaysians and international groups on this issue.

Would we be affected if a plant is constructed in Thailand, Indonesia, Singapore or Vietnam?

Malaysians would be affected because of our proximity to these countries. Radiation from plants in these countries and transportation of hazardous material can travel long distances particularly if there is a change in the weather such as strong winds. Nuclear power plant radiation has no respect for geographical borders.
Can Malaysia’s electricity needs be met without nuclear power?

Yes, they can. There are other methods of providing electricity to people, such as renewable energy (RE). Currently, Malaysia’s electricity consumption amounts to approximately 14,000 megawatts (MW), but we already have an installed capacity of 23,000 MW. That gives Malaysia an extremely comfortable margin, far exceeding the government’s target of 20%.

It is strongly believed that with a proper, effective regulatory framework and the right fiscal incentives, RE can contribute significantly to Malaysia’s energy reserves, further negating the need for investment in costly, dangerous and dirty energy source like nuclear power.

Energy efficiency (EE) can also be improved in all sectors. In fact, EE is one of the objectives of the National Energy Policy that was supposed to be implemented in the Eighth Malaysia Plan. The Malaysian government needs to intensify the promotion of EE as it is currently moving too slowly.

In any case, energy self-sufficiency is the best guarantee of energy security. This can be achieved through a diversity of sustainable, renewable energies at medium-, small- and micro-generation scales and according
to resources locally available, so that energy is used at the point of generation, saving up to 69% of the energy lost through long-distance transmission from big centralized power plants and the associated carbon emissions.\textsuperscript{7}

\textbf{Why should ASEAN be nuclear-free?}

As mentioned above, a nuclear accident in any neighbouring country will inevitably affect Malaysians. The ASEAN countries should go nuke-free for the safety of their people. Furthermore, we do not have the funds, expertise and, most importantly, the need to set up nuclear plants. As we speak, there are already countless numbers of mega hydro-electric dam projects in the pipeline. These projects, though also environmentally damaging, were planned years ago. It does not make sense to go nuclear when there is already excess provision of electricity to cater to the populace for the next few decades.

The recent Fukushima disaster has gripped ASEAN countries, particularly over the spread of radiation. This concern manifested itself in sudden halts in nuclear plans within the region and also brought about a discussion in 2011 among the governments to instead spearhead a nuke-free ASEAN region policy.

The Fukushima catastrophe
persuaded many countries, including Germany and Italy, to phase out nuclear power and invest in renewable energy. In fact, Germany announced it would shut down all 17 nuclear power plants by 2022 following Fukushima. It plans to substitute them with renewable energy, including solar and wind power to complement its coal-fuelled plants.

**Endnotes**

SAFE
Since 4,570,000,000 B.C.
STOP
NUCLEAR POWER

SORRY
2011 Fukushima (Japan), 2008 Tricastin (France),
2006 Forsmark (Sweden), 2004 Mihama (Japan),
1999,1997 Tokaimura (Japan),
1986 Chernobyl (Soviet Union),
1983 Sellafield (UK), 1981 San Onofre (USA),
1979 Three Mile Island (USA),
1975 Browns Ferry (USA),
1957 Mayak (Soviet Union), 1957 Windscale (UK)