

## GUIDES TO CHRISTIAN ETHICAL DECISION-MAKING

*This guide (and others in the series) is an initiative of the Office of the Bishop and the Commission on Social and Bioethical Questions of the Lutheran Church of Australia and New Zealand. It is intended to help church members consider how they might respond to contemporary ethical issues. It is meant for use in personal reflection and is not an 'official' statement of the church on the topic. I am grateful to Nick Schwarz, Assistant to the Bishop – Public Theology, for his ongoing work on this project.*

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# NUCLEAR ENERGY

### Learn about the matter at hand

Notes: In this guide, we assume that nuclear energy will be generated by nuclear fission, not nuclear fusion, which has yet to be successfully demonstrated as a method of controlled power generation. We mention nuclear weapons but do not cover in detail ethical issues related to them.

### Introduction: our problematic dependency on fossil fuels

Modern human civilisation is very dependent on fossil fuels (ie coal, oil and natural gas). Fossil fuels currently provide over 80% of world energy, but there are good reasons why nations should cooperate to wean ourselves off them:

- Emissions from the combustion of fossil fuels cause air pollution and increase the concentration of carbon dioxide (CO<sub>2</sub>) in the atmosphere and oceans, warming the Earth, changing the climate, melting icecaps, increasing the acidity of seawater, raising sea levels, and in other ways making life more difficult for many living species, including humans.
- Fossil fuels are also a finite (ie non-renewable) resource. Although recovering all known reserves of coal, oil and gas will not be economically viable<sup>1</sup> (meaning we will never exhaust them completely), the longer we continue to use them, the greater the disruption they will cause to human societies and non-human species. The faster the nations of the world cooperate to transition away from fossil fuels, the less disruption they will face.

Many people are working hard to transition humanity from fossil fuels to 'low emissions' energy sources. The proportion of energy produced via low emissions sources like 'renewables' (wind power, solar power, hydropower, geothermal power and biofuels) is growing, but at a rate that, if sustained, will take them many years to replace fossil fuels. Nuclear power is another low-emissions energy source, but it

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<sup>1</sup> As large high-quality reserves are depleted, extraction companies turn to less economic low-quality reserves, which are more costly and require more energy to extract and process. They will give up extracting them long before the point at which the energy invested into recovering fossil fuels equals or exceeds the energy embodied in the fuels themselves.

isn't growing anywhere nearly as rapidly. Its contribution to world energy plateaued in 2000–2010 and fell in 2011 after the Fukushima disaster in Japan. But by 2019, it had grown again to about where it was at its peak in 2006. Renewables enjoy greater public support than nuclear energy because they are seen as safer, cheaper and 'less morally tainted'.

Supporters of nuclear energy, including a number of prominent environmentalists, argue for a greater use of nuclear power to meet the world's growing energy needs as fossil fuel use declines. Apart from supplying electricity to power and heat homes and workplaces and to power electric vehicles, nuclear power could be used to produce hydrogen, which is being touted as an environmentally friendly fuel with the potential to replace fossil fuels in sectors such as agriculture, transport, industry and central heating.<sup>2</sup>

### **Basics of nuclear energy production**

In the heart of a nuclear power station is a nuclear reactor. The nuclear reactor produces heat by the controlled splitting of uranium atoms. The heat is used to make steam. The release of pressurised steam drives a turbine to produce electricity in much the same way as other power stations.

The splitting of uranium atoms must be carefully controlled and contained because it produces radioactive wastes harmful to living creatures, including humans. These wastes are not only dangerous but extremely long-lasting, so responsible management of them is absolutely vital.

### **Nuclear energy is controversial**

Supporters and opponents of nuclear energy often hold their positions very strongly and can be quite hostile to each other, eg accusing each other of exaggerating, lying and having vested interests and hidden agendas. Boxes 1 and 2 below present why some people favour nuclear power and others oppose it.

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<sup>2</sup> Burning hydrogen produces only water vapour. Proponents of a hydrogen economy hope that its environmental benefits will significantly outweigh any downsides associated with increased atmospheric water vapour and hydrogen gas.

### Box 1: Why some people favour nuclear power

Environmental and health benefits:

- Nuclear power stations are just as low in climate-change-causing CO<sub>2</sub> emissions across their lifecycle as wind power and solar power.
- Nuclear power stations emit no lung-damaging particulates, unlike power stations fuelled by coal or diesel.
- Closing existing nuclear power stations out of fear of nuclear energy is short-sighted. Where this has happened, eg in Germany and Japan, fossil fuels have largely filled the gap, and greenhouse gas emissions have increased.

Efficiency and practicality:

- Nuclear power generates a very large amount of power from a very small amount of fuel; it is 'concentrated energy'. By contrast, renewables like wind and solar are very 'energy dilute'. Huge land-hungry solar and wind installations are required to generate the same amount of power as a small nuclear power station.
- Over their working lives, nuclear power stations produce more than 70 times the amount of energy required to make them. By contrast, solar and wind installations produce less than five times the amount of energy over their working lives than was required to make them.
- Nuclear power stations provide a steady flow of 'baseload' power 24 hours per day, unlike intermittent power from wind and solar.

Safety:

- Uranium mining and nuclear power generation have caused many fewer injuries, illnesses and deaths than coal mining and coal-fired power generation.
- Nuclear power is also associated with fewer deaths than hydroelectric power installations, where dam collapses have killed hundreds of thousands.
- Nuclear power stations have minimal impact on wildlife, unlike wind installations, which take a heavy toll on birds, bats and migratory insects.

### Box 2: Why some other people oppose nuclear power

Its links to nuclear weapons and arms manufacturing:

- Nuclear power is uneconomic but is massively subsidised by governments whose underlying motivation is acquiring and maintaining nuclear weapons capability.
- 'Rogue states' around the world have tried or are trying to acquire nuclear capability. If they succeed, the world will become more dangerous.
- The process of enriching uranium to produce fuel for nuclear power stations produces depleted uranium as a by-product, which is used by arms manufacturers.
- Nuclear power stations produce plutonium, the key ingredient in nuclear weapons, as a by-product. They also produce other radioactive wastes that could be used with conventional explosives to make 'dirty bombs'.

Safety concerns:

- Plutonium and other nuclear wastes are radioactive and extremely toxic to humans and other living creatures. Their radioactivity and toxicity take anywhere from tens of years to tens of thousands of years to decline. Exposure to radioactivity can cause burns, radiation sickness, cancers and birth defects.
- Transporting and storing radioactive wastes safely and securely enough to prevent accidental or deliberate release requires extraordinary care and diligence. More

than 80 years have passed since the first nuclear reactors were developed and still no permanent deep underground repositories for high-level radioactive waste are ready and operational anywhere in the world.

- The claims of a good safety record are called into question by many near misses and the major accidents at Three Mile Island (1979), Chernobyl (1986) and Fukushima (2011). The larger the number of operational reactors, and the more they are built in countries with limited expertise and regulatory oversight – or that are corrupt and unstable or prone to natural disaster – the greater the chances of accidents, sabotage and theft of hazardous materials. Concerned citizens are right to be sceptical of assurances that all is well when governments refuse to publish nuclear energy safety data.
- We cannot assume that our descendants will be able to effectively secure and monitor nuclear waste storage sites into the far distant future or discover ways to detoxify the wastes and use them.

Justice concerns:

- People with wealth and influence generally don't work in high-risk jobs in nuclear power plants and nuclear waste dumps or allow them to be located near their homes. Hence reactors and storage sites for radioactive wastes tend to be located in poorer areas and poorer people who are willing to risk their health work in them.
- Air and water contaminated by radioactive particles travels widely, affecting soil, plants, and innocent people and animals. Present-day victims of radioactive fallout are unlikely to be compensated properly, let alone people in the future who may not even realise their illness is radiation-related.
- Radioactivity persists in some cases for thousands of years. It is arrogant, irresponsible and unfair to leave our toxic wastes for future generations to deal with. We can assume that future generations would never willingly consent to inherit our toxic wastes.

Economic/cost concerns:

- It is a very slow and costly process to approve, plan and build new nuclear power plants. It is also very costly to decommission (retire) old ones.
- It is very costly – and great expertise and vigilance is needed – to run, monitor and maintain nuclear power plants at the extremely high standards required to avoid accidents.
- It is very costly to deal with accidents, eg to compensate victims, clean up and restrict access to danger zones. Because plant operators enjoy limited liability, governments (and ultimately taxpayers) end up bearing most of the costs of accidents.
- Nuclear power is not cost-competitive now compared to other low-emissions methods of electricity generation, eg solar and wind power.
- Nuclear power is, therefore, particularly ill-suited to lower income countries.

Nuclear energy is non-renewable:

- Although uranium is a fairly common element in the Earth's crust, it is only economic to extract it where it is present in high concentrations. Known reserves of highly concentrated uranium will be exhausted within about 100 years at present rates of extraction. If nuclear power was scaled up dramatically, deposits of concentrated uranium would be depleted sooner, and we would need to spend more money and expend more energy to extract and process uranium from lower quality deposits.
- Nuclear energy could be made more sustainable if 'breeder reactors' became standard, which essentially produce their own fuel. However, only a tiny fraction of all reactors in operation in the world today are of this type. (Breeder reactors are

also more dangerous than conventional reactors and more closely linked to nuclear weapons.)

It won't contribute much to mitigating climate change:

- Because nuclear power plants are so expensive and take so long to build and begin producing electricity, it would take decades just to double the current capacity, and even then, nuclear power would still represent a small fraction of global energy.

In Australia, up until now, the arguments of the opponents of nuclear power appear to have greater traction with the public than the arguments of its supporters. Australia has large reserves of uranium and is a major exporter but uses none of it to produce electricity domestically.

In France, which has the world's highest proportion of domestic electricity generated in nuclear power plants (>70%), support for nuclear energy has fluctuated, falling in 2011 after the Fukushima accident in Japan, for example. In a survey, just over half of the French citizens polled said they would not like a nuclear power plant to be built near their home, but 88% said that nuclear power's positive contribution to combating climate change was a good reason to keep using it.

### **Christian perspectives on using nuclear power to generate electricity**

Christians look firstly to the teachings of Jesus and the Bible more generally when looking for guidance on ethical issues. Nuclear energy was unknown in biblical times, however, and the Bible makes no reference to it. Nuclear energy is a modern phenomenon, only discovered and harnessed by humans quite recently. Many Christians who take a stance on nuclear energy have been exposed to and influenced by pro- or anti-nuclear arguments not explicitly linked to the Bible. Perhaps unconsciously, many 'Christianise' the stance they have already adopted by selecting biblical texts and interpreting them in ways that support it. Consider the two contrasting Christian positions on nuclear energy in the following table:

A pro-nuclear energy position	An anti-nuclear energy position
<p>God created the universe. He made the sun, which, essentially, is a giant nuclear fusion power plant that radiates light and heat. God made the Earth, too, including radioactive elements within it that help to warm it from within. God was pleased with what he had made and declared it good.</p> <p>God gave humans dominion over the Earth and its abundance of resources, and he blessed us with the intelligence and creativity to make good use of them.</p> <p>Nuclear energy is not inherently evil. It is a neutral technology that can be used for good or bad.</p> <p>We can fulfil God's commands to steward his creation responsibly and love our neighbours by:</p> <ul style="list-style-type: none"> <li>• dedicating ourselves to improving the safety and cost-efficiency of nuclear energy and delinking it from weapons production</li> <li>• supplying our neighbours with abundant, reliable and inexpensive electricity to enhance their lives.</li> </ul>	<p>Earth is only a suitable dwelling place for humans and other lifeforms because God, in his supreme wisdom:</p> <ul style="list-style-type: none"> <li>• placed Earth a safe distance (150 million kilometres) from the sun,</li> <li>• surrounded the Earth with an atmosphere that filters out most harmful solar and cosmic radiation</li> <li>• stored harmful radioactive minerals deep underground.</li> </ul> <p>God gave humans the job of taking care of his creation and stewarding it responsibly. We are ultimately accountable to God for our care of the Earth, but we also take care of it because we love our children and want them and their descendants to experience and enjoy the Earth's bounty as much or more than we have.</p> <p>Humans have already amply demonstrated their nature as inherently sinful and flawed beings by both deliberately and accidentally demonstrating nuclear power's extraordinary potential to destroy life and poison the Earth.</p> <p>Humans, therefore, cannot be trusted to use nuclear power wisely and benevolently.</p>

The pro-nuclear position tends towards confidence and boldness and faith in humanity's capacity for good. The anti-nuclear position tends towards cautiousness and awareness of humanity's proneness to making mistakes and outright malevolence. Our view of human nature might well be what determines our position on nuclear energy. Christians tend to be characterised by their lack of faith that humans are 'basically good' or that they can be trusted to handle great (and dangerous) power responsibly. Faith in human goodness is more characteristic of humanism; a conviction of human sinfulness is more characteristic of traditional Christianity.

Christians still undecided about whether to support or oppose nuclear power might consider questions like these:

- Are we sufficiently equipped with the wisdom, watchfulness and technical know-how to manage such dangerous power?
- Does nuclear power further the common good or create winners and losers?
- What impact will nuclear power have on human dignity and freedom?
- Will nuclear power enhance or reduce the chances of peace?
- Have citizens had a fair say on whether or not to adopt nuclear power and a fair say in setting conditions under which it will operate?

## Adopt a position

Perhaps you don't think it matters what position you take on nuclear energy because you don't think your view will make any difference, even if you do feel strongly about it. In some undemocratic nations,

that might be true. In Australia and New Zealand, however, citizens' views will be taken into consideration. Citizens will be free to voice their opinions, eg via social media, writing to their members of parliament, attending rallies or protests and so on. Your voice will only be heard if you use it.

## **Review your position**

Changed circumstances often prompt people to review their position on an ethical issue. Imagine, for example, that scientists made some astonishingly brilliant breakthroughs that dramatically improved the safety and affordability of nuclear power. Would that be enough to change the minds of opponents? Alternatively, imagine that terrorists got hold of nuclear wastes and exploded a 'dirty bomb' in your city. Or imagine that a series of disastrous nuclear reactor meltdowns occurred in 'best-practice' first-world facilities, raining radioactive fallout over a wide area, killing some people in the short term and causing cancers and birth defects in many others later on. Would that be enough to change the minds of supporters?

## **Further reading**

A (dated) Christian case against nuclear energy:

World Council of Churches Energy Advisory Group of the Working Committee on Church and Society 1977, Public Acceptance of Nuclear Power – Some Ethical Issues, IAEA Bulletin vol. 19, no. 6, pp 48–57, <https://www.iaea.org/sites/default/files/publications/magazines/bulletin/bull19-6/19604794857.pdf>

A Christian case for nuclear energy:

Robert S Dutch 2017, Let There Be Light! Nuclear Energy: A Christian Case, Wipf and Stock Publishers, Eugene, Oregon, [https://www.amazon.com.au/Let-There-Be-Light-Christian/dp/149829149X/ref=sr\\_1\\_4?crid=1S3OLCRL0ADW&keywords=robert+s.+dutch+let+there+be+light&qid=1661825766&srefix=robert+s.+dutch+let+there+be+light%2Caps%2C248&sr=8-4](https://www.amazon.com.au/Let-There-Be-Light-Christian/dp/149829149X/ref=sr_1_4?crid=1S3OLCRL0ADW&keywords=robert+s.+dutch+let+there+be+light&qid=1661825766&srefix=robert+s.+dutch+let+there+be+light%2Caps%2C248&sr=8-4)