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nuclear power

no solution to climate change





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A paper prepared for:
Friends of the Earth (Australia)
Australian Conservation Foundation
Greenpeace Australia Pacific
Medical Association for the Prevention of War
Public Health Association of Australia
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Written by Dr. Jim Green
National Nuclear Campaigner
Friends of the Earth Australia

Layout and Design
Natalie Lowrey

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www.foe.org.au

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Climate Action Network of Australia
www.cana.net.au

Public Health Association of Australia
www.phaa.net.au

Medical Association for the Prevention of War
www.mapw.org.au

nuclear power no solution to climate change

Over the past year the nuclear industry has once again tried to exploit concern about climate change to reverse its ongoing decline.

One positive aspect of this debate is that it has highlighted the need for action to avert the adverse social and environmental impacts associated with climate change. The debate has shifted – the science has been accepted and we are now debating solutions.

It is widely accepted that global greenhouse gas emissions must be reduced by at least 60% by the middle of the century to stabilise atmospheric concentrations of greenhouse gases. We urgently need to change the way we produce and consume energy, and it is now clear that Australia and other countries cannot continue to rely on coal for electricity generation without major climate impacts.

Key environmental and medical groups reject nuclear power as a method of reducing greenhouse gas emissions. Nuclear power poses unacceptable proliferation and security risks, it is not clean, it is not cheap, and there is no solution to the intractible problem of nuclear waste.

The true climate-friendly solutions to Australia's energy and greenhouse problems lie in the fields of renewable energy – such as wind and solar power – and stopping energy wastage. This report shows that nuclear power is a dangerous and inefficient way to address climate change. It also shows why policy-makers should focus on the practical benefits provided by renewable energy and energy efficiency – safe, proven technologies available now.

the false nuclear 'debate'

A Front For Expanding Uranium Mining

The nuclear industry, long in decline in Europe and the US, has seized on climate change to promote nuclear power as a 'climate friendly' energy source. However, there is little political support for the introduction of nuclear power in Australia.

Nuclear power is currently unlawful under the 1998 Australian Radiation Protection and Nuclear Safety Act, while Victoria and New South Wales also have legislation banning nuclear power and nuclear waste storage and disposal. Three other states – South Australia, Western Australia and the Northern Territory – have legal prohibitions against various forms of radioactive waste transportation and dumping.

In Australia, nuclear interests are far more concerned to expand uranium mining rather than to promote the introduction of nuclear power reactors.

The adverse environmental impacts of uranium mining in Australia have been significant. This year's prosecution of ERA (majority owned by Rio Tinto) over its operations at the Ranger uranium mine in the Northern Territory highlights the risks. The Olympic Dam uranium/copper mine in South Australia illustrates the scale of the environmental impacts associated with uranium mining. The Olympic Dam mine has produced a radioactive tailings dump of 60 million tonnes, growing at 10 million tonnes annually with no plans for its long-term management. The mine's daily extraction of over 30 million litres of water from the Great Artesian Basin has adversely impacted on the fragile Mound Springs, and the mine is a large consumer of electricity and a major contributor to South Australia's greenhouse gas emissions. (1)

A further concern is that the current regulatory environment for uranium mining is inadequate. For example, the Olympic Dam mine enjoys a range of exemptions from the South Australian Environmental Protection Act, the Water Resources Act, the Aboriginal Heritage Act and the Freedom of Information Act. (1)

The 2003 Senate Inquiry into the regulation of uranium mining in Australia reported "a pattern of under-performance and non-compliance", it identified "many gaps in knowledge and found an absence of reliable data on which to measure the extent of contamination or its impact on the environment", and it concluded that changes were necessary "in order to protect the environment and its inhabitants from serious or irreversible damage". (2)

Attempts to establish new uranium mines would likely result in further examples of mining companies exerting unwanted pressure on Indigenous communities, as with the attempt to override the Mirarr traditional owners' unanimous opposition to the Jabiluka mine.

Australia's uranium mining industry may expand with proposed exports to China and India. Both China and India have nuclear weapons programs. India is not even a signatory to the Non Proliferation Treaty (NPT). China is not an open society and faces serious, unresolved human rights issues. It is difficult to imagine a nuclear industry worker in China publicly raising safety, security or proliferation concerns without reprisal.

Australia's uranium exports are already a cause for concern. Why do we allow uranium sales to Japan given the grossly inadequate safety culture in the nuclear industry there, as demonstrated by a number of serious and fatal accidents over the past decade and by revelations of systematic falsification of safety data? Why do we turn a blind eye to the regional tensions arising from Japan's plutonium program and its status as a 'threshold' or 'breakout' state capable of producing nuclear weapons in a short space of time? (3)

Why do we allow uranium sales to South Korea when only last year it was revealed that numerous nuclear weapons research projects were secretly carried out there from the 1980s until 2000, in violation of the country's NPT obligations? (4)

Why do we allow uranium sales to the US, the UK and France – nuclear weapons states which are failing to fulfil their NPT disarmament obligations? As retired Australian diplomat Richard Butler notes: "[The NPT] is a two-way – not one-way – street. It provides that states which do not have nuclear weapons must never acquire them and that those which do have them must progressively get rid of them." (5)

A doubling of global nuclear power output by 2050 would reduce greenhouse gas emissions by just 5%.

nuclear power

A Limited and Problematic Response to Climate Change

There are significant constraints on the growth of nuclear power, such as its high capital cost and, in many countries, lack of public acceptability. As a method of reducing greenhouse gas emissions, nuclear power is further limited because it is used almost exclusively for electricity generation, which is responsible for less than one third of global greenhouse gas emissions.

Because of these problems, the potential for nuclear power to help reduce greenhouse gas emissions by replacing fossil fuels is limited. Few predict a doubling of nuclear power output by 2050, but even if it did eventuate it would still only reduce greenhouse gas emissions by about 5% – less than one tenth of the reductions required to stabilise atmospheric concentrations of greenhouse gases.

Nuclear power is being promoted as the solution to climate change, as a technical fix or magic bullet. Clearly it is no such thing. As a senior analyst from the International Atomic Energy Agency, Alan McDonald, said in 2004: "Saying that nuclear power can solve global warming by itself is way over the top". (6)

Nuclear power is not a 'renewable' energy source. High-grade, low-cost uranium ores are limited and will be exhausted in about 50 years at the current rate of consumption. The estimated total of all conventional uranium reserves is estimated to be sufficient for about 200 years at the current rate of consumption. (7) But in a scenario of nuclear expansion, these reserves will be depleted more rapidly.

loose nukes

& Terrorism

Nuclear smuggling – much of it from civil nuclear programs – presents a significant challenge. The IAEA's Illicit Trafficking Database records over 650 confirmed incidents of trafficking in nuclear or other radioactive materials since 1993. In 2004 alone, almost 100 such incidents occurred. (14) Smuggling can potentially provide fissile material for nuclear weapons or a wider range of radioactive materials for use in 'dirty bombs'.

Civil nuclear plants are potentially "attractive" targets for terrorist attacks because of the importance of the electricity supply system in many societies, because of the large radioactive inventories in many facilities, and because of the potential or actual use of 'civil' nuclear facilities for weapons research or production.

A 2004 study by the Union of Concerned Scientists concluded that a major terrorist attack on the Indian Point reactor in the US could result in as many as 44,000 near-term deaths from acute radiation syndrome and as many as 518,000 long-term deaths from cancer among individuals within fifty miles of the plant. The attack would pose a severe threat to the entire New York metropolitan area. Economic damages could be as great as US$2.1 trillion. (15)

Proliferation concerns have led a number of nation states to use conventional weapons to attack nuclear facilities. Iraq's nuclear facilities have been bombed by Iran, Israel and the US, and Iraq itself targeted a nuclear plant in Iran in the 1980s and claimed to have targeted Scud missiles at Israel's Dimona nuclear plant in 1991.

climate-friendly nuclear power?

Claims that nuclear power is 'greenhouse free' are incorrect as substantial greenhouse gas emissions are generated across the nuclear fuel cycle. Fossil-fuel generated electricity is more greenhouse intensive than nuclear power, but this comparative benefit will be eroded as higher-grade uranium ores are depleted. Most of the earth's uranium is found in very poor grade ores, and recovery of uranium from these ores is likely to be considerably more greenhouse intensive. (8)

Nuclear power emits more greenhouse gases per unit energy than most renewable energy sources, and that comparative deficit will widen as uranium ore grades decline.

the hazards of nuclear power

The hazards associated with nuclear power include the risk of potentially catastrophic accidents, routine releases of radioactive gases and liquids from nuclear plants, the intractible problem of nuclear waste, and the risksof terrorism and sabotage. But there is another hazard which is unique to nuclear power and which is of such concern that alone it must lead to a clear rejection of a nuclear 'solution' to climate change ... even if such a solution were possible. This is the repeated pattern of 'peaceful' nuclear facilities being used for nuclear weapons research and production.

Nuclear Proliferation: The Myth of the Peaceful Atom

Global expansion of nuclear power could contribute to an increase in the number of nuclear weapons states – as it has in the past. It would probably lead to an increase in the number of 'threshold' or 'breakout' nuclear states which could quickly produce weapons drawing on expertise, facilities and materials from their 'civil' nuclear program. Nuclear expansion would also increase the availability of nuclear materials for use in nuclear weapons or radioactive 'dirty bombs' by terrorist groups.

Supposedly 'peaceful' nuclear facilities and materials have been used in various ways in secret weapons programs, including the production of highly enriched uranium and plutonium.

Of the 60 countries which have built nuclear power or research reactors, over 20 are known to have used their 'peaceful' nuclear facilities for covert weapons research and/or production. (9) In some cases the military R&D was small-scale and short-lived, but in other cases nation states have succeeded in producing nuclear weapons under cover of a peaceful nuclear program – India, Pakistan, Israel, South Africa and possibly North Korea.

In other cases, substantial progress had been made towards a weapons capability before the weapons program was terminated, with Iraq's nuclear program from the 1970s until 1991 being the most striking of several examples. The current tensions around the nuclear programs in Iran and North Korea further highlight the potential use of 'peaceful' nuclear facilities for nuclear weapons production.

The International Atomic Energy Agency's (IAEA) safeguards system still suffers from flaws and limitations despite improvements over the past decade. At least eight Nuclear Non-Proliferation Treaty (NPT) member states have carried out weapons-related projects in violation of their NPT agreements, or have carried out permissible (weapons-related) activities but failed to meet their reporting requirements to the IAEA – Egypt, Iraq, Libya, North Korea, Romania, South Korea, Taiwan, and Yugoslavia.

Recent statements from the IAEA and US President George W. Bush about the need to limit the spread of enrichment and reprocessing technology, and to establish multinational control over sensitive nuclear facilities, are an effective acknowledgement of the fundamental flaws and limitations of the international non-proliferation system. The NPT enshrines an 'inalienable right' of member states to all 'civil' nuclear technologies, including dual-use technologies with both peaceful and military capabilities. In other words, the NPT enshrines the 'right' to develop a nuclear weapons threshold or breakout capability.

Another serious deficiency is that the NPT places no stronger obligation on the five 'declared' nuclear weapons states – the US, Russia, the UK, France and China – than to engage in negotiations on nuclear disarmament. IAEA Director-General Mohamed El Baradei noted in a 2004 speech to the Council on Foreign Relations in New York: ''There are some who have continued to dangle a cigarette from their mouth and tell everybody else not to smoke.'' (10) The intransigence of the nuclear weapons states provides incentives and excuses for other states to pursue nuclear weapons – and civil programs can provide the expertise, the facilities and the materials to pursue military programs.


Toxic waste

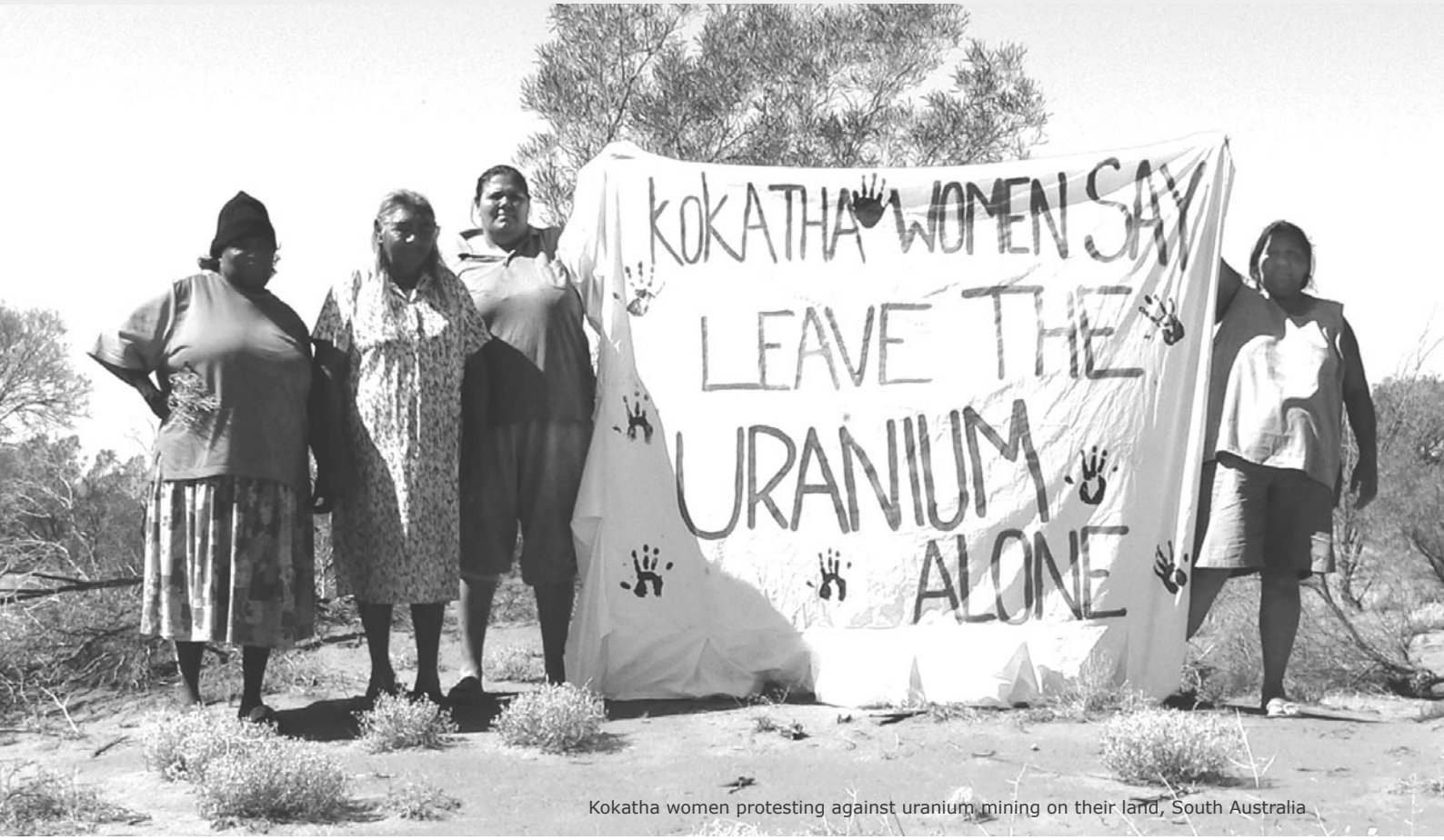
plutonium & proliferation

A nuclear weapon powerful enough to destroy a city requires a mere 10 kg of plutonium. The 'peaceful' nuclear power industry has produced 1,600 tonnes of plutonium (11) – enough to build about 160,000 nuclear weapons. If 99% of this plutonium is indefinitely protected from military use, the remaining 1% would suffice for 1,600 nuclear weapons.

Australia's uranium exports, once irradiated in nuclear power reactors, have produced about 80 tonnes of plutonium (12) – enough for about 8,000 nuclear weapons.

The UN's Intergovernmental Panel on Climate Change (IPCC) has considered a scenario involving a ten-fold increase in nuclear power over this century, and calculated that this could produce 50-100 thousand tonnes of plutonium. The IPCC concluded that the security threat "would be colossal." (13)

Not a single repository exists anywhere in the world for the disposal of high-level waste from nuclear power.



Kokatha women protesting against uranium mining on their land, South Australia

radioactive waste

Radioactive wastes arise across the nuclear fuel cycle. High-level waste – which includes spent nuclear fuel and the waste stream from reprocessing plants – is by far the most hazardous of the waste types. A typical power reactor produces 25-30 tonnes of spent fuel annually. Annually, about 12,000 to 14,000 tonnes of spent fuel are produced by power reactors worldwide.

About 80,000 tonnes of spent fuel have been reprocessed, representing about one third of the global output of spent fuel. Reprocessing poses a major proliferation risk because it involves the separation of plutonium from spent fuel. It also poses major public health and environmental hazards as reprocessing plants release significant quantities of radioactive wastes into the sea and gaseous radioactive discharges into the air. Cogema's reprocessing plant at La Hague in France, and British Nuclear Fuel's plant at Sellafield in the UK, are the largest source of radioactive pollution in the European environment. (17)

Not a single repository exists anywhere in the world for the disposal of high-level waste from nuclear power. Only a few countries – such as Finland, Sweden, and the US – have identified potential sites for a high-level waste repository.

The legal limit for the proposed repository at Yucca Mountain in the US is less then the projected output of high-level waste from currently operating reactors in the US. If global nuclear output was increased three-fold, new repository storage capacity equal to the legal limit for Yucca Mountain would have to be created somewhere in the world every 3-4 years. (18) With a ten-fold increase in nuclear power, new repository storage capacity equal to the legal limit for Yucca Mountain would have to be created somewhere in the world every single year.

Attempts to establish international repositories are likely to be as unpopular and unsuccessful as was the attempt by Pangea Resources to win support for such a repository in Australia.

Synroc – the ceramic waste immobilisation technology developed in Australia – seems destined to be a permanently 'promising' technology. As nuclear advocate Leslie Kemeny notes, Synroc "showed great early promise but so far its international marketing and commercialisation agendas have failed". (19)

nuclear accidents

The "safe and clean" image being pushed by nuclear proponents seriously misrepresents the true performance of the industry. In fact, nuclear accidents and near misses are common, and radioactive emissions are routine.

Chernobyl and Three Mile Island are only the best-known of hundreds of nuclear accidents:

• There have been at least eight accidents involving damage to or malfunction of the core of nuclear power or research reactors.

• At least five nuclear research reactor accidents have resulted in fatalities.

• There have been other serious reactor accidents which did not involve core damage or malfunction, and a number of 'near misses' with power reactors found to be in a serious state of disrepair – one such incident was discovered in 2002 at the Davis-Besse reactor in the United States.

• There have been many accidents involving reprocessing plants, waste stores and other nuclear facilities.

In addition to the hazards posed by accidents, radioactive emissions are routinely generated across the nuclear fuel cycle. The United Nations Scientific Committee on the Effects of Atomic Radiation has estimated the collective effective dose to the world population over a 50-year period of operation of nuclear power reactors and associated nuclear facilities to be two million person-Sieverts. (21) Applying the standard risk estimate to that level of radiation exposure gives an alarming total of 80,000 fatal cancers.

Applying the standard risk estimate to the IAEA's estimate of human exposure to radiation from the Chernobyl disaster (22) gives a figure of 24,000 fatal cancers. While the death toll is subject to uncertainty, the broader social impacts are all too clear, including those resulting from the permanent relocation of about 220,000 people from Belarus, the Russian Federation, and the Ukraine. As the OECD's Nuclear Energy Agency notes, Chernobyl "had serious radiological, health and socio-economic consequences for the populations of Belarus, Ukraine and Russia, which still suffer from these consequences." (23)

Safety concerns are not limited to the ex-Soviet states. For example, the Japanese nuclear power industry has been in turmoil since the August 2002 revelations of 29 cases of false reporting on the inspections of cracks in numerous reactors. There have also been a number of serious accidents, including fatal accidents, at nuclear reactors and other nuclear facilities in Japan in the past decade. (24)

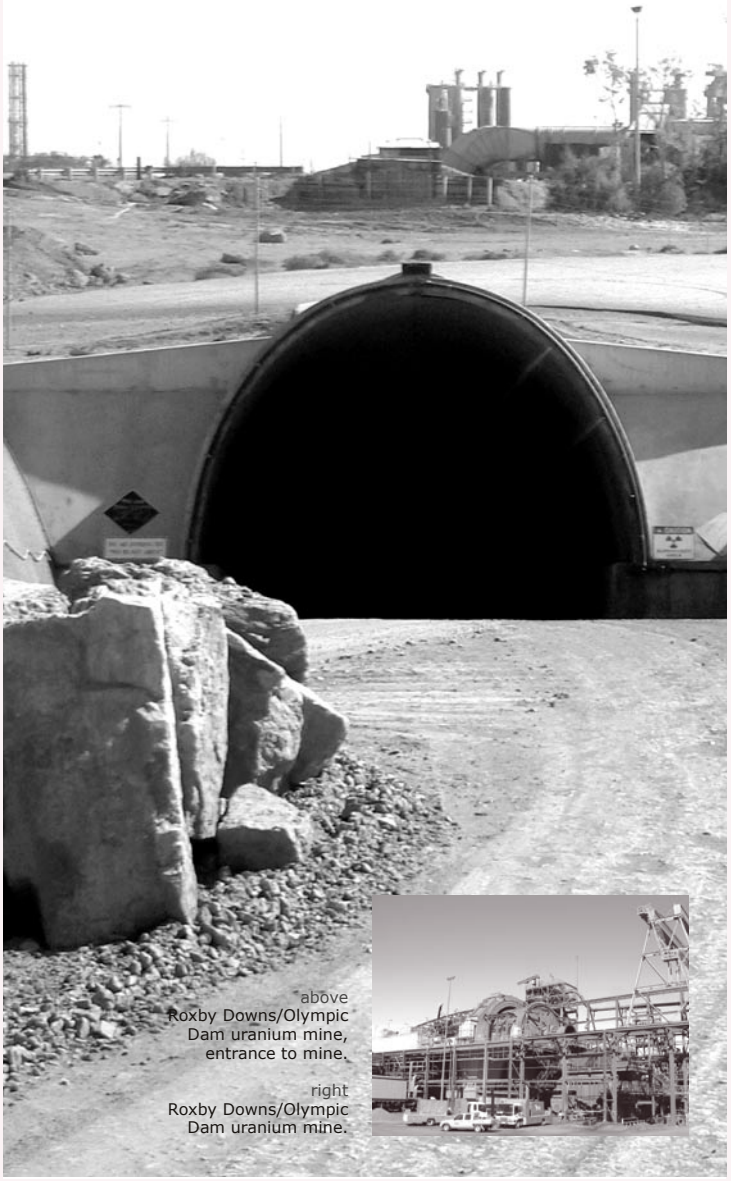
Commercial pressures and inadequate regulation have clearly played some part in the flawed safety standards in Japan. Such pressures are by no means unique to Japan, and they will intensify if privatisation and liberalisation of electricity markets proceeds.

Calculations indicate that the probability of an accident involving damage to the reactor core is about one in 10,000 per reactor per year for current nuclear power reactors. In a world with 1,000 such reactors, accidents resulting in core damage would occur once per decade on average. (25) With a ten-fold nuclear expansion, a reactor core damage accident would occur every 2-3 years on average.

The hype about future reactor designs with supposedly 'passive' safety systems has attracted scepticism and cynicism even from within the nuclear industry, with one industry representative quipping that "the paper-moderated, ink-cooled reactor is the safest of all." (26)

	Spent Fuel from Power Reactors (tonnes p.a.)	Plutonium Production from Power Reactors (tonnes p.a.)	Potential Additional Plutonium Weapons (annual)*	Reactor Core Damage Accident Frequency**	Longevity of high-grade uranium ores	Longevity of all conventional uranium ores
Current nuclear output	13,000	70	7,000	1 / 30 yrs	50 yrs	200 yrs
Three-fold nuclear expansion	39,000	210	21,000	1 / 10 yrs	15–20 yrs	60–70 yrs
Ten fold nuclear expansion	130,000	700	70,000	1 / 3 yrs	5 yrs	20 yrs

** Assuming 10 kg of plutonium for one nuclear weapon.*
*** Assuming a risk of one in ten thousand per reactor per year.*



above
Roxby Downs/Olympic Dam uranium mine, entrance to mine.

right
Roxby Downs/Olympic Dam uranium mine.

the nuclear industry transfers risks and costs to future generations

"The waste problems of the uranium mining and power generation are numerous and long lasting. Due to the long half lives and inability ... to find an acceptable final disposal method for radioactive materials, the problem will continue for a long time without a solution. Therefore there are significant concerns about whether an acceptable waste disposal option currently exists. From a sustainability perspective, while the nuclear waste issues remain unresolved, the uranium/ nuclear power industry is transferring the risks, costs and responsibility to future generations."

AMP Capital Investors,
Nuclear Fuel Cycle Position Paper (20)

"in five years, the world has changed."

The IAEA Director-General Mohamed El Baradei addressed a range of serious nuclear security problems in his address to the 2005 Non-Proliferation Treaty Review Conference (16):

"In five years, the world has changed. Our fears of a deadly nuclear detonation – whatever the cause – have been reawakened. In part, these fears are driven by new realities. The rise in terrorism. The discovery of clandestine nuclear programmes. The emergence of a nuclear black market. But these realities have also heightened our awareness of vulnerabilities in the NPT regime. The acquisition by more and more countries of sensitive nuclear know-how and capabilities. The uneven degree of physical protection of nuclear materials from country to country. The limitations in the IAEA's verification authority – particularly in countries without additional protocols in force. The continuing reliance on nuclear deterrence. The ongoing perception of imbalance between the nuclear haves and have-nots. And the sense of insecurity that persists, unaddressed, in a number of regions, most worryingly in the Middle East and the Korean Peninsula."

the real solutions to climate change: energy efficiency and renewables

Renewable energy and energy efficiency can deliver the power we need – without the problems. Renewable energy, mostly hydroelectricity, already supplies 19% of world electricity, compared to nuclear's 16%. The share of renewables is increasing, while nuclear's share is decreasing.

Worldwide, there were only 26 nuclear reactors under construction at the end of 2004, with only one in Western Europe and none in the USA. Nuclear power capacity in Europe is falling and is expected to drop 25% over the next 15 years. The projected growth of nuclear power in a small number of countries, such as China and India, will not substantially change the global picture of stagnation and decline. (27)

By contrast, wind power and solar power are growing by 20-30% every year. (28) In 2004, renewable energy added nearly three times as much net generating capacity as nuclear power. (29)

Europe is planning to get 22% of its electricity from renewable sources by 2010, creating nearly a million additional jobs (30):
• Germany is on track to supply 13% of its electricity from renewables by 2010, while nuclear power is being phased out.
• Spain expects to get 26% of electricity from renewable energy by 2010.
• Sweden already supplies 48% of its electricity from renewable sources (mostly hydroelectricity) and expects renewables to provide 60% by 2010 with increased use of wind and bioenergy sources. Sweden plans to phase out nuclear power and has shut two reactors since 1999.
• Denmark already supplies 13% of its electricity from wind, and will supply 29% of electricity from renewables by 2010.

Many other countries are setting ambitious renewable energy targets. However, in Australia, only 8% of electricity is from renewable energy – down from 10% in 1999. (29) With the political commitment, we could achieve much greater usage of renewable energy, and also go a long way to solving energy and greenhouse problems through energy efficiency measures.

A clean energy future will include a range of technologies including wind, wave and tidal power, small scale hydro schemes, biomass and solar technologies.(29)

• **Wind power:** Australia could get 10% of its electricity from wind without major modifications to the electricity grid. This would create about 37,000 job years in construction and manufacturing and up to 1,000 fulltime jobs in operation and maintenance.

• **Bioenergy:** Bioenergy (energy from organic matter, including non native forest wood, energy crops, sewage, or wastes) could provide 30% of our electricity in the long term – but only if we plan for it. This would need about 14,000 MW of bioenergy and would create up to 46,000 permanent rural jobs in operation and maintenance, and a further 140,000 short term construction jobs.

• **Solar electricity (Photovoltaics):** Solar electricity has a huge potential to provide electricity for Australia. According to the PV Industry Roadmap we could supply 6,700 MW capacity by 2020. This would be equivalent to building two 600 MW nuclear power stations. The solar electricity option would create 31,000 jobs.

The biggest gains are to be made in the field of energy efficiency. Government reports have shown that reductions in energy consumption of up to 70% are cost effective in some sectors of the economy. Energy experts have projected that adopting a national energy efficiency target could reduce the need for investment in new power stations by between 2,500 – 5,000 MW by 2017 (equal to about 2-5 large nuclear power stations). The energy efficiency investments would pay for themselves in reduced bills before a nuclear power station could generate a single unit of electricity. (29)

The Australian Ministerial Council on Energy has identified that energy consumption in the manufacturing, commercial and residential sectors could be reduced by 20-30% with the adoption of current commercially available technologies with an average payback of four years. (31)

Many studies have detailed how major greenhouse gas emissions reductions can be achieved without reliance on nuclear power. (32) A number of studies have considered the relative cost of various means of reducing greenhouse gas emissions. Replacing fossil fuels with nuclear power does not fare well in these studies. Energy efficiency measures are shown in an American study to deliver almost seven times the greenhouse gas emissions reductions as nuclear power per dollar invested. (33)

The argument that nuclear power could be a "bridging" energy source while renewables are further developed is erroneous. Nuclear expansion would require such vast expenditure that renewables would fall by the wayside. Of the funds spent by 26 OECD member states between 1991 and 2001 on energy R&D, 50% was spent on nuclear power and only 8% on renewable energy. (27)

Renewable energy already provides the world with more electricity than nuclear power. The share from renewable energy is rising, while nuclear's share is falling.

The Sustainable Energy Vision

We need to make a clear choice for a clean energy future based on renewables and energy efficiency. As former US and UN environment advisor Professor Frank Muller notes:

"Nuclear power and sustainable energy involve future paths for electricity systems that diverge. Nuclear power reinforces conventional grids dominated by central power stations and powerful supply-side institutions – a pattern that we have inherited from an era of more centralised economic decision making. The sustainable energy vision is for these grids to evolve into more decentralised consumer-oriented networks. Investment would be directed to the lowest cost options for meeting customer needs, on either the supply or demand sides, rather than into an inexorable expansion of supply." (34)

The Nuclear Industry is not Financially or Environmentally Sustainable

"Nuclear power and the uranium industry are neither financially or environmentally sustainable. ... The positive greenhouse impacts could be equally, and arguably better, obtained from investment in, or support of, the renewable energy sector. It is critical that the nuclear industry does not manipulate the climate change threat to divert government policy and finance away from the intrinsically safe renewable sources of electricity."

AMP Capital Investors,
Nuclear Fuel Cycle Position Paper (20)

conclusion

In our search for solutions to climate change, the question must not be, "how do we resuscitate the nuclear power industry or expand uranium exports?" Instead, we must ask *"how can we best tap affordable, safe, renewable energy sources that are widely available and tradeable worldwide?".* Renewable energy, such as wind and solar power, along with energy efficiency measures, clearly fit these criteria. In contrast, nuclear power offers the spectre of more radioactive pollution, along with increased risk of accidents, terrorism and nuclear weapons proliferation.

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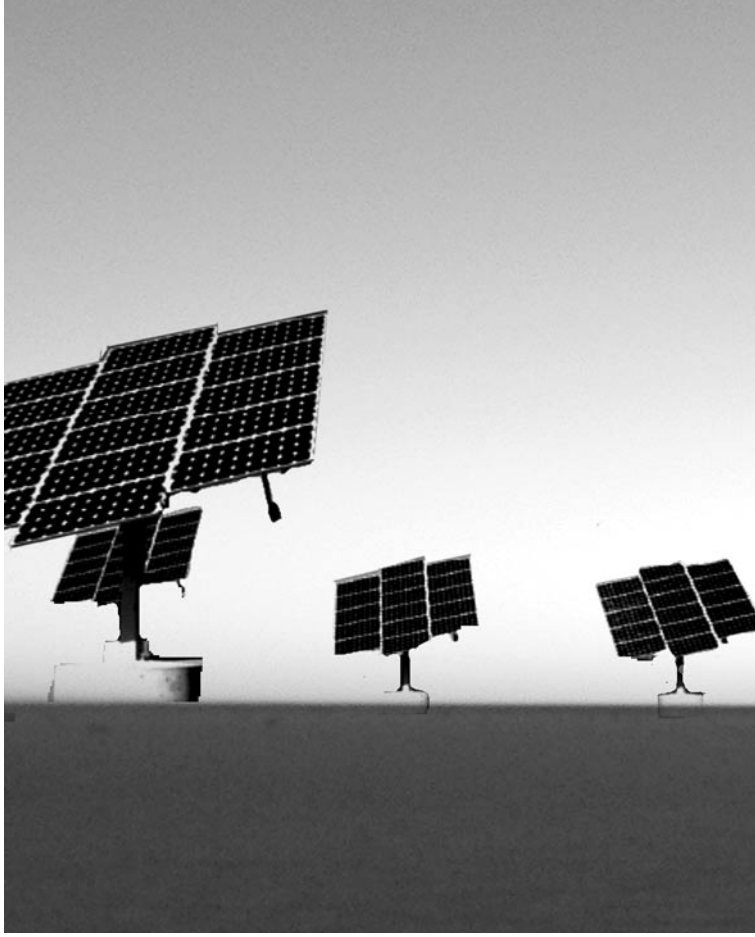

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“if nuclear power is the answer, it must have been a pretty stupid question.”

By Professor Ian Lowe

The debate about nuclear energy is a welcome recognition of the urgent need to respond to climate change. I welcome that awareness and the resulting debate, but the nuclear option is not a wise response. It is too costly, too dangerous, too slow and makes too little impact on greenhouse pollution. That is why most of the developed world is rejecting the nuclear option in favour of renewable energy and improved efficiency.

There is no serious doubt that climate change is real; it is happening now and its effects are accelerating. It is already causing serious economic impact such as reduced agricultural production, increased costs of severe events such as fires and storms, and the need to consider radical water-supply measures such as desalination plants. So we should set a serious target for reducing our rate of releasing carbon dioxide, like Britain's goal of 60 per cent by 2050. The Australian policy vacuum is a failure of moral leadership and also an uncertain investment framework.

The economics of nuclear power just don't stack up. The real cost of nuclear electricity is certainly more than for wind power, energy from bio-wastes and some forms of solar energy. Geothermal energy from hot dry rocks also promises to be less costly than nuclear. That is without including the huge costs of decommissioning power reactors and storing the radioactive waste. So there is no economic case for nuclear power. As energy markets have liberalised around the world, investors have turned their backs on nuclear energy. The number of reactors in western Europe and the United States peaked 15 years ago and has been declining since. By contrast, the amount of wind power and solar energy is rising at rates of 20 to 30 per cent a year.

Nuclear power is expensive, slow and dangerous, and it won't stop climate change.

Reducing energy waste is the cheapest way to reduce greenhouse pollution. For instance, more than 10 per cent of household electricity is used by keeping appliances such as TVs and videos on standby.

Nuclear power is too dangerous – not just the risk of accidents such as Chernobyl, but the increased risk of nuclear weapons or nuclear terrorism. The recent United Nations conference on the Nuclear Non-Proliferation Treaty ended in disarray. Most countries holding weapons and some others aspiring to join the nuclear “club” are in breach of the treaty.
It's possible this debate will do little more than provide a smokescreen for proponents of increased uranium mining in Australia. Uranium mining should not be expanded. It remains the case, as the Ranger Inquiry found nearly 30 years ago, that increased export of Australian uranium would contribute to the proliferation of nuclear weapons.

Nuclear power also inevitably produces radioactive waste that will have to be stored safely for hundreds of thousands of years. After nearly 50 years of the nuclear power experiment, nobody has yet demonstrated a solution to this problem. In the absence of a viable solution, expanding the rate of waste production is just irresponsible.

Nuclear power is too slow and too limited in its capacity to make a difference. Even if all government approvals were granted, it would still take about 10 more years and several billion dollars to construct a power station and deliver the first electricity.

Nuclear power won't stop climate change. The argument that it would reduce greenhouse pollution presumes high-grade uranium ores are available. Even with such high-grade ores, there is a massive increase in greenhouse pollution from mining, processing and reactor construction before any electricity is generated. The known resources of high-grade uranium ores only amount to a few decades' use at the present rate, so an expansion of nuclear power would see those resources rapidly depleted.

To avoid dangerous further changes to our climate, we need to act now. We should make a commitment to the sensible alternatives that produce sustainable cost-effective reductions in greenhouse pollution: wind power, solar water-heating, energy efficiency, gas and energy from organic matter such as sewage and waste.

Nuclear power is expensive, slow and dangerous, and it won't stop climate change. If nuclear power is the answer, it must have been a pretty stupid question.

Ian Lowe is Emeritus Professor of Science, Technology and Society at Griffith University, Brisbane. One of Australia's best-known environmental scientists, he is president of the Australian Conservation Foundation.

The detailed version of this report is on the following websites:

Friends of the Earth (Australia)
www.foe.org.au

Australian Conservation Foundation
www.acfonline.org.au

Greenpeace Australia Pacific
www.greenpeace.org.au

Climate Action Network of Australia
www.cana.net.au

Public Health Association of Australia
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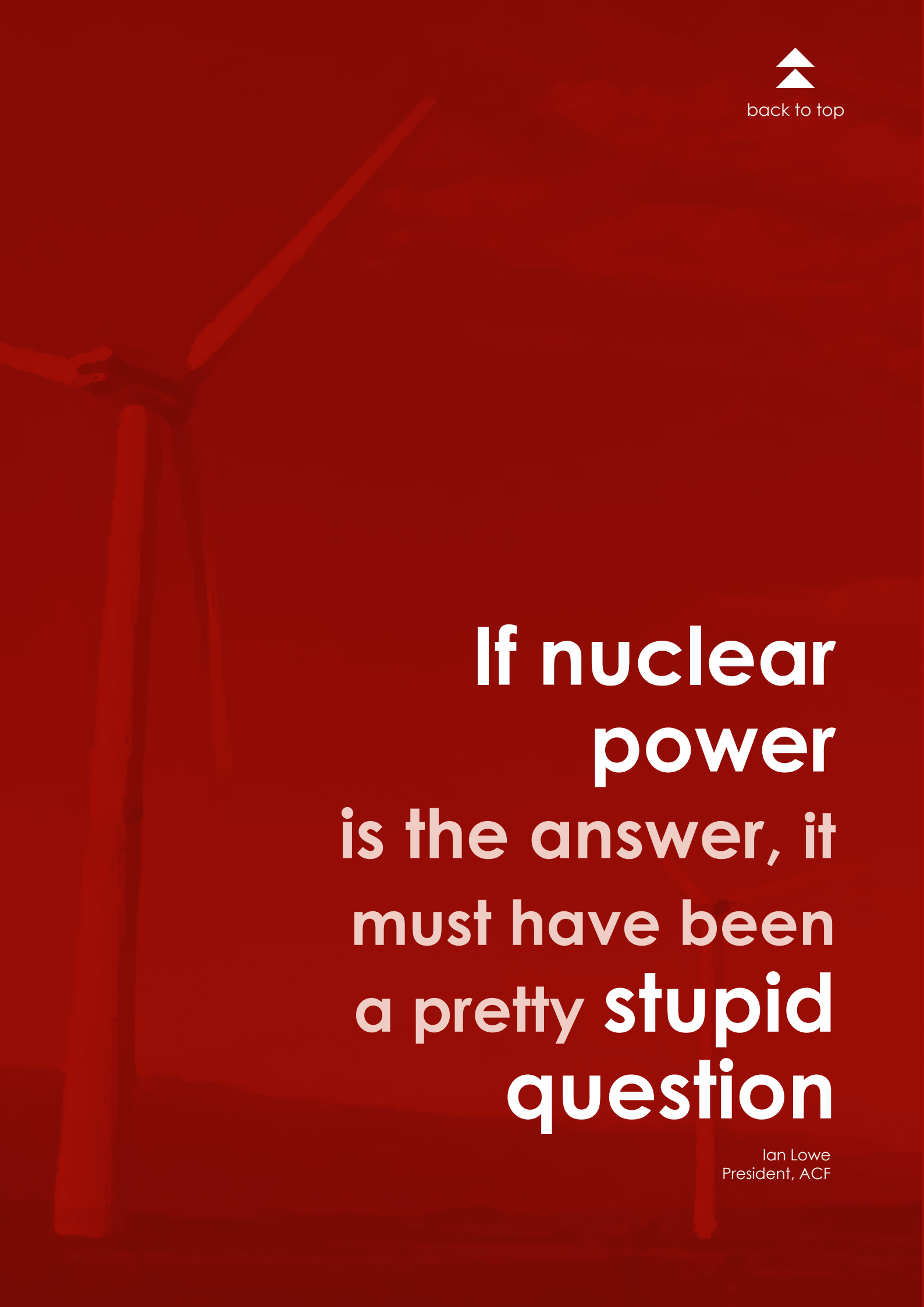

If nuclear power is the answer, it must have been a pretty stupid question

Ian Lowe
President, ACF