NUCLEAR POWER & CLIMATE CHANGE

Anti-Nuclear & Clean Energy Campaign
Friends of the Earth, Australia
www.foe.org.au/anti-nuclear

There are several problems with the nuclear “solution” to climate change — it is a blunt instrument, too slow, too dangerous, and it is unnecessary.

A blunt instrument

Nuclear power could at most make a modest contribution to climate change abatement. The main limitation is that it is used almost exclusively for electricity generation, which accounts for about 25% of global greenhouse emissions.

The 2006 Switkowski report found that building 12 reactors in Australia would reduce emissions by 8% if they replaced coal-fired plants, yet reductions ten times greater are required. Doubling global nuclear power output at the expense of coal would reduce emissions by just 5%. Those figures are halved if nuclear power displaces gas, and there is no reduction in greenhouse emissions if nuclear power displaces renewable energy sources. In any realistic nuclear expansion scenario, nuclear power makes only a modest contribution to climate change abatement – and then only if we assume that nuclear power displaces fossil fuels.

Compared to most renewable energy sources, nuclear power produces equivalent or greater greenhouse emissions per unit of power generated. For example, the 2006 Switkowski report states that nuclear power is three times more greenhouse intensive than wind power. Nuclear power is far more greenhouse intensive than many energy efficiency measures. Therefore, displacing renewables and energy conservation with nuclear power will worsen climate change, as explained by US physicist Amory Lovins: *"If climate is a problem, we need the most solution per dollar and the most solution per year. We can get two to 10 times more coal displaced per dollar buying stuff other than nuclear. Every time I spend a dollar on an expensive solution I forgo a lot more that I could have bought of a cheaper solution."*

Too slow

Expanding nuclear power is impractical as a short-term response to the need to urgently reduce greenhouse emissions. The industry does not have the capacity to rapidly expand production as a result of 20 years of stagnation. Limitations include bottlenecks in the manufacturing sector, the dwindling and ageing workforce, and the considerable time it takes to build a reactor (typically 10 years) and to pay back the energy debt from construction (which can be six years or more).

In Australia, it would take 5− 10 years of planning before reactor construction could begin, then 10 years to build a reactor, then another 6 or so years to pay back the energy debt from construction. Thus it would take at least 20 years before nuclear power could even *begin* to help reduce emissions.

Nuclear power and nuclear weapons

All nuclear power concepts (including “next generation” concepts) fail to resolve the greatest problem with nuclear power – its repeatedly demonstrated connection to the proliferation of weapons of mass destruction.

These risks are not hypothetical. Supposedly 'peaceful' nuclear programs have facilitated many nuclear weapons research and production programs. Of the 10 nations to have produced nuclear weapons, five did so under cover of a supposedly peaceful nuclear program.

The greenhouse benefits of a global doubling of nuclear power output would be small but the same cannot be said of the proliferation risks. Doubling nuclear output by the middle of the century would require the construction of 800− 900 reactors to replace most of the existing cohort of reactors and to build as many again. These reactors would produce over one million tonnes of nuclear waste (in the form of spent fuel) containing enough plutonium to build over one million nuclear weapons.

UNSW academic Dr Mark Diesendorf argues: "On top of the perennial challenges of global poverty and injustice, the two biggest threats facing human civilisation in the 21st century are climate change and nuclear war. It would be absurd to respond to one by increasing the risks of the other. Yet that is what nuclear power does."

Former US Vice President Al Gore has summarised the problem: "For eight years in the White House, every weapons-proliferation problem we dealt with was connected to a civilian reactor program. And if we ever got to the point where we wanted to use nuclear reactors to back out a lot of coal ... then we'd have to put them in so many places we'd run that proliferation risk right off the reasonability scale."

Running the proliferation risk off the reasonability scale brings us back to climate change — a connection explained by Alan Robock in *The Bulletin of the Atomic Scientists*: "As recent work ... has shown, we now understand that the atmospheric effects of a nuclear war would last for at least a decade — more than proving the nuclear winter theory of the 1980s correct. By our calculations, a regional nuclear war between India and Pakistan using less than 0.3% of the current global arsenal would produce climate change unprecedented in recorded human history and global ozone depletion equal in size to the current hole in the ozone, only spread out globally."

Nuclear power *and* climate change

Energy expert Mycle Schneider notes that countries and regions with a high reliance on nuclear power also tend to have high greenhouse emissions:

"The largest generators of nuclear power also have energy sectors with the highest CO2 emissions. Western Europe and the United States produce about two-thirds of the nuclear electricity in the world [yet] their energy sectors also produce 39% of the world's energy-related CO2 emissions.

"The same analysis applies to overall CO2 emissions per country or region. There is an interesting correlation between nuclear generation and CO2 emissions. The United States alone, [with] less than 5% of the world's population, accounts for 25% of the world's total CO2 emissions and generates 29.4% of the world's nuclear electricity. Western Europe, with only 6.5% of the world's population accounts for about 15% of global CO2 emissions and 34% of the nuclear power production."

Clean energy solutions

A significant and growing body of scientific literature demonstrates how the systematic deployment of renewable energy sources and energy efficiency policies and technologies can generate major reductions in greenhouse emissions without recourse to nuclear power. (References are posted at foe.org.au/anti-nuclear/issues/clean-energy)

UNSW scientists propose the following electricity mix for Australia in 2030:

- Wind 46%
- Concentrated solar thermal with thermal storage 22%
- Solar photovoltaic 20%
- Biofuelled gas turbines 6%
- Existing hydro 6%

Computer modeling (matching wind and solar resources with demand at different times of the day / year) carried out by the UNSW scientists shows that wind and solar are unable to meet demand only a few times a year, so there only needs to be a small amount of generation from flexible renewables (hydro and biofuelled gas turbines). There is no need for battery storage. The cost of this 100% renewable energy plan is A$7−10 billion per year more than that of the existing fossil fuelled system − a 50% increase. UNSW scientist Mark Diesendorf notes that the cost "is likely to be less than the damage caused by the increased frequency of heatwaves, droughts and floods in a business-as-usual scenario."

A summary of the UNSW research is posted at: http://theconversation.com/renewable-energy-is-ready-to-supply-all-of-australias-electricity-29200

Baseload

It is a myth that all renewable energy sources are incapable of providing reliable baseload electricity (see the briefing paper on this topic posted at www.energyscience.org.au):

- Geothermal 'hot rocks' can provide baseload power.
- Bioenergy can provide base-load power.
- Depending on the water source, hydro can provide base-load, intermediate-load or peak-load power.
- Dispersed wind farms with a small amount of back-up (e.g. from gas) can provide base-load power.
- Solar with storage can provide baseload. Solar water heating can reduce demand for baseload supply.
- Energy efficiency and conservation measures can reduce demand for base-load, intermediate-load and peak-load power.

More information on the nuclear/greenhouse debate:

Friends of the Earth:
foe.org.au/anti-nuclear/issues/nfc/power

Detailed 2010 briefing paper:
www.choosenuclearfree.net/climate-change/

Links to other literature:
foe.org.au/anti-nuclear/links#ghnp