The New Nuclear Menace

Nuclear no Solution to Energy Scarcity or Global Warming

by Andy Wilson

"One of the worst ideas, circulating in many corners of the global discussion, is the call for an expansion of nuclear power as a means of climate protection."

Jürgen Trittin,
Former German Federal Minister for the Environment, Nature Conservation and Nuclear Safety (1998-2005) March 2007.

On January 10, 2008, the UK government gave the go-ahead for a new generation of nuclear reactors to be commissioned. The move was warmly welcomed by the nuclear lobby but vociferously criticised elsewhere.

The UK government justified its decision on the grounds that it would ensure future security of supply. However, the plan has been condemned in a report published by the Nuclear Consultation Working Group (NCWG), an independent think tank made up of leading scientists and economists, some of whom had served on the UK's own committee on radioactive waste management.

The report states: *"Significant issues were not consulted on in any meaningful way or resolved in practice. It has left the government vulnerable to legal challenge and may lead to hostility and mistrust of any future energy decision."*

A year earlier at the High Court, Mr Justice Sullivan ruled that the consultancy process had been "*seriously flawed*" and was "*manifestly inadequate and unfair.*"

Regardless, it appears that the outcome of the consultancy process would not have swayed the UK Government from its nuclear course. Even before the process was completed, Prime Minister Gordon Brown had stated that *"we have made the decision to continue with nuclear power."*

Paul Dorfman, editor of the NCWG report, described the series of public meetings as a green-washing exercise in which:

..."the nuclear agenda seamlessly entwined [with] the threat of global warming...However, this sleight of hand was performed without clear reference to how the former related to the latter."

Dave Elliot, another one of the NCWG authors, pointed out that the UK government's nuclear energy consultation document played down the viability of renewable sources of energy in order to make the nuclear option appear more attractive, and he argued that the poor development of the renewables sector in the UK was a direct consequence of poor policy (1).

No Solution to Fossil Fuel Depletion

Building new reactors requires enormous amounts of fossil-fuel energy – so much so that for the first five years or so of the operating life of a nuclear reactor, it remains a net energy loser because the initial energy to build the plant has yet to be recouped.

Given the long lead-in time for commissioning nuclear plants, any possible gain from reduced demand for fossil fuels is many years into the future. The energy break-even point on any reactor given the go-ahead now could not occur before 2020, which hardly addresses short- or even medium-term energy-security issues.

During the lifetime of the nuclear plant, considerable quantities of fossil fuels are required to extract the uranium ore from the ground. For an ore to be viable, it must contain upwards of 0.02 percent uranium oxide (U_3O_8).

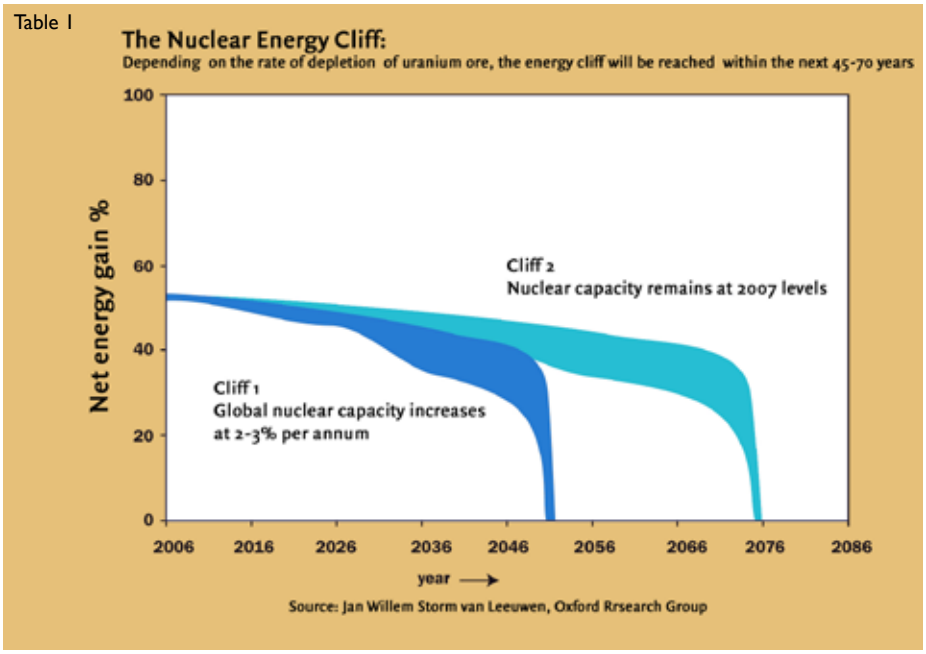
As Jan Willem Storm van Leeuwen, one of the authors of a March 2007 report by the Oxford Research group explains:

"The energy needed to recover the uranium from the rocks in the earth's crust increases with decreasing ore grade. At a certain grade the extraction energy equals the gross energy produced in the reactor. Using ore at that critical grade (0.02 percent U3O8, compared to an average today of 0.15 percent) the nuclear system as a whole produces no net energy" (Table 1).

Far from being a plentiful resource, the world's total reserves of uranium ore will last only another 60-70 years at current levels of demand for uranium oxide. These reserves will shrink even faster if the number of nuclear reactors increases.

Talk of extracting unlimited supplies of uranium from seawater or from granite is the stuff of science fiction. Granite contains only about 3 parts per million of uranium, while in seawater the concentration is only 3 parts per *billion*. In both cases, the energy required to extract and process the uranium oxide would be much greater than the energy payback.

Table 1



Fast Breeders

Since the 1960s, so-called 'Fast Breeder' or 'Generation IV' reactors have been presented as a solution to the finite supplies of uranium oxide. In theory, these reactors could create their own fuel in the form of plutonium.

Plutonium is extremely rare in nature but can be produced synthetically by bombarding uranium with neutrons. Currently, its main use is in the manufacture of nuclear weapons. Plutonium is extremely toxic when inhaled in particle form, and its long shelf life of 24,000 years means it remains dangerous for a very long time.

The Fast Breeder programme has also been beset by technical problems:

"Fifty years of intensive research [by the world's major nuclear powers], with investments of tens, if not hundreds of billions of dollars so far have failed to demonstrate that the breeder cycle is technically feasible. At present three fast-neutron sodium-cooled [Fast Breeder] reactors are more or less operational, one in Monju in Japan, another in Beloyarsk-3 in Russia and one in Phénix in France. Only the Russian reactor is operating, and it has a history of large and serious accidents. Although designed as breeders, none of the three actually bred. It is not clear whether the French and Japanese reactors, out of operation for years, will ever be restarted."

Jan Willem Storm van Leeuwen (5).

Fusion

Some proponents of nuclear energy have suggested that fusion reactions similar to the ones that occur in thermonuclear explosions could somehow be controlled and used to generate electricity. In spite of as much research funding being poured into fusion as into all non-nuclear energy sources combined, energy from fusion remains a pipe dream.

Even the nuclear industry sees the first working prototype fusion reactor being many decades away. In 2003, the Massachusetts Institute of Technology conducted an in-depth evaluation of the potential development of nuclear energy in the U.S. over the next 50 years. Despite being broadly pro-nuclear, the *Future of Nuclear Power* study did not even mention fusion technology.

Terrorist Threat

"It is often pointed out that terrorists need succeed only once whereas the security services have to succeed every time."

Executive Summary, Civil Nuclear Power, Security and Global Warming, Oxford Research Group, March 2007

In July 2006, Tom Parry, a Daily Mirror reporter, was able to walk onto a supposedly secure train in north London carrying clearly visible radioactive flasks of spent uranium fuel rods and plant a fake bomb. Parry stated this was the tenth time he had breached security at the train depot (3).

The abandoned city of Prypiat (population formerly 50,000) with Chernobyl in the background

ENERGY

In 2004, a report from the UK Parliamentary Office of Science and Technology stated: *"No reactors have been designed specifically to withstand the impact of a large commercial aircraft."* Two years earlier, the Oxford Research Group had warned the House of Commons Defense Committee that

"a successful attack...that released 1-3 percent of the plutonium stored in tanks at Sellafield would be approximately ten times as devastating as Chernobyl and require evacuation of an area which could include Newcastle or Manchester [and presumably Belfast or Dublin], *depending on the wind direction"* (4).

Economics

Even the economics of nuclear energy don't make sense. In the first decades of development of nuclear energy, the reactors were underwritten by state-owned utilities that could pass on any unforeseen costs to the public through taxation or higher energy prices. As a result, it was very difficult to find out exactly how much existing nuclear reactors cost to commission and run.

Even harder to assess are the costs of decommissioning and safely storing waste, because that phase of the nuclear cycle is only beginning now. What is clear, however, is that since the nuclear industry began to go private, very few new nuclear plants have been commissioned. Of the world's 435 reactors, less than 10 percent were completed in the last ten years, and nearly all ran severely over budget. A typical example is the Olkiluoto 3 Reactor being built in Finland by the Elfi consortium. Although still many years from completion, the project is already expected to cost 50 percent more than planned(5).

Greenhouse Gas Emissions

The argument that nuclear energy will significantly reduce greenhouse gas emissions does not stand up to any serious scrutiny. Interestingly, one of the UK government's own handouts distributed at public meetings around the country admitted that *"the rebuilding of the UK's nuclear fleet would mitigate only 4 percent of our CO2 emissions."* Even with the relatively high-grade uranium ore used today, nuclear energy compares very unfavorably to renewables.

As the ore quality falls, the greater quantity of energy required to process the uranium oxide inevitably results in an increasingly large carbon footprint. Eventually, the carbon footprint of nuclear power will exceed that of burning fossil fuels directly. This has been carefully documented in a study carried out by the Oxford Research Group (6). See Table 2.

The Unknowns of Nuclear Waste

"As we know, there are known knowns. There are things we know we know. We also know there are known unknowns. That is to say we know there are some things we do not know. But there are also unknown unknowns, the ones we don't know we don't know...." Donald Rumsfeld, US Department of Defense February 2002

Jerome Ravetz of the NCWG sums up the problem of radioactive waste thus: *"How there could possibly be a solution to the problems of guaranteeing the integrity of containments over geological time under unknowable conditions? For that prospect, we must speak of irremediable ignorance rather than of mere unquantifiable uncertainty."*

These unknowns, however, have only spurred the UK Department of Trade and Industry to greater obfuscation with regard to the safe storage of future nuclear waste. It pretends that its own Committee on Radioactive Waste Management (CoRWM) had identified a solution.

However Pete Wilkinson, a member of this committee, has pointed out that "no solution" had been found for the *"500,000 cubic metres of long-lived legacy waste containing 78 million terrabecquerels of radioactivity requiring housing in a receptacle five times the volume of the Albert Hall over a period of one million years" (7).*

All CoRWM had done was to recommend best practice based on the current level of knowledge and technology: long-term geological depositories deep inside the earth coupled with an intermediary storage phase of undeterminable length above ground at reactor sites. At present, Britain's radioactive wastes are dispered over many reactor sites, thus increasing the risk from terrorist attack. Even the location of a long term repository has yet to be decided. No funding has been allocated for this purpose, or timetable set.

Nor is the export of nuclear wastes elsewhere the answer. One has to look at the Mayak nuclear complex in Russia (8). Since 1976, there has been a nuclear-waste storage and reprocessing facility at Mayak. Storage facilities are extremely crude, and according to Greenpeace between 5 and 6 million cubic meters of radioactive waste seeps from storage ponds into the nearby Techa River every year.

In 2002, the Russian government overturned an earlier ban on the importation of nuclear wastes from abroad. EU countries currently disposing of their nuclear wastes at Mayak include Finland, Germany, Slovakia, the Czech Republic and Bulgaria (9).

Nuclear Energy and Ireland

The building of electricity interconnectors between Ireland and the UK has been widely proclaimed as being a means of better utilising Europe's renewable energy resources(10).

However, it seems likely that these huge cables will also be used for the import of nuclear electricity from Britain and other countries. IMERA Power, who have licenses to two 350MW interconnectors across the Irish Sea, have recently been given the go ahead to build additional interconnectors from Britain to France and have applied for

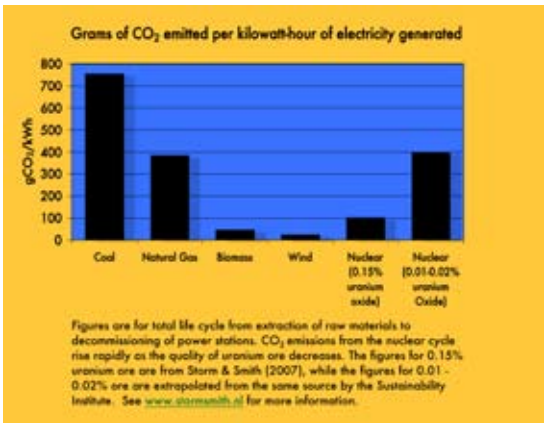


Table 2

Chernobyl

The Nuclear Interconnector Network

a license to build an interconnector to Belgium (10). Approximately 85 percent of French electricity comes from nuclear sources, while in Belgium the figure is 92 percent. One of the Irish interconnectors is to be linked with the 1.7 GW Dinorwig pumped storage facility in Snowdonia, which is a massive repository for surplus electrical energy from elsewhere.

Unlike conventional power stations fuelled from coal gas or oil which can be powered down during periods of low demand, nuclear reactors run at maximum capacity all the time. What better way of utilising off-peak nuclear surpluses then, than exporting them to a neighboring country? Although Ireland has stated on numerous occasions that it will not be going down the nuclear road, in some respects it already is.

Conclusion

To sum up, nuclear energy will have little impact on greenhouse gas emissions; it won't provide energy security in the short-, medium- or even long-term; and it is a high risk and unproven technology that places unreasonable burdens on future generations.

Andy Sterling, Co-Director of the Centre on Social Technological and Environmental Pathways to Sustainability at the University of Sussex, puts it thus:

"Nuclear power presents a unique and remarkable conjunction of intractable problems. Unlike renewables, nuclear depletes highly concentrated resources; presents risks of catastrophic accidents; generates toxic wastes requiring management over many millennia; presents highly vulnerable and potent symbolic targets for attack; contributes to pressures to proliferate weapons of mass destruction and reinforces centralized systems of coercion and control" (12)

Not exactly an attractive proposition.

1 The Energy Landscape and Renewable Energy Viability, Dave Eliot, , NCWG, Public Trust in Government, January 2008.
2 Daily Mirror, July 21, 2006.
3 Evidence to the Commons Defence Committee, Frank Barnaby, ORG, July 2002
4 The Economics Of New Nuclear Build, Steve Thomas, NCWG, Public Trust in Government, 2008
5 Secure Energy? Civil Nuclear Power, Security And Global Warming, Jan Willem Storm van Leeuwen, ORG, March 2007
6 Radioactive Waste – A Problem Without A Solution, Pete Wilkinson, NCWG, Public Trust in Government, 2008. A Terrabecquerel (Tq) is a unit of radioactivity equivalent to 1 trillion becquerels (Bq). 'Legacy' waste simply means existing waste.
7&8 Mayak: A 50-year tragedy, Greenpeace Russia. There have been a number of extremely serious nuclear accidents at Mayak, including an explosion which contaminated 15,000 km2 occupied by some 270,000 people. In 1998 the Russian Academy of Science in 1998 found that genetic abnormalities are 25 times higher than normal in the nearby town of Muslyumovo .

9 DCENR 20/12/2007 and other sources. Two 350 MW and one 500MW interconnectors are now planned for completion by 2012.

10 Irish Independent 2 April 2008

11 Choosing Energy Futures: Framing, lock-in, and diversity, Andy Sterling, NCWG, Public Trust in Government, 2008.