

IQ2 Debate 4-3-2010: Mark Diesendorf

Ladies and gentlemen, the integral fast reactor doesn't exist -- it is the archetypal **ink-moderated paper reactor**. It's true that a tiny physical version of this concept, called Experimental Breeder Reactor-2, once operated in the USA. But experimental energy technologies are just that – experiments, designed to test a concept. They have to be *redesigned* before they can be scaled-up to a medium-sized demonstration stage. Then, provided several successful demonstrations can be achieved over a period of many years, they usually need further design modifications before they could possibly move to commercial scale with full mass-production. Realistically, this whole process would take at least 20 years in the USA – much longer in Australia if our government was so foolish as to become involved.

Even if the integral fast reactor could somehow be brought to commercial reality in 2030, its proponents are naive to claim that it cannot be used to produce plutonium for nuclear weapons. A government that controls such a reactor could still build a conventional reprocessing plant to separate the plutonium from the other high-level nuclear waste. Safeguards are grossly inadequate.

The promoters of nuclear power claim that we have to choose between coal and nuclear, that there is no alternative. This is a false choice, between BHP-Billiton and ... BHP-Billiton.

The *real* choice is between dirty and dangerous technologies (such as coal and nuclear) on one hand and clean and safe technologies (that is, energy efficiency and renewable energy) on the other hand.

The nuclear lobby is fond of telling us that the Sun doesn't shine at night and the wind doesn't blow all the time. On this simplistic basis, it claims that renewable energy cannot provide baseload, that is 24-hour power. However, an ecologically sustainable electricity generating system will not be composed of wind alone or solar energy without storage alone. Instead it will consist of several different types of power station with different properties: initially wind; bio-electricity which is baseload; solar PV without storage; concentrated solar thermal power with thermal storage (potentially baseload); and gas turbines fuelled on ethanol or methanol produced sustainably. All of these sources are commercially available or, in the case of concentrated solar thermal power, pre-commercial and on the brink of becoming commercial.

Taken together, they can form a system that is just as reliable as the dirty and dangerous systems based on fossil fuels and nuclear. Even wind power can be made as reliable as coal by geographic dispersion of wind farms and by adding a little *intermittent* back-up by means of gas turbines. **It is simply untrue that coal-fired power stations have to be kept running continuously to back-up wind.**

Energy efficiency and solar hot water can also substitute for baseload coal. In Australia 4600 megawatts of coal power are kept running between midnight and dawn for the sole purpose of heating water. As the switch is made to solar and gas hot water, these coal stations could be retired and their daytime generation replaced with gas power and renewable electricity.

Given the effective government policies, which are lacking at present, renewable energy could supply *at least* 40% of Australia's electricity by 2020. Moving into the 2020s, we could also expect significant contributions from wave power, currently at the demonstration stage, and possibly hot rock geothermal power, which is close to medium-scale demonstration. If we also include natural gas, we could phase out *all* of Australia's coal power by 2030. That's the key measure recommended by Dr Hansen. By 2030 renewable electricity could generate at least 80% and possibly even 100% of our electricity.

But the 2006 Uranium Mining, Processing and Nuclear Energy Review, chaired by Dr Switkowski, knew better. It claimed that

Nuclear power is the least-cost low-emission technology that can provide baseload power.

However, there was no basis in the report for such a gratuitous statement, which was outside the terms of reference of the report. Not one of the authors had research experience in renewable energy. They all came from the nuclear industry or nuclear research. They were ignoring, among other things, the rapid growth of base-load solar power that has been occurring in Spain since 2004.

Another false claim made by nuclear proponents, is that renewable energy cannot supply the energy needs of an industrial society. Actually, a square 30 km by 30 km filled with solar collectors and installed on marginal land could supply *all* of Australia's current electricity demand. Beyond 2030, Australia could *export* vast quantities of renewable energy – stored as hydrogen or ammonia or methanol – to the rest of the world.

On a global scale, leading renewable energy researcher Bent Sørensen has shown that, with small improvements to existing technologies, there is more than enough renewable energy available to supply everyone on this planet with sufficient energy for a good standard of living in 2050. Of course, some regions have less potential than average, and other regions have more, just as with fossil fuels and uranium. So, Sorensen allowed international trade in renewable energy by means of transmission line, pipeline and ship. More recently, Mark Jacobson and Mark Delucchi have outlined a case for 100% renewable energy on a global scale *by 2030*.

Nuclear power stations, whether conventional plant or hypothetical integral fast reactors, are *inherently slow to build*, because they are gigantic construction projects. On the other hand, most renewable energy systems are fast to build, because their components can be manufactured in factories. On-site site installation is a minor part of the process.

In both 2008 and 2009, the biggest additions to the European Union's generating capacity came from renewable electricity, mainly wind. In China, wind power's generating capacity has doubled every year for the past 5 years.

Such an extraordinary rate of growth is possible with renewable energy, but is *impossible* for coal and nuclear power. Nuclear power is a particularly slow

technology to grow. It is neither a short-term nor medium-term solution to the climate crisis.

The fact that most renewable electricity systems are manufactured, while nuclear power stations are constructed, also explains why renewable energy can create 2 to 4 times more jobs per kilowatt-hour in Australia than coal or nuclear. The smaller components of renewable energy can be readily manufactured here. Even wind turbine blades were being manufactured in Portland before the collapse of the former Mandatory Renewable Energy Target in 2006.

Ladies and gentlemen, you can find more details in my books, *Greenhouse Solutions with Sustainable Energy* and *Climate Action*. I've also prepared a one-page handout that's attached to your program.

Our case is that nuclear power is slow, dangerous, expensive and unnecessary. It's a diversion from the real solutions to the climate crisis, which are energy efficiency and renewable energy.