



SENATOR SEAN EDWARDS

## The Nuclear Opportunity

The Sydney Institute, 7 April 2015

In Australia the nuclear debate has generally occurred on three fronts. They are the scientific, economic and political dimensions.

Discussion of Australia's place in the nuclear industry has been in hibernation since the Switskowski report of a decade or so ago when a change in government stopped progress in its tracks. However the South Australian Government's Royal Commission into the nuclear fuel cycle, announced in February this year, has raised the prospect of this *already* nuclear-nation of ours capitalising on an expanded embrace of the nuclear opportunity.

I reiterate that point, ladies and gentlemen: we are very much a nuclear nation already, given we stand here tonight not 40 kilometres from the very fine OPAL research reactor at Lucas Heights.

This evening I will speak about the nuclear opportunity; what it offers Australia economically and what hurdles must yet be overcome in order for us to realise it.

I am a Senator for South Australia in the Federal Parliament and so I broach this topic from the perspective that it provides a platform that would rescue my state from its economic doldrums.

That's how significant an opportunity this is; the economics are truly transformative.

I'll spend half an hour or so addressing these matters and I look forward very much to discussing them with you afterwards.

\* \* \*

### **The science**

Let us start with the science, which is inherently an argument about safety.

Ladies and gentlemen, the science is settled. In fact it's so settled that the scientific case behind the merits of nuclear technology barely need defending anymore in a serious forum like this one. But I will take the opportunity to debunk a few of the more stubborn myths anyhow.

The evidence over six decades is that nuclear power is among the very safest means of generating electricity. It's certainly safer than coal and you can even argue it's safer than wind; enough people die falling off of windmills each year to make this a statistical truth!

In the 15,000 cumulative year history of nuclear power in 33 countries, there have been just three major incidents at commercial nuclear reactors and at only one of those did nuclear fallout physically harm members of the public.

That incident occurred at Chernobyl in 1986, a facility completely without containment and subject to what I think we can reasonably call world's worst practice. The death toll there stands at less than 70.

Suffice to say, the former USSR will never be an example to Australian regulatory authorities.

You may not know that the Three Mile Island facility in the US continues to operate to this day, less one damaged reactor which was deemed uneconomical to repair after the incident there in 1979.

That leaves Fukushima, where radiation release hasn't caused a single death. In fact what Fukushima proved is that even when an earthquake, a tsunami and human error conspire against it, a nuclear power plant struggles to do physical harm while coal kills thousands every year.

Ladies and gentlemen, the truth is that nuclear power saves lives. Thousands of them if we consider workers who are alive today because they spend their days at nuclear plants and not amongst the coal industry, which kills thousands of workers annually.

Nuclear technology saves millions of lives if we consider the impact of reduced air pollution on the planet.

Former NASA climate scientist Professor James Hansen says nuclear power has prevented 1.8 million deaths. He said it could save 7 million more on this basis in the next four decades.

If the historical safety record of the nuclear industry isn't confidence inspiring enough, then consider the future.

The main measure of reactor safety is "Core Damage Frequency". This represents the likelihood of an accident that would damage the reactor core by indicating the number of years that a reactor would remain statistically accident-free. It's like the "days since last safety incident" sign in a warehouse or factory.

Today the US Nuclear Regulatory Commission requires reactor designs to meet a 1 in 10,000 year Core Damage Frequency standard.

But US reactors commonly meet a 1 in 100,000 year Core Damage Frequency standard and the best modern reactors already achieve a 1 in 1 million year standard.

Reactors likely to be built in the future will achieve close to a 1 in 10 million year standard.

Ladies and gentlemen, per kilowatt hour there is no safer form of base load power than nuclear power.

### **The economics**

The economic dimension of the nuclear opportunity is more compelling now than it's ever been. I'll offer you a case study.

In his book *Prescription for the Planet*, environmentalist Tom Blees writes about the potential of Integral Fast Reactors (IFRs).

These are nuclear power stations capable of running on what old nuclear plants have left behind. Conventional nuclear power can use around 0.6 per cent of the energy contained in mined uranium, wasting more than 99 per cent of the resource. IFRs can use almost all of the remainder. There is already enough so-called "waste" on earth to meet the world's energy needs for many hundreds of years.

IFRs are so efficient they can be supplied with a lifetime inventory of fuel and raw material at commissioning. From then on, they progressively make their own new fuel from what was once regarded as waste, producing plentiful electricity all the while.

The recycling process removes the tiny amount of true waste for disposal, and that waste has a half-life of tens rather than tens of thousands of years. For example, getting base load electricity for a year from 1,000 megawatts of IFR produces around just one tonne of shorter lived waste.

To get that much energy from Victorian brown coal produces around 8.5 million tonnes of carbon dioxide, with an atmospheric life of around a thousand years.

Throughout the past two or so years I've been developing a business case for a South Australian intervention into the global spent nuclear fuel recycling industry. The global stockpile of spent uranium stands at around 240,000 tonnes and in simple economic terms it represents a whole lot of demand for which there is presently limited supply.

That's because the nuclear powered nations, which in many cases are importing our uranium, are thereafter encumbered by it and their problem is growing by 12,000 tonnes each year.

As Blee explains, the latest generation of nuclear facilities, the generation four technology such as GE's PRISM IFR, can take that spent fuel and do much more with it. While we reduce the waste burden by volume by a factor of twenty times or more compared to the uranium they started off with – a service for which we can charge very good sums of money – the real beauty of this model is the power is generated as a by-product of that process.

This is power we can use in the manner that nuclear powered economies traditionally do – by supplying domestic customers and industry with cheap energy.

So consider these nation states, encumbered with their pre gen-IV technology and their ever increasing burden of spent fuel. Consider that some of them are legally, politically or technically restricted from reprocessing it themselves even if they wished to.

Consequently what we have is an economic equation with a great deal of pent up demand. South Australia, in the context of the Royal Commission, has the opportunity to position itself on the supply side of that equation.

To give you a sense of the scale of that demand, one prospective client state I have been in discussions with, which is in the position of being unable to reprocess their own spent uranium for geopolitical reasons, has such an appetite for a solution they have indicated an in-principle willingness to meet our capital costs, were facilities to be built in Australia to cater for them.

That means nil start-up costs and lucrative fees from a global market thereafter. You'll forgive me for providing no more detail about those discussions at this point, except to say they have been elevated to ministerial level.

This is a once in a lifetime opportunity, offering a stake in an industry worth billions annually and which, as a by-product, produces abundant cheap energy.

Ladies and gentlemen, while the fees might be significant, it's the implication of cheap energy on our economy that I believe is the centrepiece of this model.

In that respect, there is a range of possibilities starting with cheap power, scaling up to free power for all. That is, if a decision were made to take a stake in this industry of sufficient scope and scale, that industry could generate enough power to supply each and every domestic and business customer in

the state of South Australia with all of their power needs met at no cost above that of the poles and wires.

I invite you to imagine the competitive pressures this would place on other clients supplying our National Electricity Market.

You might also imagine the economic impact of abundant cheap power on employment, on consumer spending, on disposable income, on business investment and on State Domestic Product.

Many of those Arab states with abundant energy reserves today don't need to imagine this at all.

Nor do we.

This is the implementation of a quasi-special economic zone by stealth.

In a former life I was a businessman and those instincts die hard. This is a business opportunity that passes every scrutiny I've subjected it to for the past two years.

### **The politics**

Ladies and gentlemen, we know the science is sound – this is a safe and reliable technology to the satisfaction of expert intellect many ranks above mine.

I've also laid out to you what is a once in a life time business opportunity, an economic case with clients actually willing to meet our financial barrier to entry and pay service fees thereafter, as we all the while produce electricity nearly too cheap to meter with a transformative effect on our economy.

Science and economics are not the challenges here. It's politics where the fight lies.

If there's one party in Australian politics morally and philosophically compelled to support advanced nuclear energy it's the Greens.

The Greens insist they want the best for our environment but in opposing nuclear power, it's the Greens who are standing in its way.

That they so actively oppose it is an act supreme hypocrisy.

Try as they might, they simply can't meaningfully do so on environmental grounds.

Nuclear reactors produce no emissions that contribute to global warming, acid rain or smog. In fact, the life-cycle emissions of nuclear energy rank alongside those of renewables but unlike renewables, nuclear energy can actually provide base load power. The lifetime emissions from an IFR, with all the fuel already mined, will make this easily the lowest-emission energy source available to humanity.

Renewable energy sources today require substantial tax payer subsidy. But they might one day provide reliable baseload power source. However informed estimates say that's 40 years away and even the most strident advocates must acknowledge the need for an interim measure, if you call forty years 'interim'. And our most rigorous scientists tell us the scaling challenge of renewables may remain insurmountable.

Consider, the two largest "renewable" energy sources globally, by far, are hydro electricity and biomass. The first sacrifices valleys, forests and watersheds on the alter of renewable energy. While Australia has no further capacity to exploit, the same cannot be said of South America and Africa, where the planned and proposed hydro developments are frightening in scale for anyone who wants to preserve our wildspaces.



Biomass is a fancy word for the polluting practice of burning plants. Those plants need to be grown and harvested, collected or chopped down. They may brand it renewable, but above niche uses it's anything but sustainable.

Large scale solar-energy is also greedy for land. The largest in the world, 392 megawatts in the Mojave Desert, took over 3,500 acres of wilderness land. In the process, and endangered species, the Desert Tortoise, had to be relocated in large numbers. Can you imagine that being permitted for a nuclear plant? Well, you don't have to worry. The IFR would produce three times the electricity, more reliably, on about 1/100<sup>th</sup> the land, and that land can be just about wherever you want it to be, rather than in prime wilderness.

So the anti-nuclear campaigners' argument moves swiftly onto safety. But as I've argued, assessed against the historical record, nuclear energy is as safe as wind power and far safer than coal.

"But what about Fukushima?" they plead, where as we noted, to this day radiation release has not resulted in a single death.

That brings us to the question of managing waste, which is where nuclear opponents reliably go next. We've already discussed the impact IFR technology will have on spent nuclear fuel management, however let's get this completely clear and on the record: this technology represents the solution to what the Greens have told us, for decades, is the problem. Yet they cannot draw a line and support even this leading technology.

No wonder the Greens generally aren't inclined to subject themselves to a proper debate on this matter. They prefer to stack panels and orchestrate anti-nuclear love-ins, as per the one conducted in Adelaide on April Fools' Day.

The Greens stacked that event, omitting to include even a single voice for the affirmative which allowed them to peddle all manner of fabrications to their audience unchallenged.

Now I may not have been invited to this Greens love-in but it's entirely possible I have an insight into what was and wasn't said at that meeting (along with six pages of detailed notes).

I can confirm it was an ideological echo chamber full of misinformation, groupthink and political theatre which is a neat example of how the Greens will campaign against the nuclear Royal Commission.

Now I say "theatre", because in the theatre there are scripts, there are lines and there are rehearsals, right?

During the fifteen minute Q&A session, the MC, Greens' MLC Mark Parnell, just happened to know every one of the questioners by name.

Theirs was a Simpson's inspired version of the nuclear industry, complete with Homer asleep at his desk at the power plant, spilling coffee on his control panel, triggering a full-scale nuclear emergency.

In fact I'm advised there were so many references to the Simpsons it does give rise to wondering about the Greens' constituency. But I am not being harsh on environmentalists. One of my top consultant advisors on this very project is one of them by heart.

Anyway, if the Greens are so confident that the facts are on their side why lock out anyone who might disagree? Why won't they organise a debate of expert opinion and appropriate rebuttal?

And why not trust the Royal Commission process? They call for Royal Commissions all the time when it suits them.

The Greens have asked for Royal Commissions into offshore detention, onshore detention, church abuse, abuse of the disabled, the Commonwealth Bank, Manus Island, our intelligence services' efforts before the Bali bombings, the Tasmanian forestry industry, the 2004 Palm Island riot, the Reserve Bank of Australia, domestic violence, the Iraq War and the Shen Neng 1 incident in 2010.

But they don't trust a Royal Commission into the nuclear issue?

I believe that's because deep down, they know that objectively the facts are not on their side.

Something else occurred in recent days highlighting the selectiveness of the Greens and also how untenable their position on nuclear power really has become.

During the most recent sitting of Parliament Senator Milne saw cause to move a motion congratulating US President Barack Obama for his recent Executive Order requiring the reduction of greenhouse gas pollution from US Federal Government activities.

That motion applauded the US for its suite of renewable energy projects, productivity improvements, raised vehicle efficiency standards and increased ethanol use across the US Federal Government. That sounds fair enough.

But the Greens conveniently left out five very important words that also appeared on that same Executive Order:

'Small modular nuclear reactor technologies'.

Ladies and gentlemen, US Government climate change policy, which the Greens formally and enthusiastically commended in the Senate, openly relies on nuclear power.

Professor Hansen who I referred to earlier has seen the light. When he (and others of similar stature) implore anti-nuclear environmental organisations to revise their position, it's clear that environmental science has diverged sharply from Greens-style anti-nuclear activism.

However, elsewhere this activism is not without its successes. Germany not so long ago succumbed to political pressure and began the closure of its seventeen operating nuclear reactors. It will close all of them by 2022 and that move alone will produce 300 million tonnes of carbon dioxide before the shutdown is complete. The Germans are now buying nuclear power from the French, by the way.

While polling last year indicated 68% of South Australian respondents either favoured or felt neutral in respect to nuclear power, empty vessels do make the loudest noise and the Greens have had a lot of practice.

While we're in possession of a compelling argument that is simply beyond them, political theatre is not constrained by facts, argument and reason. The Greens know this.

The good news is that by virtue of the South Australian Labor Government's Royal Commission, for the first time ever, there is a bipartisan sentiment attached to an impartial, evidence-based consideration of the nuclear issue.

## **Conclusion**

There you have it.

The science is beyond serious rebuttal.

The business case is strong and a highly profitable one at that.

But if it's so good, I hear you ask me, why aren't others lining up to beat us to it?

What's restricting other players in this space at least for now is the inherent conservatism of the nuclear industry. It's slow moving and it's cautious. For countries to move from older reactors to Gen-4 technology takes time. When you are firmly committed to the physical, legal and regulatory infrastructure of the current generation of technology, the cost of change is high, and the appetite for innovation is low.

Having a clean slate to start with as Australia does will help but should a decision be made to embark upon a programme to develop a nuclear industry of the nature I have outlined, it will take time to develop a regulatory framework, to carry out all necessary studies, to pass relevant legislation and to construct the necessary facilities: no less than five years, I would say.

Energy is at the heart of modern society and efficient energy is at the centre of a prosperous economy. Consumers and business alike stand to prosper and both need to express their views to the Royal Commission if this is a course they want to see us take.

The Prime Minister has announced the Government's support for the Royal Commission, calling it a "gale of common sense".

"If it's right to mine it, why can't it be right to use it?," the PM rightfully asked.

Ladies and gentlemen, I've seen the latest science, I've questioned the experts and I've consulted internationally. This industry has a very strong future and I

firmly believe South Australia should be a part of it, and so I will be proposing as much to the South Australian Royal Commission.

The recycling of spent fuel is a substantial commercial opportunity. But that pales in comparison to the wider economic benefit of power almost too cheap to meter.

This is the economic game changer South Australia needs. The path ahead could reap great economic rewards. We must act and we must act now, and so I urge you all to support me in this important venture.