

NUCLEAR POWER – THE PERSPECTIVE IN 2009

Why we need to talk about nuclear power if we are serious about clean energy

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CONTEXT

- Demand for energy +2%/year >>> double by 2050 in Australia and the world
- Synonymous with economic growth, prosperity and rising standard of living
- Little difficulty in meeting demand growth; challenge is to do so in an environmentally responsible way
- Rules are evolving with costs being imposed upon carbon emission and fossil fuel use
- Climate change a key driver but energy security, diversity of supply and sustainability as important

PLATFORM ALTERNATIVES

For several generations still:

- Coal, Gas, Hydro(?), Nuclear ... for baseload electricity (to power refrigerators, washing machines, plasma TVs, traffic lights hospitals...)
- Solar and Wind ... intermittent
- Plus Geothermal, Tidal, Wave, Biomass

Heirarchy of emissions : brown coal, black coal, gas, solar, nuclear, wind, hydro

CO2 resident in upper atmosphere for 100+ years

All energy technologies have some undesirable side effects, risks or special challenges. Choice requires balancing risks with social values, costs etc

NATIONAL STRATEGIES

Let's be clear what's driving other country's national strategies:

- Peak oil?
- Dependence upon Middle East supply, and the hi cost of oil?
- Russian Gas
- Fork in the road – depletion of North Sea oil and gas – UK and Norway?
- Global warming

In every case, energy independence and security trumps environmental priorities except in Australia.

Environmental agendas are often retrofitted onto legacy strategies with different original motivations (eg ethanol in the US).

CLIMATE CHANGE - personal view

- Climate change science is sound although models very complicated
- Now in an extended warming period
- Forecasts of climate change and volatility directionally right ...more severe droughts, intense bushfires, unreliable rainfall, floods, hailstorms, rising sea levels, species destruction, melting icebergs, receding glaciers
- Currently 388 ppm, increasing by 2ppm CO2 each year
- IPCC scenario of -60% by 2050 is scientifically based
- Some countries have adopted the -60% target; none knows how to ‘connect the dots’ to achieve this.
- Australia contributes just over 1% of annual global GHG emissions. Major emitters are Us, China, EU, Japan, Russia, India, Indonesia
- Climate change is programmed in for next 20-30 years. Steps taken today will affect trends later this century.

TECHNOLOGY CHALLENGES

- Carbon capture and storage – geosequestration (Australian coal revenues >\$50B in 08/09; all price and profit)
- Transmission of electricity over long distances – to exploit geothermal and hydro remote from markets (\$0.5-1 million per km with HV DC transmission)
- Centralised vs distributed power generation
- Baseload vs intermittent (80% for refrigerators, washing machines, plasma TVs, toasters, a/c, lighting, hair dryers etc)-resolving compatibility issues
- Alternatives to the internal combustion engine
- Storage systems – ie batteries
- Cost performance of PV cells
- Even with urgency required by energy security and global warming, technology shifts occur over 20-50 years

GLOBAL TRENDS

- Australia ~ 38% uranium, 20% global production – fuel for about 1/5 world's reactors
- 31 nuclear powered countries; global industry is 54 years old
- 443 reactors >>> 1000 by 2050 (all new); 30-40 under construction
- ~150 ocean going nuclear vessels (submarines, aircraft carriers, ice breakers)
- 15% global electricity; 23 % OECD; 2/3 global population get some nuclear power
- China, Taiwan, India, Pakistan, Japan, S Korea – nuclear powered in our Region
- 20 new countries by 2020. Could include Indonesia, Vietnam, Thailand

Emerging interest in small reactors (100-200MWe) – for provincial towns, industrial sites (eg mines, smelters), desalination plants

200 MWe units already deployed in nuclear submarines (HEU).
Would power 100k population

EU – most progressive community re Climate Change – has 31% nuclear power
London – half baseload electricity is nuclear generated
France - 80% nuclear powered. A country of vineyards, cathedrals, and nuclear reactors.

A 2006 study (UMPNER) concluded that nuclear power offered the promise of being the safest, cleanest and lowest cost form of energy in the 2020s

Suggested a possible scenario where our first reactor could be operational in the early 2020s and a network of 25 reactors in place by 2050 producing about a third of Australia's electricity needs.

These would reduce national GHG emissions by 18% vs continued use of fossil fuels.

Not a silver bullet, but a considerable contribution to GHG reductions and energy diversity.

The **European Union** has been a global leader on the issue of Climate Change.

Within the last two years:

- The UK has committed to accelerate nuclear build program to replace 19 reactors producing 20% share of electricity generation and to add capacity
- Germany has reversed an earlier decision to phase out nuclear and is extending operating licenses for its nuclear reactors (17 producing 25% electricity) from 40 to 60 years while importing more nuclear power from interconnected neighbours
- Sweden added to the list of EU countries to restart building of nuclear power stations after a 30 year pause (10 reactors, 50% electricity)

- Italy also joined that list last year (0 reactors, 10% imported nuclear). Target of 25% nuclear by 2030
- 31% EU electricity is nuclear already.
- US President Obama has stated that the US cannot meet its climate change goals without more nuclear power
- The Chairman of the IPCC, Dr Rajendra Pachauri, has extended that comment to also represent the challenge globally
- The fastest growing nuclear economies are China (11 reactors, 24 under construction), India, Russia and S Korea; the fastest growing uranium producer – Kazakstan.
Interesting geopolitical issues with some of these esp for Australia.
- The countries directly affected by radiation fallout from the Chernobyl accident of 1986 – Ukraine, Belarus, Russia, Finland – have all recently increased their nuclear programs and construction of new reactors

RESERVATIONS RE NUCLEAR

- Management of long lived radioactive waste – no national repository yet operational anywhere

Sweden (10 reactors producing nearly 50% electricity) confirms waste repository site.

After seven years of geological investigation and consultation with local communities, a site near the Forsmark nuclear reactors at Östhammar has been selected as Sweden's permanent high-level waste repository. It was preferred to Oskarshamn due to better granite, though both communities were keen to host the facility. Sweden's waste management company SKB, owned by the four nuclear power utilities, plans to begin site works in 2013, with full construction starting in 2015 and operation in 2023. This single facility, using only 15 hectares above ground, will hold all of the high-level radioactive waste from the nuclear power reactors which provide nearly half of Sweden's electricity.

WNN 3/6/09.

- Costs of nuclear power; rising capital intensity (Finnish reactor costs x2)
- Timeliness – 15 years away. Not a solution for 2020
- Location of reactors – NIMBY

(In Australia, 25 reactors require 6-8 sites plus one national repository for spent fuel rods available by 2070)

- Risk of catastrophic accident – eg Chernobyl
- Proliferation, terrorism
- Use of water
- Sovereign risk – lack of bipartisan support

AUSTRALIAN GOVERNMENT POLICY

- Signatory to Kyoto Protocol
- Adoption of -60% target for GHG emissions by 2050
- ETS with interim targets of -5/15/25%, permits, timelines, costs
- Mandatory renewables energy : 20% by 2020 >>> wind!
- Uranium mining supported
- No nuclear power
- Middle power diplomacy to leverage Australia's initiatives with major emitting economies

Quoting Minister Ferguson:

“...nuclear power is not needed as part of Australia's energy mix given our country's abundance and diversity of low cost and reliable energy sources, both fossil fuel and renewable. The Government has a clear policy of prohibiting the development of an Australian nuclear power industry, but the government also understands that nuclear power is an important part of the energy mix in some countries where energy demand is growing strongly but which lack the abundant and diverse energy resources available to Australians”

Can Australia be unique in this regard?

Policy makers claim no scenario ahead which will require nuclear power in Australia, but

- Targeted deep emission cuts may prove beyond capability of existing technologies and renewable energy platforms to deliver in the time allowed – the inclusion of nuclear power will be critical to our meeting targets.
- Lights begin to go out because investment in clean baseload energy generation stalls in uncertain regulatory environment, and the nuclear alternative is not validated
- In a carbon constrained future, existing nuclear powered economies exploit their cost advantages for clean energy in competing with Australian products newly burdened with embedded carbon costs

The Australian Government's strategy is rational if we assume we have better options to nuclear available to us.

This requires the combination of energy conservation, supercharged growth in renewables and the success of CCS within the next 20-30 years.

As importantly, few politicians will support a pro nuclear position without community backing at least to the point where such a policy would not lose votes (and so threaten the reelection chances of a govt)

Note example of Telstra privatization where majority community support did not exist but the issue did not materially affect voter behaviour.
Australia may be 2-5 years away from that point re nuclear.

RECOMMENDATIONS

- UK (19 reactors, 20% electricity) Govt White Paper- published in Jan 2008 – concluded:

The (UK) Government believes new nuclear power stations should have a role to play in this country's future energy mix alongside other low carbon sources: that it would be in the public interest to allow energy companies the option of investing in new nuclear power stations; and that the government should take active steps to facilitate this.

It will be for the energy companies to fund, develop and build new nuclear power stations (in the UK) including meeting the full costs of decommissioning, and their full share of waste management costs.

This seems to me a very sensible position and one that I expect Australia to reach eventually.

- Steps ahead for Australia
 - Continuing public debate based upon facts and current information
 - Agreed national strategy re GHG reductions, energy mix and carbon costs
 - Creation of a regulatory regime to oversee nuclear power industry
 - Bipartisan agreement

Thank you
