



## What is the future for nuclear energy in Australia?

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## Nuclear energy worldwide has a troubled past..

- Military origins
  - Main difference between civilian and military use of nuclear energy is only in rate of reaction process
  - No other energy technology has had such an impact on public mind; an astounding source of military power
- Safety concerns throughout nuclear fuel chain
- A proven vehicle for weapons proliferation
- As yet unmet waste management challenges
  
- *However, now provides approx. 15% of global electricity supply in over 30 industrialised and developed nations*
  - Very low levels of traditional *fossil-fuel* pollutants



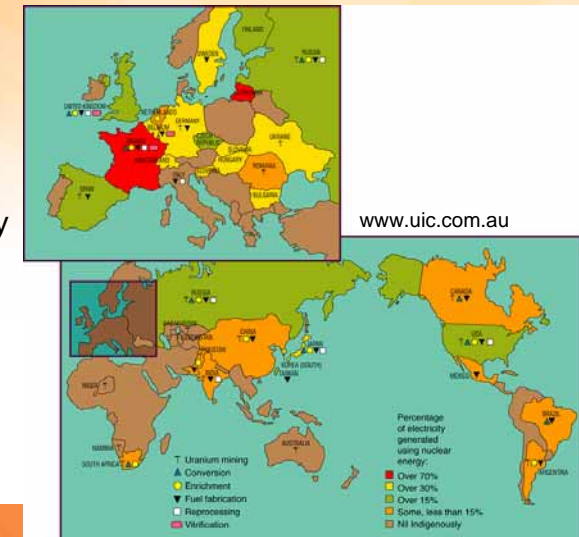
## .. a contested present + hence uncertain future

- Currently approx. 25GW of plant under construction
  - Around 2% of global ‘new build’ generation capacity post 2000 (*by comparison, global wind capacity grew by ~12GW in 2005*)
  - 1 unit under construction in Europe, none in US (*although this may soon change*)
- However, nuclear energy clearly now back on the agenda
  - Progress on ‘old’ issues
    - economics, safety + waste management
  - Important ‘new’ issues
    - climate change
    - energy security
    - *fears of a new round of weapons proliferation*



## Australia’s current context...

- Considered nuclear options in 1960s but current involvement only uranium mining for export
- Federal Govt. Energy White Paper (2004) assessed nuclear energy as ‘reserve’ low-priority option...



## ...but what next?

Last Update: Saturday, November 4, 2006. 4:00pm (AEDT) www.abc.net.au



### Ignoring nuclear power foolish, PM says

The Prime Minister says nuclear power production must be an option in Australia and it would be foolish to ignore the option with the country's vast reserves of uranium.

A review by the Federal Government's nuclear energy task force has found a nuclear power industry could be commercially viable within 15 years.

John Howard believes Australian attitudes to nuclear power are changing. (File photo)

- Much will depend on international developments
  - International uranium market, fuel chain opportunities, new plant designs, proliferation?
- ...but Australia will also have key decisions to make

## Potential proliferation

- By some measures 'atoms for peace' and NPT a success
  - Only ~~X~~ 5 nations have definitely acquired nuclear weapons since it was signed: *none were signatories at the time*
- However, IAEA estimates 35-40 non-weapon states now possess technical know-how – nuclear club could grow fast



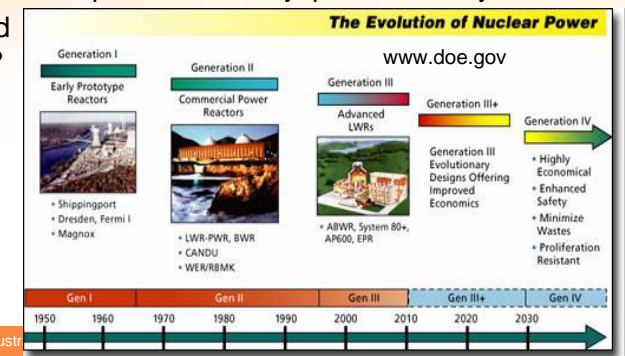
www.wikipedia.org

## Waste management

- Nuclear energy chain produces relatively small amounts of highly radioactive wastes
  - One of many waste streams of industrial society (eg. POPs) but potential proliferation risks + long time frames of risk
- Deep geological disposal may offer reasonable compromise b/n safety, security, economics, possible reuse
- **However**, as yet not a single authorized + operational final disposal repository (waste dump?) for high level waste
- **For Australia**
  - questions of possible Extended Producer Responsibility for current/expanded uranium exports
  - almost certainly require local disposal if have own power plants

## Nuclear power plant technologies

- Gen III designs seem to offer safety, economics + waste management improvements over current designs
- **However**
  - Some of these designs haven't yet been built (eg. AP1000)
  - Unlikely to achieve complete 'walk away' passive safety
  - Able to withstand terrorist assault?
- **For Australia**
  - Will have to buy from o/s
  - No significant existing industry capability

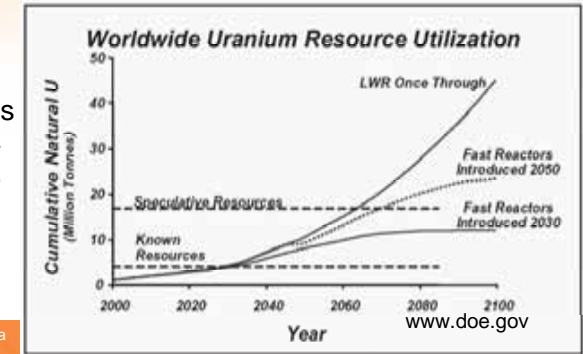


## Nuclear power plant economics

- Considerable disagreement on nuclear's real costs
  - Many 'hard to price' externalities
    - Accident risks, waste disposal, decommissioning, proliferation
  - More government subsidies than any other energy technology
    - > 1/2 of all public energy R&D over last 30 years, blurred military + civilian budgets, Govt underwritten insurance
  - Unlikely that it is as low-cost as other options for many countries
    - Countries with major nuclear not typically low-cost internationally
    - <5% global Al smelting supplied by nuclear ([www.world-aluminium.org](http://www.world-aluminium.org))  
*New smelters primarily being fuelled by hydro, gas + geothermal*
    - Restructured competitive electricity industries have shown little interest in investing in new plant
  - **However**, climate change will change costs of main other options
- **For Australia**
  - No likely cost-advantage over other countries for nuclear: fuel only a small proportion of costs, plants will be imported

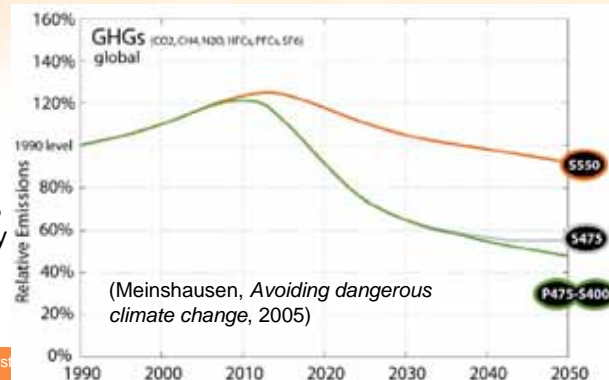
## Energy security

- Growing fossil-fuel security concerns *especially wrt gas*
- > 40 countries have potentially economic U resources but Canada + Sth Africa amongst few self-sufficient countries
- Considerable debate over size of global U resources
  - Potential for closed fuel cycles – reprocessing, fast-breeder
- **For Australia**
  - Plentiful U reserves
  - more other energy options than many other countries



## Climate change

- Avoiding dangerous warming
  - likely require global emission cuts of 50-70% by 2050
  - 20 year delay in taking action requires emissions to fall 3-7 times faster to a lower level than if we start now
- **For Australia**
  - World's highest per-capita emissions (2 X industrial country average)
  - Projected 40-50% increase in energy emissions over 1990 levels by 2010 (AGO)



## Australia's energy options

- Need to assess future nuclear role through rigorous transparent process that considers our other options
  - Key part of establishing societal consensus for 'tough' decisions
- Many other options available
  - Large coal, gas + renewable resources; *none are perfect*
  - Energy intensive + low efficiency economy (2004 White Paper)
- Need a risk-based technology assessment framework
  - current technical status, integration into existing energy industry, present / possible future costs, potential scale + speed of deployment + abatement, other possible societal outcomes
- **For nuclear**
  - Proven plant options, good integration potential, med-high cost, slow to deploy, range of potentially adverse societal outcomes



## What is the future for nuclear energy in Australia?

- We don't know yet
  - shouldn't rely on it or any other technology to solve problem
- Require an Australian policy framework that
  - doesn't try to pick winners
  - will resolve question of what role nuclear + other options might play in med-longer term while reducing risks + max. opportunities through support of existing abatement options
    - improved energy efficiency, gas-fired generation and cogeneration, range of renewable energy sources
- Key policy needs
  - a price on carbon
  - targeted policy efforts for energy efficiency, cogeneration + renewables
  - public R&D & Demonstration funding support for range of promising technologies
  - Process for building societal consensus on 'tough' decisions req'd

Thank you... and questions

*Many of our publications are available at:*

[www.ceem.unsw.edu.au](http://www.ceem.unsw.edu.au)