GNE ADVISORY

Nuclear Energy for Australia?

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Singapore – 14 November 2019

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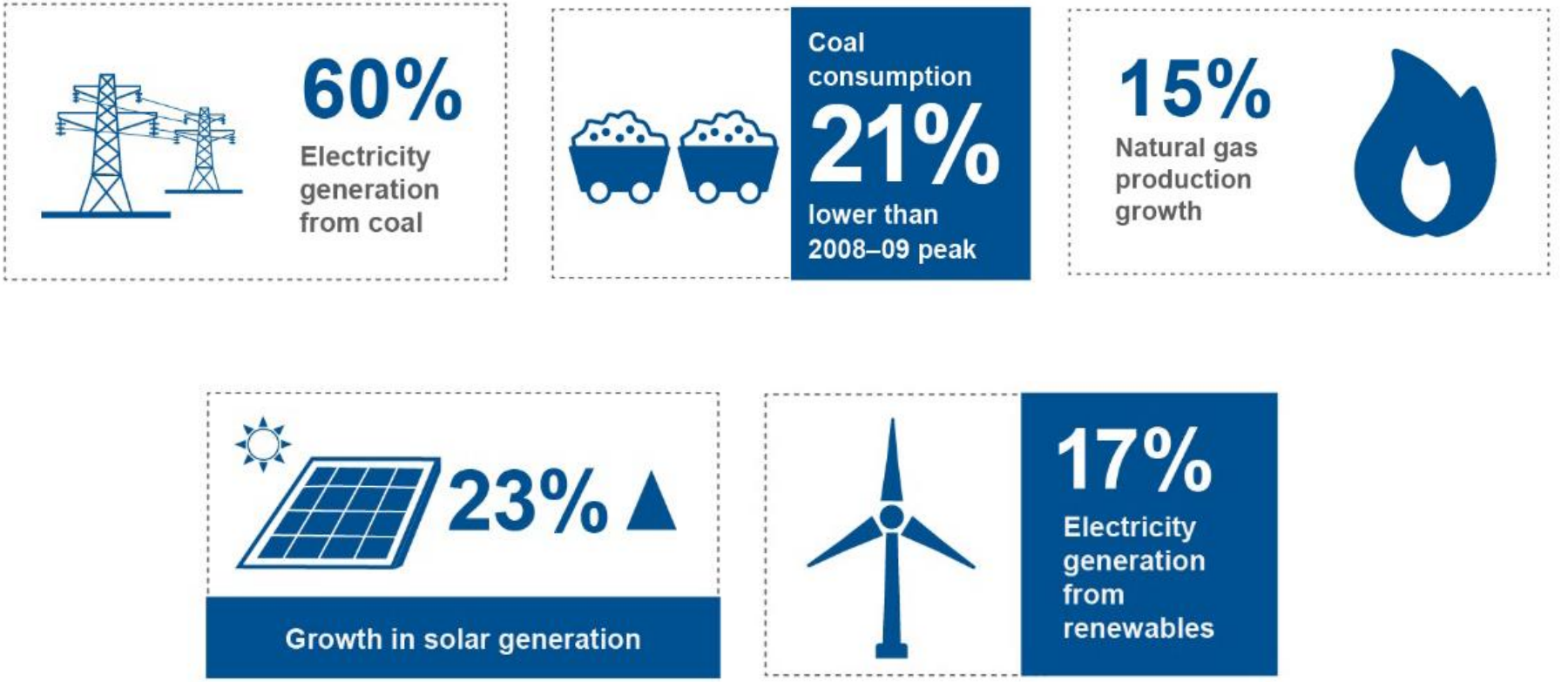

Source: Australian Energy Update 2019, September 2019, Department of the Environment and Energy

Australian energy statistics (cont.)

Table 2.2: Australian energy consumption, by fuel type

	2017–18		*Average annual growth*	
	PJ	share (per cent)	2017–18 (per cent)	10 years (per cent)
Oil	2,387.8	38.7	3.2	2.0
Coal	1,847.2	29.9	-4.3	-2.6
Gas	1,554.6	25.2	3.8	2.4
Renewables	382.1	6.2	0.9	5.3
Total	**6,171.7**	**100.0**	**0.9**	**0.6**

Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*,

93.8% fossil fuels…

Australian energy statistics (cont.)

Table 3.2: Australian electricity generation, by fuel type

	2017–18		*Average annual growth*	
	GWh	share (per cent)	2017–18 (per cent)	10 years (per cent)
Fossil fuels	**216,497**	**82.9**	**-0.5**	**-0.6**
Black coal	121,702	46.6	2.9	-0.5
Brown coal	36,008	13.8	-17.3	-5.0
Gas	53,882	20.6	6.8	4.1
Oil	4,904	1.9	-7.0	4.2
Renewables	**44,643**	**17.1**	**10.4**	**10.2**
Hydro	16,021	6.1	-1.6	3.4
Wind	15,174	5.8	20.5	16.6
Bioenergy	3,518	1.3	0.5	2.6
- bagasse	1,425	0.5	-0.7	na
- wood, woodwaste	315	0.1	-11.2	na
- municipal, industrial waste	95	0.0	25.7	na
- sulphite lyes, biofuels	429	0.2	-2.9	na
- landfill biogas	1,027	0.4	5.9	na
- sludge biogas	226	0.1	1.6	na
Solar PV	9,930	3.8	23.0	58.7
- small scale	8,922	3.4	20.6	56.8
- large scale	1,008	0.4	49.8	na
Total	**261,140**	**100**	**1.2**	**0.6**

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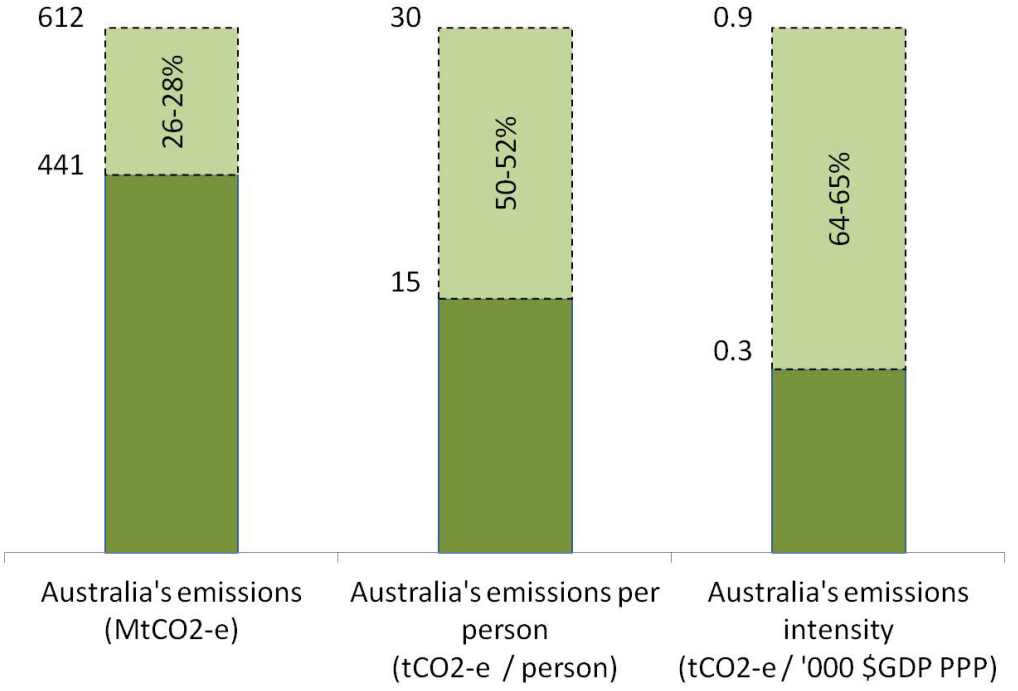
What is Australia's contribution to global carbon emissions?

What about Australia's commitments under the Paris Agreement?

Australia's 2030 climate change target

- **Contribution:** Australia is responsible for around 1.3% of global emissions
- **Target**: Australia will reduce emissions to 26–28 per cent on 2005 levels by 2030



Source: environment.gov.au, Factsheet - Australia's 2030 climate change target

3.
Nuclear energy and Australia

Australia does not have operating nuclear power plants or a nuclear energy programme – prohibited by law

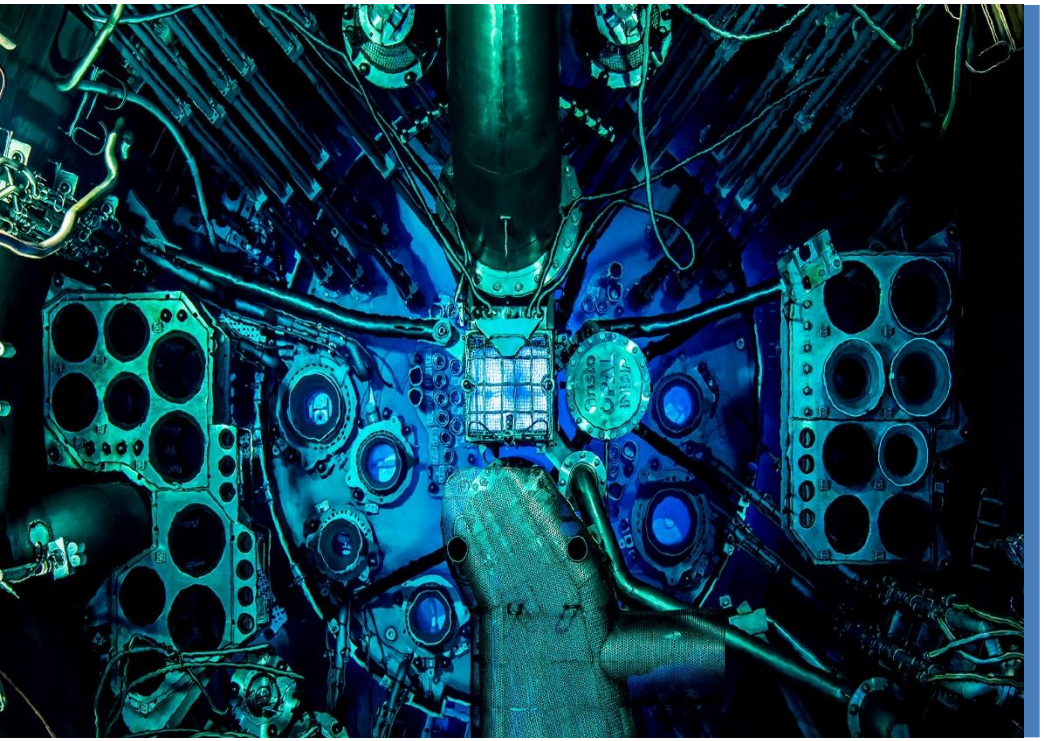
Is that strange?

- **31 countries** in the world operate nuclear power plants
- **Of the G20:** Argentina, **Australia**, Brazil, Canada, China, France, Germany, India, **Indonesia**, **Italy**, Japan, Republic of Korea, Mexico, Russia, **Saudi Arabia**, South Africa, Turkey, United Kingdom, United States, and the European Union (**Note** 12 of 28 EU countries do not have NPPs)

Australian uranium

5th largest historical producer of uranium

Australian nuclear research reactor



Australia has operated a research reactor since the 1950s – HIFAR and now the OPAL research reactor located in Sydney, operated by ANSTO

Why doesn't Australia have nuclear energy?

Historical perspective

- **AAEC:** In 1953 the Australian Parliament passed the Atomic Energy Act, which established the Australian Atomic Energy Commission (AAEC)
  - AAEC's functions included advising the Government on nuclear energy matters,
  - In 1955 it established a research facility at Lucas Heights and constructed the HIFAR research reactor
- **ANSTO:** AAEC became Australian Nuclear Science and Technology Organisation (ANSTO) in 1987 and now operates the OPAL research reactor
- **NPP:** The AAEC also initially convinced the Government in the late 1960s to construct a nuclear power plant at Jervis Bay, south of Sydney
  - Competitive bids obtained
  - Low cost of other energy sources
  - Change in political leadership and proposal abandoned

Historical perspective (cont.)

How nuclear power came to be banned in Australia

Population growth and industrialisation post-World War II saw a boom in nuclear power generation across America, Russia, Britain and France between the 1950s and the 1970s. Towards the end of this period the nuclear debate reached Australia.

Australia's nuclear timeline

1969

Proposal to build Australia's first nuclear reactor at Jervis Bay. Tenders were called and land cleared, but low cost coal and fiscal constraints saw the plan deferred and eventually scrapped.

1980s-90s

Anti-nuclear movement gains traction against a back-drop of French nuclear testing in the Pacific; the Rainbow Warrior incident; the siting of a nuclear waste repository for medical and industrial nuclear waste; and leaked plans to commercially site international nuclear waste in Australia.

1998

The *ARPANS Act 1998* passes into law. The Australian Radiation Laboratory and the Nuclear Safety Bureau are merged and renamed the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). Horsetrading with the Greens and the Australian Democrats results in the 'prohibition on certain nuclear installations' included in the Act.

1999

A similar clause, but with greater effect, is written into the *EPBC Act 1999*. Section 140A(1)(b) reads:

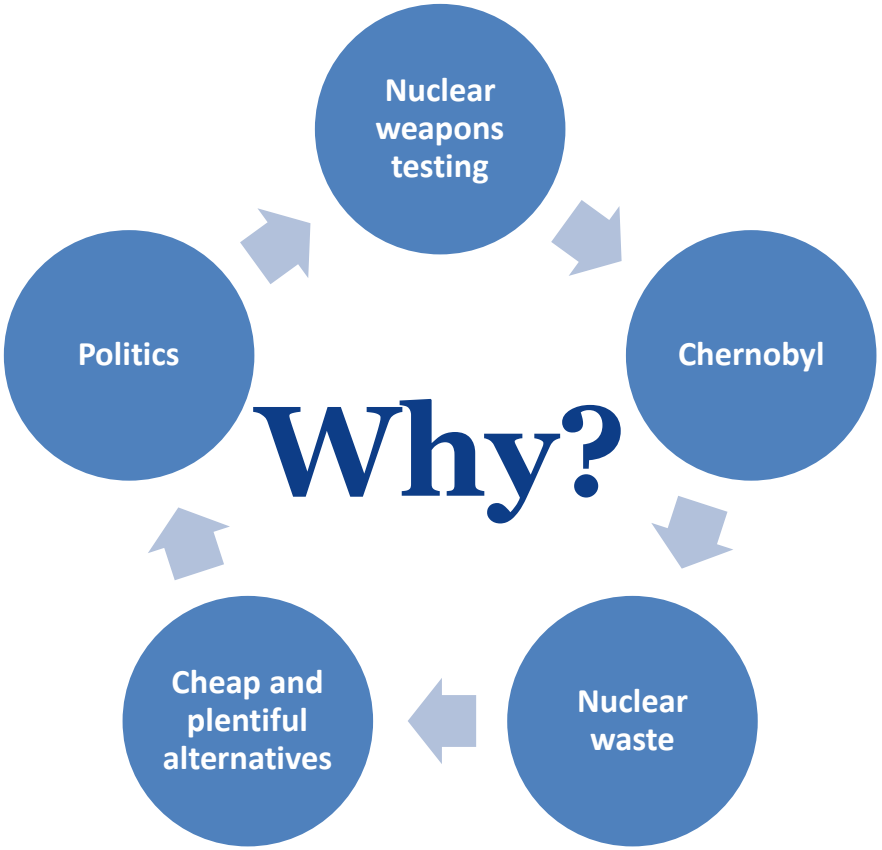
> The Minister must not approve an action consisting of or involving the construction or operation of a:
>
> b) nuclear power plant.

Australia's domestic legal prohibitions

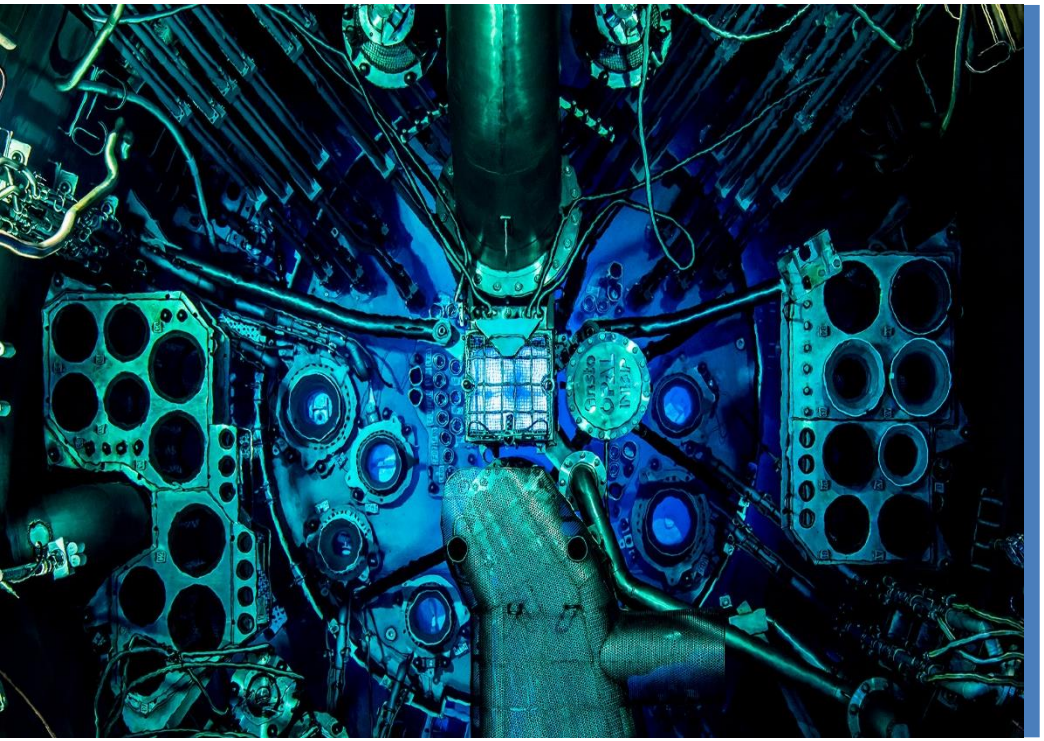
Federal Acts	Content
Australian Radiation Protection and Nuclear Safety Act 1998 (ARPANS Act)	• Regulates the operation of nuclear installations and the use and management of radiation sources, where these activities are undertaken by Commonwealth Government entities. • Empowers ARPANSA to promulgate regulations. • ***Prohibits*** *approval of actions involving the construction or operation of a nuclear fuel fabrication plant, a nuclear power plant, an enrichment plant, or a reprocessing facility.*
Environment Protection and Biodiversity Conservation Act 1999	• Establishes requirements for EIA processes for actions in relation to matters of "national environmental significance", including "nuclear actions" • ***Prohibits*** *approval of actions involving the construction or operation of a nuclear fuel fabrication plant, a nuclear power plant, an enrichment plant, or a reprocessing facility.*

State Acts	Content
NSW Uranium Mining and Nuclear Facilities (Prohibition) Act 1986	• Prohibits uranium mining • Prohibits nuclear power plants and associated nuclear facilities and activities
Victoria Nuclear Activities (Prohibitions) Act 1983	• Prohibits uranium mining • Prohibits nuclear power plants and associated nuclear facilities and activities

Historical perspective to current reality

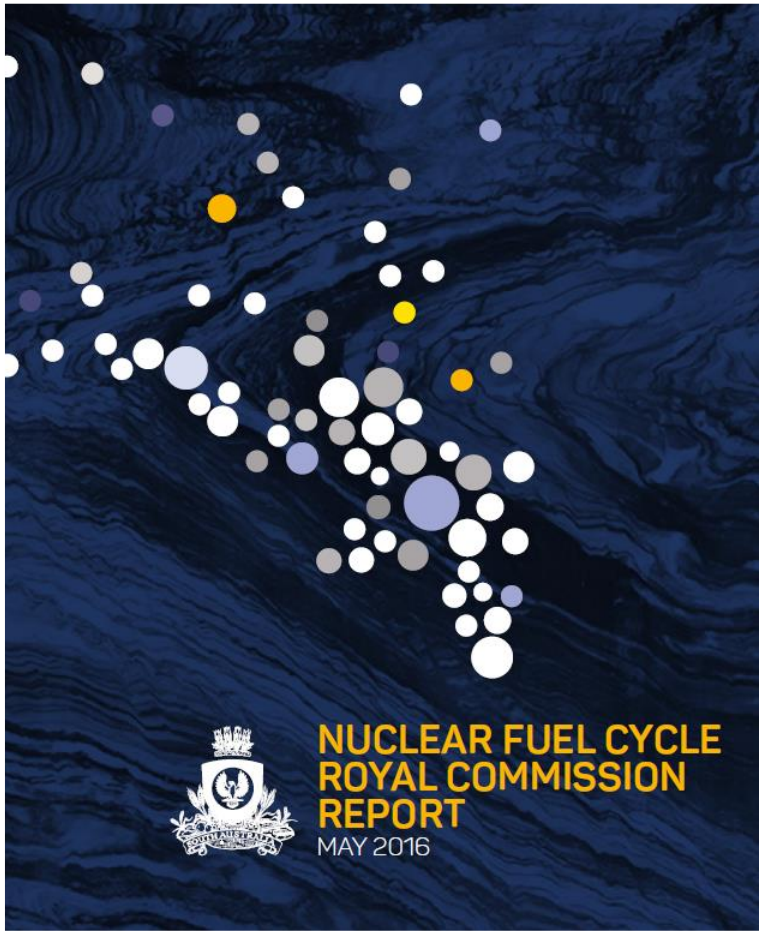


Inquiries...



- 2006 UPNER Report
- 2016 SA Royal Commission
- 2019 NSW Inquiry
- 2019 Federal Inquiry
- 2019 Victorian Inquiry

2016 SA Royal Commission



- **Scope:** The nuclear fuel cycle
- **12 recommendations:** Included:
  - Nuclear energy not commercially viable now but pursue removal at the federal level of existing prohibitions
  - Promote a comprehensive national energy policy that enables all technologies, including nuclear, to contribute to a reliable low-carbon electricity network at the lowest possible system cost
  - Collaborate with the Australian Government to commission expert monitoring and reporting on the commercialisation of new nuclear reactor designs
  - Pursue the opportunity to establish used nuclear fuel and intermediate level waste storage and disposal facilities in South Australia
- **South Australian Government:** Adopted nine of the recommendations but not recommendation on overturning the ban on nuclear power facilities or fuel cycle facilities and said it would continue to study the prospects of an international storage facility

2019 Inquiries – content and drivers…

 NSW Inquiry  Federal Inquiry  Victorian Inquiry

Climate change mitigation and GHG emissions

Industry and jobs

Politics

Instability of power grid as more renewables come online

Technology development - SMRs

Watch for an outcome as early as next week

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4.

What would Australia need to do from a legal perspective to develop nuclear energy?

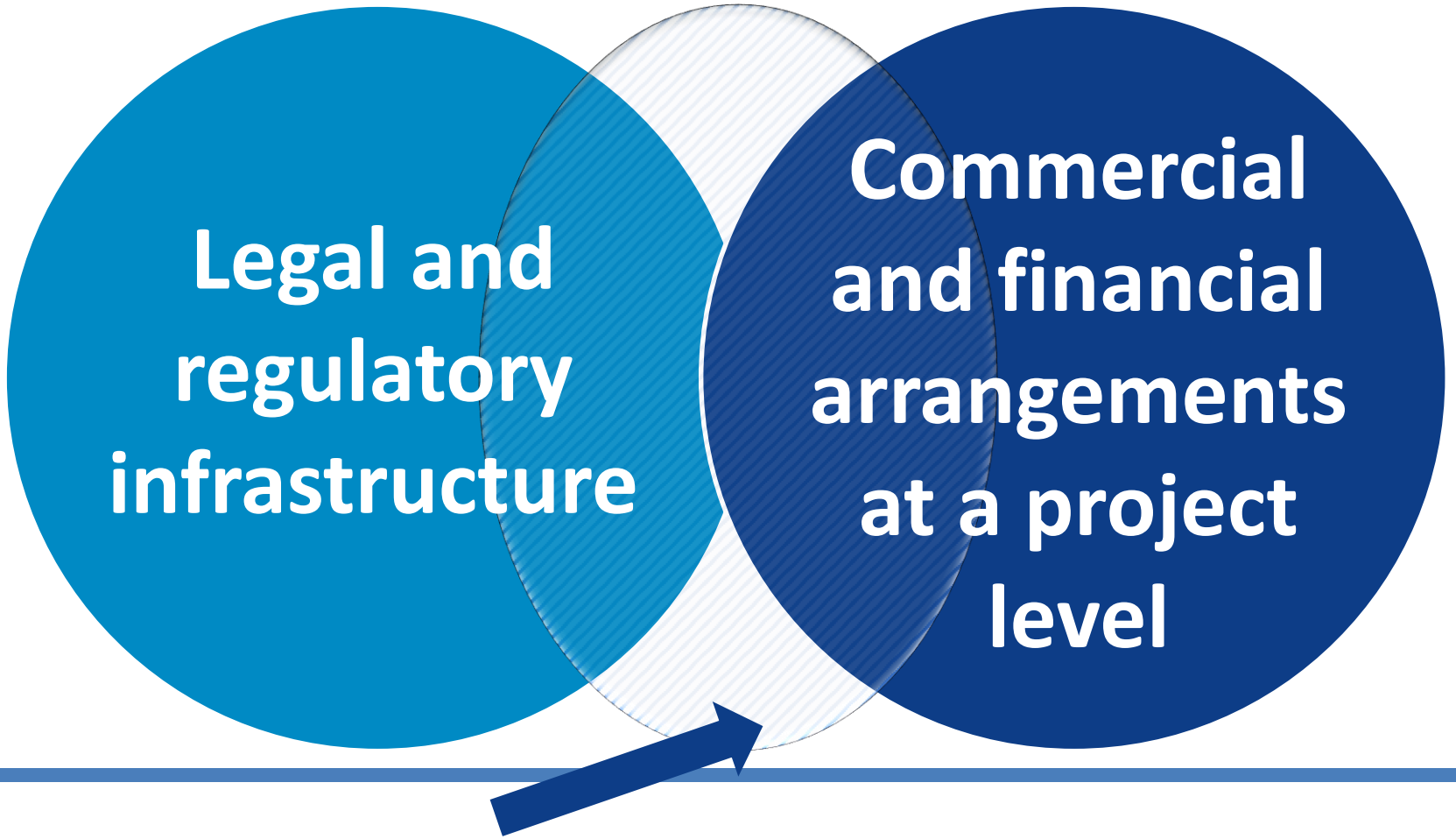
So what would Australia need to do?

- **Prohibition:** Remove the prohibitions
- **International law:** Ensure all international treaty obligations are implemented domestically
- **Nuclear liability:** Consider an international nuclear liability regime and implement domestically
- **Nuclear law:** Revise and expand primary legislation – federal and state

So what would Australia need to do? (cont.)

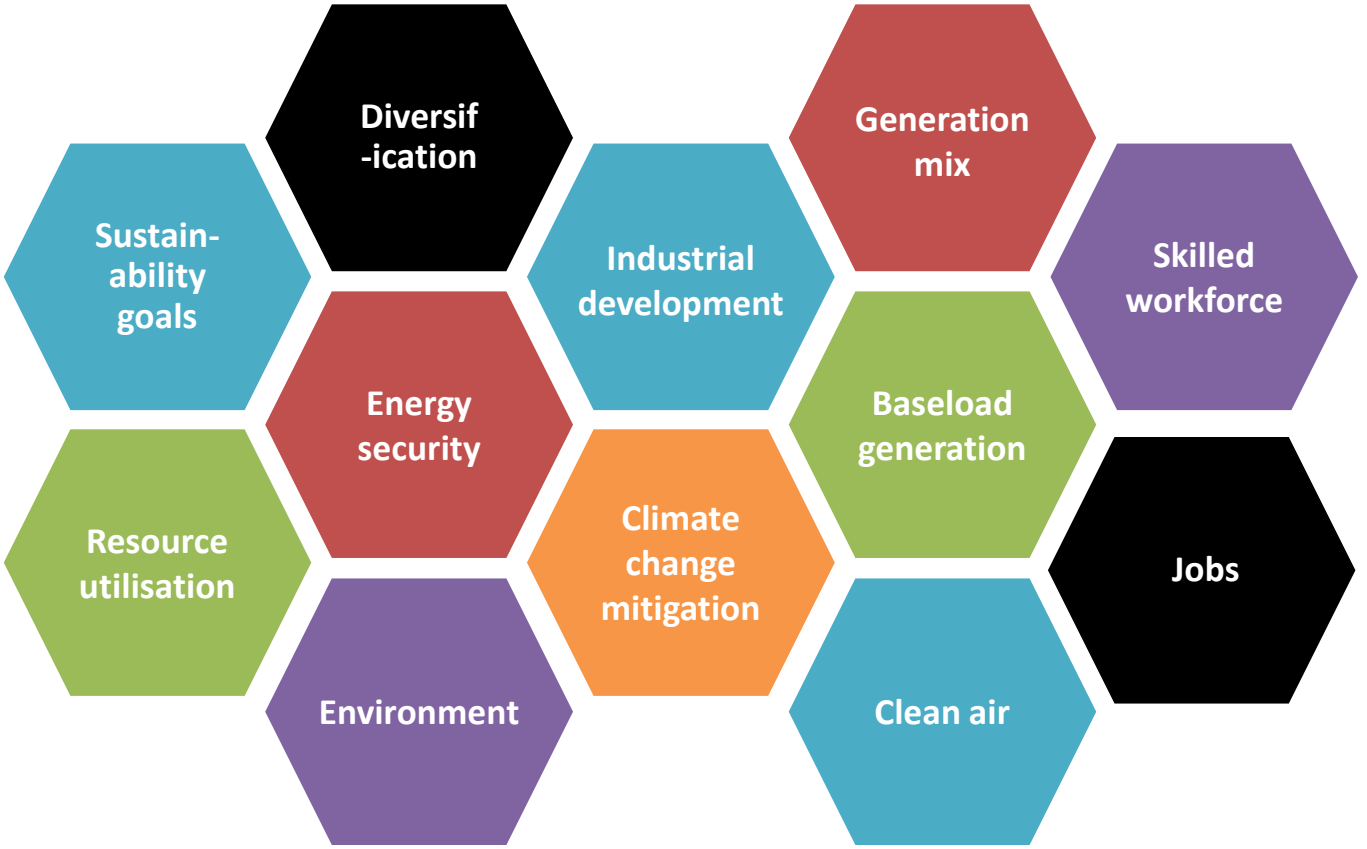
- **Regulatory authorities:** Review and consider the jurisdictions of the primary/specialist authorities
- **ARPANSA:** Transform ARPANSA into a comprehensive nuclear regulator
- **Regulations:** Promulgate regulations covering siting, design, construction, operation and decommissioning of NPPs
- **Support mechanisms:** Government nuclear policy into law - government role, incentive mechanisms

Two primary areas



Drivers of nuclear energy policy

- **Benefits:** The benefits of nuclear energy are **long term** and **sovereign** in nature
- **Value:** Only governments can properly value these benefits, in particular over the 60-80 year operating life



Forms of Government support

Direct participation	Indirect participation	Other
• Equity • Debt • Project guarantees - sovereign guarantees, loan guarantees • Revenue guarantees - payments PPAs, strike price under CfDs • Carbon pricing • Other asset ownership and/or contribution to the project (e.g. NPP site)	• National infrastructure delivery - upgrades to electricity grid and transport systems to the NPP site • Waste solutions – practical and financial • Nuclear liability - backstopping operators' liability, acting as nuclear liability insurer of last resort	• Strong and clear government policy • International/bilateral nuclear cooperation • Providing a predictable and transparent regulatory environment • Public education initiatives • Long-term work force education programs • National research and development initiatives

A nuclear energy programme requires strong Government commitment and long-term policy

5.
Conclusions

Thoughts for Australia (but many applicable to any embarking country)

- **Timing:** Not an overnight decision or outcome - IAEA says 10/15 years; UAE set a new model (but not for all)
- **Legal/regulatory framework:** Is complex; but Australia has foundations
- **Nuclear liability:** Treaty and national law will be required
- **Leadership:** Australian global leadership in nuclear security, nuclear safeguards to continue

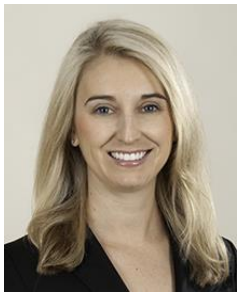
Thoughts for Australia (cont.)

- **Technology:** Timing and demand are important factors in technology availability/utility – large, small, advanced…
- **Preparation:** Preparation prior to procurement/contracting – appropriate risk allocation and timely delivery are more likely
- **Lessons learned:** There are many, many lessons to be learned from global construction experience
- **Human resources:** Experienced resources cannot be created overnight – short-term hires and long-term local planning needed

Thoughts for Australia (cont.)

- **Public acceptance:** May be the single largest challenge for Australia – for nuclear policy development and implementation
- **Government policy:** Strong and clear government policy – 100+ year commitment with whole-of-government approach
- **Government role:** Must have clarity on Government role and incentive mechanisms
- **Foundations:** Australia has excellent nuclear credentials and a strong foundation on which to build

Questions



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