

Opening Address



Hon Ted O'Brien



Navigating Nuclear

UNSW Sydney - 13 May 2024

A one day opportunity to learn everything you need to know about nuclear energy and what it means for Australia's future from global experts.

Closing Address



Dr Adi Paterson

Speakers & Organising Committee



Jaz Diab - Women in Nuclear



Prof Koroush Shirvan - MIT



Prof Jacopo Buongiorno - MIT



Prof Rob Hayes - North Carolina State University



Dr Dave Collins - MIT/PhD UMelb



Prof Simon Michaux - Geological Survey of Finland/PhD UQ



Dr Sarah Lawley - PhD UAdelaide



Mark Nelson - Radiant Energy/UCambridge



Sai Prasad Balla - MIT



Steven Nowakowski - Rainforest Reserves Australia



Helen Cook - GNE Advisory



Dr Ross Koningstein - Google/PhD Stanford



Atte Harjanne - MP Finland Greens/PhD Candidate UAalto



Prof Mike Golay - MIT/PhD CornellU



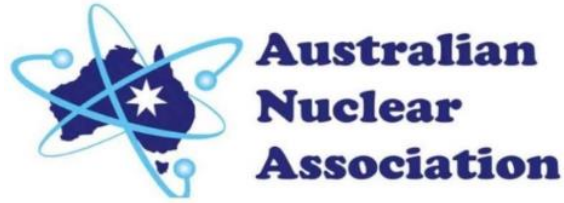
Tony Irwin - ANU



Dr Mark Ho - Australian Nuclear Association



Dr John Harries - Australian Nuclear Association



Organising Committee

Dr Dave Collins (Chair), Dr Mark Ho (President, Australian Nuclear Association), Jasmine Diab (President, Women in Nuclear), Dr John Harries (Secretary, Australian Nuclear Association).

Acknowledgments

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Chatham House Rules

The Q&As and the Discussion panel were not recorded under the agreed Chatham House Rules.

Speakers & topics

No	Topic	Speakers and affiliation
1	<i>Opening address</i>	<i>Hon Ted O'Brien – Australian Parliament</i>
2	<i>Introduction to Navigating Nuclear</i>	<i>Jasmin Diab – Global Nuclear Security Partners</i>
3	<i>How does nuclear energy work?</i>	<i>Prof Koroush Shirvan - MIT</i>
4	<i>Nuclear energy in the 21st century</i>	<i>Professor Jacopo Buongiorno - MIT</i>
5	<i>Radiological risk in perspective</i>	<i>Professor Robert Hayes - North Carolina State University</i>
6	<i>What would the environmental impacts of nuclear energy in Australia be?</i>	<i>Dr Dave Collins - MIT</i>
7	<i>Challenges and bottlenecks to the green transition</i>	<i>Professor Simon Michaux - Geological Survey of Finland</i>
8	<i>Australia's electricity system</i>	<i>Dr Sarah Lawley - PhD University of Adelaide</i>
9	<i>What is the value of nuclear energy?</i>	<i>Mark Nelson - Radiant Energy Group</i>
10	<i>What happens inside an operating nuclear power plant?</i>	<i>Sai Prasad Balla - MIT</i>
11	<i>Environmental impacts of renewable energy in Queensland</i>	<i>Steven Nowakowski and Jeanette Kemp - Rainforest Reserves Australia</i>
12	<i>Current nuclear energy developments around the world</i>	<i>Helen Cook - GNE Advisory</i>
13	<i>A discovery that nuclear was nonpartisan in the USA</i>	<i>Dr Ross Koningstein - Google</i>
14	<i>How nuclear became green in Finland</i>	<i>Atte Harjanne - Finland Parliament</i>
15	<i>Experience and lessons from creating nuclear safety cultures</i>	<i>Professor Michael Golay - MIT</i>
<i>Not recorded</i>	<i>Discussion panel</i>	<i>Chair: Tony Irwin - ANU</i>
16	<i>Closing address</i>	<i>Dr Adi Paterson – ANSTO (retired)</i>

Experiences and lessons from creating nuclear safety cultures

AUKUS related nuclear seminar

Navigating Nuclear, UNSW Sydney

Michael Golay
Prof. of Nuclear Science and
Engineering
MIT, Cambridge MA, USA

13 May 2024

Creating a Nuclear Safety Culture

- Nuclear systems can be dangerous – reactor power must be controlled, nuclear materials can be radioactive, personnel shielding is necessary – recovery from failures can be difficult & expensive
- E.g., Lost US submarines Thresher (1963) and Scorpion (1968), both losses due to equipment failures
 - Soviet and Russian navies have lost 9 submarines
 - Failures are punished severely by societies

Other mishaps have occurred, mainly in early days

Requirements for success

A successful nuclear safety culture must be created ASAP

Goals

- Must get good results on the first try
- Individuals must support good performance and intervene as needed to correct weaknesses.
- Allow no silos

Methods

Imitate successes of other high quality nuclear programs

Naval originally -
US, UK, France
Non-naval
originally – Japan,
Canada, Sweden,
S. Korea

Means for success

Leadership team must:

- Realize what must be done
- Gain the means for success
- Study examples of success and failure (naval & non-naval)

US experience

- Atoms for peace plan, 1953, announced by US president Eisenhower at the UN
- First nuclear-powered submarine, Nautilus 1954
- Handoff to US electric utilities of nuclear propulsion technology for power production
- First nuclear power plant, Shippingport 1957
- Three Mile Island (TMI) Unit 2 core melt event 1979
- Formation by utility coalition of Institute for Nuclear Power Operations (with support from US navy alumni) 1980—it is essential to ensure that a TMI-like event will not be repeated

Institute for Nuclear Power Operations

- Based upon prior program in US navy for command of nuclear-powered surface ships
- Programs involving all US nuclear power plants
- Evaluations and assistance (important for obtaining liability insurance), Data, Event analysis and communications
- Training (12 courses, 2 at MIT), Executive level performance reviews

Other Important Events

- Chernobyl 4 (Ukraine/Soviet Union), explosion and widespread contamination, 1986
- Consequence: Formation of World Association of Nuclear Operators (WANO), (In imitation of INPO)
- Regional HQs [London, Paris, Moscow, Tokyo, Beijing, Atlanta (with INPO)]
- Functions (for international nuclear power plant fleet)
- Evaluation and assistance
- Communications

Nuclear safety culture is essential

**Must be shared
throughout entire
nuclear enterprise**

**An explicit,
enforceable plan is
needed, based
upon experience**