
BUILDING A NUCLEAR WORKFORCE: A WHOLE-OF-NATION CHALLENGE

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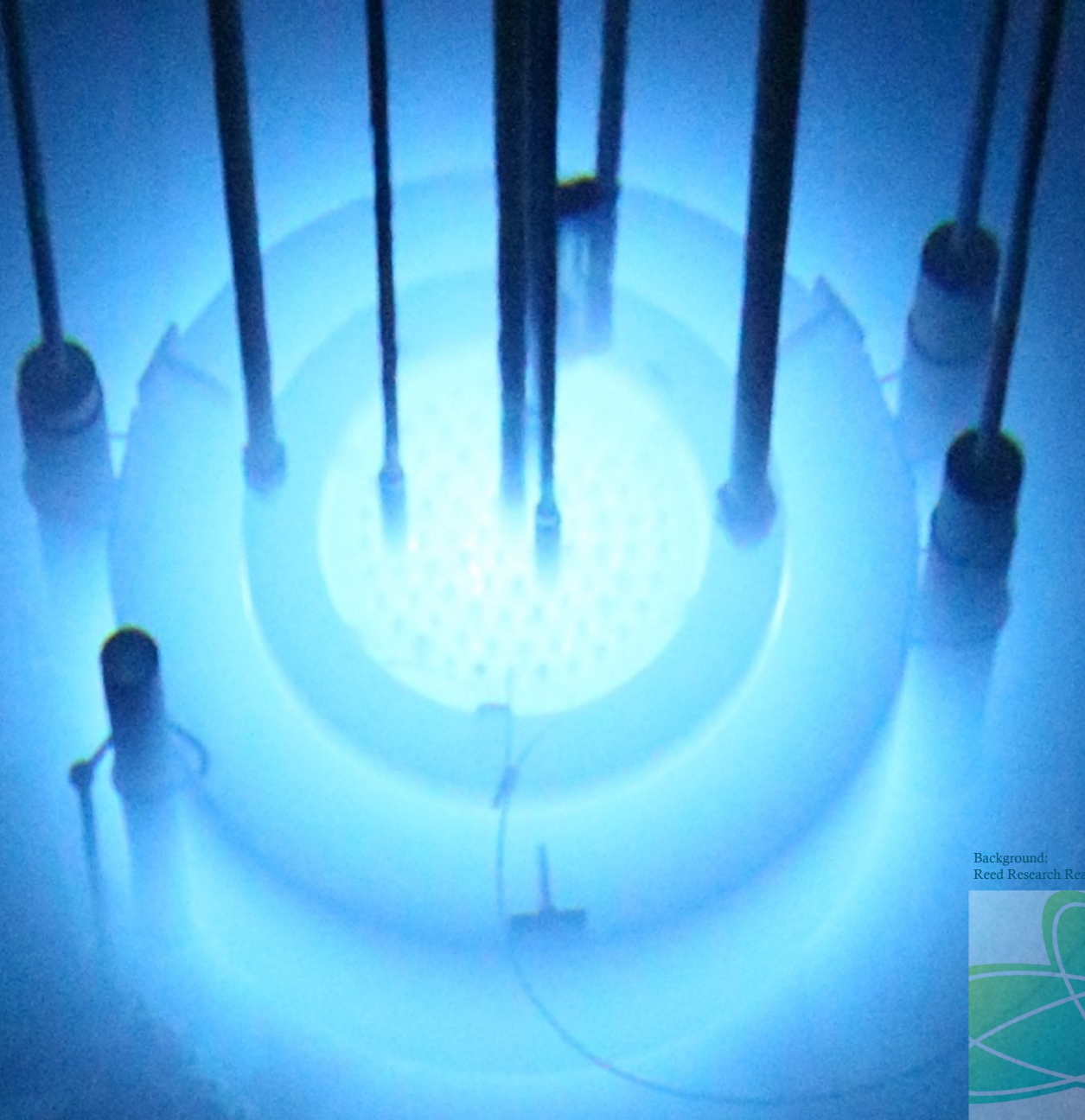
Australian Nuclear Association Conference 2025



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AGENDA

- Situation report
- The need for sovereign nuclear literacy
- Building a nuclear workforce pipeline
- The Australian Nuclear Research and Education Network
- Conclusions



Background:
Reed Research Reactor (EBC)



SITUATION REPORT

1. The demand for sovereign nuclear expertise **already outstripped supply** prior to the AUKUS announcement (September 2021). Demand has increased dramatically since then.
2. The civil nuclear industry is restricted by Australian legislation; **the naval nuclear workforce required for AUKUS cannot be drawn from the existing civil nuclear industry in Australia.**
3. Importing nuclear expertise is not a practical solution: there is a **global nuclear workforce shortage, and citizenship restricts awarding of security clearances.**
4. Public perception of nuclear capabilities has been **disproportionately negative** in Australia; this can make it difficult to attract people to the field.
5. The sovereign nuclear expertise base (i.e. nuclear academics) required to increase nuclear literacy and expertise in Australia is **critically limited in capacity.**



SOVEREIGN NUCLEAR LITERACY NEEDED:

1. To **crew** nuclear-powered submarines.
2. To **maintain** nuclear-powered submarines.
3. To **make decisions** about nuclear submarines; design (SSN AUKUS), regulation, safety, the environmental, legal issues etc.
4. To **assure** the Australian public, AUKUS partners and the international community that Australia can safely and responsibly operate nuclear-powered submarines.
5. To **facilitate social license discourse** on nuclear technology in Australia; to counter misinformation and disinformation.

But nuclear-powered submarines are not the only thing Australia requires nuclear expertise for.

SOVEREIGN NUCLEAR LITERACY NEEDED:

We also need to ensure that the sovereign literate workforce **supply meets demand across all sectors**, e.g. including nuclear medicine, space exploration, mining, environment, safeguards, ... And nuclear energy, if we choose to go there as a nation.

We also may need people to plan for and support our neighbours as they consider and potentially embark on civil nuclear power programs of their own.

So how do we build this workforce?

NUCLEAR WORKFORCE DEVELOPMENT PIPELINE

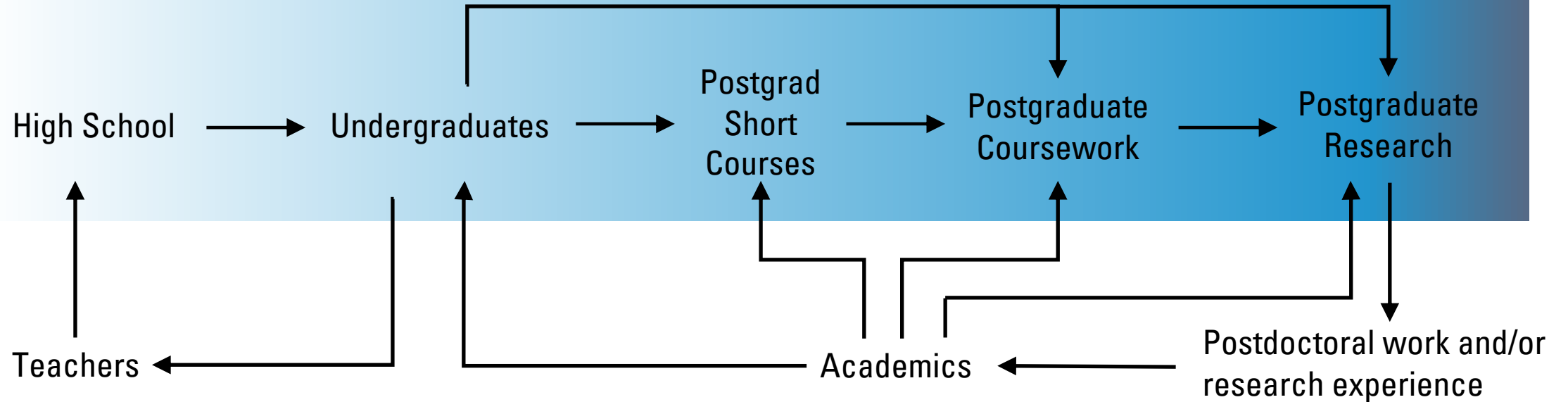


Diagram modified from Ed Simpson and AJ Mitchell diagrams, ANU

Australian Nuclear Research Education Network (ANREN)



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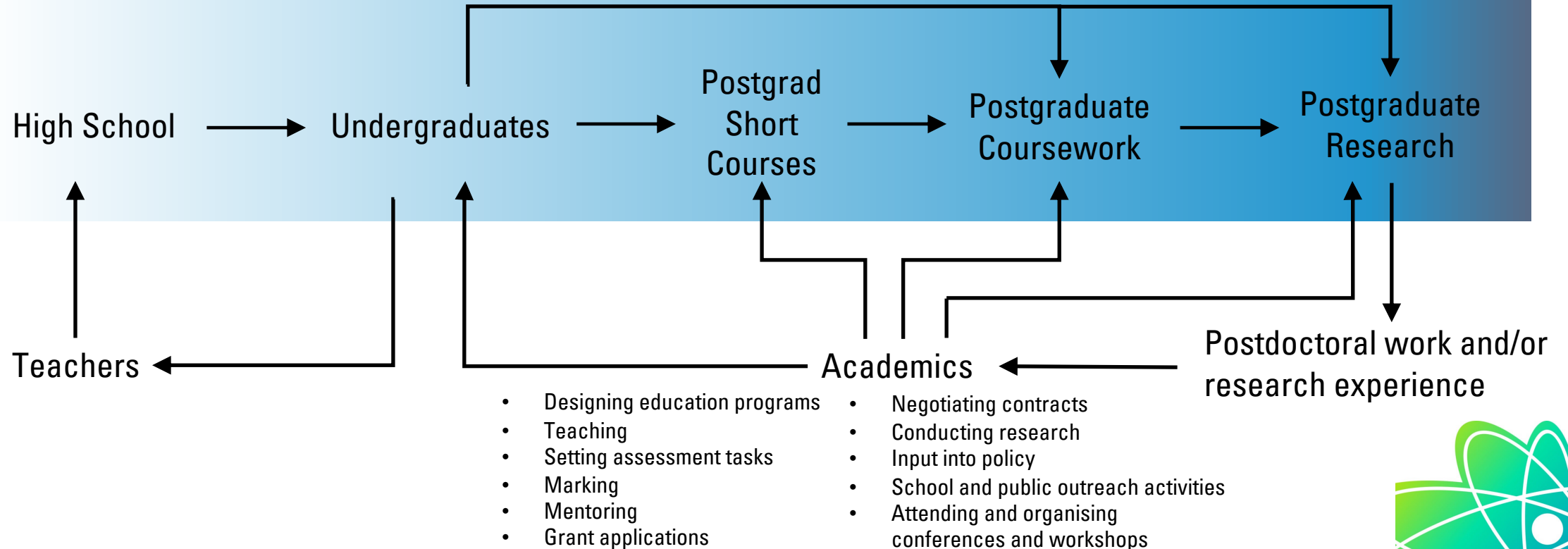


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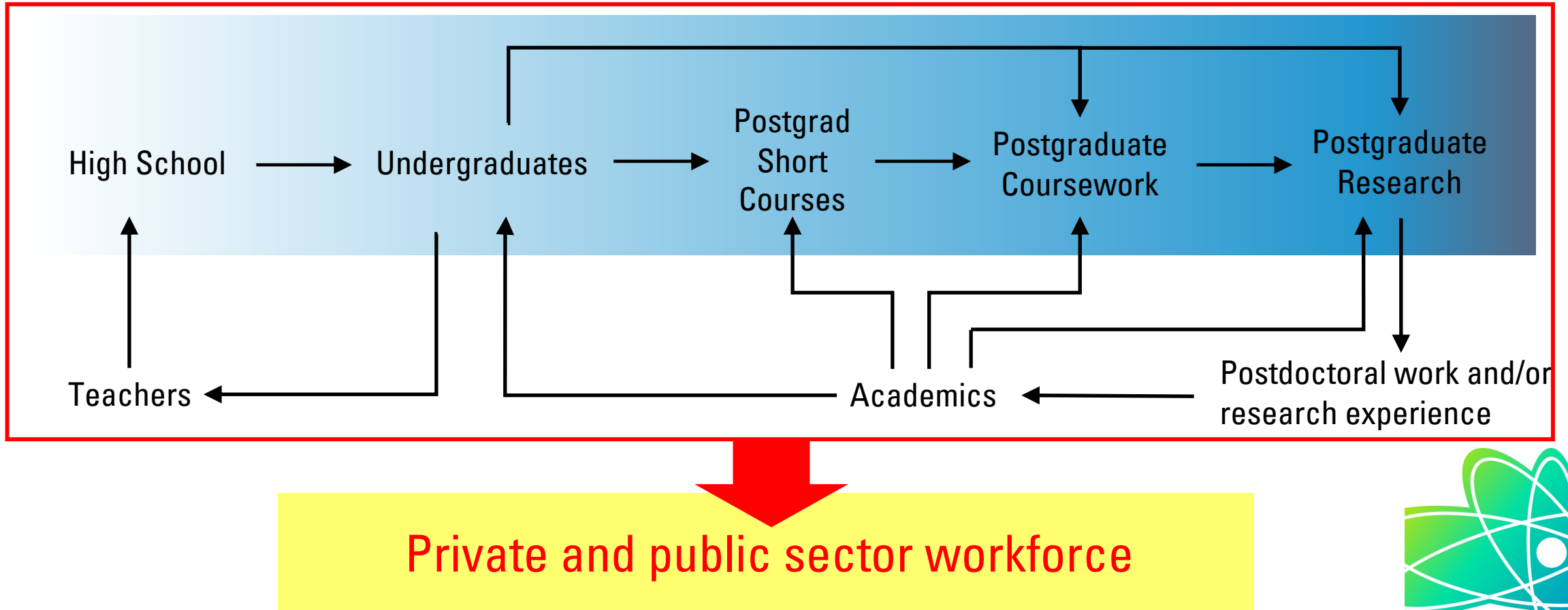


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CAREER PATHWAYS

An informal ANU review of its nuclear science / HDR graduates' current roles (as of 2024) shows the diversity of possible career pathways:

- Bioinformatics
 - Data science / Machine Learning
 - Defence
 - Engineering
 - Environmental Monitoring
 - Forensics
 - Health data analytics
 - IP / Patent Review
 - Mass Spectrometry (Industry Applications)
 - Medical Technology Development
 - Meteorology
 - Mining
 - Nuclear Medicine – R&D and clinical
 - Nuclear Safeguards and Nonproliferation
 - Radionuclide Metrology
 - Research
 - Risk / Safety
 - Space Industry
 - Tertiary Education
-

WHAT DRAWS STUDENTS TO NUCLEAR?

This list is based on our experience, but much of this is echoed in *Workforce planning for new nuclear power programs* by the IAEA.

- Scholarships
- Exciting (and varied) career opportunities
- Opportunities for work placements, internships, or research projects that give them direct experience working in nuclear
- Teachers that are enthusiastic about the topic
- **Academics** that are encouraging, passionate, and actively involved in nuclear research and education
 - This brings us to ANREN

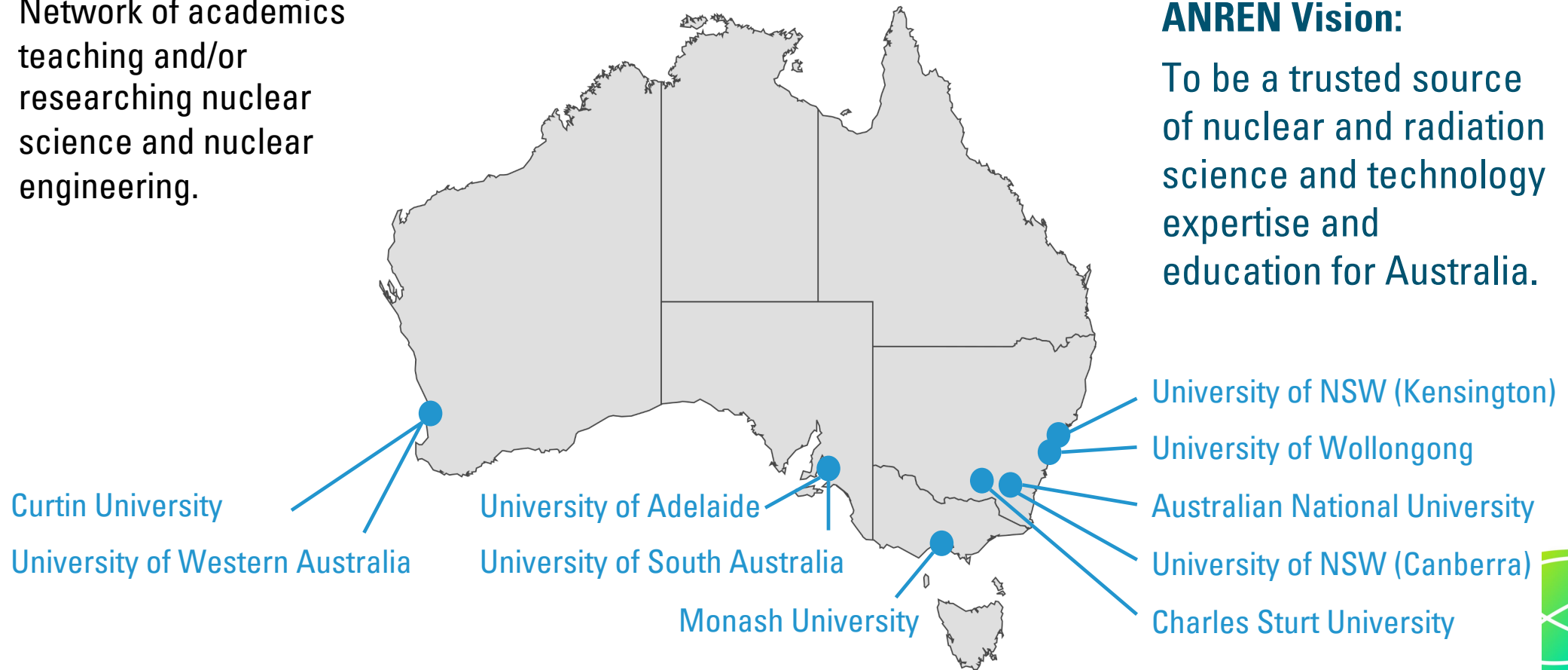


AUSTRALIAN NUCLEAR RESEARCH & EDUCATION NETWORK (ANREN)

Network of academics teaching and/or researching nuclear science and nuclear engineering.

ANREN Vision:

To be a trusted source of nuclear and radiation science and technology expertise and education for Australia.

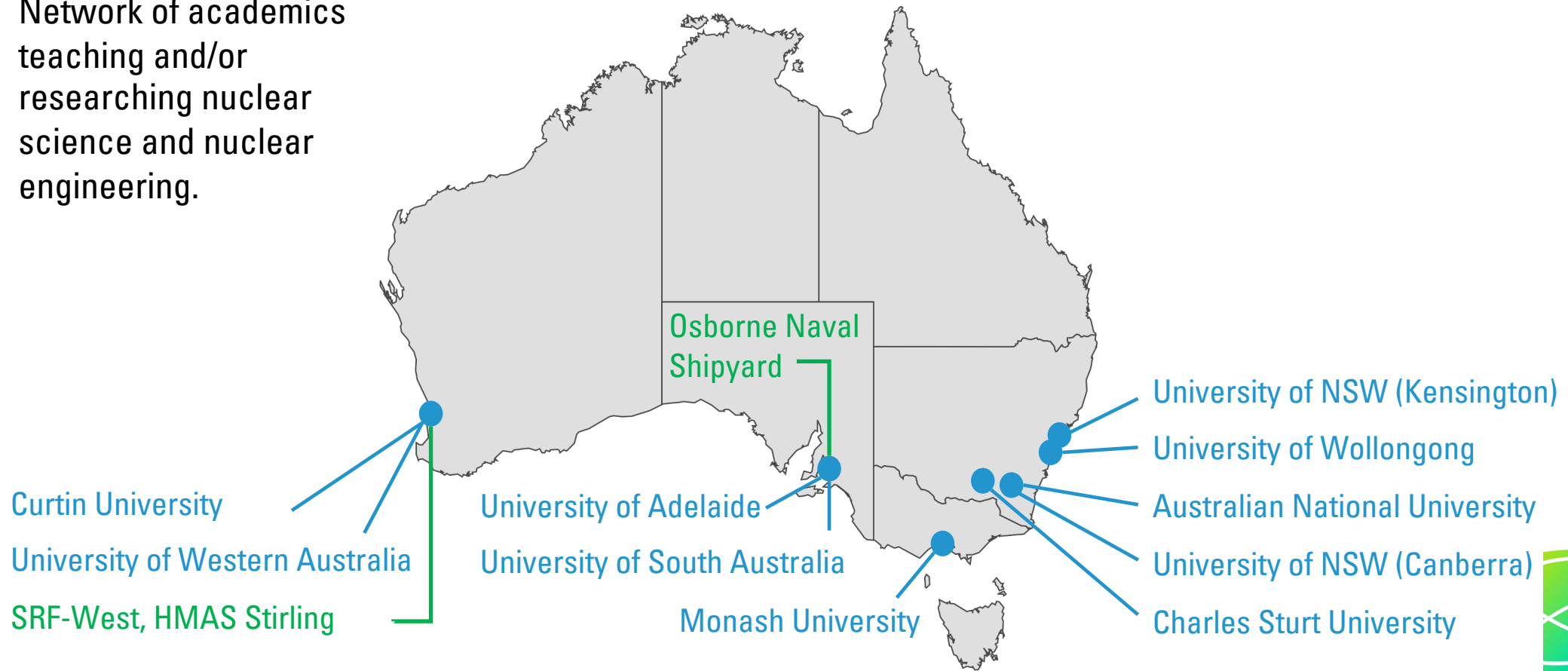


Map graphic: Lokal_Profil (Wikimedia Commons)



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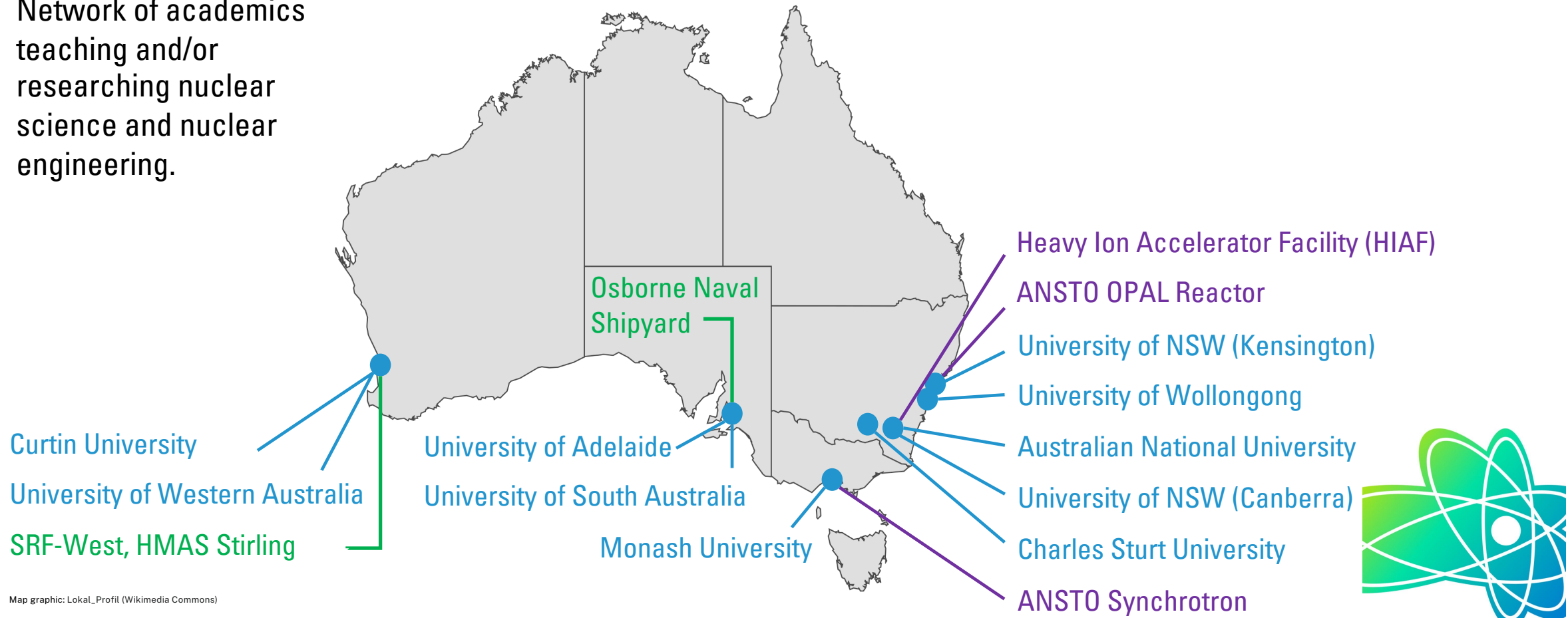
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Australian Nuclear Research Education Network (ANREN)

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Australian Nuclear Research Education Network (ANREN)

BREADTH OF EXPERTISE ANREN EMBODIES

Foundational nuclear science	Applied nuclear science	Medical radiation science	Nuclear engineering	Interdisciplinary nuclear research
Nuclear structure	Dosimetry	Radiation biology	Computational materials	Safety critical systems design / AI integration
Nuclear fission	Nuclear medicine	Particle therapy	Nuclear incident modelling	Human and organisational factors
Nuclear reactions	Radiation protection	Theranostic medical physics	Nuclear materials	Social licence
Hadron physics	Radiation transport	Boron neutron capture therapy medical Physics	Nuclear reactor kinetics	Radiation Medicine
Quantum chromodynamics	Radionuclide development	Particle therapy medical physics	Radiation damage	Mining Engineering
Nuclear astrophysics	Single atom detection	Medicinal chemistry	Reactor control systems	
	Radiation detection	Space medicine	Waste management	
		Medical physics	Nuclear fuel cycle	



HOW DOES ANREN BUILD AUSTRALIA'S NUCLEAR FUTURE?

ANREN Vision:

To be a trusted source of nuclear and radiation science and technology expertise and education for Australia.

1. Provide nuclear science and nuclear engineering education options;
 - short courses & professional training
 - undergraduate and postgraduate coursework degrees
 - postgraduate research training
2. Conduct applied and foundational research to build knowledge, train new experts, solve problems and foster critical thinking skills. (Research informs education and puts learning into practice.)
3. Provide independent expert advice on nuclear science and engineering issues.
4. Engage in public outreach activities; open days, podcasts, media responses.
5. Support schools to increase the student pipeline; defining curriculum, providing teaching materials, training school teachers, working with students and presenting at career days.
6. Have established connections with industry, international universities, government agencies and international organisations, e.g. IAEA, Los Alamos, Rolls Royce etc.



COURSEWORK DEGREES OFFERED BY ANREN MEMBERS

- 19 undergraduate degrees (3-4 years full time study) across science and engineering that include nuclear courses and/or nuclear minor or major (5 of which are nuclear medicine focussed).
- Graduate Certificates (6-month full-time study)
 - Engineering Science (Nuclear Engineering)
 - Nuclear Safeguards and Security
 - Nuclear Technology Regulation
 - Radiation Management
 - Maritime Engineering
 - Medical Physics
- Masters (18-24 months full-time study)
 - Engineering Sciences (Nuclear Engineering)
 - Science (Nuclear Science)
 - Physics
 - Medical Physics
 - Maritime Engineering



RESEARCH DEGREES OFFERED BY ANREN MEMBERS

MPhil and PhD programs by research across a range of topics;

- foundational nuclear science
- applied science
- nuclear medicine
- maritime engineering
- medical radiation physics

Through research students apply their knowledge and develop problem solving and critical thinking skills.

SHORT COURSES OFFERED BY ANREN MEMBERS

- Microcredentials and professional training are offered at most universities.
- These are usually bespoke courses designed to meet requirements of a particular audience/organisation.

CONCLUSION

ANREN is a collaborative effort to increase nuclear literacy across the country

This self-organised group is making the most of Australia's limited nuclear academic expertise by working together.

ANREN is unfunded (in-kind support is provided by ANU through the ANREN Secretariat role).

Under AUKUS, there has been an increase in funding to support students attending universities to study nuclear science and nuclear engineering (increased Commonwealth Supported Places and student scholarships).

However, under AUKUS there has been no significant increase in funding to help universities increase their capacity to deliver education to these students.

ACKNOWLEDGEMENTS



Attendees of the **Australian Nuclear Academics Workshop 7-8 August 2025** (Co-hosted by the UNSW Nuclear Innovation Centre and the Australian Nuclear Research and Education Network).

Nuclear science and nuclear engineering academics from ANREN universities:

- Australian National University
- Charles Sturt University
- Curtin University
- Monash University
- University of Adelaide
- University of New South Wales (Kensington and Canberra)
- University of South Australia
- University of Western Australia
- University of Wollongong



Main Membership:
40 Universities +
ANSTO, CSIRO and AtkinsRéalis



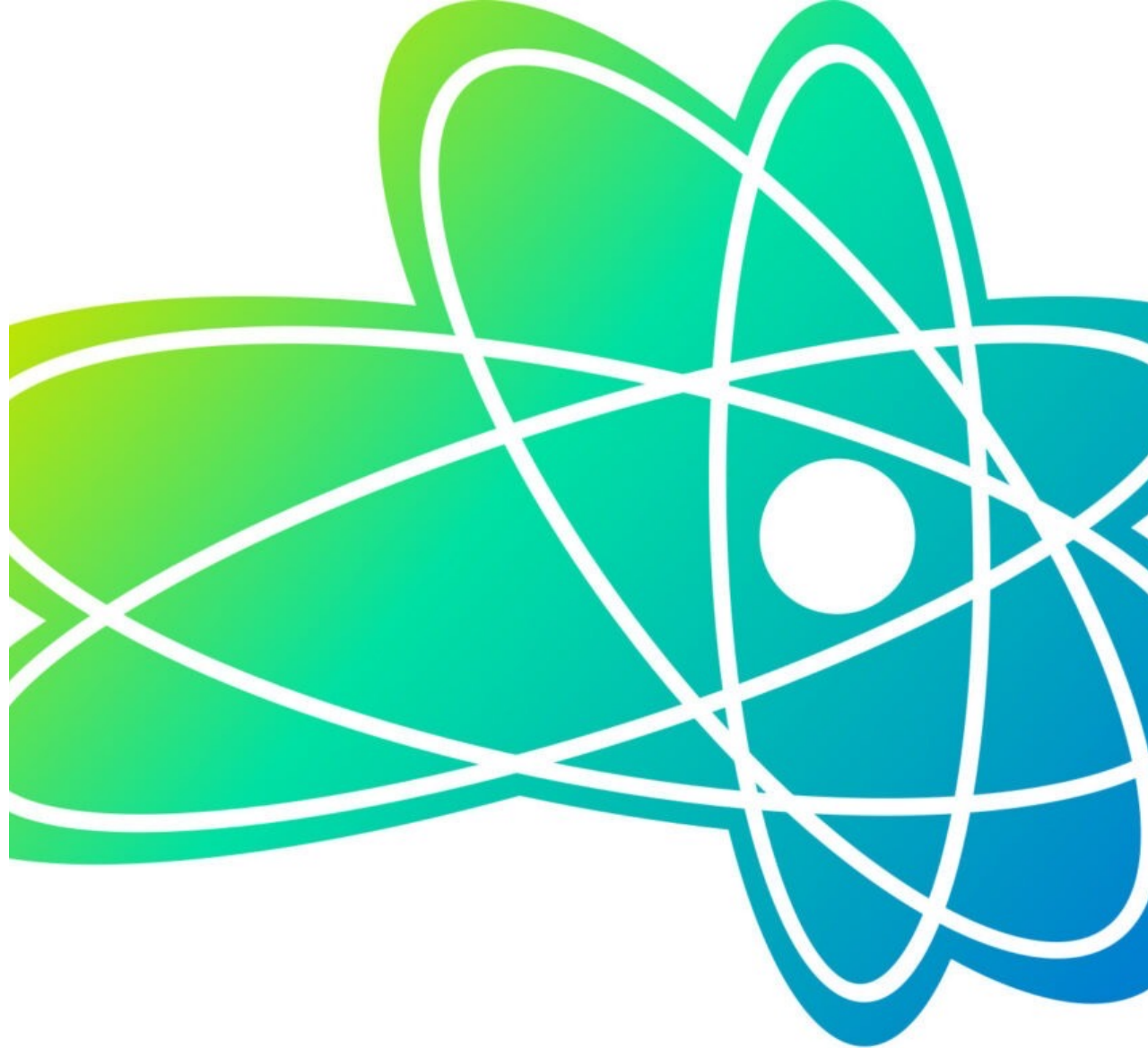
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- 100+ Ph.D. scholarships.
- 20+ Pathway scholarships for Honours and Masters students.
- 5 international research internships for PhD students and ECRs.
- 15+ international travel scholarships.
- 15+ Early Career Researcher Grants.
- 140+ senior undergraduate students attending the AINSE Winter School online.
- 50+ students attending site visits at ANSTO Lucas Heights in September.
- 50+ postgraduate students attending the Postgraduate Orientation Week.
- 40+ first-year students at the Women in STEM and Entrepreneurship (WISE). School.
- 70+ WISE students in 12-month mentorship program.
- Travel/accommodation support for Researchers provided by ANSTO through merit-based access.

Thank you!

For more information on ANREN, email
the ANREN secretariat, Julieanne
(Jules) Dougherty:

nuclearstewardship@anu.edu.au



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