

House Standing Committee on Industry, Science and Innovation

Inquiry into Australia's International Research Collaboration

Submission by the Australian Nuclear Science and Technology Organisation
(ANSTO)

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Introduction

The Australian Nuclear Science and Technology Organisation (ANSTO) is Australia's national nuclear research organisation and the centre of Australian nuclear expertise. ANSTO operates nuclear science and technology based facilities, including Australia's nuclear research reactor, OPAL. The uniqueness of ANSTO's capabilities to the Australian research setting has meant that strong international collaborations with overseas counterparts or nuclear-focused multinational organisations have always been essential to Australia's national interest, leveraging Australia's nuclear research capabilities and ensuring best practice, cutting-edge competitive research, and effective knowledge sharing. ANSTO's international research initiatives and collaborations are multifaceted and extensive. They incorporate both multilateral and bilateral collaborations, and the hosting of international conferences. These activities are implemented under a range of research agreements, which cover access to facilities, joint research and development, and researcher exchange and training.

Not only does ANSTO provide international engagement opportunities for its researchers, but we also act as an important conduit between the broader Australian research community and international researchers by providing mechanisms for Australian researchers to establish global partnerships.

1. The nature and extent of existing international research collaborations

ANSTO's international collaboration has both variety and breadth. Collaborations occur across the full range of ANSTO activities. Our landmark facilities OPAL, the Accelerators and nuclear research suites, and specialised activities in materials, stable isotopes, biology, detectors and imaging, and neutron scattering are applied to diverse areas including climate change, radiopharmaceutical development, materials science, archaeology, tracking of pollutants, border protection and nuclear forensics. Our collaborations also come in many forms - from facility access and instrument building to multilateral collaborations and the hosting of international conferences, and span across a vast number of nations.

1.1 Multilateral Collaborations:

Multilateral collaborations are undertaken under the aegis of bodies such as the International Atomic Energy Agency (IAEA), the OECD Nuclear Energy Agency (NEA), the Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology (RCA) and Forum for Nuclear Cooperation in Asia (FNCA).

International Atomic Energy Agency (IAEA)

Australia, a founding member of the IAEA since 1957, holds a designated seat on the Board of Governors. Australia participates in numerous regional activities through the IAEA, focused on the peaceful use of nuclear energy. Australia is a major contributor to the IAEA's Regular Budget, and has a strong record in supporting the Agency's Technical Cooperation Programme, which provides research opportunities and technical assistance to developing Member States. In addition, Australia supplements these contributions by the provision of experts, lecturers, equipment and facilities for the placement of IAEA fellows to undertake research and training in institutes across Australia. Australia is committed to the goals of the Technical Cooperation program to ensure that benefit is delivered where it is most needed.

Through the IAEA, ANSTO also takes part in a number of Cooperative Research Programmes, such as the “Unification of Nuclear Techniques for Sample Characterisation in Environment and Materials Research” promoting accelerator-based techniques globally. This particular collaboration involved over 10 countries and concluded in June 2009.

Nuclear Energy Agency (NEA)

The NEA is a Paris based multi-lateral body whose membership includes a number of countries that use nuclear energy as part of their total energy mix. The NEA assists its Member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for the safe, environmentally friendly and economical use of nuclear energy for peaceful purposes. It is part of the Organisation for Economic Cooperation and Development (OECD), of which Australia is a leading member. ANSTO is also a participant on the NEA Sorption Forum which is researching radionuclide migration and sorption behaviour to better understand the performance of radioactive waste repositories.

Regional Cooperative Agreement (RCA)

The RCA facilitates Australian scientific, technical and political cooperation in nuclear science and technology with 16 other major regional countries. This agreement is coordinated through the IAEA and has recently been extended for the fourth time due to its usefulness in providing a regional framework for initiating cooperative projects and coordinated research programming between the 17 IAEA member states in the Asia-Pacific region. Under the agreement, Australia is involved in projects in the sectors of Agriculture, Radiation Protection, Health Care, Environment and Industry. Under the RCA, Australia has led (and funded) 7 extrabudgetary projects, and participated in and co-funded 11 others. Australia has also provided support to developing Member States through training IAEA fellows, hosting regional events and providing nuclear analytical services to Member States that lack such capabilities.

Forum for Nuclear Cooperation in Asia (FNCA)

The FNCA is a framework consisting of ten neighbouring Asia-Pacific nations (including Australia) promoting cooperation in the peaceful uses of nuclear energy and applications. Australia provides important assistance in nuclear science and technology to the developing Member States of the FNCA.

1.2 Bilateral/Regional Collaborations:

Bilateral collaborations are undertaken through intergovernmental agreements, institute to institute arrangements with research organisations and universities, and commercial agreements on research and development. For example, ANSTO is undertaking joint research projects on medical imaging using radiopharmaceuticals with the Commissariat à l'Énergie Atomique (CEA) in France, neutron-instrument control-system development with the Paul Scherrer Institute (PSI) in Switzerland and the development of a helium-3 polariser with the Institute Laue-Langevin (ILL) in France.

In addition, the variety and breadth of ANSTO's collaborative arrangements can be demonstrated by our diverse engagement with the Asia Pacific Region. In this region, we have been partnering with international researchers and using nuclear techniques

to characterise fine-particle pollution and quantify its sources and origins across 15 countries in the region. We are involved in nuclear medicine research in Vietnam, and collaborations in materials science with partners in Singapore, Japan and Korea. Taiwan's National Science Council, together with its National Central University, is building a neutron-beam instrument in ANSTO's neutron beam guide hall. In addition, as an 'IAEA Collaborating Centre for Neutron Scattering Applications', ANSTO promotes research collaborations in neutron scattering in the Asia-pacific region.

ANSTO also conducts a variety of collaborative research projects with countries such as the United States of America, Canada, South Africa, Argentina, France, Italy, New Zealand and Belgium, just to name a few.

1.3 Providing Access to Facilities:

The commencement of operation of the OPAL research reactor in recent years has enhanced Australia and ANSTO's capacity for international research collaborations. OPAL and the associated neutron beam instruments serve as a major focal point for international collaboration at ANSTO. OPAL has been recognised as a centre of excellence in neutron beam science by the IAEA, and is one of the world's leading research reactors. ANSTO's Bragg Institute utilises OPAL's neutron production to lead and partner in Australian and international research using neutron scattering and also X-ray techniques to solve complex research and industrial problems across many important fields. The neutron beam facilities at ANSTO are available for use by Australian and international researchers on a competitive peer reviewed basis. The Bragg Institute has already been highly successful in attracting some of the best instrument scientists and researchers from Australia and internationally. The demand for time on the instruments has already exceeded supply, allowing selection of the best research projects. For example, the neutron beam instrument "Wombat" (attached to the OPAL reactor) is in high demand as a world-leading instrument for fast real-time measurements of materials.

ANSTO's accelerator facilities are also available for international researchers, primarily for environmental and materials science research. Demand for these also outstrips our ability to serve it.

2. The benefits to Australia from engaging in international research collaborations

Australia benefits greatly from engaging in international research collaborations. Such collaborations deliver outcomes consistent with the Australian Government's National Research Priorities and if properly crafted, they contribute to Australia's research capabilities and expertise, enable the sharing and learning of world-best practice and ensure that Australian science remains relevant and competitive in the international arena.

International collaborations can bring key skills, capability and infrastructure to Australia, and facilitate the participation of Australian experts in research activities of global significance. Strong collaborations also open opportunities for our younger scientists to be involved on the global stage, promote careers in science and provides career paths for research scientists.

In addition, international collaborations enhance Australia's ability to deliver the outcomes relevant to the National Research Priorities, including the following examples:

- A. *Supporting an Environmentally Sustainable Australia* – ANSTO collaborates with universities in Europe, Asia, New Zealand and the United States regarding climate change research. This research uses isotopes to profile oceans (determine their depth and temperature etc.) and landscapes to understand how the earth’s climate has evolved over time;
- B. *Promoting and Maintaining Good Health* – In joint research projects with Argentina, the United States, Canada, South Africa and Belgium, ANSTO is involved in research regarding the most widely used radiopharmaceutical – Molybdenum-99. ANSTO is also contributing to this National Research Priority through collaborations with the CEA in France regarding medical imaging using radiopharmaceuticals.
- C. *Building frontier technologies for building and transforming Australian industries* – ANSTO is undertaking materials science research with universities in the United States regarding waste form technologies and the encapsulation of problematic waste. We are also involved in an important materials research collaboration with the European Union. This research involves the simulation of extreme pressure to test the integrity of welded joints used in industry. Strategic partnerships with the European Neutron Scattering community have also been established to exchange technology and research capabilities in neutron instrumentation.
- D. *Safeguarding Australia* – This priority is supported through joint research with partners in the United States developing detectors for border protection and improved techniques for nuclear forensics.

Global engagement through ANSTO’s science and innovation also greatly raises Australia’s international profile. As a result of extensive collaborations, ANSTO has been able to host major international scientific conferences. These conferences provide the opportunity to showcase Australia’s science to the international science community and promote collaboration between researchers. In 2005, ANSTO was a leading partner in hosting the eighth International Conference on Neutron Scattering in Sydney. This conference attracted around 750 delegates from around the world. In 2009 we organised the second Asia-Oceania Neutron Scattering Association (AONSA)¹ neutron school at ANSTO.

Also, in taking the lead for the Australian research community, ANSTO recently won the bid to host the International Small-Angle Scattering (SAS) conference to be held in Sydney in 2012. This is the first time the conference will be hosted in Australia.

At the governmental level, advice which is underpinned by good science enables Australia to contribute to the IAEA, the NEA and other international bodies. It creates a base for Australia to have influence at the highest levels in these agencies. Australia’s geographical location, range of science skills, facilities and nuclear capability also provide a natural base for regional leadership. As a result, Australia can influence science and broader nuclear policy agendas, and provide a base to train scientists from the region.

3. The key drivers of international research collaboration at the government, institutional and researcher levels

¹ <http://j-parc.jp/MatLife/en/AONSA/sub7.html>

To operate at the desired level, ANSTO needs to ensure it invests in developing and maintaining cutting-edge infrastructure, and contributes to training the next generation of nuclear-capable scientists. ANSTO is involved in a number of international benchmarking exercises on a variety of methods and materials. ANSTO's world-class research facilities (particularly in neutron beam research and accelerator science) bring a steady stream of scientists and technologists to Australia to use that infrastructure, and foster invitations for ANSTO scientists to:

- become involved in world-class research elsewhere;
- participate in international workshops and conferences; and
- serve on prestigious and influential committees and panels.

ANSTO's mix of different cultural backgrounds, combined with scientific interdisciplinary strengths, provides an approach to research that leads to innovation, and therefore ensures Australia's competitiveness. These partnerships are also relevant in building trusted relations, which ultimately strengthen Australia's standing.

4. The impediments faced by Australian researchers when initiating and participating in international research collaborations and practical measures for addressing these

Due to Australia's geographical location, the Australian Government has put in place a number of grant schemes. The Access to Major Research Facilities Program (AMRFP)² supports access by Australian researchers (from industry, private and public research organisations and universities) to major international research facilities that are not available in Australia or to attend overseas strategic planning meetings. The Program is funded by the Department of Innovation, Industry, Science and Research (DIISR), and delivered by ANSTO under an agreement with DIISR. This funding mechanism gives access to facilities such as synchrotron-radiation sources, high-flux neutron-beam sources, high-energy physics facilities and astronomy facilities. The program makes provision for multiple personnel to visit the facilities, as in many cases the use of these facilities is complex and requires more than one person to operate the equipment.

Until the end of 2008, ANSTO also administered the Australian Synchrotron Research Program (ASRP), which provided beam time (through agreements) and travel funding for synchrotron beam-time abroad. The opening of the Australian Synchrotron in Melbourne obviated the need for that program to continue.

As these programs recognise, Australia's geographic location makes travel grants an important means of supporting international research collaborations. Given that these grants are normally for relatively small amounts of money, it is desirable that the paperwork for application and reporting is kept to the minimum necessary to comply with normal rules on accountability. It would also be useful if calls for applications were made on a regular basis with short turnover, especially for 'hot research topics'.

An overarching approach is required in order to facilitate international collaborations. This includes that visa regulations are coherent with the research needs. In particular, the process for obtaining visas for visits of over three months is significantly more complex than that for shorter stays, and may discourage or limit important collaborations.

² http://www.ansto.gov.au/research/user_access/amrfp

5. Principles and strategies for supporting international research engagement

Collaborative agreements need support mechanisms at governmental and institutional levels. These mechanisms need a flexible approach to ensure that new emerging science and technology collaborations are not hindered by bureaucratic barriers. Research collaborations frequently take on a wider context, for example combining education and innovation activities. The combination of education, research and innovation can drive knowledge generation, transpose that knowledge to other sectors and contribute to Australia's competitiveness.

Grants are an important support mechanism, but it is also critical to continuously explore alternative methods that could be beneficial to advancing research collaborations and to achieving scientific and technological excellence.