

# ANSTO submission to “Boosting the commercial returns from research”

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## EXECUTIVE SUMMARY

ANSTO strongly endorses the discussion paper’s acknowledgement of the importance of world-class research infrastructure and stable, predictable funding over the long term for national research excellence. Overseas experience confirms that provision of such infrastructure and funding can only be done by government. ANSTO looks forward to the results of the review of research infrastructure recommended by the Commission of Audit.

Establishing greater collaboration between research providers and industry is a long-term proposition, requiring stable funding which could include forms of private sector contributions, and development of shared expertise, including through training, secondment, and shared deployment of personnel. Industry will derive most benefit from collaboration if Australian research remains world class. Government strategies to maintain that research quality, such as the Chief Scientist’s proposed STEM strategy, are vital in that regard. Government engaging with Industry to establish best practice research and development policy that is mutually beneficial is also vital to ensuring a sustainable national innovation pipeline.

## ABOUT ANSTO

The Australian Nuclear Science and Technology Organisation (ANSTO) is home to Australia’s nuclear expertise. At the heart of ANSTO’s research capabilities are a multi-purpose nuclear research reactor (OPAL) and a suite of accelerators. ANSTO is also the operator of the Australian Synchrotron in Melbourne, and home to Australia’s critical nuclear medicine manufacturing capabilities. One in two Australians will require a nuclear medicine produced at ANSTO. In addition, the minerals industry relies on ANSTO to provide advice and technology to handle naturally occurring radioactive materials in minerals processing.

ANSTO’s various technological platforms are used for research in scientific fields as diverse as life sciences, chemistry, physics, earth and environmental sciences, cultural heritage, materials and engineering. Researchers gain access to this research infrastructure through ANSTO’s national and international partnerships with higher education institutions, research agencies, industry and government agencies.

This submission follows the structure of the conclusions reached in the discussion paper *Boosting the commercial returns from research*.

## CREATING STRONGER INCENTIVES FOR RESEARCH – INDUSTRY COLLABORATION

As noted in the discussion paper, the current higher education evaluation system focuses on the production of peer-reviewed publications. ANSTO is strongly linked into this system through its user programme, under which university-based researchers utilise the unique capabilities of ANSTO’s technological platforms to produce peer-reviewed research. At the same time, in accordance with

its Act, ANSTO sells goods and services in areas relevant to its mandate – most importantly nuclear medicine, but also provision of its expertise through consultancy services and research supporting industry and commercial outcomes. This means that in some scientific fields (for example, geochemical engineering in the minerals processing industry), ANSTO's output in terms of publications is higher for commercial and technical reports than for peer-reviewed publications. It is important to note that the additional economic value delivered to industry can be significant in terms of the expertise and knowledge transferred.

ANSTO has invested significant effort in building relationships with industry. For example, industry access to the neutron beam instruments attached to the OPAL reactor is available through a proprietary, user-pays access system; additionally, ANSTO has recently established the Bragg Institute Industrial Liaison Office to manage technology transfer and promote the use of the Bragg Institute facilities in applied industrial research. Similarly, access time on the instruments housed by the Australian Synchrotron is sold to industrial users via an industry-focused portal.

Another mechanism by which ANSTO researchers collaborate with industry is through the ARC Linkage Grant scheme, mainly by engaging through partnership with higher education institutions. Unfortunately, ANSTO is unable to take full advantage of this scheme because, as a Publicly Funded Research Agency (PFRA), ANSTO is ineligible to directly apply for grants from the ARC (and the NHMRC) to support its collaboration with industry, or to take on the role of administering organisation under ARC or NHMRC-funded schemes. The rationale for this approach has been expressed to be that PFRAs already received government funding; however, the bulk of universities' research activities are also funded by government through block grants. So industry may be tempted to partner with a university for a particular research task rather than with ANSTO because government will meet some of the costs, even though ANSTO's expertise may actually be more suited to the task and deliver the best outcomes for that industry partner.

There are other schemes which enable ANSTO to successfully participate more directly in industry engagement and collaboration. ANSTO's participation in the Defence Materials Technology Centre enables it to develop and deliver new materials technologies and manufacturing processes to enhance Australia's defence capability. The success of this scheme relies on its adoption of a collaborative partnership approach between Defence, defence industries and research agencies. There is a role for government in facilitating collaboration through similar schemes in other industry-relevant research areas. One option may be to embed researchers in industry to facilitate and encourage knowledge brokerage / translation.

The success of European institutions, such as the German Fraunhofer Institutions, serves as examples of the benefit of setting up long-term relationships across sectors. In northern European countries such as Denmark and the Netherlands there is an emphasis on addressing and integrating design thinking . essentially approaching multi-dimensional problems with effective methods to conceptualise, select and execute solutions, at the very early stage of a project. Participating in multidisciplinary design projects is high on the curricula of European higher-education institutions<sup>1</sup> that are involved in general industrial linkage, which also has the benefit of exposing students to different working styles.

ANSTO's unique status as Australia's only nuclear facility means that international engagement is vital. ANSTO has a strong incentive to participate in nuclear related international interactions, especially those with strong engagement of Asian countries. These interactions may be with research institutes or with industry partners. It is not clear from the discussion paper that the

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<sup>1</sup> See for example <http://www.tnw.tudelft.nl/?id=33099&L=1>.

proposed commercialisation strategy will address links with Australian industry only, or also with overseas industry.

### Recommendations:

- Researchers from PFRAs should be able to access government grant funding to support collaboration with industry.
- Government can facilitate industry engagement with PFRAs through further investment in collaborative partnership opportunities similar to the Defence Materials Technology Centre.

## SUPPORTING RESEARCH INFRASTRUCTURE

ANSTO strongly endorses the discussion paper's acknowledgement of the importance of world-class research infrastructure and stable, predictable funding over the long term for national research excellence. Overseas experience confirms that provision of such infrastructure and funding can only be done by government. Through the National Collaborative Research Infrastructure Strategy (NCRIS 2005-11), Australia developed a roadmap for research infrastructure and created networks across the country that fostered engagement on a national / state/ institutional scale. Those networks continue to deliver impressive results. A successor plan is required, and ANSTO looks forward to the results of the review of research infrastructure recommended by the Commission of Audit.

The impact of national large-scale research facilities goes beyond the scientific results. The planning and construction of such a facility is not only important for the scientific community, but also impacts on the local community; potentially affecting infrastructure and employment. Clearly, there is also a requirement for training of scientists, engineers and other professionals, as well as for public outreach programs including engagement with schools and teachers. New facilities are also likely to lead to the development of new technologies which have the potential to involve industry generally, and local businesses in particular, for example during the construction phase. However the physical infrastructure is only one facet of national large-scale research facilities. The collateral effects of engagement with industry, talent pooling and skills enhancement together with use of relevant local infrastructure, provide a boost to the competitiveness and wealth of a country.

An example of a national research infrastructure plan is the German Helmholtz Roadmap for Research Infrastructure, which looks decades ahead and takes into account international developments (see [http://www.helmholtz.de/en/research/research\\_infrastructure/](http://www.helmholtz.de/en/research/research_infrastructure/)). It might also be useful to look at the infrastructure strategies adopted in Switzerland, which demonstrate that investment and long-term planning in research drives innovation; a model copied by countries like South Korea. Embracing high standards and investment in world-leading research infrastructure has paid off for Switzerland. It should be noted that Switzerland has a strong commitment in basic sciences, e.g. nuclear and particle physics, while also fostering landmark research infrastructure and taking risks in supporting new technology concepts, for example a first of its kind continuous spallation neutron source. The Swiss example illustrates the long-term impact of investment in research infrastructure on the economy as well as considerable societal and environmental benefits. Looking at CERN (European Organization for Nuclear Research) in particular, the mix of interdisciplinarity and different cultures is not only a source of new ideas, but also the centre of a scientists' hub that creates new nodes around the world.

As a big country with a small population, it is vital for Australia to establish research priorities and a national research strategy because we don't have the resources to do everything. As research is increasingly addressing issues on a global scale, often utilising major infrastructure costing billions of dollars, there is a need to look beyond our borders in developing those priorities and strategy. For example, there is no prospect of Australia looking to duplicate a major international facility such as CERN or ITER; rather a national research strategy in those areas of science would seek to secure access to those facilities for our scientists, and to provide the necessary funding support or indeed as a longer term goal, look at regional collaborations in these areas.

### **Recommendations:**

- Government should develop a national research infrastructure plan that looks out over decades, with a full appreciation and commitment of both capital and operating costs indexed to national benefit/impact.
- Government should develop a national research strategy that considers both mainstream and niche expertise and platforms, along with consideration of encouraging global collaboration particularly in those areas of science dependent on major international facilities. This would include securing access to those facilities for our scientists with the commensurate funding requirements.

## **PROVIDING BETTER ACCESS TO RESEARCH**

In recognition of the difficulty highlighted by industry in negotiation of Intellectual Property (IP) contracts, the Australian Council on Intellectual Property (ACIP), in its *“Collaboration between the Public and Private Sectors: The Role of Intellectual Property”* Review recommended that the Coordination Committee on Innovation (CCI) promote and encourage the use of flexible terms and conditions in Australian Government grants and research contracts, including those specifically related to background and project IP licences, warranties, indemnities and moral rights. ANSTO was a member of the CCI working group responsible for implementing this recommendation, which culminated in the development of a Draft Guide document for government to use when engaging with industry in undertaking joint research. ANSTO supports the approach espoused in the Draft Guide, namely that government should consider its needs on a project-by-project basis, rather than having a one-fits-all approach, especially in relation to intellectual property. Such an approach would enable quicker and simpler engagement with industry, and address concerns that engagement is often difficult and complicated. The Draft Guide is currently open for consultation.

ANSTO has also provided submissions to IP Australia in its development of an IP Toolkit for Collaboration. ANSTO supports the development of an IP Toolkit to assist government, universities and industry in streamlining their processes of engagement and collaboration. This should include provision of sample template documents as well as guidance on how to assess potential commercial outcomes.

For its research infrastructure output, ANSTO embraces an open access policy making its raw data accessible, and much of ANSTO's research output is freely available. ANSTO has a policy position on data archiving which encourages openness. As noted above, ANSTO has established a number of points of contact (accessible via the ANSTO website) for business to access ANSTO's facilities. At the same time, we are obviously conscious that the results of research undertaken on behalf of or jointly with commercial partners may need appropriate protection.

## Recommendations:

- When interacting with industry, government agencies should consider their needs on a project-by-project basis, rather than having a one-fits-all approach, especially in relation to intellectual property.
- That research providers embrace an open access policy making its research output freely available and raw data accessible, subject to any commercial confidentiality considerations when partnering with industry.

## INCREASING INDUSTRY-RELEVANT RESEARCH TRAINING

ANSTO welcomes the Chief Scientist's Science, Technology, Engineering and Mathematics (STEM) initiative that embraces the entire educational system from pre-school to higher education. At ANSTO, research training for university students mainly takes place through collaborations with universities, as ANSTO is not a degree-awarding institution. Even so, ANSTO hosts university students to undertake research (in co-supervision) in a variety of scientific fields for various degrees (bachelor, master, PhD), including year-in-industry students, and organises schools that offer specialised training, often hands-on, to transfer knowledge and expertise. In their internships, students not only carry out research, but also address engineering challenges. Due to its specialised expertise in the nuclear sector, ANSTO is also a recognised partner for international students. For example, the Korea Nuclear International Cooperation Foundation (KONICOF) sponsors internships at ANSTO. There is lack of similar programmes in Australia that foster this type of international relationship-building for Australian students to experience different cultures in addition to receiving research-industry training. Such hands-on training exposes students early on to skills that are useful for establishing networks, building relations and becoming knowledge brokers. ANSTO would welcome programmes that include entrepreneurship at an early stage of study to overcome the different perceptions of the different sectors, and consequently foster a cultural change. Through practical training courses in specialised areas, such as radiation protection, ANSTO knows how important it is to have a holistic approach that embraces continuous learning across disciplines. Our vocational courses are appreciated by a broad range of industrial sectors, from health to minerals.

As young people need to be exposed to science early on in order to engage their interest in a science career, ANSTO offers educational visiting tours not only for the general public, but also for school pupils. For high schools, there are tours that supplement the curriculum and provide teachers with the appropriate learning materials. This includes also specific teacher training, with ANSTO recently being accredited as a Board of Studies, Teaching and Educational Standards (BOSTES) NSW endorsed provider of professional development at the proficient teacher level of the Australian Professional Standards for Teachers. Experiential educational programmes are also run to capture the imagination of primary school students. Due to the low number of female STEM students, we also provide lectures by female role models and foster discussion and engagement to attract pupils into STEM.

## Recommendations:

- The development of a national STEM strategy is vital for the maintenance of Australia's national research capability. Without that capability, strategies for engagement with industry will be of little assistance to Australia's national competitiveness.

- Research institutions must further develop engagement programmes with primary and secondary school programs to ensure continuous engagement throughout a school career with the sciences as part of a national curriculum strategy along with demonstrating the opportunity for the business/industry side of science.

## MEASUREMENT OF OUTCOMES

Research outcomes are monitored and evaluated through the ARC's Excellence in Research for Australia (ERA) initiative, which has been comprehensively adopted in Australia. Commercial outcomes of research are monitored and evaluated on the basis of the development of an IP portfolio (e.g. number of patents, development of know-how, etc.) and/or in the delivery of commercial reports (or 'grey' literature) to clients and other stakeholders.

Capturing of research-industry relations outcomes is difficult as this 'grey' literature lacks bibliographic control with non-standardised documents, e.g. in layout, and different channels of distribution. Although case studies are a useful way to understand the impact of R&D, some defined metrics would be valuable. When measuring impact, it should be taken into account that it can take 20 years to develop a new product or establish a new medical treatment.

ANSTO supports the development of an impact and engagement metric for measurement of industry outcomes, as has been done at a number of overseas institutions. At the same time, establishing a mechanism similar to the ERA for evaluating research-industry outcomes must be careful to ensure it drives the behaviour for which it is established, as any metrics system is prone to unintended consequences. In its early years, the implementation of any such metric will therefore need to be monitored, with a preparedness and flexibility to make changes if it is seen to drive unintended behaviours. The Australian Academy of Technological Sciences and Engineering (ATSE) has suggested an impact and engagement metric (see <http://www.atse.org.au/atse/activity/innovation/reports/content/activity/innovation-content/developing-impact-engagement-australia-metric.aspx>). However, additional administrative burden should be avoided as much as possible and it may be necessary to consider a set of metrics that evolve over time, recognising the differences in measures that will drive the embryonic nature of research-industry collaboration in Australia at present, versus the measures required to sustain established programs in the future

### Recommendation:

- The consultative development of an impact and engagement metric for evaluating research-industry interactions is important. However, such a metric should be open to amendment, particularly in its first years, in the light of experience in its implementation.

## CAPITALISING ON THE MEDICAL RESEARCH FUTURE FUND

When the Fund is established, it will be important to ensure that it is not bound by the same restrictive rules regarding eligibility for funding as apply currently to the ARC and NHMRC grants. If ANSTO is the best partner on research in a particular area – which it may well be in some areas of diagnosis – industry should be free to partner with ANSTO without feeling a need to bring in a university as an additional partner in order to secure access to funding.

## **Recommendation:**

- Researchers from PFRAs should be able to access funding from the proposed medical research future fund to support collaboration with industry as part of broadening the opportunity base for as many stakeholders as possible for the biggest possible impact and outcomes.