



Australian National Fabrication Facility Ltd  
151 Wellington Road, Clayton 3168  
ABN 50 124 231 661

28 November 2014

Dear Secretariat,

**Re.: ANFF response to the consultation paper *'Boosting the Commercial Returns from Research'***

The Australian National Fabrication Facility (ANFF) welcomes the opportunity to respond to the consultation paper *'Boosting the Commercial Returns from Research.'*

ANFF has been funded under the National Collaborative Research Infrastructure Scheme (NCRIS) to provide access to state-of-the-art micro and nanofabrication facilities. ANFF, with its focus on the fabrication of new materials and devices, is a highly relevant organisation for fostering Australian innovation and university-industry collaborations.

Key recommendations are:

- a) Voucher schemes for industry access of research infrastructure provide support for emerging industries.
- b) Stability of funding is critical. A roadmap for long-term research infrastructure investment and a commitment to funding the roadmap is essential for increased productivity in the sector.
- c) The ANFF governance model, a company limited by guarantee with a non-representative industry-based board, has been highly successful.
- d) Education is critical to ensure technology uptake, reduce skill shortages and enable informed public discussion.
- e) ANFF welcomes the development of a system-wide collaboration to develop metrics for engagement, knowledge transfer, research outcomes and impact. Strong international relationships are essential to operate in a global market and an examination of overseas facilities should contribute to the assessment of outcomes.

Yours sincerely,

Rosie Hicks  
CEO Australian National Fabrication Facility

## Background

In 2007, the Australian National Fabrication Facility Pty Ltd (ANFF) was established under the National Collaborative Research Infrastructure Strategy (NCRIS) to provide access to state-of-the-art micro and nanofabrication facilities. These facilities enable researchers and industry to process hard materials (metals, composites and ceramics) and soft materials (polymers and polymer-biological moieties) and transform these into structures that have application in sensors, medical devices, nanophotonics and nanoelectronics.

Nanotechnology is a transformational technology impacting on many sectors of industry: communications and information technology; health; defence and security; biotechnology; agriculture; minerals recovery and processing; construction; and education. At its heart is the ability to fabricate at the nano-scale (to  $10^{-9}$  m) where surface effects become very important and high functionality can be achieved in a very small volume at a low materials cost. Such fabrication typically takes place in a dust-free, clean room environment using special equipment. This may build structures by top-down patterning techniques or using the self-assembly characteristics of chemicals. Providing researchers with expert support and the facilities to fabricate prototypes for scientific and commercial evaluation is the role of ANFF. Its users cover the gamut of pure and applied science through to technology and engineering.

On the world scale nanotechnology products are predicted to constitute an annual market of \$US 3 trillion by 2020<sup>1</sup>. Currently there are in excess of 150 Australian companies listed as active in nanotechnology. The number is expected to grow significantly as the benefits of using nanotechnology impact on established technologies and offer new solutions. An analysis of the latest Australian Research Council (ARC) funding outcomes shows that nanotechnology-related Discovery projects account for 13% of the annual total, with the annual funding by ARC in all grant categories for nanotechnology-related research exceeding \$80 million.

ANFF consists of eight university-based nodes which provide researchers and industry with complementary access to state-of-art fabrication facilities. Members of the company include 19 universities and CSIRO. Its facilities are provided to all Australian researchers and to industry. It has fostered linkages with overseas research groups and aided in developing collaborative research projects with groups such as the US Military Laboratories.

To date, ANFF has received funding of \$113 million from the Commonwealth and has augmented this to over \$200 million with grants from State Governments, institutions and CSIRO.

In 2013-14, ANFF serviced the research needs of 2,500 researchers, with its use by industry (238 researchers) totaling 23% of its operational hours. Significant innovations developed using the ANFF facilities are detailed in case study reports<sup>2</sup> in which 61 innovations of commercial significance are described.

Australia's response in developing ANFF parallels that in most OECD countries, with shared facilities seen as a way to foster world-class research and to assist in the establishment of a strong industry base incorporating nanotechnology. All users are charged access fees, with those for industry users aimed at recovering the operating costs of the facility. This is in line with practice overseas.

---

<sup>1</sup> M C Roco, C A Mirkin and M C Hersam *Nanotechnology research directions for societal needs in 2020: summary of international study* [http://www.nsf.gov/crssprgm/nano/reports/MCR\\_11-0301\\_Nanotechnology\\_Research\\_Directions\\_To\\_2020\\_JNR13.pdf](http://www.nsf.gov/crssprgm/nano/reports/MCR_11-0301_Nanotechnology_Research_Directions_To_2020_JNR13.pdf)

<sup>2</sup> ANFF Providing Solutions – A Casebook 2012 <http://www.anff.org.au/anff-2012-casebook.pdf>  
ANFF Building Competitive Advantage – A Casebook 2013 <http://www.anff.org.au/anff-2013-casebook.pdf>  
ANFF A Platform for Innovation - A Casebook 2014 <http://www.anff.org.au/anff-2014-casebook.pdf>

## Creating stronger incentives for research-industry collaboration

ANFF supports the adoption of the Government's proposals. While recognising that fundamental research is often at the heart of transformational innovation, ANFF strongly recommends that funding agencies encourage applicant researchers in appropriate disciplines to commercially scope the likely benefits flowing from their research if it is successful and to explore mechanisms for linking with industry end-users. This same approach should flow through to institutional use of block grant funding.

National infrastructure facilities are a means of promoting industry-university collaboration and provide assistance for SMEs to develop pre-commercialisation prototypes. ANFF is of the firm view that a number of the NCRIS capabilities are in an excellent position to promote industry-university collaboration and has made the improvement of this a Key Performance Indicator for ANFF management and Node Directors. Through its annual Research Showcases and with support from the National Nanotechnology Network, it has sought to bring Australian industry up-to-date with promising research and to encourage the researchers to foster linkages with industry. ANFF's Business Development Manager has the clear remit to engage industry with the national R&D effort and to search for areas where nanotechnology can offer commercial opportunities for the transformation of existing technologies to world prominence. Across ANFF, external enquiries about nanotechnology from academia and industry are directed to the most appropriate node and researchers.

It is noted that translation of research to commercially attractive outcomes frequently requires the production of a prototype that can be tested for public or industry acceptance. This has been the pattern followed in a number of the successful commercialisations outlined in the ANFF case studies. Key to this is often the provision of modest start-up funds to allow access to an ANFF facility to allow a prototype to be developed.

ANFF believes it would be very beneficial to innovation if voucher schemes to provide funding for SMEs to access NCRIS facilities in partnership with a public sector collaborator were introduced at the national level. It would also see benefit in ARC Linkage Grants scheme being amplified with an accent, where appropriate, placed on the development of prototypes as a route to commercialisation.

Several State-based schemes are helpful in this regard.

## Supporting research infrastructure

ANFF supports the Government's proposals in this area. As a research infrastructure funded by NCRIS, ANFF has a demonstrated track record for acting as an intermediary between research and business. For example, 23% of all usage in FY13 included industry. 13.5% of usage was for ARC Linkage grants. However, as stated in the consultation paper, stop-start funding of the National Collaborative Research Infrastructure Strategy (NCRIS), has reduced the sector's productivity. Stability of funding beyond the current 18-month, then 12-month extensions is essential to maximise the return on the investment. ANFF plays a key role in the translation of research because it allows the development of devices up to pre-production quantities without the significant investment in capital equipment, such as cleanrooms, that would be otherwise required. This significantly lowers the risk associated with device development. However, industry must have confidence that the facility will continue to operate until development has been completed.

Stability of funding is critical. A roadmap for long-term research infrastructure investment and a commitment to funding the roadmap is essential for increased productivity in the sector.

## Governance

The six member Board of ANFF is non-representative and comprises an independent Chair and five senior persons from industry. Though conscious of the need for ANFF to provide quality infrastructure for Australia's leading researchers, the Board has maintained since the outset of ANFF a policy of encouraging collaboration between public sector researchers and industry and has set operational strategies accordingly. Being divorced from the elements of day-to-day competition that characterise inter-university research activities, it has been able to take hard decisions when necessary. ANFF strongly supports the strong involvement of business and industry leaders in research management at the national level and believes that it has been effective for ANFF.

ANFF sees clear benefit in having significant business and industry personnel on the governing Boards of national facilities, given the link that these can provide of links to commercialisation of innovations.

## Providing better access to research

Whilst ANFF does not seek to share in the intellectual property (IP) of innovations developed using its facilities, it is conscious that in leaving the development of intellectual property agreements to the commercialisation arms of public sector research institutions may not be optimal. It sees real benefit in the development of whole-of-Australia policies that provide benefit to the originators of technology whilst at the same time maximising the likelihood of commercial development.

ANFF supports the Government's proposals with regard to facilitating the transfer of intellectual property between public sector researchers and industry. It sees benefit in linking the allocation of research funding to the dissemination of intellectual property. ANFF is working on a compendium of national research on nanotechnology to make potential industry users more aware of relevant research being done in Australian

There would appear to be real benefit in developing unified national protocols for the licensing of public sector innovations to Australian companies able to move the innovations to commercial application.

universities

## Increasing industry relevant research training

National infrastructure facilities offer an excellent training ground for relevant undergraduate and postgraduate students in new technologies. A number of undergraduate and postgraduate degrees in Australia focus on nanotechnologies and nanofabrication. Working in collaboration with its university members, ANFF sees real benefit in using its NCRIS capability as a training ground to give experience to university research students in the practical aspects of nanofabrication, which is a fast-growing transformative technology. The provision of such training ensures that those going into industry are aware of the new technologies and have a first-hand experience of what is required to implement innovation.

One role of NCRIS infrastructure capabilities should be to conduct training programs for undergraduates and postgraduates so that, on graduation, graduates who go into industry are well aware of the practical issues in implementing innovations and be sufficiently skilled to exercise dispassionate judgement on their route to commercialisation.

## Measurement of outcomes

ANFF sees real benefit in a system-wide collaboration to develop metrics for engagement, knowledge transfer, research outcomes and impact. It notes that some useful information is now being provided in the annual reports of NCRIS capabilities to Government.

## International Outreach

As indicated in the discussion paper, Australia's contribution to the world's intellectual property represents a small percentage of the total. Therefore it is most important that Australian researchers and companies anxious to exploit transformative technologies be aware of developments overseas and, if appropriate, engage overseas researchers and institutions in collaborative ventures. To this end ANFF has established an International Advisory Committee to advise it on significant international developments and has worked with major offshore nanofabrication facilities to learn of their developments. Added to this is a collaboration that has been developed by ANFF with US National Defense Laboratories. The US National Defense Laboratories support 50% of the basic research in sciences and engineering in the USA and have indicated a wish to support high quality R&D in Australia that makes use of ANFF facilities. They do not wish to own any intellectual property developed. Whilst Australian researchers are generally quite knowledgeable about significant developments in their technologies, having access to insights and funding from the US National Defense Laboratories offers a unique opportunity for Australia to be aware of significant international trends and to adjust its R&D activities appropriately.

Through their ability to interact with similar facilities overseas, national infrastructure facilities are at a distinct advantage in identifying significant transformative technologies, and can inform their constituent members of these.

## Capitalising on the Medical Research Future Fund

ANFF notes the objective of Government to ensure collaboration in the *Medical Research Future Fund* and supports this. It notes that much of novel medical research is interdisciplinary, with ANFF facilities being widely used by this sector and the emergence of some commercially interesting new technologies

## Concluding Remarks

This submission calls for a greater role for national infrastructure capabilities in supporting the Australian Government's desire to develop greater collaboration between the private sector and industry in R&D in Australia and the development of a climate where more of the national research effort leads to innovations that are commercially generating jobs and wealth. To date, ANFF has been successful in this agenda. Given an even more supportive climate and the ongoing provision of funds to maintain expert operating staff and to maintain equipment at state-of-art, it could substantially facilitate the Government's wish to better capture the outcomes of publicly funded research in the nanotechnology area.