

## INQUIRY INTO NANOTECHNOLOGY IN NEW SOUTH WALES

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***SUBMISSION:***

**NSW Parliament Legislative Council**

**Standing Committee On State Development**

**Inquiry into Nanotechnology in New South Wales**

Submission by the **Australian Nano Business Forum (ANBF)**

**Date:** 27 March 2008

This submission is made in response to the Inquiry launched by the NSW Parliament Legislative Council into the status and issues related to nanotechnology in Australia.

Nanotechnology is an important area of opportunity for New South Wales and Australia, providing new sources of competitive advantage for our industry, and new products and services to address community issues.

The over-riding message of the **Australian Nano Business Forum (ANBF)** is that, like any new technology or industry, responsible management must be undertaken to ensure that benefits are achieved and risks mitigated. There is significant benefit available to the NSW community from nanotechnologies; at the same time new uncertainties will undoubtedly emerge. However NSW and Australian industry, community, and government at all levels has proven capable of adoption of complex new activities, and of assessing and managing attendant threats and issues.

The Committee has asked for submissions which specifically address the 6 topics below. The ANBF's position is stated under each one:

**A. Current and future applications of nanotechnology for New South Wales industry and the New South Wales community**

There are already several hundred nanotechnology applications available in markets such as the USA, Europe, Asia, and Australia. The majority of these are current applications in **materials science**; the use of ultrafine particles, thin films, small fibres in products such as sporting materials, automotive components and coatings,

cosmetics, and industrial filtration systems.

The development of nanotechnology is expected to be a long process, with new applications likely to emerge over the next 20-30 years. Nanotechnologies will play a role in most industries and in the production of most if not all consumer and industrial products. Over the long term, the major benefits of nanotechnologies are expected to be in **medicine** and in the **energy** sector.

It is likely that use of nanoscale materials and processes will revolutionize the **detection and delivery of disease and of major ailments**, including cancers, cardiovascular diseases, neurological diseases, and infectious diseases. Similarly, nanotechnologies will play a crucial role in the development of **next-generation solar cells**, of **lightweight materials** reducing energy consumption, and of highly **efficient energy transmission and storage**.

Current applications of nanotechnology in the NSW community appear to be in line with those of other developed economies. Future applications will also be much the same (medical, materials, ICT, environmental, etc); there may be a bias towards applications that have a higher community value in NSW (eg. sun protection, solar energy etc).

Industry in NSW has some of the national leaders in nanotechnology, together with outstanding research institutions. Companies include electronic device firms **cap-XX** and **Peregrine Semiconductors**, medical device companies **NanoSonics**, **Cochlear**, **Eiffel Technologies**, **SIRTeX**, and **AMBRI**, food company **Protech**, solar cell manufacturer **Dyesol**, and information services firm **AZoNetwork**, the publisher of **AZoNano.com**. Leading research organisations include the Centre for Quantum Computing at the **University of New South Wales**, the NANO MNRF at the **University of Sydney**, the Centre for Functional Nanomaterials and the Intelligent Polymer Research Institute at the **University of Wollongong**, and the **University of Western Sydney** and **University of Technology Sydney**. **ANSTO** and the **CSIRO** also have considerable research activities in nanotechnology.

*In summary, the development of nanotechnologies is proceeding well in NSW and Australia, and these will provide substantial benefits for the community and the economy.*

## **B. The health, safety and environmental risks and benefits of nanotechnology**

It is well understood that certain characteristics of engineered materials change as

their size is reduced towards the nanoscale. In particular, free ultrafine particles can present new pulmonary hazards, or can be absorbed into biological and environmental systems along different pathways. A considerable body of work already exists relating to the absorption of nanoscale materials, notably that led by Professor Michael Roberts of the **University of Queensland**.

The health, safety and environmental risks of nanotechnology are a major concern of governments, individuals (including many scientists) and organisations around the world.

No nanomaterials have yet been classified as dangerous, by regulatory regimes in Australia, the USA, or Europe. Studies are being conducted in several major centres to assess the exposure, transport, and toxicology of these materials. Considerable efforts have been undertaken to define safe practices for the handling nanomaterials, notably the publication by **NanoSafe Australia** of Current OHS best practices for the Australian Nanotechnology Industry.

Australia has also been a leading participant – engineered by ANBF – in the development of a Responsible NanoCode for industry, as part of an international effort led by the Nanotechnology Industries Association (UK). A national workshop held by ANBF on November 26<sup>th</sup> 2007 featured a strong NSW team of contributors, including Mr Shane Coombe and Dr Chris Armstrong (Department of State and Regional Development, NSW Government), Ms Anne Trimmer (Medical Industry Association of Australia, NSW), Prof Bill Price (University of Western Sydney) and Mr Andrew McKay (Standards Australia). The Responsible NanoCode provides a mechanism by which industry can establish best practice and self-regulation mechanisms for the handling of nanomaterials. Self-regulation and best practice do not replace legal regulation, but serve to support areas where regulatory oversight has not yet been established and/or ambiguity exists.

The precautionary approach adopted by industry, and the absence of evidence relating to health effects, does not lessen the need for comprehensive and rigorous toxicology assessment. To the contrary, the ANBF believes there is a requirement for Australia to conduct – or have access to via its international linkages – assessment of the toxicology of nanoscale materials. It does not appear feasible for any single entity to understand all potential benefits or risks, so that a collaborative approach with other national or international stakeholders is imperative.

There are aspects in which Australia will not be able to rely solely on the results of

external assessments and collaboration. Several of our important industries – resource extraction and processing, agribusinesses, medical therapies and diagnostics, advanced manufacturing, water management – are at the forefront of global technology adoption, or face particular challenges in Australia, and must be directly involved in hazard assessment. A large amount of work needs to be done to build up new knowledge about the risks and how to assess them for our industries and activities. Moreover, Australia has an opportunity both to conduct toxicology and to use the results to establish an outstanding work and investment environment, encouraging both inward investment and the expansion of domestic industries. These are priorities at a national level, to which all states can potentially contribute.

It is also well understood that nanoscale materials provide benefits, in terms of increased bioavailability, which enables their superior performance in the delivery of drugs. They are also ideally suited to the detection of pathogens and contaminants, forming the basis for new generations of detectors and scrubbing agents for environmental remediation.

*In conclusion, there may be new hazards from nanoscale materials. However work is being done to understand these hazards, and to prevent exposure. Industry and research organisations are proceeding with great caution. Our view is that Government and the community should encourage nanotechnology development, while also supporting a rigorous risk assessment and mitigation approach. The ANBF believes there is an important role for Australian government at several levels in managing and conducting assessments, research, and the establishment of protocols, to ensure safety of the industry and community, and to make Australia attractive for investment.*

### **C. The appropriateness of the current regulatory frameworks in operation for the management of nanomaterials over their life-cycle**

At the specific rule level (eg. allowable environmental concentrations or human exposures to certain chemicals) the existing regulations will require review due to the different reactivity, properties and transport mechanisms of nanomaterials.

However, the products, processes and opportunities of nanotechnology arrive not into a vacuum, but a well-designed and robust regulatory environment. The ANBF and its members have been directly involved in assessments of the current regulatory structure – much of this led by Law Faculties at Monash University and the University of Sydney – and concluded that there is little cause for discarding the established regulatory system, or for superimposing new regulatory structures on top of these

current mechanisms.

The regulatory systems provided by NICNAS and the TGA cover most if not all of the domain of engineered nanomaterials. Each of these organisations is applying resources to evaluating the adequacy of their frameworks with respect to nanomaterials. There will be adjustments made to measurement technologies, standards, and protocols to ensure employee and consumer safety. However, the ANBF believes these adjustments can be made to and within existing frameworks. The ANBF does not believe existing regulations should be discarded; nor does it believe that new regulatory frameworks or organisations specific to nanotechnology in Australia need to be installed.

*In summary, the current regulatory frameworks provide an excellent basis for the supervision of nanotechnologies, and current organisations are working diligently to address gaps and overlaps. The ANBF has confidence in this process. The ANBF does not see the need for new frameworks and organisations for nanotechnology.*

#### **D. The adequacy of existing education and skills development opportunities related to nanotechnology**

Australia already has a good range of general science and engineering courses and more specific nanotechnology courses available at secondary and tertiary levels. The secondary education initiative at St Helena Secondary College in Victoria provides an outstanding base, which is currently being converted into a national curriculum. Notably, both the University of Western Sydney and University of Technology Sydney have well developed undergraduate nanotechnology programmes, which address future skills requirements in NSW.

The largest gap appears to be education and skills development for the executives, tradespeople, educators and policy makers who have left the education system, but now make up the bulk of the leadership, managers and operators in business, government and education. To the extent that nanotechnology represents opportunities, threats, or operational requirements (eg. implementing nanotechnology processes in business, or teaching nanotechnology concepts to secondary students) education and skills development will be required.

*With its strong education system and sophisticated research sector, Australia has a great opportunity to position itself as a leader in nanotechnology education and skills development, and to use this to support industry growth in Australia.*

## **E. The adequacy of the National Nanotechnology Strategy in the New South Wales context**

The National Nanotechnology Strategy was developed as a response to the PMSEIC Working Party Report of March 2005. It was a partial response, in which the former Department of Industry Tourism and Resources (DITR) developed an options paper relating to nanotechnology, presenting a "do nothing" and a "do something" comparison. The latter was recommended and implicitly adopted. As a result, the Australian Office of Nanotechnology (AON) was established in mid 2007 and a budget allocated to a combination of metrology, OH&S, and community awareness activities.

Effective awareness building and rigorous OH&S assessment and regulation are the major and most complex difficult tasks, and the Strategy starts to address these. It would be advisable for NSW to work with the AON to support these tasks and benefit from their resolution. It is also critical to collaborate and share the load across the states and Commonwealth, rather than duplicating organisational cost and effort – these tasks are too important to address inefficiently.

The ANBF's view is that the strength of the existing Strategy was its support for the enablers of nanotechnology – metrology, OH&S, awareness – but the Strategy significantly lacked in provision of industry support. The Strategy is silent on activities which might assist small businesses focused around nanotechnology products, the awareness and adoption of nanotechnology by larger established businesses, or the access to international markets by Australian businesses with nanotechnology products. In all of these areas, some State Governments have chosen to play a much more active role.

Further, the ANBF's view was also that the strategy developed by the AON did not define or support a leadership position for Australia. We believe an opportunity exists for Australia to stake out a distinctive position as a leader as a niche player in the nanotechnology world, not by virtue of scale of investment, but as a result of smart choices in industry support (eg. medical technologies, composite materials, water, energy) combined with excellence in education, regulatory design, safe practices, or community engagement. We regard this as a missed opportunity.

It is also worth noting that the recent statement by Senator Carr regarding review of the AON and the Nanotechnology Strategy, as part of the Review of the National Innovation System, has been perceived by both industry and by international partners

as a cutback of funding. We do not believe this was Senator Carr's intention, but the perception will remain that "Australia is no longer in nanotechnology". We hope that actions and public positions will be forthcoming to assure all stakeholders that Australia is very much "in nanotechnology".

This positioning is important to NSW, with its role at the core of Australian industry, manufacturing and technology development. The reality is that the states have driven Australian nanotechnology to date, but that a national position and leadership is critical if our industries are to be internationally competitive. ANBF analysis indicates that the majority of Australia's nanotechnology companies are located on the eastern seaboard, and efforts to collaborate between NSW, Victoria, and Queensland could be highly productive. The ANBF would encourage liaison and cooperation between these states, and ultimately all State and Federal Governments, to provide common approaches and support for nanotechnology development.

*In summary, the ANBF believes that the National Nanotechnology Strategy has some good initiatives, but lacks support for industry. This has an impact on NSW. There is an opportunity to establish national leadership through State and Commonwealth collaboration under the new Federal Government.*

#### **F. The level of community understanding of nanotechnology and options to improve public awareness of nanotechnology issues.**

The ANBF believes that one of the critical issues is public awareness, understanding, and acceptance of nanotechnology. All new technologies are subject to intense media, government, and community scrutiny and for good reason: unmanaged technology risks can have devastating consequences. Nanotechnology already has an "image", of tiny robots able to perform miraculous operations, and potentially to replicate without constraint. This is not an accurate view of either the way it works or what nanotechnology does. Ultimately, perpetration of these concepts damages the industry, eroding community trust, inhibiting investment and allowing the creation of barriers to development.

The ANBF's view is that nanotechnology has a good story to tell: of advances in materials science and biotechnologies at the smallest scale which will allow the development of better medical therapies, new solutions to the energy challenge and water contamination, and new manufacturing. It also has an important role in the economy, in making existing businesses more internationally competitive, growing new businesses, and growing employment and wealth creation.



At the time of writing, approximately 50% of Australians have heard of nanotechnology (DITR surveys), and around 10% of the community have a reasonable understanding that it is about small-scale solutions in medicine, materials science etc. The numbers are much higher for industry (Nanotechnology Victoria and Victorian Government surveys). Due to nanotechnology's very wide potential application, a deep understanding of nanotechnology is therefore lacking: it is difficult to convey in non-scientific terms. The ANBF believes efforts around public awareness should relate nanotechnology to leading opportunity applications, rather than attempting to explain the science.

We believe there is a need for strong and consistent messaging about the nature and importance of nanotechnology for the Australian community. We believe Government has a vital role in this communication, together with industry and academia. Mechanisms available include the education and community awareness activities of Governments, industry associations, universities, CSIRO, and the media. The Government can play a key role not only in ensuring consistency of message, but in ensuring that the message is truly unbiased: unduly influenced by neither business interests, academic objectives, or activist concerns.

Technically robust, balanced education at the primary and secondary levels offers an excellent opportunity to provide the community with information about nanotechnology, which over time will increase community comfort with the concepts and encourage informed debate about the benefits and risks. A critical component of this is the need for professional development and training of primary and secondary teachers.

At the same time, broadly available awareness building programs, carefully targeted at major community sectors (eg. industry sectors, government sectors, NGOs etc) could help to avoid entrenched positions arising without the benefit of robust debate, and would assist businesses and governments be more aware of potential threats and opportunities.

*The ANBF believes community understanding and support is critical to the industry. The community is not fully engaged yet, but mechanisms to gain engagement are available. Government at both Federal and State level needs to play a role, and the ANBF and its industry members would be pleased to contribute to this activity.*

The ANBF would be happy to provide further information in support of this submission, to respond to questions from the Standing Committee, or to appear before the Committee if

requested.

Signed:

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### **About Australian Nano Business Forum (ANBF)**

The Australian Nano Business Forum was formed in early 2006, following the 2<sup>nd</sup> National Nanotechnology Conference in Melbourne in September 2005. The ANBF is the peak national body representing and promoting Australian industries and companies involved in nanotechnology. The ANBF provides a collective voice for member organisations engaged in this emerging technology, as well as facilitating links between other key stakeholders such as government, funding, regulatory and research entities.

The Australian Nano Business Forum plays a distinctive role in national technology leadership. In 2007, it made an important contribution to the regulatory debate through its leadership of the Responsible NanoCode initiative in Australia, and to policy in its contribution to the Victorian Nanotechnology Statement (released February 2008). It led much of the MANCEF COMS2007 conference in Melbourne in September 2007, and designed the industry stream for ICONN08 in Melbourne from February 25-29 2008. Uniquely among peak nanotechnology industry bodies internationally, it leads international marketing of Australia's national capabilities.

**For more information visit: <http://www.anbf.com.au>**

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