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INQUIRY INTO NANOTECHNOLOGY IN NEW SOUTH WALES

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Inquiry into nanotechnology in New South Wales

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Introduction

At the "Nanosymposium 2007" meeting in Singapore, 3 December 2007, organised by SPRING, Singapore's national standards and conformance body, experts predicted that the annual production of nano-products worldwide will likely exceed US $1 trillion in several years' time.

Nanotechnology will have a significant impact on the Australian economy and will dramatically change, influence and be a driving factor in the development of many industry sectors.

The early engagement and support for standardisation as part of Australia's National Nanotechnology Strategy will contribute to the growth of the sector by:

- Providing a basis for consistent development across scientific disciplines and industry through common frameworks for measurement, characterisation and nomenclature and foundations for technological development, application and product development.
- Providing certainty for manufacturers, suppliers and consumers alike in the quality and safety of nanoparticles and nanotechnology.
- Documenting consensus based agreement between all interested stakeholders, including governments, industries, academia and the community.
- Supporting government policy frameworks for both formal regulation and industry self regulation.
- Ensuring Australian requirements are included in the development of International nanotechnology standards.

Standards Australia Overview

http://www.standards.org.au/

The Federal Government recognises Standards Australia as the nation's peak non-government standards development and approval body. Standards Australia prepares voluntary, technical and commercial standards for use in Australia and accredits other Australian Standards Development Organisations. It meets national needs for contemporary, internationally aligned standards and related services that enhance Australia's economic efficiency and international competitiveness.

To ensure this, a Memorandum of Understanding has existed between Standards Australia and the Commonwealth Government since 1988. Among the principal accords, are that no Australian Standard will contravene the World Trade Organisation's requirements that national standards should not be used as non-tariff barriers to free trade; and agreement that no new Australian Standard will be developed where an acceptable international standard already exists.

Standards Australia is Australia's member of the International Organisation for Standardisation (ISO), the International Electrotechnical Commission (IEC) and the International Council of Societies of Industrial Design (ICSID), providing a link to international best practice and creating further standards development efficiencies.

Standards Australia has well-established links into all areas of Australian business, professions, academia and the community with more than 9,000 experts drawn from over 1,000 nominating organisations. It has developed standards across most sectors of the Australian economy, in traditional industries such as goods and services, engineering and construction; in other technical areas such as health and food; in emerging new areas of technology such as e-health; as well as in less technologically based subjects such as complaints handling and risk management.

Role of Standardisation

There are a number of basic arguments supporting standardisation as a fundamental component for the development of nanotechnology in Australia:

- Protection of Australians. Standards give businesses and consumers confidence that the goods and services they are developing or using are safe, reliable and will do the job they were intended for. Government public health, safety and environment policies are often measured against Australian Standards.

- Support of innovation. Standards provide a platform on which to build new and exciting ideas. For example, new information and communications technology Standards such as radio frequency identification have helped spread 'cutting edge' practices across emerging industries. Standards Australia believes the same stimulation will be seen by the creation of standards in nanotechnology terminology, measurement, characterisation and nomenclature.

- Contribution to production, productivity and competitiveness. Standards save businesses time and money. Standards cut production costs. Products that comply with Australian Standards have a competitive edge over products that do not. Australian exporters using international standards have a head start when they move into overseas markets.

- Common international specifications. Standards ensure products manufactured in one country can be sold and used in another. Standards reduce technical barriers to international trade, increase the size of potential markets and position Australian firms to compete in the world economy. Around 70 per cent of all new Australian Standards are based on international equivalents.

Standards Australia and Nanotechnology

Standards Australia has identified nanotechnologies as a key cross-industry area to be supported by the development of Australian and International Standards. In early 2005 Standards Australia voted to establish a new International Standards Organisation (ISO) Technical Committee (TC229) to develop standards in nanotechnologies.

In mid 2005, Standards Australia hosted a forum to consult with industry and government on Australia's potential participation in this international committee. This consultation resulted in agreement from all parties that Australia should take an active role in TC229 nanotechnologies and should initiate an Australian technical committee (NT-001) to contribute to the development of nanotechnology standards in Australia.

Standards Australia's NT-001

In early 2006, Standards Australia formed the technical committee NT-001 and hosted its first meeting in March 2006. The constitution of NT-001 covers a broad range of industry, government, academic and consumer groupings. A full committee constitution is attached at Appendix A. NT-001 has met 8 times since inception. The committee aims to meet every 3 months.

In summary to date, Standards Australia has:

- Supported an Australian delegate to attend the first meeting of TC229 in London in November 2005;
- Convened the new Australian technical committee, NT-001 Nanotechnologies to participate on an ongoing basis to the development of Australian and International Standards in this area;
- Appointed a senior staff member for NT-001;
- Identified NT-001 as a key cross-sector standards development activity, reporting to all standards sector advisory boards.
- TC229 have met 5 times, the last time in Singapore in December 2007. Each time Standards Australia has sent a partially funded an expert from NT-001;
- Standards Australia has become a member of the Australian Nanotechnology Business Forum (ANBF);
- International Electrotechnical Commission (IEC) established a new committee TC113 - Nanotechnology standardization for electrical and electronic products and systems. Standards Australia attended the first meeting in Frankfurt, March 2007 as an 'Observer' member;
- Standards Australia is monitoring the work being done by the IEC TC113.

Standards Australia has identified the following actions to ensure the success of the Australian standardisation effort in nanotechnologies:

- Engagement with government, industry, academic, union and consumer bodies;
- The constitution of NT-001 will be monitored on an ongoing basis to ensure that all relevant parties are consulted and represented in the development of Australian and International Standards.
- Ongoing, consistent, and strong representation at TC229;
- Strong project management;

- Leadership by Standards Australia in building a strong and viable community of interest who are committed to ensuring Australian voices are heard and requirements incorporated at the international level.

It has been noted that there are differences in opinion on many standards issues within nanotechnologies in the international arena, particularly in the positioning of European and North American perspectives. Australia can provide a useful brokering role between these perspectives. Standards Australia has expressed clear interest in monitoring, contributing, and where possible, leading work in this area.

International Nanotechnology Standards Activities

The scope of TC229, which has 30 'Participating' and 10 'Observer' member countries, is standardisation in the field of nanotechnologies that includes either or both of the following:

1. Understanding and control of matter and processes at the nanoscale, typically, but not exclusively, below 100 nanometres in one or more dimensions where the onset of size dependent phenomena usually enables novel applications;

2. Utilizing the properties of nanoscale materials that differ from the properties of individual atoms, molecules, and bulk matter, to create improved materials, devices, and systems that exploit these new properties.

Specific tasks include developing standards for: terminology and nomenclature; metrology and instrumentation, including specifications for reference materials; test methodologies; modelling and simulation; and science-based health, safety, and environmental practices.

At the first meeting of ISO TC229 in London in November 2005, the committee established the following structure:

- Working Group 1 - Terminology and nomenclature (Convenorship – Canada)
- Working Group 2 - Measurement and characterization (Convenorship – Japan)
- Working Group 3 - Health, safety and environment (Convenorship – USA)
- Chairman's Advisory Group (CAG)

ISO TC 229 will, in accordance with ISO's strategic plan for 2005 to 2010, develop robust standards and other deliverables relevant to nanotechnologies that will:

- Support the sustainable and responsible development and global dissemination of these emerging technologies;

- Facilitate global trade in nanotechnologies, nanotechnology products and nanotechnology enabled systems and products;

- Improve quality, safety, security, consumer and environmental protection, together with the rational use of natural resources in the context of nanotechnologies;

- Promote good practice in the production, use and disposal of nanomaterials, nanotechnology products and nanotechnology enabled systems and products.

These objectives will be achieved by:

- Establishing appropriate structures to support the timely and optimal development of International standards and other deliverables – calibration procedures, CRMs, etc.
- Evaluating existing standards relevant to the field of nanotechnologies by undertaking a comprehensive survey amongst relevant technical Committees and other standardisation bodies.
- Constructing and maintaining a road map of standardisation needs to provide the basis for the on-going work programme for the next 5 – 10 years.
- Collaborating with all relevant technical committees of ISO and IEC to identify the best solutions for standards development needs in the fields of nanotechnologies.
- Establishing formal liaisons with all relevant Technical Committees and other bodies with a formal interest in standardisation for nanotechnologies.
- Identifying and prioritising areas needing research to support the development of standards and encouraging appropriate bodies to undertake such research.
- Establishing appropriate structures to inform the Technical Committee of the latest developments in nanotechnology research, development, applications and issues.
- Contributing to the world-wide effort to evaluate health and environmental impacts associated with nanotechnologies and supporting appropriate regulation by cooperating in the development of robust, science based standards for comprehensive characterisation, exposure assessment, and, where appropriate, for determination of bio- and eco-system response.
- Encouraging member bodies to promote awareness of the work of TC 229.

The calendar for future meetings of TC 229 is as follows:

May 2008	26-30	Bordeaux (France)	*	TC 229
November 2008		(Israel)	*	TC 229
May 2009		Seattle (USA)	*	TC 229
November 2009		(Malaysia)	*	TC 229
November 2010		(Australia)	**	TC 229
November 2011		(China)		

International Electrotechnical Commission (IEC) Nanotechnologies Developments

The purpose of IEC TC 113, which consists of 15 'Participating' members and 13 'Observer' members, is to deal with the relevant nanotechnological aspects in developing generic standards for electrical and electronic products and systems. Typically, these concern electronics, optics, magnetics and electromagnetics, electroacoustics, multimedia, telecommunication, and energy production and, more specifically, terminology and symbols, measurement and performance, reliability, design and development, electromagnetic compatibility. The Working Group structure of IEC TC 113 has been set up as below;

- Joint Working Group 1: "Terminology and Nomenclature"
- Scope: Define and develop unambiguous and uniform terminology and nomenclature in the field of nanotechnologies to facilitate communication and to promote common understanding.

- Joint Working Group 2: "Measurement and Characterization"
- Scope: Standardization of metrology and test methods and consideration of reference materials used to characterize properties of mainly materials and structures in the field of nanotechnologies.

- Working Group 3: "Performance assessment"
- Scope: To develop standards for the assessment of performance, reliability, and durability related to the nanotechnology-enabled aspects of components and systems in support of continuous improvement at all stages of the value adding chain.

ISO TC229 and IEC TC113 last met together in Singapore in December 2007.

Health, Safety and Environmental Risks and Benefits

The development of national and international Standards for nanotechnologies will support the management of environmental, health and safety issues. Standards Australia has a strong track record in the development of product safety standards, environmental management standards and occupational health and safety standards. Additionally, the development of a common terminology and nomenclature for nanotechnology will provide an agreed basis for ethical discussions in appropriate forums.

ISO TC 229 Working Group 3 has been established to deal with the spectrum of issues under the title Health, Safety, and Environmental Aspects of Nanotechnologies. ISO/TC 229 Secretariat distributed the Draft Technical Report Ballot for "Health and safety practices in occupational settings relevant to nanotechnologies" on March 19, 2008. This ballot is closing on May 17. If the Draft Technical Report is approved, it will be finalised and published by ISO shortly after that. Standards Australia will monitor the progression of this Technical Report.

Conclusion

A Report from the National Academies Forum, for The National Nanotechnology Strategy Taskforce, prepared by Professor Greg Tegart AM FTSE, in April 2006, states:

> "The opinion of the Academies is that there is an urgent need to clarify the nomenclature of the topic, from the viewpoint of communication between industry, society and policymakers, particularly on issues of risk. Further, Australia should be strongly involved in international standards activities to protect its interests."

Standards Australia is proud of its work to date in the field of nanotechnology standardisation and the role it has played contributing to the development of international nanotechnology standards. Effective standards for nanotechnologies will increase consumer confidence and acceptance, assist the development of new markets and support global trade.

Standards can assist in promoting good practices, developing risk assessment methods and providing a robust and relevant framework. Standards Australia looks forward to working collaboratively with State and Commonwealth agencies, organisations and industry groups towards the new opportunities and challenges posed by the emergence of nanotechnologies in our society.

Appendix A

NT-001 Committee Constitution Details

The current constitution of NT-001 Nanotechnology includes members from the following groups:

- ACCORD Australasia
- Australian Academy of Technological Sciences and Engineering
- Australian Council of Trade Unions
- Australian Food and Grocery Council
- Australian Industry Group
- Australian Nano Business Forum Limited
- Australian Research Council Nanotechnology Network
- CSIRO Molecular and Health Technologies
- Chair NT-001-01
- Consumers' Federation of Australia
- Council of Textile and Fashion Industries of Australia Ltd
- Department of Industry, Tourism and Resources (Commonwealth)
- Engineers Australia
- Federation of Automotive Products Manufacturers
- Insurance Council of Australia Limited
- Medical Industry Association of Australia Inc
- Monash University
- National Association of Testing Authorities Australia
- National Industrial Chemical Notification and Assessment Scheme
- National Measurement Institute
- Office of the Australian Safety and Compensation Council
- Plastics and Chemicals Industries Association Incorporated

Appendix B

Representation and Participation in ISO TC 229

There are currently 28 Participating (P) Members and 8 Observer (O) members in ISO TC 229.

Participating countries:

- Australia (SA)
- Belgium (IBN)
- Brazil (ABNT)
- Canada (SCC)
- China (SAC)
- Czech Republic (CNI)
- Denmark (DS)
- Finland (SFS)
- France (AFNOR)
- Germany (DIN)
- India (BIS)
- Iran, Islamic Republic of (ISIRI)
- Israel (SII)
- Italy (UNI)
- Japan (JISC)
- Kenya (KEBS)
- Korea, Republic of (KATS)
- Malaysia (DSM)
- Netherlands (NEN)
- Poland (PKN)
- Russian Federation (GOST R)
- Singapore (SPRING SG)
- Spain (AENOR)
- Sweden (SIS)
- Switzerland (SNV)
- Thailand (TISI)
- United Kingdom (BSI)
- USA (ANSI)

Observer countries:

- Argentina (IRAM)
- Egypt (EOS)
- Estonia (EVS)
- Hong Kong, China (ITCHKSAR)
- Morocco (SNIMA)
- Slovakia (SUTN)
- South Africa (SABS)
- Venezuela (FONDONORMA)

Appendix C

Standard Development, Committees and Consensus

To have credibility and broad community acceptance, a Standard must represent the consensus of a balanced committee of experts from representative interest groups. Consensus does not necessarily mean unanimity, but it does imply more than a simple majority. Standards Australia looks to eighty per cent agreement within a committee with no major interest dissenting, before a Standard can be published.

This combination of balanced representation and high consensus requirements ensures that no specific interest group can dominate. The process must also be transparent, meaning that there is a well-established procedure, which is equitable to all parties, and that each step of the standardising process is open and available for scrutiny.

Standards Australia is the neutral party in this process and does not play an active part in the decisions of committees. Standards rest with the committee members who are under an obligation to develop a Standard which best matches the needs and values of our society.

The content of an Australian Standard is the responsibility of a technical committee. The basis for the composition (or 'constitution') of a technical committee is to ensure balanced participation by those interests that will be significantly affected by the resulting Standard. Individual members of a technical committee are selected by nominating organisations that may include, but are not restricted to, government bodies, industry associations, community-based and consumer organisations, employee organisations and professional, technical or trade associations. In recognition of the national status of Standards, national rather than regional or local organisations are preferred when seeking nominating organisations to cover the range of interests affected by the Standard.

Australian Standards are living documents that reflect progress in science, technology and systems. To maintain their currency, all Standards are being periodically reviewed.
There are two key processes that provide Australian Standards with their authority and widespread acceptance, *transparency* and *consensus*.

- *Consensus*: taken to mean general agreement, characterised by the absence of sustained opposition to substantial issues by any important part of the concerned interests, arrived at by a process that takes into account the views of all parties concerned while reconciling any conflicting arguments.

- *Transparency*: means that notification and all information on current work programs and proposals is available to all interested parties. Transparency also includes the concepts of openness, participation on a non-discriminatory basis, and impartiality.

It is only by maintaining the openness and integrity of standards that they will continue to be of benefit to society.

Appendix D

Standards Australia and International Co-operation

Standards Australia represents the country on the two major International Standardizing bodies, the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). We co-ordinate the attendance of Australian experts at international meetings and participate extensively in the preparation of a wide range of International Standards. We are extremely active within the International Standardisation movement and a number of our senior management team members hold important voluntary offices on International Standards bodies.

The policy of Standards Australia is to base Australian Standards on International Standards to the maximum extent feasible and to use the World Trade Organization (WTO) Agreement on Technical Barriers to Trade (commonly referred to as the TBT Agreement) as a benchmark. In addition, Standards Australia is committed to complying with Annex 3 of the WTO TBT Agreement, the Code of Good Practice for the Preparation, Adoption and Application of Standards, which is applicable to non-government standardizing bodies such as Standards Australia.

Standards Australia has a policy of adopting International Standards wherever possible. This policy is in line with Australia's obligations under the World Trade Organization's Code of Practice, which requires the elimination of technical Standards as barriers to international trade. As a result approximately 33% of current Australian Standards are fully or substantially aligned with International Standards.

The principal benefit to Australia of basing Australian Standards on the equivalent International Standards is the benefit to the Australian economy by facilitating the international exchange of goods and services. Other benefits include the following:

- International (IEC and ISO) Standards generally reflect the best experience of industry and regulators worldwide and cover conditions in a variety of countries.
- Australia's obligations under the WTO TBT Agreement are supported.
- Participation in international certification schemes is facilitated.