Dear Taskforce Members,

The University of Sydney welcomes the opportunity to make this submission on the Manufacturing Industry Action Plan Issues Paper. The University commends the NSW Government for developing Industry Action Plans as strategic roadmaps in key industry sectors in NSW and in particular, the focus on supporting and developing the NSW manufacturing sector.

The University is keen to emphasise the importance of education and research in the development of a strong manufacturing sector. The work of researchers has a potential to develop new industries and transform the society in which we live with long term and sustainable benefits for the community. In addition, the University, and other education providers, play a vital role in educating the future workforce and the future senior executives across many businesses and industries. It is the education sector that will assist with up-skilling the workforce and re-training as job descriptions change with the emergence of new industries and new technology.

The work of NSW TAFE and universities is well recognised. However, the skills required for the future workforce are changing and posing challenges for education institutions in developing work-ready graduates. Researchers and students need to be collaborative, globally connected, analytical, proactive and innovative leaders who have the potential to create and develop opportunities, many of which are yet to be imagined. The challenge for education providers to develop this ideal skill set amongst students is important for the individual, and will also support the Taskforce’s aim to have a manufacturing sector with a flexible and highly skilled workforce who value innovation and collaboration.

We note with particular interest the focus on biomedical and medical devices and renewable energy technology in the Issues Paper. A very brief outline of the research at the University in these areas, and the potential for emerging industries, is outlined below. Our academics would be delighted to provide further details to the Taskforce on their research.
Biomedical Technology

The University has strengths in:

- Biomechanics, Biomaterials and Tissue Engineering
- Biotechnology and Biomolecular Engineering
- Biomedical Devices and Instrumentation
- Data management and data sharing
- Imaging, Visualization and Information Technologies

It is difficult to isolate one researcher or area of research, an indication of which is that the Faculty of Engineering and Information Technology now has Biomedical Engineering as one of its core interdisciplinary research themes. More specifically the University has a particular strength in biomaterials for implants and artificial bone, and research in elastin-based skin repair to help burns patients and tailored blood vessels for tissue repair. A number of successful collaborative relationships have been built, with current negotiations involving the development of low cost wound repair biomaterials with colleagues in India, and a recent joint NIH (USA) grant application with MIT on cardiac repair.

To provide the Taskforce with a cross-section of recent news items in regard to this area of research, we have provided the weblink to the relevant news item on the University website:

- **Gates grant helps work on childhood malnutrition** – 8.11.11 – $100,000 grant from the Gates Foundation awarded to a team led by Alistair McEwan (Electrical and Information Engineering) to develop a non-invasive, solar-powered device measuring body fat in newborns.
- **Mutant gene boosts melanoma risk** – 14.11.11 – Sydney Medical School’s Associate Dean of Research, Professor Graham Mann, is one of the leaders of a project that has found some 200,000 Australians carry a mutant gene that increases their melanoma risk.
- **Blue-sky grants benefit medical research** – 1.11.11 – Team headed by haematologist John Rasko has won a grant to continue research into human cell reproduction. Professor Rasko (Centenary Institute) has recently shown that blood-forming cells respond favourably to being grown on an elastic bed or ‘nano mattress’.
- **Discovery offers new hope for drug addiction treatments** – 31.10.11 – Users of heroin and other addictive opioids may be spared from distressing withdrawal symptoms thanks to identification of protein in nerve cells that drives response.
- **Australian mammals take on antibiotic-resistant drugs** – 2.9.11 – The wallaby and platypus could turn out to be the key weapons in fighting the growing health threat of multidrug-resistant bacteria.
- **Technology tethers free radicals** – 17.8.11 – new platform technology developed by University physicists that anchors proteins to a surface.
- **Microsoft grant boosts stroke, cardio disease detection devices** – 19.7.11 – $100,000 Microsoft fellowship awarded to Dr Alistair McEwan to investigate the electrode-skin interface, with the aim of improving emergency diagnosis of heart attacks and strokes, and long-term monitoring of cardiovascular disease.
Renewable Energy

The University’s Faculties of Engineering and Information Technology, and Science encompass leading research programs in important interlinked fields:

- Electrochemical energy storage using flow batteries
- Distributed hydrogen production and storage using novel micro-structured process systems
- Diabatic and adiabatic compressed air energy storage suitable for large scale solar and wind farms
- High temperature thermal storage for solar thermal applications
- High efficiency power conditioning and innovative inverter designs
- Nano-engineered materials for energy conversion and storage

Recently, the two news items below have been gaining attention:

- **Four Young Tall Poppy Science Awards for University of Sydney** – 4.11.11 – Young Tall Poppy Award winner Dr Deanna D’Alessandro (School of Chemistry) is developing ‘Metal-Organic Frameworks’ to capture and convert carbon dioxide emitted from power plants and natural gas wells – like ‘molecular sponges’ to mop up greenhouse gases.

- **Sydney researcher wins Science Minister’s Prize for Life Scientist of the Year** – 12.10.11 – Associate Professor Min Chen won the prize for her contribution of our understanding of chlorophyll. She last year discovered the first new chlorophyll in 67 years, which attracted huge interest not only within the scientific world, but also in industries related to agriculture, biofuels and solar cells.

A particularly exciting area of research has been the development of the work of Professor Thomas Maschmeyer in biofuels. Recent news items of his work are attached for the information of the Taskforce:

- **Leading the way in sustainable manufacturing** – 21.11.11 – Professor Thomas Maschmeyer’s current research on making biocrude oil from sustainable feedstocks is extending to a project that could find sustainable new ways of producing plastics, foams, paints and other everyday materials.
- **Technology tethers free radicals** – 17.8.11 – new platform technology developed by University physicists that anchors proteins to a surface
- **Tequila plant could fuel vehicles and help reduce emissions** – 29.7.11 – Large scale farms of the agave plant could be established in Australia’s arid inland as a novel and greenhouse-friendly solution to our transport fuel problems.
- **University of Sydney expert developing next generation biofuels** – 16.5.11 – Professor Thomas Maschmeyer is behind cutting edge research that could fuel the aviation industry from sustainable energy sources.
Two other fields of research of particular note for this Taskforce are:

Nanoscience

The Australian Institute for Nanoscience is in development with a purpose-built building in the final planning phase. The Institute will develop nano-devices with potential to transform Australian society ranging from innovations in broadband and low energy, secure communications technology, advanced medical diagnostics and therapies, and new astronomy instruments. The Institute will host a range of nationally accessible research infrastructure including Centres of Excellence in photonics and astronomy.

- Large-scale plans for small-scale technology – 15.6.2010 – University to build world-leading facility for specialist research into nanoscience

Robotics

The past decade has seen substantial technical development and commercial investment in robotics, especially in civilian applications such as cargo handling, mining, agriculture and marine environments; applications which are of central importance to the Australian economy. Research continues in multi-sensor perception, cooperative navigation, large-scale terrain modelling, multi-robot planning and human-robot interaction.

The future possibilities of current research are exciting for the individual academics, the University and the State of NSW. To maximise the possibilities, a strong political starting point is a collective and collaborative “shared vision”, with support and encouragement for universities, industry and government to work together to maximise the potential.

We would be delighted to host a “showcase” of this potential and look forward to engaging with the Taskforce about these and other issues as the review proceeds. Please do not hesitate to contact the University through my office.

Yours sincerely,

[Signature removed for electronic distribution]

Professor Jill Trewhella
Deputy Vice Chancellor (Research)