

The Productivity Agenda – education, skills, training, science and innovation

<http://www.australia2020.gov.au/topics/infrastructure.cfm>

The current debate on the world's future energy requirements and the need to reduce carbon dioxide emissions has focussed government leaders and the community at large on the need to develop alternative base-load power sources.

Fusion is the process that powers the stars. If realised, terrestrial fusion power reactors will deliver millions of years of safe base-load electricity, free of greenhouse emissions and weapons potential. The promise of fusion has prompted international governments, representing half the planet's population, to accelerate fusion energy development through common support of the ITER project, the world's largest science experiment. The ITER reactor is anticipated to generate net power and represents the penultimate step on the path to commercial fusion power. Together with other emerging clean energy technologies, fusion promises to be a key element in the global solution to climate change.

The Australian ITER Forum has outlined a "strategy for fusion science and engineering – through ITER and into the future". The strategy calls for Australian engagement in the ITER project through targeted research fellowships, enabling-infrastructure investments and an Australian designed and built contribution to the ITER device. The plan will enable Australia to contribute to the quest for a global solution to climate change while simultaneously opening opportunities for Australian industry and maintaining Australia's hard-won research credentials in this highly technological field.

At a time of decline for the technological sciences in Australia, fusion will inspire a new generation of gifted students to embrace the study of physics and engineering. This will both expand the domestic skills base and allow Australia to participate and compete effectively in global research, leading to potential new markets for Australian high-tech industries.

Australia is endowed with many of the advanced materials used in the construction of a fusion reactor. These include the fusion fuel lithium and the important structural elements vanadium, tantalum, titanium and zirconium. If properly managed, these mineral riches, together with Australia's well-established research strengths in materials technology, could lead to new industries producing the high performance components needed for fusion power reactors. Potential opportunities for Australian industry are found in the manufacture of high technology materials, systems control and software engineering, nuclear safety systems, and specialised instrumentation.

Given that the overall ITER budget of \$16 billion, the modest cost to implement the strategic plan (\$63 million over 10 years) represents outstanding value for money, ensures Australia's seat at the fusion energy table, and helps to build Australia's innovation system. The strategic plan, which can be found at www.ainse.edu.au/fusion.html is supported by the ITER organization, seven Australian Universities, ANSTO, and five Australian learned societies.

Population, sustainability, climate change, water and the future of our cities

<http://www.australia2020.gov.au/topics/sustainability.cfm>

Excluding war, climate change is arguably the single greatest threat to face modern civilization. Our way of life is largely powered by fossil fuels, whose environmental impacts have caused global warming. Climate change is a global problem, and demands a global solution. To be successful, energy supply technologies need to preserve or increase our standard of living, and offer the developing world, such as China and India, the energy resources to significantly lift theirs. There is no single technology that offers a solution: we need to do everything, from lowering our consumption to evolving our energy supply to draw from a diverse range of clean energy technologies. Such technologies also need to span the dynamic range of power needs, from base-load through to intermittent supply. Australia can make a difference to its own greenhouse gas emissions by evolving our energy supply and consumption to a more sustainable mix. In addition however, Australia also needs to be part of the global quest to find a sustainable replacement to fossil fuel derived base-load power.

Fusion is the process that powers the Sun and the stars. If realised on Earth, it offers millions of years of zero greenhouse emitting, safe, proliferation-free, base-load electricity. This promise has prompted the international community to accelerate fusion energy development, principally via support of the technology-enabling experiment, ITER. The ITER project is the worlds largest international science experiment, and is supported by governments representing half the planet's population

Australia is well endowed with many of the advanced materials used in the construction of a fusion reactor. These include the fusion fuel lithium, the structural elements vanadium, tantalum, titanium and zirconium, and the superconductor niobium. Rather than sell these in their raw state, these elements could be value added by processing and component manufacturing. If properly focused, Australia's well-established research strengths in materials technology offer an innovation channel to translate new high performance materials needed for fusion power to a manufacturing industry, whose products have wider appeal. A parallel is the development of superconductors, which have been driven principally by the need for strong magnetic fields in fusion research and particle physics.

The Australian ITER Forum has outlined a "strategy for fusion science and engineering – though ITER and into the future. The strategy (www.ainse.edu.au/fusion.html) calls for Australian engagement in the ITER project via the provision of an Australian designed and built machine contribution, and strategically-orientated and internationally-embedded fellowships. These elements are the conduit by which Australia can contribute to the quest for a global solution to climate change, and simultaneously nurture industry development in high technology materials. Other opportunities for Australian industry exist in control engineering, nuclear safety systems, and instrumentation.

In summary, the Australian ITER Forum has a vision for the future, which promotes sustainable and responsible economic growth and fosters creation of a fusion-energy industry through engagement in the international fusion research program.

The future of the Australian economy

<http://www.australia2020.gov.au/topics/economy.cfm>

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In summary, the Australian ITER Forum has a vision for the future, which promotes sustainable and responsible economic growth and fosters creation of a fusion-energy industry through research. If implemented, our vision would have already yielded substantial benefits to the nation's economy by 2020.