QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Submission to the Inquiry into developing Australia's non-fossil fuel energy industry

We are making this submission as representatives of the Australian ITER Forum, a group of Australian scientists and engineers from the Australian National University, Flinders University, the University of Canberra, the University of Sydney, the Australian Nuclear Science and Technology Organisation (ANSTO), and the Australian Institute of Nuclear Science and Engineering (AINSE). We are advocating an Australian role in the International Thermonuclear Experimental Reactor (ITER), - the next step on the journey to a magnetic confinement fusion power plant.

While we recognise that the major focus of the inquiry, at this stage, is the strategic importance of Australia's uranium resources, we believe that the Standing Committee should be informed about the current status and long-term prospects of thermonuclear fusion as a non-fossil fuel energy source.

Fusion energy promises virtually limitless energy based on the nuclear fusion of hydrogen isotopes found in ordinary seawater, with minimal greenhouse gas emissions. The greenhouse emissions are on par with those from fission nuclear reactors and are almost totally derived from the building and eventual decommissioning of the power plant. The great advantage over fission reactors (aka "atomic" reactors or "nuclear" reactors) is the very low-level short-lived radioactive waste produced by the fusion process. Indeed, by using advanced materials in fusion reactors, plant radioactivity could be, after 100 years quarantine, reduced to levels comparable to the ash from a coal-fired power station. At this low radioactive level, the entire facility could be recycled. Even if existing structural materials were used however, the induced radioactivity in a fusion reactor is still 10 times less than in a fission reactor of comparable size. Fusion reactors are also operationally safe in the sense that Chernobyl-type disasters cannot occur.

ITER is a US$10bn international project in energy supply research and development, and supported by six countries and groupings, the US, Russia, China, Japan, Korea and the EU. Two others, India and Brazil, have expressed interest in joining. Australia is, at this stage, not part of this partnership. In addition to the scientific and technology benefits, the industrial spin-offs of ITER for the ITER partners will be immense. Most of the costs of the ITER experiment are in industrial contracts to provide the machine components and structures. There are some obvious short and long term benefits for Australian engineering and component manufacturing industries in this project. Involvement by Australia would also increase our standing in international science and engineering and give us access to a large range of technologies.

Over the past 30 years, progress in the magnetic confinement of fusion plasmas has advanced even more quickly than the spectacular increase in computer performance with which we are all familiar. Modern experiments are at break-even energy thresholds, where the energy required to produce the plasma equals the energy output from the fusion process. ITER will be the first experiment to explore the ``burning plasma" regime, in which the energy yield from confined fusion-born particles is sufficient to sustain reaction. The total energy gain (ratio of energy out to energy in) will be a factor of 10, with total energy output of 500MW. ITER is being built to explore new power-plant scale physics and engineering of fusion reactors. The international importance of this research is demonstrated by US. Dept. of Energy policy, which placed fusion energy and ITER as the highest priority for research funding across ***all*** the physical sciences.

The current consensus is that recent experiments on the Joint European Tokamak (JET) and many other tokamaks (the leading type of magnetic confinement design) have proved the scientific feasibility of fusion energy production. ITER is an international project to explore and prove the engineering feasibility and to set the parameters for a working power plant. It is a project which will take about 10 years in construction, followed by at least another 10 years of experimentation and development. A working power plant based on these results may therefore be more than 40 years away. However, over this period the world must solve its energy supply problems in a way which does not lead to environmental breakdown and ensuing political instability. The current ITER partners have recognised this and see the development of fusion energy as being an essential strategy in the long term...when even uranium is scarce and expensive.

Representatives of the Australian ITER forum would be willing to speak to the Inquiry if requested.

Dr Matthew Hole
Chair, Australian ITER Forum

Prof Robin Storer
Deputy Chair, Australian ITER Forum