Dr Matthew Hole,
Chair, Australian ITER Forum,
Ph : +61 2 6125 7606
Fax: +61 2 6125 7606
http://www.ainse.edu.au/fusion.html

John Ryan,
Chair, National Research Infrastructure Council

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Submission to policy paper: "A process to identify and prioritise Australia's Landmark Research Infrastructure needs"

The Australian ITER Forum would like to thank NRIC for the opportunity to comment on the discussion paper "A process to identify and prioritise Australia's Landmark Research Infrastructure needs". We note that ITER engagement had been identified in the 2006 NCRIS Strategic Roadmap.

We have the following comments on the questions raised in the discussion paper:

Question 2: Is this financial threshold of $100m acceptable for landmark infrastructure?

We believe a lower threshold has the potential to deliver more cost effective outcomes in some cases. For example, $100M over five years might exceed what would be required to secure an Australian engagement in the ITER project (most likely through a collaborative agreement with one of the ITER partners, or engagement with the ITER organisation as a third party). A more modest sum in the range $40-50M may be sufficient to deliver an Australian contribution to the $20bn ITER project, and thereby leverage the enormous infrastructure that the project represents.

In some situations, support of research infrastructure also implies, or requires support of associated research activities. We believe that there is a case for greater flexibility in the apportioning of NRIC funding between hardware, operational support and research activities. This is particularly the case where the requirements for participation in global research projects encompassing large infrastructure are not necessarily set by the Australian side. For example, an engagement with the ITER project would require funds not only for hardware systems and ongoing operational support, but also a mix of more research-oriented activities such as feasibility studies, prototyping, benchmarking and data analysis.

Question 3: Are there any other criteria that should be necessary for registering a potential landmark research infrastructure project? Should all of this information be made publicly available?

We agree with the criteria identified in the Discussion paper: " a description of the proposed landmark research infrastructure project, how it meets the definition, the impact of and need for the infrastructure, and the current status of the project."

The text of the discussion paper also indicates potential projects would be registered by institutions. We believe that registration of potential landmark infrastructure projects should not be restricted to institutions, and that the wider research community have an opportunity to register landmark projects. Such a clarification would also be consistent with the flowchart on page 10.

Question 4: Are these criteria sufficient? Are there other criteria that should be applied?

The definition of "landmark facilities" in the discussion paper allows the situation where Australia can be a partner in international infrastructure initiatives. The degree to which a project leverages access to major international infrastructure, facilities or programs and their scientific outcomes would therefore seem to be an important additional criterion.

Question 5: Is a program for landmark project proposals warranted? What is the scale of funds realistically required for each project to make such a program worthwhile?

A proposal for ITER involvement has been outlined in the Australian ITER Forum 2007 Strategic Plan for Fusion Science and Engineering. In February 2009, at a meeting between representatives of ITER and the Australian fusion science community, a combination of three ITER diagnostics were identified by ITER as a potential Australian contribution to ITER. The realisation of this package requires (i) a dialogue between the Australian government and ITER to articulate how an Australian contribution would fit into the ITER framework, (ii) funding.

We agree that both the creation of a "source of funds to enable development of landmark research infrastructure proposals" into mature proposals, and a mechanism to evaluate landmark project proposals are warranted. We believe that the scale of funds required to make such a program worthwhile is of order 1% of the project value. We wish to raise several other aspects related to such a program, which are particularly pertinent to engagement in global research initiatives such as ITER:

- Entities such as the ITER Organisation interact at a government level. In addition to provision of seed funding, Australian government participation is essential to develop mature proposals.
- International science projects rarely conform to Australian funding program timeframes. The development and evaluation of landmark infrastructure proposals which have a major international dimension need to be processed on a time scale that matches the project.

Attached is some background information about the Australian ITER Forum, fusion energy, the next step fusion energy experiment ITER, and the importance of Australian engagement in this global quest to harness fusion for power.

Yours Sincerely,

Dr Matthew Hole, Chair, Australian ITER Forum

Professor John Howard, Head -Toroidal plasma, Plasma Research Laboratory, ANU

Dr Boyd Blackwell, Director H-1 National Plasma Fusion Research Facility, ANU.

Dr Adrian Paterson, Australian Nuclear Science and Technology Organisation.

Professor D.J. O'Connor, Head, School of Mathematical & Physical Sciences, University of Newcastle

Dr Dennis Mather, Managing Director, AINSE.

Hon. Assoc. Prof. Brian James, School of Physics, University of Sydney

Background

The Australian ITER Forum includes over 150 Australian scientists and engineers from universities, Government research laboratories and industry, who support an Australian involvement in the international development of fusion energy via participation in the world's largest science project, the International Thermonuclear Experimental Reactor ITER.

ITER is designed to demonstrate the technical and scientific feasibility of fusion power, which promises virtually limitless energy for the future. Fusion, a reaction first discovered by the Australian Sir Mark Oliphant in 1934, is the fundamental process that powers the Sun and the stars. In ITER and successor power plants, isotopes of hydrogen – the most abundant of the elements, will fuse to produce helium, an inert gas, and releasing an energetic neutron, whose energy will be harnessed to generate electricity.

Successfully taming nuclear fusion offers clean, base-load sustainable power generation, virtually free of greenhouse emissions. The fusion process itself generates zero greenhouse gas emissions, acid rain or particulates. Almost all emissions are derived from the construction and processing of materials and fuel used in the reactor. Unlike fission, the direct products of fusion are not radioactive. Rather, radioactivity is generated indirectly, by neutron activation of the first wall and vessel structure. Employing present-day technology, the materials used in a fusion power plant which become radioactive could be completely recycled within 100 years of shutdown. Fusion is also intrinsically safe. There can be no chain reaction, explosions or meltdown. At worst, a loss of magnetic confinement will damage the first wall of the system. Magnetic confinement fusion cannot be used as a weapon, or in weapons development.

The attractive features of fusion have inspired governments representing half the planet's population to invest over US$18bn to build and operate the ITER experiment. Everything about the ITER project is a grand challenge: the science questions it will answer, the technology and engineering needed to construct it, and the international negotiation, policy and global management issues it creates. . It will define not only fusion energy development over the next 30 to 40 years, but become the textbook for large scale international science.

Under the "ITER Broader Approach", two of the seven ITER partners (the EU and Japan) have also drawn up plans for the post-ITER development of fusion power with a demonstration reactor, DEMO. The ITER Broader approach also includes the International Fusion Materials Irradiation Facility (IFMIF), a high current linear accelerator in which materials that will be developed for the ITER device will be tested. The research outcomes of ITER and the ITER Broader approach will guide design of a prototype power plant, and design roadmaps envisage that fusion will become a commercial technology in the second half of this century.

At this stage, Australia is not part of the ITER partnership. The benefits to Australia for engagement are multi-fold and include: participation in global efforts to find a technological solution to mitigate climate change; scientific kudos and leadership; capability development and retention of skills; potential contract opportunities for Australian industry; and maximisation of the value of Australia's mineral resources of strategic importance to fusion. Perhaps the most significant is that without an Australian engagement in ITER the long term viability of the research activity in Australia is in jeopardy, and so the nation may lose the ability to harness opportunities during the commercial exploitation of fusion power.