

# 1 Submission Template

## 2016 National Research Infrastructure Roadmap Capability Issues Paper

Submission No:

*(to be completed by Departmental staff)*

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<b>Would you like your submission to remain confidential, i.e. not published on the website?</b>	<b>NO</b>

Question 1: Are there other capability areas that should be considered?

Question 2: Are these governance characteristics appropriate and are there other factors that should be considered for optimal governance for national research infrastructure.

The international standard for large scale research infrastructure are expert independent science panels that regularly meet to review, inform and shape the science direction. We would add “international scientific review” to the model of optimal governance.

Question 3: Should national research infrastructure investment assist with access to international facilities?

Expert scientists are the enabling component of engagement with any international field of research and/or facility. It is the experts who serve the national interest, have global networks, whose activity and profile provide a seat at the table, and whose research output meets the nation’s obligations.

In the case of fusion science, the Australia’s expertise is disparate and distributed, spanning theory and modelling, diagnostics, materials science, and superconducting technology. It is the international program and [ITER](#) (the world’s largest science experiment, now under construction in the South of France) that is the integrating component. A number of Australians already represent fusion science at very senior levels, both in the International Energy Agency and the International Atomic Energy Agency.

In the case of ITER participation, a collaborative agreement between the ITER Organisation and ANSTO has been proposed by the [Australian ITER Forum](#), ANSTO and the ANU on behalf of the fusion science community. This agreement, which is at an advanced stage of negotiation, will enable Australian participation in the [International Tokamak Physics Activity](#) (ITPA). The ITPA is the science framework for internationally coordinated fusion research activities on ITER research. The collaboration agreement, which will be a coup for Australian science, will enable expert Australian scientists to fully participate in ITER science through the ITPA, and provides opportunity for additional projects.

The major missing component for effective international engagement is the absence of a funding mechanism to support scientists to engage in international science. Such support is critical to enable any science engagement in international infrastructure and projects.

In light of this omission, we propose a Big Science fellowship scheme, to enable participation in the science of massive international projects, which are beyond the capacity of nation to fully engage. Fusion (ITER) is an example, but then so are projects in gravitational astronomy, particle physics, and an array of accelerators, to name but a few. Such a scheme would feature:

- Embedding of fellow(s) in international program(s).
- Available to existing or new research staff.

- Enables research activities (which may be nationally disparate) to be coordinated at an international level.
- Support for travel
- Support for subscription costs (if required).

It is not a Future Fellowship, and is not intended to provide a career path at an institution. The scheme is intended to recognise that support for scientific engagement in large scale international projects is normally beyond the capacity of an institution. Applicants would be expected to harness appropriate Australian research infrastructure and/or capacity to maximise international impact.

An alternate, more targeted scheme could be developed to retain and expand research capability in the domain of fusion science and ITER. An "Australian Fusion Energy and Plasma Science Collaboration" linked to ITER (and other nominated institutions) would support Australia's new special status as a research partner and technology supplier to ITER. Such a scheme could support scientific staff, travel and secondment, as identified in the Fusion Science Strategic Plan [\*"Powering Ahead: A National Response to the Rise of the International Fusion Power Program"\*](#), which was co-written by the Australian ITER Forum, the ANU and ANSTO.

There is much scope for national research infrastructure to support Australian participation in international facilities, and ITER in particular. As a specific example, port space on ITER has been allocated for an Australian-conceived diagnostic system that has been deployed on more than a dozen high power fusion devices across Europe, Asia and the USA. In addition, theory, modelling and experimental activities, along with national infrastructure across Australia is currently being employed to understand how ITER will perform and mitigate any design issues. It is critical that scientific positions, as well as technical resources, are provided to exploit national infrastructure and capabilities, and contribute to international programs.

Question 4: What are the conditions or scenarios where access to international facilities should be prioritised over developing national facilities?

When the international facility is one of a kind, and represent the leading science edge, access to the international facility should be prioritised over development of a national facility in the same field of research.

In the big science field of fusion research, the leading edge toroidal magnetic confinement science experiments are high performance, large scale devices. Appropriate support for scientists to undertake international research engagement in toroidal magnetic confinement is hence the highest priority.

Question 5: Should research workforce skills be considered a research infrastructure issue?

The most important research workforce skills are those acquired when undertaking research. For this to occur in fusion science for ITER engagement, scientists need to be supported. Scientists are presently supported by diminishing institutional funds, or externally via the Australian Research Council.

In general workforce skills are certainly also relevant to research infrastructure, and so should be considered as a research infrastructure issue.

Question 6: How can national research infrastructure assist in training and skills development?

Question 7: What responsibility should research institutions have in supporting the development of infrastructure ready researchers and technical specialists?

Question 8: What principles should be applied for access to national research infrastructure, and are there situations when these should not apply?

Open, merit-based access is essential if the infrastructure is financed by the public. If new instruments are added then the lead scientists should have first right of publication at time of commissioning. The same principle should apply to dedicated experiments: the lead scientist should have first right of publication. A data access policy should exist, which should include a data sunset clause, defining the time limit beyond which data should be accessible to all users.

Question 9: What should the criteria and funding arrangements for defunding or decommissioning look like?

It is reasonable that the Commonwealth provide support for defunding or decommissioning for the portion of the investment supported by the Commonwealth. Asset distribution would be pro-rata Commonwealth / Institution.

Question 10: What financing models should the Government consider to support investment in national research infrastructure?

Co-investment with any partner should be considered, with the proviso that a lack of partner should not be a reason to restrict or remove funding. The Government has an obligation to fund research infrastructure for the purposes of discovery.

Question 11: When should capabilities be expected to address standard and accreditation requirements?

Question 12: Are there international or global models that represent best practice for national research infrastructure that could be considered?

See answer to Question 1.

Question 13: In considering whole of life investment including decommissioning or defunding for national research infrastructure are there examples domestic or international that should be examined?

Question 14: Are there alternative financing options, including international models that the Government could consider to support investment in national research infrastructure?

#### **Health and Medical Sciences**

Question 15: Are the identified emerging directions and research infrastructure capabilities for Health and Medical Sciences right? Are there any missing or additional needed?

Question 16: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?

Question 17: Is there anything else that needs to be included or considered in the 2016 Roadmap for the Health and Medical Sciences capability area?

#### **Environment and Natural Resource Management**

Question 18: Are the identified emerging directions and research infrastructure capabilities for Environment and Natural Resource Management right? Are there any missing or additional needed?

Question 19: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?

Question 20: Is there anything else that needs to be included or considered in the 2016 Roadmap for the Environment and Natural Resource Management capability area?

#### **Advanced Physics, Chemistry, Mathematics and Materials**

Question 21: Are the identified emerging directions and research infrastructure capabilities for Advanced Physics, Chemistry, Mathematics and Materials right? Are there any missing or additional needed?

Question 22: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?

Australia should participate in the ITER project, and a mechanism is being implemented to support collaboration. The major missing funding component is support for scientists – see answer to Question 3.

Question 23: Is there anything else that needs to be included or considered in the 2016 Roadmap for the Advanced Physics, Chemistry, Mathematics and Materials capability area?

#### **Understanding Cultures and Communities**

Question 24: Are the identified emerging directions and research infrastructure capabilities for Understanding Cultures and Communities right? Are there any missing or additional needed?

Question 25: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?

Question 26: Is there anything else that needs to be included or considered in the 2016 Roadmap for the Understanding Cultures and Communities capability area?

### **National Security**

Question 27: Are the identified emerging directions and research infrastructure capabilities for National Security right? Are there any missing or additional needed?

Question 28: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?

Question 29: Is there anything else that needs to be included or considered in the 2016 Roadmap for the National Security capability area?

### **Underpinning Research Infrastructure**

Question 30: Are the identified emerging directions and research infrastructure capabilities for Underpinning Research Infrastructure right? Are there any missing or additional needed?

Question 31: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?

Question 32: Is there anything else that needs to be included or considered in the 2016 Roadmap for the Underpinning Research Infrastructure capability area?

### **Data for Research and Discoverability**

Question 33: Are the identified emerging directions and research infrastructure capabilities for Data for Research and Discoverability right? Are there any missing or additional needed?

Question 34: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?

Question 35: Is there anything else that needs to be included or considered in the 2016 Roadmap for the Data for Research and Discoverability capability area?

### **Other comments**

If you believe that there are issues not addressed in this Issues Paper or the associated questions, please provide your comments under this heading noting the overall 20 page limit of submissions.