Submission to the Joint Standing Committee on Northern Australia
Inquiry: Preparing for Emerging Industries across Northern Australia

Preparing Northern Australia for the Fusion Energy, Food, and Defence Industries of the Future

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Version 1.1 – November 2025 | Prepared for the Joint Standing Committee on Northern Australia | ARPANSA terminology applied

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Cover Letter

The Secretary
Joint Standing Committee on Northern Australia
Parliament House
Canberra ACT 2600

Dear Secretary,

Please find enclosed my updated submission titled “Preparing Northern Australia for the Fusion Energy, Food, and Defence Industries of the Future.” This revised version ensures full alignment with all Terms of Reference issued by the Committee on 28 October 2025, addressing renewable energy, critical minerals, export industries, decommissioning, defence, infrastructure, biosecurity, workforce training, Indigenous empowerment, marine access, and research and development. It explains how fusion energy—legally permissible in Australia under current Commonwealth law—can enable sustainable irrigation, regional energy independence, and sovereign capability.

I thank the Committee for examining emerging industries as part of the Northern Australia development strategy. Fusion energy, food security, and defence manufacturing can form the foundation of a resilient northern economy. This document integrates ARPANSA terminology and Australian legislative references, confirming the legality of fusion machines in Australia under the Australian Radiation Protection and Nuclear Safety Act 1998 and the Environment Protection and Biodiversity Conservation Act 1999 (s140A).

Yours sincerely,

JOHN C. JP (Qual.)
Fusion Energy Australia

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1. Executive Summary

Northern Australia is ideally positioned to host emerging industries critical to Australia's long-term prosperity. Fusion energy, together with food and defence infrastructure, will underpin water-secure agriculture, low-carbon logistics, and sovereign capability. This submission demonstrates how legally permissible fusion machines can anchor sustainable energy, research, and employment across the north.

2. Legal and Regulatory Framework

Fusion energy is lawful in Australia. The Australian Radiation Protection and Nuclear Safety Act 1998 defines a 'nuclear reactor' as a device sustaining a self-supporting fission chain reaction using fissile material, excluding fusion machines. Section 140A of the Environment Protection and Biodiversity Conservation Act 1999 restricts nuclear power based on fissile fuels but omits any reference to fusion. ARPANSA's Glossary of Terms (2023) distinguishes fission and fusion as separate processes. Consequently, fusion systems may be built and operated under existing radiation-safety and environmental controls, consistent with ARPANSA's regulatory guidance.

3. The Global Energy Transition and Fusion's Role

The global transition to net zero depends on scalable clean energy. Fusion complements renewables by providing constant, weather-independent generation to stabilise the grid. International leaders—EUROfusion (EU), Commonwealth Fusion Systems (US), and NIFS (Japan)—are nearing commercialisation. Australia can join this transformation through regional demonstration sites in Northern Australia supported by ANU, CSIRO, and the University of Queensland.

4. Critical Minerals and Regional Supply Chains

Northern Australia's mineral endowment—lithium, boron, vanadium, helium-3, and rare-earths underpins fusion technologies. Developing, refining, and manufacturing capacity for fusion components will enhance export revenue, create skilled jobs, and expand sovereign control of advanced materials. These assets align with NAIF and Northern Minerals Development Fund investment priorities.

5. Defence and Sovereign Capability

Fusion energy supports AUKUS-aligned defence readiness. Compact fusion systems could power naval shipyards, autonomous bases, and plasma propulsion research. Integrating fusion into defence logistics ensures energy security for operations across Darwin, Tindal, and Townsville while fostering innovation in materials science and high-density energy systems.

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6. Food Bowl and Water Security

The Northern Territory's role as Australia's future food bowl requires dependable irrigation and desalination. Fusion-driven desalination plants and plasma-enhanced water treatment will provide continuous, non-rain-dependent water supplies. These systems enable new agriculture, aquaculture, and controlled-environment farming zones, particularly around Katherine, Mataranka, and the Ord Basin, while reducing carbon emissions.

7. Infrastructure, Transport, and Marine Access

Fusion energy can electrify rail, ports, and logistics networks. A fusion–hydrogen hybrid power system along the Darwin–Townsville corridor would sustain cold-chain exports, rail freight, and intermodal facilities. Electrified ports and barge landings powered by fusion energy can improve marine access for remote communities and support refrigerated shipping of food and pharmaceuticals.

8. Indigenous Participation and Workforce Training

First Nations peoples are essential to Northern Australia's future. Fusion and related industries create pathways in engineering, data systems, and energy technology. Partnerships with Batchelor Institute, Charles Darwin University, and local TAFEs will expand Indigenous STEM participation, ensuring equitable skills development and long-term regional leadership.

9. Research, Development and Industry Partnerships

A Northern Fusion Research Precinct should be established to link universities, CSIRO, and private innovators. Collaboration with ANU, UNSW, and international partners such as UKAEA and NIF would accelerate fusion diagnostics, materials science, and engineering innovation. Embedding fusion research into regional universities strengthens the knowledge economy and export capability.

10. Recommendations

1. Recognise fusion energy as a key emerging industry.
2. Establish a Northern Fusion and Food Security Precinct (Darwin–Townsville corridor).
3. Develop ARPANSA–ANSTO fusion regulatory guidance.
4. Fund R&D via the National Reconstruction Fund and Defence Science Partnerships.
5. Integrate fusion desalination and irrigation into water-planning frameworks.
6. Expand Indigenous STEM programs in northern colleges.
7. Support fusion-powered logistics, cold-chain, and marine access.
8. Include fusion infrastructure in NAIF funding priorities.
9. Strengthen international collaboration on fusion technologies.
10. Report annually on fusion readiness and energy resilience.

11. Decommissioning and Biosecurity

Fusion research and engineering capacities can support Australia's decommissioning and biosecurity industries. Remote-handling robotics, plasma sterilisation, and advanced material recycling developed for fusion systems are directly transferable to mine and plant decommissioning. Fusion-powered cold-chain and sterilisation technologies can improve agricultural biosecurity, reducing spoilage and pathogen risks in northern export markets. This synergy strengthens environmental management and resource stewardship while expanding industrial capabilities.

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