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McGee, Jeffrey
Shibata, Akiho

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BEYOND ARTICLE V: NUCLEAR USE AND ENVIRONMENTAL ASSESSMENT IN ANTARCTICA

Jeffrey McGee and Akiho Shibata

Key Messages

- 1 As the 48th Antarctic Treaty Consultative Meeting (ATCM) and 28th Committee for Environmental Protection (CEP) in May 2026 are to be held in Hiroshima, a city with particular sensitivities towards nuclear issues, it is timely to re-confirm the non-nuclear principle enshrined in Article V of the Antarctic Treaty and to examine the Antarctic Treaty System's potential to regulate the future nuclear use in Antarctica.
- 2 The Antarctic Treaty's Article V prohibits nuclear explosions and radioactive waste disposal in Antarctica, but is silent on controlled nuclear technologies — reactors, nuclear-powered vessels, and radioisotope devices. All three have either been used in Antarctica or are now being actively contemplated.
- 3 The 1991 Protocol on Environmental Protection to the Antarctic Treaty ('Environmental Protocol') designates Antarctica as a 'natural reserve devoted to peace and science' and requires environmental impact assessment (EIA) for all activities. Despite this, the Protocol has never been systematically applied to nuclear-related activities involving controlled nuclear reactions, creating a significant regulatory uncertainty.
- 4 Recent developments — including a 2020 plan by a Consultative Party to deploy a nuclear-powered icebreaker to Antarctic waters, and rapid advances in small modular reactor (SMR) technology — make this uncertainty increasingly urgent. There is no public evidence that the proposed voyage triggered a specific environmental assessment addressing nuclear risk issues.
- 5 To ensure nuclear risk issues are addressed in the future, the Antarctic Treaty Consultative Parties should consider adopting a consensus-based text reflecting a shared understanding on a presumption that activities involving nuclear reactors, nuclear-powered vessels, or radioisotope devices in Antarctica require at least an Initial Environmental Evaluation or Comprehensive Environmental Evaluation — under Annex I of the Environmental Protocol.
- 6 This modest but practical step would improve transparency, strengthen environmental accountability, and ensure that future nuclear use in Antarctica is subject to robust scrutiny — including justification against lower-risk energy alternatives — such as renewables — without requiring new treaty negotiations in a challenging geopolitical environment.

1. Introduction

The 48th Antarctic Treaty Consultative Meeting (ATCM) and the 28th Committee for Environmental Protection (CEP) meeting in Hiroshima in May 2026 provides a timely opportunity to reflect on an understudied dimension of Antarctic governance: the legal framework applicable to nuclear technologies. The Antarctic Treaty System (ATS) has, for 65 years, served as the primary legal and institutional framework for ordering the Antarctic region. Yet it now faces several challenges — from intensifying environmental impacts, including climate change and ocean acidification, and from a more contested global geopolitical situation reflected in, among other things, the current international armed conflicts in Ukraine and Iran (Scott, Stephen & McGee, 2024).

Nuclear issues sit at the intersection of these pressures. Article V of the 1959 Antarctic Treaty establishes a clear prohibition on all nuclear explosions and the disposal of radioactive waste within the Treaty area. However, beyond these explicit prohibitions, the ATS provides limited guidance on the use of nuclear technologies for peaceful purposes. This silence is increasingly significant: controlled nuclear technologies — including use of nuclear reactors on the continent, nuclear-powered vessels, and radioisotope-powered field devices — are either already part of Antarctic history or are now being considered as viable options for future Antarctic operations.

While the ATS has been effective in prohibiting the most dangerous nuclear activities in the Antarctic Treaty area south of 60 degrees South Latitude, it lacks clear guidance on how the Protocol's environmental assessment framework applies to

controlled nuclear technologies. Addressing this regulatory uncertainty— through a consensus-based understanding explicitly reflected in an ATCM document, including a possibility of a targeted, non-binding Resolution— would represent a practical and achievable step toward ensuring that nuclear use in Antarctica is subject to the environmental scrutiny that a region designated by the Environmental Protocol as a ‘natural reserve, devoted to peace and science’ warrants (Environmental Protocol, Article 2).

2. Article V and the Limits of Antarctica's Nuclear Prohibition

Article V of the 1959 Antarctic Treaty constitutes a landmark in international arms control: it was the first legally binding commitment to designate a region of the Earth as off-limits to all nuclear explosions. It prohibits any nuclear explosion within the Antarctic Treaty area and the disposal of radioactive waste there. The 1997 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management strengthened this obligation by prohibiting shipment of spent fuel or radioactive waste to the area below 60 degrees South Latitude and also for ‘storage’ (Joint Convention, 1997, Article 27 (2)).

The negotiating history of Article V is instructive. The United States (US) and the United Kingdom initially sought to preserve flexibility for so-called ‘peaceful nuclear explosions’— but ultimately conceded this point under sustained pressure from the Soviet Union and Southern Hemisphere states, particularly Argentina, Australia and Chile (Musto, 2018). These Southern states were concerned by the

prospect of radioactive fallout in their territories from the testing of nuclear weapons in Antarctica. The result was a comprehensive prohibition on all nuclear explosions, regardless of purpose.

However, Article V's scope has always been limited. Controlled nuclear reactions — including use of nuclear reactors, and the natural decay of radioisotope powered devices — do not constitute 'nuclear explosions' and are therefore not prohibited by the Treaty. This was confirmed in practice between 1962-72, when the US operated a small nuclear reactor at McMurdo Station in the Ross Sea area (Nielsen, 2024).

Crucially, all historical placement of controlled nuclear technology predates the environmental protection framework of the Environmental Protocol. The US McMurdo reactor was decommissioned in 1972; the Environmental Protocol did not enter into force until 1998. The environmental assessment regime established under the Environmental Protocol has therefore never been applied to nuclear-related activities involving controlled nuclear reactions — and this temporal gap is the source of the regulatory uncertainty that this paper addresses.



Exterior view of McMurdo Station nuclear power plant with drums stacked along the wall. Date 1967-68 season
Antarctica New Zealand Collection <https://adam.antarcticnz.govt.nz/nodes/view/6083>

3. Nuclear Use in Antarctica: Three Categories

Three categories of controlled nuclear technologies are directly relevant to contemporary Antarctic governance. Each raises distinct — but related — questions about the application of the Environmental Protocol.

Station-Based Nuclear Reactors

The nuclear reactor operated at McMurdo Station demonstrates that Article V does not preclude the use of nuclear reactors in Antarctica. With advances in small modular reactor (SMR) technology — designed to be safer, more compact, and more reliable than earlier generations — deployment of a fresh reactor at an Antarctic research station is no longer a remote prospect (Busto, Vergara & Correa, 2021). Recent US–Japan collaboration on SMR development underlines the pace of progress in this field (US Department of Commerce, 2026). While no party has yet announced plans to introduce a fresh SMR to Antarctica, the technology trajectory makes this more likely in the future.

Nuclear-Powered Vessels

In 2020, the Russian Federation planned to use its nuclear-powered icebreaker vessel *Sevmorput* to transport construction materials for its Vostok Station in East Antarctica (Nilsen, 2020a). The voyage was ultimately aborted due to mechanical difficulties (Nilsen, 2020b), but had it proceeded it would have been the first publicly known use of a nuclear-powered vessel in Antarctica since the Treaty's entry into force. Critically, there is no public record of any specific environmental impact assessment having been submitted in connection with the

planned voyage of the nuclear-powered *Sevmorput* to Antarctica (Antarctic Treaty Secretariat EIA Database). Although the meetings of ATCM and CEP in the spring of 2020 was cancelled due to COVID-19, the apparent absence of any EIA on the *Sermorput* did not attract comment from the CEP or the ATCM at subsequent meetings in 2021. This illustrates the regulatory uncertainty surrounding application of the Environmental Protocol's environmental assessment provisions to nuclear-powered vessels in Antarctica.

| Radioisotope Thermoelectric Generators (RTGs)

RTGs, which generate electricity through the natural decay of radioactive isotopes, were deployed by both the US and the Soviet Union at remote locations including Antarctic automated stations (Porter, 2017). All known devices were removed by 2015 through cooperative effort of the US and Russian Federation (Russian Federation & US, 2015). While their placement in Antarctica is thought to have predated the Environmental Protocol coming into effect in 1998, any future proposal to reintroduce RTGs would also engage the environmental assessment requirements of Annex I. As with the other categories, no specific guidance currently addresses the applicable assessment threshold that would apply to these devices under the Environmental Protocol.

4. The Protocol: A Framework Underexplored

The Environmental Protocol elevated environmental protection to

a foundational principle of the ATS. It designates Antarctica 'a natural reserve, devoted to peace and science' and commits Parties to its 'comprehensive protection' (Article 2). It also requires that environmental protection be a fundamental consideration in the planning and conduct of all activities in Antarctica (Article 3(2)(a)). Central to this framework is the environmental impact assessment (EIA) regime detailed in Article 8 and Annex I of the Protocol. These requirements are additional to and more tailored to the specific context of Antarctica than the international rules on nuclear safety for land-based nuclear installations (Convention on Nuclear Safety, 1994), on nuclear merchant ships (Code of Safety for Nuclear Merchant Ships, 1981), and on the Non-Proliferation Treaty with IAEA safeguards regime (Suseanu, 2021).

Under Article 8 of the Protocol, any proposed activities in the Antarctic Treaty area must be assessed against three thresholds. Activities with less than a minor or transitory impact may proceed without further environmental assessment (Annex I, Article 1 (2)). Those likely to have a minor or transitory impact require an Initial Environmental Evaluation (IEE) which, inter alia, must consider alternatives to the proposed activity (Annex I, Article 2 (1)). Activities likely to have more than a minor or transitory impact require a Comprehensive Environmental Evaluation (CEE), including analysis of alternatives and the option of not proceeding (Annex I, Article 3 (1) (2)).

Applied to the three nuclear categories, the implications are significant.

A nuclear reactor at an Antarctic station would almost certainly require a CEE: the low probability but potentially catastrophic consequences of a nuclear accident, combined with the limited capacity for emergency response in Antarctica, make it very difficult

to characterise such activity as having only a minor or transitory impact. A CEE would require the proponent to justify the choice of nuclear energy against available alternatives, including renewable energy sources increasingly in use at Antarctic research stations.

A nuclear-powered vessel in Antarctic waters, particularly at points of discharging or embarking cargoes or personnel, could also engage the CEE threshold. The risk of radioactive contamination of the marine and terrestrial environment as well as adverse impacts on its dependent and associated ecosystems from collision, grounding or malfunction in ice-covered waters is a serious environmental consideration. Due to isolation emergency response capacity is limited and there is known difficulty in remediating nuclear leaks. A CEE would require exploring the alternative of using a non-nuclear power vessel.

States may argue that their nuclear-powered vessels are entitled to exercise freedom of navigation south of 60° latitude under Article VI of the Antarctic Treaty. However, for Environmental Protocol parties, the right to navigate should not exempt a Party from conducting the required EIA before a voyage takes place. This requires a renewed efforts by the Antarctic Treaty Consultative Parties to align their practice of Article VII (5) notification to include all vessels under their flag and/or registration entering the Antarctic Treaty area conducting and/or supporting Antarctic activities — as Annex I obligations to conduct EIA apply to 'any activities in the Antarctic Treaty area ... for which advanced notice is required under Article VII (5) of the Antarctic Treaty' (Protocol, Article 8). It is a well-known fact that the practice of the Antarctic Treaty parties in their implementation of Article VII (5) of the Antarctic Treaty has shown some discrepancies in their interpretation and scope of notifications (Shibata, 2015).

Reintroduction of RTGs would engage Annex I at IEE level at minimum, requiring justification against available renewable alternatives.

5. A Case for New Norms: A Practical Way Forward

The contemporary global geopolitical environment is challenging. Yet it is precisely because of these constraints that a modest, targeted, and consensus-based step would be valuable — one that works within the existing framework rather than seeking to extend it.

A complete prohibition on all nuclear use in Antarctica — while likely to attract support from environmental NGOs and some states — is very unlikely to achieve consensus. The Antarctic Treaty structure, and the subsequent practice of Parties, preserve the possibility of controlled nuclear uses. Any attempt to foreclose those uses entirely would be resisted by key Consultative Parties as inconsistent with the original balance struck in the Treaty.

The proposal advanced here is more modest. The Antarctic Treaty Consultative Parties should consider adopting a consensus-based text establishing a shared understanding that Antarctic activities involving (i) nuclear reactors on the continent or ice shelves, (ii) nuclear-powered vessels supporting such activities, and (iii) radioisotope power devices; all carry risks of environmental harm sufficient to engage a presumption that a specific environmental assessment will be required under Annex I of the Environmental Protocol. Such a text would best be reflected in a stand-alone Resolution noting that these activities will likely have at least a minor

or transitory impact on the environment and thereby require at least an IEE and, in many cases, a CEE before proceeding. Such text may also be incorporated in a revision of the Guidelines for Environmental Impact Assessment in Antarctica (ATCM, 2016), or, as a preliminary step, in a small revision to the Information Exchange Requirements (ATCM, 2023), requesting Parties to provide information on energy source of their vessels, devices, and stations in Antarctica. Again, the EIA obligations are closely connected to the scope of the Article VII (5) advance notice, the Pre-seasonal Information in the Electric Exchange Information System (EIES).

Such an agreed and explicit text in a Resolution, the EIA Guidelines, and/or the EIES Requirements could also invite the CEP to develop a focused work program on energy requirements in Antarctica — functioning as an informational clearing house, facilitating exchange of knowledge and best practice regarding low-carbon and environmentally responsible energy options. This would assist Parties in identifying viable alternatives to nuclear technologies and support capacity-building in this issue.

6. Conclusion

Antarctica's legal framework has successfully prohibited the most dangerous nuclear activities associated with the Cold War era. But the governance of controlled nuclear technologies —remains uncertain. As technological advances make such activities more feasible, and as at least one Consultative Party has recently contemplated deploying a nuclear-powered vessel in Antarctic waters without specific environmental assessment, this gap is becoming

increasingly important.

The approach proposed here does not seek to re-open the Antarctic Treaty or impose new binding obligations. It proposes instead that Parties use the existing tools of the ATS — specifically an ATCM Resolution and/or Guidelines and Requirements adopted through the means of a Resolution or Decision — to articulate a shared understanding that nuclear-related activities require specific assessment and will likely engage the higher-level environmental assessment requirements of the Environmental Protocol, and that proponents should be required to justify nuclear use against reasonably available, lower-risk alternatives. The Environmental Protocol parties should favour transparency in environmental assessment of all nuclear environmental as well as safety risks in the region.

This is a practical, achievable, and overdue step. It would reinforce Antarctica's status as a natural reserve devoted to peace and science, strengthen the operation of the Environmental Protocol, and demonstrate the ATCM's continuing capacity for leadership in the region. The 48th ATCM and 28th CEP in Hiroshima — a city whose name is itself synonymous with the tragic consequences of nuclear issues — would be a fitting occasion to start dialogue on it.

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Profile

Jeff McGee is a Professor of Antarctic, Marine and Climate Change Law at the Faculty of Law and the Institute for Marine and Antarctic Studies (IMAS), University of Tasmania, Australia. He is an internationally recognised expert on Antarctic law and geopolitics. He has served as an academic adviser to Australian delegations to the ATCMs.

Akiho Shibata is a Professor of International Law and Director, Polar Cooperation Research Centre (PCRC), Kobe University, Japan. He has written in the fields of Antarctic Treaty System, Arctic governance, and international environmental law. He has attended ATCMs as a member of the Japanese delegations (2002 - 2008) and as a visiting delegate of ASOC (2023 - 2026).



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