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Mining and the EPBC Act nuclear action trigger
A review of its rationale and operation

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Minerals Council of Australia

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Abbreviations

ACT	Australian Capital Territory
ALARA	As low as reasonably achievable
ANCOLD	Australian National Committee on Large Dams
ANSTO	Australian Nuclear Science and Technology Organisation
ARD	Acid rock drainage
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASNO	Australian Safeguards and Non-proliferation Office
CoAG	Council of Australian Governments
DEWHA	Department of the Environment, Water, Heritage and the Arts (now DoEE)
DoEE	Department of the Environment and Energy
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cth)
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
NORM	Naturally occurring radioactive material
UMPNER	Uranium Mining, Processing and Nuclear Energy Review
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
WA	Western Australia

Executive summary

Uranium mining and milling (mining[1]) is treated differently to other forms of mining under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is defined as a nuclear action, which is a Matter of National Environmental Significance, and requires approval from the Commonwealth Environment Minister if it is considered likely to have a significant impact on the environment.

The treatment of uranium mining reflects a view within government that it carries special risks that warrant a higher level of regulation than other types of mining. This has been the accepted position within the Australian Government since the Ranger Inquiry in the mid-1970s. It is reflected in the 1997 Council of Australian Governments *Heads of agreement on Commonwealth and State roles and responsibilities for the Environment* roles on which the EPBC Act is based.

This report assesses whether the special treatment of uranium mining in the EPBC Act is warranted.

Environmental impacts from uranium mining are generally the same as those for mining other commodities. Most impacts (e.g. clearing of vegetation; pit dewatering) are completely independent of the commodity being mined. There are only two risks from uranium mining that distinguish it from mining other commodities: nuclear proliferation and radiation.

Nuclear proliferation is dealt with through a number of international agreements and legislation, most notably, the *Nuclear Non–Proliferation (Safeguards) Act 1987*. The inclusion of uranium mining as a nuclear action in the EPBC Act is not needed to address these international obligations.

Radiation risks are not restricted to uranium mining but require management in mining other commodities such as mineral sands. Radiation is one of the most heavily regulated aspects of the mining industry where national guidance is developed by ARPANSA based on best international practice, and state and territory governments regulate within well-established systems. There is little evidence that assessment of uranium mining projects under the EPBC Act adds sufficient benefit to this regulatory framework to justify the cost of complying with the Act.

Despite the above, assessment of uranium mining projects under the EPBC Act are required to, and have, considered all impacts on the environment. This creates an inequitable situation where two mines with identical impacts could be treated quite differently under the EPBC Act, simply because of the commodity that is being mined.

There is a strong case for uranium mining to be removed from the nuclear action trigger. The Commonwealth's resources could be better directed to working with state/territory governments through ARPANSA to ensure assessment of radiological aspects of uranium mining continues to reflect world best practice and uniform approaches are applied across Australia. Important components of such an approach include:

- Adherence with the ARPANSA National Standards for radiation protection in mining and minerals processing

- A radiological risk assessment of waste disposal facilities (such as tailings dams).

If the Australian Government wishes to retain uranium mining and milling as a nuclear action, it should, at the very least, make the following amendments to the EPBC Act and Regulations:

- Change the nuclear action trigger so it only applies if the radiological aspects of a proposed action are likely to have a significant impact on the environment.
- Limit the EPBC Act assessment of uranium to the radiological aspects of the proposal, and not a whole of environment assessment.

In the absence of any regulatory change, the Department of the Environment and Energy could still take a number of steps to improve its administration of the nuclear action trigger:

- Revising Significant Impact Guidelines 1.1 on Matters of National Environmental Significance to provide better guidance on definition and assessment of nuclear actions, and determination of significance
- Focusing EPBC Act assessments and approval conditions for uranium mining projects on radiological impacts
- Working cooperatively with state/territory governments to improve consistency in uranium mining assessments.

This report also notes that the inclusion of large-scale disposal and storage facilities for radioactive waste in the definition of nuclear action in the EPBC Act has created considerable confusion. It has led to non-uranium mining projects (such as a mineral sands mine and a copper mine) triggering the Act as a nuclear action, even though this would not appear to be the intent of the Act. Such projects have no relationship with the nuclear fuel cycle and their treatment as a 'nuclear action' is incongruous.

There is a need to review the provisions in the EPBC Act and Regulations relating to large scale disposal/storage facilities for radioactive waste to ensure they are focused on nuclear activities. This should be done by specifically excluding facilities that only contain Naturally Occurring Radioactive Material (NORM).

The changes recommended in this report will not lessen the level of protection to the environment from uranium mining but will reduce costs and delays to industry. They will ensure that environmental assessment of uranium mines in Australia will continue to meet world best environmental and regulatory standards.

1

Introduction

This report reviews the operation of the nuclear action trigger in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as it relates to mining and, in particular, uranium mining. The Minerals Council of Australia (MCA) has argued for many years that uranium mining should be treated in the same way as any other form of mining in the EPBC Act. In other words, uranium mining should only require assessment and approval under the Act if it triggers one or more of the other matters of national environmental significance. On behalf of the MCA, for example, Zavattiero has stated:

> Uranium mining does not require extraordinary regulatory treatment under the EPBC Act to ensure its safe operation and the avoidance of unacceptable environmental impact. This assurance is available through state-based regimes and the EPBC Act where a uranium development could have a significant impact on a Matter of National Environmental Significance.[2]

The MCA has also been concerned about the application of the nuclear action trigger, specifically, the provisions on large scale disposal/storage facilities for radioactive waste, to non-uranium mining projects such as mineral sands, copper and rare earth projects.

To determine whether there is a case for changes to the nuclear action trigger in relation to mining, this report:

- Reviews the rationale for inclusion of uranium mining, and the capture of other mining projects with radiological aspects, as a Matter of National Environmental Significance under the nuclear action trigger
- Reviews the extent to which uranium mining has unique environmental impacts that do not apply to other forms of mining
- Summarises the issues and conclusions that have arisen from other reviews and inquiries relevant to this matter
- Reviews how the nuclear action trigger has been administered for mining projects
- Provides recommendations on changes to the nuclear action trigger and its administration in relation to mining projects based on the above evidence.

2

The *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act is Australia's key national environmental law. The Act provides for a national scheme of environment and heritage protection and biodiversity conservation. It focuses the Australian Government's environmental assessment and approval role on the following defined Matters of National Environmental Significance:

- World heritage properties
- National heritage places
- Wetlands of international importance (Ramsar wetlands)
- Nationally threatened species and ecological communities
- Migratory species
- Nuclear actions
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- A water resource, in relation to coal seam gas and large coal mining development.

Actions that are likely to have a significant impact on a Matter of National Environmental Significance must be referred to the Commonwealth Environment Minister for decision on whether assessment and approval under the EPBC Act is required. The Minister can decide that an action:

- Does not require approval
- Does not require approval if it is undertaken in a particular manner
- Requires approval and is therefore a 'controlled action'
- Is clearly unacceptable.

A significant impact is not defined in the EPBC Act. However, the Department of the Environment and Energy has prepared Significant Impact Guidelines which define a significant impact as:

> an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts.[3]

The guidelines also note that:

> To be 'likely', it is not necessary for a significant impact to have a greater than 50 per cent chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility.
>
> If there is scientific uncertainty about the impacts of an action and potential impacts are serious or irreversible, the precautionary principle is applicable. Accordingly, a lack of scientific certainty about the potential impacts of an action will not itself justify a decision that the action is not likely to have a significant impact on the environment.[4]

The Australian Government has entered into bilateral agreements with each state/territory government that allows the Commonwealth Environment Minister to rely on the relevant state/territory government assessment in making the decision on whether the project should be approved. This reduces duplication

in the assessment process but still results in separate approval decisions being made by the Australian Government and the state/territory government.

The EPBC Act also allows for approval bilateral agreements that would altogether remove the need for an approval decision by the Commonwealth Minister and, consequently, remove any duplication with state/territory processes. Draft agreements were prepared in 2014-15 but have not proceeded further.

2.1 The nuclear action trigger

Nuclear actions are defined in section 22(1) of the EPBC Act as meaning any of the following:

a) Establishing or significantly modifying a nuclear installation

b) Transporting spent nuclear fuel or radioactive waste products arising from reprocessing

c) Establishing or significantly modifying a facility for storing radioactive waste products arising from reprocessing

d) Mining or milling uranium ore

e) Establishing or significantly modifying a large-scale disposal facility for radioactive waste

f) De-commissioning or rehabilitating any facility or area in which an activity described in paragraph (a), (b), (c), (d) or (e) has been undertaken

g) Any other action prescribed by the regulations.

Consequently, it is clear that uranium mining and milling is a nuclear action under the Act. This does not, however, include uranium exploration or transport of uranium oxide.

A 'large scale disposal facility for radioactive waste' is defined in the EPBC Regulations, with cross reference to the Australian Radiation and Nuclear Safety Regulations. The EPBC Regulations also extend the definition of nuclear actions to large scale storage facilities for radioactive material. As will be seen below, these provisions have triggered non-uranium mining projects as nuclear actions.

A nuclear action only requires approval under the EPBC Act if it is likely to have a significant impact on the environment. The 'environment' is broadly defined in the Act as including:

a) Ecosystems and their constituent parts, including people and communities; and

b) Natural and physical resources; and

c) The qualities and characteristics of locations, places and areas; and

d) Heritage values of places; and

e) The social, economic and cultural aspects of a thing mentioned in paragraph (a), (b), (c) or (d).

The constitutional basis for the nuclear action trigger does not draw on the external affairs power, unlike several of the other Matters of National Environmental Significance (i.e. world heritage, threatened species and ecological communities, migratory species, Ramsar wetlands). As discussed in section 4.16, Australia's international agreements relevant to uranium address non-proliferation. The nuclear action trigger is not needed to meet Australia's international obligations.

Instead, the trigger relies on a range of constitutional powers such as the trade and commerce power and the corporations power.[5] This can be seen in the wording of section 21 and 22A of the EPBC Act which specifies those who are subject to the provisions. The constitutional limits mean, for example, that the nuclear action provisions cannot apply to a state government or individual.

3

The rationale for inclusion of uranium mining and milling as a nuclear action

When a Bill is introduced in Parliament, there are two important sources that explain the rationale for the Bill. These are the Explanatory Memorandum and the Second Reading Speech.

The Explanatory Memorandum for the EPBC Act simply notes: 'Nuclear actions include mining or milling uranium ore'. It also adds this clarification: 'To avoid any doubt, this does not include operations for the recovery of mineral sands or rare earths'. This is discussed further in section 6 of this report.[6]

The Second Reading Speech makes it clear that the EPBC Act implements a deal that was done by the Council of Australian Governments (CoAG):

> Over the last three years, the federal coalition government has worked cooperatively with the state governments to identify the reforms needed to produce a more effective and efficient national approach to environmental management. The result was an agreement, given in-principle endorsement by the Council of Australian Governments in 1997, which defines the Commonwealth's role by reference to certain matters of national environmental significance.[7]

The 1997 *Heads of agreement on Commonwealth and State roles and responsibilities for the Environment* has its own genesis in the 1992 *Intergovernmental Agreement on the Environment*. This sought to establish a more cooperative approach to the environment and better definition of the roles of the respective governments. The agreement does not specifically address nuclear actions or the other matters of national environmental significance. Instead, it notes the responsibilities and interests of the Commonwealth as including:

- Matters of foreign policy relating to the environment and, in particular, negotiating and entering into international agreements relating to the environment and ensuring that international obligations relating to the environment are met by Australia
- Ensuring that the policies or practices of a State do not result in significant adverse external effects in relation to the environment of another State or the lands or territories of the Commonwealth or maritime areas within Australia's jurisdiction.

Following this agreement, CoAG sought to better define the above responsibilities and interests. In November 1997, CoAG agreed that 'the Commonwealth's involvement in environmental matters should focus on matters of national environmental significance as identified in Attachment 1 of the Agreement'.[8] Attachment 1 listed the matters that were subsequently incorporated into the EPBC Act.[9] Attachment 1 included the following on 'nuclear activities':

> The Commonwealth has a responsibility and an interest in relation to the assessment and approval of mining, milling, storage and transport of uranium and the development and implementation, in consultation with the States, of codes of practice as provided under the *Environment Protection (Nuclear Codes) Act 1978* [replaced by the *Australian Radiation Protection and Nuclear Safety Act 1998*] for protecting the health and safety of the people of Australia, and the environment, from possible harmful effects associated with nuclear activities.[10]

This concern about protecting people and the environment from the impacts of uranium mining was also reflected in the report of the Senate Inquiry on the Environment Protection and Biodiversity Conservation Bill 1998:

> The minerals industry and the South Australian and Northern Territory Governments opposed the inclusion of uranium mining and milling as a nuclear action subject to Commonwealth approval, on the grounds that there is no environmental reason to treat the mining and milling of uranium ore differently from the mining and milling of other minerals such as gold, nickel or iron ore. …The Committee does not agree with the view that uranium mining and milling is no different from other types of mining due to the nature of the materials produced and the high level of public concern about activities involving uranium.[11]

It is likely that the inquiry's noting of the 'high level of public concern' was influenced to some extent by the anti-uranium mining campaigns that were being waged at that time in South Australia and the Northern Territory. The Jabiluka campaign had a particularly high profile. The Gundjeihmi Aboriginal Corporation note that it involved significant national and international media coverage, two federal parliamentary inquiries and a blockade of the site by over 5000 protestors.[12]

Harris believes significant public concern about uranium mining can be traced back to the 1970s, sparked partly by French atmospheric nuclear testing in the Pacific.[13] Environment groups 'began to draw links between uranium mining and nuclear weapons, and to highlight the possible environmental impact of uranium mining'.[14] This, in part, resulted in the decision by the Whitlam Government in 1975 to establish the Ranger Uranium Environmental Inquiry, headed by the Chief Judge of the ACT Supreme Court, Russell Walter Fox.

The Inquiry presented two reports – the First Report dealt with the general question of whether Australia should mine or sell uranium.[15] The

The Ranger Uranium Environmental Inquiry has been decscribed as the 'foundation for current policy on uranium mining in Australia'.

Second Report dealt with issues specific to the Ranger proposal.[16] Harris argues that the First Report 'would lead to the formalisation of Australia's uranium export and non-proliferation policy, and has been described as the 'foundation for current policy on uranium mining in Australia'.[17] An analysis of the report suggests there is considerable validity to this claim.

The major focus of the First Report was proliferation of nuclear weapons and several recommendations addressed this issue. This resulted in the Fraser Government introducing a uranium export and safeguards policy which limited exports to, in the case of non-weapon states, those which were parties to the Non-Proliferation Treaty. The policy included additional safeguards and these formed the basis of Australia's policy for the next three decades.[18]

A secondary issue in the First Report was concern about the radiological aspects of uranium mining. The report concluded:

> It was not contended that, if properly regulated and controlled, hazards associated with the mining and milling of uranium were of such a magnitude that those operations should not be allowed. There may nevertheless be quite natural concern that there may be a risk to health from releases of radioactivity in the course of those activities or after they have ceased … We are quite satisfied that, if properly regulated and controlled according to known standards, those operations do not constitute any health hazard which is greater in degree than those commonly experienced in everyday industrial activities.[19]

The First Report made a number of findings and conclusions relating to uranium mining. These included:

- The hazards of mining and milling uranium, if those activities are properly regulated and controlled, are not such to justify a decision not to develop Australian uranium mines
- Any development of Australian uranium mines should be strictly regulated and controlled
- A decision to mine and sell uranium should not be made unless the Commonwealth Government ensures that the Commonwealth can at any time, on the basis of considerations of the nature discussed in this Report, immediately terminate those activities, permanently, indefinitely or for a specific period.[20]

As a result, while the report led to the Fraser Government allowing uranium mining to proceed, it also created an acceptance in government that uranium mining required strict regulation and control. Nowhere was this more emphasised than in the Second Report, which resulted in the complex regulatory oversight system for uranium mining in the Alligator Rivers Region of the Northern Territory that still exists today through the Supervising Scientist Division and within the Northern Territory Government. Two decades after the Fox inquiry, the 1997 CoAG agreement again reflected the government view that uranium mining was a Matter of National Environmental Significance to protect 'the health and safety of the people of Australia, and the environment, from possible harmful effects associated with nuclear activities'.[21]

The next section of this report reviews the potential 'harmful effects' of uranium mining and whether they justify it remaining a Matter of National Environmental Significance in the context of current regulatory systems.

4

Should uranium mining be a nuclear action?

There is a case for retaining uranium mining in the EPBC nuclear action trigger if:

- It has unique nationally significant environmental effects that do not occur with other commodities, or not to the same extent and
- Those effects cannot be adequately managed by other regulatory regimes or
- Any deficiencies in the management of those effects cannot be more efficiently addressed through other means.

This section considers the first two points. The last point will be addressed in section 7.1.

4.1 Non-proliferation and physical protection

A key concern of the Fox Inquiry was the risk that uranium mining could result in proliferation of nuclear weapons. Several of the recommendations of the First Report addressed this issue and it has remained an important policy focus for Australia since then.

Australia has ratified several international agreements addressing nuclear non-proliferation and physical protection:

- 1968 Treaty on the Non–Proliferation of Nuclear Weapons
- 1985 South Pacific Nuclear Free Zone Treaty
- 1996 Comprehensive Nuclear Test Ban Treaty
- 1979 Convention on the Physical Protection of Nuclear Material.

The *Nuclear Non–Proliferation (Safeguards) Act 1987*, *South Pacific Nuclear Free Zone Treaty Act 1986* and the *Comprehensive Nuclear Test-Ban Treaty Act 1998* establish the legal framework in Australia to implement these agreements. In particular:

- The Commonwealth Government permits exports of nuclear material only to countries with which Australia has concluded a bilateral safeguards agreement. These agreements are designed to guarantee that Australian uranium can be used only in the civil nuclear fuel cycle of partner countries.
- In 1974 Australia concluded a safeguards agreement with the International Atomic Energy Agency (IAEA), as required by the Treaty on the Non-Proliferation of Nuclear Weapons. Although the main function of the Agreement is to establish a system of safeguards to apply to nuclear material within Australia, it also requires Australia to notify the IAEA of intended transfers of material subject to IAEA safeguards out of Australia. On 23 September 1997 Australia became the first country to sign a Protocol supplementing and strengthening its basic safeguards agreement with the IAEA.
- The *Comprehensive Nuclear Test-Ban Treaty Act 1998* prohibits the causing of any nuclear explosion at any place within Australian jurisdiction or control and establishes a penalty of life imprisonment for an offence against the provision. This Act also prohibits Australian nationals from causing a nuclear explosion in any other place.
- The *Nuclear Non–Proliferation (Safeguards) Act 2003* establishes a national system regulating the possession of nuclear material, equipment and technology. In practice, the bodies chiefly affected by this system are uranium mining companies and ANSTO. The Act seeks to subject all nuclear material and associated items within Australia to a system of stringent and detailed controls.[22]

The principle underlying the safeguards system is that all possession, use and transportation of nuclear material covered by the Safeguards Act is prohibited unless it is carried out under a permit granted by the Minister for Foreign Affairs. The Minister may not grant the permit unless:

- Appropriate procedures can be applied at the nuclear facility concerned for the implementation of the Australian safeguards system
- Adequate physical security can be applied to nuclear material and associated items at the facility.

In establishing this system of permits and authorities, the Safeguards Act gave statutory recognition to the Australian Safeguards and Non-Proliferation Office (ASNO), and the Director General of ASNO. The functions of the Director General include ensuring the effective operation of the permit system, carrying out Australia's safeguards obligations under its agreement with the IAEA and its bilateral agreements, and monitoring compliance by Australia's partners in those bilateral agreements.[23]

In summary, Australia has a comprehensive set of measures in place to meet its national obligations relating to non-proliferation and physical protection of nuclear material. The nuclear action trigger in the EPBC Act plays no role in this framework, nor is it equipped to do so. The EPBC Act would be an inappropriate mechanism to address risks of uranium mining to nuclear non-proliferation and it has not been used for this purpose to date.

4.2 Radiation

The OECD Nuclear Energy Association notes that 'although uranium itself is barely radioactive, the ore which is mined must be regarded as potentially hazardous due to uranium's decay products, especially if it is high-grade ore'.[24]

There are four main pathways for exposure to radiation from uranium and the ore:

- Irradiation by gamma radiation
- Inhalation of radionuclides in dust
- Inhalation of the decay products of radon
- Ingestion of radionuclides.

A number of precautions are taken at a uranium mine to protect the health of workers:

- In all mining operations, dust control is important. For mining operations involving radioactive materials, dust is controlled to minimise inhalation of radionuclides. In practice, dust is the main radiation exposure pathway in an open cut uranium mine and in the mill area.
- Gamma radiation exposure in the mine, plant and tailings areas is generally limited. Highest exposures occur in underground mines where workers are exposed from all sides. Exposures are controlled when levels are elevated by, for example, concreting the mine wall to attenuate the gamma radiation. The most effective method for gamma radiation control is by minimising exposure to mineralised areas.
- Radon is an inert gas that occurs naturally. The hazard from radon is its short lived decay products. Controlling radon also acts to control the decay products. Radon can accumulate in enclosed places, like an underground mine, therefore, significant effort is placed on ensuring that good ventilation exists in all underground workplaces. Ventilation acts to control other workplace hazards such as dust and heat.

A key aspect of radiation management is radiation measurement, with the results of the monitoring providing regular and real-time feedback on the effectiveness of controls.

From an environmental perspective, radioactive waste management is important. UMPNER notes that the 'major task in managing radioactive waste from uranium mining and milling is safe disposal of tailings, since they contain most of the radioactivity originally in the ore. Tailings are significant because of their volume, rather than their specific radioactivity, which is generally low'.[25] For tailings disposal facilities it is important to ensure that other hazards are well controlled, such as facility stability.

The need to manage radiation at uranium mines in Australia is well recognised. Radiation is one of the most highly regulated aspects of mining in Australia.

4.2.1 National radiation management

The Australian framework for the management and control of radiation is based on and aligned to, international systems. There is generally international consensus on the management of radiation, its effects and controls. The main international organisations that contribute to the framework are:

- The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) which provides a consolidated overview of the effects of radiation by regularly reviewing research and publishing the summaries. UNSCEAR provides the scientific basis for radiation protection.
- The International Commission on Radiological Protection (ICRP) is an independent, international, non-governmental organization, which provides recommendations and guidance on radiation protection. It is recognised as the pre-eminent international authority on radiation protection. ICRP provides the philosophical basis for radiation protection.
- The International Atomic Energy Agency (IAEA) develops and publishes standards and guidance on nuclear safety and radiation protection. The IAEA publications are developed collaboratively and provide advice for both operators and regulators. The IAEA provides operating standards which are almost uniformly adopted internationally. (Note that an obligation of Member States to the IAEA is to adopt the IAEA standards).

The internationally agreed approach to radiation protection is presently based on ICRP Publication 26.[26] In this publication, the ICRP first recommended the 'system of dose limitation' which is made up of three key components as follows:

- Justification – meaning that a practice involving exposure to radiation should only be adopted if the benefits of the practice outweigh the risks associated with the radiation exposure
- Optimisation – meaning that radiation doses should be 'As Low As Reasonably Achievable', taking into account economic

Australia has a comprehensive set of measures in place to meet its national obligations relating to non-proliferation and physical protection of nuclear material. The nuclear action trigger in the EPBC Act plays no role in this framework.

and social factors. This is also known as the ALARA principle

- Limitation – meaning that individuals should not receive radiation doses greater than the prescribed dose limits.

The ALARA principle is generally regarded as the most important and the most effective of these components for the control and management of radiation. While the ALARA principle is the foundation for radiation protection, radiation dose limits have been established to provide an absolute level of protection. The limits apply only to the radiation dose received as a result of a 'practice' and excludes natural background radiation. The limits are:

- 20 mSv/y for a worker (whilst at work) averaged over a period of five consecutive years with the dose not to exceed 50 mSv in any single year
- 1 mSv/y for a member of the public (total year).

The international framework is adopted in Australia through the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). ARPANSA is the Australian national authority on radiation protection in all areas and contributes to the development of various international standards. ARPANSA represents Australia at the international organisation level. For example, the current CEO of ARPANSA is a member of the main ICRP committee, an ARPANSA staff member is the current vice chair of the IAEA Joint Convention and another staff member sits on the main UNSCEAR committee.

ARPANSA develops standards and Codes of Practice based on the IAEA codes and standards. These standards are then able to be adopted in state and territory legislation since ARPANSA has no regulatory jurisdiction except over national facilities and on Commonwealth lands.

The primary national guidance documents related to radiation protection in the mining or processing of uranium are:

- *Fundamentals for Protection Against Ionising Radiation*.[27]
- The *Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing 2005*; known as the Mining Code.[28]
- *Safety Guide for the Management of Naturally Occurring Radioactive Material.*[29]
- The *Code of Practice for the Safe Transport of Radioactive Material 2014*; Known as the Transport Code.[30]

ARPANSA aims for national uniformity on radiation protection standards through the National Directory for Radiation Protection.[31] This approach was endorsed by the Australian Health Ministers' Conference in August 1999 as the means to achieve uniformity in radiation protection practices between jurisdictions. The Conference agreed that upon consideration and approval of the provisions of the Directory, the regulatory elements will be adopted in each jurisdiction as soon as possible, using existing Commonwealth/state/territory regulatory frameworks. In practice, legislative approaches vary across Australia. For example, regulations in South Australia refer to the Mining Code while those in Western Australia ignore it. The only uniform radiation requirements are through the Transport Code, which all states and territories have adopted.

The CEO of ARPANSA is advised by a council and there are two other advisory committees; the Radiation Health Committee (RHC) and the Nuclear Safety Committee (NSC). The RHC is responsible for overseeing the development of the ARPANSA standards and approving them for inclusion in the National Directory. The uranium mining industry (under the position of industry adviser) is represented on the council, however, there are no mining industry specific members of the RHC or NSC.

There has been a recent policy shift within ARPANSA, where international standards and codes developed by the IAEA will be preferentially adopted as national standards. The implication of this is that efforts need to be focussed on ensuring that the international documents are fit for purpose.

4.2.2 State and Territory radiation management

Regulation of activities varies from State to State (including territories) under relevant radiation protection legislation (see Table 4.1). The differing years of Acts and Regulations and differing state/territory circumstances (such as a focus on mining rather than agriculture) and priorities mean that the requirements of the legislation vary across the country despite the existence of the National Directory.

Most states/territories adopt the national guidance from ARPANSA on mining and processing of radioactive materials. However, Western Australia has specific detailed guidance written into state legislation and a lower level reference to the Mining Code.

In South Australia, the primary legislation for radiation control is the *Radiation Protection and Control Act 1982* and associated legislation. The Act and regulations refer to permitting processes and the development of a radiation management plan and a radioactive waste

Table 4.1 **State and territory radiation legislation**

State	Legislation
Australian Capital Territory	*Radiation Protection Act 2006* *Radiation Protection Regulation 2007*
New South Wales	*Radiation Control Act 1990* *Radiation Control Regulation 2003*
Northern Territory	*Radiation Protection Act* *Radiation Protection Regulations (No 20 of 2007)*
Queensland	*Radiation Safety Act 1999* *Radiation Safety Regulation 2010* *Radiation Safety (Radiation Safety Standards) Notice 2010*
South Australia	*Radiation Protection and Control Act 1982* *Radiation Protection and Control (Ionising Radiation) Regulations 2000* *Radiation Protection and Control (Transport of Radioactive Substances) Regulations 2003*
Tasmania	*Radiation Protection Act 2005* *Radiation Protection Regulations 2006*
Victoria	*Radiation Act 2005* *Radiation Regulations 2007*
Western Australia	*Radiation Safety Act 1975* *Radiation Safety (General) Regulations 1983* *Radiation Safety (Qualifications) Regulations 1980* *Radiation Safety (Transport of Radioactive Substances) Regulations 2002*

management plan. The laws also enact various ARPANSA codes of practice, in particular, the Mining Code.

For example, in South Australia, the *Radiation Protection and Control Act 1982* requires the following from the proponent:

- Maintaining a system for radiation control, ensuring that worker dose limits are complied with, and that doses are as low as reasonably achievable
- Maintaining all apparatus, source control mechanisms and radiation monitoring equipment
- Provision of radiation training and induction for all employees
- Signposting of radiation areas as necessary
- Ensuring that adequate radiation protection expertise is available and properly resourced
- Undertaking radiation monitoring and personal monitoring as necessary and maintaining records
- Conducting medical surveillance of workers as required
- Ensuring that previous exposure to radiation is recorded for new radiation workers
- Conducting investigations as necessary for any radiation related incidents and accidents
- Reporting of emergencies and accidents
- Preparation of contingency plans
- Requirements for the installation and maintenance of radiation apparatus
- Maintaining a management system for control for sealed and unsealed sources, including storage and disposal
- Ensuring that requirements are met for any laboratory in which unsealed radioactive substance is kept or handled
- Maintaining a system for all necessary licences.

4.2.3 Need for regulation under EPBC Act

As noted at the start of this chapter, there is a case for retaining uranium mining in the EPBC nuclear action trigger if:

- It has unique nationally significant environmental effects that do not occur with other commodities, or not to the same extent, and
- Those effects cannot be adequately managed by other regulatory regimes or
- Any deficiencies in the management of those effects cannot be more efficiently addressed through other means.

Radiation risks are not unique to uranium mining. For example, they also require management in mineral sands mines and in some underground mines that target other minerals. There is an arguable case that radiation does not generally carry the same level of risk in other forms of mining as it does in uranium mining (a notable exception is in situ recovery uranium mining which results in very low exposure to radiation), However, radiation is just one of a number of hazards and risks that must be managed in workplaces. Radiation risks in uranium mines in Australia are relatively easy to manage and are very low compared with the standard industrial risks found on any mine site.

As discussed above, there is a mature and internationally accepted framework for radiation management across Australia. Radiation levels at mines and milling facilities are generally low and well within regulatory limits. For example, the Australian National Radiation Dose Register confirms that the average additional worker dose in the Australian uranium industry is approximately one-half of the additional dose of professional airline pilots and approximately one-eighth the normal background dose from living in Cornwall.[32]

On this basis, the radiation risks of uranium mining do not provide a justification for its inclusion in the nuclear action trigger.

4.3 Other environmental impacts

Uranium mines can have a range of environmental impacts in addition to the effects of radiation. The key question is the extent to which these are different to other forms of mining.

Table 4.2 draws on a summary of the environmental impacts of mining prepared by the Australian Government and considers whether any of these impacts are unique to uranium mining, ignoring any radiological impacts which have already been discussed above.[33]

Most impacts from mining are unrelated to the commodity being mined. For impacts such as clearing of vegetation, in fact, it is irrelevant whether the clearing is for mining, urban development or some other use – the impact remains the same. One risk that does warrant further discussion is heavy metal leaching and acid rock drainage. Fox, Kelleher and Kerr note:

> Regions bearing commercial grade uranium ore also tend to contain greater or lesser amounts of toxic heavy metals such as lead, zinc, copper and cadmium, usually as sulphides. If released from mining or milling wastes in significant quantities, these metals would go into solution in due course and might do considerable damage to the local environment.[34]

Similarly, Heard mentions:

> Acid rock drainage (ARD) presents perhaps the most serious risk for long-term environmental impact that can arise from mine tailings and therefore requires appropriate planning and management. ARD refers to the oxidation of newly exposed minerals and rock, particularly common sulphide bearing minerals like pyrite, which react with water to create sulphuric acid. The acid, in turn, can leach residual metals from the tailings. These metals can become serious off-site pollutants in waterways and enter the biological food chain unless appropriately managed.[35]

However, Heard also notes:

> Two points pertinent to uranium mining are readily apparent. Firstly, the production of tailings is commonplace and not limited to, or exceptional in, the case of uranium mining. Secondly, ARD and its consequences similarly are unrelated to uranium *per se* and can occur in the extraction of many mineral deposits in the absence of suitable management.

This is reiterated in a benchmarking study for the Olympic Dam Expansion which reviewed the tailings storage facility designs for a number of operations, both uranium and non-uranium. The study reviewed ten operations, including five uranium mines, and identified the risks for each operation as being:

- Spillage from pipes
- Wall failure
- Water and rainfall
- Seepage
- Radiation (radon and dust emissions).

The study concluded that the presence of potential risks and associated mitigation measures was not dependent on the type of mining.[36]

The mining industry is improving its performance in managing tailings. The Australian National Committee on Large Dams Inc has published guidelines on tailings dams which are widely used in the industry and recognised as leading international practice.[37]

From a health and safety perspective, uranium is a heavy metal and this can present a health risk to workers unrelated to radiation:

> Strict hygiene standards are imposed on workers handling the uranium oxide concentrate. If it is ingested it has a chemical toxicity similar to that of lead oxide (Both lead and uranium are toxic and affect the kidney. The body progressively eliminates most Pb or U, via the urine). In effect, the same precautions are taken as

Table 4.2 **Impacts of mining on the environment**

Environmental impact	Types of impacts	Unique to uranium mining
Topography and landform	Temporary changes to the topography from mining operations include access and haul roads, laydown and hardstand areas, topsoil stockpiles, process plant sites and support infrastructure. Permanent changes include open pit voids, waste rock landforms, tailings storage facilities (TSFs) and permanent water flow diversions.	Apply to all forms of mining
Flora	Direct impacts on floral communities occur mainly through clearing for the mine, waste rock landforms, processing plant, TSFs and associated infrastructure.	Apply to all forms of mining. Low value commodities such as iron ore will generally result in a larger mining footprint than a higher value commodity such as uranium.
Fauna	The impact of mining on fauna can generally be described as either primary or secondary. The primary impact is the direct destruction of habitats through land clearing and earthmoving. Secondary impacts relate to activities with varying degrees of disturbance beyond the immediate location where mining is taking place, such as access and haul roads; powerlines; pipeline and transport corridors; other infrastructure; introductions of feral animals or increases in their numbers; and general workforce activities.	Apply to all forms of mining.
Surface water hydrology and groundwater	The development of open pits, stockpiles, waste rock landforms, TSFs, processing plant and other infrastructure often interrupts natural drainage paths. Interference with drainage patterns can result in deprivation of water to drainage systems downstream of the mining development or localised 'shadowing' effects on some vegetation that may rely on intermittent flows.	Apply to all forms of mining.
Soil and water contamination	Chemical reactions in waste rock and tailings have the potential to be detrimental to the environment and rehabilitation, and to result in the contamination of surface soils, groundwater and surface water. In addition, mining and processing operations require the transport, storage and use of a range of hazardous materials, including fuels, process reagents, lubricants, detergents, explosives, solvents and paints. If these materials are not properly managed, they have the potential to cause atmospheric, soil or water contamination and could potentially pose ongoing risks to human health and the environment.	Applies to most forms of mining. Leaching of heavy metals and acid rock drainage are limited to certain types of ore bodies but not unique to uranium.

in a lead smelter, with use of respiratory protection in particular areas identified by air monitoring.[38]

In short, while heavy metal leaching and acid rock drainage can be concerns at uranium mines, they are risks that are not restricted to uranium and also occur in mining a number of other commodities. They are not even present at all uranium mines as *in situ* recovery mining does not generate tailings.

Uranium mining can also have social and cultural heritage impacts. Again, these are almost always due to factors that are unrelated to the commodity being mined (e.g. influx of workers to a town resulting in increase in house prices, physical disturbance of cultural heritage sites) and are not a reason to distinguish uranium mining from other forms of mining.

4.4 Public concern

The Senate Inquiry on the Environment Protection and Biodiversity Conservation Bill 1998 concluded that the 'high level of public concern about activities involving uranium' was one factor warranting its special treatment. As noted, this Inquiry coincided with the later stages of a high profile campaign against the Jabiluka mine.

The more recent approval of uranium mines in Western Australia has also generated media attention. However, media coverage is not a good guide to broader public concern. Zavattiero notes polling by Essential Research that 'showed only 30 per cent of Australians oppose uranium mining and export'. He also argues that opposition is lower in states with a history of uranium mining and refers to research by the South Australian Chamber of Mines and Energy that 'found almost three quarters of South Australians support or hold neutral attitudes towards uranium mining'.[39]

More importantly, public concern is not necessarily a good rationale for imposing regulation. The Department of Health notes that there a number of psychological factors that distort public understanding of radiation hazards.[40] For example, people will tolerate more risk when it is adopted by choice, such as exposure to increased radiation while flying; or if they perceive benefit from the activity (X-rays and CT scans). They are less likely to accept risk from uranium mining if it is imposed on them, or they do not trust the mining company or regulators, or they have concerns about the morality of uranium mining. Regulating based on public concern could result in regulation of relatively low risk activities while high risk activities remain unregulated.

The Australian Government Guide to Regulation includes the following in its 'Ten principles for Australian Government policy makers':

- Regulation should not be the default option for policy makers: the policy option offering the greatest net benefit should always be the recommended option
- Regulation should be imposed only when it can be shown to offer an overall net benefit.[41]

Based on the analysis in this section, the regulation of uranium mining under the EPBC Act does not appear to be consistent with these principles.

5

Assessment of uranium mines under the EPBC Act

A number of uranium mining proposals have been assessed and approved under the EPBC Act. These are shown in Table 5.1. Full details of these projects can be found at: http://epbcnotices.environment.gov.au/referralslist/. Western Australian decisions and reports can be found through: http://search.appealsconvenor.wa.gov.au/appeals/index.html.

In addition, several projects were referred but were withdrawn for financial viability or other reasons (e.g. Crocker Well, Mt Gee). Referrals were also submitted for field leach trials and rehabilitation activities but these did not require approval.

The following discusses how the EPBC Act has been administered in relation to uranium mining.

5.1 Referral

The Department of the Environment and Energy has developed guidelines on determining whether an action is likely to have a significant impact on a matter protected under the EPBC Act.

Significant Impact Guidelines 1.1 address Matters of National Environmental Significance.[42] In contrast to the other matters, it provides minimal guidance for nuclear actions:

> All nuclear actions, as detailed in section 22 of the Act, should be referred to the Department of the Environment for a decision on whether approval is required.

Not only is this unhelpful, it is also inconsistent with section 68 of the EPBC Act which only requires referral if an action is likely to have a significant impact on a matter (i.e. the environment, in the case of nuclear actions). As such, it is overly conservative. The Second Reading Speech on the Environment Protection and Biodiversity Conservation Bill 1998 noted that the bill 'applies to environmentally significant nuclear actions'.[43]

Despite the title, *Significant impact guidelines 1.2 - Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies* is more helpful as it provides guidance on how to assess a significant impact on the environment.[44] However, it is clearly not specific to uranium mining. There is no guidance available which considers how to assess significance in the context of the risks from a uranium mining project.

The Explanatory Memorandum to the EPBC Bill notes that uranium mining and milling does not include mining of mineral sands or rare earths.[45] Significant Impact Guidelines 1.1 make no reference to this intention and there has been some confusion as a result over how minerals sands projects should be treated under the Act.

All uranium mining proposals (other than field leach trials as noted above) have been determined to be controlled actions. For smaller scale low risk proposals, this may reflect a precautionary approach by the Department. However, this may not be appropriate. The precautionary principle addresses circumstances where there are threats of serious or irreversible damage. The effects of radiation have been extensively studied and the pathways are well understood. The main area of uncertainty relates to the effects of low levels of radiation such as those experienced at mine sites.

There is no evidence of effects from radiation below 50 mSv, but such causality is difficult to prove given the multitude of other radiation sources to which people are exposed in everyday life. For this reason, radiation management takes a highly conservative approach by assuming there is no safe level of radiation (the linear no-threshold model) and adopting a system of dose minimisation. This has been regarded by ARPANSA, through the Radiation Health and Safety Council, as effective demonstration of the precautionary principle.

Techniques for managing radiation on mine sites are well established and effective. While there may be site-specific issues at a mine site, the approach to radiation protection provides a high level of confidence that impacts will not be greater than predicted. Consequently, it may not be justified to rely on the precautionary principle as the primary argument for making a uranium mining proposal a controlled action.

5.2 Assessment

There has generally been an effort to coordinate the EPBC Act assessment of a project with the state/territory assessments. Where available, assessment has been undertaken by the state/territory under a bilateral agreement. However, bilateral agreements depend on the cooperation of both levels of government and the negotiation of agreements in some states did not occur for many years after commencement of the EPBC Act.

The scope of the EPBC Act assessment has been broad for two reasons:

- The Australian Government has been required to assess all impacts of the proposed mine on the environment. The assessment is not limited to the radiological aspects of the proposal or to the other matters of national environmental significance. This has meant that EPBC Act assessments have also addressed state/territory issues that would not be relevant if a different commodity was being mined (see Box 1).

Box 1

Yeelirrie Uranium Mine, WA

The proposed Yeelirrie Uranium Mine triggered the EPBC Act as a nuclear action due to the potential for significant impacts on listed threatened species and communities, and listed migratory species. The triggering of EPBC under nuclear actions required a whole of environment assessment.

Despite the Western Australian Government approving the project on 16 January 2017, the project is still waiting for a decision on EPBC Act approval. According to Cameco (proponent), the two key issues of Commonwealth concern are impacts on stygofauna through dewatering, and impacts on the plant, *Atriplex Yeelirrie*, due to clearance.[46] Neither of these impacts is related to radiation or any other unique risks due to the project being a uranium mine. In other words, they are unrelated to the commodity being mined.

Were any other commodity being mined, both of these issues would have been outside the scope of the EPBC Act assessment. The stygofauna appear to be endemic to the Yeelirrie area and are not nationally listed. While it is now a nationally listed species, *Atriplex Yeelirrie* was not listed at the time the controlled action decision was made and, consequently, would be excluded from the EPBC Act assessment for any other mining project.

This is not to diminish the importance of these impacts. However, it highlights the incongruence in that two mines with identical impacts could be assessed quite differently under the EPBC Act, simply because of the commodity that is being mined.

Box 2

Olympic Dam expansion, SA

The Olympic Dam Expansion involved a range of associated infrastructure: electricity transmission line, rail line, new airport, barge landing facility, desalination plant, additional port facilities, accommodation village and expansion of Roxby Downs township. The project triggered the EPBC Act as a nuclear action, along with several other Matters of National Environmental Significance. This decision meant that the entire project was regarded as a nuclear action and the EPBC Act assessment had to consider all impacts on the environment.

Most of the infrastructure components would not have triggered the EPBC Act if they had been referred separately. This is because they would not have been regarded as a nuclear action and they were unlikely to significantly impact any other Matter of National Environmental Significance. However, because they were being constructed for a mine that produced uranium (albeit as a secondary product), they required a full EPBC Act assessment.

For example, the EPBC Act approval included several conditions addressing impacts from the proposed desalination plant near Whyalla on the Australian Giant Cuttlefish. This is not a listed threatened species under the EPBC Act. If the water was being produced for any other purpose, this would have been outside the scope of any EPBC Act assessment.

The Second Reading speech suggests this was not the intent of the EPBC Act. It notes that until 1999, the Commonwealth had become 'involved in the assessment of projects which raise environmental issues of only local or state significance. This should not occur'.

- All components of a proposed action are taken as being part of the nuclear action if this provision is triggered, i.e. the nuclear action assessment is not restricted to only those project components that have radiological aspects. This means, for example, that a proponent will need to consider all impacts on the environment for supporting infrastructure such as water supply pipelines, electricity transmission lines, roads etc. (see Box 2).

Table 5.1 **Uranium mining decisions under the EPBC Act**

Proposed action	Controlling provisions	Status[47]	State conditions	Commonwealth conditions
Beverley Uranium Mine Extension EPBC 2006/3167	Nuclear actions	Approved 28 Aug 2008	Required achievement of environmental outcomes relating to: • Groundwater • Native vegetation and fauna • Weeds, plant pathogens and pests • Uncontrolled fires • Aboriginal cultural heritage • Land and soils • Radiological impact on the environment • Public health and safety Monitoring program required to verify achievement of outcomes.	EPBC Act conditions required similar outcomes. The outcomes were agreed between the South Australian Government and Australian Government to ensure consistency.
Four Mile Uranium Mine EPBC 2008/4252	Nuclear actions	Approved 13 Jul 2009	Required achievement of environmental outcomes relating to: • Groundwater • Native vegetation and fauna • Weeds, plant pathogens and pests • Uncontrolled fires • Aboriginal cultural heritage • Land and soils • Radiological impact on the environment • Public health and safety Monitoring program required to verify achievement of outcomes and to validate predictions of enhanced natural attenuation of mining fluids.	As above, required similar outcomes. Allowed the Minister to impose a rehabilitation bond if not satisfied as to the adequacy of the South Australian Government bond.

Proposed action	Controlling provisions	Status	State conditions	Commonwealth conditions
Beverley North Extension EPBC 2009/5138	Nuclear actions	Approved 6 Dec 2010	Required achievement of environmental outcomes relating to: • Groundwater • Biodiversity • Weeds, plant pathogens and pests • Aboriginal cultural heritage • Land and soils • Radiological impact on the environment • Public health and safety Monitoring program required to verify achievement of outcomes and to validate predictions of enhanced natural attenuation of mining fluids.	As above, required similar outcomes. Allowed the Minister to impose a rehabilitation bond if not satisfied as to the adequacy of the South Australian Government bond.
Olympic Dam Expansion	Wetlands of international importance Listed threatened species and communities Listed migratory species Nuclear actions Commonwealth land	Approved 10 Oct 2011	State conditions were complex and some were addressed through amendments to the Indenture Agreement. State conditions were generally more detailed than the EPBC Act conditions. Consistent provisions applied to the environmental protection management program for mining activities.	Required achievement of outcomes relating to: • Radiation • Site contamination • Groundwater • Fauna • Extraction of water from the Great Artesian Basin Required development of an environmental protection management program and regular review of that program. Allowed the Minister to impose a rehabilitation bond if not satisfied as to the adequacy of the South Australian Government bond. Included conditions on other project components – desalination plant, barge landing facility, sulfur handling facility, transport of copper and uranium oxide and Port of Darwin handling facility and the infrastructure corridors. Required an environmental offsets plan for vegetation clearance.

Proposed action	Controlling provisions	Status	State conditions	Commonwealth conditions
Wiluna Uranium Project EPBC 2009/5174	Nuclear actions	Approved 2 Apr 2013	Conditions related to: • Flora and vegetation • Research offset for impacts on Tecticornia species • Groundwater drawdown • Surface water • Dust management • Stygofauna.	Required achievement of environmental outcomes relating to: • Radiation • Groundwater • Surface water Included specific conditions on construction and rehabilitation of the tailings storage facility. Required approval of an environmental management plan and a cultural heritage management plan, and demonstration of consultation with relevant Indigenous persons. Allowed the Minister to impose a rehabilitation bond if not satisfied as to the adequacy of the Western Australian Government bond.
Kintyre Uranium Project EPBC 2010/5637	Nuclear actions Listed threatened species and communities	Approved 22 Apr 2015	Conditions relating to: • Conservation significant fauna • Non-human biota	Required achievement of environmental outcomes relating to: • Radiation • Groundwater • Surface water • Terrestrial fauna • mine closure Included specific conditions on construction and rehabilitation of the tailings storage facility. Required approval of an environmental management plan and a cultural heritage management plan, and demonstration of consultation with relevant Indigenous persons. Allowed the Minister to impose a rehabilitation bond if not satisfied as to the adequacy of the Western Australian Government bond.

Proposed action	Controlling provisions	Status	State conditions	Commonwealth conditions
Mulga Rock Uranium Project EPBC 2013/7083	Nuclear actions Listed threatened species and communities	Approved 2 Mar 2017	Conditions related to • Flora and vegetation • Terrestrial fauna • Aboriginal heritage • Inland waters environmental quality (dewatering) • Terrestrial environmental quality • Tailings storage facilities The conditions also included detailed requirements for outcome based and management based conditions, environmental management plans and compliance assessment reporting.	Required approval holder to implement the conditions of the Western Australian Government approval. Required an offset plan for the Sandhill Dunnart.
Extension of Wiluna Uranium Project EPBC 2014/7138	Nuclear actions Listed threatened species and communities	Approved 5 Jul 2017	Conditions related to • Flora and vegetation • Exclusion zones for specified species • Subterranean fauna • Groundwater drawdown and dewater reinjection • Surface water • Dust management • Heritage • Flora and fauna offsets • Tailings storage facility. The conditions also included detailed requirements for outcome based and management based conditions, environmental management plans and compliance assessment reporting.	Required approval holder to implement the conditions of the Western Australian Government approval. Required an offset plan and management plan for the Night Parrot.

Proposed action	Controlling provisions	Status	State conditions	Commonwealth conditions
Yeelirrie Uranium Mine 2009/4906	Nuclear actions Listed threatened species and communities Listed migratory species	Awaiting approval decision	Conditions related to • Subterranean fauna • Threatened flora (Atriplex yeelirrie) • Flora and vegetation • Terrestrial fauna • Hydrological processes – survey and management • Inland waters environmental quality • Heritage • Rehabilitation and decommissioning • Subterranean fauna research plan • Rare flora offset plan The conditions also included detailed requirements for management based conditions, environmental management plans and compliance assessment reporting.	To be determined

5.3 Approvals

A notable feature of the approval process for uranium mining proposals under the EPBC Act has been the time taken to make an approval decision. Table 5.2 shows proposals that have had the approval timeframe formally extended. There are other projects where the timeframe was not extended but the decision was late.

Most proposals have had their approval timeframe formally extended, in one case multiple times. For three Western Australian (WA) projects, timeframes were extended but the decision was still made well after the extended timeframe (or is yet to be made). The EPBC Act decisions for the WA projects were also made well after the WA Government decisions.

The Department of the Environment and Energy has changed its approach to condition setting over the last 10 years. The conditions attached to the EPBC Act approvals in South Australia sought to ensure consistency with the South Australian Government conditions. Consequently, both sets of conditions required the approval holder to meet similar environmental outcomes. These had been negotiated and agreed between the two governments.

Table 5.2 **Time extensions for uranium mining assessments**

	Extension	Date of state decision	Date of EPBC Act decision	Days between decisions
Beverley Uranium Mine Extension EPBC 2006/3167	12 business days from 12 Aug 2008 40 business days from 17Jun 2018	29 Aug 2008	(SA decisions were delayed so that they were made at the same time as the EPBC Act decision)	0
Beverley North Extension EPBC 2009/5138	45 business days from 28 Sep 2010	6 Dec 2010		
Wiluna Uranium Project EPBC 2009/5174	Extended on 6 Nov 2012 for 30 business days Further extended 18 Dec 2012 to 31 Mar 2013 Further extended on 26 Mar 2013 to 5 Apr 2013	10 Oct 2012	2 Apr 2013	174
Mulga Rock Uranium Project EPBC 2013/7083	Extended on 12 Sep 2016 for 40 business days	16 Dec 2016	2 Mar 2017 (WA decision)	76
Extension of Wiluna Uranium Project EPBC 2014/7138	40 business days to 13 Dec 2016	9 Jan 2017	5 Jul 2017	177
Yeelirrie Uranium Mine 2009/4906	Extended on 2 Sep 2016 for 40 business days	16 Jan 2017	No decisions at Jul 2018	>450

The EPBC Act approval for the Wiluna Uranium Project also took an outcomes based approach.[48] While this was not necessarily inconsistent with the WA Government approval conditions, the WA conditions were far more detailed for certain issues. They also did not address other matters that were addressed in the EPBC Act conditions. This was because the WA Environmental Protection Authority (EPA) took the position that it did not need to condition for matters that would be adequately addressed by other WA government agencies. For example, the EPBC Act decision required a Mine Closure Plan whereas the WA EPA considered this could be adequately addressed by the Department of Mines and Petroleum.

By 2016, it had become clear that the attempt by the previous Abbott Government to develop approval bilateral agreements under the EPBC Act was not going to be supported by the Senate. In response, the Government sought ways to place greater reliance on state/territory approval conditions. As a result, the Department of the Environment and Energy developed the *EPBC Act Condition-setting Policy*.[49] This specifies that if a project is subject to state/territory conditions, the Australian Government will decide whether:

- A single condition to require compliance with particular state or territory conditions is attached to an approval under the EPBC Act
- Custom conditions are attached to an approval under the EPBC Act
- No conditions are attached to an approval under the EPBC Act.

When considering which condition-setting option is most suitable for a project, the Policy states that the Minister will consider its particular circumstances. For example:

- Is the proposed action likely to result in a residual adverse significant impact to a protected matter?
- Do the state or territory conditions appropriately manage the likely impact to the relevant protected matter?
- Are there any further avoidance or mitigation measures identified during the assessment phase which require codifying in Commonwealth conditions?

This approach can be seen in condition 1 of the Mulga Rock approval:

1. To manage the impacts of the action on protected matters, the person taking the action must implement the conditions of the WA approval.

The approval includes a condition requiring preparation of a Sandhill Dunnart Conservation Plan. The remaining conditions are administrative. The approval for the Extension of Wiluna Uranium Project has a similar condition requiring compliance with WA conditions and specific conditions addressing potential for impacts on the Night Parrot.

According to the Condition-setting Policy, it 'aims to streamline the regulatory process by avoiding duplicative or unnecessary approval conditions between jurisdictions, in circumstances where state or territory conditions appropriately manage the environmental impacts on a Matter of National Environmental Significance'.

To some extent, the policy has been successful in achieving that aim with the recent uranium mining approvals. However, it has potentially broadened the scope of the Australian Government's compliance role. The previous approach meant that the Department of the Environment and Energy was selective in condition-setting and only applied conditions to those matters which it considered were sufficiently important. The recent approach means that a failure to meet any WA condition is also a breach of the EPBC Act. Consequently, the Australian Government is effectively duplicating the compliance responsibility of the WA Government.

6

Capture of non-uranium mines under the nuclear action trigger

The Senate Committee that reviewed the EPBC Bill 1998 made the following comment in their report:

> The Bill is clearly not intended to capture non-uranium mining. To avoid doubt, the Explanatory Memorandum states that the mining and milling of uranium ore does not include 'operations for recovery of mineral sands or rare earths'. The Committee considers that the mining and processing of minerals containing incidental or trace amounts of uranium or other radioactive elements could not reasonably be interpreted as being a nuclear action.[50]

Given this comment, the committee members may be surprised that the following projects have triggered the EPBC Act as a nuclear action:

- Fingerboards mineral sands project, Victoria (Kalbar Resources Ltd)
- Nolans Rare Earth Oxide and Phosphate Mine (Arafura Resources)
- Carrapateena copper-gold mining and processing project, South Australia (OZ Minerals).

These projects were considered to include a large scale disposal/storage facility for radioactive waste as radiation resulting from the uranium and thorium content exceeded the activity values and activity concentration value specified in the EPBC Regulations. This interpretation could potentially capture a number of mineral sands, rare earth and other mining projects that have naturally occurring radioactive material (NORM). It is somewhat incongruous to capture such activities as a 'nuclear action' given they have no relationship with the nuclear fuel cycle.

The Senate Committee noted concerns from state governments about the wording of this provision. For example, the Western Australian Government stated:

> There is no technical definition of radioactive waste. Arguably this could include radioactive waste of very low activity, or small amounts of higher level activity such as medical isotopes. This trigger would then be used to provide for Commonwealth involvement in a wide range of waste disposal matters at local or regional level which was not the intent of the Council of Australian Governments' Heads of Agreement.

The Committee did not believe such concerns were valid:

> These concerns are addressed by the Explanatory Memorandum, which indicates that a judgement about whether a disposal facility is large scale will be based on factors including: the activity of radioisotopes to be disposed of, the half-life of the material, the form of the radioisotopes, and the quantity of isotopes handled. For example, a National Radioactive Waste Repository would be considered to be a large scale disposal facility, but radioactive waste disposal facilities operated by hospitals would not. The Committee concludes that the intended meaning of a large-scale disposal facility is clear.

The Committee supported the approach in the Bill to leave further definition of a 'large-scale disposal facility' to regulations.

The 1997 CoAG Heads of Agreement does not specifically mention radioactive waste facilities as it only focused on uranium mining and milling.[51] There is no indication in the agreement that regulation of nuclear activities should extend to 'mining and processing of minerals containing incidental or trace amounts of uranium or other radioactive elements'. Nor is this apparent from the EPBC Bill Explanatory Memorandum, as noted by the Senate Committee. The capture of a range of non-uranium mining projects under this provision would appear to be an unintended consequence of the wording of this provision.

The implementation of these provisions in the EPBC Act also appears to be inconsistent. It is difficult to see why the above three projects triggered the EPBC Act as a nuclear action while other projects with similar radiological issues haven't. This supports the conclusion that greater clarity is needed around this section of the Act and its intended effect.

The Hawke review of the EPBC Act briefly addressed this matter and acknowledged the need for clarification.[52] The review noted the following from a submission by the South Australian Chamber of Minerals and Energy:

> Irrespective of the definition of 'nuclear action' the Act does not clearly define mining in the context of uranium. The Chamber is concerned that some activities could technically invoke the Act and be deemed controlled actions because they involve the extraction of material that contains uranium, although not the target resource. These include geothermal and mineral sands operations, and could also extend to oil and gas operations. The Department of Environment, Water, Heritage and the Arts (DEWHA) web site clarifies that mineral sands is excluded as a nuclear action, although the EPBC Act itself and the relevant guidelines (EPBC Act Policy Statement 1.1 – Significant Impact Guidelines, May 2006) does not clearly articulate this exemption. The Act and guidelines/policies need to be clear on matters around what constitutes a nuclear action. For operations where uranium is incidental to projects such as geothermal, mineral sands, and oil and gas, these should be specifically excluded as a nuclear action under the Act.

The review concluded that 'the suggestion to clarify the scope of the matter of NES relating to nuclear actions has merit and should be explored further by the Australian Government'. However, this was not included as a specific recommendation and has not been acted on. As noted above, the Significant Impact Guidelines remain unchanged and only further confuse the matter.

In addition, there is inconsistency between the EPBC Regulations and the ARPANS Regulations, in defining large scale facilities requiring regulation. The ARPANS Regulations define controlled material if it exceeds the prescribed activity level or the activity concentration. To trigger the definition of a nuclear action through the EPBC Regulations, a facility must exceed both the prescribed activity level and activity concentration. The activity concentration and activity levels for storage are different in the ARPANS Regulations to those for disposal whereas they are the same in the EPBC Regulations.

Like uranium mining, mining of commodities containing NORM is subject to regulation by state/territory agencies. This can include a requirement for a project specific NORM Management Plan, that consists of a Radiation Management Plan and Radioactive Waste Management Plan, and other project specific management arrangements as agreed with the relevant state/territory authority, using the guidance from the ARPANSA Mining Safety Guide as a basis.[53] The additional benefit of EPBC Act regulation to these operations is questionable.

7

Options for change

7.1 Removal of uranium mining and milling as a nuclear action

As already noted, the mining industry has a firm view that uranium mining should be treated in the EPBC Act in the same way as other forms of mining. Others, such as the Senate Committee that reviewed the EPBC Bill, believe it warrants special attention due to 'the nature of the materials produced'.

The 'nature of the material' means that it carries two key risks: nuclear proliferation and radiation. The first of these is dealt with through a number of international agreements and legislation, most notably, the *Nuclear Non–Proliferation (Safeguards) Act 1987*. The nuclear action provisions in the EPBC Act are not needed nor are they appropriate to address this matter.

The second, radiation, is one of the most heavily regulated aspects of the mining industry where national guidance is developed by ARPANSA based on best international practice and state and territory governments regulate within well-established systems. Radiation exposure to workers and members of the public from uranium mines in Australia is consistently well below the required standard indicating that these risks are already well managed.

The Commonwealth's resources could be better directed to working with state/territory governments through ARPANSA to ensure assessment of radiological aspects of uranium mining continues to reflect world best practice and a consistent approach is applied across Australia, as agreed by the Australian Health Ministers' Conference. Important components of such an approach include:

- Adherence with the ARPANSA National Standards for radiation protection in mining and minerals processing
- A radiological risk assessment of waste disposal facilities (such as tailings dams).

For mining and mineral processing of radioactive ores, tailings disposal facilities are generally classified as radioactive waste disposal facilities. There are a number of guidelines that could be considered for the design, operation and closure phases for the control of radiation for radioactive waste disposal facilities. In Australia, ARPANSA has adopted the International Atomic Energy Agency Standard (IAEA), as the national standard for radioactive waste disposal.[54]

For tailings disposal facilities, the Australian mining industry uses Australian National Committee on Large Dams (ANCOLD) guidelines which provide guidance on the full range of potential hazards and risks associated with tailings facilities.[55]

In recent years, the IAEA and OECD have developed formal processes to assess the potential impacts from radioactive waste disposal facilities. The processes involve an assessment against a standard set of features, events and processes against which the broad facility design and operating practices are considered. In practice, at its most basic, the assessment is a risk assessment, with the focus on radiation related controls.

It is reasonable to expect that a proponent has undertaken a radiological risk assessment of any waste disposal facility and that the facility complies with nationally recognised standards such as the ANCOLD guidelines.

These assessments are best undertaken by regulatory agencies responsible for radiation protection. The Department of the Environment and Energy does not have expertise in radiation assessment and management, other than limited resources within the Supervising Scientist Division which are primarily directed to oversight of the Ranger uranium mine. Instead, the Department generally seeks advice from ARPANSA and state/territory radiation regulatory agencies.

There are no other impacts of uranium mining that are unique to the 'nature of the material'. Non-radiological impacts are shared by many other types of mines. The fact that two mines with identical impacts could be regulated quite differently under the EPBC Act is unjustifiably discriminatory and inconsistent with good regulatory practice. Furthermore, two mines with identical radiological risks could also be regulated differently if one is a uranium mine and the other, for example, is a mineral sands mine.

Consequently, there is a strong case to argue that uranium mining should be removed from the list of nuclear actions. If considered necessary, this change could be subject to the Australian Government and state/territory governments agreeing on minimum requirements for assessment and regulation of uranium mining projects. Amendment to the provisions for large scale disposal or storage of radioactive waste would also be required to ensure uranium mining wasn't then captured by these provisions due to their tailings storage facilities.

Uranium mining would still trigger the EPBC Act if it was likely to have significant impact on one of the other Matters of National Environmental Significance. This is appropriate and consistent with other mining projects.

7.2 More focused EPBC Act assessments

If removal of uranium mining and milling as a nuclear action is not supported by the Australian Government, there is, at the very least, a need to ensure the EPBC Act assessment is focused on radiological aspects and does not, as at present, address all impacts on the environment. As discussed above, non-radiological impacts cannot reasonably be considered a matter warranting Australian Government assessment and approval unless they significantly impact one of the other Matters of National Environmental Significance.

The Second Reading speech on the Environment Protection and Biodiversity Bill 1999 was very clear about the involvement of the Commonwealth in projects that raise environmental issues of only local or state significance: 'This should not occur'.[56]

A more focused approach is consistent with that adopted for other Matters of National Environmental Significance. These restrict the EPBC Act assessment to certain protected matters, e.g. the world heritage values of a property; ecological character of a Ramsar wetland etc. This ensures that the assessment remains focused on the matter that triggered the need for Commonwealth approval. Unlike nuclear actions, having triggered the Act, the assessment does not then consider all impacts on the environment. The residual matters are appropriately left to state/territory governments to assess.

The EPBC Act would require amendment so that:

- A uranium mining proposal would only require approval under the Act if the radiological aspects of the action were likely to have a nationally significant impact on the environment
- The 'relevant impacts', as defined in section 82 of the EPBC Act, would only be those relating to impacts that could be caused by radiation.

7.3 Exclusion of non-uranium mining projects from the nuclear action trigger

The triggering of copper and mineral sands mining projects as a nuclear action appears to be inconsistent with the intent of the drafters of the Act as noted in the Explanatory Memorandum. This has been a source of considerable confusion and, as a result, inconsistent application. There is even less of a case for inclusion of mining projects that have incidental amounts of uranium or thorium than there is for uranium mining. Mineral sands and copper mining are not part of the nuclear fuel cycle and it is inappropriate to define them as a nuclear action.

This situation could be addressed through amendments to the EPBC Regulations to provide a clearer understanding of what is to be regarded as a large scale disposal or storage facility for radioactive waste. The EPBC Regulations should reflect the intent of the Explanatory Memorandum by specifically excluding 'operations for the recovery of mineral sands or rare earths'. This should be done through a more general provision that excludes NORM to ensure these provisions are focused on radioactive material associated with nuclear fission and reprocessing.

7.4 'No legislative change' actions

In the absence of any legislative change, there are still actions that can be taken by the Department of the Environment and Energy to improve the administration of the nuclear action trigger:

- Revising Significant Impact Guidelines 1.1 to:
    - Provide clearer and more specific guidance and justification on when a uranium mining action is likely to have a significant impact on the environment. The guidance should:
        - Identify the environmental aspects of uranium mining that could result in a significant impact on the environment (e.g. dust emissions, radiation, tailings seepage, groundwater drawdown, changes to surface water flow)
        - For each aspect, provide guidance on the types of impacts that are likely to be significant focusing on those matters that are specific to uranium mining. Significant Impact Guidelines 1.2 (refer to Stage 4 in the guidelines) could be referenced for guidance on more general impacts.
    - Provide greater clarity around the application of the EPBC Act to non-uranium mining projects.
- Focusing EPBC Act assessments on radiological impacts, drawing on advice from ARPANSA and state/territory regulatory agencies, and leaving assessment of non-radiological impacts to state/territory agencies, other than those relating to other matters of national environmental significance.
- Amending the EPBC Regulations to ensure consistency with the ARPANS Regulations in the definition of large scale disposal and storage facilities for radioactive waste.
- Reducing duplication through the current practice of relying on state/territory conditions where possible. However, EPBC Act approvals should not require compliance with all state/territory conditions. The EPBC Act approval should only specify the state/territory conditions that address radiological impacts and are of sufficient importance to warrant EPBC Act compliance.
- Working cooperatively with state/territory governments to ensure good practice in the quality and efficiency of uranium mining assessments. This could include ensuring:
    - More consistent approaches
    - Best practice for radiation assessments is used, as discussed in section 7.1
    - An outcomes and risk-based approach is used for assessments and approvals.

References

Australian Government, Department of the Environment and Energy, *Heads of agreement on Commonwealth and State roles and responsibilities for the Environment*, Council of Australian Governments, 1997

Australian Government, Department of the Environment, *Matters of National Environmental Significance – Significant Impact Guidelines 1.1*, Commonwealth of Australia, 2013

Australian Government, *Mine Closure*, Leading Practice Sustainable Development Program for the Mining Industry, Commonwealth of Australia, September 2016

Australia, House of Representatives, *Parliamentary Debates,* Environment Protection and Biodiversity Conservation Bill 1999. Second Reading Speech. 29 June 1999. Commonwealth of Australia

Australia, Parliament, *Explanatory Memorandum*. Environment Protection and Biodiversity Conservation Bill 1998 (Cth)

Australia, Parliament, *Regulating the Ranger, Jabiluka, Beverley and Honeymoon uranium mines,* Senate Environment, Communications, Information Technology and the Arts References Committee, October 2003

Australian National Committee on Large Dams Incorporated (ANCOLD), *Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure*, May 2012

Australian Radiation Protection and Nuclear safety Agency. *National Directory for Radiation Protection*, Radiation Protection Series No. 6. June 2017

Australian Radiation Protection and Nuclear Safety Agency, *ANRDR in Review 2016*, 2016

Australian Radiation Protection and Nuclear Safety Agency, *Fundamentals for Protection Against Ionising Radiation*, Radiation Protection Series F-1, Canberra, 2014

Australian Radiation Protection and Nuclear Safety Agency, *Code of Practice for the Safe Transport of Radioactive Material*, Melbourne, Radiation Protection Series RPS 2, Canberra, 2014

Australian Radiation Protection and Nuclear Safety Agency, *Management of Naturally Occurring Radioactive Material (NORM)*, Radiation Protection Series Publication No. 15, August 2008

Australian Radiation Protection and Nuclear Safety Agency, *The Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing*, Radiation Protection Series, RPS 9, Canberra, 2005

Australia, Senate, *Senate Environment and Communications Committee Report*, Environment Protection and Biodiversity Conservation Bill 1998. April 1999

Commonwealth of Australia 2006, *Uranium Mining, Processing and Nuclear Energy — Opportunities for Australia?*, Report to the Prime Minister by the Uranium Mining, Processing and Nuclear Energy Review Taskforce, December 2006

Department of the Environment and Energy, *EPBC Act Public notices*, 2018

Department of the Environment, *EPBC Act Condition-setting Policy*, 2016, viewed 28 June 2018

Department of the Environment, Water, Heritage and the Arts, *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*, 2013, viewed 28 June 2018

Department of Health, *Australian Clinical Guidelines for Radiological Emergencies*. Commonwealth of Australia. September 2012

Department of the Prime Minister and Cabinet, *The Australian Government Guide to Regulation*, Commonwealth of Australia, Canberra, 2014

Department of Sustainability, Environment, Water, Population and Communities, *Significant impact guidelines 1.2 - Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies*, 2013, viewed 28 June 2018

Doering, C. (2014). *Environmental protection: Development of an Australian approach for assessing effects of ionising radiation on non-human species*, Australian Radiation and

Nuclear Safety Agency, Technical Report 154. October 2010

Environment Protection and Biodiversity Conservation Act 1999 (Cth)

Environment Protection and Biodiversity Conservation Regulations 2000 (Cth)

Government of Western Australia, *Report and recommendations of the Environmental Protection Authority*, Wiluna Uranium Project, Report 1437, May 2012

Gundjeihmi Aboriginal Corporation, *Uranium Mining*

Fox RW, Kelleher GG & Kerr CB, *Ranger Uranium Environmental Inquiry: First Report*, Australian Government Publishing Service, Canberra, 1976

Harris M, *The origin of Australia's uranium export policy*, Background Note, Parliamentary Library, Department of Parliamentary Services, 2 December 2011

Hawke A, *The Australian Environment Act - Report of the Independent Review of the Environment Protection and Biodiversity Conservation Act 1999*, Commonwealth of Australia, October 2009

Heard B, *Environmental impacts of uranium mining in Australia: History, progress and current practice,* Policy paper commissioned by the Minerals Council of Australia, Canberra, May 2017

Hirth G, *A review of existing Australian radionuclide activity concentration data in non-human biota inhabiting uranium mining environments*. Australian Radiation Protection and Nuclear Safety Agency, Technical Report 167, May 2014

House of Representatives Senate Standing Committee. (2014). *Inquiry into Streamlining environmental regulation, 'green tape', and one stop shops.* 2014

International Atomic Energy Agency, *Disposal of radioactive waste*, Specific Safety Requirements No. SSR-5, IAEA Vienna, 2011

International Commission on Radiological Protection, *Protection of the environment under different exposure situations*. ICRP Publication 124. Annals of the ICRP 43 (1): 58, 2014

International Commission on Radiological Protection. *Recommendations of the ICRP*. ICRP Publication 26. Annals of the ICRP 1 (3) 1977

Paulka S and Burgess A, *Tailing Management Benchmarking Study*, Uranium Services, Adelaide, SA, 2008 – (attached to Appendix F1, Tailings Storage Facility Design Report, BHP Billiton Olympic Dam Expansion Draft Environmental Impact Statement 2009)

OECD Nuclear Energy Agency, *Managing Environmental and Health Impacts of Uranium Mining*, 2014

OECD Nuclear Energy Agency, *Nuclear Legislation on OECD and NEA Countries, Regulatory and Institutional Framework for Nuclear Activities: Australia*, 2008

Senate Environment and Communications Committee. Environment Protection and Biodiversity Conservation Bill 1998. April 1999

Simon Williamson, *Cameco Australia*, personal interview

Zavattiero D, *Uranium and the case for reform*, Minerals Council of Australia, presentation to AusIMM International Uranium Conference, 2016

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Endnotes

[1] The definition of 'mining' is usually broad and includes milling.

[2] D Zavattiero, *Uranium and the case for reform*, Minerals Council of Australia, presentation to AusIMM International Uranium Conference, 2016.

[3] Australian Government, Department of the Environment, *Matters of National Environmental Significance – Significant Impact Guidelines 1.1*, Commonwealth of Australia, 2013.

[4] Australian Government, Department of the Environment, *Matters of National Environmental Significance – Significant Impact Guidelines 1.1*, Commonwealth of Australia, 2013.

[5] Australia, Parliament, Regulating the Ranger, Jabiluka, Beverley and Honeymoon uranium mines, Senate Environment, Communications, Information Technology and the Arts References Committee, October 2003.

[6] Australia, Parliament, Explanatory Memorandum. Environment Protection and Biodiversity Conservation Bill 1998 (Cth).

[7] Australia, House of Representatives, Parliamentary Debates, Environment Protection and Biodiversity Conservation Bill 1999. Second Reading Speech. 29 June 1999. Commonwealth of Australia.

[8] Australian Government, Department of the Environment and Energy, *Heads of agreement on Commonwealth and State roles and responsibilities for the Environment*, Council of Australian Governments, 1997.

[9] National heritage places were not originally included in the Environment Protection and Biodiversity Conservation Act. Two additional matters of national environmental significance were later added: the water trigger and the Great Barrier Reef Marine Park.

[10] Australian Government, Department of the Environment and Energy, Heads of agreement on Commonwealth and State roles and responsibilities for the Environment, Council of Australian Governments 1997

[11] Australia, Senate, Senate Environment and Communications Committee Report, Environment Protection and Biodiversity Conservation Bill 1998, April 1999.

[12] Gundjeihmi Aboriginal Corporation, *Uranium Mining*, viewed 28 June 2018.

[13] M Harris, *The origin of Australia's uranium export policy*, Background Note, Parliamentary Library, Department of Parliamentary Services, 2 December 2011.

[14] M Harris, *The origin of Australia's uranium export policy*, Background Note, Parliamentary Library, Department of Parliamentary Services, 2 December 2011.

[15] RW Fox, GG Kelleher & CB Kerr, Ranger Uranium Environmental Inquiry: First Report, Australian Government Publishing Service, Canberra, 1976.

[16] RW Fox, GG Kelleher & CB Kerr, Ranger Uranium Environmental Inquiry: Second Report, Australian Government Publishing Service, Canberra, 1977.

[17] M Harris, *The origin of Australia's uranium export policy*, Background Note, Parliamentary Library, Department of Parliamentary Services, 2 December 2011.

[18] M Harris, *The origin of Australia's uranium export policy*, Background Note, Parliamentary Library, Department of Parliamentary Services, 2 December 2011.

[19] RW Fox, GG Kelleher & CB Kerr, Ranger Uranium Environmental Inquiry: First Report, Australian Government Publishing Service, Canberra, 1976.

[20] RW Fox, GG Kelleher & CB Kerr, Ranger Uranium Environmental Inquiry: First Report, Australian Government Publishing Service, Canberra, 1976.

[21] Council of Australian Governments. (1997). *Heads of Agreement on Commonwealth and State roles and responsibilities for the Environment*, viewed 28 June 2018.

[22] OECD Nuclear Energy Agency, *Nuclear Legislation on OECD and NEA Countries, Regulatory and Institutional Framework for Nuclear Activities: Australia*, 2008.

[23] OECD Nuclear Energy Agency, *Nuclear Legislation on OECD and NEA Countries,*

Regulatory and Institutional Framework for Nuclear Activities: Australia, 2008.

[24] OECD Nuclear Energy Agency, *Managing Environmental and Health Impacts of Uranium Mining*, 2014.

[25] Commonwealth of Australia 2006, *Uranium Mining, Processing and Nuclear Energy — Opportunities for Australia?*, Report to the Prime Minister by the Uranium Mining, Processing and Nuclear Energy Review Taskforce, December 2006.

[26] International Commission on Radiological Protection. Recommendations of the ICRP. ICRP Publication 26. Annals of the ICRP 1 (3) 1977.

[27] Australian Radiation Protection and Nuclear Safety Agency, Fundamentals for Protection Against Ionising Radiation, Radiation Protection Series F-1, Canberra, 2014.

[28] Australian Radiation Protection and Nuclear Safety Agency, The Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing, Radiation Protection Series, RPS 9, Canberra, 2005.

[29] Australian Radiation Protection and Nuclear Safety Agency, Management of Naturally Occurring Radioactive Material (NORM), Radiation Protection Series Publication No. 15, August 2008.

[30] Australian Radiation Protection and Nuclear Safety Agency, Code of Practice for the Safe Transport of Radioactive Material, Melbourne, Radiation Protection Series RPS 2, Canberra, 2014.

[31] Australian Radiation Protection and Nuclear safety Agency. National Directory for Radiation Protection, Radiation Protection Series No. 6. June 2017.

[32] Australian Radiation Protection and Nuclear Safety Agency, ANRDR in Review 2016, 2016.

[33] Australian Government, Mine Closure, Leading Practice Sustainable Development Program for the Mining Industry, Commonwealth of Australia, p.6, September 2016.

[34] RW Fox, GG Kelleher & CB Kerr, Ranger Uranium Environmental Inquiry: First Report, Australian Government Publishing Service, Canberra, 1976.

[35] B Heard, *Environmental impacts of uranium mining in Australia: History, progress and current practice*, Policy paper commissioned by the Minerals Council of Australia, Canberra, May 2017.

[36] S Paulka and A Burgess, *Tailing Management Benchmarking Study*, Uranium Services, Adelaide, SA, 2008 – (attached to Appendix F1, Tailings Storage Facility Design Report, BHP Billiton Olympic Dam Expansion Draft Environmental Impact Statement 2009).

[37] Australian National Committee on Large Dams Incorporated (ANCOLD), *Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure*, May 2012.

[38] Commonwealth of Australia 2006, *Uranium Mining, Processing and Nuclear Energy — Opportunities for Australia?*, Report to the Prime Minister by the Uranium Mining, Processing and Nuclear Energy Review Taskforce, December 2006.

[39] D Zavattiero, *Uranium and the case for reform*, Minerals Council of Australia, presentation to AusIMM International Uranium Conference, 2016.

[40] Department of Health, Australian Clinical Guidelines for Radiological Emergencies. Commonwealth of Australia. September 2012.

[41] Department of the Prime Minister and Cabinet, The Australian Government Guide to Regulation, Commonwealth of Australia, Canberra, 2014.

[42] Department of the Environment, Water, Heritage and the Arts, *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*, 2013, viewed 28 June 2018.

[43] Australia, House of Representatives, Parliamentary Debates, Environment Protection and Biodiversity Conservation Bill 1999. Second Reading Speech. 29 June 1999. Commonwealth of Australia.

[44] Department of Sustainability, Environment, Water, Population and Communities, *Significant impact guidelines 1.2 - Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies*, 2013, viewed 28 June 2018.

[45] Australia, Parliament, Explanatory Memorandum. Environment Protection and Biodiversity Conservation Bill 1998 (Cth).

[46] Simon Williamson, Cameco Australia, pers. com.

[47] Status as of 13 June 2018

[48] Government of Western Australia, *Report and recommendations of the Environmental Protection Authority*, Wiluna Uranium Project, Report 1437, May 2012.

[49] Department of the Environment, *EPBC Act Condition-setting Policy*, 2016, viewed 28 June 2018.

[50] Australia, Senate, Senate Environment and Communications Committee Report, Environment Protection and Biodiversity Conservation Bill 1998. April 1999.

[51] Council of Australian Governments (1997), *Heads of Agreement on Commonwealth and State roles and responsibilities for the Environment*, viewed 28 June 2018.

[52] A Hawke, *The Australian Environment Act - Report of the Independent Review of the Environment Protection and Biodiversity Conservation Act 1999*, Commonwealth of Australia, October 2009.

[53] Australian Radiation Protection and Nuclear Safety Agency, Management of Naturally Occurring Radioactive Material (NORM), Radiation Protection Series Publication No. 15, August 2008.

[54] International Atomic Energy Agency, Disposal of radioactive waste, Specific Safety Requirements No. SSR-5, IAEA Vienna, 2011.

[55] Australian National Committee on Large Dams Incorporated (ANCOLD), *Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure*, May 2012.

[56] Australia, House of Representatives, Parliamentary Debates, Environment Protection and Biodiversity Conservation Bill 1999. Second Reading Speech. 29 June 1999. Commonwealth of Australia.

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