

NUCLEAR WASTE Q & A

WHAT IS BEING PROPOSED TO BE DUMPED AT A MUCKATY RADIOACTIVE WASTE REPOSITORY — SOME FACTS —

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RADIOACTIVE WASTE comes either from unstable materials which give off energy in the form of ionising radiation, or from a process called 'fission' which occurs in a nuclear reactor. Australia has a nuclear reactor at Lucas Heights in Sydney. This is the most recent of several reactors running at Lucas Heights over the last sixty years. Just from the operation of these, we have now accumulated considerable radioactive waste in Australia.



Why is radioactive waste dangerous?

The radioactivity in radioactive waste can be long-lived and can continue to be a hazard to humans, animals and the environment for hundreds to thousands of years. In humans it causes cancer, usually after 10-20 years of exposure, and continues to do so over many decades once a person has been exposed.

How do people become exposed to this hazard?

If the waste enters the ground water, atmosphere or soil, it can contaminate the food chain and enter our bodies when we eat or drink our normal food, exposing us to radiation. This happens if radioactive waste is not properly isolated. Contaminated water, for example, can contaminate grass that cows eat and so contaminate the milk that we might drink, or, more directly, it can contaminate plants we might eat.

How should radioactive waste be disposed of?

The aim of disposal is to isolate the waste from the environment as long as it remains hazardous.

This time period depends on what is actually contained in the waste and how long each particular substance takes to break down (called decay).

Radioactive decay is like a battery running down – eventually the battery runs flat and has little or no energy left in it. Some radioactive waste decays in a few minutes, some takes days to weeks, and much of the most hazardous waste can last up to hundreds or even thousands of years. The longer a substance takes to decay, and the more of it there is, the longer it needs to be isolated from the environment.

What is meant by 'storage'?

Storage means placing waste in a temporary location, with the intention of retrieving it at a later date to finally properly dispose of it. Storage is intended to be short term – it is not meant to replace proper long term disposal. Storing waste in this manner is only acceptable in the short term, to avoid an immediate threat to the environment and humans or in preparation for proper disposal.



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What is meant by 'disposal'?

Disposal means permanently isolating the waste with no plan to ever retrieve it. For example, burying something deep in the ground and planning never to dig it up again is 'disposal'.

What is low-level waste?

This term refers to radioactive waste that needs to be isolated from the environment and humans for at least 300 years, during which time it remains a danger. This is done by burying it in trenches down to about 30 metres below the earth's surface which are engineered to withstand wind and rain for up to 300 years. Wind and rain are the enemies of radioactive waste disposal since they can leach out the waste and contaminate the groundwater and soil despite efforts to contain it.

What is intermediate level waste and how should it be disposed of?

This is the most hazardous radioactive waste in Australia. Intermediate level waste is waste that, because of its content (particularly of long-lived radioactive substances) requires a greater degree of containment and isolation than burial in a shallow trench. It requires disposal at greater depths of tens to hundreds of metres, **typically about 300m**. Furthermore, the isolation needs to be for at least thousands of years whilst it still remains dangerous to humans.

Does all radioactive waste need to be disposed of in a dump such as is proposed at Muckaty?

Only long-lived radioactive waste would be disposed of at the proposed Muckaty site, namely low level waste (LLW). Intermediate level waste (ILW) would also be 'stored' there, but NOT disposed of.

Short-lived waste (not LLW or ILW) decays quickly, in days or weeks, and is not hazardous for long enough to send it vast distances for disposal. By the time it arrived it would have decayed to a safe level. This kind of waste is usually kept in storage for the necessary number of days or weeks until it has decayed to a low enough level. It is then safely discarded in landfill rubbish tips or through the sewers.



Above, Australia's only low level waste repository at Mount Walton, Western Australia. It is only for WA waste. Note the drums of radioactive waste sitting in the middle. When the trench is full, the contents are then buried under topsoil and various other layers to prevent wind and rain reaching them. The aim is never to dig the contents up once the trench is closed.

Nearly all nuclear medicine waste produced now is of this short lived kind and is safely disposed of in this manner. So virtually no nuclear medicine waste produced now will qualify for disposal at the proposed dump at Muckaty.

What low level waste will be disposed of at Muckaty, if it goes ahead?

1. More than half will comprise **ten thousand drums** of contaminated soil currently stored at Woomera. This waste was produced by CSIRO in the 1950s and 1960s during radioactive ores research
2. Less than half would come from the operation of the Lucas Heights nuclear reactor and from its laboratories.
3. The remainder would be another 20 cubic metres of contaminated soil, plus spent radioactive sources used in industrial gauges and smoke detectors, contaminated medical equipment and luminous signs (these are currently held at Defence sites) plus CSIRO waste and research sources from various sites.

Note that the amount of low level waste coming from nuclear medical waste is either negligible, or nil.



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What would happen to the intermediate level waste at Muckaty?

This will *not be disposed of* at Muckaty. It will be *stored*. This plan is indefinite.

The government's policy is not to dispose of this waste, despite this being against international best practice and arguably in breach of Australia's international obligations. Australia's plan has been criticised by international bodies.

The reason that indefinite storage is not acceptable is that storage does not decrease the risk it poses for the duration of the risk, as appropriate disposal would do. The waste is merely brought together in one location. Future generations are left to deal with the problem. Meanwhile, the risk to the environment and humans remains, and the risk to the particular location is increased. Temporary storage might be acceptable while preparing a proper burial site hundreds of metres below ground. But this is not proposed, and there is no such plan.

How is intermediate level waste going to be stored?

It will be placed in a large secured warehouse above ground with the waste stored in various containers on shelves.

What intermediate level waste would be stored at Muckaty?

There is over 500 cubic metres of this waste at the moment. Most is waste from the operation of Lucas Heights reactors. Much of the rest is radioactive thorium, and uranium residues from mineral sands processing during the last century. A very small volume of radioactive sources (objects that are radioactive) are held by CSIRO and Defence at various sites. Much of the 100 cubic metres of state and territory waste is disused sources from industrial, medical and research equipment. So, at most, there is only a very small proportion in this category that might even remotely be referred to as medical waste.

The vast majority of the radioactive waste which requires a dump does not come from nuclear medicine or cancer therapy.



Typical dry cask storage of spent nuclear fuel. The casks to be sent to Australia will be smaller but there will be many more than pictured here.

That small proportion still needs to be disposed of safely but it is misleading to suggest that it alone justifies a specific radioactive waste dump.

What future intermediate level waste will be stored at Muckaty?

A nuclear reactor is powered by fuel rods of radioactive material (uranium). After the fuel rod has been used up in a nuclear reactor, they are referred to as 'spent' fuel rods. Spent fuel rods are highly radioactive (much more radioactive than when they were originally placed in the reactor). Over the past 60 years, Australia has accumulated many spent fuel rods. These have been sent to Scotland and France where two substances which can be re-used, are removed. The rods are still very hazardous and are categorised as intermediate level waste. This 'reprocessed' spent fuel will be returned to Australia. It is planned to store (not dispose of) it in the warehouse on site.

What does this look like?

Fifty-three 500 litre concrete containers of this spent fuel will be returned from Scotland by 2020. Approximately three times as much more will return from in casks from France — to sit on shelves in a warehouse.



What other intermediate level waste will be stored at Muckaty in the future?

Almost 1000 cubic metres of intermediate level waste will accumulate at Muckaty over the next forty years, nearly all of it from the nuclear reactor at Lucas Heights.

What low level waste will be buried at Muckaty in the future?

Almost 2000 cubic metres of low level waste will accumulate and be buried at Muckaty over the next forty years. The vast majority of this too will be from the Lucas Heights nuclear reactor.

In the next forty years (the life of the new reactor at Lucas Heights), the Muckaty dump will be used mainly for the waste derived from this nuclear reactor (80-90% of all future waste). Proportionately, there will be little waste from other sources.

Is Muckaty the preferred site on scientific grounds?

No. Several other sites have been assessed and found to be better than Muckaty for radioactive waste disposal. For example, Mr Everard, about 25km from Alice Springs was the preferred site on scientific, economic and transport grounds identified in a 2009 Australian government report.

Muckaty was found to be a more expensive and less convenient site, partly because extensive shallow rock would require blasting to prepare the low level trenches.

Furthermore, the underground aquifers were much closer to the surface than elsewhere requiring greater engineering (and expense) of the trenches than some other locations.

But don't we need a nuclear reactor to provide nuclear medicine services in Australia and to treat cancer victims?

Australia has chosen to have its radioisotopes used in nuclear medicine made in Australia.

Most countries around the world import their isotopes with no problems. There are five major reactors around the world which supply the world's market.

Even Australia relies on some of its radioisotopes to be imported from time to time, even with our own reactor. The Lucas Heights reactor failed to produce radioisotopes for Australia in its first two years of operation due to technical faults. During this time we imported all our radioisotopes successfully – as we have done successfully for decades.

No nuclear reactor operates for 100% of the time, and imports are needed during the down-time. It is misleading to claim that the Lucas Heights reactor is essential to Australia's nuclear medicine industry to justify a radioactive waste dump.

Canada is the largest producer of medical isotopes in the world, responsible for over 40%. It will close its medical isotope reactor in 2016. Canada has decided that a new reactor is not necessary to provide nuclear medicine services and reactor production is not the most reliable, or the preferred method for the future. It has chosen instead to invest in non-reactor production of isotopes which does not cause the significant degree of radioactive waste that nuclear reactors cause, among many other benefits.

How necessary is the Lucas Heights nuclear reactor for Australia?

It is only as necessary as we want it to be. Its main purpose is for research, and services to private industry from which it earns its income. This is a choice that the Australian government has made. There is no reason that Australia must have a nuclear reactor. Radioisotope production is a side business that is also a choice, not a necessity. It is not the main purpose of Lucas Heights.

If radioisotope production was stopped tomorrow, the waste from the Lucas Heights reactor generated by radioisotope production would only marginally decrease. That is because the reactor produces most of its waste just by running, irrespective of what is done there.

It is a furphy to suggest that the dump is required because Australia needs a nuclear reactor. We require proper disposal of radioactive waste as long as Australia chooses to have a nuclear reactor which will generate the majority of future waste.

The need for radioactive waste disposal is the result of choices made by the Australian government, not of necessity.

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NOTES

Approximately 26m³ of residues from reprocessing of research reactor spent fuel (cemented waste UK) in 53 casks (loaded cask volume 72m³) is expected to be returned to Australia by 2020.

• Approximately 6m³ of vitrified glass waste from processing research reactor spent fuel from Areva, France (in two Transnuclear Inc [TN type] casks, loaded cask volume 60 m³) expected from about 2015.

• Approximately 20m³ of vitrified glass waste (in TN type casks, loaded cask volume up to 120m³) from Areva, France expected between about 2020 and 2060.

