From: George Gear
To: Economics, Committee (SEN)
Subject: NATIONAL RADIOACTIVE WASTE MANAGEMENT AMENDMENT (SITE SPECIFICATION, COMMUNITY FUND AND OTHER MEASURES) BILL 2020 [PROVISIONS] Addition to my submission.
Date: Friday, 26 June 2020 4:43:32 PM
Attachments: Attachment three
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The Chairman
Senate Economics Committee
Parliament House Canberra ACT

Dear Chairman

I have attached two short articles on radioactive storage which will be of assistance to the committee. As you will see the proposal by the government will not be licensed for storage in Australia. It fails to reach the International Atomic Energy Agency (IAEA) standards for the storage of Intermediate Level Waste (ILW).

Accordingly your committee must inform the senate that the Kimba proposal in the bill does not meet IAEA standards and should be withdrawn.

The two articles make this clear.

The first is written by Aurora who are the only company operating a (low level) radioactive storage facility in Australia.

In it they draw attention to the following factors which are relevant to Kimba:

1. The buffer zone is inadequate, it is measured in hectares instead of kilometres. *Leonora has a buffer zone of 15 kms.*

2. The site should be at a location where there are "few active land uses" on surrounding land. As you know the Kimba site is in the middle of a prime wheat growing area. *The site at Leonora is remote, nothing grows there and nobody goes there.*

3. When the governments proposed site is finished with in 30 years and a new underground site has been established the redundant Kimba site will have to be managed (at taxpayer expense) for 300 years.

4. Based on their experience none of the sites in SA would have been considered if it were not for the expression of interest model chosen by the government.

5. The Kimba site is unsuitable.

6. The decision to site the facility at Kimba is a political one and not based on technical or scientific considerations.

The second article is by the AINS Group who are a specialist group in storing radioactive waste. They are based in Helsinki and this article is specific to the decision to establish the facility at Kimba. The main points of the article are:

1. Intermediate Level Waste (ILW) should be stored at intermediate level geological disposal. The Department already knows this. The quote below is taken straight from the " National Radioactive Waste Management Facility Project" (NRWMFP) Facebook home page (attached). The statement that it will take

several decades to site and build is wrong and they know it. The Leonora site can store the ILW at depth within a year and the NRWMFP have known this for 3.5 years.

2.There have been older above ground disposal facilities established in Europe. The Kimba site is based on the El Cabril facility in Cordoba Spain. These sites do not meet current standards of disposal and have either been abandoned or grandfathered with a constant monitoring regime in place where they are still

operational.

3. The current International Atomic Energy Agency (IAEA) guidelines for the storage of ILW is underground. This fits in with the statements by both Aurora and the NRWMFP. It is only the government that have made the political decision to store it above ground.

4. The Kimba site contradicts both the IAEA and ARPANSA (Australian regulator) statements on correct disposal.

These are the IAEA standards for ILW:

Intermediate level waste (ILW): Waste that, because of its content, particularly of long lived radionuclides, requires a greater degree of containment and isolation than that provided by near surface

disposal. However, ILW needs no provision, or only limited provision, for heat dissipation during its storage and disposal. ILW may contain long lived radionuclides, in particular, alpha emitting radionuclides that will not decay to a level of activity concentration acceptable for near surface disposal during the time for which institutional controls can be relied upon. Therefore, waste in this class requires disposal at greater depths, of the order of tens of metres to a few hundred metres.

Source:General Safety Guide No. GSG-1 IAEA publication

5. The El Cabril facility Spain is not on productive land which contrasts with the Kimba proposal. As well it already had radioactive waste at the site when it was established.

6. When comparing Kimba and Leonora they make the obvious point that there would be a need to establish a large infrastructure for transport and development of the facility , which is expensive and already exists in Leonora.

7. Social factors will be important and will more readily be supportive in a mining rather than a farming community.

8. The Kimba site would never gain approval of the regulatory body Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).

You will see that the authors of this report are well credentialed and are active in the field of radioactive waste disposal.

The government proposal is for Kimba is as a temporary facility for ILW which will be about 30 years. In that time the whole process will have to be duplicated and an underground facility will then house the waste. This comes at a huge cost to taxpayers, $325M for the Kimba facility, $30M to the Kimba council, $6.5M in

interest payments every year, $195m over 30 years. Paying 45 public servants for 30 years.. On top of that the expense of going through this whole exercise again

At Leonora we will exceed the IAEA standards and do it for $40M at no capital cost to taxpayers. We can have it operating within a year and the storage happens once and is permanent . Ongoing costs will be much lower than the Kimba proposal.

This is a classic case of politicians dictating an outcome which has no scientific backing. It defies logic.

I would appreciate the opportunity to be able to make a statement to the committee and answer questions.

Regards

Hon George Gear

[redacted]

MEMORANDUM

TO:	Mr Peter Remta
FROM:	Noel Davies
SUBJECT:	[Subject]
DATE:	4/09/2019
CC:	Click here to enter text.
DOCUMENT NO:	AZK-2019-001_001_nd_V1

1 Background

Aurora Environmental or its predecessors have managed the Mt Walton East Intractable Waste Disposal Facility on behalf of the Government of Western Australia. We are, in fact, the only company in Australia with experience in designing and operating a near surface radioactive waste facility.

At your request key Aurora staff have reviewed the documentation released by the Department of Industry, Innovation and Science in relation to the land requirements for the proposed National Radioactive Waste Management Facility. The documentation can be found at the following URL Facility land requirements | Department of Industry, Innovation and Science).

The information presented in the Web site includes a table (reproduced below) outlining changes in the required land area for the site

Site use	Wallerberdina Station		Lyndhurst		Napandee	
Estimates	Early	Revised	Early	Revised	Early	Revised
Operational zone	40	40	40	40	40	40
Buffer zone	60	100	60	100	60	100
Community zone	0	20	0	20	0	20
Total	100	160*	100	160*	100	160*

2 Analysis

It is somewhat surprising, given the level of expenditure committed by the Federal Government and the time that has elapsed since a search for suitable site began that the key design characteristics of the site are still in such a formulative stage and the facility design is still at a conceptual stage. A key factor contributing to the slow progress on the site is the decision to seek Expressions of Interest from

communities to host the site. This approach means that no specific site has been identified (multiple sites are still being evaluated) and also that the nominated sites do not necessarily possess optimal environmental and geological characteristics for a geological repository for low and medium level radioactive waste.

In terms of land use allocations proposed, it is also surprising, given the remote nature of the proposed sites and the low population densities and land use intensity in the regions under consideration that the size of the buffer zone in both the original and the revised land use proposals are quite small. Given the level of public concern regarding long term management and disposal of radioactive waste, a buffer zone of several kilometres around the site would assist in allaying concerns and also in ensuring that the surrounding land uses do not impact on the integrity of the subsurface containment cells during either operational or post-closure phases of the facility.

The proposal to locate a small community zone (20 Ha) of unspecified nature, apparently located proximally to the proposed facility, appears to be at odds with sound planning principles for a facility of this type which are based on locating sites where there are few active land uses on surrounding land during the operational phase and more particularly following closure where there is typically an Institutional Control Period (ICP) of 100-300 years duration. During the ICP the closed cells are required to be monitored and managed by the proponent to ensure that the integrity of the sub-surface containment cells is maintained while radioactivity levels progressively decrease to levels where ongoing management should not be necessary. It is understood that the intention of the Community Zone is to offer the host community a social and economic benefit for hosting the facility. It is not clear that this is best achieved by the siting of a community zone. It would seem likely that a greater benefit would be achieved by ensuring that the facility provides opportunities for employment in the local community and the Federal Government offered to invest in facilities and services located in close proximity to surrounding settlements which would provide a lasting social and economic benefit for the largest number of people.

A final observation offered based on our experience with Mt Walton-East facility, is that whilst it may be feasible to obtain approval site the National Radioactive Waste Management Facility at any of the three proposed locations in South Australia, none of them is likely to have been selected if they had not been nominated through the Expression of Interested Process. Site Selection reports prepared by AECOM on each site show that sites have relatively shallow groundwater tables (albeit with saline groundwater) and have surface water courses within reasonable proximity to the operational area and permeable elements in the soil profile. The Kimba area is known as an agricultural area and has reasonably reliable average annual rainfall of around 360 mm per annum. These characteristics are in stark contrast to the

Mt Walton -East (for example) where the nearest permanent settlement is Koolyanobbing some 75 km distant, the average annual rainfall is closer to 200 mm, there are no water courses and groundwater has not been detected. Finally, the geology at Mt Walton-East consists of 1-2 m of sand and gravel overlying a hard and impermeable layer of silcrete (2-6m thick) which is in turn underlain 10-20 m of highly impermeable kaolin clay which overlays unweather granite bedrock. These are the typical characteristics one would expect to be associated with a facility of this type.

Similar geology, hydrology and hydrogeological conditions exist throughout the Goldfields region in Western Australia extending north from Kalgoorlie both to the west and east. This area experiences uniformly low rainfalls and as a result groundwater is scarce and generally very saline while surface water bodies are scattered and without exception ephemeral. There are few land uses other than mining and dryland p[pastoral agriculture while population densities are low. Notwithstanding the area well served by a regional road network for heavy vehicles to allow safe transport of materials.

3 Conclusion

It is our view that the approach being developed more by politico/social considerations rather than a thorough technical and scientific assessment. As a result, the three potential sites currently under consideration appear to be sub-optimal and the conceptual design for the facility does not appear to reflect what would be expected of a site that is handling a relatively small volume of low-level radioactive waste.

Superior sites exist in the Leonora region and the surrounding Goldfields area which and due to the nature of surrounding land uses (predominantly mining) and scattered population centres there tends to be public acceptance for such proposals.

For and on behalf of Aurora Environmental,

[redacted]

Noel Davies
Director, Waste and Special Projects

AINS GROUP

The disposal of low and intermediate level waste in Australia

N. Marcos & M. Siitari-kauppi

Approaches to LILW disposal

AINS GROUP

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1 Classification of radioactive waste and disposal concept options

IAEA (2009) classifies radioactive waste according to activity content and radionuclides half-live:

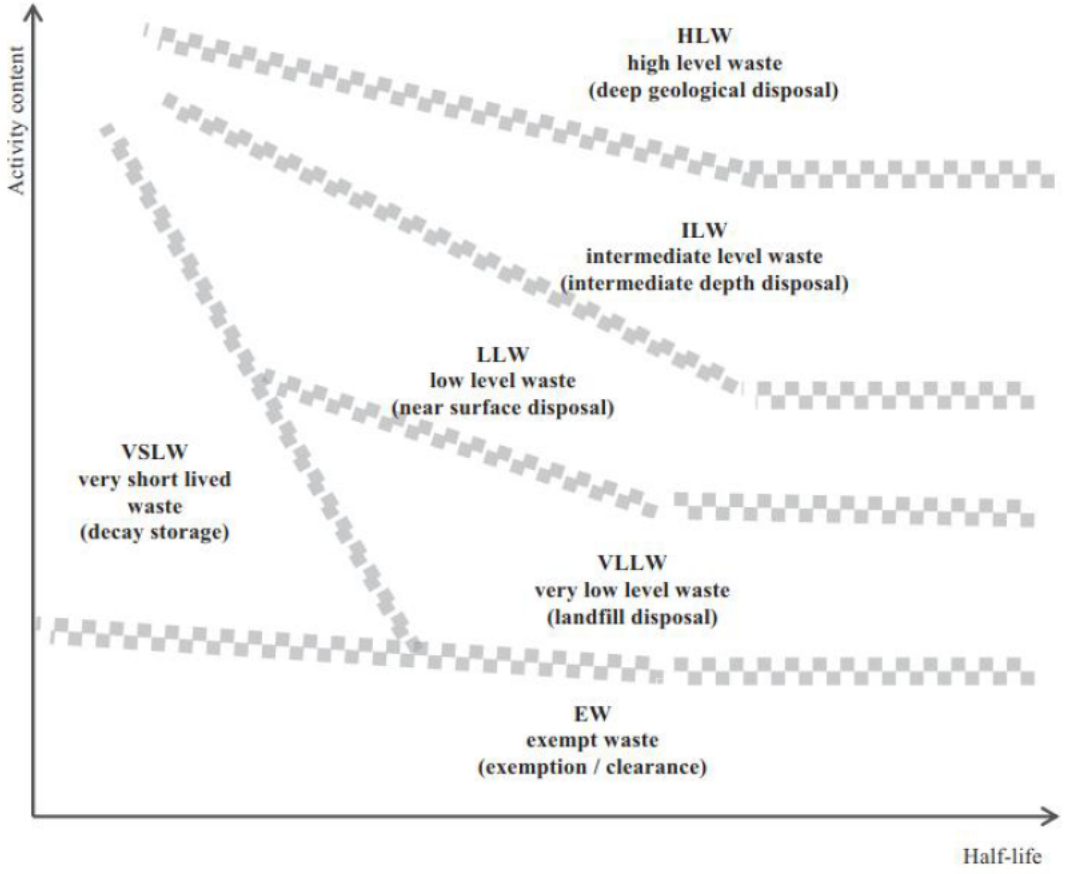

FIG. 1. Conceptual illustration of the waste classification scheme.

In the Figure above, intermediate level waste (ILW) should be disposed of at intermediate depth and low-level waste (LLW) could be disposed of in a near-surface disposal facility.

However, as stated in the same IAEA document para. 2.28 and 2.29:
"Intermediate level waste is defined as waste that contains long-lived radionuclides in quantities that need a greater degree of containment and isolation from the biosphere than is provided by near surface disposal. Disposal in a facility at a depth of between a few tens and a few hundreds of metres is indicated for ILW. Disposal at such depth has the potential to provide a long period of isolation from the accessible environment if both the natural barriers and the engineered barriers of the disposal

system are selected properly. In particular, there is generally no detrimental effect of erosion at such depth in the short to medium term. Another important advantage of disposal at intermediate depth is that, in comparison to near-surface disposal facilities, the likelihood of inadvertent human intrusion is greatly reduced. Consequently, long-term safety for disposal facilities at such intermediate depth will not depend on the application of institutional controls."
"(…)the boundary between the LLW class and the ILW class cannot be specified in a general manner with respect to activity concentration levels, because allowable levels will depend on the actual waste disposal facility and its associated safety case and supporting safety assessment. For the purpose of communication pending the establishment of disposal facilities for ILW, the regulatory body may determine that certain waste constitutes LLW or ILW on the basis of generic safety cases."

Concerning already existing disposal facilities, IAEA (2011a) states that:
"Para 6.1. Some disposal facilities that were developed and constructed and entered into operation before these requirements were established may not meet al the requirements.These facilities may be operational or non-operational. Some disposal facilites may have been abandoned. These would be considered 'existing situations' in which the government would have to take responsibility for the facilities(…)
Requirement 26: Existing disposal facilities: The safety of existing disposal facilities shall be assessed periodically until termianation of the licence. During this period, the safety shall also be assesssed when a safety significant modification is planned or in the event of changes with regard to the conditions of the authorization. In the event that any requirements set down in this Safety Requirements publication are not met, measures shall be put in place to upgrade the safety of the facility, economic and social factors being taken into account."

In IAEA (2011b) para. 2.1 and 2.2 are of interest concerning geological disposal:
Para. 2.1. Geological disposal is the emplacement of solid radioactive waste in a facility located underground in a stable geological formation. A distinctive feature of geological disposal is that post-closure safety of the facility is provides, in part, by passive means inherent to the characteristics of the geological formation. The depth chosen for disposal in a particular facility will depend on a number of factors including, but not limited to, climatic and groundwater conditions, rock stability, host rock composition and the nature of hazard of the waste.
Para. 2.2 Containment of the waste and isolation of the waste from the biosphere, is an accepted management strategy for radioactive waste (IAEA 2011a). Containment and isolation can be provided through a series of complementary barriers, e.g. the waste for itself, waste containers, backfill materials and the host geology, each of which will be effective over different timescales. The depth of disposal and the characteristics of the host geological environment provide isolation from the biosphere and reduce the likelihood of inadvertent or unauthorized human

intrusion. Moreover, emplacement at depth in a stable geological formation may significantly reduce the influence of climatic and other surface processes.

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) uses the same classification of nuclear waste as above is done by IAEA (ARPANSA 2010).

2 Near-surface disposal facilities for radioactive waste

According to IAEA (2014) "near-surface disposal refers to the emplacement of solid, or solidified radioactive waste containing predominantly short-lived radionuclides in a disposal facility located at or near the land surface. The depth chosen for disposal, and the type of facility that is developed, will depend on a number of factors including, but not limited to, the nature of the waste and the local environmental conditions at the proposed site. An important feature of near-surface disposal in the possible need to maintain institutional control over the site for a period following closure, owing to the need to prevent disturbance of the facility and its contents by human activities. However, as stated in para.3.48 of SSR-5 (IAEA 2011), "*the long-term safety of a disposal facility for radioactive waster is required not to be dependent on active institutional control*". In para. 4.15 it is stated that the concept of near-surface disposal covers a wide range of facilities (e.g. disposal at the surface in engineered vaults or trenches, or disposal at varying depth – from a few metres to a few tens of metres – in facilities with various types of engineered barriers.

In the IAEA (2014) no exact depth of the facility is given, though a few tens of metres may be indeed less than 100 m. ARPANSA gives a depth of about 30 m for such a facility for low level waste (see below).

ARPANSA (2010) writes on the facility design options for low level waste as follows:

- may rang from simple to more complex engineered facilities
- may involve disposal at varying depth, typically from the surface down to 30 metres
- will depend on
    - safety assessments
    - national practices; and
- are subject to approval by the relevant regulatory authority.

In the same guide (ARPANSA 2010) it is stated that the suitability of a disposal facility for a particular inventory of waste is required to be demonstrated by the safety case for that facility (IAEA 2006, NWMRC 1992).

3 Low and intermediate level waste disposal in Australia

In arguing the potential selection of a site for the planning and implementing of a disposal facility for low and intermediate level waste (LILW) the IAEA recommendations above are of most interest, as also the ARPANSA guide.

NAPANDEE, in Kimba is one of the options for the disposal of LILW in a near-surface facility. This option is already contradictory with the statements in IAEA (2009) above and with the ones in ARPANSA (2010). The planned facility is expected to be similar to El Cabril, in Córdoba, Spain (e.g. Ruiz & Alonso 1993). However, the facility in El Cabril is, regarding IAEA (2011a, Req. 26) an existing disposal facility meaning that any new facility for LILW and explicitly for ILW should be developed at intermediate level depth (IAEA, 2009, Fig. 1).

Napandee is also a site in agricultural land, which is not the case of El Cabril. Given the current climate conditions, Napandee seems not to be productive, but as for El Cabril, safety assessment and institutional oversee should ensure safety from the living environment for at least 300 years. In 300 years, the climate conditions at Napandee can change making the land once more productive.

AZARK, at Leonora shire is the other option. In the site there is a plan to develop a facility at intermediate level depth (around 100m), which is a more acceptable option given the recommendations by IAEA. Such a facility will be in line with other similar facilities developed e.g. in Sweden (SFR, SKB 2013), in Finland (VLJ at Olkiluoto and Loviissa, e.g. Vieno & Nordman, 1991; Eurajoki, 2006; Posiva 2014), in South Korea (Wolsong, Park et al. 2009).

As for the transport of radioactive waste from Lucas Heights (near Sydney) to either Napandee or Azark, it must be noted that there is no difference or advantage on the selection of one or the other site. In comparing Napandee to El Cabril, at the time El Cabril was officially established, there were already radioactive waste at the site, though at that time it was non-conditioned.

Another technical point is that Napandee would need of the development of a large infrastructure for transport and development of the facility, which is expensive. Infrastructure for transport and development of a facility at Azark is nearly ready.

Should social factors to be taken into account, it also seems that the local community at or near by the Azark site will accept the establishment of such a facility more easily than the local community or communities at Napandee.

Given the point above it is quite unlikely that Napandee could ever be commissioned by the regulatory body.

Nonetheless the selection of a site would need of a thorough safety assessment that includes climatic and groundwater conditions, rock stability, host rock composition and the amounts and nature of the hazard of the waste.

REFERENCES

ARPANSA 2010. Safety guide – Classification of Radioactive Waste – Radiation protection Series No. 20.

Eurajoki, T., 2006. Loviisa Low and Intermediate Level Waste Repository, Safety Case. LOKIT-5243. Fortum Nuclear Services Ltd, Espoo, Finland.

IAEA 2006. INTERNATIONAL ATOMIC ENERGY AGENCY, Geological Disposal of Radioactive Waste, IAEA Safety Standard Series No,. WS-R-4, IAEA, Vienna (2006).

IAEA 2009. INTERNATIONAL ATOMIC ENERGY AGENCY, Classification of Radioactive Waste, IAEA Safety Standard Series No. GSG-1, IAEA, Vienna (2009).

IAEA 2011a. INTERNATIONAL ATOMIC ENERGY AGENCY, Disposal of Radioactive Waste, IAEA Safety Standards Series No. SSR-5, IAEA, Vienna (2011).

IAEA 2011b. INTERNATIONAL ATOMIC ENERGY AGENCY, Geological Disposal Facilities for Radioactive Waste, IAEA Safety Standards Series No. SSG-14, IAEA, Vienna (2011).

NHMRC 1992. Code of practice for the near-surface disposal of radioactive waste in Australia, Radiation Health Series No. 35, National Health & Medical Research Council, Commonwealtht of Australia, Canberra.

Park, J.B., Jung, H., Lee, E.Y., Kim, C.L., Kim, G.Y., Kim, K.S., Koh, Y.K., Park, K.W., Cheong, J.H., Jeong, C.W., Choi, J.S., Kim, K.D. 2009. Wolsong low-. and intermediate level radioactive waste disposal center: Progress and challenges. Nuclear Engineering and Technology May 2009 DOI: 10.5516/NET.2009.41.4.47

Posiva 2014. Radionuclide Transport in the Repository-Near-Field and Far-Field. Eurajoki, Finland: Posiva Oy. Posiva Report 2014-2.

Ruiz, M.C. & Alonso, J. 1993. Safety aspects related to the operation of the El Cabril L/ILW disposal facility. Paper presented at 1993 International Conference on Nuclear Waste Management and Environmental Remediation, held in Prague, in September 5-11.

SKB 2013. Site description of the SFR area at Forsmark at completion of the site investigation phase, SDM-PSU Forsmark, SKB Technical Report TR-11-04, Swedish Nuclear Fuel and Waste Management Co, Stockholm, Sweden.

Vieno, T. & Nordman, H. 1991. VLJ Repository Safety Analysis (in Finnish). Teollisuuden Voima Oyj. Report YJT-91-12. ISSN-0359-548X.

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Nuria Marcos works as a leading specialist of the long-term safety team at the Nuclear Waste Management (NWM) Unit of AINS Group. She has more than 20 years of experience and wide range of knowledge in NWM from low and intermediate level waste (LILW) to high level waste (HLW) in the long-term safety of geological disposal. She has participated in the public acceptance of geological disposal by the study and use of natural analogues for the materials of the disposal system components. She has more than 10 years of experience in the participation of the preparation of the safety case documentation for Posiva's construction licence application.

She has also participated in the NWM plans for UK and South Korea and worked in co-operation with SKB in Sweden.

Marja Siitari-Kauppi is a lecturer in Radiochemistry at the University of Helsinki. She is a specialist in Chemistry, radiochemistry and material science. Her research topics are linked to nuclear waste disposal. Focus on transport processes of elements in hard material and the environment. Migration/retardation of radionuclides in cement, clay and rock. Matrix diffusion and sorption or radioactive elements on minerals. Uranium decay series nuclides behaviour in the environment. Har materials structure and porosity characterisation from micro- to decimetre's scale. Alfa- beta and gamma spectroscopy. Autoradiographic techniques, SEM/EDS.