



19 March 2021

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## **SUBMISSION ON LYNAS' PROPOSED RADIOACTIVE WASTE REPOSITORY AT BUKIT KETAM**

Friends of the Earth Australia welcomes the opportunity to comment on Lynas' proposed radioactive waste repository at Bukit Ketam in Kuantan.

It should be noted that credible waste management solutions should have been planned and implemented many years ago, before LAMP began operating. It is a significant failure of the Malaysian government and the Atomic Energy Licensing Board (AELB) that Lynas' absurd claims about radioactive waste recycling projects were accepted and that a vast amount of toxic/radioactive waste has been accumulating with no credible long-term plan in place.

The volume and weight of Water Leach Purification (WLP) waste to be disposed of is huge – over one million cubic metres or 1.5 million tonnes in wet weight. For comparison, successive Australian governments have been trying (and continuously failing) to establish a national radioactive waste repository which would accept about 6,000 cubic metres of waste – less than 1% of the volume of the WLP repository.

The AELB includes "permanent forest/nature reserves" as areas warranting an "exclusion criteria" for the disposal facility location ... yet Lynas plans to dispose of its radioactive waste in a forest reserve. Rezoning the proposed disposal site (i.e. excluding it from the forest reserve) is a semantic non-solution. Other locations should be considered and that site-selection process should be rigorous and transparent. Site-selection processes have been topical and contentious in Australia and we can provide further information on request.

Water infiltration into radioactive waste stores / repositories is a problem without a solution. The EIA states that clay and HDPE liners will prevent seepage into soil and groundwater. If so, water intrusion will result in pooling inside the repository and the manifold adverse effects that pooling can result in. As one example of how these problems can play out, ANSTO's 'dry' waste store at Lucas Heights, Australia, was subject to water intrusion and efforts to resolve the problem were difficult, protracted, and involved at least two accidents, one of which resulted in four workers being exposed to ionising radiation.

The source of the water intrusion at ANSTO was never determined – a point that should be kept in mind when reading the assurances in the EIA regarding water intrusion, seepage etc.

Colloidal migration of insoluble or low-soluble radionuclides (e.g. thorium) is an issue requiring further detailed investigation. Colloidal migration of plutonium is a problem that has been demonstrated – and prior assurances that insoluble plutonium would not migrate were proven false.<sup>1</sup> Colloidal migration has been demonstrated with radionuclides other than plutonium.<sup>2</sup> The EIA fails to address colloidal migration, an inexcusable omission which must be rectified.

We understand that the company awarded the construction contract may have no experience in radiation safety and protection, toxic waste management or construction of a facility for this purpose. If so, the project is doomed to fail and that failure will further weaken Lynas' already questionable social licence to operate LAMP. A review of the competence, experience and independence of project management would be simple and quick and could make a world of difference to the success or failure of the project. The farcical mismanagement of radioactive waste at Maralinga in South Australia is one of numerous examples of radioactive waste management project failures due to inexperienced and incompetent project managers and inadequate regulation.<sup>3</sup>

Predictably, the EIA downplays the health risks associated with the proposed repository and more generally the health risks associated with exposure to ionising radiation. The concept of 'very low level waste' needs to take into account factors such as concentration / accumulation. The longevity of relevant radionuclides and their progeny is given insufficient attention. The post-closure control period seems arbitrary in light of radionuclidic longevity and this has consequences for human radiation exposure (e.g. failure to maintain adequate safety after the control period) and also financial consequences (the longer the control period, the higher the costs). Poor decisions made now will have consequences for Malaysians long into the future. These issues must be resolved before approval for a repository is granted, and the working assumption should be that Lynas' must be required to lodge a bond with the Malaysian government to cover long-term costs.

There is no safe dose of exposure to ionising radiation:

- The United Nations Scientific Committee on the Effects of Atomic Radiation states that "the current balance of available evidence tends to favour a non-threshold response for the mutational component of radiation-associated cancer induction at low doses and low dose rates."<sup>4</sup>
- The 2006 report of the Committee on the Biological Effects of Ionising Radiation (BEIR) of the US National Academy of Sciences states that "the risk of cancer proceeds in a

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<sup>1</sup> See for example: <http://www.sciam.com/article.cfm?id=colloids-in-russia-have-p>

<sup>2</sup> <http://www.sciencedaily.com/releases/2015/12/151218110259.htm>

<sup>3</sup> <https://nuclear.foe.org.au/flawed-clean-up-of-maralinga/>

<sup>4</sup> UNSCEAR, 2011, 'Report of the United Nations Scientific Committee on the Effects of Ionising Radiation 2010', [http://www.unscear.org/docs/reports/2010/UNSCEAR\\_2010\\_Report\\_M.pdf](http://www.unscear.org/docs/reports/2010/UNSCEAR_2010_Report_M.pdf)

linear fashion at lower doses without a threshold and ... the smallest dose has the potential to cause a small increase in risk to humans."<sup>5</sup>

- A study published in the *Proceedings of the National Academy of Sciences* (US) in 2003 concluded that: "Given that it is supported by experimentally grounded, quantifiable, biophysical arguments, a linear extrapolation of cancer risks from intermediate to very low doses currently appears to be the most appropriate methodology."<sup>6</sup>
- Claims are sometimes made that the Linear No-Threshold Model overestimates risks, a claim often tied to the false claim that there is a threshold below which exposure to ionising radiation is harmless. However, as noted immediately above, there is strong scientific support for a linear model. Also, importantly, the linear model may *underestimate* risks. The above-mentioned 2006 BEIR report of the US National Academy of Sciences states: "The committee recognizes that its risk estimates become more uncertain when applied to very low doses. Departures from a linear model at low doses, however, could either increase or decrease the risk per unit dose."<sup>7</sup>

When discussing health risks associated with the PDF, Lynas states 'RISK = EXPOSURE X DOSE' ... but obviously timespans are also important to the assessment. No-one can have confidence in the integrity of natural or engineered barriers, or institutional control and regulatory oversight, over the timespans involved at the proposed PDF given the longevity of the relevant radionuclides.

### **Problems at overseas radioactive waste repositories**

Recent problems at overseas radioactive waste repositories are ignored in the EIA.

Information that should be considered include the following:

- 'World Nuclear Waste Report 2019 – Focus Europe'<sup>8</sup>
- 'Nuclear waste nightmares – USA, Germany, France'<sup>9</sup>
- 'Fires at radioactive waste repositories'<sup>10</sup>
- 'New Mexico nuclear waste accident a 'horrific comedy of errors' that exposes deeper problems'<sup>11</sup>
- 'Mismanagement of nuclear waste in Australia (Radium Hill, Port Pirie, Maralinga, Woomera)<sup>12</sup>

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<sup>5</sup> Committee on the Biological Effects of Ionising Radiation (BEIR) of the US National Academy of Sciences, 2006, 'Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2', <https://www.nap.edu/catalog/11340/health-risks-from-exposure-to-low-levels-of-ionizing-radiation>

<sup>6</sup> Brenner, David, et al., 2003, 'Cancer risks attributable to low doses of ionizing radiation: Assessing what we really know', *Proceedings of the National Academy of Sciences*, November 25, 2003, vol.100, no.24, pp.13761–13766, <http://www.ncbi.nlm.nih.gov/pubmed/14610281>

<sup>7</sup> <https://www.nap.edu/catalog/11340/health-risks-from-exposure-to-low-levels-of-ionizing-radiation>

<sup>8</sup> [www.boell.de/sites/default/files/2019-](http://www.boell.de/sites/default/files/2019-11/World_Nuclear_Waste_Report_2019_Focus_Europe_0.pdf)

[11/World\\_Nuclear\\_Waste\\_Report\\_2019\\_Focus\\_Europe\\_0.pdf](https://www.boell.de/sites/default/files/2019-11/World_Nuclear_Waste_Report_2019_Focus_Europe_0.pdf)

<sup>9</sup> <https://nuclear.foe.org.au/nuclear-waste-nightmares-usa-germany-france/>

<sup>10</sup> [https://wiseinternational.org/sites/default/files/NM883-final-5Feb2020\\_0.pdf](https://wiseinternational.org/sites/default/files/NM883-final-5Feb2020_0.pdf)

<sup>11</sup> <https://theecologist.org/2014/nov/27/new-mexico-nuclear-waste-accident-horrific-comedy-errors-exposes-deeper-problems>

<sup>12</sup> <https://nuclear.foe.org.au/wp-content/uploads/Mismanaging-waste-in-Oz-2018-2p.pdf>

Strangely, Lynas references Port Hope (Canada) as a facility comparable to the planned PDF at Bukit Ketam. However there have been numerous, serious problems with radioactive waste management arising from the Port Hope uranium conversion plant. Examples include:<sup>13</sup>

- 2004: Gamma radiation discovered in a school playground.
- 2007: Substantial leakage of radioactive and chemical pollutants into the soil under the conversion facility – leakage not detected by monitoring wells.
- 2007: Cameco reports subsoil contamination found at Port Hope conversion plant might have extended beyond property line (Ontario)
- 2007: Cameco suspends operation of Port Hope conversion plant, after contaminants found in subsoil (Ontario)
- 2008: Leak from Cameco's uranium conversion plant has reached Port Hope harbour (Ontario)
- 2009: String of incidents prompts investigation at Cameco Port Hope conversion plant (Ontario)
- 2010: Cameco Port Hope UO<sub>2</sub> plant shut down after elevated uranium emissions (Ontario)
- 2014: About 450 Port Hope homeowners have had their soil sampled and properties tested in the first phase of the biggest radioactive clean-up in Canadian history.
- 2014: Cameco Port Hope conversion plant discharges cooling water containing elevated levels of uranium and fluoride to harbour (Ontario)
- 2017: Cameco conceals massive exceeding of action limit for uranium concentration in sanitary sewer discharge at Port Hope conversion plant (Ontario)
- 2018: Uranium concentration in sanitary sewer discharge at Cameco's Port Hope conversion plant exceeds action level 30-fold after precipitation event (Ontario)

Further information on the problems with radioactive waste management at Port Hope can be found in these documents:

- 'Table of Cameco's incidents', 2017<sup>14</sup>
- WISE Uranium 'Cameco Corp. Hall of Infamy'<sup>15</sup> and 'Cameco Port Hope conversion plant - Current Issues'<sup>16</sup>

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<sup>13</sup> For details see WISE Uranium, <https://www.wise-uranium.org/uccamhi.html> and <https://www.wise-uranium.org/eopcdnph.html>

<sup>14</sup>

[https://d3n8a8pro7vhmx.cloudfront.net/foe/pages/199/attachments/original/1496989875/Cameco\\_Incidents\\_Table\\_-\\_June\\_2017.pdf?1496989875](https://d3n8a8pro7vhmx.cloudfront.net/foe/pages/199/attachments/original/1496989875/Cameco_Incidents_Table_-_June_2017.pdf?1496989875)

<sup>15</sup> <https://www.wise-uranium.org/uccamhi.html>

<sup>16</sup> <https://www.wise-uranium.org/eopcdnph.html>