

Responses to questions and comments from public submissions re: IWS, ANM Mo99 and SyMo applications

Question/comment	ANSTO Response	ARPANSA Comment
<p>1. Of primary concern is a mixture of highly radioactive fission products ('molywaste') generated from ⁹⁹Mo is stated by ANSTO to comprise the majority of radioactivity to be stored at Lucas Heights, surprisingly more than spent fuel rods and considerably more than the waste returning from France. Molywaste, particularly in its liquid form represents the most hazardous material at Lucas Heights, both for ANSTO workers and surrounding residents.</p>	<p>The licence applications do not make this statement.</p> <p>The OPAL reactor at Lucas Heights is designed for 20MW with 300 days operating time per year. This requires burning 6.3Kg of U-235 per year with the corresponding fission products. The ANM Mo-99 plant running at its design capacity will use only 0.35Kg of U-235 per year generating a correspondingly significantly smaller amount of fission products.</p>	<p>ARPANSA assessor considers that ANSTO comment is acceptable as it relies on the proposed purpose and corresponding design. ARPANSA will consider further details when assessing the licence application for construction and operation of the facility.</p>
<p>2. Why has ANSTO not evaluated non-fission alternatives to avoid generation of molywaste? Serious consideration should be given to alternatives that use accelerators to produce ⁹⁹Mo or ⁹⁹Tc-m by selective reaction without fission-product waste.</p>	<p>ANSTO has evaluated non-reactor alternatives for the production of Mo-99 and Tc-99m. Such evaluation has also been undertaken by international bodies, in particular the OECD Nuclear Energy Agency (NEA). The NEA report (http://www.oecd-nea.org/med-radio/reports/Med-Radio-99Mo-Prod-Tech.pdf) noted that no such alternative technologies are currently in use anywhere in the world, and expressed strong doubts as to whether they could ever substitute for reactor technologies. Given that, it would be grossly irresponsible for ANSTO to risk the health of Australians on unproven technology.</p>	<p>The application is for production of Mo-99 in commercial scale. Based on the available information on production of Mo-99 in the literature ARPANSA assessor notes that accelerator production of Tc-99m is not used for any commercial scale production facilities.</p>
<p>3. Little has been said about the alternate proliferation risk of plutonium created as a by-product of ⁹⁹Mo production and potentially separable from molywaste by altering the chemical treatment of the waste stream.</p>	<p>In a typical production year, the ANM Mo99 facility operating at capacity will produce approximately 6.2 g of Pu-239, which is less than 1/1000 of the amount that would be of significance from a safeguards perspective. Furthermore, that Pu-239 will be mixed with other materials and will therefore be unusable for any purpose.</p> <p>Further, the facility will be under IAEA safeguards, including regular inspections, to ensure that any material of concern could not be diverted from the declared activities. We also note that sub-section 5(2) of the ANSTO Act provides: "The Organisation shall not undertake research or development</p>	<p>ARPANSA will consider sampling requirements and possible OLCs in this regard.</p>

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	into the design or production of nuclear weapons or other nuclear explosive devices”.	
4. Insufficient details have been given to assess whether the quantity of Pu239 in accumulating molywaste is likely to be a proliferation concern. The isotope ratio is likely to be weapons-compatible.	See response to question 3.	See 3 above
5. Just how much plutonium will be produced in the waste stream for the new facility? ANSTO is requested to publish an accurate calculation of the mass of 239Pu created for each batch of 99Mo and the mass to thus accumulate over the course of the planned 99Mo production program.	See response to question 3.	See 3 above
6. ANSTO is asked to provide a long term road map for the development of non-fission based methods for the production of 99Tc-m regardless of the outcome of the current application.	See response to question 2.	See 2 above
7. There is concern that the proposed radioisotope production facility might potentially facilitate nuclear weapons development at Lucas Heights.	See response to question 3.	See 3 above
8. If the Synroc system is so safe then why have there been so many successful legal challenges to moving the waste from Lucas Heights to a permanent repository?	<p>There have been no successful legal challenges to moving the waste from Lucas Heights to a permanent repository. There is currently an unresolved court case (in which ANSTO is not involved) regarding the nomination of Muckaty Station in the Northern Territory as a possible site for a National Radioactive Waste Management Facility (NRWMF), but that case is based around provisions of the Land Rights Act, not any hazard which might be posed by radioactive waste.</p> <p>In any event, the waste to be stored in the IWS is not in synroc form but the majority of the waste is vitrified and a small amount of waste is cemented (i.e. technological wastes). The waste from the IWS will be moved to a</p>	ARPANSA is not aware of any legal challenge in transferring waste from Lucas Heights.

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	NRWMF when it becomes available.	
9. Is Synroc being used anywhere else in the world? If it is successful in dealing with nuclear waste why did we need to transport our waste overseas if we had this technology at the time?	<p>Synroc is being investigated by many governments around the world and it has been shown to be cost effective for certain wastes. The Synroc HIP technology has been chosen by the UK for Pu-wastes and in the USA for calcined waste in Idaho.</p> <p>The <i>Environment Protection and Biodiversity Conservation Act 1999</i> and the <i>Australian Radiation Protection and Nuclear Safety Act 1998</i> prohibit the development of nuclear fuel reprocessing facilities in Australia. It is therefore not possible to use Synroc in fuel re-processing.</p>	
10. A cost/benefit appraisal of Synroc and its reliability are missing from the public information.	A cost/benefit appraisal was developed in preparing the business case for the ANM projects. This has been subject to detailed scrutiny through the Cabinet process and the subsequent application to the Public Works Committee (PWC).	
11. Are we still going to transport any waste overseas for reprocessing?	<p>Spent fuel from the OPAL reactor will be returned either for reprocessing in Europe or for permanent storage in the US.</p> <p>There is no current intention to send any wastes arising from the ANM facility overseas for reprocessing.</p>	Any such conduct will be subject to ARPANSA scrutiny.
12. What are the risks of transportation of radioactive waste?	The safety record of the transport of radioactive material is very strong. The international regulations ensure the protection of people and the environment in all credible accident scenarios.	The safety of transport packages is assessed against the requirements of the ARPANSA Code of Practice for the Safe Transport of Radioactive Material 2008 (RPS 2) which is based on the IAEA Regulations for the Safe Transport of Radioactive Material. The transport containers are heavily engineered and extremely robust. This, coupled with the immobilised nature of the waste make the risks associated with transport of radioactive waste extremely low.
13. ANSTO may be given the go ahead to produce more	One of the fundamental principles of radioactive waste	ARPANSA has in the decision requested ANSTO to

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nuclear waste than may be necessary.	management is that of waste minimisation and ANSTO is committed to this principle. A strong factor in the selection of the Synroc process is that it minimises the volume of waste for later handling and storage. There are also comprehensive features in the ANM Mo99 plant for safely handling and minimising gaseous and other wastes.	further detail their waste management plan and contingencies.
14. There is no information on the cost of the expansion of the production facilities, the IWS or the decommissioning of HIFAR.	We are not sure how this is relevant to the safety and security of the facilities. This application is not relevant to the decommissioning of HIFAR.	
15. State Emergency Services are already suffering a lack of resources. Does ANSTO contribute to the need for increased services? Is this included in the costs?	ANSTO has long established liaison arrangements with the NSW Emergency Services. These include joint meetings and joint exercises. In terms of the requirements for support and cooperation with these services, the new ANM Mo99 and Synroc facilities are similar to the existing facilities on the ANSTO Lucas Heights site which include the OPAL reactor, the existing Mo99 production facility and waste facilities. There will be no need for changes to these arrangements.	
16. Security has not been adequately addressed.	ANSTO has a comprehensive security system, based on Australian and internationally required standards, to guard its nuclear materials, radioactive sources and facilities. All people and vehicles entering the site are subject to inspection by Australian Federal Police (AFP) Protective Service officers, who guard the site 24 hours a day. AFP and ANSTO officers also regularly patrol the entire site and the buffer zone. There are regular reviews by expert agencies, including the Australian Security Intelligence Organisation and the Australian Safeguards and Non-Proliferation Office, to ensure security continues to meet the stringent national and international physical security protection standards. In addition, agency inspectors from the Australian Radiation Protection and Nuclear Safety Agency can require access to ANSTO's sites at any time to conduct security inspections. ANSTO's security risk assessments are supported by	Assessment of arrangements for Security has been assessed as required by Item 4(a) of Part of Schedule 3 of the Regulations. The results of assessment are presented in Section 2.2.5 of this report.

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	<p>information provided by the Australian Security Intelligence Organisation and other government departments and agencies. The Australian Federal Police are on site to provide an armed, high level and professional service that deters, prevents and effectively manages security threats through a proactive, flexible, robust and intelligence driven approach. The Australian Federal Police have a 24 hour presence at ANSTO with support from NSW Police and the Australian Defence Force as appropriate. Whilst armed Australian Federal Police is a strong deterrent there are a range of other of other sophisticated security controls involving people, technology, operations and processes. For each transport of radioactive materials a security transport plan is developed in conjunction with law enforcement agencies who provide security support to such movements.</p>	
<p>17. There is no legal compensation commitment for public health, property or environmental damage resulting from a serious accident.</p>	<p>On the issue of legal liability, ANSTO's liability would flow in accordance with usual legal principles of negligence applicable in NSW. This means that if ANSTO is proven to have caused personal injury or death to persons or property damage or environmental damage due to a release of ionising radiation, whether directly or indirectly, or due to other negligence, then it will be legally liable to compensate such persons or owners of such property. ANSTO has commercial insurance in place to cover this potential liability, as well as supplementary cover under a Deed of Indemnity from the Commonwealth of Australia.</p> <p>The commercial insurance policy covers liability arising out of ANSTO's responsibility for : (a) managing, storing and conditioning Ionising Radiation (as defined) emitting material and waste; (b) transporting nuclear waste and materials for disposal both within Australia and overseas; and (c) transporting radioactive materials including radioisotopes.</p>	

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18. Why is such an industry supported when the scientific research community is crying out for funds for non-invasive and safe treatments?	<p>The beauty of nuclear medicine is that it is indeed non-invasive and safe – which is recognised by doctors and by organisations such as the Cancer Council. ANSTO supplies some 10,000 doses of radioisotopes per week for use in nuclear medicine procedures across Australia. One in two Australians in their lifetime will receive a nuclear medicine treatment from OPAL. ANSTO-produced radioisotopes are used for the diagnosis of heart disease and a range of cancers and skeletal injuries both in Australia and internationally.</p>	
19. Why is ANSTO producing Mo-99 beyond Australia’s needs that are for overseas distribution, as the wastes to be generated from the excess production will be stored at ANSTO Lucas Heights Facility?	<p>The Global supply of nuclear medicine is currently under threat, with reactors responsible for around 70 per cent of the world’s current Mo-99 production due to close between 2015 and 2020. Further with medical modernisation in developing countries, global demand for Mo-99 is increasing by up to 10 per cent a year.</p> <p>The production of Mo-99 is dependent on highly specialised infrastructure e.g. a reactor and Mo-99 production facility. As a result, every country cannot be expected to produce its own supply. Australia has benefited from international cooperation in the past when we needed to rely on imports of Mo-99 and has also contributed to world supply during shortages.</p> <p>Australia is well placed to help meet the increasing demand for Mo-99 and as a member of the community of nations and a significant player in the region has a responsibility to do so.</p> <p>Australia is also in a unique position of being able to produce Mo-99 exclusively using low enriched uranium (LEU). Currently, most of the global Mo-99 supply is produced in reactors fuelled by highly enriched uranium (HEU) and using HEU targets. HEU can be used in nuclear weapons. Consequently, alternative manufacturing processes are highly desirable.</p> <p>For example, the US has put measures in place to favour Mo-99 produced in reactors fuelled by proliferation proof LEU, such as that used in Australia’s OPAL reactor. The development of ANSTO’s new Mo-99 facility will therefore contribute to global nuclear security and non-proliferation, and was identified by the former</p>	<p>This matter has been considered in the decision and ANSTO is requested to further develop their waste management plan including contingencies</p>

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	<p>Prime Minister at the 2012 Nuclear Security Summit as a major contribution by Australia to global nuclear security.</p> <p>Importantly, the co-located Synroc waste treatment plant will use the Australian innovation, Synroc, to convert the necessary waste into a stable, synthetic rock suitable for transportation to the National Radioactive Waste Management Facility for long term storage once it is operational. The new Synroc plant will reduce the volume of nuclear byproducts by 90 to 95 per cent compared to existing waste treatment methods, resulting in a smaller volume of waste being temporarily stored at ANSTO's Lucas Heights campus. The costs of waste treatment will be included in the price charged for Mo-99, meaning that there will be no subsidy to overseas patients.</p>	
<p>20. Where and when is a 'National Radioactive Waste Management Facility' going to be constructed?</p>	<p>There is bipartisan support for a NRWMF and it will be the Government who decides its location. The site currently under study is Muckaty station in the Northern Territory, however other sites may be considered. It is expected that a facility will be available by the end of the decade.</p>	<p>The <i>National Radioactive Waste Management Act 2012</i> makes provision to site, construct and operate a NRWMF subject to environmental and radiation protection regulatory approvals. The Department of Resources, Energy and Tourism (RET) has responsibility for management of the Commonwealth's radioactive waste and as part of this responsibility is implementing the Government's policy to establish a permanent facility.</p>
<p>21. The analysis given at 2.2.1 of "Siting Safety Assessment. Site Characteristics and Site Related Design Bases" about population around LHSTC looks really superfluous. There is a reference to quite out-dated "OPAL Safety Analysis Report (INVAP/ANSTO 2004)" (which is not provided) whereas the analysis about population density and population distribution is required.</p>	<p>As stated in the Siting Safety Assessment (section 2.2.1), there are no credible accident scenarios that could cause any conceivable risk to the surrounding population. It was thus considered unnecessary to include such population data in this application. However, ANSTO has developed decade projections of population from the ABS 2006 Census data, and the NSW Department of Planning data for another licence application</p>	<p>For the three ANSTO licence applications, the projected population out to 2046 has been considered by ARPANSA; in particular, in its analysis of the Reference Accident of ANM Mo99 Facility.</p>
<p>22. The general requirement of the IAEA is low density area around a waste storage site. A multimillion</p>	<p>That is not correct. The siting process is a risk-based one. To cite text from IAEA, the siting of nuclear installations "...is</p>	<p>For the three ANSTO licence applications the projected population out to 2046 has been</p>

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population urban area in Sydney metro area cannot be considered low density. Location near the Woronora River, a major water supply, adds to the hazards.	concerned with the evaluation of those site related factors that have to be taken into account to ensure that the site– installation combination does not constitute an unacceptable risk to individuals, the population or the environment over the lifetime of the installation.” IAEA Safety Requirements No. NS-R-3, Nov 2003. Given the robust nature of the transport / storage containers and the immobilised nature (vitrified and cemented) of the waste, the risks associated with storage at Lucas Heights are negligible. Although the Woronora River is a water supply source, Lucas Heights is well downstream of the Woronora Dam. In any case, this is not relevant as there are no liquid, gaseous, or soluble wastes to be stored in the facility and therefore no credible release scenario is considered.	considered by ARPANSA; in particular, in its analysis of the Reference Accident of ANM Mo99 Facility.
23. The risks of possible large bushfire are too high (every 8 – 12 years). The deserted location looks much better.	Extensive studies have been undertaken in relation to the bushfire risk to the OPAL reactor. This has led to a detailed analysis of the different pathways that would constitute a risk to the public or to the environment. It has been concluded that there is no credible risk of the release of radiation from the OPAL reactor. The IWS is well enveloped within the risk assessment for the OPAL reactor. There is much less radioactive material associated with the IWS, and the TN81 transport/storage container in which the vitrified waste will be housed is rated to withstand temperatures of 800°C for 30 minutes. Hence there is no credible radiation risk from the IWS as a result of bushfire.	
24. What is to become of the decommissioned reactor? Is it to be cut up and buried at Lucas Heights?	This is a separate issue, and its regulatory approval process will be dealt separately but when the permanently shut-down reactor HIFAR is decommissioned, it will be dismantled in a safe manner. The radioactive waste arising from the decommissioning operation will be appropriately conditioned, packaged and sent to the NRWMF.	Decommissioning of HIFAR reactor is subject to ARPANSA regulatory approval.
25. I was required to sign an indemnity for the Australia	ANSTO is not aware of the basis for this statement, and	

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Government before I could buy my house and when I raised that issue at the information session my veracity was challenged. So what is it that ANSTO is trying so hard to conceal? Whatever happened to transparency?	cannot comment without seeing the document referred to. The applications for this facility – like ANSTO’s operations generally - are open and transparent.	
26. ANSTO and the Government should negotiate deferral of planned return shipment until a suitable national repository is available.	Any attempt to renegotiate the time scale for return of the waste could damage Australia’s international reputation in relation to our global nuclear obligations. It is important to meet our obligations to France otherwise it raises uncertainty and may have negative financial impacts on future reprocessing services.	
27. What assurances are there that Lucas Heights will not become a permanent waste store?	The ANSTO Act prevents that occurring.	The <i>ANSTO Act 1987</i> prohibits the permanent storage of radioactive waste at ANSTO.
28. I understand that the waste returning from France and the UK will carry the same amount of radioactivity as the original material sent from Australia.	This fact has been public since the 1990s.	This is correct, however there is a substitution contract for the waste from the UK, which means that the cement waste will remain there and an equivalent amount of more stable and lesser volume of vitrified waste will be returned.
29. Is there any high level waste resulting from decommissioning of HIFAR?	There will be no high level waste resulting from the decommissioning actions of HIFAR. ANSTO does not generate High Level Waste.	
30. What is the impact on the increased local population?	The safety assessment of the IWS (ANSTO/T/TN/2021-03 Rev 2) concluded that there are no credible scenarios which could impact on people or the environment.	The projected population until 2046 has been considered in ARPANSA analysis of the reference Accident of the ANM Mo99 Facility. ARPANSA analysis shows that there are no significant radiological risk to the people and environment.