MAPW

Health professionals promoting peace

Dr Carl-Magnus Larsson
Chief Executive Officer
ARPANSA
PO Box 655
Miranda NSW 1490

5th June 2017

Dear Dr Larsson,

Re: Submission on the application for a facility licence under the *Australian Radiation Protection and Nuclear Safety Act 1998*

*Application by the Australian Nuclear Science and Technology Organisation **(ANSTO)** Nuclear Medicine Pty Ltd for a licence to operate a nuclear installation being a facility for the production of molybdenum-99 at the Lucas Heights Science and Technology Centre, New Illawarra Road, Lucas Heights, New South Wales*.

Thank you for the opportunity to comment on this proposal, and for your consideration of our concerns.

Yours Sincerely

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SUMMARY POINTS

There is no permanent disposal plan for the Intermediate Level Waste produced by this proposal.

The vast majority of the nuclear waste burden from this plant will be created by sales to the overseas market, and leave Australia with the waste from ANSTO's overseas customers.

There has been no public consultation by ANSTO about increasing nuclear waste production. Given the current difficulties and harms from the processes seeking to deal with our current nuclear waste burden, it is difficult to see a justification for increasing this.

The business model is highly questionable, precluding any profit to offset waste liabilities, and ANSTO has very opaque accounting which prevents scrutiny and accountability. Detailed economic analysis by the NEA taking into account the true "whole of chain" costs has found that technetium isotope production usually has only a 10-15% cost recovery, with the remainder subsidised by taxpayers.

The increased production and retention of plutonium and uranium from target dissolution creates nuclear security concerns.

There is no license for the Synroc facility, and indeed no Synroc facility built yet to the process waste. This further raises the issue regarding whether it is really appropriate to ramp up waste production at this time. We already have accumulated significant amounts of nuclear waste and have nowhere to dispose of it.

NEA 2016 projections demonstrate there is sufficient technetium production internationally for nuclear medicine to continue, regardless of increases in Australian production. False claims of isotope shortages are driving ANSTO's argument of urgency.

Review of the NEA 2017 projections for isotope production highlight a number of important issues, including a fall in demand of 25% from 2011-2015 and a number of new production facilities coming on line in the next five years internationally. It is also of note that the NEA have modelled a two year delay in new production coming on line (including delaying increasing Australian production) and this would not compromise supply, even including the 35% outage reserve capacity.

The first principle of toxic waste management is to reduce production, to reduce potential harms to the community.

MAPW believes there is a clear and urgent need for an independent inquiry into nuclear waste

production and storage in Australia. Any expansion of Australia's production of nuclear waste should be ceased until this issue has been appropriately investigated.

SUBMISSION

The proposed facility will produce significant radioactive wastes, including 4500 litres annually of intermediate level liquid waste that requires isolation from the environment for 10-100,000 years (ANM Waste Management Plan, Q-50084). There is no plan for disposal of this waste.

Disposal of Australia's existing nuclear waste has proved both difficult and contentious. The planned storage facility in South Australia for intermediate level waste does not meet world's best practice standards, as it represents storage rather than disposal. ARPANSA's Radiation Health and Safety Advisory Council (April 2010) has provided formal advice which concluded: "*that Australia's current policy of indefinite storage for intermediate level waste does not appear to be consistent with International best practice."*

Furthermore, communities are understandably reluctant to take on highly radioactive material that has to be isolated for extended periods to remain safe, and has no plan for future disposal.

The current process is already causing significant harm in communities, with division and great distress. It has caused major division within families, major division in the aboriginal community, and individuals in these small regional communities have reported life-long friends are no longer talking with each other. It is in the public realm that one aboriginal person has attempted suicide over this issue, and it is not clear the extent to which other mental health issues of this severity have occurred. Certainly the process has created significant anxiety and depression in both the communities being considered.

There has been no public consultation by ANSTO about whether increased production of nuclear waste is acceptable to the Australian community. Given the huge difficulties and distress already caused by nuclear waste, and the fact we do not have a national facility despite almost two decades of trying, community consultation would seem essential. The community interest around this issue is very significant for those communities approached to store it.

The application by ANSTO omits a number of critical issues in determining the "Net Benefit"

These are as follows:

The NEA 2016 report on global demand for technetium^{99} found it had fallen by 25% in the last four years[1]. The reasons for this are several, and include both increasing efficiency in use of molybdenum and changes in medical uses for technetium. The fastest growing area of nuclear medicine involves isotopes made in cyclotrons, which do not produce intermediate level waste.

There are significant developments in a number of countries in alternative methods of production of technetium without using a reactor, including cyclotron production. In Canada cyclotron production has been commercially licensed and the technetium so produced is currently undergoing routine clinical trials.[2] Commercial levels of production have been demonstrated in January 2015 on three different types of commonly used cyclotrons.[3] It is very disappointing that ANSTO is choosing to expand old methods of isotope production that will leave a significant ILW stream and not explore new avenues to produce technetium^{99} without the accumulated ILW burden.

The NEA 2017 projections[4] note increasing an number of facilities producing technetium. As stated earlier, demand has dropped by 25% over four years, and conservative projections are that the global market will grow by 1.22%. Even with no new capacity there is sufficient supply until 2022.

WORLD DEMAND FOR ^{99}TECHNETIUM[1]

- 2011 12,000 6-day Curies EOP
- 2014 10,000 6-day Curies EOP
- 2015 9,000 6-day Curies EOP

The following graphs from the 2017 NEA projections[2] are useful to consider. They demonstrate the supply situation and that it is likely there will be a very significant global over supply by 2022.

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[1] The Supply of Medical Radioisotopes Final Report of the Third Mandate of the High-level Group on the Security of Supply of Medical Radioisotopes (2013-2015) https://www.oecd-nea.org/med-radio/ accessed 4/6/2017

[2] ARTMS™ Products Inc. Licenses Canadian Technology to Address the Global Medical Isotope Supply Challenge http://www.newswise.com/articles/view/660744?print-article accessed 4/6/2017

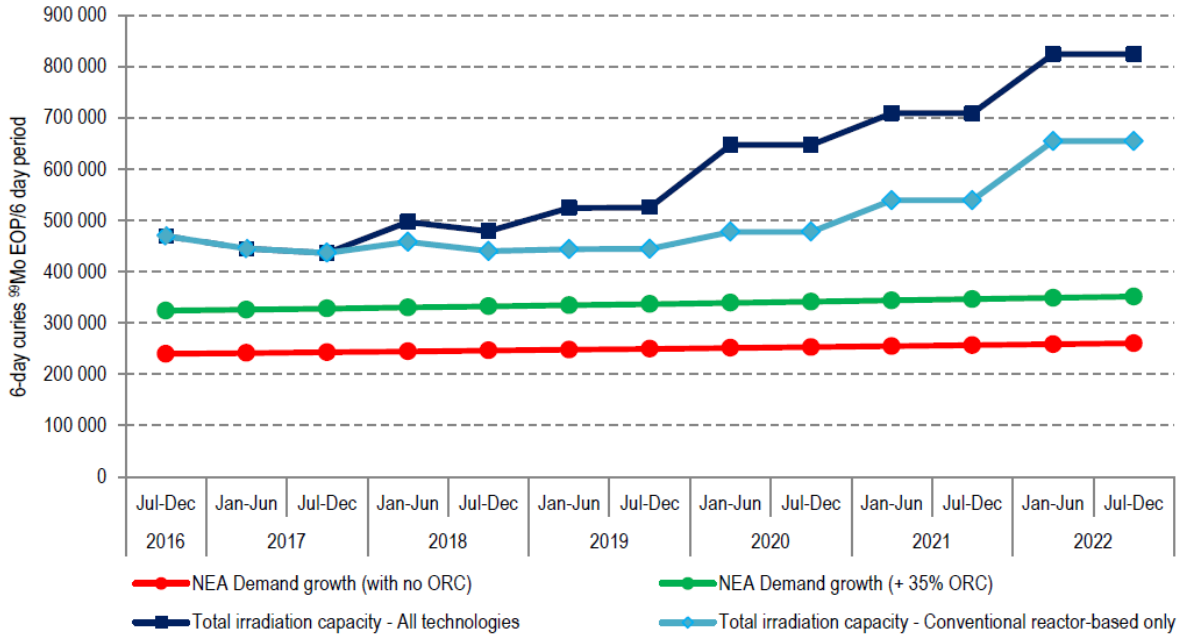
[3] Triumf CycloMed 99 http://www.triumf.ca/cyclomed99 accessed 4/6/2017

[4] The Supply of Medical Radioisotopes: 2017 Medical Isotope Supply Review: 99Mo/99mTc Market Demand and Production Capacity Projection 2017-2022 https://www.oecd-nea.org/med-radio/ accessed 4/6/2017

IRRADIATION 2017-2022

This projection adds the planned new reactors in Europe, North and South America (pale blue line) and only 50% of worldwide planned non-reactor production (dark blue line). It omits reactors that the NEA evaluates as unlikely to be producing before 2022.

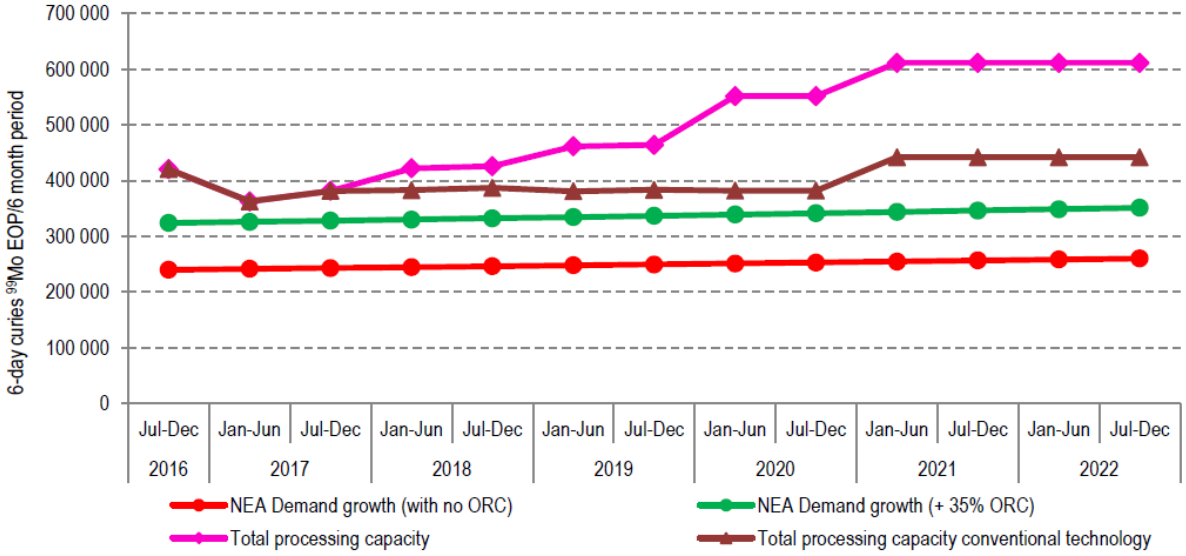
Figure 5.1: Current demand (9 000 6-day Ci ^{99}Mo/week EOP) and demand +35% ORC vs. irradiation capacity – total and conventional reactor-based only, 2017-2022: Scenario B



PROCESSING 2017-2022

This graph again omits capacity that is unlikely to be available before 2022. Once again only 50% of alternative capacities have been included.

Figure 5.2: Current demand (9 000 6-day Ci ^{99}Mo/week EOP) and demand +35% ORC vs. processing capacity – total and processing capacity – conventional only, 2017-2022: Scenario B



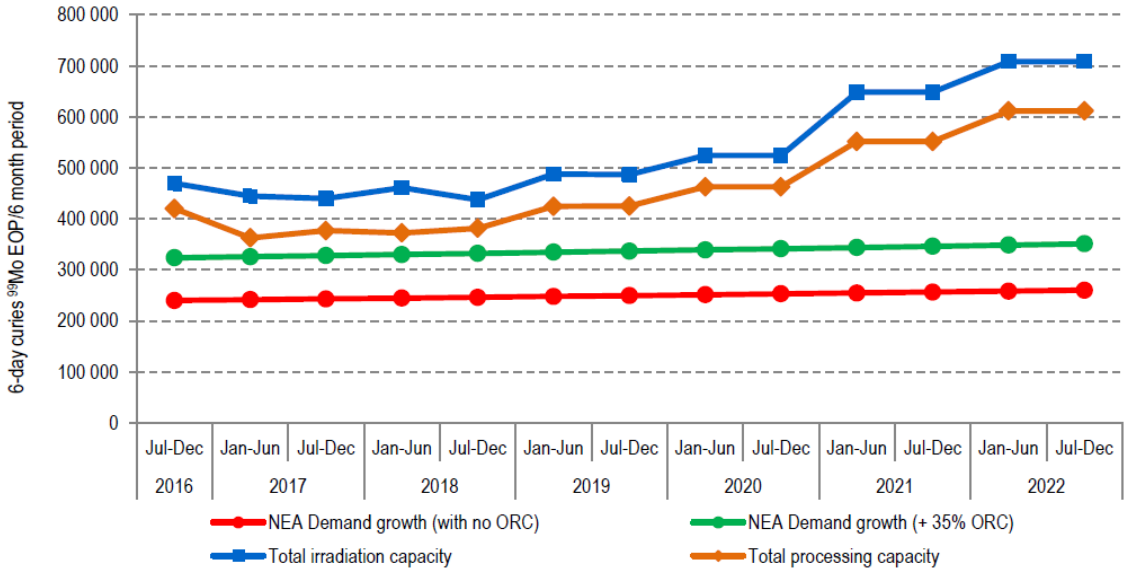
POSSIBLE DELAYS

It is useful that the NEA modelled delays in increased production (including Australian capacity) coming online for both one year and two years and these graphs are presented below. This is helpful information, as it means there is time to stop and evaluate the current ANSTO export business proposal without causing problems for global supply.

One year delay

The 2017 report specifically included the impact of a one year delay in the commissioning of the new ANM in its evaluation, and this is depicted in the graph below.

Figure 6.1: Current demand (9 000 6-day Ci ^{99}Mo/week EOP) and demand +35% ORC vs. total irradiation capacity and total processing capacity – projects delayed, 2017 - 2022: Scenario C



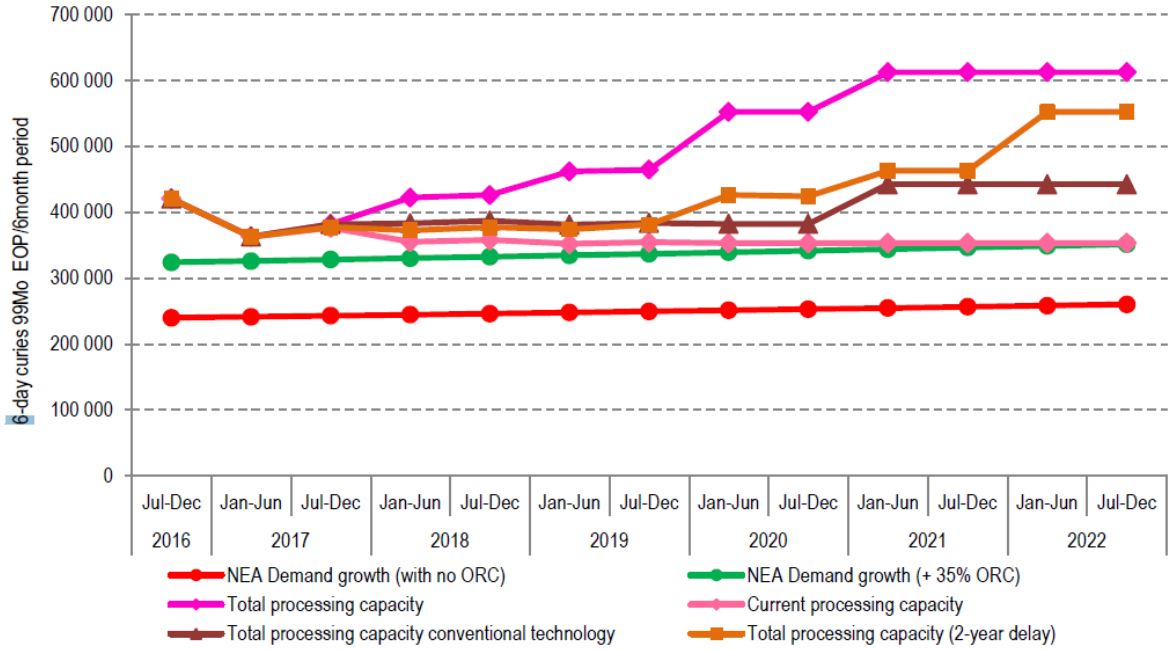
Two year delay, conventional sources only

This is very conservative, as none of the non-reactor or alternative technologies are included. Again the delay includes delay in increased Australian production. To quote from the NEA 2017 report[2]:

"The potential impact of even more extended project delays is relevant as history confirms that most projects experience some delays and sometimes multiple year delays. Figure 6.2 looks at the potential impact of further delays and concentrates only on processing capacity, because it has lower levels of reserve capacity. It shows the projected demand and projected demand

+35% ORC lines compared to the current processing capacity, the total processing capacity and the conventional technologies only capacity (all with no project delay), and with a total processing capacity line with a two-year total project delay. The graph lines therefore represent the minimum, the maximum and two potential intermediary lines for processing capacity that represent different types of challenge."

Figure 6.2: Current demand (9 000 6-day Ci ^{99}Mo/week EOP) and demand +35% ORC vs. processing capacity – current, total, total conventional only and total two-year delay, 2017 - 2022: Scenarios A + B + C (two-year delay)



It is likely that ANSTO's new facility will be facing an oversupplied market. There is no urgent global shortage.

A 2010 OECD Nuclear Energy Agency report titled "The Supply of Medical Radioisotopes- An economic study of the Molybdenum-99 supply chain"[5] found reactor based production of Mo-99/Tc-99m requires significant taxpayer subsidies, as the cost of sale does not cover the cost of production. This study was very comprehensive, and in its opening acknowledgements states:

"This report would not have been possible without input from a significant number of supply chain participants and stakeholders including all major reactor operators, all major processors,

[5] https://www.google.com.au/search?q=The+supply+of+medical+isotopes+An+economic+study+of+the+Molybdenum+supply+chain&ie=utf-8&oe=utf-8&gws_rd=cr&ei=d2yYVr-uE8zP0ATX_KegBQ accessed 4/6/2017

generator manufacturers, representatives from radiopharmacies and nuclear medicine practitioners. The input from the supply chain participants was essential for completing this study, and the NEA greatly appreciates the information provided by interviewees."

The report goes on to conclude: "*In many cases the full impact of Mo-99/Tc-99m provision was not transparent to or appreciated by governments who were financially supporting research reactors' 99Mo production. The full costs of waste management, reactor operations, fuel consumption, etc. were not included in the price structure, thus providing a significant deficiency in the pricing mechanism. This is a subsidisation by one country's taxpayers of another country's health care system. Many governments have indicated that they are no longer willing to provide such subsidisation.*

Overall, it is clear that there is a market failure in the 99Mo supply chain. This market failure has contributed to a supply chain that is economically unsustainable. This pricing structure has resulted in a lack of investment in current and new infrastructure to reliably supply 99Mo."

The Canadian Government Expert Review Panel on Medical Isotope Production in 2009 was examining options for future isotope supply, and concluded:

> *"Research reactors are shared facilities that have all the benefits associated with multi-use facilities, including the benefit of costs being spread over a large base of activities. However, this is the most expensive of the options, with high capital and operating costs. Costs associated with the processing facility, training, licensing requirements, security, and waste management are also very significant.*
>
> *Revenue from isotope production would likely offset only approximately 10–15% of the costs of the reactor".*[6]

The ANSTO accounts are opaque and there is no evidence that this is not the case in Australia. There is a major lack of transparency and public accountability, both financially and with regard to social licence. There is no separation of molybdenum production in the annual accounts presented to the public. The NEA found items such as the cost of infrastructure, insurance, waste storage and decommissioning are all costs that are commonly omitted in calculating the degree of government subsidisation of reactor production of technetium.

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[6]**Report of the Expert Review Panel on Medical Isotope Production** 2009 Presented to the Minister of Natural Resources Canada
https://www.google.com.au/search?q=Canadian+review+nuclear+isoptope+production&ie=utf-8&oe=utf-8&gws_rd=cr&ei=SE-XVvHLFMbA0gSL4YrAAw accessed 4/6/2017

The NEA 2017 report commented on their own projections:

"A so-called "all-in" scenario (where all the planned new/replacement projects are included at full projected capacity) is not reported in this projection. If all new potential projects proceed at the capacities and times as announced, there will be significant overcapacity of supply in the 99Mo/99mTc market by 2022, a capacity level which is unlikely to be sustainable by the market in the long term.

In this report, a total of four projects have been excluded as their likely commissioning dates have been delayed beyond 2022. This is not to suggest that the projects will not become operational, but that they are now not scheduled in the forecast period (2017-2022).

Furthermore, all new alternative technology projects whether reactor-based or nonreactor based are assumed to have a 50% probability of being commissioned within their announced timelines. This assumption is to account for the fact that alternative technologies have yet to be proven on a large scale in the 99Mo/99mTc market. This has been translated as applying only 50% of the expected maximum capacity to the forward projections for each of those projects.

In the time frame beyond 2022, the proposed projects for 99Mo/99mTc irradiation and associated processing capacity, if all completed, would significantly exceed projected market demand. However, this apparent future excess capacity should not imply that long-term security of supply is assured as it does not take into account any current capacity being retired early, the continued delay of projects, or consider the commercial sustainability of any potential "overcapacity" in the market.

The 2017 scenario C (two year delay in new projection for both total irradiation capacity and total processing capacity) stay well above the NEA demand +35% ORC line throughout the reference period. This improvement has been achieved because of the on-time introduction of additional capacity in Australia utilising existing facilities."

CONCLUSION

There will be significantly increased intermediate level nuclear waste from the operation of the new ANM facility. There is neither urgency nor demonstrable need for further expansion of Australia's ^{99} Mo isotope production at this time. Indeed the recent expansion of isotope production in the existing facility is also worthy of review, given supply and demand trends and the accumulating waste burden.

ANSTO assumes there is a disposal plan for this waste, when in fact this is a highly contested area. Even the existing proposal from ANSTO for ILW is only for temporary storage, and there is no proposal for disposal.

The location of a waste facility has been actively pursued and has been unsuccessful for nearly two decades.

There is no location currently other than ANSTO facility at Lucas Heights that is licenced to accept this material.

The current process searching for a nuclear waste site location is causing major community distress and clear harms.

There are clearly significant public health harms associated with nuclear waste. The requirement for long term isolation of this highly toxic material is onerous for any community.

It is irresponsible to be significantly increasing intermediate waste production at this time, given there is no method of long term disposal. The current proposal to store this waste for up to 100 years is well below world's best practice management of this waste. It is effectively just "kicking the can down the road". It not addressing the issue that this waste is a liability for the community for generations to come.

The net benefit of expanding molybdenum production to the Australian community has not been demonstrated, nor in fact the need to supply the global community, nor the reliance on significant opaque taxpayer subsidies.

The proposed business model to expand the ANSTO capacity should not be at the cost of the health of the Australian community. We challenge ANSTO's statement on page 8 of its operating licence application that "This SAR demonstrates that the ANM Mo-99 facility, as built, configured, managed and maintained can be operated without posing any undue risk to either the workforce or members of the public or the environment."

We ask that licencing of this facility should be delayed until it is clearly (and independently of

ANSTO) demonstrated that there is in fact some net benefit to the Australian community. Production increases should also be delayed until there is a genuine method of disposal that meets world's best practice standards.

The claimed global benefit is not supported by NEA 2016 projections. The taxpayer subsidies of this process could be spent with much greater benefit on other critically underfunded health issues, either domestically or internationally.

The first principle of toxic waste management is to reduce production.

MAPW believes there is a clear and urgent need for an independent inquiry into nuclear waste production and storage in Australia. This proposal is not consistent with international best practice.

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