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Submission No. 01.2
(ANSTO Project)
Date: 26/02/13

Committee Secretary
Parliamentary Standing Committee on Public Works
PO Box 6021
Parliament House
Canberra ACT 2600

25 February 2013

Dear Sir/Madam,

Re: Supplementary Submission to the ANSTO Nuclear Medicine Project enquiry

Please find attached for the Public Works Committee's consideration, the Australian Nuclear Science and Technology Organisation's (ANSTO's) supplementary submission to the ANSTO Nuclear Medicine Project inquiry.

During the public hearing held on 1 February 2013, ANSTO undertook to provide three additional documents to the Committee. These were as follows:

1. A paper addressing the concerns raised by the Sutherland Shire Council in their submission to the inquiry;
2. A summary of the business case for the Synroc waste treatment plant; and
3. Detailed risk registers for both the nuclear medicine manufacturing facility and the Synroc waste treatment plant once a sufficient level of design maturity is achieved.

ANSTO is pleased to provide the Committee with items 1 and 2 within this submission, and looks forward to providing item 3 once the necessary design maturity has been achieved.

As one of the Sutherland Shire's largest employers, ANSTO values its strong relationship with the local community and Council. ANSTO is always pleased to discuss its activities with Council and has recently proposed regular quarterly meetings be set up to update Council on ANSTO projects. ANSTO will also shortly brief the Council's Environment Health and Regulation Committee on the ANSTO Nuclear Medicine Project and in preparation for this briefing, has provided relevant sections of this supplementary submission.

If you would like any further information in relation to the submission, please do not hesitate to contact me.

Yours sincerely,

Ms Nadia Levin
General Manager
Government, International and External Relations

Australian Government

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SUPPLEMENTARY SUBMISSION TO THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

ANSTO Nuclear Medicine Project

FEBRUARY 2013

AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION

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1. Introduction

As outlined in ANSTO's *Statement of Evidence*, referred to the Committee on 26 November 2012, the ANSTO Nuclear Medicine Project has two main components:

- A new nuclear medicine manufacturing facility which will guarantee the supply of one of the world's most important nuclear medicines, Molybdenum-99 or Mo-99, to all Australians now and into the future; and

- A Synroc waste treatment plant which will provide a safe and economical way of treating the necessary by-products of Australian nuclear medicine manufacture.

The project will put Australia at the forefront of the global fight against cancer and heart disease, as well as position Australia as a regional and global leader in nuclear medical science and nuclear non-proliferation.

On 1 February 2013, at the public hearing for the Public Works Committee (PWC) Inquiry into the ANSTO Nuclear Medicine Project, ANSTO undertook to provide three additional documents to the Committee. These were as follows:

1. A report addressing the concerns raised by the Sutherland Shire Council in their submission to the inquiry entitled *Sutherland Shire Council Submission to the Parliamentary Standing Committee on Public Works: ANSTO Nuclear Medicine Project*;

2. A summary of the business case for the Synroc waste treatment plant; and

3. Detailed risk registers for both the nuclear medicine manufacturing facility and Synroc waste treatment plant once a sufficient level of design maturity is achieved.

The following submission is intended to be a supplementary submission to ANSTO's *Statement of Evidence*. Within this submission, ANSTO is pleased to provide the Committee with items 1 and 2, and looks forward to providing item 3 once the necessary design maturity has been achieved.

2. Submission by the Sutherland Shire Council

2.1 ANSTO and the Sutherland Shire Council

ANSTO values its strong relationship with Council and the local community and works hard to ensure public confidence in ANSTO and its operations.

For example, ANSTO meets regularly with Council to discuss a range of initiatives and to ensure there is an ongoing dialogue between the two organisations. ANSTO is also a proud sponsor of a variety of local events and regularly welcomes members of Council to its Lucas Heights campus. As recently as 25 January 2013, the new mayor of Sutherland Shire visited ANSTO for a familiarisation tour. Similarly, all new councillors visit ANSTO as part of their informal induction process.

Approximately half of ANSTO's 1200 strong workforce resides in the Sutherland Shire, and as one of the region's largest employers, ANSTO is keen to continue to work with Council to continue to benefit the local community.

2.2 Further information requested by Sutherland Shire Council

In its submission, Council raises five areas where further information was sought. These are:

- **Concern 1:** *A lack of detail surrounding the size of the facilities*. Council's submission states "the information available to Council and the public is not sufficient in detail to determine the size of the facilities";

- **Concern 2:**

    a) *An increase in the generation of waste*. Council's submission states that no indication is given as to "the scale of the increase in nuclear medicine production, and hence the scale of the increase in waste production".

    b) Council also questions how the additional capacity of the Synroc plant will be used once legacy wastes have been processed.

- **Concern 3:** *The storage of nuclear wastes*. Specifically, Council is concerned that ANSTO may become a de facto nuclear waste processing plant for wastes other than those generated by ANSTO and that the processing of waste will reduce the urgency for the establishment of a National Radioactive Waste Management Facility.

- **Concern 4:** *The function of the Synroc plant*. Council is concerned that, as part of the Synroc plants function as a demonstration plant to sell Australian innovation overseas, wastes will be imported for processing.

- **Concern 5:** *Safety and Synroc*. Council makes the comment that no information has been provided as to whether the final product from Synroc processing is inherently safer or will reduce activity and exposure compared to the current situation or traditional methods.

2.3 Response to Council's request for further information

2.3.1 Concern 1: A lack of detail surrounding the size of facilities

Preliminary design for both facilities is progressing well. Preliminary design of the Synroc plant has been completed, and preliminary design of the nuclear medicine manufacturing facility is well underway and is expected to be completed by mid-2013. While the design of both facilities will not be finalised until the detailed design has been approved by ARPANSA later in the regulatory process, the preliminary designs provide a significant amount of detail, including the proposed size and layout of the facilities.

The core design of the nuclear medicine manufacturing facility will be based on ANSTO's existing Mo-99 facility and an existing South African facility to ensure maximum safety, simplicity, robustness and cost effectiveness of operation. The building will have three levels, a basement, ground floor and mezzanine level and at 12 meters tall will be shorter that ANSTO's existing Mo-99 facility. The ground floor will be primarily used for Mo-99 production and will also accommodate a loading dock to ensure the efficient despatch of life-saving nuclear medicines. The basement will house necessary support systems for the building and nuclear medicine manufacturing equipment. The mezzanine level will provide an open plan office space for staff. At this stage, floor space is estimated at around 4,000 square metres. A concept design for the façade of the building appears at Figure 1 below and gives an indication of the look and feel of the building.

Figure 1: Nuclear Medicine Manufacturing Facility – South Western Perspective

The Synroc plant will be the first-of-its kind and will utilise Australian developed technology. ANSTO scientists have used their years of experience and expertise to carefully tailor the technology to the unique chemistries of the by-products of nuclear medicine production. As a result, the waste forms produced will be even more stable than those processed using alternatives methods such as cementation.

ANSTO has worked with local and international engineering firms and consultants to develop and test the technology, which has then been evaluated and verified by independent experts. The technology has also been tested at scale, and a full-scale test plant is currently under construction to demonstrate the effectiveness and maturity of the technology.

The Synroc building will be approximately 1200 square meters and will stand at approximately 18 metres tall. To put this figure in perspective, there are currently seven buildings on the ANSTO campus that are 18 meters or taller. The building will have three main areas, a processing area, a service area and administrative area. The processing or main area will be the largest area and is where the actual processing of wastes will occur. The service area will accommodate electrical switchboards and other support equipment, and the administrative area will house staff offices and amenities. A concept for the façade of the building is Figure 2.

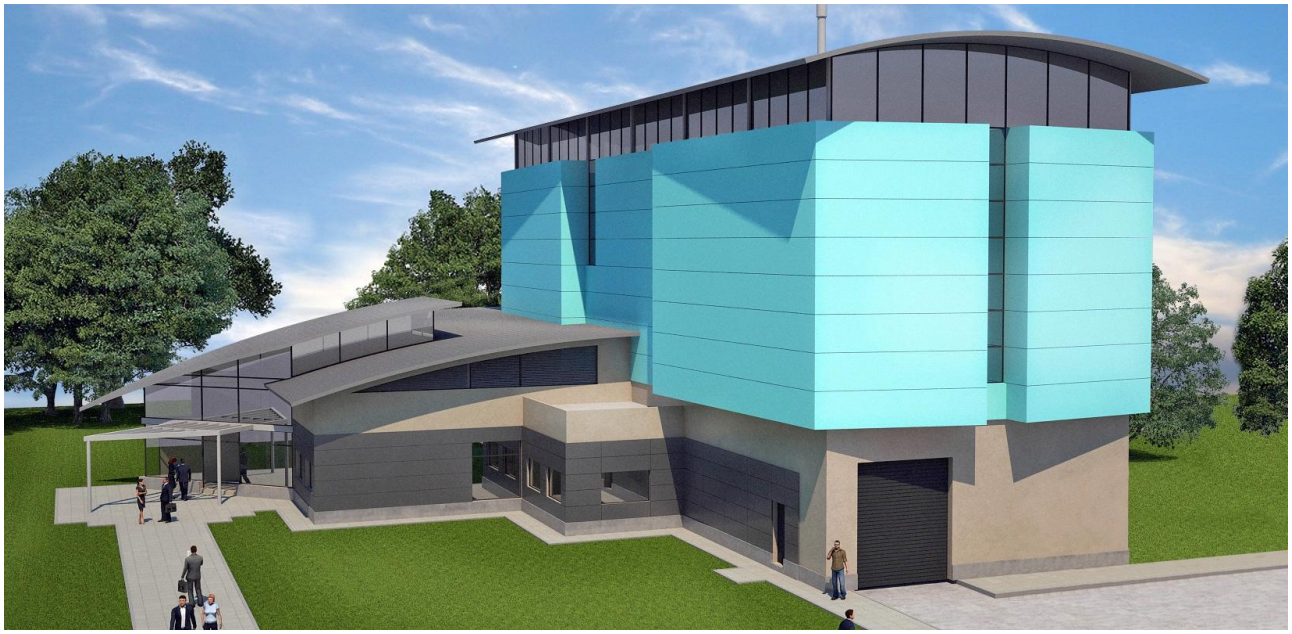

Figure 2: Synroc waste treatment plant

As part of ANSTO's ongoing modernisation program, the contemporary architectural design of both facilities will incorporate environmental friendly features. They will also align with *ANSTO's 2055 Master Plan* which aims to provide the necessary vision and guidance to encourage the best site development, a state of the art scientific installation and a user-friendly facility.

Both sites have been selected following an extensive Siting Analysis Study which identified the optimum location for both facilities in terms of location, efficiency and safety. Importantly, neither facility is expected to have a significant impact on the environment.

Both facilities will of course comply with appropriate Australian and international building standards, including those set by the International Atomic Energy Agency (IAEA), the Australian Safeguards and Non-Proliferation Office (ASNO) and the independent nuclear regulator, ARPANSA.

It is worth noting that at this stage in the approval processes required for the project, both for approval from the PWC as well as approval from the independent nuclear regulator, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), detailed design is not required. For example, the siting licence application submitted to ARPANSA that is mentioned in Council's submission as a possible source of information on the design of the facilities, does not require design details but instead focuses on the site selection for both facilities. ANSTO expects this submission to be made publicly available by ARPANSA shortly as part of their public consultation process.

ANSTO has already been in contact with Council to offer a briefing on the preliminary design of both facilities as well as other questions raised within their submission. ANSTO is pleased that Council has accepted this offer and looks forward to briefing them further on this important project.

2.3.2 Concern 2: An Increase in the Generation of Waste

(a) Regarding Council's questions over an increase in the generation of waste

The Synroc process will reduce the volume of waste produced by the new nuclear medicine facility by 75%. It will also be used to reduce the volume of ANSTO's existing liquid waste stocks from past nuclear medicine production. Ultimately, the new Synroc plant will result in a smaller volume of waste being held at ANSTO's Lucas Heights campus.

The new nuclear medicine manufacturing facility will increase ANSTO's nuclear medicine production threefold. This increase will secure Australia's future supply of the world's most important nuclear medicine, Mo-99, and will allow Australia to supply a significant proportion of the

world's demand. Importantly, the Synroc project will provide cutting-edge technology to enable ANSTO to reduce the volume of waste produced from Mo-99 as well its existing medical waste holdings.

Waste is a necessary by-product of producing any nuclear medicine and is completely safe when correctly stored. The new nuclear medicine manufacturing facility will produce around 4,400 litres of liquid waste per year, compared to the 1,165 litres currently produced at ANSTO. This is a relatively small increase, and is put into perspective when you consider the average backyard swimming pool holds around 30,000 litres of water.

Importantly, neither ANSTO's existing waste holdings nor the future arisings from the operation of the new Mo-99 facility will be able to be transported to the National Radioactive Waste Management Facility until they have been solidified. The new Synroc plant will allow this process to happen efficiently and will thereby facilitate the transport of waste to the national facility once it is operational.

(b) Regarding Council's questions over the additional capacity of the Synroc plant

Council questioned how the additional capacity of the Synroc plant will be used once ANSTO's existing waste holdings have been processed. The Synroc plant will only be used to treat wastes produced by ANSTO. Under the *ANSTO Act*, ANSTO is only empowered to manage or process radioactive wastes arising from its own activities or those of another Commonwealth entity.

Once existing waste holdings have been processed, the plant's sole function will be to process the by-products of nuclear medicine production and invaluable research. The plant's operating schedule and production volume will be determined by and correspond to radioisotope production.

2.3.3 Concern 3: The Storage of Nuclear Wastes

ANSTO agrees that a national facility is the most appropriate solution for the long-term storage of radioactive waste. While ANSTO can safely manage the by-products of nuclear medicine production in the interim, it remains ANSTO's position that waste should be sent to a national facility for long-term storage.

International best practice for the long-term storage of radioactive waste is for each country to manage its own waste in a centralised national facility. Such a facility would allow for the permanent and safe storage of waste that is currently stored at over 100 sites across Australia, including hospitals and medical practices, research facilities, universities and sites associated with the minerals sector.

ANSTO is encouraged that there is now a legislative framework in place to allow for the establishment of such a facility. In April 2012, the Australian Government passed the *National Radioactive Waste Management Act* to pave the way to establish a purpose-built national facility. ANSTO was also pleased to see that the tender for the first-phase of pre-site design was recently awarded.

ANSTO was involved in the public consultation at the time of the finalisation of the *National Radioactive Waste Management Act* and is very comfortable with the legislative framework it established. ANSTO will continue to assist the Department responsible for the facility as well as the organisation awarded the tender with its nuclear expertise and experience in interim waste management.

In the meantime, ANSTO has a responsibility to continue to safely manage and store its waste and to ensure it is processed into a form suitable for long-term storage or disposal at the National Radioactive Waste Management Facility. Delaying the ANSTO Nuclear Medicine project until a national facility is built, as suggested by Council, is not possible without risking supplies of Mo-99 for Australians, because ANSTO's existing Mo-99 manufacturing facility must close by 2017. Delaying the project would also prevent ANSTO from solidifying and reducing its existing waste holdings using Synroc technology.

As has been previously communicated to Council, there are a number of strong factors that prevent ANSTO from becoming a 'de facto' waste store or storing waste other than that produced on the ANSTO site. Firstly, under section 5 of the *ANSTO Act*, waste cannot be permanently stored at ANSTO's Lucas Heights campus. Further, under the Act, ANSTO is only empowered to manage radioactive wastes arising from ANSTO's own production processes and facilities or those of an entity controlled by the Commonwealth Government.

Secondly, ANSTO's Lucas Heights campus is not the right location for a permanent waste store or centralised national repository due to future land use considerations, both by ANSTO and the local community.

Thirdly, ANSTO is a scientific research institute. It is not international best practice for a country to have their centre of nuclear expertise and national repository located at the same site. This is the view of the International Atomic Energy Agency (IAEA), the world's centre of cooperation in the nuclear field, and has been acknowledged by the Parliament in its adoption of the *National Radioactive Waste Management Act.*

It is therefore ANSTO's opinion that there a number of pragmatic as well political drivers that mitigate the concerns of Council in terms of ANSTO becoming a 'de facto' long-term waste store.

2.3.4 Concern 4: The Function of the Synroc Plant

It is Australian Government policy that Australia only processes and stores radioactive wastes produced within Australia. As previously stated, under the *ANSTO Act*, ANSTO is only empowered to manage or process radioactive wastes arising from its own activities or those of another Commonwealth entity.

The Synroc plant is a fantastic opportunity to showcase Australian innovation. It will be an operating facility that will demonstrate how Synroc technology could be used in other countries. The plant will allow potential customers to visit ANSTO, see an operating demonstration of the technology and discuss the viability of building a Synroc plant within their own countries with the assistance of ANSTO's Synroc experts. As such, the Synroc plant could create excellent spin-off opportunities for Australia with significant commercialisation potential.

2.3.5 Concern 5: Synroc and Safety

ANSTO scientists have used their years of experience and expertise to tailor the Synroc process to the unique characteristics of the by-products of nuclear medicine production. The result is a waste form that is even more stable than waste forms produced using alternative methods such as cementation.

The Synroc plant will utilise mature technology that will enable the volume of waste to be reduced dramatically, up to 99% when compared to other methods such as cementation, and hence reduce the life cycle costs associated with storage, transport and eventual disposition. More importantly, the final product will be dense, durable ceramic or glass-ceramic contained within a stainless steel canister, which locks-up radioactivity, preventing its release into the environment.

The Synroc plant will comply with all appropriate Australian and international standards, including those set by the International Atomic Energy Agency (IAEA), the Australian Safeguards and Non Proliferation Office (ASNO) and the independent nuclear regulator, ARPANSA.

3. The Synroc Business Case

3.1 Background

The Synroc component of the ANSTO Nuclear Medicine Project is intrinsically linked to the nuclear medicine manufacturing component. The Synroc plant is needed to process the necessary by-products of nuclear medicine production and is therefore needed in a form and scale to support this important nuclear medicine production.

Consequently, the Synroc business case forms part of the overall business case for the project, and providing a summary of just the Synroc business case is not possible. Instead, ANSTO provides the following additional information which details the purpose of the facility, discusses the justification for adopting Synroc over other options and describes the Synroc process.

3.2 Summary: Business Case

Purpose of the Synroc Facility

The purpose of the Synroc waste treatment facility will be to treat the legacy and ongoing waste generated from the production of nuclear medicine. The Synroc plant is based upon ANSTO's proprietary Synroc technology and is the "first-of-a-kind" to treat various types of wastes.

Legacy waste from past production of nuclear medicines is currently stored in holding tanks on the ANSTO Lucas Heights site. While this waste is currently safely managed in accordance with existing licences, this waste is not in a form suitable for long term storage or for transport to a national waste management facility, and the construction of this plant and subsequent treatment of the waste will produce a waste form suitable for ultimate disposal. The planned facility will also be capable of treating the increased volumes of waste associated with the proposed ANSTO Nuclear Medicine Project. In determining the price to be charged for product produced from this new facility, an allowance will be included to cover the cost of encapsulating the resulting waste into synroc.

In accordance with sound project and risk management guidelines, the facility will be designed to ensure maximum process reliability and will include proven design principles.

Alternatives to Synroc Processing

ANSTO has considered all reasonable alternatives to Synroc technology. These include:

- Bituminisation;
- Increased storage capacity; and
- Cementation

The Synroc process has key technological, operational and logistical advantages over the alternatives. It is the only alternative that can effectively treat legacy and future wastes arising from the Mo-99 production.

If the current standard method of waste treatment (being cementation) was used, it would produce 52,000 litres of waste; utilisation of the Synroc methodology will reduce this to just 500 litres. This 100-fold reduction in the final volumes of waste stored will generate significant storage and logistical savings for ANSTO, the Commonwealth Government and other prospective users of this ANSTO technology. Although the Synroc technology will have marginally higher capital costs, when the full life cycle costs are taken into consideration there will be significant savings compared to other storage methods.

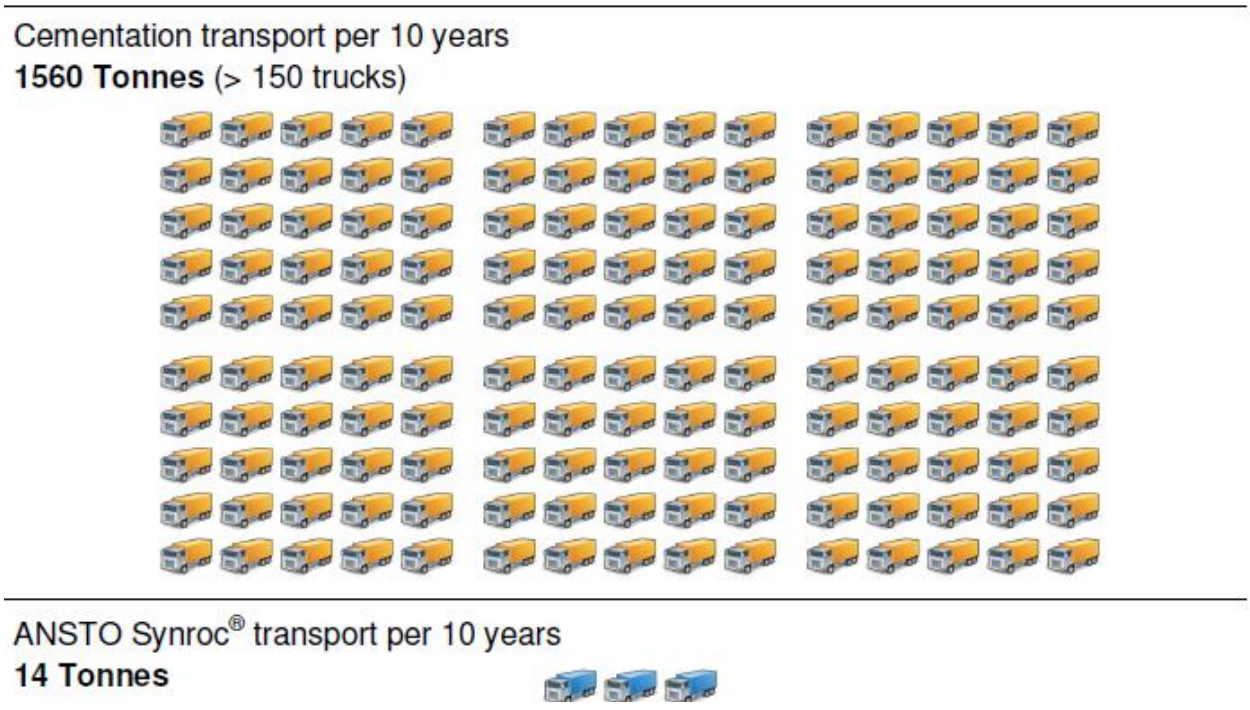

Figure 3: 10 year Disposal Volumes of waste (Synroc vs Cementation) for current ANSTO Mo-99 Production

Figure 3 demonstrates the significant transport and waste disposal differences when comparing Synroc and Cementation, based on a 10 year production volume at the current ANSTO Mo-99 production capacity.

Reasons for Proposing Synroc Now

Synroc technology provides for a long-term stable waste form to treat the waste arising from Mo-99 production. Synroc is the lower cost (i.e. long-term full lifecycle costs) alternative. All Mo-99 producers around the world are faced with similar challenges to ANSTO for treatment of waste from their operations. There are inherent problems with the current options available for treatment of waste and long term storage and disposal costs. A number of Mo-99 producers worldwide have expressed an interest in exploring the Synroc process option, based on ANSTO having an operating facility for assessment.

Maturity of the Technology

The Synroc plant will be the first of its kind and will utilise Australian developed technology. ANSTO scientists have used their years of experience and expertise to carefully tailor the technology to the unique chemistries of the by-products of Mo-99 production. As a result, the waste forms produced will be more stable than those processed using alternative methods such as cementation.

ANSTO has worked with local and international engineering firms and consultants to develop and test the technology, which has then been evaluated and verified by independent experts. The technology has also been tested at scale, and a full-scale test plant is currently under construction to demonstrate the effectiveness and maturity of the technology.

Protecting Australian Intellectual Property

The intellectual property of Synroc consists of a combination of patentable and patented technology, registered designs and know-how. ANSTO is currently pursuing a number of additional patent applications for the technology, for which it plans to obtain patent protection both in Australia and overseas. To ensure maintenance of confidentiality and to retain the proprietary nature of the technology, ANSTO only releases proprietary information to third parties on a strict need-to-know basis. This means that no third party has complete access to all of the synroc technology, but only to that portion which relates to their services. In addition, each third party requiring access to any Synroc technology is required to sign a black-box confidentiality agreement as well as a document assigning any new and relevant intellectual property back to ANSTO.

The Synroc process

During the Synroc process, the liquid waste is mixed with synroc precursor materials, dried and calcined (otherwise known as airing). Together these processes result in the formation of a powder. This powder is then transferred into a specially designed stainless steel canister which is subjected to high temperatures to convert the mixture into its final waste form.

The final product is a dense, durable ceramic contained within a stainless steel can, which locks up radioactivity, preventing its release into the environment.

Conclusion

In this supplementary submission to the PWC, ANSTO has provided:

1. A paper addressing the questions raised by Sutherland Shire Council in their submission to the Committee; and

2. A description of the purpose of the facility, a discussion of the justification for adopting Synroc over other options and a description of the Synroc process.

ANSTO looks forward to providing risk registers for both components of the ANSTO Nuclear Medicine Project once a sufficient level of design maturity has been achieved.

The new nuclear medicine manufacturing facility will guarantee the future supply of one of the world's most important nuclear medicines, Mo-99, to all Australians now and into the future. Mo-99 is the most widely used medical radioisotope and is used in approximately 85% of nuclear medicine procedures worldwide. As well as supplying the domestic market, the new facility will allow Australia to meet a significant proportion of the world's demand for Mo-99. The facility will use low enriched uranium targets, which is internationally preferred to minimise proliferation and security concerns.

The co-located Synroc waste treatment plant will deliver a permanent, safe and economical way of treating waste from past, current and future manufacture of nuclear medicines. In addition, this plant will be an operational scale demonstration of the Synroc process, with possible spin-off opportunities.

In summary, the project will put Australia at the forefront of the global fight against cancer and heart disease as well as position Australia as a regional and global leader in nuclear medical science and non-proliferation.