AUSTRALIAN RADIATION PROTECTION AND NUCLEAR SAFETY AGENCY
PUBLIC FORUM ON THE DEPARTMENT OF EDUCATION, SCIENCE AND TRAINING NATIONAL RADIOACTIVE WASTE REPOSITORY LICENCE APPLICATION
WEDNESDAY, 25 FEBRUARY 2004
PANEL
DR JOHN LOY, Chair
PROF IAN LOWE AO
MR GEORGE JACK
PRESENTERS
HON JOHN HILL MP
MS KARINA LESTER
MS EILEEN KAMPAKUTA BROWN
MS IVY MAKINTI STEWART
MS MARTHA UGANBARI EDWARDS
MS EMILY MUNYUNGKA AUSTIN
DR ROGER THOMAS
MR DAVID NOONAN
COUNCILLOR GEORGE HURLEY
DR GARRY SMITH
DR JIM GREEN
COUNCILLOR GENEVIEVE RANKIN AM
ADELAIDE
1
DR JOHN LOY: Good morning, ladies and gentlemen. Welcome to ARPANSA's public forum.
My name is John Loy and I'm the CEO of the Australian Radiation Protection and Nuclear Safety Agency. The purpose of this public forum is to assist me to make a decision on the application by the Department of Education, Science and Training for a licence that would allow them to prepare the site for, to construct and to operate the proposed National Radioactive Waste Repository at site 40A, near Woomera in South Australia.
I firstly acknowledge that this forum is being conducted in the country of the Kaurna people, the traditional owners and custodians of the Adelaide Plains. The Australian Radiation and Protection and Nuclear Safety Act requires that, when deciding whether to issue a licence, I must take into account a number of things: First, I must take into account - that is, consider carefully - international best practice in radiation protection and nuclear safety; what is the best practice in the world about radiation protection and nuclear safety for radioactive waste disposal.
I must also take into account whether the information that is provided by the applicant establishes that the proposed actions - in this case preparing a site, constructing and operating a shallow burial waste repository - can be carried out without undue risk to the health and safety of people and to the environment. The third matter is whether there is a net benefit in carrying out the proposed actions. The fourth is the capacity of the applicant to comply with the licence that I may issue. I'm sure we will hear a good deal of debate about all of these matters in the next two days.
With regard to an application such as the one we are considering today I must, and I have, sought submissions from members of the public about the application. The Act says that I'm required to take into account the content of any such submissions made. I thank the people and organisations that made the effort to make a submission in the first round. The submissions can be found on the ARPANSA web site.
I view the public forum as an extension of the public submission process. The presenters in the forum over the next two days generally are people who have made public submissions and the forum

is an opportunity for them to present their submissions and to explain them further. The questioning by members of the panel and myself of the presenters and their responses is another contribution to the openness of the decision-making process. I will certainly take into account what is said in this public forum as part of my decision-making on the application, and I stress that I have not made any decision on the application to date. So I am very much looking forward to the next two days and to doing a lot of listening.

I should mention that the event is being recorded and, as soon as possible after the forum, a transcript of the proceedings will be posted on the ARPANSA web site. I should say that as this is not a formal hearing process, like a court or tribunal would conduct, I cannot offer any protection from legal actions such as breach of confidence or defamation, et cetera. The conduct at this forum is based on goodwill and cooperation, not legal and formal rules of procedure.

I'm glad in this forum that I'm not alone, and I would like to introduce to you the two panel members who will be working with me. Firstly, on my right, Mr George Jack. Mr Jack moved from Scotland

to Australia, where he worked for five years as a health physicist at Lucas Heights. He then migrated to Canada where he worked for many years for the Canadian Nuclear Safety Commission, which is the regulator of nuclear safety in that country. For many years he has focused on waste management regulation with the commission, dealing with radioactive waste involving the whole range of nuclear activities in Canada. In 2001 he retired as secretary to the commission but since his retirement he has continued his involvement in radioactive waste management matters. He played a particular role with the development of the International Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management. Good morning and welcome.

Our other panellist this morning is Prof Ian Lowe AO. He is an emeritus professor at Griffith University in Queensland, where he was previously head of the School of Science. He has had a very eclectic career in recent years, focusing on policy issues affecting science and technology, especially in the fields of energy and the environment. He has contributed to the international panel on climate change, took part in the Geneva and Kyoto conferences on the climate change treaty. He is particularly noted for his weekly column on science and public affairs in the New Scientist magazine. I think I would summarise his career as being particularly noted for thinking about futures, both broadly and deeply. He's a member of the Radiation Health and Safety Advisory Council and the Environmental Health Council. Welcome, Ian.

I know that George and Ian and I look forward to doing a lot of listening over the next two days, as well as participating in the questioning. I'll be asking my two panel members to write me a short report after the forum, summarising their views on the outcomes of the forum and the matters raised. Their reports to me will also be published on the ARPANSA web site. We do have a very long list of participants. The general format will be that the participants, the submitters, will come forward and make a presentation and then there will be a period of questions from members of the panel and responses by the participants.

I'd ask people, of course, to try and stick to the time as much as possible, especially leaving us time for the interaction of questions and answers. I'm reminded to say that, given the need to produce a transcript, it will also be very valuable if people identified themselves as they begin to speak. May I now call upon our first presenter, the Honourable John Hill MP, Minister for the Environment in the South Australian Government.

HON JOHN HILL MP: Good morning, everybody. Dr Loy and other members of the panel, Senator Penny Wong and the indigenous owners of the land in question, and to everybody who is here today, a very warm welcome. Dr Loy, my presentation will begin with an outline of the South

Australian Government's position on the proposed radioactive waste dump. I will then make comments about our technical objections to the process that has led to the selection of site 40A at Arcoona Station.

From the outset let me put on the record South Australia's profound concerns about this process; a process that all along has been contrived and controlled by Canberra; a process that places you, Dr Loy, I believe, in an impossible position. Impossible because we know that the Howard Government is strongly biased in this matter. We know that the Prime Minister has already decided to acquire the land for which his Government now seeks a licence.

3

The Crown Solicitor has advised me that section 16 of the Australian Radiation Protection and Nuclear Safety Act of 1998 allows the Minister, if he says that he is satisfied that it is in the public interest to do so, to give you written directions to issue the licences for the dump, so the Federal Minister, Peter McGauran, can direct you to find in his favour. Our rights as a State have been trampled, our land could be seized against our will, and our future as a clean and green State would be in danger of being destroyed.

Today is about the low-level repository, but if the Prime Minister gets his way next time it could be about a medium-level dump, despite the Federal Government's belated promises. Who knows what the future holds? One day we may be forced into accepting another nation's waste under the rules of a free trade agreement. There is no case for a national repository. The risks are too great. I believe the will of our people and the decisions of our Parliament are being crushed with callous disregard by the Prime Minister and his cabinet, aided and abetted every step of the way by the staff of the Australian Liberal Party.

As a Minister of this State it angers me that we have a national government which ignores the people of South Australia and the State's tragic nuclear history. There has been no meaningful consultation, not even with the regional towns in the far north. Instead the Howard Government has bullied South Australia. This is not how a good government treats its people in a democracy. The Howard Government is behaving as the Menzies Government did in the 1950s. Then, just as now, there was secrecy, not consultation. Then it was the explosion of atomic warheads in South Australia's outback. Now it's a threat of radioactive waste in South Australia's backyard.

Atomic testing at Maralinga and Emu in the 1950s and ‘60s left a legacy of radioactive material, including plutonium, uranium, caesium and strontium, littered across the fragile outback, contaminating the land and the air. A radioactive mess was left in the desert. The clean-up took decades and cost millions of dollars. The personal damage to the Maralinga people was even more costly. For decades they were unable to occupy their traditional lands. It was a Federal Government decision to allow this testing and South Australians vowed to never again allow our backyard to become a nuclear testing or, for that matter, a national dumping ground.

That is why the South Australian Labor Party took to the last election an explicit commitment to oppose this dump, a position we have held consistently for more than a decade, irrespective of which party has been in power federally. It's a position with overwhelming support amongst South Australians. According to a range of opinion polls, up to 90 per cent of South Australians continue to support our position and more than 120,000 South Australians have signed petitions to Parliament.

The South Australian Labor Party policy is that all States should be responsible for the waste that they generate. That is why the South Australian Labor Government asked the independent EPA to undertake a comprehensive audit of radioactive waste generated and stored in this State. I am advised that this is the first time any State has undertaken such a comprehensive physical audit. The audit found that waste is generally safely stored. However, recommendations were made to improve the storage of radioactive waste into the future. The Government is acting on these recommendations

because it is committed to best practice on this issue.
4
The national dump is not the solution to South Australia's waste needs. It would not replace other dumps. Interim facilities would continue to be required because the proposed national dump would be closed for periods of between two and five years. Consistent with our policy we say that waste should be stored in the State where it is generated. The logical place for the vast majority of the waste proposed for this dump is at Lucas Heights, because that is where the waste is generated.
I am advised that currently the Lucas Heights reactor produces around 30 cubic metres of radioactive waste each year. That's three times the level of waste produced in the rest of the country. The new reactor proposed to come on stream after 2006 is expected to produce a similar amount on an annual basis. I am also advised by our radiation protection branch of the EPA that over the life of the current and proposed reactors we could expect up to 5000 cubic metres of waste to be produced and trucked to the site in South Australia.
On the other hand, in South Australia there is only 12 to 17 cubic metres of waste that has accumulated over several decades that could be deposited in this proposed dump. It is just nonsense to suggest that it is better or safer to move the waste 1500 kilometres across the continent to put it in the pristine pastoral lands of South Australia. On his first full day in office Premier Rann wrote to the Prime Minister to clearly spell out the new Government's position on nuclear waste and to clearly state that it is the wish of South Australians that this dump be abandoned.
If the Commonwealth insists on the need for a new national repository, then it should restart the process and seek to identify a site with community acceptance. After all, that has been the experience in other countries, such as Finland and Sweden, where the public has been consulted about the possible establishment of radioactive waste repositories in their communities. There are other international precedents; for example, Nuclear Monitor, a publication of the World Information Service on Energy (WISE) and the Nuclear Information Resource Service reports that a six-monthlong dispute over the construction of South Korea's first nuclear waste dump has ended now that the Government has abandoned its chosen location. The South Korean Government now intends to seek regions willing to provide a site for the controversial facility. If it's good enough for South Korea, it's good enough for South Australia.
I know that the World Nuclear Association - an organisation in support of the nuclear industry - encouraged this process of proper public consultation. Instead the Howard Government, along with the South Australian Liberal Party, has insisted that the dump be in South Australia. I am not convinced that the sites selected in South Australia are the safest locations. The Honourable Peter Slipper, Parliamentary Secretary to the Prime Minister, admitted, and I quote:
It was possible that there were other sites in Australia, apart from the three sites mentioned, which could have been shown to fully meet the stringent siting requirements set out in the NHMRC Code.
The Parliamentary Secretary to the Prime Minister let slip that there may be other sites in Australia that are at least as safe. Three sites were originally identified in outback SA, but the Federal Government had to rule out its number 1 site because internal defence advice identified the site as
5
risky because it was near a missile-testing range. The Federal Government has publicly stated that it would not co-locate a medium-level dump in South Australia. If that is to be believed, then obviously South Australia is not the only safe place.
The Federal Government issued a notice to compulsorily acquire the land overnight, taking the land against the wishes of the State; in fact the land grab was in defiance of State law, because a proposed national nuclear waste dump is illegal under South Australia's laws. I am advised that this is one of the few times in the nation's history that a Federal Government has sought to compulsorily acquire

land in a State against the wishes of the State Government and its people.
This State believes that this attempted land grab is improper and we are now pursuing the matter in the Federal Court, but what the action reveals is that the Federal Government will, on this issue, trample over States rights. The Federal Government wants South Australians to accept, even support, the dump being located here, so much so that they have spent significant amounts of taxpayer dollars to sell the dump to South Australians through a questionable, almost covert, public relations campaign.
Back in 2002 it was revealed that the Federal Government was seeking a communications and marketing company to sell the national dump. Its key objective was - and I quote - "to increase support for the Commonwealth Government's position to locate the dump in South Australia". The expressions of interest documentation allocated $300,000 to the task and included a list of all the stakeholders that opposed the dump.
It was a long list that included environmental groups, indigenous groups and regional townships. The brief identified Adelaide metropolitan residents and communities in the central north region as the primary target audience for the campaign. However, it hasn't worked. South Australians remain overwhelmingly opposed to the Howard Government's dump. I would like to draw the forum's attention to a very timely report by the Joint Select Committee on the Transportation and Storage of Nuclear Waste that was tabled in the New South Wales Parliament.
What is really surprising about this report is that it is a cross-party committee report. Members from the Labor Government, the Greens, a country Independent and importantly the Liberal Party and the National Party were all on the committee. I'm advised there was no opposition to the report within the committee and that there is no dissenting report.
It's worth remembering that, according to the New South Wales report, that State is home to about 90 per cent of Australia's radioactive waste. New South Wales could have taken the approach of out of sight, out of mind. They could have supported the Federal Government to get the waste out of their State. Instead the cross-party committee has handed down a commonsense report that condemns the Federal Government's plans for a dump in South Australia.
When referring to the proposed repository and site the report states, and I quote:
Under these proposals both Lucas Heights and the operational non-ANSTO …
6
that is, unsafe -
… sites will continue to be waste facilities as they accumulate waste on a two to five-year cycle. This neither reduces nor rationalises the number of operating waste facilities; rather the proposals actually increase the number of operating facilities by two: The store and the repository. This rationalisation is then a curious argument. It is hard to see how the proposal to move waste to remote areas away from the point of production will increase safety as the transportation of the material actually increases the risk from accident or intervention. According to the Federal Government the small volumes generated do not justify separate State facilities but neither can they justify creating two new facilities for ANSTO's waste at least one of which is in a very remote location. ANSTO has repeatedly assured the Committee that the storage of the material at Lucas Heights is safe, indeed international best practice, and the Government's own radiation protection regulator has advised that there is capacity to store existing and future waste there – a point confirmed by ANSTO. The Committee therefore cannot support these storage proposals. For the time being, Lucas Heights should continue to be the major

national waste facility until a more acceptable resolution of the waste problem is developed. The Federal Government should, as a matter of urgency, recommence a site selection process for a waste facility in a genuinely consultative way in line with more contemporary and democratic approaches being utilised overseas and outlined in this report that are based on community acceptance criteria.

That's the end of the quote from the New South Wales Select Committee that looked into this issue. The New South Wales report is proof that there is no national consensus for this dump. As I have said, if the Federal Government insists on establishing a dump, then they should seek community acceptance. That's how they did it in Finland and Sweden. It is international best practice. This dump is not in South Australia's interest and it is not in the national interest. The State Government opposes the dump, the South Australian community opposes the dump, the Federal Opposition opposes the dump, every State Government opposes the dump, the Democrats and the Greens oppose the dump and a cross-party committee of the New South Wales Parliament opposes this dump.

In the event that a national radioactive waste repository is forced onto South Australia, there are significant issues that would need to be resolved before any licence should be issued. The South Australian Government's submission to ARPANSA contends that the Department of Education, Science and Training has not adequately addressed the issues pursuant to the ARPANSA regulations. This report has already been forwarded to your committee, Dr Loy, so I won't go through it in detail. I'd just like to highlight some of the issues that are in that report.

Firstly amongst them is Aboriginal opposition. The Kupa Piti Kungka Tjuta, the senior Aboriginal Women's Council of Coober Pedy, strongly oppose the proposed repository on the grounds of physical and spiritual detriment to the health of all people and the environment. We believe there is a negative impact on the food and wine industry, and our report goes into that in some detail.

We believe it will have a negative impact on tourism and, in addition, our report goes into that in detail. We believe there is a risk of the repository to the people and to the environment. The South

Australian Government considers that the DEST application has not satisfactorily demonstrated that the repository could be sited, constructed and operated without undue risk to people and the environment. For example, the EIS does not have adequate regard for surface water, including extreme rainfall events and rainfall monitoring and records and information on groundwater, including the nature and characteristics of the geological units at the proposed site and the extent of rock fracturing.

The report refers to the potential impact on heritage sites. It talks about the increase of trucks on local roads. These increased truck movements have the potential to require increased levels of road maintenance and rehabilitation and associated costs pressures for both the State and Local Government. We believe there's a risk of accidents. DEST did not address the risk to the River Murray associated with an accident on the Paringa Bridge and on roads adjacent to the river.

There will be extra pressure on emergency services as a result of this dump, if it goes ahead. There will be exposure to radiation increases. There will be a loss of South Australian land. South Australia has already taken on more than its fair share of the national radioactive waste burden. Locating a national repository here means an extra loss of access to land in South Australia, as well as a significant handicap to the State's tourism image and industry.

Now I wish to go on to comments on the supplementary information that has been provided. Failure to account for water conditions: Key points highlighted in the South Australian Government's

submission regarding surface water for the proposal were that the EIS does not address extreme rainfall events; in particular the size of the event to be used in designing surface water control structures should be specified. It is most appropriate to use at least one in 250 and preferably a one in 1000 design return period by way of explanation necessary to maintain a continuous rainfall record and undertake regular analysis and review of the storm events frequencies employed in the design of the facility.

Reviews should consider the adequacy of facility design, in terms of threats associated with extreme rainfall events and other surface water management issues. DEST has utilised data from existing Bureau of Meteorology rainfall stations sited at Woomera and Andamooka to characterise the rainfall at that site. The length of this continuous rainfall record - less than 50 years - is insufficient to provide a high degree of certainty in an area of episodic rainfall and flooding. Review processes are required to improve confidence in the one in 100 to one in 1000 year events determined from this data.

It was suggested that the continued operation of Bureau of Meteorology sites couldn't be guaranteed for the operational life of the repository, so in order to undertake the recommended data analysis and design review processes additional continuous rainfall records should be collected on site.

Continuous monitoring and review of performance was also suggested as necessary for the evaporation ponds, again to improve confidence in the design criteria.

It was strongly suggested that a continuous stream flow record was necessary at the site in order to improve the understanding of rainfall and run-off processes. This record should be maintained for the life of the facility and data regularly reviewed, in terms of adequacy of design criteria. Also there

should be an allowance for load based monitoring of the stream flow to determine absolute quantities of contaminants present, rather than a simple concentration based sampling approach suggested in the EIS. None of the South Australian Government's concerns that I have just mentioned, relating to surface water, have been addressed in the supplementary information provided by DEST.

Lack of information on subsurface geology: It was suggested in the South Australian Government's submission that further information was required regarding the nature and characteristics of the subsurface geology of the proposed site; in particular, the extent of rock fracturing needs to be determined. I note that Environment Australia has made a similar request.

Inadequate management plans for the repository: The South Australian Government made the following recommendations about the environmental management and monitoring plan to include inspections of all surface water disposal structures after extreme rainfall events, automated methods of flow sampling for monitoring surface water, such as automated flow proportional composite sampling, incident reporting and remediation procedures following leakage of contaminants to surface and groundwater, annual monitoring for all parameters and all groundwater wells surrounding the operational zone, annual water level and salinity monitoring on wells at the end of the buffer zone and five-yearly monitoring for all other parameters.

Besides a recommendation for baseline annual monitoring to be undertaken for five years, none of the recommendations I have just outlined have been addressed. It is unclear to what degree the public submissions have influenced the content of the supplementary information, if at all.

Extra pressure on South Australian emergency plans: It is noted in the supplementary material that the emergency response plans and security plans will be subject to joint services exercises between the Federal Government and the South Australian police as part of the requirements. These exercises

will impact on SAPOL resources for both the exercise development and execution and add to the cost of the repository proposal overall.
As the proposed dump would be on Commonwealth land, the Federal Government should take responsibility for security and protests on that land. Responsibility should also be taken for the impact on police services. However, notwithstanding these responsibilities, SAPOL is ultimately responsible for public safety and security in South Australia and any failure of the Federal Government to accept its responsibilities leaves the South Australian Government to pick up the shortfall. The experience of protest activity at the Woomera and Baxter Detention Centres over recent years demonstrates and highlights the impact on police resources. Police and cost-recovery issues will need to be resolved.
While the supplementary information identifies emergency response plans, both those associated with the repository and those that are standing plans for dealing with any emergency, they are only applicable after an emergency has arisen and not before. The emphasis from DEST should be on prevention. The transport and logistics plans proposed in the review of waste packaging and transport envisage that single semitrailers carrying containers will be used, albeit with the drivers properly accredited and supported by communications technology and that, in the event of an emergency, the emergency responses plan would be triggered.
9
Lack of police escorts: The use of police escorts is not proposed by DEST on the grounds of cost and to avoid drawing the attention of protesters. By not having police escorts it will be necessary for all emergency services to be on stand-by during the movement of radioactive waste, which is expensive, rather than relying on a police escort to mobilise emergency response teams in the event of an emergency. The supplementary information does not contain a commitment from DEST to meet the additional emergency response and stand-by costs, nor is it clear whether these costs have been included in a calculation of the net benefit.
Inadequate roads: The supplementary information does not contain details of the road access, width, et cetera and its intersection layout, where it connects to the Commonwealth, State or Local road and highway network. It does not contain a commitment to construct a new, sealed, all-weather access road into the site, nor is there a commitment from DEST to fund the construction and ongoing maintenance of whatever access road is provided. Detailed plans for the access road should be provided and the costs included in a quantitative cost-benefit analysis.
Dr Loy, panel, ladies and gentlemen, in closing let me say this: As Premier Rann said at Labor's recent national conference, the South Australian Government along with Aboriginal communities, the food industry, the tourism industry and regional communities have fought every move by the Federal Howard Government to stop this dump. We've seen the Federal Government spending hundreds of thousands of dollars in a campaign in favour of the dump through a local public relations company. We have seen the Federal Science Minister Peter McGauran threaten to cut South Australia's science budget in order to mount a court challenge against South Australians who don't want the dump. We have seen the Federal Government riding roughshod over the rights of the people by using urgency powers to compulsorily acquire land for the dump. We have seen the Federal Government moving to place a dump here in direct defiance of the State Parliament, which has passed laws making the national waste dump illegal in South Australia. We have said time and time again that we do not want nuclear and radioactive waste being transported thousands of kilometres, mostly from the Lucas Heights nuclear reactor in New South Wales, over our roads, across our borders and through

our communities into the outback of South Australia.
While the Howard Government has ignored the wishes of South Australians and the Government, this forum should not. Thank you very much.
DR LOY: Thank you, Minister. I think that was a terrifically clear presentation of the South Australian Government's position.
MINISTER HILL: Thank you.
DR LOY: Both I guess what you would call a political position on the one hand, but also some of the technical and scientific issues that need to be taken up. I might just clarify that DEST supplementary information was in response to a request from myself in a letter. It wasn't specifically designed to be responding to matters in the public submissions. Having said that, of course, as I said at the outset, my job is to take account of what is in public submissions and certainly some of the
10
particularly important matters that have been raised in your submission will obviously be at the front of that. We didn't actually toss a coin to decide who would go first in asking questions, but since you're closest to the Minister I'll give you the opening ball, Ian.
PROF IAN LOWE: Thank you very much. Thank you for your presentation, Minister. Could I be clear: It seemed to me you were saying two different things. You were saying that South Australia would prefer there not to be a national facility, that each State take responsibility, but you were also saying that the Federal Government should start again with a consultative process for a national repository. Is what you're saying essentially that you would prefer there not to be a national facility but, if there were, there should be a different process?
MINISTER HILL: I think that sums it up well. It's our view that each State should be responsible for its own waste. We have around about 22 cubic metres of waste, which is a relatively small amount. We believe we could well look after that, well into the future. Each of the other States has a relatively small amount. Most of the waste is in fact Commonwealth waste generated by Lucas Heights. But if the Commonwealth is determined to have a national facility they should try and do it on a consensual basis in line with what we understand is current best practice.
PROF LOWE: Let me give you an opportunity to respond to assertions that I'm sure we'll hear from the proponent. The proposal suggests that if there is a national production of radioactive waste we should seek the safest place to store it and, just as South Australia is the best place to have a world music festival, it could turn out, after proper process of investigation and site selection, that the best site was in South Australia. How would you respond to that suggestion?
MINISTER HILL: I argued in my presentation that the place that has been chosen in South Australia, even on the Commonwealth Government's own set of criteria, is not necessarily the safest place. In fact, the safest place was ruled out because it was next to a rocket range. As I said at the time, you didn't have to be a rocket scientist to work that out. I dispute that kind of argument, from that point of view, but the logic of it, it seems to me, is a forced logic. Most of the waste is generated at Lucas Heights. If it's okay to have a nuclear reactor in the suburbs of Sydney, then it would seem to me logical that the waste created by that reactor could equally safely be stored at that site. There you have the security regime in place, you have the scientists who understand how to manage it, there in place.
Why would you take the risk of transferring it all the way across outback South Australia, through the villages and towns and across the rivers and over the hills in New South Wales into South Australia, to put it in an isolated place where there won't be any human protection, as I understand it.

There will be a fence and perhaps a remote-controlled television camera - so a very limited security regime will be in place there. In addition, of course, you still have the reactor left in Sydney. I'm not sure: Is the reactor less dangerous or more dangerous than the waste? If the reactor is more dangerous than the waste, then really the argument the Commonwealth should be mounting is that we should put the reactor in the safest place in Australia. Why isn't the reactor going out to the northern part of our State? I suggest it's something to do with the fact that the scientists wouldn't like to work there.

PROF LOWE: That may well be the case. You suggested an inclusive process similar to that being proposed in South Korea, if there were to be a radioactive waste facility somewhere in the country. How likely do you think it is that any community in Australia would put their hand up and volunteer to be the location?

MINISTER HILL: I think that's a valid question you ask. Is there likely to be any part of Australia that will consent to having a facility in their area? I think that probably the answer is no. There may well be some community that wishes to have it, but if the answer is no, then I think the position that ought to be adopted is the position that South Australia is recommending - that each State should look after its own. If each State looks after its own it does put pressure on us, as governments and as communities, to limit the amount of waste that we actually produce. While it can all go to another place, it just allows people to use it and then get rid of it; park it somewhere else.

PROF LOWE: Let me ask you about a couple of the specific points in your submission. You've started an inventory of radioactive waste in South Australia. Can you tell us briefly, from the South Australian Government's point of view, what's the alternative long-term plan for management of radioactive waste generated locally in South Australia?

MINISTER HILL: I'm not sure if the committee has got a copy of our report. We could certainly make a copy available to you. We'll make sure we do that. What this audit has found is that there's waste across a whole range of sites in South Australia, about 22 cubic metres of it that's in either the low level or medium level. It's stored generally in a reasonable fashion, according to the EPA, although there are some better protocols that we're going to put in place, or the EPA will put in place, to make sure that it's properly managed. Most of it is sealed source or material that's used in hospitals and universities and so on.

What the EPA audit recommends to us are two things. One is to identify an interim packaging - I've forgotten the technical language they used, but a place where the waste is taken to be conditioned. That's the word I'm looking for. That, according to the EPA, would need to happen whether or not there was a national repository. Under the national proposal, there would be a requirement to have some sort of conditioning process, so we'd need to do that regardless. We're looking at that. We're exploring that at the moment.

The report also says we should look at long-term disposal. We do think we do have options in South Australia in relation to long-term disposal. It's a relatively small amount. Roxby Downs - the Olympic Dam site - of course, is a large uranium and other materials mine, and there is a considerable amount of tailings material that's kept there, and we would like to explore more closely whether or not the small amount of low-level waste that we have could be stored at that site.

PROF LOWE: Thank you very much. Can I look at some of the specific objections? I agree in principle that planning should be on the basis of a one in 250-year or, preferably, a one in 500-year rainfall event. I'm conscious, living in Queensland, that we've been looking at the problem of

flooding. The difficulty is that Europeans have only been there for less than 200 years, so there's not adequate data even for knowing what is a one in 100-year flood in the parts of Queensland where Europeans have settled. The problem, I think, with the desirable technical aim of looking at a one in
12
500-year event is that there's nowhere in Australia where we have more than 200 years of records. Isn't it an unachievable target to base planning on records that just don't exist anywhere in Australia?
MINISTER HILL: We're talking about a facility that will be here forever and which will be, I guess, actively managed for, I think, 300 years that's being talked about. I guess you have to consider how great is that risk? We're saying that the risk is great and it shouldn't be contemplated without that data. I guess that makes a practical problem for you, but maybe we should say that this is not a practical solution to the needs of Australia's waste storage and there needs to be another look at it.
PROF LOWE: Has the South Australian Government looked at any studies of what the effect of climate change is likely to be on rainfall patterns in general and extreme events in particular?
MINISTER HILL: Yes. We have a report that was published last year by CSIRO, which said that the rainfall - I think the year we looked at was 2070, from memory. We'll make sure we get a copy of the report to you, but it talks about an increase in average temperatures by up to six degrees in parts of the State. If you bear in mind that the difference between the temperature now and when there was an ice age was only about four or five degrees, you're talking about an extreme variation in the climate. It also talks about a dramatic change in rainfall patterns and a much greater likelihood of storm events; so heavy rain, and also greater chances of long periods of drought.
PROF LOWE: Thank you. Just two other issues. You mentioned, among the reasons for opposing the proposal, the likely impact on the food and wine industry of South Australia. Can you tell us in more detail what you see those impacts as being? Is it simply in terms of what consumers elsewhere will think about food and wine from South Australia or do you have direct evidence of any harmful impact to food and wine production?
MINISTER HILL: We're not suggesting that this would directly impact on the grapes grown in the Barossa, unless a truck was to go through there and tip over. What we're saying is it's about our perception. We want to market our State as a clean, green State. Agriculture is a very important product, or series of products, that come from South Australia. Our economy is very dependent on it. We sell our wines internationally, and we know that markets are pretty sophisticated now and they do look for that kind of clean and green imagery. There is another debate going on in South Australia at the moment about GM foods. It's very strongly the view of certain sectors in the community that we should be a GM-free State as well, because there are market advantages associated with that.
PROF LOWE: You also referred to the impact on tourism. What do you think the impact of this proposal would be on tourism?
MINISTER HILL: I was going to say something quite flippant, but it's the same kind of issue. Our tourism strategy is based on ecotourism, I guess, largely. We're saying this is a natural, unspoilt place. You can come to the vaster outback - have a look at a different kind of world, a different kind of nature - and that would be diminished or tarnished in some way if there was a permanent radioactive waste dump in the middle of it, to put it crudely.
PROF LOWE: Two final points. You mentioned the cost to the community of securing transport of
13
waste from wherever it was generated - mainly at Lucas Heights - to this site. Have you quantified what the cost would be of ensuring that the transport didn't pose a risk to the South Australian

community?
MINISTER HILL: I'm sorry, I can't answer that question. I'm not sure if we do know that, but if we have we could certainly make that information available. What we do know, based on the experience of the Baxter Detention Centre, is that there obviously are a lot of issues associated with protest at the site and also protest from within the centre, and we've been in conflict with the Commonwealth about who pays for it and how it's managed. That certainly is a huge drain on the State's resources. Over the Easter weekend each year there's been a large presence there of the South Australian police. They have to come from somewhere else. We pay for it and then we get into an argument with the Commonwealth about it, so there are issues there.
PROF LOWE: Just one final point. I thought I heard you say that Peter McGauran, as Commonwealth Minister, had threatened to cut South Australia's science budget to fund a legal challenge to the South Australian law which seeks to prohibit this proposal. Is that actually what you said?
MINISTER HILL: It's actually what I said and it's actually what he said.
PROF LOWE: Thank you very much.
DR LOY: George, can I pass to you now for some questions for Minister Hill?
MR GEORGE JACK: Thank you very much. Most of my questions, in fact, have already been covered, but I gather, Minister, that if you were to go the route of individual states looking after their own waste, which is your stated preference, South Australia would still to some extent envisage centralising the existing South Australian waste and perhaps look at storing it up at the Olympic Dam mine. How would you go about getting community acceptance of that? Isn't it a reasonable expectation that you might run into the same opposition in terms of the community acceptance of that as for the national repository, which isn't too far away from the Olympic Dam mine?
MINISTER HILL: I think that's a valid point to make. We would certainly need to work with the community about it, and that's what we're proposing to do. We've said in an open way what we think the issues are. We've had an audit of the waste that's in our State. No other State has had an audit. I don't believe the Commonwealth has conducted an audit of the waste that's around Australia. We know where it is, we know what its level of radioactivity is, we know under what conditions it's kept, we know it's a relatively small volume, and I think we would be able to mount a reasonable argument in South Australia that that waste could be safely stored at a place like Olympic Dam under conditions which we could describe, but we'd have to go through a proper process. In fact, we've asked the EPA to begin those processes.
MR JACK: Thank you. One other point on the issue of tourism being negatively affected. I think if you look at the Finnish and the Swedish situation you'll find that that is a two-edged sword - that in fact one can get a lot of visiting scientists from all over the globe actually coming to look at the

repository and thereby increasing the revenue to your State. Have you contemplated that, and I am not being entirely facetious when I say that, Minister Hill?
MINISTER HILL: I suppose the Maralinga tests that we had here in the 50s caused a lot of British scientists to come and visit the outback, but I don't know if that is really part of our tourism strategy.
MR JACK: I wasn't suggesting that, but thank you very much. I don't have any other questions. I think they have all been covered adequately. Thank you very much indeed, sir.
MINISTER HILL: Thank you.
DR LOY: I gather you are required to leave us pretty quickly, Minister, so thank you very much for

attending. In terms of some of the issues that have come out of what you have said, obviously there are some specific technical critiques of the application that are very important and that we will have to take into account. I think the overall issue does raise one of the questions about the issue of longterm storage versus a repository. The notion of a repository is to deal with the waste forever, as it were, versus long-term storage, and I think those issues are being debated throughout the world and obviously are important in this context, as well. You have certainly launched the forum very vigorously and I very much thank you for that and look forward to continued dialogue with you and the Government as I progress this matter. Thank you.

MINISTER HILL: Can I just say, thank you very much to the panel. We do appreciate this. I think it is the first opportunity that people in our State have had to put their point of view and we hope you have two days of very interesting conversations with South Australians. Thank you.

DR LOY: We now have a morning break scheduled and, amazingly, we are running a little ahead of time, so could I suggest now that we break until 11.20 and then we'll hear from Karina Lester, I believe, on behalf of the Coober Pedy Kungka Tjuta. Resume at 11.20.

ADJOURNED

RESUMED

DR LOY: We now have a really important part of the forum - to hear something of what Indigenous Australians think about these issues. We have with us members of the Kungka Tjuta and Roger, one of the native title claimants for the area. I think, Karina, you are going to introduce us and take us through your presentation. Thank you.

MS KARINA LESTER: Yes, thank you, Mr Loy. Before I proceed any further I would like to take this opportunity to make an acknowledgment that we, as Anangu people are on Kaurna land. Our special acknowledgment to Auntie Veronica and her daughter, that have accompanied us; that have joined us in support to hear from the Kupa Piti Kungka Tjuta. We thank you for allowing us to come here and do our presentation to Mr Loy and the panel for giving us this opportunity as the Kupa Piti Kungka Tjuta to express our concerns that we have for this particular waste repository, so thanks again to Auntie Veronica.

15

Just to clarify a few things. My name is Karina Lester and I'm one of the grand-daughters to Eileen Brown, who is a part of the Kungka Tjuta group up there at Coober Pedy. I'm accompanied with two of my grandmothers and three of my aunties and I will introduce you to them individually because they would like to take this opportunity to get up and speak individually, also in their native language as we are strangers to this area of Australia. We come from the far north western area of the area, what's known as "the Coober Pedy area", but also further north, as well, and so we're Yankunytjatjara, Pitjantjatjara and Antikirinya speakers, and hopefully we'll be hearing from Kokatha representative also, and talk about the concerns of Aboriginal people and traditional people about what's going to take place maybe in the near future as well.

A lot of the women will talk very strongly about their concerns. Nana mob are lore teachers. They pass on a lot of this oral history - that's passed on generation to generation and me being the grand-daughter makes me the next line of generation to be taking on the sort of responsibilities that we have as Anangu people and Aboriginal people of Australia. Nana mob will, as I said, take this opportunity to get up and speak individually and you will hear from them speaking in their native language and I will, hopefully, interpret clearly for everyone to understand what it is that the ladies are talking about.

Also I believe Mr Thomas will like to have this opportunity to also talk about - from the Kokatha group, and this will hear another side of the story also. One thing I really want to make clearly is that we are hearing from traditional tribal women, who carry a very important role in passing on this oral history that we have. As I mentioned, it's generation to generation passing on, learning this oral history of song, of dance, and the knowledge or the stories of the land, and that's one of the concerns that we have - if this was to go ahead, then there would be missing pieces for the next generation like myself and great-grandchildren also to learn those very important stories that are created out there in the country that we're talking about. So hopefully this morning and leading into this afternoon there will be a strong argument against this waste dump that might be happening up that way, and the women will talk very very strongly about their concerns as teachers.

I just want to make a quick mention also that my Auntie Ivy Stewart was acknowledged on Australia Day for her involvement in teaching culture, as well, and my grandmother was last year also acknowledged for the work, so they are our oral teachers who have been acknowledged in the western way, not only through our cultural way but also through our western ways, so there has been people out there who have really taken on and listened to the old women and know what they have done in actually fulfilling their role and their responsibilities as our oral teachers, so I might hand it over to the women, who might share with us a song of what we call "the irati wanti inma" and "Irati Wanti" means, "Poison. Leave it." "Wanti" means "leave it," so I might ask Nana mob if they can open up by just talking and singing a particular song and then we'll lead into hearing from the ladies individually, talking about their concerns that we have.

SONG

MS LESTER: This was a particular song that the women are singing as part of the Seven Sisters story. This story travels through many States in Australia and, most importantly, coming from our

region down to the Whyalla region and further across to the east and up, so this is a story of where the sisters travelled through smoke and it's a very important chapter to that whole story. I want people to understand that there are many versions of one song connecting to chapters or versions or parts of a particular story, so this Seven Sisters story is a very big concern that Nana mob have in wanting to pass that knowledge on, and that's a fear that I have as the next generation - is not being able to learn or pass it on to my children or to the great-grannies that are out there, these very important songs and these are songs of the land, and that's the angle of where Nana mob are coming from.

My grandmothers have a very important role in passing on this oral history and it's not only through verbal conversation. It's only through song and dance, and that's something that is very very important to us Anangu people who still have that connection to our land and still go out there to fulfil our obligations and our responsibilities, and so I just want to make that clear to everyone - that Nana mob are tribal women. This whole new western world is very new to them. It's my generation that's growing up with a foot in two worlds. Nana mob have come so strongly from their Anangu culture, passing on that oral history through songs and through dances, and teaching in oral history, but also with the involvement of our mothers, as well, and our fathers, doing the practical work as well, fulfilling those roles of being the hunters and the gatherers, of knowing how to survive out in that country and knowing how to live off that country.

It might look barren and very scarce out that way but, to us Anangu people it's very much a part of our life and it's something that will teach us you know for the future generations to pass on that oral

history to the next generation, as well, about how to survive and live out there in that land, so I might hand it over to my grandmother Eileen Brown. She's one of the leaders of the Kupa Piti Kungka Tjuta and she might have a few words to talk about her concerns as she has been fighting this battle for quite a while - for the last six, seven years now, and Nana mob have been speaking very very strongly against this and still continue to do so, and have also given me the blessing to be able to make their voices be heard, as I am one of the lucky ones who have grown up also with a foot in two worlds, learning from my mother and learning from my grandmothers how to speak our native language, and so I will hand it over to my grandmother and she'll speak in her native language, where I hope to make it clear for everyone to understand about her concerns - that are part of her responsibilities as a traditional woman, as well. I will hand it over to Eileen Brown.

MS EILEEN KAMPAKUTA BROWN: My name is Eileen Brown. (Indigenous language)

MS LESTER: Mrs Eileen Brown is saying, "My name is Eileen Brown, Mrs Brown." She had spent a lot of time up in the further north of the State. She mentioned Maralinga and some of you may be familiar with Maralinga, which were the British tests that took place. She said, "Maralinga was one of our first experiences. We were working on a station called Walatinna, which is up in the far northwest of the region. Walatinna was where we were doing domestic chores." It was there, with her son Yami Lester that they noticed these tests that took place - or bomb. Nana was a bit confused. She was saying that she thought people might have been just burning fires, but we later found out that these were British tests that took place out there as well. "We started soon after, when we saw the smoke, when we saw the mist rolling through, that we became sick." She mentioned urkalytjara which means “coughing up a lot of phlegm in the respiratory system.” So they became really ill soon

after those tests.

MRS BROWN: (Indigenous language)

MS LESTER: Nana was just saying, "We shifted soon after those tests took place." She had an older brother and an older sister also, who are no longer with us today. This is a little bit emotional, because I think Nana was getting a little bit emotional there.

MRS BROWN: (Indigenous language)

MS LESTER: Nana was just saying, "And I'm still talking very strongly." She is on her own and it is something that is very strong, that she gets the support. I'm sorry for getting a little bit emotional, but it's something that is very close. Of course, being the grand-daughter, it's part of my responsibility to be able to get her voice heard and to speak the language that she has taught me, and as she said she is still speaking strongly, and I'm here to make that clear to everyone - that her language is still very much a part of us. Thanks to my grandmother. I will hand over to Ivy Stewart, who will also speak as one of our elders in our community. I was just pointing out to Auntie Ivy that these are what we call microphones, so we'll speak into these things.

MS IVY MAKINTI STEWART: I be Ivy Makinti Stewart, my own name. (Indigenous language)

MS LESTER: She is just making it very very clear that her name is Ivy Makinti Stewart.

MS STEWART: (Indigenous language)

MS LESTER: Auntie Ivy is talking about her time when the British tests took place, that she was working up at a place called Dungebar. Dungebar is Oodnadatta. People might know where Oodnadatta is. Dungebar is where the old line used to run, and that was the work that Auntie Ivy was doing; working up that line right up to Finke. It was at that time when they realised that these tests had taken place down further south - sort of south-west from where they were.

MS STEWART: (Indigenous language)
MS LESTER: Kuru pati means "closed eyes". "So we had a lot of eye infection. We were with a sister, one of the nurses. She helped us and, over time, we were able to get back that sight and then we travelled up to Finke." That's where the line continued on, up from Oodnadatta to Finke. Auntie Ivy was just talking about at that time when Maralinga took place, or the tests took place she was working up that line, all the way up to - - -
MS STEWART: (Indigenous language)
MS LESTER: Auntie Ivy is saying, "Maralinga is the only experience that we want to have. This experience of this new waste repository is something we don't want." It's clear for the Kungkas that Maralinga was bad enough through their experiences and so Ivy is saying, "I'd rather have that experience and not go through anything further as well."
18
MS EILEEN UNKARI CROMBIE: My name is Eileen Unkari Crombie. We don't want the poison to go back there on our land. See, we've got water and bush medicine, we've got outside. We are making that one, our own medicine and bush tucker. We don't want the poison to go back there, to poison our land, you know? Good enough Maralinga, you know, and we don't want to make it two. At that time we were in Wilcannia and they been send us to West Coast. White man never let us know. We don't know what's going on. They been sneak in that time.
We don't want them no more. No more poison to go back that way. There might be accident, you know? There are a lot of people in the road. They might have accident. A truck might have accident and kill the lot then. The truck roll, and we don't want them to go back there, make it number two. They should listen to us.
MS LESTER: I don't think I need to interpret what Nana Eileen Crombie was talking about. She spoke it in the western language and obviously hoping to make it very very clear that this is definitely something that they don't want to experience and see. I will hand over to Martha, who will also have a few words.
MS MARTHA UGANBARI EDWARDS: My name is Martha Edwards Uganbari and I've been sitting there. The old people I sit down next to are Maralinga and we don't know if something happened there (Indigenous language) and it's old people that's getting sick. The (Indigenous language) from working there. That's all. Thank you.
MS LESTER: One of the things that Martha said was ngurpa meaning, "We were sitting down without any knowledge. We had no knowledge of what was taking place." I would like to add to that by saying that language was a big concern or a big problem. The British could not communicate to the Yankunytjatjara people or Pitjantjatjara people. So we had no knowledge. We didn't know that there were these tests that were going to be taking place in our backyard, let alone what took place afterwards as well with the new illnesses and sicknesses that took place afterwards as well. So we were sitting down without this knowledge.
Through my information, through my father, that was passed down they had spoken to a lot of the pastoral owners, or property owners. So Mr Cullinan, Mr Giles, those patrol officers or servicemen, had actually spoken to them and not to the Aboriginal people, or to the Anangu people of that area there. The stories that the women are talking about are stories of what happened at that time - that they had this experience which was bad enough. We don't need to have this national repository, national radioactive waste repository in our backyard. I can't stress how important - the stories that the women have and the song that they sang is very important to us, which is recorded into the land.

And that's that oral history.
MS EMILY MUNYUNGKA AUSTIN: My name is Emily Munyungka Austin. I'd like to say something about the dump too, you know? They already told something about the bomb because they was in the bomb and I wasn't. I was in the mission home, I think. I know it's really bad because a lot of people got sick and they lost a lot of family, you know? And it was really bad, I know. I don't like this dump they are talking about, to bury it in our land again. We don't want that dump

buried there because it is like the bomb, the same as a bomb, and we don't want that. We don't want another one. One was good enough. It killed a lot of people and damaged the land and bush tucker and all those things we used to live on.
Our great-great-grandmother and grandfather, they used to live on that food. And they went there and they poisoned it. And you know what? They said - I don't like this little bit - "There was no blackfellas was living there and that's why they went and done the test," you know? Because there's the desert and we love that desert, we live there. That's all I can say.
MS LESTER: Thank you, Mrs Austin. I think she spoke very strongly about it. She said, "We've heard a lot of stories of the Kungkas from Maralinga and those experiences of the tests." But as she said, she was in the mission at that time, when that took place. As an Aboriginal woman she has that responsibility or the urge to keep on the culture very strong, and that's definitely a part of the Kupa Piti Kungka Tjuta is to pass on that oral history that they have.
Within the next minute or so I just want to sum up what Nana mob and my aunties have been able to share with everyone here. It's something that is very new to them. There are a lot of strangers in this audience. We don't know everyone. Sometimes it can be a little bit fearful to get up there and speak openly about something that's so important to us as Anangu people.
The one thing, I remember last year we travelled to Sydney. Nana mob drove down from Coober Pedy and I actually snuck across on the western technology and flew across to Sydney and met up with Nana mob there, where Nana was actually internationally acknowledged for her work against the waste dump and was awarded the international Goldman Prize. So her work that she has been doing has also reached out to international people, or that international audience. So with us networking and getting as much work out from the great work that the girls are doing there, at Coober Pedy, also with the Iranti Wanti Campaign. We wouldn't have been able to get as half acknowledgment out there and get Nanas' voices out there to let the wider community know about how important this issue is.
As we've heard from the Kungkas they are all very concerned about this waste dump. They've had that Maralinga experience: The British test, that took place where we lost our family members. And now we don't need to contaminate that land again any further because of what's recorded out in that country as well. Very important stories. And I can't stress how important those stories are to us Anangu people. We want to be able to hang on to as much as we can so there is that next generation coming up and learning those very important stories about what we call our tjukurpa or wapar, our ancestral stories. You might know the term “dreamtime stories.” It's something that's not dreamt up for us Anangu people. It's something that's very much a part of it. We live it, we breathe it, we practice it every day.
That's something that hopefully has come strongly across to everyone here, the people on the panel, the members on the panel, but also the wider audience here, that these are tribal women and they still have that very strong responsibility in passing on that oral history. It was never taught out of a book.

My learning was never read out of a book. Nana never spoke to me and said "Read it from this chapter to that chapter."
20
She spoke to me in that oral history, so I've been privileged enough to have learned the language, but also get the blessing from my old people to speak strongly about the concerns that we have. Also, a special acknowledgment Nina Brown for the great work that she's been doing also with the campaign. Alex has just joined on as well, so I hope to see that this work will continue on in getting everybody, both black and white, aware.
I just want to take this opportunity now to hand it over to Mr Roger Thomas, who's the named native title claimant for the Kokatha group. The women felt very strongly that there was this need to get the support from the Kokatha group also, to hear from them their important stories and their important arguments also. Then perhaps, if there are questions from the panel after Mr Thomas speaks, we'll be able to answer some of those questions for you, the panel. I'll hand it over to Roger.
DR ROGER THOMAS: I'll just do some housekeeping here and get myself a glass of water ready, because I probably will choke up also. My name is Roger Thomas. I'm a Kokatha man, and I am here today as the named applicant for the native title Kokatha claim. I too wish to acknowledge the Kaurna people and I thank them on behalf of the Kokatha for allowing us the opportunity to meet on your land, and I pay my respects to the Kaurna people of the Adelaide Plains.
I think it's quite significant in the presentations that we've had that there are at least three of these ladies that have taken the time to come down who have actually - and I think this is quite unique - experienced the fallout effects of Maralinga. It is significant because - if I can ask the audience if there is anybody who can put their hand up to say that they actually physically experienced the fallout of Maralinga, I don't think that you, as delegates here from your organisation, would see any further counts to that. It is significant because, as they said, they don't want this to happen again. We have been saying this for years and years and we will keep saying it until finally whitefellas will stop and listen to us.
When we talk about our tjukurpa - our dreaming - we're talking about the people, the land, the animals, the environment, everything. We do not separate those. The imposition that was placed upon my people with the experience of Maralinga lingers on today and we are still grieving the impact and the effects of that. I would like to spend some time going through the processes that we've been put through as the native title claim group for this area, where it is proposed for the site. I wish to register up-front if there are occasions when I trip up and become emotional, I tender no apology for that at this point in time.
The Commonwealth sought from the native title claim group the opportunity to carry out site clearances. They presented to us, as a native title group, some 58 sites that they would like us to consider for the purpose of cultural significance clearance. Of the 58, there were seven sites that they saw as being the priority locations for where they had intentions to want to locate the waste repository. I would like it to be registered that, of the 58, the senior law men and women had difficulty and made it quite clear that there was no intent on their part to want to give any agreement to any of those sites. I make that point because there are some aspects to the process here that I would like you, as a panel, to take into your consideration in the most serious way with the Commonwealth.
21
We were presented with six or seven sites, as I mentioned, because these were seen as the areas that

they were wishing to develop this arrangement. We agreed on a sign-off for the purpose of test drilling only. We did not sign off for the purpose of the construction of a waste repository. We went in good faith for the purpose solely of test drilling. We did not go through the process of any of the site clearances for the purpose of construction. There may well be an argument by the Commonwealth that their presentation and their case was it was intended in terms of the sign-off for the purpose of the construction of the actual waste repository. Our position is that we went into it with the purpose of test drilling only.

Needless to say, our position was unequivocally clear, and I'll say that again - unequivocally clear - we did not want any waste material put in this land. The point of concern and controversy for us is that we were advised - and we were told this by the various agencies involved - "If you don't proceed with signing the agreement, the Federal Government will acquire it under the constitution legislation." From our point of view, we not only had the shotgun at our head, we also were put in a situation where we were deemed powerless. If this is an example of the whitefella process and system that we've got to comply with as Indigenous Australians, then we attest that this whole process needs to be reviewed and looked at and we need to be given under the convention of the United Nations the appropriate rights as Indigenous first nation people.

Our bottom line position is that we do not agree with any waste material of any level being dumped, located or deposited in any part of this country. Our position is based on - which I'll move to in a moment - the native title claimant group and our position from a tjukurpa law perspective, which is what we use as a part of the process for consideration of clearance. But I make it unequivocally clear our position right from the beginning is that we don't want any waste material put into this country. I make the other point again - and whilst this sounds repetitive, I think it's necessary for the purpose of what we're talking about here - we were put in a position of no choice but to proceed with carrying out clearance. Our understanding was that the clearance was for the purpose, in the first instance, for drilling only.

The sites that we're talking about that then become the priority for the Commonwealth relate to areas which - and I have to say that there has not been a comparison of notes between myself and the Kungka Tjuta. We don't need to compare notes. We live it, we breathe it, it is us. From our perspective as Kokatha, as already mentioned, the significance of the Seven Sisters dreaming goes through this country. There is also the significance of a dreaming story which relates to the native cat, which is also quite significant.

It will be a sad day if white Australian Government proceeds to remove from the library of indigenous culture a complete section of the library of our material and of our stories, because the analogy here is that this is a library that is ours. It has important materials and stories in it and the white man are going to remove that section of the library. We, as indigenous people, and certainly our generations to come, will not be able to access those materials, those stories in this capacity. There may be some difficulty in the minds of non-indigenous people to appreciate and to conceptualise the whole process and arrangement of our dreaming. For us it is something that is

there with us all the time; it is passed down and it forms the most significant part of the structure of our culture. Please do not allow this to proceed and have a significant part of our library removed. I say respectfully that it is analogous with - and I say respectfully because if there are Christians in the audience, then I don't mean to be disrespectful to Christianity - if you remove out of the Bible and you completely wipe it, or burn it, or destroy it, any of the Old Testament or any of the New

Testament, then that is no longer part of man's relationship to those stories and to that part in the Bible; similarly with the Koran and so on and so forth.
Please have regard and respect for us. This is our story, this is our religion, this is our belief. By putting this material there our people, our elders, our lore, men and women cannot relate to that because it has been damaged. And it will be damaged. We appeal to you in your position to recommend strongly to this Federal Government that there needs to be a process that is going to be fully considerate and respectful to us as Aboriginal people.
We heard earlier from Minister John Hill and your questions as a panel to him about it being - I think it was the gentleman at the end - part of a State process. Our position as the Kokatha have argued that there needs to be consideration through the Commonwealth under heritage legislation about what is happening here in terms of the impact on Aboriginal people. We have been advised that it stays under the Commonwealth legislation where there is not a heritage consideration. I may be slightly unclear in terms of the actual position of the Federal heritage legislation, but clearly the Federal heritage legislation does not have the same stipulation of legislation as the State one.
Our argument with the Commonwealth is that this should be put under the auspices, if it's going to proceed in any way - and we don't want it to proceed but if it does we would like it to be considered under State heritage legislation. Our representation and argument to the State would be for a different configuration of waste repository and how they dispose of that - not in the ground - but we would want to put a case very strongly that the significance of the sites and the dreaming trails that go through this country and the artefacts that are therein would be better protected under State legislation than under the Federal.
We feel that we've been threatened by the fact that if we don't proceed with the signing-off agreement there would be, under compulsory acquisition legislation of the constitution, the Commonwealth move as they did with Maralinga and as they did with the Commonwealth protected area around Woomera. They would simply acquire it under that and we wouldn't have any say in it. The most disappointing aspect to the negotiations that the Commonwealth had with us, as Kokatha, is to try to buy our agreement. This was most insulting to us as Aboriginal people and particularly to our elders. For the sake of ensuring that I don't further create any embarrassment, I will not quote the figure, but let me tell you, our land is not for sale. Our native title rights are not for sale. We are talking about our culture, our lore and our dreaming. We are talking about our future generations we're protecting here. We do not have a "for sale" sign up and we never will. We appeal to you to take these points into consideration. We ask that a process that involves actually coming with us, not with anybody else, but with us as the Aboriginal people of this country, and sit down as we say "on the manta," on the ground, and listen to and feel the story that we tell about the significance of this area 40.
23
We were not given this opportunity; the opportunity of process involved meetings at Port Augusta and also here in Adelaide. That is not in our country. It is foreign to us and we would like to ask for any decision to be made - should be contingent coming and sitting down with us on the ground and listen first-hand to our men, women and our senior lore men and women in our community. That hasn't been done yet and when we are given that opportunity I believe that anybody who is involved with it will have no other choice but be convinced that this is a very very serious matter that we're dealing with.
We appeal to you to include that as a part of the process, besides the fact that we are not in support, unequivocally again, in any shape or form, for any waste material to be put in our country. It is most

important that you understand that what the ladies have referred to in their experiences from Maralinga, no matter how intelligent, how smart, how well intended governments, scientists and the whole array or specialists who have been involved with this may be, in 20, 30, 40, 50 years' time this land will be seeping and crying, the same as what we are still today with what happened with Maralinga.

I ask you to be strong in your recommendations to tell the Commonwealth, "Don't proceed with this until you have spent time sitting on the ground with us and hearing our stories, on our ground and on our turf." It is then that I think you'll come to understand better what it is that we are saying and why we are in opposition to it.

Finally, the Kokatha would like to express its unequivocal and undivided respect and certainly appreciation to the Kungka Tjuta and to those associated Aboriginal groups who have been involved with this, because they know how we feel and they know the fight that is in front of us to stop this from happening. In concept terms, you will be damaging our mother. The earth is our mother.

Thank you for listening to me.

DR LOY: Thank you all. That is just, I guess, a very brief insight into the deep human issues that are involved in this proposal. Ian, would you like to ask some questions?

PROF LOWE: I don't have many questions because I think the submission stands by itself and it is in a different category to all of the other submissions that are being made to us about the scientific issues. But I want to be clear that I understand the position of the Indigenous people. Is it fair to say that even if the proponents were able to convince us that the proposal is totally scientifically sound and would involve no risk to the land or the plants or animals, that as custodians of the land you would still be opposed to the proposal? Is that a fair summary?

DR THOMAS: I think the answer is yes. The answer is yes.

MS LESTER: Mr Lowe, that would be a strong yes, especially from the Coober Pedy Kungka Tjuta. As tribal women they have that obligation; that is their responsibility. ARPANSA stands for Australian Radiation Protection and Nuclear Safety Agency and a part of their role and their responsibility as tribal women is to protect what is there and what is still very much a part of our culture That would be a strong yes definitely, on behalf of Kokatha people, but also Kungka Tjuta, to say that we don't want to see this happen and go any further, in fear of doing damage to our mother,

as Roger said.

PROF LOWE: What do you believe we should be recommending should be done with the radioactive waste which has been generated because presumably you wouldn't want us to move the proposal on to somebody else's tribal land? Would you be arguing for storage above ground, or what would you be recommending if you were sitting in the uncomfortable chair that I'm in?

MS LESTER: As Mr Thomas suggested, and actually took this opportunity to invite you all, to come to the manta and sit down with the people. This is being a part of our way of doing it; our traditional way of consulting and sorting through our issues and concerns that we have is by doing it on the land where it's taking place. I think, as the ARPANSA panel, you need to take that opportunity, go up there, sit down with the Kokatha people, invite the Kungkas, and they will advise you on what you guys should do. I can't speak. You are dealing with tribal men and women and you need to consult with them. I am here as a grand-daughter and I do have a concern for this, but also there are other groups that need to be consulted with as well, and I think your next step would be to take the opportunity and come up and visit us and then take it from there.

DR THOMAS: Your question about the difficult position that you find yourself in - and if it becomes a question of not wanting to impose it on to another Aboriginal group - if I can respectfully say that that is a bit of a cop-out for me. The bottom line in this is that in this country there have been various levels of waste generated and I think there needs to be more resource and specialist type of research done into how to effectively dispose of that, by not putting it into the ground. I'm not a scientist but I do a fair amount of reading to understand that around the world there are various means and ways that some countries dispose of waste without having to put it into containers and into the ground.

Our bottom line position is, don't damage the land by putting it in the land. There are alternative ways, either on the surface, or other ways than putting it into our land. If I could respectfully ask you to consider that and not put it as being us seen to be saying, "Well, we fought it here and we've stopped it and now the problem becomes another Aboriginal community over the way." All right? What I'm saying is whitefellas created this stuff, whitefellas have to do the thing that is going to be stop damaging our mother and our country. That's the bottom line.

I also think that from a whitefella's legislative point of view, we, as Aboriginal people in this instance, have got a better chance to negotiate locally about - and I'm not agreeing with this, but I'm saying if it's a choice between the Commonwealth and the State, the State heritage legislation gives us better protection in terms of the protection of these sites, than what the Commonwealth does. It is my argument that the Commonwealth, if they don't get their way, just go to compulsory acquisition. I know that's not your business, but that's the business that we are now faced with from having equal rights and citizens of this country.

I say it should be with the State - not that we always agree with the State, but we've got a better position to argue and to stop damage under State legislation. Whilst we've got concerns about it we have a better chance in this one. I think there are better ways to deal with this, than putting it into the manta.

25

PROF LOWE: Thank you very much for that and I certainly respect your position. Unlike our Prime Minister, I don't have any trouble at all saying I'm sorry for what previous generations of whitefellas have done to your lands and your traditions.

DR THOMAS: Thank you.

PROF LOWE: Just one final question: is your concern about this site specifically about the fact that the waste is radioactive, or is it about the general principle of not wanting waste dumped on your land?

DR THOMAS: To respond to that, we have the experience - not very far from this site - which is the Roxby establishment. Back in the 70s and the 80s the process that was carried out to acquire that, we fought it and we fought it and we fought it. Whilst I was arguing a few moments ago for this to come under State legislation, the State did the same dirty trick to us; the absolute same dirty trick to us, where they acquired it under State legislation - the Roxby indenture bill. Back then the State heritage legislation was not as profound and as clearly protective of sacred sites and sites of significance as it is today. So I'm putting the argument that back then, if we had proper and sound legislation, we probably would have had a better chance to reduce the impact of damage to our country that has now resulted in terms of Roxby.

Our position is - and I'm saying this as a native title claimant and as an Aboriginal man - we do not support or agree to any form of damage to the land that involves extensive mining, extensive I

suppose impact upon the land that hasn't regard for our sacred sites, our sites of significance, our story lines, our tjukurpa. The State legislation gives us the room and the capacity to be able to put in place appropriate heritage arrangements to protect that. The Commonwealth are not giving us that opportunity.
Our argument is we don't want anything in the land whether it's contaminated or not. If it's just digging it out we have a real argument and difficulty with that. I hope that answers what you were asking.
PROF LOWE: Yes, thank you.
MS LESTER: Mr Lowe, if I could just add to that also as grand-daughter to Nana mob, who have come here, travelled so far: That is a part of it, in that it's contaminated, it will go there and it's buried underground, but the real concern that I have as a young grand-daughter is that it's destroying that chapter, or that part of that story or that tjukurpa. That's the real concern. I don't know whether you got that message across from Nana mob and hearing from these elderly ladies. That land we're talking about is full of stories and these are our tjukurpa, our wapar. These stories are very important to us through that oral history of the singing and dancing that is involved.
We heard the women open up by singing this afternoon, or this morning. That is the part that I fear, as the younger generation, that piece will be lost. You'll destroy that. You'll contaminate the things around that area and that's the concern I have as an Anangu woman, but also as the grand-daughter

who - Nana mob have given me the blessing to be here to speak strongly about this, and that's my concern. That's a part of it - that it's radioactive waste - but the big concern is that you'll wipe that story out, and that story is very much a part of our survival to make us the people who we are today, which is strong Aboriginal women, and that's what my concern is - not that it's just radioactive waste. It's destroying that story.
MR JACK: Thanks very much indeed. I don't know that I have any questions, but I would like to make a comment. I would like to thank very much indeed the people who have come this morning to make these presentations. I think it was said that they're in a strange environment and haven't seen microphones, et cetera; they're not at home in this sort of convention hall, and that commands a tremendous respect - that they have come here to make those presentations. Similarly, I would hope that they accept from me, for example, a difficulty in fully comprehending what some of what you're saying - this is not disrespect for it, but it's a different world, it's a different background, and therefore it is difficult for me to fully comprehend exactly the significance of some of what you're saying. Maralinga must have been a horrendous experience, and that is without dispute. One of my difficulties in what you're saying is that Maralinga affected a huge area of your land. The proposed repository, by comparison, is a tiny portion of it. It may affect it significantly, but it's a tiny area compared with the enormity that was Maralinga. I don't say that to discount your concerns in any way, shape or form, but once again if you have any comment on the size of the area I would appreciate it; otherwise my last word is to express my respect for what you have said this morning and thank you intensely. I think we could go on discussing it for a long time, but today's schedule doesn't allow it, but thank you very much indeed from me anyway.
MS VERONICA BRODY: Why doesn't my fellow man understand just how badly contaminated South Australia is. We have a lot of contaminated land, and when the fallout happened in Maralinga, how many in this audience today know that some of it fell on Adelaide? On behalf of the Ngarrindjiri people where I come from and also the Kaurna descendants I would like to give you our

full support to the Kungka Tjuta women and let you know that we will be there, side by side, with you in your fight for your land, because I know that the (indistinct) is a very big Commonwealth company which has taken off of us the land in Australia, and I have been fighting them here in South Australia over a little bit of contaminated land in Port Adelaide for the Kaurna people, but when we realised how badly contaminated South Australia is, we don't want another dump, and we stand firmly by your side with that belief.
DR LOY: Thank you.
DR THOMAS: I know that we can keep on talking and talking and responding to each other, but I just wanted to give my response based on the knowledge that I've been given and the impact statement documents and your comparative statement on Maralinga and site 40. I don't think it's a question of - and I would argue this - if you came and sat down on that land with me you would see very clearly what I mean and what we mean when we talk about this little square kilometre of land - that is what is the concept in whitefella's mind about digging that hole is.
For us the tjukurpa starts way over there. It's bigger than Maralinga ever was, because that tjukurpa
27
starts many, many miles away and it travels all the way through there. That's what I'm saying about whitefella concept and misunderstanding about our tjukurpa and our dreaming, and you - and I say this respectfully to you, sir.
MR JACK: Sure.
DR THOMAS: This is where the difference between what you see as being that hill - and if you go and blow that up and get the minerals out of it, it's only going to affect that immediate area. For us, that affects the storyline way back over there. That's the difference. From a whitefella technical point of view, you're going to - or they're going to put - this waste material in the land - in the manta - underneath there there is a watertable.
You heard these old ladies about the bush tucker. You know if you grow vegetables at home and if something gets into that water that's not going to help them to grow, they won't grow. We can keep talking about this - and that's why I'm saying I think it's time that whitefella come and sit down on the manta with us, so we can give you the experience of knowing - if this is the land here that's going to be the whole area that's going to contain all those drums, we will show you that it's not just this here - how that is connected to a big part of the country, and you don't only be quarter. You be all groups that are linked to the tjukurpa, and that's the conceptual difference that you have - if I can say respectfully - and what whitefellas have, and they don't understand. It's only when we sit down and show you that we're talking about this bigger land and how its affected, and it is much bigger than Maralinga. It's a lot bigger. I wanted to say that respectfully to you.
MR JACK: I just want to make sure that there was no impression that my comment was disrespectful to you either. It's a genuine difficulty in comprehension, as you're saying, sir. Thank you very much.
DR LOY: Thank you. I guess, Roger, I did simply want to ask you to let us know where your native title claim is at in terms of being considered and resolved. Is it in the tribunal?
DR THOMAS: I can tell you it is. Do you want me to - - -
DR LOY: Would you? Yes, okay.
DR THOMAS: The tribunal in South Australia has called for a review of all native title claims, of which there are some 26 or thereabouts, of which Kokatha claim is one of those. One part that I did not announce because I don't represent them, but I am aware of two other groups that also have a

claim over this country. That is more indicative of what the Native Title Act does to us Aboriginal people rather than the dispute that we have between Aboriginal people, and I make that point, so there are two other claim groups.
We have been going through, like many groups, that protracted process of trying to deal with overlaps. We are in the process now, with the Native Title Unit of South Australia, to try and resolve those overlaps through a strategy called the North-West Strategy. That will involve all those, I suppose, north-western part of the State claim groups, bringing them together with senior law men
28
and women and to apply the principles and the rules of law to try to deal with the overlaps.
Having said that there is no argument from those in the know and those with authority that the section of land that we are talking about specifically here is Kokatha land. I would imagine that if the other two claim groups were here they would also put claim to it - it's their country. But from a tribunal point of view it is the subject of review and we are going through that process and the Native Title Unit has taken us through to the senior law men and women process now to try to deal with the overlaps for it to proceed in the tribunal.
DR LOY: Okay. Thank you. I guess it's difficult to simply express my gratitude to you for coming here today. I know the women have come a long way and it is a pretty confronting environment for anyone. So I say thank you very much and it has certainly informed me and the panel members about the depth and breadth of your issues with regard to this proposal. All I can say is we will do our best, in the light of what you've said. So again thank you very much for being here.
We do now break for lunch and I think, given the pressure of the timetable - - -
DR THOMAS: Can we give you a little song on the way out?
DR LOY: Of course. Please.
SONG
MS LESTER: Just for the panel and the audience, Nana mob wanted to end up with a song that's very much a part of the Seven Sisters, and this version is a part of man - what they call Little Boy, which is Wati Nyiru - who was the man who chased the Seven Sisters, and this is part of that song where he stood looking, or perving, at the women. So that was one chapter of that song. Thank you.
DR LOY: Thank you very much. I'd like to resume at 1.30, given the pressures of this afternoon's timetable. The Australian Conservation Foundation has the difficult task of being next up.
ADJOURNED
RESUMED
DR LOY: I think we might begin, even though I expect a few more people will drift in as the afternoon goes on. I'd now like to welcome the Australian Conservation Foundation and their presenter, David Noonan, who is going to expand upon and talk about the position of the Australian Conservation Foundation in relation to the proposal. David.
MR DAVID NOONAN: The Australian Conservation Foundation is a national environment group.
We have the clear policy position that there's no net benefit to the nuclear industry in Australia and we facilitate communities who are under pressure from the nuclear industry and the nuclear expansion, whether that be Sutherland Shire and the local community in southern Sydney or whether that be communities in the north of South Australia, including traditional owners.
29
I'd like to first address the broader issues about radioactive waste management in Australia, where there may be a way forward to a socially and politically acceptable outcome to radioactive waste

management, and to contrast that with the current Federal Government position, which is essentially to proceed regardless of having no consent and of no demonstrated net benefit - essentially, a flawed Federal Government approach. I'd then like to go on and discuss the proposal in the context of the licensing decision and the licensing process and the requirements that should have to be demonstrated along the way in terms of the ARPANS Act's obligations.

Prior to the last Federal election, all the national environment groups had a clear position that to achieve a socially and politically acceptable outcome for radioactive waste management in Australia there were two essential prerequisites. One was that you had to remove the threat of proposed new reactor operations and the threat of new reactor waste production in Sydney and you had to remove the threat of imposed nuclear waste transport and dumping under the current Federal Government proposals. You could then move on to have a full public inquiry under the provisions of the Federal environment legislation as to the future management and the status of Australia's radioactive waste. Only if you remove that threat of imposition can you reasonably expect to come to any socially and politically acceptable outcome.

In contrast, the Federal Government have pursued a course of imposition and override. The Federal Government have clearly failed any test of community acceptance. Essentially, they are not even trying to realise community acceptance for this proposal. We've heard earlier today, essentially, the theme of democracy and interests of South Australians having been put forward by the South Australian Government and we've heard the theme of human and cultural rights for traditional owners. A Federal Government approach that does not address those matters and doesn't properly protect those rights cannot reasonably be expected to also provide environmental protection or safety. We believe the onus is on not just the Federal Government but on the licensing body ARPANSA and the CEO - particularly John Loy because the powers of that Act vest almost entirely in the CEO - and that the CEO should have to be demonstrating how he is properly taking into account the democratic rights and the human and cultural rights that he's heard of earlier today in his proposed decision.

The Federal Government's approach is one of imposition - that they should choose a plan and then push that plan through regardless of the level of opposition to it, to the extent that they will even consider overriding legitimate State legislation. We believe that the SA Nuclear Prohibitions Act may well be found to be valid versus the ARPANS Act, and we've not yet heard Dr John Loy establish the validity of his licence-making decision for what, effectively, are activities that are illegal to conduct under South Australian law.

The environment movement believes that one should minimise the risk in waste production and minimise the risk in nuclear operations. That's countered by the Federal Government and the nuclear industry position - and, essentially, ANSTO is the nuclear industry in Australia, other than in the context of uranium mining - where the hazardous industry has a position of denial. They deny the increasing concerns about low-level ionising radiation impacts on health, they deny the risks that the new Sydney reactor places on the community in southern Sydney, they deny the long-term intractable

30

management problems of imposing that new reactor waste and they deny the rights of all those who choose not to agree with their proposal.

We should note that the European Committee on Radiation Risk reported last year and recommended a fourfold reduction in the limit for ionising radiation for nuclear industry workers from 20 millisieverts a year down to five and a tenfold reduction in the maximum public exposure from one millisievert down to 0.1. We're yet to hear how Dr John Loy will address the very likely reduction in

international required radiation exposure standards in the context of this proposal, which is vested in the old standards.

ACF believes that there is an ongoing management responsibility for radioactive waste. We do not accept the claim that it can be disposed of or discarded, and we believe that it is irresponsible to act on today's means - and what in this Federal Government proposal are the least credible means - of simply shallow burial and discard. In implementing proper management responsibilities, we don't wish to have that pre-empted by a one-off disposal means. Essentially, this disposal means as represented in the repository loses control of that material and denies the opportunity to intervene, to monitor, to secure and to address that waste management in the longer term by intervention and by ongoing management.

We also believe that there is a preference and a responsibility for on-site storage. Every legitimate user of radioactive materials in Australia will have to have, regardless of this repository proposal going ahead, proper on-site storage facilities for a minimum of up to five years, given that the repository will only be open for business approximately every five years according to the documentation.

The Federal Government's position is vested then on the potential for, at best, five-yearly transport and dumping of nuclear waste. We've heard, in regard to the transport context, from many of the interested parties before the New South Wales Parliamentary Inquiry, including the Fire Brigade Employees Union of New South Wales, where they made clear that this transport was an unnecessary and avoidable risk to their members and that it was essentially unsafe and unresourced. You could note that in New South Wales there are only some five fire brigade offices that even have radiation monitoring equipment. Three of them are in Sydney, one is in Newcastle and one is in Wollongong. By the time you attempt to take 132 truck loads of reactor waste up to the Blue Mountains and across 1100 kilometres to Broken Hill, you are a very long way from any effective response. I've met with fire brigade officers across some of that transport corridor and they're clear that if they attend an accident, and they understand it's a radioactive accident, they would attempt to rescue anyone involved and then all they can do is tape off the area and wait for a hazmat response crew to come from the East Coast. That is an unresourced transport proposal. There is no demonstrated capacity in New South Wales or in South Australia to address a radioactive accident, and that is made clear by Local and State Governments and by emergency services and was very clearly accepted by the New South Wales Parliamentary Inquiry.

We believe that there is a responsibility for above-ground storage and management of radioactive waste and that the current burial proposal is, as the SA Government technical submission to Minister

Kemp said, designed to leach. The SA Government submission went on to say:

The design philosophy adopted by the proponent creates the potential for environmental harm to occur as result of leach out migration to the water table as defined by the SA Environment Protection Act. The facility is designed to leach rather than each storage cell being totally sealed.

Not only does the proposal accepted deliberately breach the South Australian Nuclear Prohibitions Act, but it is considered to be contrary to the preventions that are required under the Environment Protection Act in SA to prevent environmental harm from occurring.

We also believe that there is a responsibility not just on the proponent and the Federal Government Ministers but also on the licensing body to have an open and accountable debate. We'd have to say

that the Federal Ministers, in our view, have been misleading at best. The nuclear waste dump issues were introduced to South Australia with the claim that this was a proposal to facilitate State and Territory management of waste, particularly medical waste, and it's only soon after that the community found out that the vast proportion in volume and in radioactivity of the waste intended for the repository is Commonwealth owned waste and, very significantly, it's reactor waste. Not just existing reactor waste, but the Lucas Heights reactor itself is intended to be decommissioned and dismantled and trucked over in the same way for shallow burial in the north of SA and all of the waste from those categories that would come from a new reactor in Sydney is intended to be trucked over in the same way.

Essentially, the new repository proposal is the opposite to waste minimisation. The new repository is here to facilitate a new reactor waste production in Sydney. It in no way addresses radioactive waste management in Australia. It attempts to impose decades further of a problem that is entirely unnecessary.

We've heard of siting studies, and South Australians have had the experience of the Federal Government from November 1997 saying that their first siting option would be to co-locate the store for the high-level waste with the proposed burial site - the repository for the so-called lower level waste. They weren't completely public about that co-location proposal, but eventually it was understood by the public that there were essentially two national nuclear waste dumps being pointed at South Australia.

From November 1997 through till, I think, May 2000, South Australia was the only considered site for the store and the Federal Ministers were saying, "Well, South Australia is the best place." They were saying they've done the studies, "The scientists advise South Australia is the best place." Then the Federal Government, under political pressure, had to open up that study to other States, but restricted to only Commonwealth owned land, because no State or Territory Government would accept that nuclear waste imposition.

Mid last year the Federal Government had to rule out South Australia as a site for the store. Amazingly, the Federal Minister then changed his mind and said, "Well, there are no acceptable sites in South Australia," when he had for years said that South Australia was the best site. There is

absolutely no consistency and no public evidence on the record to establish the claimed credentials, as they change over time, for the Federal Government's siting studies and preferences.

That has been topped off by the Federal Government compulsorily acquiring the site in South Australia. That's the clearest demonstration that they're willing to override the will of the State Parliament and the people, that they're willing to break the laws here and to impose - they hope - the application of the ARPANS Act on a Commonwealth controlled site and, therefore, be able to circumvent the duly valid South Australian Nuclear Prohibitions Act. When you look at the potential for the repository, were it to go ahead, what wastes are ready to come over? Essentially it is only the reactor waste that can come over to the nuclear repository, if it should open for business in the time lines that Minister McGauran is indicating, and he would hope to have the repository operating in South Australia by the end of the year.

ANSTO have been preparing waste, regardless of the licensing process not having set the waste acceptance criteria - I understand they prepared some 5 and a half thousand of 6000 drums to come over to the repository so far, so they must have some inside knowledge as to what the waste acceptance criteria is, that no-one else has, and presumably John Loy doesn't yet have, because he

hasn't made his decision.
No State or Territory government, as has been recently attested to in the press, is ready to send their waste over, no State or Territory government necessarily agrees to do so. Some certainly refuse to do so, such as WA. They see no role and no need for the national repository, in terms of managing their own waste. Given that South Australia is the only State that has ever conducted a proper audit in terms of what is required, and that New South Wales hasn't yet got to that stage, it could be one or more years before any State or Territory government could be ready to send waste to a repository, even should it go ahead. Essentially, the lies are being exposed here in that the true role of the repository is to take Commonwealth waste and principally to take reactor waste, that being the only waste that is currently intended to arrive in the first opening of the nuclear dump should it go ahead at the Minister's requested time lines, by late this year.
We believe there certainly is an increasing public and political liability to nuclear imposition in Australia and that is perhaps why the Federal Government chose not to put the store in South Australia in the end. They were being led by a strong community will, and we believe that strong community will also needs to be a determining factor in preventing imposition of nuclear waste dumps because otherwise we are never going to come to any socially and politically acceptable outcome.
We believe it is very much for John Loy, as the decision-maker, to have to demonstrate how he will take into account the democratic and the human rights that he has heard about earlier today. By what means will you, John, weigh up those rights in terms of the claimed net benefit from having a national nuclear repository imposed in SA, against the law and against the will of the people here? Those rights are certainly not being taken into account by the proponent in any net benefit analysis that they have ever put forward.
It is unfortunate but I believe, from the ACF's perspective, very clear that the assessment so far on the
33
licensing issues around the assessment are being driven by the nuclear proponent and not being driven by the public interest. It is not yet apparent that it's being driven at all by the CEO of ARPANSA, who has accepted an application which we believe is essentially a fast-tracking licensing process.
They are looking to get an approval in one step for siting, construction operation and transport of nuclear waste to the national repository. We believe this is clearly counter to any public interest and confidence in the facility going ahead, should there be any reason for it to go ahead - and that none has been established. It seemed, interestingly, to be directly contrary to the now international best practice, as recommended to John Loy, from the IAEA - the international review group that visited Australia recently - although they were not allowed to meet anyone when they came here and they did not meet with the South Australian Government. They wouldn't face the media or the community and no-one essentially, while they were here, was even told what membership were on the panel. But that international review group came up with very strong findings and criticisms as to the licensing process currently being conducted by Dr John Loy. They said that the application for siting, design, construction and operation of the facility in a single step overlooks the step-by-step approach that is now considered to be international best practice. ARPANSA are required to implement international best practice and here they have a very clear recommendation as to what that is, and it's certainly not what they are doing.
They went on to say that a single-step approach precludes - which is a very strong word - the iteration

considered necessary to achieve, demonstrate and give confidence to the safety of the facility. Essentially the way the Federal Government are going about it, the way the licensing body is going about this assessment precludes - in other words, it makes it impossible for people to have confidence in the safety of the facility or for the proponent to achieve and demonstrate any such safety.
IAEA were very clear that the documentation provided to date by the proponent does not demonstrate a safety case. They went on to give the recommendation to John Loy - and we're yet to hear his response to it. It's recommended that alternatives be explored to take the licensing process forward in a more step-by-step manner. Essentially, don't fast-track everything through the one assessment process; don't mix together all of the stages of the issue - which comes up with the most difficult conundrums where you have an applicant asking for a licence to operate, to transport waste over, when the applicant themselves have not even conducted the appropriate site studies which have been recommended by the Federal Minister, Dr Kemp.
The significance of the lack of site studies, particularly the lack of any further fracture studies that have been advised by - as a condition of approval, actually, on any use of the site by the Federal Environment Minister - these fracture studies have been further recommended by the South Australian Government repeatedly, in advice to the Federal Government. They have now been recommended by the IAEA in their advice to Dr John Loy. If you haven't yet characterised the site, how can the proponent claim that the burial of waste there can be safety conducted?
Claims have been made by the proponent that essentially it wouldn't matter if and when - because we believe it will happen - radioactive waste would leak from the shallow burial site, because they say

it's a long distance and very slow migration of any potential leachate through to the ground table. Yet they haven't even characterised the site to know what the fracture conditions are on the site that they intend to use. It's a key - and ridiculous - flaw in the order of events.
So how then, given that every other consequential step follows from the capacity of the site to contain waste, and follows from the assumptions made by the proponent as to the capacity of their design and of the site to prevent environmental harm, or prevent that leaching, can anyone have any confidence, John Loy, in your licensing process where, at this late stage, of you looking at a decision potentially in April as you earlier indicated, there isn't even yet a characterisation of the fracture issues to do with the proposed site? Why is it that you've allowed the process to go to this stage without the proponent having to demonstrate that level of relevant information before the Australian community?
The IAEA went on to say, as I've indicated, that the documentation - the initial three volumes and the further information provided by the proponent - the Federal Department of Science, who are here today - it's very rare to have them in Adelaide. They rarely appear to explain their case for imposing a nuclear waste dump against the will of the community here. They have appeared in the past at public forums organised by the ACF in Adelaide, but never before have they come under their own hat to appear before the community.
IAEA are clear that the proponent hasn't yet demonstrated a safety case. The IAEA are clear that the characterisation of the disposal zone is yet to be done and it needs to be done to confirm the geological, hydrogeological and geochemical characteristics of the site, and therefore it needs to be done to confirm the assumptions the proponent makes about the performance of the site in terms of managing radioactive waste in the long term.
The proponent is also yet to demonstrate the effectiveness of proposed barriers. There are a few

barriers involved because the proponent essentially is using a shallow unlined trench and has not agreed to engineer the base of the trench, and makes assumptions about the trench being built on solid rock, when they haven't even done the site studies to demonstrate the extent of potential fractures. Fractures of course are very important because it could allow leachate to move some three or more orders of magnitude faster through a fractured rock system, than it would occur through potential for solid rock.

More stingingly again, perhaps, or equally stingingly with IAEA's criticisms of the licensing process, the single step being clearly not international best practice, they were very clear the documentation is neither systematic nor transparent. The documentation is supposed to facilitate the public coming to an informed view as to what is involved in the nuclear waste dump proposal, so the public can then come to their - make their intervention as they may choose. If the documentation doesn't facilitate that role, if the documentation is too difficult to navigate - if it is not necessarily inconsistent, if it doesn't demonstrate its case, it is certainly not facilitating then that public consultation.

Proper public consultation is again an obligation of ARPANSA to provide the public and it certainly, in our view, hasn't happened to date, as is evidenced by the IAEA's condemnation of the documentation put before anyone so far. ARPANSA does have a set of statutory obligations on how

they go about addressing the application. Before addressing John Loy's obligations, it's interesting to note the Federal Department of Science's approach. They've made clear in the initial application, in volume 1 in section 7.4 at page 40, essentially that they intend to reserve a right to change the design of the facility over time, that they reserve a right to change the volume of wastes that are assumed to go to the facility over time, and that they reserve a right to change the activity limits for waste acceptance there, at their own privy, on a campaign-by-campaign basis. By that I mean that the dump is intended to open every five years.

So perhaps every five years if DEST were given the rights of approval that they sought in the original application, they would be allowed to vary the design and vary the activity limits and essentially there could be no assurance now given to anyone in the licensing decision that what would be proposed to be conducted would be safe or would occur within particular parameters because the proponent is saying they should have a right to vary those parameters thereafter.

They go on to say that the activity limits are based on a concept design of the disposal trenches as presented in the application. Different limits could apply should the actual disposal structure vary from this design in order to accommodate a different volume of waste being disposed of during a disposal campaign from that assumed in this analysis; that they provide a concept design and that they provide some assumptions in the analysis, but then - so they should have a right to vary them, doesn't give anybody any confidence or any certainty in regard to ARPANSA's statutory obligations under section 32 of the Act and, I believe, regulation 41, as to what should have to be demonstrated before the CEO can make his decision on what the potential impacts of the proposal are.

I believe that the CEO, John Loy, has instructed the proponent that they should have to provide him with a description of the structures, components, systems and equipment of the control facility as they will be constructed. Now, that's contrary to the design, the conceptual design, with the assumed right to vary that design, which DEST has put forward so far. We still believe that there is no actual design. I've read the further information. They provided a couple of pages more on design issues. IAEA weren't accepting of the further information in regard to design. They asked for a reference design to be provided and we would certainly want to know on what design basis would the facility

open every five years. What variance in the design parameters are envisaged by the proponent that would be accepted by the regulator? None of that is clear. There are very many issues that are unclear, partly because it appears that the proponent not just is being allowed to design the licensing process - and that, depending on their application, that the proponent can decide how many stages will be addressed at the one time, clearly contrary to international best practice as we've been told by the visiting review team - but essentially there are no external reference standards for waste acceptance criteria in operation here.

The proponent draws on a 1992 code of practice for shallow burial in Australia, yet that essentially is outdated and it's clear it's outdated even in regard of their own contractor's advice; for instance, Serco Consultants from the UK looked at the activity limits and the waste acceptance criteria as set out through the 1992 code and they made it very clear that it would be unsafe to act on those standards and they recommended, for instance, that some half of the caesium-sealed sources should have to be excluded from the inventory intended for the repository, and some 85 per cent of the radium-sealed
36
sources should have to be excluded.

Now, that was post the EIS, when the proponent was completely happy with their proposal as to what waste would go into the repository, their own consultants disagreeing with their proposal. It is unfortunate there is no external reference standards for these issues in Australia. They are not provided by ARPANSA. They can't be provided by reliance on the 1992 code. Essentially the proponent is making it up - they are making it up as they go along - although they denied that on the radio this morning.

They're being allowed to make up the waste acceptance criteria, the activity limits for the system. They're being allowed to come up with the design that they prefer - essentially a least-cost design. That's why it's a burial site in the first place, because they've rejected the costs involved, legitimate costs involved in ongoing management for above-ground storage. There is still no clear inventory of what wastes are intended to go to this national nuclear waste dump.

In the EIS there was only one page at the back of the document that actually addressed radioactivity of the waste. They were happy to talk for a chapter or so about volume, but the actual issues, the real issues, where harm comes about, where environmental protection and health and safety are related to the radiation of the waste - was only addressed in a one-page table in the back of the EIS. There is clearly insufficient evidence in the further documentation provided by DEST. In the three volumes that we went through, you still can't tell what the actual intended inventory of waste to go to the repository is.

They provide what they call "a design inventory", but the only information they provide - numerical and quantity of information they provided with that design inventory has been decay corrected for 50 years' time. They won't tell the public in any readily accessible form what actual wastes and what amounts are in the preliminary inventory to go into the proposal into the site, should it open this year or next year. They won't tell the public what actual radiation is to go into that repository over the arise - what they call "arisings" over the next 50 years, primarily from 50 years' use of imposing a new reactor in Sydney, and then they arrive at what they say are activity limits or safety standards for what they think would be left in the repository in 50 years' time.

Again, the IAEA looked at the standards and the methodology being used by the proponent and rejected them in terms of the methodology being used to assume the levels of safety in regard to potential intrusion, particularly human intrusion, in that waste site when it should close in some

50 years on, and it was interesting that the IAEA recommended some methodology to the Federal Government that are actually to do with long-live waste management and not so-called "low-level waste" - the lie the repository is to take medical and State and Territory low-level waste.
Not just were many of the waste proposed in the EIS far too concentrated - the short-lived intermediate level waste - as attested to by the Serco consultancy, where very much of the caesium and the radium was agreed to be too hazardous to be disposed of in this method, but the IAEA are recommending that the methodology to be applied to address a safety case for the facility when you are looking 50 or 30 years ahead, has to be in terms of their methodology for long-lived waste, because it is a long-term hazard.
37
There is a long-term leakage hazard and an intrusion hazard because of the design of the facility, but also because it is intended to dispose of such hazardous materials. They're concentrated short-lived intermediate level waste and the long-lived waste that should never have been sent to this facility in the first place. The New South Wales Parliamentary Inquiry was clear about that. They made a clear recommendation that long-lived waste should not go to the low-level repository.
The difficulties of navigating these technical assumed limits and standards for the facility have not been made any easier by the absence of clear standards set by ARPANSA, as the licensing body. We find it unfortunate that they are leaving the determination of these standards to the proponent and the proponent is then seeking a determination of standards that suit them and it would be interesting to see what knowledge of waste acceptance criteria ANSTO were using when they packaged the 5 and a half thousand drums that are ready now at Lucas Heights to come over to the repository, prior to there being any official finalisation through the licensing process of what the waste acceptance criteria would be.
We would also note for people's information that John Loy has already made a considered decision as to the safety of managing the waste at Lucas Heights. He did so in his reasons for decision when he gave the construction licence for the new reactor at Lucas Heights - that was back in, I think, April 2002 - and he made quite clear in his decision that he is satisfied with ongoing potential management of not just existing reactor waste but new reactor waste in these categories at the Lucas Heights site. It's true that Sutherland Shire Council will attest that ANSTO did fail to implement international best practice in how they manage their own waste, but it satisfied John Loy, as the CEO of ARPANSA, that they were capable and the arrangements were there in terms of management for them to be able to do so on site in the long term, which does beg the question as to why then the repository is going ahead when the repository is primarily to take Commonwealth waste and reactor waste and the reactor waste would be the only waste ready to come over to South Australia if it should go ahead on the time line the Federal Minister requests, when the CEO of ARPANSA has already satisfied himself that there is no need for it to be moved off the site.
There are some fundamental outcomes that come from this. There's a very clear need for a further set of studies and a further set of documentation to be provided from the proponent. The studies should have to start at the most obvious level - that they undertake the fracture studies and the site characterisation. They need to do so. It's an obligation on them actually. It's a condition of approval from the Federal Minister for the Environment - an environmental approval - yet at this late stage they have not done that work.
A layperson might assume that that work should have been done first, but the proponent is apparently happy to have neglected to do that work at the stage when they're asking for an operational licence

approval for the facility, so we believe that you, John Loy, should have to go back to the proponent and not ask their view, but direct them as to how they should be complying with the IAEA critiques. You should go back and direct them as to the further studies they should do in terms of the specific site proposed and that you should be directing them as to the further documentation they should have to provide to demonstrate a safety case, but also to provide something that is both systematic and

transparent in terms of proper community consultation and to which they have actively failed to facilitate that required proper community consultation through the documentation they have put forward to date - those drafts.

We would want to hear from you what time line you're intending to do so. We would also want to hear from you - and hopefully today you might give some indication to the community - as to what needed changes you are willing to put into your own licensing process to bring it into line with international best practice, as you are obliged to do under your Act; to address the stinging critique from the IAEA that the current one step - we believe a fast-track licence process that you are undertaking - is clearly not international best practice and that it effectively precludes achieving or demonstrating and having any confidence in any potential safety for the facility that's proposed.

So we believe that given it is a public forum and given that we do have question and answer, we should also be able to hear from the licensed decision-maker as to what he is going to do to put in place proper net-benefit analysis and protection for the democratic and the human rights that he has heard of earlier today, but also to tell us what directions he'll be giving to the proponent for these needed further studies and documentation and what changes you're willing to make in your licensing process. Presumably you could give us an assurance today that you will require and provide a proper period of public consultation in the future on the final nuclear waste dump plans, and not just on the drafts that we've been provided with to date - the inadequate drafts from the proponent.

The ACF are clear there is no net benefit and no need for a national repository in Australia, just as there is no net benefit and no need for medical isotope provision, given that they can be provided by importing or by production of cyclotrons and no need for a new reactor in Sydney.

In hoping to realise a socially and politically acceptable outcome to radioactive waste management in Australia, the next leg of that essentially lies with John Loy. He has a pending decision and we believe he should set out a number of stages that the proponent thinks that the Federal Government should have to go through. Provide these further studies and the further documentation. Make them public and provide a public consultation period on those final nuclear waste dump plans, but also to change his licensing process so that there may be the potential for achieving some confidence in the outcome, but principally to provide some legitimacy to what you are undertaking. You are essentially being asked by the Federal Government to approve the imposition of a facility against the democratic and the human rights of people in South Australia, essentially against the law in South Australia. You have yet to prove any validity for your own legislative capacity to do so.

You are essentially looking to approve a facility that the South Australian EPA says has the potential to cause environmental harm, as defined under the Environment Protection Act. You are looking at approving a facility that will put in place the practice for decades to come, potentially, to mismanage, by shallow burial and by imposed long-distance transport, radioactive waste in Australia. If you follow that back to the original concern, the original concern is the new reactor in Sydney. That is why the Federal Government has these national nuclear waste dump proposals.

You should not be making a decision on an inadequate set of documentation on a failed public

consultation process through a licensing process that's clearly not international best practice to
39
facilitate some further step towards the Federal Government getting its way with a new reactor in Sydney, at the expense of South Australians.
DR LOY: Thank you. Thanks David. You've asked some direct questions of me, and that's fair enough. I will make some brief responses to those and then pass on to questioning by the panel. I guess in what you were saying, just at the end there, for example, "you" - meaning me - "are looking at approving a facility" - et cetera, and I'm not. I am assessing a proposal from DEST against the requirements in the ARPANS Act. Whether that means I approve what comes through and approve a licence is a question that I haven't answered yet. So I'm not looking at approving a facility; I am undertaking an assessment.
The issues you raise about - you put it as "democratic and human rights", clearly I must do my duty, as it were, under the ARPANS Act and follow through what that Act requires me to do. If, in the fullness of time, there is some challenge to that about the South Australian law then that obviously will be resolved by a court. I have to do what I have to do under my legislation. That then goes also to the fact that I have received an application that does cover the three conducts of "prepare a site, construct and operate" and I need to consider that. I'm not obliged to approve it, to approve all three conducts. It's legally open to me to make a decision on one. So that's a relevant issue and again it's not something I've made a decision about, I emphasise again.
The matter of the IAEA reports: It is a serious critique, no question, and when we receive the final report - which I believe will be very soon - I will put it to DEST and seek responses, and in doing so I will certainly expound on some of the guidance that I'd expect them to respond to. I can't tell them how to make their case, in other words, but I can offer them some views and propositions. Of course that request to DEST for a response to the IAEA report, and of course the IAEA full report, will be available publicly and at that time also I will review the timing for further public consultation processes. I hope that's of some help in some of the questions you've asked. Could I throw to you now, Ian?
PROF LOWE: Thank you, John, and thank you, David, for your presentation. The first question I wanted to ask is about your general proposition that the waste is more safely stored on site at places like Lucas Heights rather than in the proposed repository. Is that a view from first principles or is that a view based on an assessment that the risk is diminished by cutting out transport and storing the waste where it's produced?
MR NOONAN: Essentially it's both. We would understand that there should be a preference for onsite or close to site of production or use long-term management of waste unless there's a good reason to do otherwise. The Federal Government proposal does not give us in any way a good reason to do otherwise. It does not give us a good reason to accept the transport risks that are inherent in moving material such long distances, particularly when there is no demonstrated capacity in the other levels of society in Australia - the State and the Local levels of Government, and the emergency services - to address the potential for proper response to radioactive accidents in the transport of that waste. Essentially it's a Commonwealth action, but the responsibility and the liability for it is being put upon State and Local authorities and local communities. So we see the Commonwealth, in their etheric
40
way, saying that they, under a code of transport, can authorise the transport of waste, ignores the reality that there is no demonstrated state capacity to deal with the possible consequences of the

movement of the waste.
So in the first case we would say we have a preference to on-site storage, particularly for radioactive waste at a site where there's a continuing operation of a reactor. It may be that there can be a good case made for some rationalisation of local storages in terms of State and Territory responsibilities and that could be done on a case-by-case analysis. Principally we would see that there are inherent risks in unnecessary transport of waste, particularly when there's no demonstrated capacity to properly manage the transport and that the Commonwealth hasn't made any case in the first place that the waste should be moved.
PROF LOWE: Has that covered everything you meant in your heading, when you said, "no credible transport assessment", and if not, what in your mind would constitute a credible assessment of transport risks?
MR NOONAN: There are a couple of aspects to that. One again goes to the licensing process. John Loy says he has three conducts before him - to site, construct and operate. But it is almost obscure how the transport approval would come about under the current ARPANSA process. Essentially John Loy has acknowledged that transport is a relevant matter, that safety and transport is a relevant matter to your approving a facility licence, but there is no clear, comprehensive assessment of the transport issues in the current proposal; certainly none that satisfies communities across New South Wales or the New South Wales Parliamentary Committee who have recently just conducted an investigation into that.
Essentially transport proposals have been put forward by one preference from the proponents. They have said that they will road transport reactor waste across New South Wales and they would do it on a preferred route that goes across the Blue Mountains, through Orange and Dubbo to Broken Hill, but they would also consider an alternative route. I understand more recently the Federal Minister said, well, he could use either or both routes at his discretion in the future.
The Federal Government has not presented any contingency plan for their transport proposal. For instance, a New South Wales Parliamentary Inquiry found it, in their view, unacceptable under the current arrangements to transport the reactor waste by road. All the communities along that transport corridor are saying that in their view it's unacceptable for the reactor waste to be transported through their areas against their will. But the Federal Government has no contingency plan for transport other than to impose it against potentially the will of State Governments and potentially State laws, as is already the case on the South Australian side of the border.
It's interesting to note that the New South Wales Parliamentary Inquiry, in saying that the repository and associated transport could not be justified and should be abandoned, went on to say that if the Commonwealth proceeds with the current proposals the New South Wales Parliament should legislate to prohibit that transport of radioactive waste across New South Wales. Then John Loy would be having to address two State Premiers' blatant opposition and legal opposition to the Federal Government going ahead and not just the one.

PROF LOWE: Thanks. You talked about lack of site studies and I certainly noted the Federal Department of Environment's suggestions and those from the international review team. Are there any other site studies besides those specified by the Department of Environment and the IAEA review team that you think would be a prerequisite to going ahead with a repository on this or a similar site?
MR NOONAN: I suppose from the policy perspective of the ACF in terms of good public policy in

radioactive waste management, they should have been looking at a site study for an above-ground facility in the first place. Essentially, much of their site study has led them to a preference for a small group of sites, but that was predetermined by their assumptions that shallow burial was the only way to go forward. Essentially, they had no contingency plan or no other plan - I mean a parallel assessment - as to how radioactive waste could have been managed in Australia above ground.
It's another flaw of the EIS process and of the proponent's documentation, and potentially a flaw of the ARPANSA licensing process, that at no time have other ways of managing the waste been equally assessed. The Federal Government has a particular preference for shallow burial, so essentially above-ground storage has been only minimally addressed from that stage on, through all the process. The Federal Government has a clear preference for road transport of reactor waste and no other transport proposal has effectively been considered in any detail.
PROF LOWE: Just two more points. Could you expand for me a bit on what you mean by saying that the proposal provides for unacceptable variants of radionuclide activity concentrations?
MR NOONAN: An example of that is that the 1992 code provides for the acceptance of category C waste that may be 10 times more concentrated than what is set out in the limits in the rest of the documentation, so they're providing an exemption for the acceptance of waste that would be 10 times more concentrated. It's in the code, section 2.6.3 I think, from memory. It's in my submission. Also, the proponent claims the right to review activity limits on a campaign-by-campaign basis, meaning that each time the dump would open, the proponent claims that they are privy to reviewing the activity limits and potentially to be varying the assumptions that go into determining activity limits by their potential change of the design of the facility, by their potential change of the size or scale of the facility as to different volumes of waste being taken to the dump - than has been anticipated in the initial documentation.
PROF LOWE: Thanks. Finally - because I want to leave time for George Jack to ask some questions - by saying that the proposal is based on outdated quantitative criteria, are you saying that we should be moving to the European Union's revised criteria under dose limits or are you saying something different?
MR NOONAN: In two senses it's based on updated criteria. It's based on the updated criteria as to what is an acceptable legal limit for radiation exposure. For instance, the European Committee on Radiation Risk have made it very clear that they believe the permissible standards are far too high. So it's predicated on an older view of what is a legitimate risk from ionising radiation in comparison to an increasingly obvious view that those standards need to be brought down. That's a very

fundamental level before you get to any specifics of a proposal.
This proposal has been predicated on a 1992 code of shallow burial, and the code as it was written then provided for particular waste acceptance standards in terms of concentration and other matters, and the categories of the waste, and even the proponent's own consultant, Serco Ltd from the UK, made it very clear that that code was outdated and it didn't provide for a range of significant matters in terms of radiation protection, and they made it very clear that in their view it would be unsafe to proceed to bury waste that fell within the categories as provided for in the 1992 code. For instance, they said that the NHMRC code itself only provides generic categorisations of types of waste, and they go on to say:
But the criteria for waste categorisation are not detailed enough to provide the basis of operational waste acceptance criteria or facility management. For example, they do not

address the differences in radio toxicity between radionuclides or the varying dependencies of the impacts of different radionuclides on exposure route. They themselves are based only on a human intrusion scenario and do not consider alternative exposure pathways.

Serco Consulting went on to be quite specific as to a range of isotopes and a range of particularly concentrated sealed sources of those isotopes that they said in their view would be unsafe to discard, to dispose of, through this proposed design and methodology. It's quite significant that they recommended some half of the caesium-sealed sources should not be put into the dump. That is half in terms of the design inventory that is proposed by the Federal Government, and I think it was some 85 per cent of the radium-sealed sources should not be put into the dump. That presumably means that those radioactive sources should be reclassified as category S under the 1992 code and put aside for management through above ground; it is accepted by the Commonwealth that category S should be managed above ground.

There is no clear dividing line here, even within the Commonwealth Government's own preferred terms. The Commonwealth says that certain classes of waste are suitable for shallow burial but that certain other classes of waste, what they call category S, should be managed above ground. But the category S is essentially defined by exclusion in the 1992 code. They set out what the lower limits are and they say, "Well, anything else must be category S."

Those lines are very unclear now, and increasingly unclear, when the Federal Government's own consultant, Serco, is saying, "Well, some of the waste that you had proposed for shallow burial is actually too concentrated and should be reserved for above-ground storage." Again, it appears to be the proponent making up the standards as they go along, rather than the regulator, John Loy, telling them what standards they have to comply with in the first place to implement the objects of his Act: to protect health and safety and the environment from radiation.

DR LOY: I was a bit alarmed by you, Ian, using the words "European Union" when referring to David's European Committee - - -

MR NOONAN: I was referring to the European Committee on Radiation Risk.

DR LOY: The European Committee is a group that's put forward a proposal and argument, but their connection with the European Union is not a formal one, if I can put it that way, and there's obviously debate about that. The other point I would make is that what the proponent has to do is to demonstrate that what they propose to put in the repository, roughly speaking, is safe given the design of the repository. Out of that falls waste acceptance criteria. If they are licensed, those waste acceptance criteria will be part of the licensing basis, no question. Any amendment to them would require an amendment to the licensing.

MR NOONAN: We haven't yet heard from you, John, as to whether you accept the Serco Consulting advice that many of these wastes are too concentrated and would be unsafe to be buried as proposed.

DR LOY: Well, I haven't made any decision yet about what the waste acceptance criteria should be, but obviously I'll take their views - - -

MR NOONAN: You should realise that that doesn't facilitate the informed public consultation, because then no-one knows what the waste acceptance criteria may become when there is very clear evidence being put forward that some of the wastes are unsuitable or unsafe for shallow burial.

DR LOY: The proponent will ultimately have to demonstrate that what they wish to put in the

repository, taking into account its construction and the features and events and processes that they analyse, will result in a safe repository, and that's what I must assess and make my judgment on.
MR NOONAN: To be honest, for us to feel any assurance in your pending decision, we would like to know the standards before the event and not afterwards.
DR LOY: I think there's a difference between standards and waste acceptance criteria. But, look, let's have some more discussion perhaps in another place to resolve that. George.
MR JACK: Thanks, John. My first question was going to be coming back to something you just mentioned about the European Committee. I think you then expanded upon that to say that it was very likely that the international dose limit recommendations would be changed. Do you have any grounds for saying that and, if so, what? These are produced by the International Commission on Radiological Protection, which is not at all associated with any European Committee. What are your grounds for making that statement?
MR NOONAN: I think as you would be well aware, the international standards have been coming down over time. There have been a number of rounds of that in the last 50 years and, each time, there has been a significant reduction and each time the reduction was along the lines of recommendations that had been discussed over a long period by expert investigations. In the current period, the vestige of that current knowledge of the actual increasing recognition of risk from ionising radiation to health is, I believe, vested in that European Committee on Radiation Risk's findings, and you would be well aware that in all of the previous evidence, when ICRP reduce their formal standings, it happens very quickly on the day.

MR JACK: That may be an opinion that the European Committee has made that best decision, but the information that I have is that the International Commission on Radiological Protection is not so inclined. Unless there is good reason for believing otherwise, it is questionable to state that it's likely to happen. As I say, my information is that it's not likely to happen.
MR NOONAN: We would have no doubt that there would be a significant delay in that, because that would be typical of the denial of the nuclear industry of the actual and real health risks from ionising radiation.
MR JACK: I won't argue with that point. The International Commission on Radiological Protection is hardly "the industry". But going on to another question: It seemed to me that you were condemning burial as a means of management of radioactive waste in toto, and I don't know if I interpreted your statements correctly. I'd like some clarification. Is that the case, or are you opposed just to this particular design of facility in this particular location, or is there blanket opposition to putting radioactive material underground?
MR NOONAN: We have a policy position that it is more credible in this era to manage radioactive waste by above-ground ongoing responsible management in dry, accessible, retrievable, monitored storage rather than to discard and dispose of waste. There are very different philosophical assumptions involved in ongoing management compared to the assumption that you can dispose of or discard something in a one-off event and, therefore, absolve yourself of the ongoing responsibilities to it. I know that people will say they have an institutional control period, et cetera, but there's no demonstrated capacity to intervene. You do, we believe, lose control of that waste when you bury it.
MR JACK: What would you say to a design that allowed intervention and even recovery, if necessary, after the fact?
MR NOONAN: Most designs like that are above-ground.

MR JACK: Recently, there are some coming in for below-ground too.
MR NOONAN: None that are proposed by the Commonwealth here.
MR JACK: That may be the case. Would you, by your opposition to below-ground disposal, then criticise countries like Finland and Sweden, which have been doing this for some considerable period of time, apparently with community acceptance and apparently with a great degree of safety? Would you criticise those countries for doing that, because these are actual facilities in operation for many years?
MR NOONAN: We have, as I've said, a policy position of preference to above-ground management of radioactive waste rather than burial, and we have a very specific proposal before us - not the Finnish model or any other model. We have a very specific Federal Government proposal before us, which we believe is irresponsible and, under the South Australian Environment Protection Act, would cause the potential for environmental harm, which has all of the human and cultural rights - 45
impacts on an array of people that you've heard from today. We're dealing with the one-off proposal the Commonwealth has put before us, which is clearly flawed, and the Commonwealth has failed to provide any contingency plans such as the ones that you're potentially indicating. They have particularly failed to provide any contingency plan that would allow for community acceptance, such as what you said happened in Finland.
MR JACK: What I'm trying to draw a distinction between though is your stated policy and any opposition to this particular facility. What I hear you saying now is that it's opposition to this particular facility rather than the general - - -
MR NOONAN: No, it's both. We have an objection to burial of radioactive waste. We have a policy position preferring above-ground storage. There are specific and numerous flaws in the current specific proposal which is before you, many of which were accepted by the South Australian EPA in their technical comments to the Federal Minister for the Environment, for instance.
MR JACK: Could I go onto another question that I had? It was on your opening slide that there was zero net benefit.
MR NOONAN: No net benefit, sorry, not zero.
MR JACK: My apologies. All right, no net benefit. It would not be a complete solution, but would it not be some benefit if you were to centralise radioactive waste currently spread over several locations - or at least a large percentage of those wastes - into one centrally managed facility instead of continuing to increase the inventory in all those disparate sources across the country? Isn't that some sort of benefit? Not a total solution, I agree, but some sort of benefit?
MR NOONAN: In an absolute sense, it is not necessarily a benefit, just as the South Australian and WA Governments don't propose or support a centralised national facility. They have very clear positions against that. For you to say there is some benefit in a particular course of action - what we are speaking about is the net benefit resulting from the overall action, and that is what John Loy is actually required to take into account and to act on in terms of his licence decision. It's net benefit. It's not necessarily that the proponent will claim that there are some benefits moving forward in this direction from some rationalisation of centralisation of waste, when there is such a clear lack of benefit moving forward in other directions, from transport risks or from discarding the democratic and the human rights and cultural rights of South Australians in so doing.
MR JACK: Yes, I fully understand the meaning of the word "net", but the difficulty is equating what you call social and democratic rights with, for example, perhaps improved security and safety of

managing the radioactive material.
MR NOONAN: First, it's questionable that there is increased security and benefits in the management of the radioactive material. Second, I think if you're feeling any difficulty in the comparative analysis - that is, the problem of the nuclear industry and the problem of the regulator to demonstrate that they can deal with - otherwise they're not in a fit position to make the decision. If you can't integrate the social and human rights issues, the environmental protection issues, the

broader term public policy issues of not facilitating unnecessary waste production through a new Sydney reactor - if you can't integrate those issues properly, it's the technical shortcomings of the process and the decision-maker - of the methodology and potentially of the decision-making body - not the individual but the decision-making body, ARPANSA, under their Act. That should not be used as a reason to say that one should therefore move forward in a particular course just because one line of knowledge in society is more easily quantified than another.
MR JACK: Going to the transportation risks that have been referred to several times during the last little while, do you see a significant difference between transporting radioactive waste and all the other shipments of radioactive material that happen in the course of normal modern society?
MR NOONAN: I believe that the New South Wales Inquiry and the fire brigade submission to it is informative there, in that the New South Wales Inquiry didn't accept that the transport of radioactive waste was somehow less hazardous than, for instance, the transport of fuels or dangerous chemicals. The New South Wales Fire Brigade, in their submission to the Parliamentary Inquiry there, were quite clear that although the issues may be slightly different they considered them to be commensurate hazardous events.
MR JACK: Yes.
MR NOONAN: Although the immediacy and the spread of risk may be different in a fuel tanker compared to a transporter of radioactive waste, they found them no less hazardous events in terms of management to deal with.
MR JACK: Yes, but not comparing it with fuel tankers and things like that, all the other radioactive material that is transported on a daily basis across countries - - -
MR NOONAN: If you're referring to the transport of medical isotopes - - -
MR JACK: That, for example, or the transportation of isotopes used in industrial applications and so on. These are all, as far as I'm aware, transported in Australia in accordance with the recommendations of the International Atomic Energy Agency. The IAEA has been quoted here extensively by yourself in support of the criticism of the applicant's submission, but if these are all being transported in accordance with the IAEA's requirements for transportation is this not a plus on the other side? Shall we not be fair both ways, is what I'm getting at? If the IAEA is involved - - -
MR NOONAN: I hope that - unlike perhaps the proponents when they cite the number of transports of medical isotopes in Australia - you accept that there is a significant fundamental difference between the scale of the radiation issues involved in a package of medical isotopes being moved from one place to another and hundreds of truck loads of radioactive waste being moved some 1700 kilometres across the country.
MR JACK: Yes, but if you start looking at the transport packaging requirements and what accidents the packages will resist and survive - have you looked at that carefully before you've come to this conclusion?

MR NOONAN: I understand the New South Wales Government looked at the matters carefully when they said that they had no emergency services capacity to respond to a radioactive waste accident west of the Blue Mountains. I understand the New South Wales Fire Brigade looked at it carefully when they said that should the proposed transport of reactor waste go ahead from Lucas Heights it would either have to involve a significant redistribution of Fire Brigade resources or there would have to be a substantial increase in New South Wales Fire Brigade resources to deal with their response requirements - their responsibilities under their acts to respond to what would be a Commonwealth action.
MR JACK: Yes, okay. Thank you very much.
MR NOONAN: I think you should accept there is no demonstrated capacity for the emergency services' response to the proposed transport of radioactive waste, particularly reactor waste, by the Commonwealth. That's what all those States and local bodies are telling you.
MR JACK: I hear that clearly, thank you.
DR LOY: I did note that it was one of the recommendations of the New South Wales Parliamentary report that the report be formally referred to me and taken into account in this process. I think that would be an appropriate thing to happen. Thank you very much, David, for your presentation and I'm very glad that we were able to engage in some to and fro on it. Thank you.
MR NOONAN: Thank you.
DR LOY: We now move to a presentation on behalf of the Sutherland Shire Council. I have here that it is to be by Councillor George Hurley, assisted by Dr Garry Smith. Welcome.
COUNCILLOR GEORGE HURLEY: Yes, thank you, Mr Loy and panel, and to all the audience here. I'd like firstly to recognise the traditional owners and the South Australian Government, and indicate Sutherland's support for their cause and issue at the moment. I'm here to represent the Sutherland Shire Council, not as an expert witness, but to voice the concerns of the residents of the Shire, some 225,000 of them, and the problems they've had.
I think it's good to look back on history, not just on the current situation, and I appreciate the forum today is on the waste dump, but what we should look at, too, and back to is the generation of this waste over the last say 50 years and what is going to happen. We have to bring the reactor in, the new reactor because the generation of waste just seems to go against the responsibility of any government or any organisation in minimising waste in the future.
Sutherland Shire people have really grave concerns regarding the Federal Government imposing the new reactor on the shire. It's going to generate an enormous amount of extra waste. It's double the size of the original one. We have asked for quite a long time: Why is this so? Why do we need a new reactor? Why do we need a new reactor that is twice the size of the one we've got? We've been told that the reactor is for medical research, that without a reactor - and I'm sorry but we have to put

up with this monthly in Council from other members of the Council, the opposite side to what I represent, telling us that we've got to look at people with cancer and so forth.
We are quite concerned and really concerned with the welfare of people in hospitals and with the continual upgrade in scientific improvements for people with cancer and so forth, but we don't see the relevance and we don't see the motivation of why you need a 20-megawatt reactor producing maybe two to three to four times the amount of waste that we have created over the last 50 years. We are aware that the Lucas Heights facility is currently the reactor repository for virtually all the radioactive waste generated over the last 50 years.

The Council and residents of the shire are seriously concerned - this is a major concern of ours - with the consultation process and the fight that the Council on behalf of the residents and the community - not only the community in Sutherland Shire but outside - because in 1997 on the opening or the Government's intention to open a new reactor, there were eight other Councils who joined in with the Liberal Party and Federal Ministers, one who is still there, Danna Vale; Chris Downey, the State Member and so forth - to condemn this reactor opening on the grounds we're fighting on today. We're generating, not minimising waste over the future.

Not only that, the placement of the reactor and the waste - because we have got a storage repository there - is 1.6 kilometres from residential housing. There was no need - it's said: Why do people buy this close? There was no need for these people to worry in the future, and this is what people do. They've got to live somewhere, they've got to look at the future. That reactor was phased down; it was going to be finished in the early 90s. What we find now is that those people are stuck 1.6 kilometres - children, schools, everything that goes with life in a residential area.

No communication, no consultation other than the words, but I can assure you that the Sutherland Council has had problems. To gain information in regard to things that affect the safety, the security and to enable us to set up emergency plans, we had to ask for answers. Those answers weren't forthcoming. It has cost us thousands and thousands of dollars and months and years of time just to get feedback on serious issues, to let us start up with an emergency plan, or some kind of plan to help the people. I can assure you also that every time our scientific staff asked for information we paid our money, we waited our time, we fought the good fight - every single time that information, it was proved, vindicated us in why we asked - why we were able to use that information quite freely. This exercise emphasises the lack of cooperation between the community and the Sutherland Shire Council and the Government and their authorities.

The recent New South Wales Parliamentary Inquiry we all know about and we know what's come out of that. We're very happy with that. But what we've got to get is to the stage where there is a round table. I applaud this forum. We've travelled from Sydney purely and simply to put our case and to show our support for the people in South Australia and for the organisations that are representing the issue. But what we'd like to see is some new kind of cooperation, new kind of community consultation. I think this is coming through from everybody - what plans we've got in place to dispose of generated waste? What plans have we got for emergency procedures? They've fallen over in the last week and I won't go into that. When will Council see a comprehensive independent inquiry into waste?

We look at the Australian Radiation Protection and Nuclear Safety Agency and you see above it "Australian Government" and it's a perception. When you get these things that come back to you, when you're trying to help the community and you see above an organisation the sign "Australian Government" you've got to accept that those people are the same as I am at work, they have to get paid by these people. You know, they've got an obligation to listen to them and maybe it's not true, but the perception is there and some of the actions seem to reflect this.

I won't go on. Garry is going to give some technical stuff and I'll wind up afterwards. Thanks very much.

DR GARRY SMITH: Thank you, Councillor Hurley. Dr Loy, Prof Lowe, Mr Jack, ladies and gentlemen, thank you for the opportunity to speak to our submission to ARPANSA regarding the waste repository, and to bring the experience, as Councillor Hurley has said, of Sutherland Shire

Council to the matter. I am a member of staff of Sutherland Shire Council. I've been that for about 10 years. So I've seen most of the development issues, with respect to a new reactor and now a waste repository, during that time. I'm also a serving member of the nuclear safety committee of ARPANSA. I'm nominally a Local Government contact on that committee. I was formerly a member of the Radiation Health and Safety Advisory Council and prior to that, a member of the safety review committee, which used to visit the site quarterly, out at ANSTO, to check up on certain safety matters.

I wanted to begin briefly by way of a short, but I think relevant, introduction to set the context of, in one sense, why we're here. Councillor Hurley has already said it is to bring what experience we have and also to show support for other communities, because it was quite striking, I think, during the presentation of the Indigenous community representatives this morning, and the South Australian Government Minister, that to some degree New South Wales and particularly our local government area of Sutherland Shire Council, feels treated by the Commonwealth in a very similar way to the treatment that is perceived by the Indigenous people and the South Australian Government.

The issue I'm going to go to is that the problem we have here about nuclear waste is essentially a source problem - that we are making large amounts - not as much as overseas, but still large amounts and highly radioactive amounts of radioactivity, and that the Government approach to sourcing this material has been poor and now we're forced to find a place to put the waste residual from the use of that radioactivity.

When the reactor was first located in Sutherland shire and started up operation in the late 1950s, our community was told that there would be no impact, no air emissions, no off-site emissions whatsoever. Subsequently we found out that that wasn't true. When Sutherland Shire Council tried to limit development of residences adjacent to the reactor, Commonwealth and State planning law allowed that development to go ahead, so we from Sutherland Shire Council are not recent blow-ins to this issue and you know crying poor at the last minute.

There has been a history of this and I think obviously now indigenous and white communities in Australia and other levels of government - in this case the South Australian Government - have been

treated, I think, very poorly by the Commonwealth by way of the siting and location and operation of these types of facilities - and I am going to talk about that in more detail shortly. As I said, I think the key issue we want to address is that the source of the radioactivity is the key problem in this matter. Our community has never tried to force waste on to other communities, but there's a balance between the amount of waste that's produced, stays on site, with what goes off site, either into our sewer or transported somewhere else, and our community and your communities are put in this invidious position because of a generation of the radioactivity in the first place.

One of the key problems we've had with this process all the way along is that it is clearly second-best practice. The Commonwealth, during the advent of the replacement reactor - which is going to lead to a continuation of production or sourcing of radioactivity and therefore radioactive waste - has applied a second-best process. In state planning laws in New South Wales and other parts of Australia hazardous industry is not assessed with respect to siting and operation without an EIS and an inquiry to test the information in that EIS.

Indeed to test all information. We, Sutherland Shire Council, would like our information and our concerns about the original reactor EIS and now the waste repository EIS, tested. Not just the proponent information, but our information tested, but unfortunately on both these occasions the

Commonwealth Government, in contrast to State planning law, just hasn't allowed a proper testing of this information.
What has happened is that the safety outcomes and safety concerns and proposals have defaulted from the EIS planning process across to this ARPANSA licensing process, and our Council - I have got to say up-front - is critical of the ARPANS Act. We consider it a very weak Act. Frankly it shouldn't be put in a position where, after a poor EIS process and poor testing process, the regulatory process has to clean up afterwards, particularly with a weak Act.
There are three or four key points I would like to make about the situation we find ourselves in now in light of what I have just said. First of all, with respect to problems of waste storage at Lucas Heights Science and Technology Centre, Sutherland Shire Council has solicited opinion from a number of international experts all the way along the development of the reactor - and now the waste repository proposal - on matters like waste storage, safety and so on and, by the way, I might say we've always made that information fully publicly available, together with the backgrounds and CVs of the experts who have given us that information, unlike - I have to say - some of the approaches of the Commonwealth Government.
What that information has led us to conclude is that there are continuing - there have been earlier and there are continuing problems with waste storage at Lucas Heights Science and Technology Centre, and these are documented in the expert reports that are attached to our submission to ARPANSA on the waste repository proposal. They go to issues such as the fact that best practice is not used to essentially eliminate emissions off site of radioactive waste dumped into our sewer and into our air. Over the last decade there have been improvements - and, in the case of air emissions, considerable improvements - in what is put out from LHSTC, but it has taken us 10 years to get those improvements. Unfortunately our perception is that waste management on the site has been the

Cinderella issue, ahead of trying to get some science done. Frankly, what I am going to put to you today is that the overheads for this site at Lucas Heights between the security problems, finding somewhere to develop a repository and so on and so forth, the overheads on this science-based plan at Lucas Heights - admittedly it also makes sound medical radioisotopes - must be incredible.
How we're going to do good science on that site and still have to pay for all these externalities really beats me and I think if we'd had a good EIS process and siting process earlier on from the Commonwealth, which had tested all information, we might have realised that much sooner. We're not happy with a waste storage at Lucas Heights Science and Technology Centre. That doesn't mean automatically that the waste should go somewhere else. You will see in the initial Council submission on the DEST licensing process that we took what we think is a very constructive view of pointing out the problems at LHSCTC, but the problems that we also perceived in transporting the waste somewhere else.
I have got to say that our initial pass at the early DEST information was that it was very poorly put together; in particular it seemed like the waste repository site was in some magical vacuum in South Australia and there wasn't an issue about how you get the material there, for example. Virtually nothing on transport as an issue that affects both our site as the initiation point of a large amount of the waste and the many communities along the way and, in addition, the communities in South Australia.
Dr Loy, in his initial response to the original DEST information, did ask for more information on transport issues. That's emerged by way of packaging and waste assessment criteria information, but

I've got to say, even Dr Loy's letter to the proponent I think did not give the issue of transport the due consideration that it should have been given, so this has all the way along seemed to be something about a piece of land in South Australia that is going to take waste under certain conditions, and we're critical about the depth of that particular process.

Looking at the issues of transport. Well, really there were several issues about transport that were raised, particularly by our independent consultants: One included the very clear jurisdictional difficulties between Commonwealth and State planning law and emergency response law if an accident is to occur or were to occur when this material is being transported, and concern about those jurisdictional issues about liability, clean-up, and who responds and whether there is adequate infrastructure to respond along the route, have been voiced by several parties, not just ourselves, including the council of ARPANSA at one stage, so there are clear jurisdictional issues and we have legal advice to that effect.

There are also issues of the ongoing transport of the material. Is a licence going to be produced which will allow, as it were, a first-pass approval, to then go on and keep shipping, or are individual shipments going to be licensed individually - I think the former is more likely to be the case - and that again was raised in detail by one of our consultants and is in our original submission. There is also an opinion attached to our original submission about the issue of security and it goes to issues such as theft and sabotage with respect to the material being transported, so we did raise some issues originally, and some questions on the original DEST application about the potential for that sort of misadventure; in fact the issue of dirty bombs has come up, and it was brought up in the New South

Wales Parliamentary Inquiry. Is the material suitable or adequate for use in that sort of misadventurous way.

We raise that - I think and I hope in a very responsible manner - not to get to the issue of how you make that sort of material, but what are the consequences? Is it something we should be concerned about? Quite frankly, I think the original information from the proponent tended to either leave that sort of issue out or deal with it very poorly.

That gets us to the point of the supplementary DEST information, and I raise that separately because, in a sense, chronologically it gives us a feel for how the ARPANSA regulatory procedure is occurring and what type of shift, if any, has occurred in the proponent's position, particularly with respect to providing more information. When we look at the very bulky additional DEST information on the proposal we see some improvement, and I'll get to that in a moment. First of all can I just say I think overall the issue of transport, and key factors in transport, are still what we would call missing. It's as if because there is a transport code everything is okay; that's all we have to comply with.

The issues of implementation, liabilities and so on, that are raised earlier just really aren't considered in any detail. Perhaps they are considered unimportant. If so I think that should be stated somewhere. We do have more information though. There is some clarification of certain issues that we had raised earlier. First of all the nature of the waste assessment criteria or more properly now the transport packaging criteria because both now come into play. The nature of those packages is becoming clearer. For example, cobalt 60, is 330 gigabecquerels, as far as I can make out, in one package in the transport proposals. Caesium is 280 gigabecquerels, I think, again probably in one package. But uranium 238 is 14 gigabecquerels in something like 90 packages.

Those types of materials, as far as I can make out in our initial reading of the literature - and that

includes everything from looking at the Internet to looking at submissions from the Australasian Radiation Protection Society, are prone to potentially serious misadventure of theft and use in problematic ways, such as making dirty bombs. We would like that possibility screened much more fully because it does go to the issue of the security of these types of shipments.

Another issue, which seems to have been clarified, is the vulnerability of this material to fires and explosions. I'll actually quote one particular point, which is in appendix F of the proposal, the supplementary information from DEST. Section 10.5.2:

The heat of a fire or the force of an explosion has the potential to break open any package with the release of radioactive dusts and gases. The external exposure risk would no longer be restricted to the immediate accident scene -

and it goes on. Why was that not raised at the EIS stage and in the initial analysis of the proposal of transporting this material? It appears just to be covered by the code, and it seems very late in the piece to raise that sort of information and allow a proper planning assessment to occur, particularly because, as you will note from further reading of the supplementary material, the emergency response, the initial emergency response if there is fire or some other misadventure - appears to be in

the hands of the transport contractor.

I think a further piece of information that is becoming clearer, in the supplementary material, is the level of discretion as we see it, particularly at this point, in the nature of some of the shipments. There's something mentioned - I think again in appendix F - about exclusions to the waste assessment criteria, whereby the surface doses normally would be set at something like 2 millisieverts per hour but can actually be varied up to 10 millisieverts per hour by a special clause.

Now, the annual dose, as I understand it, is about 2 millisieverts per year in Australia. We are talking here of that dose in an hour or maybe five times that dose in an hour. These issues are possibly covered by the transport code, but I think at this late date, to see these types of discretions available in a somewhat obscure regulatory process, particularly given the obscurity in the discretions inherent in the original planning and EIS process, is not good enough for the community to accept that there won't be problems with these types of undertakings.

The other thing that has become clear, I think, is the nature of the difficulties in trying to post waste acceptance criteria which will serve the Australian community in the long term and particularly for future generations. I go to the Serco report in the supplementary material, which looks at the issue in this case of radium and radon, particularly generated, as I understand it, from uranium 238. It seems to argue that this could be a potential problem in the long term, notably for something like 200,000 years. But by that time the material will be substantially diluted by erosion.

We think that the difficulties the consultant appears to have had, in setting acceptable risk criteria because of those long timeframes and so on, does suggest that in this case the post-closure impacts of some of these materials are very poorly described and the risk are very poorly quantitated.

I just want to close by making a final, very key point for us with this proposal. It's clear in the comparison made within the supplementary DEST material that when you compare the IAEA waste management criteria - the recent ones - with that earlier 1992 NHMRC approach to siting the material there are some clear deficiencies and those deficiencies are considered in some detail. I also note, in reading the introductory on the IAEA material that the IAEA guidelines talk about a fundamental principle of minimising the generation of radioactive waste. But the concept of minimising the production of radioactivity as a source of waste is really nowhere evident in the

material provided by DEST. I think that should be a clear consideration of ARPANSA.
Not to be too flippant, but one wonders whether one can turn out the reactor as you go home to minimise the waste, the amount of initial radioactivity produced, and then the amount of radioactive waste that comes from that radiation production. Now, clearly that's flippant because you can't just turn the reactor on or off. There are issues to do with the type of research being done, with critical use of the instruments and so on, that dictates certain amounts of use of that machine.
I haven't seen anywhere to date a consideration, either from the proponents of the reactor and flowing through to this waste repository process or in the questions that have come forward from ARPANSA, about a plan to actually - if you like - not use the reactor as much when you don't have to. We think that is a fundamental issue of relevance to ourselves and to communities along the route and in South
54
Australia to all communities here as well.
I think the only other comment I'll make is that when one looks even at the issue of non-human biota and the potential impact of the waste repository on that it indicates in the supplementary DEST material that that's given an overview rather than, we think, the sort of detailed assessment that it deserves. So that's our best analysis at this point of the type of information that had come up originally and has come up subsequently from DEST and in the interaction with DEST of ARPANSA. I would like to hand over to Councillor Hurley now to wrap up with a few final comments.
COUNCILLOR HURLEY: Thanks, Garry. That's a very good summation of what we've got, technically. All I want to do is just wind up with what the Sutherland Council believes in what way we could help; what would help, from the Federal Government, in changing the attitude from the last 10 to 15 years. Number 1, that the Council and the community wants to know, is that we need to know and we need the Federal Government to demonstrate the need for a new reactor. The reason we say this is because of the generation of waste.
Number 2, we want alternate sources for medical uses. Why is this ignored? We have been bringing this up - we've even brought people from overseas into the Sutherland Council, at the residents' expense, to explain and let us have a look at what can be done and what has been done in the past. It's not only feasible; it's seeing an alternative: Like to get rid of the reactor. We support the reactor and we are being told, on medical grounds as I said earlier, that we've got to have a reactor.
On the other side we get told there are 800 people there. I'd like the people in South Australia to know that over the last few years ANSTO has spent millions of dollars on advertising and publications, putting down these simple facts; that without a reactor you'll lose 800 jobs. These people opposing the reactor - they've got names for us and the other people - but what we're saying is that there will be no jobs lost there. It's common sense that technology, the way it is, we would need scientists and medical research staff, we could get away with - I think it's less than 5 per cent of the radioactive material and nuclear material up there, and we can already satisfy 80 per cent or 87 per cent or close to it, of the medical demands.
We also want to get best practice, like Garry said, which is in the safety. It's very easily hidden. When you've got a secret organisation, as we call it, ANSTO, we only find out after the event and then it's very easy then to say, 'Well, we fixed it, we've changed the safety rules." They haven't changed. We have in Australia at the industrial level, the basic, private company level, occupational health and safety restrictions and legislation that these people could go out of business if they don't follow a certain line on the shop floor, or in the street.

We go to the Federal Government level with something that is scientifically unknown - nuclear reactors and so forth and waste is so strange to people, there are no answers; no-one can tell you anything; you can't smell it; you can't see it; you can't feel it and no-one wants to go down the road - as the latest Government Inquiry, the New South Wales Government Inquiry, says – and monitor the water into Port Hacking at our place, because this water comes out. There are so many things that come out of these facilities.
55
But best practice - we can go back to a few years ago when there was a spent fuel. This is a notation that someone gave me on an actual - that we found a spent fuel from the reactor; it was placed into water to cool, when it is taken from the reactor at a later time, it is transferred to dry storage in stainless steel containers, where according to ANSTO it can be kept indefinitely. Also, they told the McKinnon Inquiry in 1991-92 these stainless steel containers are stored in holes drilled in the ground, in sandstone, inside buildings.
In recent years - and only recent years - ANSTO found water inside one of these so-called dry storage containers. In fact, there was 90 litres of water inside one container. The aluminium cover over the uranium had corroded and things had happened. I won't go right through it. But what I'm saying is that things do happen. It doesn't matter whether it's in transport. We've got all the rules in the world and in the last few months we've had trucks tip over with any type of product on them. There's no way in the world you can tie things down to being safe.
Going back to the knowledge in the reactor industry, we have no knowledge as far as we're concerned with what happens and how you control nuclear reactors or uranium. There's nothing. That's why we can't get to the waste and we're not the only ones in the world doing that. So what we want is a minimisation of waste; we want that achieved by stopping the new reactor. I think if commonsense prevails it's the only way we can go. I know they keep telling us it's too late but I'm sure the $500 million or so that has been allocated to it and going up all the time could be best spent on medical research, employing scientists to cut down on waste, supply our medical people and our cancer research and everything else we need in this world without having a new reactor at
20 megawatts. Thanks for your attention.
DR LOY: Thank you, Councillor Hurley and thank you, Garry. Can we move on to some questions?
PROF LOWE: I don't have many questions. I thank you for reminding us that the waste hierarchy is reduce, reuse, recycle and we should be thinking about reducing before we concern ourselves with reusing and recycling and disposal. The fundamental issue I'd like to raise with you, though, is that you've expressed concern about the current standard of waste management at Lucas Heights. If, as one extreme eventuality, the CEO of ARPANSA were to decline this application for a waste repository, presumably that unsatisfactory waste management at Lucas Heights would continue for the foreseeable future. How would you react to that outcome?
COUNCILLOR HURLEY: Again, we want transparency. I think it all goes back to transparency, communications and consultation. We know in the outside world - and I say the "outside world" meaning outside of ANSTO, because it is a security base - that people have to be accountable for what you do, and you've got to have experts tell you from all different fields - sit down at the round table as we said, a round-table conference - in the occupational health and safety arena and explain what you're doing to fix these problems up.
In government quarters, that's not happening. The things happen. Look, I don't want to be flippant

about things either, but we have family and friends who have worked in ANSTO for 40 years and we
56
hear stories, and we've heard stories. When I heard the previous stories about their safety and that, back 30 years ago, it went over my head. I mean, none of us knew what nuclear or radiation was and this is what I say; it's an unknown variation in life. But things do happen and it is human error. They used to say, the people on the shop floor, "It's the boffins who tell us to do this, and if we did that, we'd all be dead." It's as simple as that.

I know it has changed and I'm not silly enough to say that we haven't got rules and I'm not silly enough to know - I've been through the plant with my wife and we've had a tour and we've seen all the facilities there. We've seen the security staff. We've seen the safety staff, but I still know that things happen. We know that things happened recently but there is no - they're not accountable for it the same as in private industry. It's sad, in this day and age; it is a thing that affects us all. You've only got to look at the concerns of waste going into the Aboriginal people's land, into traditional lands. You've only got to look at the waste and the concerns we have.

We have on our plate things - things change. I didn't know what radioactive waste was and nor did Garry. We assumed - we didn't understand the ramifications of waste years ago. But now - we didn't understand that we'd have people in the Shire, actual terrorists walking around. I mean, we're not saying that they were going to blow it up, but we're saying that there are terrorist acts happening where people have been found. It is a target - any nuclear waste area or reactor area - and things are different now. We should be out in the open. We've all got to know what's going on. Whether it is security, or whether it is accidents, or whether it's the actual explanation on what radioactive waste actually does to us - people have got to know.

The emergency evacuation side of it has been a shemozzle. It's been a disgrace, you know, with people meeting here or there. There's no round table - by round table I mean it's an open discussion over a long period of time with people and their views are accepted. I don't think the views are accepted from the people out in the community. I really don't. I think we're treated - and I'm not a scientist; I'm representing the people in the shire. Garry is the scientist. We've got to do better. We've got to get into ANSTO and we've got to be sitting down with them.

PROF LOWE: I wonder if I could pursue one aspect of that with Dr Smith, as the scientist. Would you be comfortable if the outcome was continued above-ground storage of low-level waste at Lucas Heights?

DR SMITH: As a scientist - and I won't speak for the Council because a proposition will have to be put to the Council and it will probably have to consider the material put before it - I would need to know what conditions come with that proposition so that I could advise Council; for example, is it continuation of the new reactor proposal and continuation of the generation of the radioactivity in the first instance and subsequently waste? Is it a cutting back of the amount of radioactivity produced; for example, I notice there is a proposal to potentially run HIFAR at five megawatts - half the current power - as a contingency if the replacement reactor doesn't get up as soon as proposed. Presumably medical production as we know it won't cease to exist under those circumstances, but there would be less radioactivity and less waste, or possibly the CEO may decline to provide an operation licence until the denied waste repository proposal is resolved with some other waste
57
solution, so really there are a number of hypotheticals. Clearly there are advantages and disadvantages to above ground, in-ground, and so on. I think what I can say is that we would be

prepared in the best spirit to bring our information to the table, as usual; raise any problems we see with it and, hopefully, have a full inquiry, hopefully, under an EIS under the Act.
PROF LOWE: Thanks very much.
MR JACK: Thank you. In your presentation, Dr Smith, you criticised, for example, the EIS and the lack of testing - sorry, the lack of testing of the information. I wonder if you could expand upon that slightly. In what way was the information not subject to test or verification?
DR SMITH: Originally the reactor proposal was proposed under an older Commonwealth planning law called "the EPIP Act" for short. This current waste repository is being done under the newer Act, the EPBC Act, but in both cases the Commonwealth has quite a considerable amount of discretion with respect to the level of testing of information from a proponent all the way through from - "a review of environmental factors" was the old terminology, which is a fairly superficial overview of potential environmental effects through to a full EIS, and that has occurred on both these occasions, but the Act can go further, such that under the Act proponents, opponents and people on the fence can test information under statutory processes provided by the proponent in the EIS.
Now, the analogy I was making here is that under New South Wales planning law - because in Australia State Governments generally have carriage of environmental-impact-type proposals, particularly private ones. Under our New South Wales Act, for example, there is an automatic designation for certain types of industry and virtually all hazardous industry is designated. That means it requires an EIS. There is also in the planning law in New South Wales a commission-ofinquiry process which can be induced by the Minister to test that information in the EIS publicly in a fully open way.
I don't know of a hazardous industry development in New South Wales in the last 10 - possibly 20 years - that hasn't gone through that full EIS and public-inquiry testing process. In the Commonwealth case we have two EISs here. Quite frankly, that is better than the old days, but no inquiry into either. Why doesn't the Commonwealth do that for hazardous industry? Probably because it can, and I don't think that's good planning.
MR JACK: I'm trying to really understand this. The testing process - is this testing the acceptance by the public of the information or is it actually testing the veracity and the accuracy of the information itself?
DR SMITH: The latter, but probably both.
MR JACK: But isn't this then - sorry, I didn't mean to interrupt you - the function of organisations like Environment Australia?
DR SMITH: Well, yes, provided they have the tool of having a public inquiry to do so under the Act because the Act does propel certain qualities of information, certain levels of information, and the

hazardous industry proposals - particularly these types - deserve that sort of scrutiny in public fairness, but also with respect to the proposal itself; for example, the cost of the proposal - this particular proposal - has escalated quite considerably. We predicted that early in the process but were never given the opportunity to put that to a public-inquiry process. We wrote into the EIS about it, but it was noted and we moved on, but there are considerable costs, safety and public concern issues which deserve full airing under the Act and they just weren't used.
MR JACK: Thank you for the clarification.
DR LOY: Thank you, Councillor Hurley and Dr Smith for your presentation. It has been very useful to the panel. Thank you. Amazingly, we are a little bit ahead of time, so we can now take an

afternoon tea break. We will have an extra five minutes and we'll start again at 3.45 to hear from Jim Green, representing Friends of the Earth. Thank you.

ADJOURNED

RESUMED

DR LOY: Let me welcome to the lectern, to present the submission from Friends of the Earth Australia, Dr Jim Green.

DR JIM GREEN: Thanks very much. I am quite willing to field questions on specific safety-related matters, but I want to focus my presentation and the first part of the discussion on two other sets of issues which are at least as important: Firstly, the fact that the Government has not even attempted to demonstrate a net benefit with respect to radiological hazards by proceeding with the national nuclear waste dump, let alone succeeded in demonstrating a net benefit; and secondly, I want to discuss the social costs associated with the dump plan and to note that it would be entirely consistent with the ARPANS Act and the associated regulations for Dr Loy to give due weight to those social costs and, conversely, it would be negligent to do otherwise.

Before discussing those two sets of issues, some brief comments on ANSTO's operations at Lucas Heights and in particular the new reactor under construction at Lucas Heights, and this warrants mention because ANSTO will be responsible for 81 to 90 per cent of the waste volume destined for the so-called national nuclear waste dump in South Australia, and ANSTO, in the plan for a new reactor, are responsible for 100 per cent of the political momentum for the dump, which comes from the perceived need to reduce public opposition to a new reactor by clearing at least some of the waste off site.

That there is a clear link between the new reactor and the planned dump is not something dreamed up by environmental and anti-nuclear groups. On the contrary, this link is spelt out clearly in Federal Government documentation submitted to the Federal Court last year. The Federal Government and ANSTO never clearly established the need for the new reactor which is driving this planned nuclear waste dump in South Australia. ANSTO and the Federal Government certainly argued the case for a new reactor but there was no independent inquiry into the arguments for and against a new reactor. In fact, the last independent inquiry into proposals for a new reactor was the 1993 Research Reactor

Review, and that review was sceptical about the need for a reactor. The Research Reactor Review argued in its 1993 report that a further independent investigation should be carried out in about five years time. That recommendation from the Research Reactor Review was ignored and the Government even attempted to deny that the Research Reactor Review had recommended a future independent investigation, even though it's there on page 4 in black-and-white of the Research Reactor Review report.

Likewise, there was no cost-benefit analysis in relation to the plan for a new reactor. The Government falsely claimed that there was no need for a cost-benefit analysis because the Research Reactor Review had carried out a cost-benefit analysis in 1992-93, but the Research Reactor Review did not carry out a cost-benefit analysis and the Research Reactor Review clearly acknowledged in black-and-white that it had not carried out a cost-benefit analysis.

Similar dereliction has been on display in relation to the planned radioactive waste dump. DEST, the Department of Education, Science and Training, has not even attempted to substantiate its claim that the proposed dump will result in net benefits with respect to radiological hazards, let alone that the benefits justified the additional social and democratic costs associated with the dump. DEST's attempt to justify the dump in its application to ARPANSA is superficial, amounting to just one-third of one page, and DEST refers in its submission to ARPANSA to the EIS, claiming that the EIS clearly establishes the need for a dump. But the EIS, if you look at it, was also superficial on the

need for a dump.
DEST says in its submission to ARPANSA that the dump will "reduce the cumulative risks of managing numerous waste storage areas" and that a dump is the "safest and most effective option". So where's the evidence for those claims? It certainly isn't in DEST's submission to ARPANSA and it certainly isn't in the EIS. In fact, DEST doesn't even have the empirical information which would be a necessary starting point for an analysis of the relative hazards of different management options.
There are essentially two proposals under discussion. One is the plan for a national radioactive waste dump. The second is storage of radioactive waste at the point of production, with appropriate monitoring and regulation of existing stores and upgrades when necessary. So the empirical information we would need for a comparative assessment of the options would include an accurate inventory of radioactive waste as well as empirical data on the condition of existing waste stores. As for the inventory of radioactive waste, it goes up and down like a yoyo with each new report released by DEST. For example, there was a 37 per cent increase in overall radioactivity in the inventories provided in the draft EIS and the supplement to the EIS, and now we read the Serco consultancy which is recommending a dramatic reduction in the overall radioactivity.
Another problem is that the presentation of information on the inventory is unhelpful. For example, the application to ARPANSA appears to contain only decay corrected information on radioactivity.
Another problem is that the Government so frequently talks about waste and volumes, even though the correlation between volume and radioactivity, volume and hazard, is often weak, and that point is best illustrated with reference to the CSIRO soil stored at Woomera, which accounts for 54 per cent of the waste volume to be dumped in the proposed dump at Woomera but just 0.005 per cent of the radioactivity, using EIS figures.
60
There's also a considerable amount of guesswork in relation to future arisings, as the DEST application to ARPANSA acknowledges. In addition to an accurate inventory, we would also need reasonably solid information on the status of current radioactive waste stores in order to objectively determine the best way to manage Australia's holdings of radioactive waste, but the Government has even less knowledge on the condition of existing waste stores than it has on the waste per se.
The Government claims that it's safer to manage waste at a single site rather than at multiple sites, and there's a clear implication in the Government's statements that many of the existing waste stores will be cleared out once and for all if the dump goes ahead and will no longer be storing radioactive waste. But, of course, many waste stores will continue storing waste even if the dump goes ahead, because of ongoing production and because of the intermittent acceptance of waste at the dump. So a pertinent question is: How many existing stores would be cleared out once and for all if the dump goes ahead and how many will continue to operate as waste stores? That's a question I put to DEST last year, and specifically I asked the following question:
Regarding the storage of radioactive waste in 26 towns and suburbs in South Australia, what number of these stores will still be storing radioactive waste even if the repository project goes ahead, because of ongoing waste production?
Several months later I received a response from DEST, on 27 November, which states that:
This question should be directed to the South Australian Environment Protection Authority or to the operators of existing stores.
In other words, DEST has absolutely no idea how many stores will continue to operate as waste stores even if the dump goes ahead, in South Australia or nationally. The number of stores is a significant issue but perhaps more important is the amount of waste and the relative amount of waste being stored by different producers. We know for a fact that almost all of the waste destined for the dump - well over 90 per cent; probably over 95 per cent; perhaps over 99 per cent - is produced by

institutions which will continue producing and storing waste regardless of the outcome of this controversy over the planned dump. Those figures are relating to radioactivity, not volume, of course.

DEST said in its submission to the New South Wales Nuclear Waste Inquiry that much of the radioactive waste stored in Australia is in buildings that are nearing or have reached capacity. I have asked DEST for the evidence for that assertion and DEST has no evidence for that assertion. Moreover, that claim is certainly false. Using the South Australian data, on average, institutions storing radioactive waste in South Australia are storing approximately one-sixth to one-seventh of a cubic metre; roughly a suitcase full. So unless they are actually using suitcases to store their radioactive waste it's inconceivable that they are nearing or have reached capacity as DEST claims. Such claims are either a gross exaggeration or a complete fabrication.

Another component of the Government's case for a dump is that current waste stores are inadequate. I've asked DEST for the evidence for that claim and DEST has provided almost no evidence.

61

Specifically I asked this question:

What evidence is there of unsafe storage and is the Federal Government planning to take legal action against those responsible for unsafe storage?

DEST's response reads as follows, in part:

Two examples of unsafe storage were given in DEST's evidence before the New South Wales Inquiry. Legal action in such cases is the responsibility of the appropriate State and Territory regulators.

So of all the institutions around Australia producing and storing radioactive waste DEST can cite only a couple of examples of inadequate storage. Let me quote another question and answer.

What plans does the Federal Government have to upgrade these stores since the Government repeatedly claims that they are unsafe?

DEST's response reads as follows:

This question should be referred to the appropriate State and Territory regulators.

Now, consideration needs to be given to the option of tighter monitoring and regulation of existing stores and forcing institutions to upgrade stores where necessary. This course of action is all the more important given that many waste stores will continue acting as waste stores even if the dump goes ahead. DEST hasn't shown the slightest bit of interest in pursuing this course of action of improved monitoring regulation and forcing upgrades where necessary.

That to me is proof positive that public health and environmental criteria are not the driving factors behind this push for a radioactive waste dump. On the contrary. By its neglect and by its provision of an out-of-sight out-of-mind option, in the form of a radioactive waste dump, the Government's approach will act as a disincentive to the tighter monitoring and regulation of existing stores and it will discourage upgrades where necessary.

The Government ought to first complete and publicly release a detailed inventory of Australia's holdings of radioactive waste, providing information not only on volumes but also on radioactivity. Not only decay corrected data but also current data. We also need information on existing stores, how robust and secure they are, how many are still accepting waste from ongoing production and so on. Then we need an objective assessment of the costs and benefits of the different options.

To the extent that those costs and benefits can be quantified we need a quantitative assessment. There are also non-quantifiable social costs, which means that we need public input into the process, and I mean public input in the common garden sense of the term, not the sort of sham consultation that DEST specialises in. The assessment needs to take into account some obvious advantages of maintaining existing arrangements with improvements where necessary.

62
Firstly, storage at the site of production avoids altogether the risks associated with transportation. Secondly, forcing waste producers to manage their own waste encourages waste minimisation and conversely, the provision of off-site options tends to encourage profligacy. Thirdly, the dump would only take waste every five years or so, and, as I've said, waste producers need adequate on-site facilities whether or not the dump goes ahead. Once they have adequate on-site facilities the rationale for a dump looks increasingly circular and shallow.
Let me return to the argument that it's problematic having many different institutions managing radioactive waste. Sure, it is problematic having many different institutions managing radioactive waste, but many different institutions will be managing radioactive waste, whether or not the dump goes ahead, because of ongoing production and because the dump will receive waste only intermittently.
Even if it were possible for a single institution to take responsibility, on a national level, for radioactive waste management surely DEST is the very last institution you would entrust with that responsibility. On that point I will quote nuclear engineer Alan Parkinson, who was the Federal Government's senior representative on the Maralinga clean-up project from 1993 until late 1997 and therefore has a great deal of inside knowledge of the workings of DEST. Mr Parkinson wrote, in a 2002 article, that:
The public servants responsible for the last years of the project had no background in radiation or project management, as is illustrated by several statements they made on the public record asking, for example, what was meant by alpha radiation or how to convert a millisievert, a unit of radiation dose, to a picocurie, a unit of radioactivity, or claiming that soda ash is neutralised by limestone.
Many of those involved in the Maralinga clean-up are also involved in this dump project. They have demonstrated scientific and nuclear illiteracy of the highest order and it beggars belief that ARPANSA is even considering granting licences to transfer responsibility of existing waste stockpiles from the nuclear scientific and medical institutions which currently manage that waste to DEST.
Mr Parkinson's concerns are echoed in submission number 256 to ARPANSA by Prof Peter Johnston from RMIT, who also has first-hand knowledge of the Maralinga clean-up. Prof Johnston writes, and I quote:
The applicant for a licence does not have the technical competence required to manage the contracts of a proposed operator. The operator who may have the necessary technical competence is not a co-applicant. I am not convinced the applicant will have effective control of the project. I believe the application has not demonstrated that the applicant has the capacity to ensure that it can abide by the licence conditions that could be imposed under section 35 of the ARPANS Act because of a lack of technical competence in managing its contractors.
In the paper referenced in Prof Johnston's submission it says, and I quote:
63
A considerable problem throughout the Maralinga rehabilitation project was a lack of technical skills within the department managing the project. Until 1997 engineering skills were provided by Alan Parkinson but there was no radiation protection expertise. Technical advice had to come from contractors, MARTAC or ARL and on important occasions it was not sought.
DEST also showed itself to be woefully lacking in project management skills at Maralinga, with

perhaps the most glaring example being a major contract which contained no performance criteria. Another example was a major contract awarded to GHD with no competitive tender. GHD then had oversight of the vitrification phase of the Maralinga clean-up, despite having zero experience with the chnology and next to no understanding of the technology.
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So that's project management DEST style. Mr Parkinson believed that the Maralinga clean-up was unacceptable. To use his words, "It was a cheap and nasty solution, which wouldn't be adopted on whitefellas land." I believe that Prof Johnson believes the clean-up was sub-optimal but acceptable nonetheless, despite and certainly not because of DEST's handling of the project.
In relation to the planned dump DEST has repeatedly shown a propensity for secrecy. For example, all 667 public submissions on the EIS have been kept secret. The Defence Department's risk assessment has been kept secret and three senate orders for documents relating to the siting of the dump have been refused by the Government.
In relation to the planned dump DEST has repeatedly shown a propensity for dishonesty. For example, Peter McGauran, the Minister, and DEST, claimed that most of the waste to be sent to the dump is a by-product of medical isotope production and nuclear medicine. That claim is demonstrably false. A reasonable estimate would be 10 per cent. The upper estimate would be 20 per cent. And what we hear from the Government on this topic is erroneous, it's irrelevant and it's emotive propaganda. [One sentence deleted on legal advice.]
As a second example of misinformation from the Government, the claim that South Australia is the "best and safest site for a dump" is false. It's contradicted by the Government's own scientific siting study: The Bureau of Resource Sciences 1997 phase 3 discussion paper. In fact the Parliamentary Secretary to the Finance Minister, Nick Minchin, acknowledged last year in a letter to the State Government that equally suitable sites could be found in other States and Territories. This BRS paper identifies five States and Territories with equally suitable lands in South Australia, yet as recently as yesterday Peter McGauran has been repeating this fiction that South Australia is the best and safest site for a dump.
As a third example of misinformation from the Government and DEST, the claim that the dump is only for low level waste is false. The dump would also take the short-lived intermediate level waste and, according to the supplement to the EIS, chapter 5, pages 45 and 46, the dump would also take long-lived intermediate level waste, the highest level of waste produced in Australia according to the Government's classifications. The Government's definition of low level waste is so elastic as to encompass the highest level of waste produced in Australia.
64
As a fourth example of misinformation, the Government and DEST sometimes claim or imply that all the waste it wants to dump in South Australia will be concreted, but that claim is contradicted by other Government documents, including the Government's submission to ARPANSA. DEST's demonstrated lack of scientific expertise, its demonstrated poor project management skills and its propensity for secrecy and dishonesty, ought to suffice to convince Dr Loy to reject the dump licence applications.
Some comments on the social costs associated with the dump plan. The Government's handling of this issue has been racist. In the late 1990s, heritage clearance for test drilling at the dump site was granted by Indigenous groups, but it was granted under duress. Indigenous groups either gave that heritage testing clearance in the hope of protecting important sites or the Government was going to go ahead with test drilling regardless.
Since then, the Government has misrepresented that clearance for test drilling as support for construction and operation of the dump. It is no such thing. It was clearance for test drilling only and it was secured under duress. The Government has ignored the opposition to the dump of

Indigenous groups such as the Coober Pedy Kungka Tjuta and the Kokatha native title claimants. The Government has annulled native title rights at the dump site.
In 2002, internal DEST documents were leaked, detailing the Government's $300,000 PR campaign in relation to the dump. Perhaps the most offensive statement in this so-called communication strategy from DEST reads as follows, "Tactics to reach Indigenous audiences will be informed by extensive consultations currently being undertaken by DEST with Indigenous groups." In other words, under the guise of consultation, Indigenous groups have been humbugged so that the Government can finetune its propaganda.
The extraordinary racism of the Menzies Government in relation to the British weapons tests was crucially dependent on the complicity of a non-independent regulatory organisation in the form of the Atomic Weapons Test Safety Committee and, likewise, the current Government is depending crucially on the complicity of a current non-independent regulatory organisation, ARPANSA. The Federal Government's racism is one of a number of unacceptable social costs associated with the dump.
The dump is opposed by the South Australian Government, which has legislated in an attempt to ban the dump. It is opposed by approximately 80 per cent of South Australians. It is opposed by pastoralists, by the wine industry, by the tourism industry, by trade unions, by almost every Council on the transport corridor between Lucas Heights and Woomera, by the New South Wales Local Government Association and by the Australian Local Government Association.
In conclusion, as I said at the start of my talk, I'm willing to field questions on specific safety-related issues, but I would prefer if we began with this central issue that DEST has not even attempted to demonstrate net benefits in relation to the proposed dump. I would also welcome discussion on the social costs of this proposal.
65
DR LOY: Thanks, Jim. I would have to say I was feeling a bit uncomfortable on DEST's part until you gave me a serve at the end, so it sort of balanced it up a bit. Ian, would you like to take the first questions?
PROF LOWE: Yes. I'm not sure how to respond to your challenge though. You said you would like to address first the fact that DEST has not demonstrated a net benefit and that clearly suggests a question that I might ask DEST, but it doesn't really suggest a question that I can engage you with. Having said what you did about DEST, I was left with the impression that you wouldn't trust them to run a jelly store at a church bazaar.
The first of your recommendations in your submission is that DEST should be asked to compile a detailed national inventory of radioactive waste. I guess my question is why have you chosen that agency in particular to compile a detailed national inventory of radioactive waste, since you seem sceptical about their technical expertise?
DR GREEN: Well, it's a very good point and perhaps there are other organisations. We said DEST in the submission simply because it is the Federal Government agency dealing with matters nuclear, so in that respect it's the obvious organisation to be carrying out this task. I would agree with the suggestion that you may be making, that there would be other organisations that are better equipped. I mean, perhaps the CSIRO has that expertise. Perhaps at least at the State and Territory level it could left to State and Territory radiation protection agencies and so on.
PROF LOWE: Yes, I suppose I was struck this morning by the submission which told us that in South Australia the local regulator has done that sort of work and it seems to me that it would be sensible to have that replicated in other States, rather than asking a Commonwealth agency to come in and - if there's one thing that drives people up the wall, I think, in productive areas, it's being asked the same question twice within six months by two different levels of government.
Could I go on to ask you about your second recommendation, which says that we should be

extending the comparison of benefits and costs beyond radiological hazards to include community acceptance. If you were sitting where I am, how would you build that into our process?
DR GREEN: Well, there's no simple solution. The current level of community distrust is a legacy of decades of secrecy and dishonesty. In South Australia it runs particularly deep, because of the experiences at Maralinga and Emu. There's no simple way out of that one, but perhaps we could bring Mr Jack into this discussion at some stage if you say there are repositories in Finland and elsewhere that do have community acceptance. You know, I would be interested to know how that was built up over a period of time, but we certainly don't have it here in South Australia and nor should we.
PROF LOWE: Like a couple of other people this afternoon, you have suggested that radioactive waste would best be stored where it is. I wanted to ask you the same question I asked David Noonan. Does this come from a belief system or a considered assessment that the risk of transport is significant, compared with the risk of storing waste in several different locations of different security around the country?
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DR GREEN: Well, it certainly stems from simple cost-benefit analysis and as for belief system, that's not the phrase I would use. I would say there's a matter of responsibility involved, which is that unless there's a good reason for the matter to take a different course, then organisations producing radioactive waste have a responsibility to deal with that waste. So call that a belief system, if you will, but that's certainly a strong argument. That encourages waste minimisation, which is surely the first principle for any serious attempt to address radioactive waste management problems.
PROF LOWE: Thanks for that. Could you elaborate on the suggestion you made that the repository would not just be taking low level waste, but also intermediate level waste?
DR GREEN: Yes. The Government frequently says it's just for low level waste and then you go to that detailed documentation and sometimes it says low level, sometimes it says low and short-lived intermediate level waste. I was surprised to read on pages 45 and 46 of the supplement to the EIS that the dump would also take "small quantities" of long-lived intermediate level waste and that's where the matter rests.
I attended a hearing of the New South Wales Nuclear Waste Inquiry where that question was put to DEST and the response from DEST seemed to be, "Yes, no and maybe. I don't know," so you can try again tomorrow and you might have better luck than the New South Wales Inquiry.
PROF LOWE: It seems to me that's a significant issue, because it puts a very different time scale on what we're talking about if you're dealing with intermediate level waste.
DR GREEN: There's a related issue which is that co-location was the Government's preferred option, co-location of a store for all of Australia's long-lived intermediate-level waste. The Government was very coy about that, but finally that came to the public's attention through the media and generated a fierce storm of opposition in South Australia, so that we actually had the South Australian Liberal Government legislating to prevent the Federal Government co-locating this store with the dump.
Now the Federal Government's position is that the store won't go in South Australia, but the Government refuses to release the report it has received from an advisory committee as to a short list of locations around Australia. It seems to me that there's a significant change that, say, 10 years down the track, if they go ahead with this dump, they've annulled native title rights, they've compulsorily acquired this site, they've overridden the political opposition, they've dealt with the South Australian State Government legislation one way or another, and South Australia will then be a sitting duck for a future Federal Government to revert to its initial plan to co-locate the store for longlived intermediate-level waste with the dump.

DR LOY: I might just quickly jump in on this debate about low-level waste and short-lived and intermediate-level waste and so on. I certainly agree with many people who have said one of the problems in this whole discussion is what the hell are we talking about, in the sense that different people and different organisations and different guides have different ways of defining the various categories of radioactive waste. But certainly in terms of what is appropriate for disposal in a

shallow ground burial can surely only be either low-level waste of however long it might last - but it's low level; if the waste is of higher concentration, higher radioactivity concentration and falls into the intermediate level, then it needs to have decayed to a low level of activity by the time you give up management, institutional management of the repository. But that's one level of definition.
The terms do get thrown around a bit in quite a confused way and it might well be - certainly I know one of the tasks my Radiation Health Committee is currently grappling with is to try and come up with some common language in this that will help.
DR GREEN: Just a follow-up question there: A lot of the safety analyses seem to assume a 50-year operating life for the dump. The Government has not committed to closing it down after 50 years and, even if there was such a commitment, it wouldn't arguably be worth the paper it's written on. The Government's position is that there will be review in 50 years' time and it's inconceivable that the dump would be closed down. If there's still ongoing production from reactor operations at Lucas Heights, still significant volumes and significant radioactivity being produced and there's an operating dump, it's inconceivable that the Government would then start from scratch to build a new dump somewhere else.
We can safely assume that if the dump goes ahead it will have an operating life of much longer than 50 years. I think we could safely assume 100 years. It seems to me a fairly straightforward proposition that alternative life spans for the dump could be factored into safety calculations quite easily. Since the basic calculations have been done it would just be a matter of punching in some different figures. I was surprised that that hadn't been done at all, as far as I could tell, and I would ask you, Dr Loy, if this can be redressed at this stage of the process?
DR LOY: Yes, it's a fair question that I can certainly think about. Again, in terms of a licensing basis, I would have to think about a definition of total activity as well as activity concentration, so that if there were to be any proposal to change that, it would have to be, as it were, a new proposal, but that's just thinking off the top of my head rather than something thought through at this point.
PROF LOWE: I only had one other question, which was to tease out the implications of what you said about needing a detailed inventory on the volume and activity of waste, as well as the capacity of existing stores before you could make a proper cost-benefit analysis of a proposal for a national repository. My suspicion is that doing those inventories would take so long that accepting that recommendation would be essentially saying that this proposal should be withdrawn and we should start the process again. Is that actually what you're saying?
DR GREEN: Yes, I certainly do think the current application should be rejected but, you know, to go down any other path strikes me as being absurd, because we're getting it all the wrong way around. Surely if you've got a perceived problem with radioactive waste the first thing you need is an inventory, and you can't move forward without it, full stop. It's as simple as that. We seem to do things back to front here in Australia. The Federal Government first announces as a fait accompli a decision to produce a whole lot more waste in the form of a reactor, a new reactor, and then they deal with the lowest level of wastes and sitting on the backburner is the higher category of waste and they still don't know what to do about that. It's all back to front. But we certainly need an inventory and

there's just no way of fudging that, or avoiding it. If it takes a year or two, so be it. If some of the Government's pet projects are held up for lack of an inventory, that will certainly get them off their backsides and get them busy, wouldn't it?
PROF LOWE: Thanks very much.
MR JACK: As for Dr Loy, many of your points raise questions that I would like to address to DEST rather than to yourself, quite honestly, but that's for tomorrow. Dealing with this one, or touching on this one of inventory, in November there was the first review meeting in Vienna of contracting parties under a new international convention, the convention on the safety of spent fuel management and the safety or radioactive waste management. Australia is a signatory to that convention and in that one of the requirements of each contracting party's national reports - which were tabled there and subject to discussion and peer review - one of the requirements is a national inventory of radioactive waste. I don't recall off the top of my head what Australia said by way of a national inventory, but that national report I believe is public and so I am wondering if you - - -
DR GREEN: I've seen the report, yes. There are gaping holes; it's as simple as that. As I said, from one report to another, DEST is giving us a very different inventory. If you take what the DEST consultants are saying, it's just unrecognisable. At least some of the States have been unhelpful. In particular New South Wales has yet to produce a detailed inventory for the Federal Government. We've also got this familiar problem that what data we do get seems to be in terms of volume rather than radioactivity.
For example, here in South Australia, which is perhaps the most advanced in terms of getting a good sense of what waste is stored where and in what conditions, they've done a reasonably good job but still it's almost all volumes rather than radioactivity, which is not very helpful. I gave that example of the CSIRO soil which is 54 per cent of the volume of the waste they want to dump at Woomera and a tiny fraction of one per cent of the radioactivity.
MR JACK: I wonder if I could touch on one of the issues that was obviously key to your concerns, and this is the social costs, because scientists often have great difficulty addressing this. Have you any suggestions for how it should be tackled better than it has been tackled in this case?
DR GREEN: Yes, there need to be independent public inquiries into the specific proposal for a dump for lower-level waste, and the same could apply to the higher-level waste, including the spent fuel and the same could apply to a reactor. It's never too late for that sort of stuff. In fact, the Federal Opposition has said that if it wins Government, it will conduct an independent public inquiry into the plan for a new reactor at Lucas Heights, even though it's already under construction. So it's never too late for an independent public inquiry.
That's by far the main point I would make there and also, just to get back to that other point, there's no way you can very quickly undo the legacy of 50 plus years of secrecy and dishonesty and imposed radiological contamination. That's going to take decades to undo, just as it took decades to create the problem.

MR JACK: I agree completely with that last statement. It's very difficult to undo a reputation of any sort. By an independent public inquiry, what do you envisage an independent public inquiry to be? A panel appointed independently to hold public hearings and hear the views of everybody? Is that the sort of thing you mean?
DR GREEN: Yes, I don't think there are any clear-cut rules that you could specify in advance, but for example I mentioned the 1993 Research Reactor Review. Initially local residents of Sutherland Shire were concerned about that, because one of the three panellists was a member of ASTEC, the Australian Science Technology and Engineering Council, which already had a position in favour of a reactor. It turned out that he was an independent-minded person and the other panellists were certainly that.

They gave a report which was fairly robust and strong and it didn't come down firmly on one side or the other; it said the matter should be reviewed at some future date when some of the issues had been resolved. That's a recommendation which the Federal Government ignored and went further than that, and denied that the Research Reactor Review had even made that recommendation. So there are no clear rules. I would just say independence - there's greater and lesser degrees of independent. For example, ANSTO doesn't regulate itself at the moment, as it used to, but ANSTO's CEO was one of three or four people who were on a panel which interviewed people for the top job at ARPANSA. To my mind that was the Federal Government deliberately compromising and undermining ARPANSA's independence from the very start, even if it is a slight improvement on the old situation where ANSTO regulated itself.
MR JACK: Thank you very much indeed for those comments. Thank you.
DR LOY: It took you 56 minutes to raise Dr Garnett and the interview committee, which is very restrained of you. Okay, thank you very much for your presentation.
DR GREEN: Thank you.

DR LOY: Finally, we have a presentation on behalf of the Local Government Association of NSW, which will be undertaken by Councillor Genevieve Rankin who is a Councillor of the Sutherland Shire Council and I should have mentioned that she is Councillor Genevieve Rankin AO.
COUNCILLOR GENEVIEVE RANKIN: Thank you. I think it was AM, although I'm not a morning person. Thank you, Dr Loy. It's working, wow. Some technology works. That's great. I'd like to acknowledge the traditional owners of the land that we're meeting here on today and in particular, in making that traditional acknowledgment, pay a special tribute to the Indigenous communities that we had before us this morning. I don't think anyone could have but been moved by the breadth of their knowledge and their concern on this issue. I think it spoke poignantly to me about some of the work that we do in Local Government and I'm sure members of the panel do in their scientific and technical endeavours.
Often we do make a very false distinction in our white western science between community

knowledge and what some might call real knowledge and a narrow technical frame. I guess what I'd like to appeal to the panel at the start of this, to in their recommendations be not drawing - taking the technical boundaries, if you like, from the proponents of this proposal, but to acknowledge all the knowledge that's involved in this project. The knowledge of the people, certainly the Indigenous people here this morning, was just so impressive on this issue. I think we all need to draw breath and have a look at that.
I'm going to speak to you particularly about the Local Government response, the Local Government in New South Wales. I'm here as a result of the fact that Dr Loy wrote to the Australian Local Government Association, and it's made up of the State bodies and they wrote to New South Wales and the New South Wales Local Government Association has had a major taskforce on this issue because of the breadth of concern right across New South Wales. They asked me if I could get time off work and come here today to represent those concerns of Local Government in New South Wales. So I'm happy to be here to do that today.
There are three key things, I guess, you can take from my presentation today and that is that Local Government in New South Wales is deeply concerned about this project. It has not been consulted about the project and it is overwhelmingly opposed, as well. I think that should give some cause for concern to this particular panel. As I said, the Australian Local Government Association - and the

Australian Local Government Association, for our international visitor, is made up of one representative, usually the Mayor, from every Council in Australia - is not known as a particularly radical organisation. In fact, it represents country areas very predominantly, as well as city areas. They have a resolution very strongly concerned about the transportation of waste. The New South Wales Local Government Association, which tends to represent more metropolitan councils and the Shires Association, which represents the country areas - I'll just give you an indication of the concerns that the New South Wales conference raised. It noted the failure of the Commonwealth to satisfy the issues of safety and transportation of nuclear waste; the failure of the Commonwealth to comprehensively consult Local Government and communities along the route; the failure of the Commonwealth to thoroughly investigate waste production and waste management issues; the failure of the Commonwealth to achieve minimisation of nuclear waste production at source at the Commonwealth nuclear reactor at Lucas Heights.

That led on to their requests for the Federal Government for better processes and of course these requests have been ignored. We also have within New South Wales Local Government what we call regional organisations of councils. The Western Sydney Regional Organisation of Councils have, I think, unanimously - and these are all overwhelming positions of these bodies, not just something that has got through on the numbers - I think it's unanimous with its Mayors' concerns there about the proposal. Southern Sydney Regional Organisation of Councils is interesting because not all of those are on the transportation route but they are certainly within the region where the nuclear reactor operates.

They have expressed major concerns to the State Government about emergency planning, because it is a Local Government responsibility. I'll go into that a little bit more later. That is, like, a quarter of Sydney, the Southern Sydney Regional Organisation of Councils and Western Sydney is another

huge chunk. Individual Councils from across - all the way from Sutherland Shire to South Australia. Aboriginal land councils are now also members of Local Government Associations. They have expressed their concern. There is another batch of both Sydney city Councils, regional Councils and others, lots of others probably, that I haven't listed here at the moment.

Okay, now why is Local Government so concerned? I know I can hear Jimmy Brough and others here that you'll hear from tomorrow saying, "Why would these people be so concerned? Maybe they're all suffering from some kind of mass hysteria, that the nuclear industry brings on, or maybe there's something in the water in New South Wales." What sort of issues are Local Government concerned about? They're concerned about firstly heritage issues. These are all listed in the submission: Heritage issues, including Aboriginal heritage; floodplain issues, water supplies, catchment management issues, health impacts, economic and social impacts.

I'll be happy to take some questions, too, in my other role as lecturer in social policy. I think I do have quite a bit of information on other ways you can go about both community consultation and social impact assessment - environmental impacts and the capacity of our hazardous response agencies to respond. These are all issues that have come up when the Local Government taskforce got together to talk about the concerns with the nuclear waste dump in South Australia and in formulating our response. None of the concerns that people have expressed on these issues across the elected Local Government representatives have been in any way resolved by the Commonwealth, or even answered, as far as you can tell.

The New South Wales Parliamentary Inquiry similarly was an all-party committee, including the

National Party and conservative parties in New South Wales. It came up with a unanimous recommendation. What it recommends, and it gets to one of the questions that I think Ian Lowe was asking before - my understanding, I've read the executive summary and recommendations and just started into bits of the full report - but basically they're saying, "Let's stop this process until we can achieve some measure of community consent and use Lucas Heights as an interim facility in the meantime.

Now, you might ask why is it that we have such a poor process within Australia. This has been touched on by a lot of people and I hope the independent panel members will have a look at this issue. Certainly Sutherland Council, as was said earlier, fought very hard to get a regulator in Australia. When ANSTO was just regulating itself it was certainly not world's best practice. We lobbied very hard during the McKinnon process to have a regulator established and of course were quite disappointed by the fact that the regulator was set up in a fairly poor framework. It is a minimalist regulator. The all-powerful Dr Loy has total power to make decisions. It is not being seen as responsive to community concerns so far.

In fact, with these panels I did actually, when I was organising my work commitments for today, say to a couple of people, "I do wonder why we come sometimes." I guess we're just hoping for some kind of improvement in the process in Australia; that we will see that it's pretty poor international practice to be lagging so far behind in your lack of community consultation. No community acceptance - and I think the basic thing that I find here, just as a human being involved in some of these processes, is that we could do better. We could be great in Australia at this. We've got lots of

good models. We've got lots of models even within hazardous industries. You've only got to look over in Western Australia, look at what they're doing there in their consultation processes for bush fires and hazardous industries.

There's lots of good ways that we could do this. We don't have to sit there and say it's too hard. We also, as people involved in ARPANSA, don't have to accept the fact that because you've got very weak legislation you have to give the worst to the community. We could give the best to the community, even within a weak regulatory framework.

With that sort of thing in mind, I think you have a look at if the framework is adequate, and obviously this process here about the dump - we've had criticism, as has been pointed out here today, from Local Government - very basic community level right up to the IAEA - of this process that has taken place. That would give us a little bit of grounds, I think, to say, "Let's have a look. Are we getting international best practice here in this process?" and I think any fair-minded look at that would say no, and it's very much lacking in terms of consultation, disclosure.

I mean, we have all this debate about what's in the inventory and you know when I am sitting in the New South Wales Parliamentary Inquiry and we have ANSTO saying that, "Yes, there will be some plutonium, there will be some uranium in this material that is going to go across," and then we start smoke and mirrors tricks talking about volume and radioactivity and whether we're going to define it as low or medium and what used to be high is now medium. That's not what the community wants to hear. The community wants to know that somebody in this country has a very accurate idea of what's going to be tracked through our streets. What's going to end up there in the hole in the ground? How is it going to impact and can't we expect that in the 21st century?

So much better practice in terms of consultation, disclosure, licensing processes. This has been commented on, I understand, in the - what I've seen of the IAEA draft, and the competency is - I

mean, Jim Green's presentation I think does give a lot of pause for thought here about, are we competent? If we haven't got the skills there, can we go out and get them? Hazardous industry standards again have not been met, as Dr Gary Smith said very clearly earlier. Look, couldn't we at least expect that - we've got New South Wales legislation, which a lot of environment groups and Councils have some concerns with - if there's a model operating within the state where the proposals are being put up that you might at least give that kind of level of assurance to the community? And when it comes to the reactor where we're producing the waste and the transportation of the waste, surely at least some kind of statutory inquiry into the EIS - into whether it is actually delivering.
We've got the process here today, where you know people are coming forward to give views to a panel, and it's said to be great that we've been consulted by the CEO of ARPANSA.
However we'll have another lot of people talking tomorrow - the proponents of this proposal - presumably answering issues that are raised today. No come-back whatsoever from the people who have put a lot of work into today's presentations. No ability to cross-examine people who come forward, let alone bring in some actual accountability. If you're going to say, "This is how much it costs" - if you're going to say, "These are the safety procedures," can we test that? Can we see what they are? Can we then say - you know we either accept this or we don't, and this is where Local Government comes in again.
73
Like if anyone in our area - we're the elected representatives - wants to put up a garage in the backyard, a dual occupancy or something, they have to put the plans in. They have to be advertised to the community. They have to be tested. They have to say, "Is this accurate or not accurate?" and then you have a consultation process and the ability, if it's a hazardous industry, to say, "Let's have a proper inquiry into that" - to make sure that - you know it has been known in the history of western technology that proponents get a bit carried away.
They might have a very hazardous industry; they think it's great, and they want to promote that. Fair enough. That's why you set up independent processes to test it properly and not just have a bit of a talkfest where we can all feel better that we've said that it's no good and yet we get nothing out of it.
So community consultation that clearly doesn't meet the community consultation standards. The disclosure on transport issues from the Local Government point of view is just appalling. The Councils that have been involved in this submission that has come forward today have been constantly asking - they're ringing - you know, Sutherland is seen as taking leadership in this field and having expertise, but people pick up these documents and they say, "Where is the plan for transportation? What is the process?"
I believe Dr Loy has to approve the transportation as part of this licence approval. Well, where's the plan? Are we going to see that publicly? Are we going to see what it is. Are communities going to be consulted along the transportation route? What are the security arrangements now that we know the difficulties there and that these have been raised very publicly, so the content as we've said, and the waste plans.
The other key issue is emergency management planning. Now this affects Local Government very directly as Local Government under legislation in every State in Australia has the responsibility for chairing local emergency management plans and this is done through State legislation, so the emergency planning process depends on good information. What you do is a risk assessment. You go through each particular risk in your local area. You have them identified, so that if something happens - in the event of an accident - it's very clear who has got responsibility and who is doing

what.
In this one we can't even get - for instance, at the nuclear reactor site you can't be told what the consequence analysis is. Dr Loy has that, but not the emergency management responsible people and certainly not the community. Similarly on the transportation route. The communities that I am representing here today, right across that route, want to know what the emergency planning procedures are, and of course if you look at the State Inquiry you can see that there were submissions there from people, such as the Fire Brigade Union and others, that have shown that there are major concerns - practical things like, hazmat facilities don't necessarily operate right across the State.
You can have somebody in Dubbo, for instance - where you've got hazmat expertise. Get out a bit further on the Darling Plain or wherever and the same level of response is not available. It may take quite a number of hours before - and just roping off the scene while you wait for a long time for people to come. Okay, that sounds like a plan, but if people in the community don't know that's the

plan and they go to a traffic accident or they go to somewhere where these things are happening, then you're putting people at risk by this culture of secrecy.
As I have said, the framework in Australia between Commonwealth, State and Local is quite complex, but we have a very simple thing happening here. We've got the Commonwealth imposing unwanted facilities on communities in a very poorly regulated framework. However, when it comes to picking up the costs of those things - and this is I think where you can understand some of the flavour of the New South Wales Government report and why it is an all-party report and why there was a lot of questioning there about costs and insurance and who should pick up the tab, because it is clearly State and Local Governments that are there actually on the ground that have to deal with these issues. Just common decency would suggest that those other levels of Government should have a right to very clear, very precise information, on a hazardous industry that wants to truck all its waste through the streets.
I guess it then comes to saying, what is the role of this panel today? Why are we all standing around here, talking about these issues today? To me, I think there are a few things that I would hope we could see coming out of this panel today. I would hope that we would at least get reports here that do reflect that widespread community concern and say - like the New South Wales Parliamentary Committee has been prepared to say - "Don't licence this facility until you've got a better plan - until you've got something in train - and then have a look at some of the key issues about, who's producing the waste? What are the management practices on site? Can we improve that?" Can we say, "Let's have a proper inquiry or a proper review of that whole process to say, 'Are we minimising it on site? Do we need this constant production of waste?'" or should we be stepping back and saying, "Have another look at it. Say how we could be performing better within Australia," and I think, as I said before, there are lots of models and ways that we could go about doing that that certainly haven't been entertained so far within the current processes.
I would say, yes, please, don't recommend that this particular licence for this faulty project go ahead and, yes, that would probably mean that this interim de facto nuclear waste dump with all its poor management practices goes ahead at Lucas Heights in the meantime, but let's see if we can't come up with something a bit better overall in terms of stopping the production.
Again, if you look at Local Government experience, any industry that comes to Council now under our development control plans - I've been on Council 12 and a half years. I've been part of making sure that we develop development control plans where industry do have to put in their waste

proposals when they come for a development application. If you're going to have a factory running, we want to know how you're going to get rid of your waste.
Here we have, in the 21st century, in the middle of Sydney, a proposal which Dr Loy has been prepared to give an operating licence to, where clearly by today's evidence we don't have a clear proposal for the management of that waste. It is, as I say, just very poor practice and doesn't give the community any confidence whatsoever.
That leads on to saying that, you know, I think it would be well within this panel to start recommending some best practice procedures, both in terms of process - which is very important,
75
because I think, as the Sutherland submission shows, if you wanted to do a history, we might write this up soon. If you look at every step along the way - and it is the experience in hazardous and other sorts of industries - where people have listened to the concerns of both community and environment at the front end of projects and try and do it better, you can come up with a better result.
I am sure Ian would be aware of some pretty famous projects; sewerage treatment up on the north coast and places like that, where when the operators and the proponents of schemes actually stood back and said, "Can we listen to what has been said here?" and take it on board, they get a better result for their own project. Not that that's necessarily seen as the best outcome, but I would say that here in terms of safety and costs and all the other things that affect our community, the process is very important.
If you can get away with a sloppy process, writing an EIS by one of the cheapest shows in Sydney and having that EIS not even subject to any rigorous testing whatsoever, having the community make submissions again and again that are totally ignored, both by the proponents of the project and the regulator, then it doesn't give you much confidence in the process that we're going to get the best outcomes. Certainly that impacts on safety and I would just urge the panel to see themselves as having a role in trying to get us a better deal in Australia on these matters.
DR LOY: Thanks. Ian?
PROF LOWE: Firstly, I hope we do and my life is not so devoid of interest that I would be spending time here if I didn't think we had some role. Can I tease out a couple of tensions in what you have said. One is that your submission quotes an ALGA conference resolution that says, inter alia, Lucas Heights should not be a de facto repository for nuclear waste, but your submission is saying that the nuclear waste that's at Lucas Heights shouldn't be transported to a repository in South Australia.
COUNCILLOR RANKIN: Yes.
PROF LOWE: Is there a tension there?
COUNCILLOR RANKIN: There is certainly tension. There's been a lot of debate, both within Local Government and within community organisations on this issue. I'm sure you would be aware of some of that. What we're very clearly saying across Local Government is this proposal is wrong. That's why I'm urging you to, say, pull back on this proposal and let's see if we can get it better. The other thing we're saying is that at the moment the nuclear waste store of Australia is in the middle of Sydney. We've got it there in one of our suburbs and it is an acknowledged terrorist threat and it's right there in the middle of our biggest city of Australia. I believe - and it's been certainly our Council's position for a long time - that we don't support that continuing as the dump forever more. However, we think the current proposal is irresponsible for all the reasons that have come out today and also irresponsible to be saying, "Let's build a new reactor. Produce four times the amount of waste that we're producing now. Don’t worry about how much more goes out in liquid waste to our

beaches there at Cronulla or out in the ocean or in the air. Just keep on producing it without having
76
any plan."
My ideal world, I think we all know the arguments of the need for guardianship of this dangerous material that we have produced now and that we will have to deal with in the next, you know, few hundred generations if the planet lasts that long. We all know that's our responsibility to next generations. I would think - my personal opinion - at the end of the day if you turned off the tap and said, "Right, we're not going to keep producing this waste that we haven't got a solution for," you would not think that that site in Sydney on two major waterways, feeding out to the ocean and in the middle of Sydney, is the best place for it to stay. To me, that would be the debate we have.
When the Federal Government exercises some responsibility and says, "Right, turn off the tap. We won't be producing the waste any more," we would need a major national consensus about how is the best way to manage this. I think, from my reading, there are heaps of options and that's why I think getting some of this better practice in is what we need to do, but at the moment it's seen as just a cheap and nasty job; on the run, make a bit of space. It's a bit of politics really to make it look to the community like something is being done about the waste, but, I can tell you, the community is not buying it.
We had a concern - this is just Sutherland now, not LGA - there were some concerns locally about how people do feel; whether they're more concerned about the transportation of the waste and so we actually conducted our own in-house polling research just to inform the submission that we were putting to the State Government. We found it almost equal. There was a slight - you know, point something extra concern about management on site, because I think people in that community are pretty well informed about problems of management on site; but there was also overwhelming concern about the transportation, too.
Communities know it's not an easy matter and that's why we get very worried when we see these glib reports from Government; the sort of comments quoted from Peter McGauran before and that, saying, "It's safe as houses. We can sit on it for a few weeks," or some even at the New South Wales Inquiry getting up and saying, you know, "A bit of extra radiation is good for you." You know, it's those kinds of comments - and that's where we started in the emergency planning process at Council. It was - "We don't need a plan, because there's never been an accident," so that's the basis of the emergency plan. Well, it's not good enough in this century. It's not good enough for our communities.
I am not saying there's a straightforward, easy solution, but I'm not the Federal Government. I'm looking at their proposal and I'm saying there are major flaws in this proposal. There are major flaws in the way ARPANSA has licensed the current construction of the reactor and those same mistakes, I think, are being repeated in this process. I think it is time that as a whole we stood back and said, "How do you solve these problems?"
PROF LOWE: Thanks for that. I am as worried as anyone about absolute assurances, so I was worried to read in the submission that some of the local authorities that would be along the proposed transport route want - and I'm quoting from the submission - an absolute assurance that there will be no social, economic or environmental impacts from the transport of nuclear waste across their areas.
77
Is that a serious claim? I mean, how could anyone conceivably give an absolute assurance that there will be no social, economic or environmental impacts from any activity, let alone the transport of

nuclear waste?
COUNCILLOR RANKIN: I just was reading that myself this morning and seeing how strong it was. It was written by the Associations and I think it does reflect - well, it reflects their concern, I think particularly about the nuclear industry. We have had a lot of these minimalist statements and no doubt you will get them tomorrow; like there's LPG trucks driving around the place all the time and there's nuclear industrial packages going around all the time, so what's a little bit more? I think where that strong submission from Local Government is coming from is to say, "Look, this absolute minimisation of this problem is not good enough." You know, in the face of no information at all, which is what they're getting in response to current inquiries and no information about transportation, et cetera, they are saying they're looking for absolute assurances. Whether that could be given, I guess is the next question in the next part of the debate, but I think it does reflect the strong feeling in that submission there and that it is something that if you could be given assurances, then you'd be happier.
PROF LOWE: I suppose my concern is that if anybody did give me an absolute assurance I would know that they were lying.
COUNCILLOR RANKIN: You wouldn't believe them.
PROF LOWE: And it's like if somebody says that air travel is completely safe, we know that's not true. We strive to make the risk as low as possible and certainly to make it acceptable. I think a calculation that said you were likely to have one accident every 500 years even would be more credible than an assertion that there was absolutely no risk and that there will never be an accident. In terms of a community process I think it will be more honest to accept that there always be a risk and strive to minimise it, rather than try to give the sort of unrealistic assurances which I think have been given in the past.
COUNCILLOR RANKIN: Yes. I take your point. As I say, I think what that comment there in the submission is clearly reflecting is the lack of community acceptance of this particular proposal and I think it is a starting point. I imagine if we did move to a situation where people are around the table and trying to work out the best solutions, then you'd be looking at the risk analysis and what you want to do. You are probably aware that Local Government is involved in risk analysis in a lot of different situations and are quite capable of the technical job of having a look at that, and probably better than people who are just technically in their room, or proponents of one industry. I'm sure they would be up to that task, if they could see a sensible proposal - which we have never seen.
PROF LOWE: Can I just ask you one question about the process. You commented on the fact that most of the people who have presented today are opposed to the proposal - and the proponents and some groups who are supporting it will be speaking tomorrow - and that means those opposed to it won't have a come-back, that the proponents will have the last word, having heard the objections and

criticisms. I can see how those of us on the panel can try to minimalise that problem by raising with the proponents the sorts of issues you have raised, but can you think of anything else we could do in process terms to ensure that the views of the people we've heard today are fairly represented in the discussion tomorrow?
COUNCILLOR RANKIN: No. The reason I was commenting on that process was to draw a contrast between - if we were having a genuine inquiry here you would have the proponent putting forward what they were doing and the ability to ask questions. You might have key stakeholders asking questions and maybe then the panel making their determination after. As it is now, you are

dependent for your own report on the questions you raise yourself. I think that makes it a difficult process for you to be able to manage.
I'm not sure when your report is due. I think the way the community could contribute is to look at transcripts, or being here and responding to things that come up, but I think it's a fundamentally flawed process in that way. I'm not saying - I think with the best will in the world you're not a stakeholder involved in the issues and whilst that gives you independence and your scientific background can aid you in looking at that, it also means the key questions.
It goes back to what I say about experience with EIS processes. If you have people there who are opposing a particular proposal, they are the ones with the knowledge often, who have got the time, or put in the time because they have got it in their brief to actually look and criticise proposals. If you're going to systematically - as our process does - leave out that whole sector of the community, except in a talkfest, then you're not going to have good practice in Australia.
As I say, I'm sure you'll do your best, given that limitation and people perhaps could tomorrow be allowed to pass you questions they might want asked of people. There might be a way around it that way, but given the way that the panel is set up I think it's going to be difficult.
PROF LOWE: I think there was another problem which is that there been enough questions asked that could be legitimately put to proponent tomorrow to take up the whole day's hearing, but we have other people to hear as well. I suspect that we're going to leave tomorrow with unfinished business of questions that people have asked that should legitimately be posed to the proponent, but which with the best will in the world there will not be an opportunity for the proponent to answer during our proceedings tomorrow.
COUNCILLOR RANKIN: Yes, and inquiries are never fast processes either, when they're done properly. However, I would argue that if you went back say to 1997 and actually had - you could save more time in the long run than all this time-consuming business that we go on with asking for information and not getting answers, the freedom of information costs it costs Local Government - it is thousands of dollars - to not get answers or to get things blacked out; all this nonsense that should have stopped in the 1950s. Okay, you mightn't have everyone agree with the outcome, but they can see that matters have been considered. We cannot see that in our Federal nuclear regulation in this country at the moment.
PROF LOWE: Thank you very much.
79
MR JACK: Thanks. I was just thinking about tomorrow and I agree with the last few moments' discussion because there are a lot of questions already for tomorrow and I'm not quite sure how we are going to do justice to the issues that have arisen, so your point is well taken. It is of some concern to us. In passing, I might say that this is a different process from the one that I was accustomed to in Canada, but that's not to say it's better than this one; it's just different.
Going back to transportation for a second, I agree with what - I'll put words in your mouth and please forgive me for doing that - if you get no communication, or a lack of adequate communication this can result in an extreme demand like the one that Ian Lowe was quoting. I'm wondering, as I understand the situation - and this is a question I'll have to DEST tomorrow - the material being transported or that would be transported if this application were to be approved, will be packaged in a way that conforms to the international atomic energy's so-called regulations on transportation of radioactive material.
Those are designed to prevent untoward leakage of material even in the event of severe road

accidents - for example, trucks turning over and so on. They have been proven, over time, to be effective in that regard worldwide, because this is one of the few instances where various countries across the globe have accepted the same regulatory basis, and there have been road accidents, train accidents and so on, and extremely few accidents have caused any significant radiological consequences. I am wondering if that information has been getting down to the local Councils. If they are aware there are these transportation or these shipments going on regularly - this is not to downplay the significance of it - but these are facts that are out there that should be known as a basis for then forming a judgment. Is this known amongst your colleagues in these Councils?

COUNCILLOR RANKIN: I think it's often put, and I think it was certainly put in New South Wales - the recent inquiry there. They came up with a very strong finding that - don't add to it - you know, you've got a certain level of problem now with both nuclear and non-nuclear hazardous transports. What's the rationale? You know - as Dr Green was saying - what is the benefit analysis for saying, "Let's add to that problem"? I think in the current climate, certainly in Local Government, when they are involved in all these emergency management processes at the moment, which all involve a new element of taking more seriously what - we've been possibly fairly laid back in Australia on terrorist incidents before, but with our involvement with the coalition, et cetera, it is a practical fact of life that all our local emergency management committees are identifying in their local areas, the potential targets.

If you go to Sutherland there are three: The reactor, Westfield Shoppingtown and the oil refinery. If you go to the Westfield Shoppingtown and the oil refinery and you get very clear answers. You know, how many people are here? What are we doing? The risks at the oil refinery are very high, but people sit around the table and they actually talk about those risks and they say how they are managing them. The community complain about it and do this, and do that but they basically go back with an understanding at least of what's happening.

Now, when we go to this plan, as Councillor Hurley said before, first of all we're told "There'll never be an accident," then "No, you can't see a consequence of an accident," then you're told, "Yes, we

will change the plan and the plan's been changed but no, we're not going to tell the community about it." I mean, we're fighting - today I'm ringing people in between these meetings today just to set up a meeting next week to say, "Can we tell the community what the current plan is?" That's at the reactor.

When it comes to transportation of the nuclear waste coming out of the reactor, the practice gets even worse. And then you've got people who are involved in emergency services on the ground who will tell you they don't know what the plan is for a nuclear accident, and I'm sure they have received assurances that it's safe too. Also, the fire brigade union element, with hazmat, have said very clearly that they do think that there's the possibility of fire and other elements in, say, a truck collision with an oil tanker or something like that, where radioactive plumes could come out of such transports. I'm not sure of the technical information there, but that is coming from quite well-qualified people.

MR JACK: Again I would echo what Ian Lowe said. I, for one, would never give you a 100 per cent assurance that a significant consequence can't occur. If I did that, you shouldn't believe me. But I can state that the designs are such that the probabilities are reduced significantly, and so on it goes. Yes, absolute assurances don't exist.

I hear you saying that many communities are not convinced of the safety of this proposal. Also, there's a lot of concern about the process and about the social costs, and the process and the social

costs I see as very closely tied together. But let me put it to you - and this is hypothetical - let's suppose the safety specialists were to ultimately conclude that the proposal, as possibly amended or whatever, were to be judged safe. I think I heard you saying that, because of the social costs and the process, you would still be inclined to follow what I would possibly label as then being the second-best solution; of storing the radioactive waste at ANSTO, at Lucas Heights, for a long period of time. From my own experience in Canada, we went through a process to get community acceptance of waste. It took 22 years. It succeeded eventually, but it took 22 years to get there. Would you be prepared to put up with the waste being stored at ANSTO for another 22 years, given the location?

COUNCILLOR RANKIN: I've been involved in this issue now since 1981, so I think it is 24 years or something that I have been calling for better practices in this area. One of the earlier calls we had was for a national waste repository. At that time it wasn't government policy, and when you say "put up with it for 20 years", we have been putting up with it since the 1950s, this very poor practice, and I'm not prepared to say that some situation that's not the best practice we could get - any answer is better than no answer. I don't think that's true. I really don't think that's true.

I agree with you that no industry is ever going to have absolute assurances and I do think that comment has come from the absolute wall of silence that we get from the others. So if you want us to accept this on faith, then you give us an absolute assurance. If you want us to accept it because the Federal Government says it's okay, then you come and give us assurances that you will clean up the mess if you've got an accident, or that you will cover us for insurance if our properties are damaged, or even cover us for insurance if socially, in the marketplace, you can't sell your house after there's been a radioactive leak outside because people perceive it not to be safe. That is a real impact on communities. These potential impacts are totally ignored at this stage.

I think we go around in circles on this issue, and I'd hate to start another 20 years of circles. In fact, I can remember doing an inspection years ago out at Lucas Heights where we were asking why - I'm just not quite remembering the exact context, but it something about why particular radioactive waste was outside rather than inside a building, and they said, "Oh, well, if we put it inside a building you'd say it wasn't temporary storage." I know these circular arguments go on all the time and I'm loath to say let's have another 20 years of them.

What I'm saying is: Can we cut through that? Today, in the 21st century, there are good models for engaging the community and there are good models for social indicators and how they affect people. Let's forget all that history and say, "Can we have a proper process to examine if we need to keep creating all this waste, if we need a reactor in the country, how we're going to handle the waste that's there, and what's the justification?" and have some kind of process.

As Dr Green said, the only process that's ever come near that was also a panel set up by the Federal Government which initially was meant to, in our understanding, whitewash the proposal for a new reactor, but it did have independent people there who, when they looked at our processes at ANSTO, said there was a hell of a lot of improvement that could be made. I think to just ignore that and say, "Business as usual" - and I don't agree that it is okay, as Dr Smith said, to just leave it on site as if business as usual is okay. I think we really need to look closely at what's there. Can we do it better tomorrow, not in 20 years' time?

MR JACK: Right. Thanks very much indeed. We appreciate it.

DR LOY: Let me put a hypothetical question to you, Councillor Rankin. Let's suppose after today

DEST came to you and said, "We'd like to hire you as a consultant. What we want you to advise us on is how we should interact with the Local Governments on the transport routes to draw them into a discussion. Ultimately we, DEST, want to have them accept that the transportation is safe, but how do we engage these Councils in this discussion?" What would your advice be?

COUNCILLOR RANKIN: I'd say, "I'm a happy academic and I'm going back to my job in Western Sydney University. " I don't know. I think there's a big credibility gap, and I know the same thing is happening with ANSTO now. You can put a lot of money into public relations spin but people are a little bit more sophisticated than that these days. Those surveys that the Minister for the environment was talking about this morning, on how can we get the community to accept this: I can remember an analogy once when I was on the NRMA board and we were trying to say that some proposal was no good. If you're selling a stink bomb, you can't say it's a rose. You've got to look at what the content is, that you're doing.

I think, fundamentally, a bit of honesty on that at the moment would go a long way towards community acceptance. Local Government has lots of forums. We can call a forum at the drop of a hat and people come, and they will tell you, but they won't take part if it's seen as a total fait accompli before you start. You have to be able to say, "No, I'm not selling snake oil. There are real genuine community issues here to be considered, and how would we go forward?" That's my advice. I shouldn't be giving you free advice, should I?

82

DR LOY: That's fine. Just comments on the rest of this process: I think I need to say this isn't the end of what ARPANSA will be doing. There will be other opportunities for people to make inputs. Those inputs are taken seriously. Certainly when questions are asked that I believe are reasonable questions, I'll be putting them to DEST and seeking responses and those will all be available publicly. So we're not at the end of the process. We needn't despair if the world is not solved tomorrow and there's more water to flow under this bridge. Perhaps that's a note on which I can thank you for your presentation.

COUNCILLOR RANKIN: It's a pleasure. Thank you.

DR LOY: All the presenters have done a remarkable job in allowing us to finish around about half an hour earlier than we anticipated, but I think everyone got their points across nonetheless, and certainly I thank everyone who has participated today. I think it's been a very challenging and interesting day. I look forward to beginning again tomorrow at 10 o'clock and I'm looking forward to seeing you all back here, refreshed and invigorated and ready to go again. Thank you.

FORUM ADJOURNED UNTIL THURSDAY, 26 FEBRUARY 2004

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AUSTRALIAN RADIATION PROTECTION AND NUCLEAR SAFETY AGENCY
PUBLIC FORUM ON THE DEPARTMENT OF EDUCATION, SCIENCE AND TRAINING NATIONAL RADIOACTIVE WASTE REPOSITORY LICENCE APPLICATION
PANEL
DR JOHN LOY, Chair
PROF IAN LOWE AO

MR GEORGE JACK
PRESENTERS
MS SANDRA KANCK MLC
DR CLARENCE HARDY
MR JIM BROUGH
DR JOHN PATTERSON
PROF PETER JOHNSTON (in absentia)
DR RON CAMERON
DR CAROLINE PERKINS
MR PETER WOODS
MR TONY RYAN
MR WILLIAM RODWELL
MR MALCOLM COOPER
ADELAIDE
THURSDAY, 26 FEBRUARY 2004

Continued from 25/2/04

DR LOY: Good morning, ladies and gentlemen. Welcome to the second day of ARPANSA's public forum on the application for licences in relation to the proposed national radioactive waste repository in South Australia. Today we're going to hear from a group of people, including the proponent and including ANSTO, as well as a number of other presenters.

One piece of news is that Prof Peter Johnston is unable to attend. He has been laid low by some kind of nasty virus. We do have his PowerPoint presentation with us and we'll be making some copies of that and have it available for people to access if they wish, and also I would propose to simply read that presentation into the record at the assigned time so that at least Prof Johnston's presentation is part of the transcript of the proceedings. Though it's unfortunate that Prof Johnston can't be with us, it will end up saving us a little bit of time, so we may adjust the program a little bit prior to the lunch break, but we'll play it by ear.

Our first presenter this morning is Sandra Kanck, who's a Member of the Legislative Council of South Australia and a member of the Australian Democrats, and who has made a submission to me about the proposal. Good morning, Sandra.

MS SANDRA KANCK MLC: Good morning. I want to begin by restating the Democrat position, which I think is fairly publicly known, at least here in South Australia, in relation to this dump, but I want to ensure that those making the decisions are aware of these points.

Firstly, we believe that each State should be responsible for its own waste, that we should not be the dumping ground of other State's waste. South Australians would not be asking people from New South Wales or Queensland or Victoria or Western Australia or any other State to take responsibility for any other sort of waste that we create. Similarly, we believe that South Australia should not ask any other State to take responsibility for any radioactive or nuclear waste that South Australia should manufacture. We think this should be a two-way process, and since we advanced this view some 10 years ago, I have seen this particular view has gained currency around Australia. It seems to be a responsible way to deal with things.

The second thing I would point out is that if this waste dump is located here in South Australia, there is, I understand, going to be a time cycle of anywhere between three to five years in the pick-up. It's a little bit different to our weekly waste, where we get somebody come down the street to collect

once a week. I understand it's going to be three to five years. If that's the case, it means that each State is going to require some sort of repository of its own to hold the waste during that waiting period. If each State is going to be doing that, then it makes little sense to have a nationally based one here in South Australia, because there will be State based ones.

The Democrats also oppose the "out of sight, out of mind" approach that has always been associated with locating this national waste repository; putting it, it seems to be, as far away as we possibly can from any centres of population. We believe that the waste should be located close to the site of its creation so that those who have the technological expertise to deal with it are close to that site.

We also oppose the siting of this low-level waste repository in South Australia because we remain

unconvinced by any promise of the Federal Government that they will not then locate a higher-level waste dump on the same site. We've seen governments break promises over time and there is no reason to believe that this one would be kept, and when you consider the amount of time and effort and pain that has been gone through in this process to date to get this particular waste repository located here in South Australia, it seems to be beyond the bounds of credibility that governments would be prepared to begin this process all over again to find another site outside South Australia for a different sort of radioactive or nuclear waste repository.

I recognise that for ARPANSA these are unlikely to be reasons in their own right for refusal of a licence. I therefore want to turn to the other aspect that was in my written submission, and that is the issue of seismic activity. In my written submission I raised concerns about the location of the facility because of its proximity to the Torrens lineament fault, and it's this matter that I now wish to address. In that submission I quoted from a geologist who didn't wish to be political, but it is worthwhile hearing what he had to say. He says:

It is not possible to find a site that is tectonically stable, for there is no such thing. Even supposedly stable areas like the Gawler Craton and the Yilgarn Block are demonstrably moving, breaking and bending, yet some areas are more stable, much more stable than others; but minor shakes, some too small to be detected in seismic records, and as quarrymen working in the Minnipa and Wudinna areas located on the stable Gawler Craton will attest, are a frequent occurrence and everywhere. Ground waters are another consideration. If the waste containers were to leak for any reason, it is undesirable to have radioactive materials enter the ground waters if the latter circulate and migrate to areas where they are used for humans or stock or where they enter into the soil-plant system.

The site selection study required that the chosen site should be located away from any known or anticipated seismic, tectonic or volcanic activity which could compromise the stability of the site. It required that there be sufficient distance from seismic activity to ensure that the repository's built structures remain intact. If you go and look at an earthquake hazard map of Australia, we certainly don't have the sort of activity that Japan has, for instance, but if you look at such a map you will see that activity in Australia is described as medium, low and very low. What is very very interesting is that the Torrens lineament fault, which is adjacent to Arcoona Station, runs from Lake Torrens to Kangaroo Island and it is one of those areas in South Australia that is rated as a medium hazard level. I point out to the panel that, of earthquakes that have occurred in South Australia, there was one in Beachport in 1897 which had a magnitude of 6.5; there was one in Warooka on the Yorke Peninsula in 1902 in which two people died - admittedly of heart attacks, but nevertheless they did die; and more recently, in January 1999, on the Eyre Peninsula at Minnipa Hill there was an earthquake, not certainly of the magnitude - I think it was somewhere between 3 to 5.

The important thing to note about those three earthquakes is that none of them were in what is

considered by seismologists to be earthquake zones. The Warooka and the Beachport earthquakes - and Beachport, by the way, is 250 kilometres away from Adelaide - were felt here in Adelaide. When you consider that the Torrens lineament fault is adjacent to the site proposed on Arcoona Station, this becomes quite significant, and the alteration to the substructures are such in the case of Minnipa Hill that the quarry that was located there was abandoned that very day, because those quarrymen knew that once that quake had been through there, there was no guarantee that working on any of that granite would result in granite that was going to be free of fractures.

So if earthquakes can occur in areas where it's regarded as low hazard, and we are considering locating a dump adjacent to a fault that is in a moderate zone, then I think it raises questions of the probability of damage if any seismic activity does occur on the Torrens lineament.

This raises the issue, should such a quake occur, of contamination reaching groundwater. I know that the proponents argue that the movement of surface water is very slow because of clays in the soil and, yes, that is true as it stands today, but earthquakes fracture rocks. They move things around, they break up the soil, and it would conceivably break up the clays and create pathways to that groundwater, although they currently don't exist.

So, as far as the Democrats are concerned, we argue that the proximity of the Torrens lineament fault to the proposed repository should be cause for serious concern and it should lead ARPANSA to question the appropriateness of a licence for this fault. It is significant, I point out, that on 28 February 1954, almost 50 years to the day, there was a major earthquake in Adelaide, which is part of that Torrens lineament fault. That normally is expected by seismologists to have a 30-year turnaround. It is now 50 years since that earthquake and so we are due, sometime soon, along that fault to have a major earthquake.

Yesterday the Coober Pedy Kungka Tjuta asked that you should sit on the ground in their country and hear first-hand why they oppose what they see as the destruction of their land, their culture, their history and their future. In closing, I ask that you respect the traditional owners of the land on which this facility is proposed and make such a visit.

My party, the Australian Democrats, does not want this beautiful State to be the repository of everyone else's waste, nor do the traditional owners and nor do the people of South Australia. We ask that you consider the serious geological issues and find against the licensing of this dump. Thank you.

DR LOY: Thank you. To demonstrate our flexibility, we're going to allow George the first questions today.

MR JACK: Certainly. Thank you, John. You stated at the beginning of your presentation that it was the position of South Australia that each State should look after its own radioactive - - -

MS KANCK: The position of the Australian Democrats.

MR JACK: Sorry. Thank you for that correction. I come from a federal country as well - Canada. If each state looks after its own material of this sort, what does the Federal Government do with its material, according to that philosophy?

MS KANCK: The Federal Government has a territory. It's called the Australian Capital Territory. I saw a sign yesterday saying that if it's so safe, then put it on top of Parliament House.

MR JACK: Yes, but if we were to be serious, perhaps - and I don't know the details of the Australian Capital Territory, but if one is serious, perhaps they have to find a repository outside the actual bounds of that particular Territory. Then which State would be the recipient?

MS KANCK: If this waste is as safe as the proponents tell us, then it shouldn't be a problem for them to locate it within the Australian Capital Territory.

MR JACK: I see. Thank you. You also stated that it should be kept close to the generation, because the people are knowledgeable and that sort of thing. I understand that argument in the short term, but

radioactive waste and chemical waste and other toxic waste tends to last for a long period of time, perhaps a much longer period than the research organisation that gives rise to it in the first place. So although, for example, there's active research being done at Lucas Heights at the present time and a significant amount of waste is there, who knows what will be there by way of research activities in 200 years time, but the waste would still be there if it was put there. I see the argument in the short term, that you have knowledgeable people there at the present who could look after it well, but what about the future? If one is responsible, I would submit that one must look carefully to the future management of that waste.

MS KANCK: I agree that there has to be that responsibility, and that responsibility must surely rest with those who manufacture the material, hence the concern we have about things being out of sight, out of mind. If you have the material located close to where it's manufactured, if it's in drums - we've heard, for instance, that some of these drums are rusting - then this is a good thing that it's near them. They can see that the drums are rusting because they go past it every day and they know that they have to keep an eye on it, that they're going to have to change the outer skins of those drums or whatever it is. The moment you put it further out, in the middle of the desert, as seems to be the attitude, you do not have that oversight, and again, if it's material that is toxic, if it is so bad that it needs to be contained in this way, then it needs to be watched almost every day.

I find inconsistencies in the argument. On the one hand they argue that it has to be moved away because it's dangerous and in the next second, as I heard on radio yesterday, there was somebody claiming that it was no worse than a load of bananas. The people who want to have this material to manufacture radioactive isotopes and whatever can't have it both ways in their argument.

MR JACK: No. I agree with that, but also I question whether the people will still be there to look after it in 200 years' time.

MS KANCK: Well, of course, that raises interesting questions about the whole use of radioactive and nuclear materials. I hark back to an article I read in Science magazine. I think it was in 1984. It was laughable, because they were looking at the issue of what do you do to let people of future generations know that radioactive or nuclear waste is there. They pointed out, for instance, if you put signs on something, that there's been no culture that has lasted longer than the radioactive waste and there has been no language that has lasted longer than this radioactive waste. So this particular

article proposed things such as having to have signs around the waste dumps that were in symbols so that future generations would be able to understand it, because putting it in English would not necessarily guarantee that, or even things like creating a mythology in that area that made it a dangerous area for people to go to. It sounds so laughable, but if this is the way we have to deal with this stuff, we really have to look at our responsibility as a society and as an economy in the first place to be manufacturing it.

MR JACK: Yes, and the other part of that responsibility is that once you have it, surely it is responsible to manage what you already have, quite irrespective of generating additional materials.

MS KANCK: You certainly do need to manage it responsibly, and that can be done on site where the stuff is manufactured.

MR JACK: I wonder if I could switch to the comments from your geologist friend about seismicity, at least briefly. Where it's stated, for example, "minor shakes too small to be detected in seismic records" and the innuendo is that because of these, this is a bad site, I would ask you: If the seismic activity is so small that it can't be detected by very sensitive instrumentation, what is its significance in terms of disturbing a repository?

MS KANCK: I think these comments were made in relation to an area that is low-level, and the point that I am then making from that is that if these are occurring in what are regarded as low-level, low hazard, then it seems to be a very very stupid action to put a repository somewhere close to a

fault that is going to be in an area of at least medium hazard, and when we know that this, within the foreseeable future, is likely to have an earthquake.
MR JACK: Another point in the same series of comments in your written submission, about the groundwater - it's stated that:
It is undesirable to have radioactive materials enter the ground waters if the latter circulate and migrate to areas where they are used for humans or stock or where they enter the soil-plant system.
Obviously, I think we'd all be in agreement with that statement, but how does that relate to the repeated statements in the documentation that exists that the groundwater is (a) deep and (b) very saline, and so if it's saline it's not going to be used as drinking water, it's not going to be used for stock water; therefore, although the water is down there, it is not usable for these purposes according to the documentation, and I'm quoting from the documentation. So in those circumstances, why does your friend express concern about contaminating those very slow-moving, saline, non-usable waters?
MS KANCK: If the water is saline and non-usable then we have the attitude there that exists, that says, "Okay, this water is of no use to anyone or anything." I don't have any analysis of that water but I would suspect that there would be life forms, whether or not they are visible to the eye or whether they are microbial. I doubt that that water would have no life in it at all. It is an irresponsible attitude to say, "Okay, it's saline. We don't need it for stock and therefore it's okay for it to be contaminated."

MR JACK: I see. My last question is about the conclusion that this is a poorly chosen site. Even the international review team, which is quite critical of many aspects of the proposal, concludes that the process of site selection, and I'm quoting, "has been thorough" and that the site offers "good prospects of meeting internationally endorsed safety objectives," et cetera. So despite this peer view and everything else, this geologist is questioning the site.
MS KANCK: This geologist is questioning the site and the Democrats are questioning this site because I understood that part of the criteria was that the site be located away from any known or anticipated seismic activity, and it does not fit that criteria.
MR JACK: Okay. Thank you very much.
DR LOY: Ian?
PROF LOWE: I see why George was happy to go first because, as I suspect he experienced yesterday, I'm finding that most of the questions I was going to ask have already been asked.
MR JACK: My apologies, Ian.
PROF LOWE: I have two. One is, can I be clear about what you are saying, which is, as I understood it, that the people of South Australia would prefer radioactive waste that is generated in suburban Adelaide to remain in suburban Adelaide rather than being in a waste repository, however well engineered, in another part of the State? Is that what you are saying?
MS KANCK: I can't say that that is the view of South Australians. The only view that I can say that the polls have shown is that the majority of South Australians don't want the waste from Lucas Heights brought to South Australia.
PROF LOWE: I certainly have heard that loud and clear. It seemed to me that you were also saying that there isn't a case for a repository because the waste is best stored not away from centres of population but where, I think you said, people will see it every day.
MS KANCK: Yes. It's the exact opposite of "out of sight, out of mind". It needs to be very close to where it is manufactured, so that the people can see it, so they can see it in the drums, they can see it almost on a daily basis.
PROF LOWE: Right. The second question relates to the advice from the geologist and the

extension of that. I think you quoted him as saying it's not possible to find a site that is geologically stable.
MS KANCK: Yes.
PROF LOWE: Wouldn't that be true of sites near where the waste is generated in suburban Adelaide, as it is of the site of the proposed repository?

7
MS KANCK: Yes, that's true.
PROF LOWE: So it would not necessarily be safer in Adelaide than at this site.
MS KANCK: It would not necessarily be safer but the people who deal with radioactivity live in Adelaide. They would be closer to it so that they would be able to deal with it, if there was any problem.
PROF LOWE: Thank you for that. The other thing that I would find helpful is if it's possible for this geologist to give any sort of quantitative estimate of how much more probable a significant earth movement is on this proposed site than in more stable areas. I accept that there is nowhere that is totally geologically stable. We're talking about probabilities of seismic activity. I have no feeling for what the quantitative difference in risk is between low and medium levels of risk. Is it a factor of 10? Is it a factor of 100? Is it a factor of 1000? Is it possible to give us that sort of information?
MS KANCK: I will get back to him. He is not a seismologist, he is a geologist, but he will probably be able to talk to other people in the field, and if I can get that information I'll get it back to you.
PROF LOWE: Thanks, because it seems to me that if the responsible attitude is to try and minimise risk, we need to try and get some handle on what the relative risk is between different options. Thank you.
DR LOY: Thank you, Ms Kanck. I think it's really terrific that you made the submission and then were willing to come along and present it and submit yourself to questioning. Not a lot of political leaders would do that. I think that's really great. Thank you very much.
MS KANCK: Thank you.
DR LOY: Our next presenters, in a double act or a double act plus one, I think, are going to be the Australian Nuclear Association and the Australian Nuclear Forum, represented by Clarence Hardy and Jim Brough respectively, and I think, Clarence, you're going to open the batting on behalf of the Australian Nuclear Association.
DR CLARENCE HARDY: Good morning, Dr Loy, panel members, ladies and gentlemen. I am sorry that my voice is gravelly, but I also am suffering from a bad cold on my chest. But I felt it was important enough to turn up. I would like to say at the start of my presentation that, after listening to the presentations yesterday by the representatives of the Aboriginal communities, I have very great sympathy for the suffering, both physical and emotional, which was caused by the nuclear tests carried out at Maralinga in the 1950s, and these tests exposed both Aboriginal and non-Aboriginal people to high risks and high consequences. I am just sorry that so few are present here today to hear that expression of sympathy.
But, having said that, I must add that I believe it is wrong and unreasonable to compare the risks and the consequences of those atmospheric nuclear tests with the risks and the potential consequences of
8
this proposed low-level waste repository, and also, for that matter, the operation of the present and the proposed replacement reactor at Lucas Heights. Similarly, I believe it is wrong and unreasonable to compare those considerable risks with the transport of low-level waste through the States, yet these fears are obviously ingrained in the minds of very many people.
Well, I'll introduce my main presentation on behalf of the Australian Nuclear Association by explaining that the association is a non-profit and independent scientific institution made up of

individual members. These members are interested in the peaceful uses of nuclear science and technology. Now, the association is not allowed to have companies or organisations as members. Some of its members have worked, and some are still working, at Lucas Heights, but some work in hospitals, in universities and in industry. Many are retired, like I am, and the offices are all voluntary positions.

Many of our members have had many years of experience in safely managing radioactive materials and radiation, and I personally am currently a member of two international working groups on radioactive waste management. Last year we presented a report from one of those groups and I know Dr Loy and his staff have got a copy of a summary of that report.

We all know that radiation cannot be detected by our senses of sight and sound and smell and touch, but radiation can be detected at very low levels by modern instruments, and I can say with confidence that we know more about radiation and radioactive materials than we know about the risks and consequences of many toxic chemicals in everyday use in the home and in the garden, coming out of car exhausts, and in drugs such as nicotine and marijuana.

The submissions that the Association provided to the early siting studies and to the EIS and to this application by DEST were short and simple - just a couple of pages - but they represented the views of a committee of persons with good knowledge of waste management, and I was chairman of that committee. Now, what I want to do is to briefly refer to the 10 points that we made, and I will add a few extra comments based on the latest information provided by DEST since we wrote those 10 points and the latest information from the IAEA and from the other submissions that we heard yesterday.

Let's take point number 1. The Association supports the need and the justification for this repository, and, incidentally, for the replacement reactor at Lucas Heights. We believe that both of these are in the national interest. Now, others disagree and they believe it is safer to continue storing low-level waste in small amounts in many different locations around Australia and one large site at Lucas Heights. So I ask you to consider the cutbacks in hospitals, in universities and in industry that we have heard of recently, and where these small volumes or so-called "suitcases full" of low-level waste or sealed sources are stored. Are you confident that these owners will be able to look after them safely in future when their budgets are cut and their staff frequently changed? Are they really under day-by-day surveillance? I am not confident.

We have heard all the major opponents to the repository and to the reactor state that the present reactor and its replacement are unnecessary and their products can be replaced by cyclotrons or they can be imported, and the scientists of the future can do suitcase science overseas, although this, I

believe, is very inefficient. I understand very well what cyclotrons can do and what they can't do, and I am telling you that they cannot produce the large amounts of the main bread-and-butter radioisotope needed by our hospitals in commercial operation, in commercial quantities.

Of course, that isotope can be imported, and it is imported whenever the reactor in Sydney is shut down periodically, but if we follow this 100 per cent import route, we would place our important nuclear medicine departments and some of the 400,000 patients a year that receive the treatment at the mercies of airlines, of potential strikes and bad weather internationally, and you can see how airports are closed down regularly in the Northern Hemisphere for bad weather.

Also, I don't want to see that risk taken with our primary medical care, and in addition to that, I can't accept this approach on moral grounds, because we would be gaining all the benefits of these radioisotopes to our community but letting the overseas producers take all the risk and manage all the waste. I can't accept that.

Let's come to the second point, the chosen site. We believe that this site 40A is a suitable site and that its features have been described adequately for this application to proceed and be determined.

Even the IAEA in their review gave general support for the site but recommended that additional tests were desirable in the central area, and I am sure that ARPANSA will take this into account.
Now to point 3, the inventory of waste. We accept that the overall figure is about 3700 metres cubed of current waste, and about 40 metres cubed per year of future waste are reasonable, and we also consider the overall amount of an estimate of, say, 10,000 metres cubed over the next 50 years or so is an adequate estimate on which to base a design. Now, DEST - if you read their latest information - has put the owners of low-level waste on notice that they now have to declare exactly what they own and propose to send to this repository. I'm very glad to see that South Australia has made real progress in this area.
We turn now to acceptance criteria, our fourth point. We believe that a set of clear acceptance criteria must be approved before the repository is constructed so that these can be taken into consideration in the design and by the waste owners. We believe that the latest proposals by DEST are a suitable basis for review by ARPANSA. Now we turn to point 5, the concept design. This is based on a very simple concept of waste packages, simple containers, being placed in shallow trenches and boreholes in an arid region - a key point - following the code of practice set up by the NHMRC in 1992; but this concept requires secure containment to minimise intrusion and rainwater ingress over at least the 200 years of institutional control.
This concept therefore requires for success that the climate remains arid for this time or even longer. We are pleased to see that the latest risk assessment has finally considered a wetter climate scenario and it concludes that the site could be operated satisfactorily, but to us there is a lot of uncertainty in how wet is wetter. I point out to you, or in our submission we pointed out, that in the EIS it stated there was a period of well above average rainfall in the Woomera area in the late 1800s. I would remind you that more recently than that the Ghan train was isolated for some time by flooding. Now, one way of reducing the likelihood of radionuclides leaching out is to line the trenches with clay or, better still, concrete. Alternatively, the waste could be put into concrete overpacks instead of steel
10
drums but this would obviously cost more. This method has been used successfully overseas in nonarid areas in the Northern Hemisphere, and would have to be used in Australia if a different and nonarid site was chosen.
Now, point 6, as to records: We believe that a very high level of record-keeping, not only by DEST but by the contractors and by ARPANSA, must be required and it must be monitored independently.
Point 7, about the contractors: We support this concept of using contractors to do the work. I'm sure we wouldn't want to see DEST do it themselves. However, there has to be a very high level of contract monitoring by DEST and by ARPANSA.
Point 8, charging: We support the concept of an appropriate charge on the waste owners, and probably also penalties if the waste is not provided in an approved form. However, we can find no information on the capital or operating costs of the repository and the charges to be made. This information should be required by ARPANSA and if it's not known accurately, then at least best estimates should be provided.
I turn next to transport. We've heard a lot about this. We believe from our assessments that the transport of low-level waste and short-lived intermediate-level waste, in approved containers, will not pose a significant risk or consequences to the workers or the public along the route even if an accident occurs. I point out that several thousand drums of low-level waste were transported from Fishermans Bend in Victoria to Lucas Heights, then because of a court case they were shipped back from Lucas Heights to Woomera. I do not believe that there was a single accident reported, and this is half of the quantity of waste that is going to this repository. If there had been a significant accident, I'm sure the Friends of the Earth, the Australian Conservation Foundation and the Sutherland Shire Council would have brought it to your attention. I haven't seen that. I believe that

firemen and hazmat workers are being alarmed unnecessarily by the low risks and the low consequences of accidents.

Finally we come to this important point, the steps of approval. The IAEA commented that a step-by-step approach is regarded as best practice. I would point out to you that this project has undergone a step-by-step approach for many years. The steps included several steps for site selection, then the EIS process and now a formal application. Each step has involved considerable public consultation. You may disagree that it hasn't been enough but it's been more than anywhere else in the world that I know of in public consultation. The ANA believes that an additional step-by-step approach should only be used by ARPANSA if the steps are short, for example three months each, and do not require extensive further public submissions, consultations and further costs to all parties. This is a relatively simple project that we are trying to build. We are not building the pyramids. We think that we should let ARPANSA assess this application and take the hard decision required one way or the other. Thank you very much, Mr Chairman.

DR LOY: Thank you, Clarence. Could I ask members of the audience, please, not to interrupt presenters. People yesterday made controversial and provocative statements and were heard in courteous silence and I think the same should be extended to today's speakers. Thank you.

11

DR LOY: Thank you, Mr Brough.

MR JIM BROUGH: Thank you, Mr Chairman. My name is Jim Brough. I'm a retired microbiologist and I am representing the Australian Nuclear Forum, which is a small group of retired professionals, most of whom have had some experience in the nuclear industry. We have chemical engineers, engineers, but mainly nuclear people. Now, the Australian Nuclear Forum supports the Federal Government's initiative to establish a national repository. We also note that a repository for intractable waste - which has a half-life far longer than radioactive waste - and radioactive waste was established at Mount Walton East in Western Australia in 1992. I have never heard anything untoward about that.

Our original submission to ARPANSA dealt predominantly with the exaggerated fear of radiation and the consequent need for public education about the existence of natural radioactive background radiation, and the need for public education about the radiation background and the risks associated with radiation. In fact, when you scrutinise all of the submissions, and there are 1080 to this inquiry or to this forum or to this process, only the Australian Nuclear Forum's submission and the original proponent actually mention the fact that the world is naturally radioactive. We will add to our submission on the need for education by talking about some aspects of the transport of radioactive materials.

The hazards of transporting radioactive materials, waste or otherwise, are small and must be seen in perspective with the daily transport of other more common and hazardous chemical or inflammable materials, such as petrol, gas, diesel, kerosene, chlorine, acids, and industrial waste containing carcinogens. We will give you some statistics from the UK in 2002.

The Australian Conservation Foundation and other people's submissions quoted extensively from the New South Wales Joint Select Committee on this particular issue, and the Conservation Foundation's submission quoted the New South Wales Fire Brigades Union safety analysis as follows:

The FBEU believes that any proposal from the Commonwealth Government involving the transport of nuclear waste represents an unnecessary and avoidable danger imposed on our membership. It is of significant concern to professional fire fighters that the Commonwealth indicates there are no plans to inform emergency services of shipments of nuclear waste. The Commonwealth Government's attitude of keeping professional fire fighters and other emergency services organisations in the dark is entirely unacceptable from the perspective of occupational health and safety and represents a serious and

inexplicable threat to fire fighters and the environment.
The Union's position indicates to me that they regard radioactivity, no matter how slight, to be a far greater risk than 150,000 tanker loads of petrol, gas and diesel which move around Sydney every year. For Adelaide I suppose you could expect a quarter of that.
Now, let's look at some realities. The International Atomic Energy Agency estimates that over 10 million packages of radioactive materials are shipped around the world every year. We hear of very few problems - including ones in South Australia apparently. Britain's National Radiological
12
Protection Board's analysis of almost half a million shipments of radioactive materials made in the year 2002 discovered 27 accidents or incidents.
(Overhead shown)
This represents the year before - 37 incidents if I remember rightly. This is the most current one - 27 incidents - and you will note that eight of these incidents were paperwork. 12 are general shipments. There were at least two vehicles overturned on the motorway, carrying radioactive packages, all with no consequences. There were a number of shipments involving spent nuclear fuel, which of course is much, much more radioactive than the stuff we are talking about transporting right now.
In all of these cases there was no incident causing any radiological consequence; no radiation effects on workers or the public. That's the important part to bear in mind.
Speaking as someone who's got some experience with the transport of radioactive materials - it was part of my responsibility while I worked at ANSTO - the radiation levels on most of the packages which go from Lucas Heights and which travel to Adelaide, to all the hospitals, to industrial sites, are far more radioactive and have a higher radiation dose than what you will see in a transport of so-called nuclear waste, and that includes high-level spent fuel.
Now, a little personal story. A radioactive package containing a single therapeutic dose of radioactive phosphorus 32 was run over at Tullamarine Airport in the 1980s. Hangars were shut down and five fire engines were called out. The incident is part of the public record. You can read it in the ANSTO records if you wish - incidents/accidents to packages. The package was crushed but the material was not released, and the incident remains very vivid to me because the package contained the type of radioisotope which was injected into my mother eight times over 30 years to control her cancer, and here we had this panic caused by a small package being damaged but nothing released.
Now I'll return to Sutherland Shire Council. Councillor Rankin mentioned me by name yesterday. I'm rather flattered. We have the curious situation that Sutherland Council has campaigned for, I'd say, 20 years about what it keeps saying is the de facto nuclear waste dump at Lucas Heights. Now they tell us it's too dangerous to move the stuff. What do they want? To eat their cake and have it? It doesn't make sense.
There are 800 people working there right now, and in 2001 there was a health report which is part of the international study on nuclear workers. 7076 workers' records were examined for mortality and incidence of cancer and all other diseases. "All cause" mortality was 30 per cent lower than the national rates. "All cancer" mortality and incidents were 19 per cent and 15 per cent below the New South Wales rates. Now, this is for workers who were actually working at the place, never mind local residents. So here we have a health study which says that the health of the workers is excellent, but here we have Sutherland Council saying ANSTO doesn't keep it properly and it is not well looked after and it's dangerous. I think the evidence shows otherwise.
The issue of nuclear waste and radioactivity is bedevilled by misinformation which plays on people's
13
fear of the great unknown. I think it was H.L. Mencken who said that the aim of practical politics is to keep people terrified and scared, by raising all sorts of hobgoblins, none of which are true in fact.

The issue is, as I said, bedevilled by misinformation which plays on people's fear of the unknown. If the public has not been given the facts on radiation and radioactivity and the fact that it's natural, how on earth can they make a judgment on the issue?
A recently retired science head from a New South Wales public school said recently:
I estimate that the majority of students emerging from secondary school education in New South Wales will spend about one hour being taught any concrete facts directly related to an understanding of nuclear science.
She also said:
The Australian population as a whole has a very low level of knowledge of nuclear science. The amount currently being taught in schools, as far as I am aware, is unlikely to change that. Consequently, a great deal of misinformation is easily spread and will continue to influence people's decisions.
Now, speaking as a tour guide with 12 years experience taking people around Lucas Heights, I meet thousands of people every year, I've done my own straw poll, and I would estimate that 90 per cent of the public do not know the fact that the world is naturally radioactive. So here bear with me a little bit while I give you a little bit of history before finishing.
108 years ago a man called Roentgen discovered x-rays and a month later he took a picture of his wife's hand and six months later x-rays were being used in Adelaide, Sydney and Newcastle for the diagnosis of disease. Now, that's 108 years ago. Four months after Roentgen's discovery, Becquerel discovered radiation coming from a lump of rock. Can I make a little stop here.
How many people have heard of the name Becquerel? Three. How many people have heard of the name Curie? Everyone has. The point I want to make is that that happened four months after Roentgen discovered x-rays, and since that time more than 18 natural radioisotopes have been identified in the environment. Cosmic radiation was discovered in 1912. In fact, the radiation dose I got travelling from Sydney to Adelaide doubled my daily radiation dose living at Cronulla. Should I be worried about that? Should I be terrified about it?
Potassium 40 and carbon 14 are totally natural, and every second more than 4000 atoms decay inside our bodies. Potassium 40 has a very long half-life, and it's only 1.3 billion years. In fact, a well-known anti-nuclear campaigner said that they were going to bury radioactive potassium 40 in South Australia. Well, if that's the case, don't bury yourself anywhere.
There is also some uranium in your body - about 90 micrograms of it - and that comes from your diet because it's entirely natural. That's got a half-life of 4.5 billion years. Should we worry about that, or should we accept the fact that our earth is radioactive? There are three tonnes of uranium in a cubic kilometre of sea water just down at Glenelg. It is the same down at Cronulla where I live. It's a fact

of life.
Doses from natural background radiation have been extensively studied and measured for many years and there's no shortage of information. The average natural background radiation dose to Australians is about two millisieverts; in the Swedish people, it's about 5.9; for the Indian people at Kerala it's 15. This has been known for a long, long time, and until the public understands that the earth is naturally radioactive, they can make no meaningful decisions about the hazard of transport and storage of whatever. The earth has always been radioactive and our knowledge that radioisotopes decay tells us the age of the earth, the age of ancient civilisations, artefacts and things like that, and it is all in fact particularly natural.
I'll give you an example of a bit of - not misinformation - but lack of knowledge. There's a newspaper article which says:
Nuclear waste safety cannot be guaranteed
It says:

What guarantee is there that it would not break through to release radioactivity, which is so poisonous that a tiny bit breathed in or absorbed in any way by the body can cause cancer or genetic destruction or other health problems, even death.

If you know that the earth is radioactive, you would never make that statement. But, of course, if people don't know that they earth is radioactive, you'll frighten the bejesus out of them by saying it. We have a case of one of the submissions against the application which says:

I strongly oppose such action …

that's the repository -

… for health reasons to the South Australian population. Just because we are considered to be a backwash City and State doesn't mean that we are to be ignored in the pride of our State. A nuclear dump will devalue the State and all we have to offer, including the wine industry. When other countries learn that South Australia's great wine has been grown in a nuclear dump area, next week they will go elsewhere. May our voices be heard and acted upon.

and it is signed here as "Health Educator". Now, health educators to my mind should be better informed. Is the educator aware that there is more uranium in South Australia than in any other State, except possibly the Northern Territory, and that the radiation dose in Adelaide is very similar to other capitals? If you wish, I can show you an overhead showing the radiation doses around the country. It's less around the reactor at Lucas Heights than it is here in South Australia.

France makes most of their electricity from nuclear reactors and is a world leader in recycled spent nuclear fuel rods, without harming its wine industry. Their major low and intermediate-level waste

15

repositories are about 70 kilometres from the heart of the Champagne region and 90 from the Chablis region. All of this reinforces our initial point in our first submission that little has been done to educate the public and, in fact, the National Health and Medical Research Council recommended in 1990 that a public education program be carried out to inform the public. That was in 1990. Nothing to my knowledge has been done.

There has always been some information from ANSTO from the Australian Radiation Laboratory and now from ARPANSA. Perhaps Jill Fitch will correct me. Have the States ever done any public education of the people en masse to advise them of the risks with the transport of radioactive materials? I doubt it very much. Our recommendation was that an educative program be conducted by the DEST in conjunction with State health departments, because this is seen as a health matter. The Australian Nuclear Forum believes that the Australian governments do not have a safety problem so much as a public communication problem on this issue and it's time we started to educate the public and, in particular, educate children in high school. Have a read of what they are taught. Thank you.

DR LOY: Thank you, Mr Brough. I understand we have another short presentation.

DR JOHN PATTERSON: Good morning, members of the panel, and good morning, ladies and gentlemen. My name is John Patterson. I have worked all my life with radiation and radioactivity, mainly in universities and hospitals. I am very healthy, never had any problems all through that life. I have a son who has played AFL football. I would like to make a few brief points.

I was moved by the traditional owners yesterday - we couldn't help being moved I think - and all scientists find it difficult to understand the lack of care for the Aboriginal people and for the environment and for our own members of the army and air force who were unnecessarily exposed during the Maralinga testing. I have worked at Woomera, and I would be willing to sit down with the traditional owners and talk to them. However, what is proposed for this repository is nothing like Maralinga in area or in the amount of radioactivity. It is contained. It is low-level or short-lived intermediate level; therefore, it is largely decayed in 100 years. I fail to see the need to consider any

more than a 250 year rainfall event.
Also, State borders are of little importance to Aboriginal people, so does it matter if it is in South Australia or New South Wales? They will be opposed to it. Yet, near the gorge from Arkaroola where the traditional serpent moved out to drink up Lake Frome, there are the Paralana hot springs which contain significant amounts of radium. More serious, I think, is the lack of willingness to compromise that I heard in the speeches yesterday.
The traditional owners, as I understand, would not approve any development - including the Olympic Dam mine, and I assume the Moomba gas field, or the Arkaroola tourist resort, to name a few - but you cannot stop progress. There needs to be some give and take and I would hope that the goodwill that I feel in this hearing may contribute to some sort of understanding and compromise being reached, which will be to everyone's benefit.
Finally, I have spent all my life as a working scientist in universities and hospitals. I would like to

convey to the panel and the audience the importance to which I attach the new replacement research reactor. It is in the national interest; it must not be stopped. The Government has given $300 million of new money for this purpose and it will repay itself handsomely in terms of isotopes produced and sold. More importantly, with its 17 new scientific and medical experiments, it will provide exciting new science and medical research opportunities for graduates of our universities who need them.
I think our sister nation Canada, where science is so much better supported than here - and I ask the panel not to deny young Australian scientists this opportunity by effectively stopping the reactor by refusing a licence for this facility. There has to be some compromise, and I hope in the goodwill of these hearings that such will be found. Thank you.
DR LOY: Thank you.
DR LOY: Can we turn then to questions. George, I'll let you begin.
MR JACK: Thanks very much. First to the Australian Nuclear Association, touching on point 4, I think you mentioned that the Australian Nuclear Association believes that the set of waste acceptance criteria must be not only acceptable but must be clear. Do you consider the criteria in the documentation to date to meet those standards? Are they clear and acceptable in the eyes of the Australian Nuclear Association?
DR HARDY: They are clear to me, but I think you should ask a cross-section of owners of waste do they understand what has been put down, because if the owners don't understand, then you've got a problem.
MR JACK: Thank you.
DR HARDY: I can understand them.
MR JACK: Following on from that, in 5, the last paragraph of your written submission - I don't think you touched on it - where you were suggesting that it would be more efficient or cost-effective if the generators were to package their own waste in standard containers. I guess this was written before some of the documentation was submitted. You emphasised quality assurance in various other parts of your presentation and I am wondering if this is a potential weakness in your opinion. How does the proponent satisfy itself from a quality assurance point of view that the waste generators have put only the permissible amounts of permissible isotopes in these sealed cans?
DR HARDY: First of all, it's a problem for the waste owner. He has got several drums sitting around. He may have records or he may not have such good records, but he should have some records of what is in those drums or packages of waste or in the suitcases, as someone said yesterday – such small amounts they could fit in a suitcase. Well, if they don't know what's in that suitcase they should jolly well find out by the best available instruments - to try to detect what is in those packages - and they should be asked to declare those on a form to DEST and the contractors, and I think they

should be able to do that.
17
If they can then assess what is in those packages to the best of their ability with their instruments then equally DEST should be able to do it, or ARPANSA should be able to do it with its qualified staff and its instruments. Similarly, the contractor ought to be able to check at some point that it has been given the package it's said it's been given. If it hasn't got a number stamped on it, it should have a number stamped on it and that should be put in the record book. I think these are very wellestablished practices used everywhere else; instrumental analysis, if possible; otherwise historical records of what was put in 10, 20, 50 years ago. I think that is an acceptable way to proceed.
MR JACK: I'll be following that up later today, but thank you very much. I only have one question to the Australian Nuclear Forum - and permit me, John. It is perhaps slightly off the terms of reference of this panel, but it was in the written submissions, where they referred to policy item A and policy item B in appendix 1 of your written submission. I wonder if you can very briefly explain to me the rational argument why short-lived intermediate-level waste should be disposed by burial whereas long-lived intermediate-level waste should be stored above ground.
MR BROUGH: That was written by Dr Graeme Hanna, who has got the charge of looking after this particular area, and that is his considered opinion: That at this stage the long-lived stuff might be better under some form of above-ground institutional control until we get a little bit further down the track and have a bit more discussion to really decide what should be done. Let's face it, we're still in the early days of looking at this particular issue, although it's been started way back, as far as I know, in the 1970s, not long after I joined ANSTO or, as it was known in those days, AEC. I know the State health departments were discussing it, but they never did anything until about the late 1980s.
MR JACK: There could be a discussion about it. Thanks very much. That's all my questions.
PROF LOWE: I would like to start with this issue of the ignorant public. Both of you said in your submissions that the public is uninformed about nuclear matters because there is little objective information about those topics through the education system. I have no illusions about the inadequacy of school science and I am, in fact, at the moment chairing a task force, trying to improve the quality of science education in the sovereign state of Queensland, but are you suggesting to us that people like yourself provide objective information about these topics?
MR BROUGH: Yes, I think we do. After all, I am a biologist. Certainly I am committed to a nuclear future, but I am always looking at the facts and figures. If somebody comes up with something which contradicts what I know already, I say, "Let's check that." After all, I am a scientist and I am quite prepared to say, "You're right and I'm wrong," and that's what it's all about. I spent some time late last year in looking at a revision book for years 9 and 10 science, which I believe is the last time they get any general science - is that correct; I'm not a schoolteacher - before they go on to do their HSC things.
I've got seven pages of criticism of the questions and answers and information given in that particular book on nuclear matters. We're looking into it as a group. We're going to make representations to the HSC and, shall we say, the education people and say, "Why is all this wrong information in a schoolbook? Where is it coming from?" We don't mind some of the stuff which is there - it's factual
18
and it's okay - but there is so much misinformation in that particular schoolbook. You say I, or we, should be worried about this. I'm only talking about the nuclear side of things. I haven't looked at the biological side. I am concerned as a grandparent now about the state of education. I think it's a big, big topic right now. I suggest you have a look. Would you like to see my critique of this particular thing? I'll send it to you at a later stage.
PROF LOWE: I'd certainly like to see it. I draw your attention to the report of the Ranger

Environmental Inquiry in 1976, which said that in the evidence before them there were many distorted statements about the risk of radiation and uranium mining and nuclear power, but they also said that what surprised them more was that there were also prejudiced statements given to them by people in favour of uranium mining and nuclear power, including distinguished scientists.
MR BROUGH: That is just as wrong.
PROF LOWE: It seems to me that the issue is that there are matters of fact where science can pronounce what is the half-life of uranium 238 for example.
MR BROUGH: Yes.
PROF LOWE: There are matters of probability, where, if we have enough experience, we can make informed value judgments but, for example, at the time of the Ranger Inquiry, people from organisations like yours were saying, quite reasonably, that in the 25 years of operating commercial nuclear reactors there had been no serious accidents and, at the time, that was a factual statement. Since then there have been accidents like Chernobyl.
Nobody could have foreseen that, and to have a statistical record which would allow you to say what is the operating risk of nuclear power reactors would require a hundred years of operating a large number of reactors, so that you had a reasonable statistical basis. The problem is, I think, that in some of these issues we are dealing with situations where the facts are not only not known but probably not knowable.
Alvin Weinberg argued in his paper Science and Trans-Science that an example of this is the effect on humans at low levels of ionising radiation; that it's not ethically acceptable to conduct controlled experiments in which we irradiate different humans by different amounts, although people of my age who had the misfortune to live in a city rather than the country had their feet irradiated when they bought shoes with cheerful disregard for their safety.
We can make inferences from the different levels of background radiation, say between Adelaide and Kerala and the fact that we can't observe differences in human health that arise from that, but we cannot say with certainty what the effect on human health is of relatively low levels of ionising radiation - that's simply not knowable - and so different people will legitimately make different estimates. Do you accept that?
MR BROUGH: I accept that, but I think that the tide is turning. The more information we get the clearer it is becoming that the so-called dangers of very low levels of radioactivity are rather

mythical. I can show you - well, I didn't bring it. I thought of using it, but I have got a collection of the radiation doses to 17 countries in Europe, and in fact Garry Smith will know that I donated the Atlas of Radiation to the Sutherland Shire Reference Library. When you take those doses and you look at the United Nation World Health Organisation's statistics on cancer, you might get a surprising result. You will see that in fact instead of cancer increasing with rising radiation levels - for example, it goes from 1.6 in the UK, with the highest cancer rate in Europe, to about 7.5 in Finland - you will find that lung cancer levels decrease as the radiation level rises. I know there are other factors involved but when you're dealing with a large population of, shall we say, 270 million people, as you have in the European Union, surely some of these little bumps and things can be filtered out?
Part of the problem is that we have, I'd say, how many years, John? 30 years of LNT, 50 years of LNT - that's the linear no-threshold theory of the effects of radiation - which is very very good for radiation safety purposes but it does not tell you what is happening at a low level and it means that people who wish to scare people say there is no safe dose of radiation.
That is not what the thing means and I think, John, ARPANSA's web site puts the case very clearly, about the use of the theory, as most people say in public, of "no safe dose of radiation" as a tool just for radiation protection. It is not an absolute. This is the great fear that people have: That there is no safe dose. I meet thousands of people every year and they say, "But there's no safe dose," and I say,

"How do you know that?" It's a grey area but I think more and more as we go further and further you will find that there is a protective effect of low levels of radiation, otherwise we would not be here. If there's no safe dose of radiation and the world is radioactive, how on earth have we survived? How on earth have we evolved? In fact, people don't know that 80 per cent of the earth's internal heat comes from the radioactive decay of natural radioactive elements.
UNIDENTIFIED MEMBER OF AUDIENCE: I'd like to know the difference between ionising radiation and background radiation.
MR BROUGH: It's the same thing. We're talking about the same thing. We're not talking about mobile phone radiation here or power wires and things like that. We're talking about ionising radiation from x-rays, gamma rays, beta and alpha. That's what we're talking about.
DR LOY: I think we've probably covered the field at this point.
MR BROUGH: Yes, you have.
PROF LOWE: I wanted to explore one further step. Essentially, you're saying that people are worried about this because they don't understand that the risk is trivial.
MR BROUGH: Yes.
PROF LOWE: It's certainly true that the risk is small compared to risks that people voluntarily assume, for example, by driving cars or smoking cigarettes.
MR BROUGH: Yes.
20
PROF LOWE: On the other hand, I don't think that it's good science to say, as one of our witnesses did, "I've been exposed to radiation and I'm healthy." I mean, that is the same as people who have said to me, "I've been smoking for 70 years and I'm still alive."
MR BROUGH: "And I'm not dead yet."
PROF LOWE: We know statistically that if you smoke there is a one in three chance of your life being shortened. That's a very hazardous activity, but we all know smokers who are 90. Even at that level of recognised risk, pointing out that an individual is healthy is just bad science. I think the issue here, though, is that people are much more sensitive to risks that they feel are imposed on them than risks that they feel they have voluntarily taken. Would you accept that people who are worried are not necessarily uninformed? They may simply be saying, "I do not want this extra risk, even if it's quite small compared with risks that I do assume voluntarily."
MR BROUGH: Speaking from experience, they are largely uninformed. I'll give you a little example from yesterday. Garry Smith - I think he's sitting up there - was talking about radiation doses from some of the packages. The radiation dose he was talking about was two millisieverts an hour. That would be an industrial package or a large package, say, containing a technetium 99m generator. That is an acceptable dose for transport for workers. Now, two millisieverts an hour and he said, "That's what we get in a year," with the implication, to my mind, of "Isn't that dreadful?" I would like to inform him that way back in November I had a badly pinched nerve and I got seven millisieverts from a CAT scan in 16 minutes. So people are quite happy to accept that kind of risk. Now, a high radiation dose is worse than low levels at a long time. Sorry, we have a radiation expert here. Would you like, John, to answer it or make a comment?
DR PATTERSON: This question of risk is something that medical physicists and others, and the International Commission on Radiation Protection, have laboured over for years and years. The fact of the matter is that life is a risk. We deal with risk, we manage risk, every day of our lives when we cross the road, when we fly. We take all these things into account. The level of risk where it becomes buried in the noise is somewhere around one in 10,000 and the kind of doses that we are talking about involved in the transport of radiation waste and so on is at that level where it becomes buried in the minutiae of daily life.
Thanks.

One other point is the recovery point. Life has evolved with the ability to recover from radiation injury and any other injury. It's all part of our recovery and this is a very important aspect of radiation treatment if you go to the hospital.
PROF LOWE: Thank you. The other point that I think I would want to have on the record is that most scientists believe that because they understand the science they can make quantitative judgments, and because the people are uninformed they don't understand that the risk is acceptable. Sir Robert May, now Lord May and now president of the Royal Society, gave a paper to the 1999

UNESCO World Conference on Science, in which he looked at the issue of levels of concern in different countries about the risks of genetically modified plants, and in particular genetically modified food crops. He was trying to explain the interesting observation that in those countries where the level of scientific literacy is highest, the level of concern is higher than in those countries where the level of scientific literacy is low. His explanation was that scientifically educated people understand that there are always risks as well as benefits and that only the uninformed can believe that a technical advance provides benefits without costs or risks. He argued that, actually, professional scientists are more likely to understand that there are risks as well as benefits and not to accept the assurance that you can have the benefits of the technical advance without a risk. Do you accept that argument?
MR BROUGH: Yes, I do. Can I make one final comment: In my experience when you talk to people about background radiation, which we do, and they also ask about mobile phones and microwaves, we refer them to ARPANSA's web site and things like that, but there is a genuine wonderment and interest in what we are talking about. Prof Richard Smart of St George Hospital, who I met many years ago visiting nuclear medicine departments - I went to him for some advice when I first started as a tour guide 13 years ago, on background radiation.
He said, "I'm glad you're doing this, Jim." He said, "I do it all the time. Everyone who comes into the hospital, even the cleaners, must come past my door for a talk about background radiation." I said, "What's the effect?" He said, "They breathe a sigh of relief." Once you have the knowledge then you need no longer fear. I'm not saying that there's no such thing as a bad dose of radiation. I mean, I can quite happily drink a glass of whisky. If I drank a bottle in an hour I'd be dead.
PROF LOWE: Can I move on to a couple of other issues. One of the submissions said about the repository, and I quote: "The waste will remain in the sight of both the government and the community." The previous submission argued for not having a waste repository in the remote outback on the grounds that if the waste was stored near where it was generated it would be within sight of the community. Do you accept the argument of that previous submission that at a repository the wastes might be in the sight of the government but they certainly wouldn't be in the sight of the community?
DR HARDY: I could try to answer that. This is a very common statement that is made by persons who are opposed to nuclear of any kind, and that is "out of sight, out of mind". You know, you put it underground. But this has been a concept which has been developed over 30 or 40 years. It's not something that has been dreamed up in the last few years. In the earliest days, radioactive materials were recognised as dangerous.
There were plans going back a long time to deal with the high-level waste, which is the most dangerous, coming from power stations and processing plants by the concept of not leaving the waste for future generations to deal with. Even though they might have better technology, you should not leave it as a legacy to your grandchildren. You should learn how to deal with it today and pay for it today, and those who benefit today - the users of electricity or the users of isotopes - should pay for it today and not ask their grandchildren to pay for it.

This concept of deep burial of really dangerous waste is a very sound scientific principle. If you go a kilometre down in the earth in a borehole or in a deep mine, it is very radioactive. It is putting back radioactivity deep into the earth, sealing it up and you can walk away. That's the concept. Some people think that's very good, particularly scientists and engineers who have studied it, and some people, particularly members of the public - particularly members of Friends of the Earth, ACF, the Sutherland Shire Council and Greenpeace - don't like the idea. They think all this highly dangerous waste, which has given benefits to many people today, should be left in a concrete block house on the surface and looked after by future generations - your grandchildren - and that is acceptable.
To me, it is more acceptable - a lower risk, a better benefit - if we dispose of it deep underground. That's for the high-level waste. That is not necessary for the low-level waste, which are orders of magnitude of less consequence if an accident happens. I believe in the "put it deep in the ground and bury it and forget it and walk away." It's my belief that that's the best way to deal with it.
PROF LOWE: While you're there, Dr Hardy, your submission said one way of reducing the likelihood of any dispersal of radionuclides from the trenches would be to line them with concrete instead of using unlined trenches or, alternatively, to place the waste in concrete or fibre concrete containers of appropriate size. Are you recommending that this should be done or are you simply giving that as an example of what might be an approach if we were concerned about climate change?
DR HARDY: I'm referring to that as - that is the accepted state of the art and the best practice where there is not an arid climate which you can expect to continue for many hundreds of years. If you cannot expect the climate to be arid for hundreds of years, you should go to more engineered barriers. This is absolutely mandatory in Western countries or in Japan, for example, where you cannot have an arid climate far from the population. That, I believe, is the best practice in those countries. You could apply it here. It would give you added benefits and lower risks, but higher costs. So it comes forward to the classical cost-benefit risk assessment.
The present Government and its advisers have followed the sort of issue like the recommendations of the National Health and Medical Research Council, which said burial in shallow trenches in an arid climate would be acceptable. We pointed out in the very earliest site selection studies going back many years that these criteria were perhaps not the best criteria to have done the site study. They should have had a wider possibility of looking at other alternatives. What we had in mind then, of course, was Olympic Dam, an existing mine with huge amounts of radioactivity, very deep underground. It seemed to us to make sense to come to some arrangement whereby this low-level waste be put in the empty spaces where they dug out the uranium ore. Then it would be very deep underground and I believe it would be safe.
I don't believe Western Mining Corporation was very enamoured by that proposal, because they said, "We're trying to operate a working mine. It's not very convenient to have you putting stuff in while we're taking it out," but that's just a practical problem. I have never seen a detailed environmental impact assessment for that proposal. It's never been done, because the Government has focused on the recommendations of the NHMRC for shallow land burial. In a sense, they did look at it with blinkers on and followed that line. Other alternatives that might have been acceptable were not looked at.

PROF LOWE: Can I ask you two other questions? One is that the submission said a repository is needed because of the quantity of waste generated by the Commonwealth, but we were told yesterday that the repository was being justified on the need for the States and Territories to have somewhere to store their waste. In your view, what is the case for the waste? Is it for the waste from Lucas Heights or is it for the waste from the States and Territories?
DR HARDY: My understanding is that right from the beginning, when this study started, it was entered into in good faith by the Commonwealth Government and by all the State Governments.

This is going back quite a few years. They all said, "Yes, we think it's a good idea, let's have a study," and they agreed to it, but then one by one they asked for special treatment. It's like the free trade agreement. Western Australia said, "No, we won't take anybody else's, we'll build our own. We'd like you to forget Western Australia," and so Western Australia was forgotten. Now South Australia is saying, "Well, we've changed our mind. We don't want you to consider South Australia. Go and find somewhere else." New South Wales passed a law a long time ago saying, "We don't want anything like this in our state; we're not keen." Each one has a vested interest to say, "Not in my backyard."

This places the Federal Government in a problem. Should it abandon the concept and just accept that every State should manage its own - "They're only small amounts; let them go off and do it" - and then look after its own problem, manage its own Commonwealth waste, which is not just at Lucas Heights. There are things in other places, with the Defence Department and so on and so forth, but the bulk of the waste comes from Lucas Heights. It would be entirely feasible to keep storing it at Lucas Heights, but then the Sutherland Shire Council would start again and say, "We're not having this as a long-term waste storage site." They can't have it both ways.

(Inaudible question from audience member)

DR HARDY: I'm saying, in my view and those of my intelligent members, that we've looked at this and we believe there is a good cost-benefit case for building a replacement research reactor in the national interest and that, if you do that cost-benefit analysis, it does justify the cost of $300 million for the Australian public.

PROF LOWE: Dr Hardy, could you comment on the comment made by the previous witness, which was that somebody was quoted in the media as saying that low-level waste was "no worse than a load of bananas"? It seems to me that the whole case for having a well-engineered repository in a remote and seismically stable region has to be that the waste is not as benign as a load of bananas.

DR HARDY: I don't think that's a responsible thing to say at all, to me, that kind of trivial comparison. I don't think I should answer that, but I was concerned by the speaker previous to me saying that she has very great concerns - or a geologist friend of hers, unnamed, has great fears - about the seismology of this area. My understanding of how the siting studies were done, going back many years, was that they looked at seismic activity on known data in Australia for the whole of Australia, and that was one of the major criteria taken into consideration when the initial eight areas were chosen and then narrowed down. I find it unusual if she has data or she thinks there is data

which perhaps wasn't taken into consideration, because I would have thought that if there was any significant seismic activity in that area of site 40A it would not have got a tick in the first place. I don't understand what she's saying.

PROF LOWE: This is not a question, but a comment, because this submission referred to antinuclear organisations being well organised and well funded, and I would only say that most antinuclear organisations could only dream of having the sort of resources that an organisation like ANSTO has and, while ANSTO believes it's producing public information compared with propaganda, the anti-nuclear groups probably believe they are providing public information compared with propaganda, and it's one of those irregular verbs: My information is your propaganda.

DR LOY: On that note I conclude this session. Thank you to our presenters. We will now have our morning tea break until 12 noon and then resume. At that point I will read into the record the short submissions from Prof Johnston, so that it's part of the transcript and, I think, Prof Johnston's submission is available somewhere. If it's not, it will be. If we could resume at 12 o'clock, please.

ADJOURNED

RESUMED

DR LOY: As I said before the break, Prof Peter Johnston is unable to be with us because of the impact of a virus. His PowerPoint presentation is available down on the table at the front here. I thought, given that we are producing a transcript of the forum and that will be the major record, it would be appropriate for me to briefly read his PowerPoint presentation into the record, so that at least we have on the record what it is that he wished to present to the forum. I will do that. This is from Prof Peter Johnston of the RMIT in Melbourne.

Who am I? Professor of Applied Nuclear Physics at RMIT University in Melbourne. Technical Adviser to the Maralinga Tjarutja on Maralinga clean-up since 1989. Member of the Radiation Health Committee and Nuclear Safety Committee since 2003 - *and i will interpose by saying that they are two committees set up under the australian radiation protection and nuclear safety act to provide advice to me on those issues* - Former Government scientist who worked on Health Impact studies at Maralinga in the 1980s.

His submission in overview: This is a personal submission. Australia needs a repository for lowlevel radioactive waste. The siting studies of the repository appear adequate - but, in his view, - The applicant has inadequate technical competence to manage its contractors.

The need: Australia uses items containing radioactive material in medical, industrial, domestic and scientific pursuits. There is radioactive waste stored in many places across Australia. A recent audit of radioactive waste by the South Australian EPA showed waste stored in 31 different postcode areas.

Repository for radioactive waste: Radioactive waste is a form of hazardous waste, principally different from other hazardous waste in that with radioactive decay the hazard reduces. The need for a repository essentially comes down to consideration of the alternative. Consider the consequences of there being no repository.

If there is no repository: Waste will continue to be stored in many places. In the long term some waste will be orphaned, lost or disposed to local municipal waste facilities as management responsibility will fail and some people will incorrectly handle the waste. Having no repository is not an acceptable long-term solution.

Siting: Very long-term extensive studies of suitable sites - have been carried out presumably - Rational site selection criteria. Initial national support for the process. Nobody wants a hazardous waste disposal facility nearby, but you cannot sensibly exclude everywhere. Local politics will obviously oppose a local site - you can't please everybody.

The applicant: DEST is responsible for the Former Nuclear Test site at Maralinga, as well as the Repository project. DEST was an ineffective manager of the Maralinga Cleanup in a number of key ways. The pattern of contracting required services for the Repository project is similar to the Maralinga cleanup.

Effectiveness of DEST during the Maralinga Cleanup: DEST follows the philosophy of contracting all requirements to a Repository Operator, who is a contractor. Safety is in the hands of the operator. The equivalent organisation to the Repository Operator at Maralinga could bid for other work that would be under its operational management. The primary source of advice came from this contractor. At times the project was not fully in DEST's control.

Failures: DEST concluded a contract with Geosafe Australia for technical services that contained no performance criteria. Draft documents prepared by DEST have often been technically wrong due to a lack of technical input. Non-technical public servants made decisions where technical expertise was needed. Technical advice often not sought except from a contractor.

Accountabilities: The Project Director - and I take it that this refers to the current application - is

non-technical. The Repository Manager is a contractor. The Radiation Safety Officer is a contractor employed by the Repository Operator.
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Where does the effective control and the risk lie?
Effective Control and Risk: Effective control lies with the contractor not DEST, because it lacks the technical skills to supervise its contractor. The risk associated with the release from the repository lies with the community and the Government of Australia.
Inability to manage: The applicant has not demonstrated effective control. There is a note - see Regulatory Guidelines on Performance Standards for Licence Applicants & Licence Holders. Effective control is normally required by the licence conditions imposed under section 35 of the ARPANS Act.
26
I think the page headed Mitigating of Control Problems at Maralinga should probably come before the summing-up.
Mitigating of Control Problems at Maralinga : Oversight by the Maralinga Rehabilitation Technical Advisory Committee. Maralinga Consultative Group. ARPANSA was the supporting contractor, not a regulator until 2000 - when the work was essentially complete.
Summing up: This is a personal submission. Australia needs a repository for low level radioactive waste. The siting studies of the repository appear adequate. The applicant has inadequate technical competence to manage its contractors.
Clearly it's unfortunate that Prof Johnston wasn't able to be here to respond to questions on that but, nonetheless, we will put it in the record and I am sure DEST may take up some of the issues in its presentation this afternoon and in further discussions and questions during that presentation.
DR LOY: Our next presenter will be the Australian Nuclear Science and Technology Organisation represented by the acting Executive Director, Dr Ron Cameron.
DR RON CAMERON: Good afternoon, ladies and gentlemen and the panel. We have had some discussion today about the benefits versus the risks and I would just like to take a few moments to talk about what are some of those benefits of radioactive materials. Firstly, as you know, the Australian Nuclear Science and Technology Organisation operates the HIFAR reactor at Lucas Heights. ANSTO is a Commonwealth agency but its products and services bring benefits right across Australia. ANSTO's major facility is the HIFAR reactor but it also operates a number of other national facilities which are utilised by universities right across Australia.
Safety and waste minimisation have been key focuses for us over a significant period of time. For example, since 1996 ANSTO has spent around $12 million in upgrading its waste facilities and ensuring its waste is in a verifiably safe manner. Some of the use of reactor products and services include, of course, nuclear medicines for cancer diagnosis and therapy and just recently we were talking to the Association of Physicians in Nuclear Medicine who indicated to us that hundreds of lives are saved every year by the use of nuclear material in nuclear medicine. In addition to that, of course, we have the production of radioisotopes for industry, research into materials and environmental science.
The reactor itself is used to irradiate silicon. Silicon is one of the major components of electronics right round the world. ANSTO has about a third of the world market in that. A large number of electronic components would contain silicon irradiated at ANSTO. In addition to radioisotope production, of course, the reactor is a multipurpose reactor so it's used for neutron beam science and

for leading sub-atomic research into the properties of matter itself. One example of that is the large amount of work we do for the mining industry in neutron activation analysis to help them to discover and mine ore bodies. Science is of course a major focus for the organisation. Through the Australian Institute for Nuclear Science and Engineering we award grants to students right around the country to come and do graduate and postgraduate research using ANSTO facilities.

27

For example, students from South Australian universities, including the University of Adelaide, Flinders University and the University of South Australia have undertaken a number of projects, particularly related to dating and to mining and ore body studies. Other South Australian universities have done research into, for example, testing human hair for forensic purposes, exploring the structure of polymers, radiocarbon dating of bone including a study into the Swanport Aboriginal burial site in South Australia, radiocarbon dating of organic sediments in lakes in South Australia, and also into the problems of acid mine drainage, which has been associated with a number of mining companies right around Australia and, in fact, worldwide.

In terms of the use of radioisotopes in medicine, last year approximately 550,000 patient treatments were transported from ANSTO to hospitals right around Australia and increasingly in South East Asia as well. 42,000 of these patients were in South Australia. Nuclear medicines are chiefly used for diagnosis but increasingly also to treat disease and for pain relief. In fact, I noted there that bone scans can detect the spread of cancers six to 18 months sooner than x-rays. With a replacement research reactor we will have sufficient flux to be able to produce not just diagnostic nuclear medicines but therapeutic ones as well, where we can go to actually treat cancers and tumours in situ by injections with nuclear medicines.

In terms of industry, most industries use radioactive materials. Often that's in the form of level gauges, thickness gauges and moisture detection, because of their ability to determine during the process cycle itself what is a constituent of that material and how well does it conform to the product specification. It is also used for imaging to detect flaws and weaknesses. Also, radioactive materials and radioisotopes are used extensively in mining and minerals industries. Industrial radiography is also a principal user of radioactive sources. That's primarily to look at pipe work, for example, particularly in remote areas, and to examine that pipe work to see if there are fractures for instance in gas and water pipes. These include a number of different sources - cobalt, americium and caesium. It is worthwhile noting that a single source of that type, which are mobile sources taken around by contractors and used extensively throughout Australia - a single source contains more activity than a truckload of low-level waste.

Radio tracers is another application which gives a lot of information to people in understanding pollution and environmental problems, understanding how sewage moves off Australian beaches, understanding what's happening to contaminants and sediments in our harbours and waterways. We can use radio tracers to look at the uptake of metal pollutants by fish. That gives us information as to how clean our waterways are and what can be done to improve them, and also to track the movement of sand in storm events. I just want to give you one example which comes from New South Wales. It is part of the sort of process you can use tracers for. In Homebush Bay, which is where the Olympics were in 2000 - Homebush Bay was built on an old brickworks so the sediments in the water are contaminated.

There is a great concern because there is a wetland right next to it, a wetland of particular importance. So the Sydney Olympic Park Authority are very concerned to understand what is the

risk of that contaminated sediment going into wetlands. We have been working with them for a number of years in giving them information about that particular process. One of the ways you can do that is to inject a tracer into these sediments and then by sampling of that tracer we can work out

the contours to show how quickly those sediments are actually moving. This is particularly a concern in the bay if you get storm events or flood events because those are the times when those sediments tend to move. This is an interesting technique because in fact we use a non-radioactive tracer, usually indium, and then we bring the samples back to the reactor and we irradiate them and that helps us to know how much indium is there and therefore enables us to plot those contours. That has been extremely useful information in managing all that particular wetland area.

As I said, we also can use it to understand sewage flows in harbours and that's a particular concern in many countries, not just in Australia but round the world, as to how much sewage is going into the harbour and what that's doing to the fish life. Injecting tracers into harbours and following that sewage can help people to manage that process better, to protect the waters and to ensure that those who fish and use seafood from those areas, that that seafood is suitable for eating. This particular application I've shown here was actually in Hong Kong Harbour and it won a Hong Kong Business Award because of the valuable information it provided to help people clean up Hong Kong Harbour.

Other examples of environmental research with isotopes include stable isotope techniques that have been used to study water balance within the Murray-Darling Basin of a range of climate conditions, including drought conditions, and that helps people in the long term in sustainable development, knowing how much to take out and what's happening to the water in the Murray-Darling Basin. In addition, borehole logging and injection of tracers are very useful techniques in looking at mapping salinity in our waterways. As you know, salinity is one of the major problems in Australia and of great concern for our long-term sustainable future. Using tracer techniques we can give a lot of valuable information in where that is coming from and how quickly it is actually building up.

Having talked about the benefits, I think that it was important to say so, because we recognise that no technology is without risk. When you make those decisions about technology, you need to understand that there are benefits in doing that. We believe there are significant benefits in saving lives, in helping industries, in protecting our environment and in providing to our scientists cutting-edge technologies and equipment that enables them to develop new materials and to really move ahead in science, which is going to be important for our country in the future.

In terms of transport of radioactive materials, ANSTO sends out approximately 2500 packages each month of radioactive isotopes for medical and industrial uses. Those are transported firstly by road, but mainly by air because they have to get to hospitals and nuclear medicine centres all over Australia and internationally. As well as ANSTO's movements, there are approximately another 2200 movements per month in New South Wales alone of radioactive sources which don't originate from ANSTO. So there's a large number of these packages moving around, and the transport record has been extremely good.

Transportation is, of course, undertaken under the Australian code of practice for the transportation of radioactive materials. That code has learnt from and is based on international guidance. In both cases, the package provides the primary means of providing safety, both during the routine transport and if an accident were to occur. Around the world there are tens of millions of such transports, and people have learnt a lot through that period as to how to improve the transport, how to make sure that the preparation is right for the transport, how to make sure that people are trained in doing the

transport and how to make sure that the packaging provides the sort of protection that we, as a society, should expect.
As I said, despite this large number of transports that have occurred, no accidents have happened that have resulted in any health consequences to people. That's quite different when you compare that with the transport of other hazardous materials, such as chemicals, petrol tankers, explosives, et cetera. It's worthwhile also pointing out that previous transportation to South Australia on two other occasions were conducted safely. There were no consequences to people's health and it was in full compliance with national and international regulations.
Low-level waste consists of inert solids. They're in multiple levels of containment. They're either compacted down or they're mixed with concrete in steel drums, and those are packed securely in six-metre long steel shipping containers. That has been assessed in many risk assessments as being an appropriate level of protection. There is no liquid waste to be transported and, therefore, there's no possibility of these falling off and leaking out, as has been said a few times. Even if an accident were to occur, the consequences would not be significant to people.
Just as an example of this, although this is compacted material in steel drums and the flammable content is extremely low and the other material which is more active is mixed with concrete - and, again, concrete doesn't burn very well at all - we did a calculation which we thought would be the worst case, and that's to assume there is no overpack. Assume there is no mixture with concrete, assume we condense all of the activity from one truck down into a small mass and then that mass is involved in a fire - that was an issue raised during the New South Wales inquiry - and that fire causes a plume to rise - in this case, we assumed the plume didn't rise very far before it fell down again - and people were nearby. Even with those worst-case assumptions, the dose was around four microsieverts. In flying from Sydney down to Adelaide, I got more than four microsieverts. As we mentioned before, you need to compare that with the natural background, which is about 2000 microsieverts per year.
I'd just like to say something about the security of low-level waste. At ANSTO we put a lot of attention to security. Our waste is stored in a secure building. That building is within a protected area, which is a double fenced area patrolled by guards and which has protection between the fences so that people can't get through, and all of that is within a secure site. It was interesting that the New South Wales inquiry actually commented on the high level of safe management of waste at ANSTO. Those security standards have been assessed by national and international regulators and confirmed to be consistent with international best practice. Some people have said, "What about the terrorist issue?" Low-level waste itself is of too low an activity to be a concern for use in a dirty bomb. For the type of material that's going to the repository, it is just not an attractive target for any terrorist. The short-lived intermediate-level waste that's just been mentioned - of course, the reason why it's short lived is after the period of institutional control it will be low-level waste, so in 200 years time you could walk away from it. Just to explain again what is low-level waste, certainly the waste coming from ANSTO consists of things such as paper, glassware, piping and clothing which has been in contact with levels of radiation. Other slightly more active spent material is the material that

would be mixed with concrete, so it is all solid. Low-level waste contains enough radioactive material to require action for the protection of people, but not so much that it requires shielding during handling, storage or transportation.

We've given some examples of low-level waste compared to radiation doses from various sources. If you were to stand just two metres away from a truck containing this waste on its way to the repository, you would get less than 0.1 millisieverts per hour, which is less than what you get from a single chest x-ray. Also 0.1 millisieverts per hour is the sort of radiation exposure you would get if you flew from Sydney to LA and back again.
CT scans were mentioned earlier. It depends on which part of your body is scanned. If you have a brain scan, it's about five millisieverts. If you have a total body scan, it's about 10 to 15 millisieverts. The limit for occupational exposure is 20 millisieverts. We've talked a little bit about whether those are acceptable. I think, with regard to any risk which is imposed on you, you always have to consider the benefit versus the risk. In many cases we don't accept any risk that people impose, but as a society we tolerate certain risks because of the benefit we obtain and because of the need that we have for those particular activities.
A number of organisations around the world have looked at all the data over 50 years - whether that came from the atomic bomb survivors or from large groups of nuclear workers - and they have determined that certain levels are safe. Those levels are, essentially, one millisievert per year for members of the public and up to 20 millisieverts per year for an occupationally exposed person. They regard those as safe levels. It doesn't mean there's no risk, but compared to the other risks which people have in their occupations or from other activities those are certainly regarded as safe.
ANSTO holds, by volume, about 30 per cent of Australia's low-level and short-lived intermediate-level waste. We generate about one truckload per year. That means that after the initial legacy of past years has gone to the repository there would only be one truckload needed per year. If the repository operates in campaigns, then we're talking about maybe three trucks once every three years.
This waste is stored at a special facility in steel drums. Those drums are inspected regularly. Before the material goes into the drums it's scanned, using a drum scanner, so we know exactly what is the radioactivity of all the material in each drum. That information is kept in our records so we know before it goes into this building for storage exactly what's there and exactly the number of the drum which it's in. I think it's very important to have that information prior to transport.
We talked a little bit earlier about the replacement research reactor. The replacement research reactor offers a huge increase in our capability to provide not just diagnostic but therapeutic nuclear medicines and to really go into nuclear medicines where we can target individual molecules with radiation and deliver those molecules individually to the tumours in a slow-release process, which will improve the health care of Australians significantly. Likewise, a new reactor will offer Australian scientists the opportunity to use cold neutron science and to look at biological molecules and polymers and very much increase our capability as a nation to compete in the world. We believe it will be a centre of excellence, certainly in our region.

But, of course, in making that design, we took the opportunity to enhance the inherent safety features of the reactor and also to make sure that waste minimisation was a major feature. For example, in terms of emissions to the atmosphere, there will be about a 50 per cent reduction in off-site doses. The current level is about 0.005 millisieverts per year for someone who stood on our boundary for 365 days a year, 24 hours a day. We are talking about reducing that by half. That is an extremely low number, and it is well below the number quoted in the Sutherland Shire Council's report as being

from Frank Barnaby.
Tritium emissions will be reduced by more than 99 per cent, because the reactor will be cooled by light water and not heavy water and, in terms of solid waste arising, we will have a 20 per cent reduction in low-level solid waste and more than 90 per cent reduction in intermediate-level solid waste. So we have taken the opportunity with the new design to look at safety, to look at operability, but also to look at waste minimisation.
We believe that the central repository idea is international best practice. We believe it's important that waste is contained in an engineered central repository so that it can be safely managed over long periods. The site could be chosen to have the best characteristics to ensure that it is managed safely, rather than being dotted around the country in temporary stores, such as hospitals, universities, industrial plants, where the safety and security cannot be guaranteed.
We know that in South Australia's holdings the Environmental Protection Authority did an audit and indicated there were 134 such sites in South Australia where radioactive material was stored or used, of which 80 also contained radioactive waste. By far the greatest volumes of course are tailings associated with mining and milling sites.
In summary, ANSTO considers that there are extensive and well-proven benefits in medicine, research and industry from the use of radioactive material, including the mining and mineral industries of South Australia and in environmental research. But some waste does arise from those activities, and we believe that that waste can be managed and has been managed safely and securely over many years. Radioactive materials are transported on South Australian roads every day, following the same codes and standards as would apply to the transportation of low-level waste. As I said, after the initial legacy wastes have been transported, the number of such transports will be very infrequent indeed.
We believe that all Australian states have radioactive waste which requires appropriate disposal and that the repository represents the best way to do that. Thank you.
DR LOY: Thank you very much, Dr Cameron. George, may I pass to you to open the batting for questioning?
MR JACK: With pleasure. Thank you, John. Dr Cameron, in one of the last slides you showed, you indicated a 20 per cent reduction, I think it was, in low-level waste generation and a greater than 90 per cent in intermediate-level waste generation with a new reactor. I don't wish to open a discussion on the replacement reactor, but yesterday there was a lot of comment about waste

minimisation being one of the principles accepted internationally for good waste management practices. In fact, it is one of those listed in the fundamentals document of the IAEA. Can you expand upon how you've achieved those very significant percentages in reduction of waste generation that you're quoting in your slide, please?
DR CAMERON: Yes. I think there are three main things: One is technology. We have taken the opportunity to bring in the best technology for separation of waste, so that when we have a waste stream we now have the ability to separate out of that waste stream the radioactive components and to contain them separately so we don't have to manage the whole stream but just the bits of that which are radioactive. Secondly, we have spent a lot of effort in separation of waste, so that we make sure that only radioactive materials go into radioactive waste streams and not general materials. One of the issues early on in the history of the AEC was that the waste streams became mixed and therefore they were much harder to handle. So we have a separation process and very separate collection capabilities for both types of waste.
We also have managed to introduce processes that volume-reduce that waste very considerably. We have invested quite considerable amounts of money in plants which actually can produce that volume reduction, so the amount we're actually dealing with is much lower. I should say, for example, one of

our research areas is into the use of solgel techniques. Solgels are really a process by which we can selectively extract caesium and cobalt out of waste streams because they get encapsulated in solgels. That's proved to be an extraordinarily effective process, and that means the sort of liquid streams now going to waste have much lower activity than they had before. But I think it's a mixture of management processes and technology processes that we have used.
MR JACK: These are percentages of volume reduction, not radioactivity content - mainly volume measurement?
DR CAMERON: Mainly volume, but in fact you'll see that in terms of the amount of intermediate-level waste we've also got activity reduction as well, so that the amount of intermediate-level waste is much less than before. That's really a design process. I think the industry has learnt over many years that we can design things such that the number of components that get exposed is much lower. So we've used the shielding process, the design process, to make sure that we activate much less material than before.
MR JACK: I read in the documentation that much of ANSTO's existing waste inventory has already been packaged in drums ready for shipment, and I was left with the impression - and I may be wrong or I may be right - that some of this was done before the waste acceptance criteria were generated by DEST for the proposed repository. I'm interested to know how you could be so prescient? How could you have known in advance what the waste acceptance criteria were going to be, or did you, or was it just a lucky coincidence? Could you expand upon that for me, please.
DR CAMERON: We don't believe in using luck for these processes.
MR JACK: No, I know.

DR CAMERON: Clearly, the majority of our waste simply needs compaction, because it's paper, glassware - whatever - and that is just compacted. We have now a separate compaction plant where we can do that. That is a process that can be altered, if it needs to be altered, so there's no particular difficulty in doing that. The only process that you might think would be difficult to alter would be if you had already mixed it with concrete. Very little of our material has already been mixed with concrete. We have just built a sedimentation plant, but we have spent 10 years trying to understand the properties of concrete and how well it copes with radioactive waste and what that means in terms of how it gets dispersed in the concrete matrix.
Those really have been trials rather than a full-scale process, but they have been based on IAEA acceptance criteria and the criteria which are used around the world, plus a factor. We think we've put a factor in there that will cope with whatever comes out in the waste acceptance criteria.
MR JACK: I don't know if you were in the audience yesterday. There were various statements made by the presenters yesterday critical of ANSTO and the management of ANSTO, and referring to it as an organisation of secrecy or something like that. I wonder if you or any of your colleagues who heard some of those allegations would have any comments to make about some of the statements - for example, a total lack of information coming out about transportation of waste, et cetera.
DR CAMERON: I think ANSTO produces each year a very comprehensive document on all its waste and how much waste we create and how much waste we discharge, both to air and as part of our trade waste agreement. That is publicly available in public libraries. It was interesting to us that the New South Wales inquiry commented that they believed that was comprehensive, in terms of information.
In addition, and as a site, we certainly encourage people to come and visit. We have a large number of tour groups that go through each year. At our last open day about two years ago, we had about 5000 people who came through the site. They get the opportunity to go around and see all the activities that are happening. Recently there have been difficulties because of security concerns,

about people going through the reactor itself, but we're hoping that those will gradually abate with time, because the organisation is certainly keen to have people come and see what it does. If you looked at our list of visitors for a year you'll see it's a very large number of visitors.
We believe in our EIS process and our licensing process. We produce vast volumes of information of all that we did and I think that information is publicly available. We also have a community rightto-know charter which we have issued and that gives people the opportunity to request information. It goes beyond the normal freedom of information process in that it puts no charge on them when they ask for information of that type. But it is constrained by freedom of information regulations, in the same way as many other industries are.
MR JACK: In my experience, producing information is essential, obviously, for public information, but producing it and making it available and being willing to respond to requests or inquiries is one thing; there's another very important layer that is sometimes put on there of proactive going out and talking to the - or seeking out the critics and asking them specifically to come and be informed. Does

ANSTO do any of that proactive specific consultation, rather than just being available to respond to requests?
DR CAMERON: Yes, we spend quite a lot of effort in doing that each year. We go out and talk to community groups on a regular basis. We have an active program working with schools. It was interesting - we did a positioning research recently which showed that 90 per cent of people in the community would like more education in the schools in nuclear science and technology, so we are now trying to work with schoolteachers to produce material that would be useful for them, in explaining some of these issues.
We also find that 84 per cent of people in the population as a whole, and that included three centres - Sutherland, Bankstown and Adelaide - would like to have more information on nuclear science and technology and its benefits, and we're now going through an active program trying to work out what type of information and what is the best way for that to be done. In addition, our web site of course gets a very large number of hits every day - something like 1200 or 1500 hits per day.
MR JACK: Thank you. They are all my questions.
PROF LOWE: I have one detailed one and a couple of more general ones. The detailed one - if I got it correctly, the figures you gave were that someone standing two metres away from a truck containing low-level waste would receive a dose of less than 0.1 millisieverts per hour. Do you know how much less than 0.1 millisieverts per hour?
DR CAMERON: I don't exactly know, but it would be significantly less than 0.1.
PROF LOWE: I guess that's the issue because if it was, for example, 0.1 millisieverts per hour, someone two metres away from it for 20 hours would receive about the equivalent of natural background for a year. So that somebody who drove a truck from Lucas Heights to north-western South Australia would receive in that period about the equivalent of natural background for a year. Presumably you would have industrial issues if there were significant numbers of truckloads.
DR CAMERON: Absolutely, and of course drivers are monitored before they do such trips so we know exactly what a driver would receive. Because we've done such transports before, the exposures to drivers are actually very small.
PROF LOWE: Right. I was having difficulty reconciling that figure with your worst-case scenario of a fire that dissipated all of the radioactive materials, because you said that that would result in an exposure of four microsieverts and I was having difficulty seeing how the exposure from a fire that released all of the radioactivity could be less - by orders of magnitude - than that which would be received by somebody outside the steel container. Can you reconcile those differences for me?
DR CAMERON: Yes, I'll certainly try. There were two issues which were raised with us. One is what is the hazard from this truck itself? Suppose you stood near it, et cetera. What sort of dose

would you get? The whole point of waste acceptance criteria is to make sure that the amount of activity in a drum and the amount of activity in a truck means that people wouldn't be exposed
35
beyond what is a reasonable amount. But of course radioactivity falls off at a distance. If you were not two metres away but four metres away, you know it's going down. It's a square model.
PROF LOWE: Square law, yes.
DR CAMERON: But then someone said, "Well, suppose there was an accident?" We said, "If there's an accident normally what would happen is the drums would fall off and we'd put them back on again." Then another group said, "But what if there was a fire with the accident as well, so that it was all vaporised in this high-temperature fire?" So we did the calculation and vaporised it all. Of course, vaporising causes dispersion; quite significant dispersion. You get plumes rising and you get it spread over a longer distance, but the worst case for a person who stood around that area and breathed in some of this would be about four microsieverts. But, of course, the fire does have a dispersive potential, that the drum by itself does not have.
PROF LOWE: Okay, thanks very much. Two more general issues: One is that several submissions that have been made at this hearing have suggested that waste should be kept where it is rather than transported to a national repository. What would be the implications for ANSTO if that argument were accepted?
DR CAMERON: Really, we believe there are none. ANSTO is capable of handling and storing wastes for long periods of time. There is no difficulty with that. I think we've been doing it for many years. We have the capability and technology to do so. We are prevented by a change that was made to the ANSTO Act at the response of Sutherland Shire Council from becoming a de facto repository. It's not allowed by the ANSTO Act. But we have the storage capability and the technical capability to store our own waste, certainly.
PROF LOWE: Okay. One step further down that chain, some of the submissions to us have suggested that the regulator would have difficulty giving you an operating licence for the replacement research reactor if you did not have this provision for off-site storage and management of the waste. Is that a valid argument?
DR CAMERON: I think that's a question you need to put to the regulator, but I'm not aware that there is any particular requirement on our licence that relates to low-level waste.
PROF LOWE: Just to be quite clear, what you're saying is that from the point of view of ANSTO, if the applicant were not to succeed in this proposal and there were not to be a national waste repository, you would be confident in your ability to store and manage the low-level waste that ANSTO produces on your existing site?
DR CAMERON: Absolutely, but I need to go back really to what is a repository versus a store because I think that issue is mixed up. There are a number of temporary stores all over the place, but they are stores; they are not repositories. The point of a repository is to store it for long periods of time, so you could effectively, after a period of institutional control, walk away because all you have is a slightly radioactive natural ore body, the same as you have in many other places. That's the issue with a repository - that there are barriers caused by how you construct the thing, which means that it
36
is safe to do so. If you're storing it then you need institutional controls all the time, so you need to be managing it safely and securely all the time that it's with you, and that's why people internationally have said a repository is the best international practice for dealing with low-level waste.
PROF LOWE: If this application were not successful, would your view be that the process should be started again and another search made for a repository, or would you convert your storage

facilities at Lucas Heights into a de facto repository?
DR CAMERON: I think I answered previously that we're not permitted by our act to do so, that would need a change in the ANSTO Act. But I think I also said that international practice is that a repository is how we should handle low-level waste for long periods of time.
PROF LOWE: Thank you very much.
DR LOY: George has just thought of something else.
MR JACK: This last series of questions by Ian - I realise and I understand that the ANSTO Act doesn't allow you to accept other people's waste, but your own waste arisings, current and future, would you - if the current application were to be unsuccessful could you envisage converting that into a repository for your own waste on the ANSTO site, or would you continue just to store it? It's a slight development on Ian's question.
DR CAMERON: Absolutely, but that's not a decision for ANSTO to make. The disposal of radioactive waste is a government responsibility, as you would know from Canada as well.
MR JACK: I see. Thank you very much for that clarification; it's important. Thank you.
DR LOY: Thank you, Dr Cameron. The material you presented, including your worst-case analysis, was I assume in your submission to the New South Wales inquiry. Is that correct?
DR CAMERON: That latest one wasn't, but it was a question that arose as a result of the inquiry, so we thought we would do the calculation. Now you mention the inquiry, I think it is worth saying that there have been various reports of the inquiry but if you look into the body of the report it comes to four conclusions which we thought were very important: One is that transport can be managed safely; secondly, that the likelihood of any impact on people is very low; thirdly, that ANSTO safely manages, handles and stores its current waste; and the fourth one is that the report itself makes it clear that you need to deal with more than just ANSTO. There are other holders of radioactive materials and so whatever solution you come up with has to deal with these other people who hold radioactive materials all around the different States.
DR LOY: Okay, I'm glad I gave you that opportunity, but my question was really about how we get the supporting material for your presentation on the public record, as part of the ARPANSA process. I think it would be material that people would like to see and respond to.
DR CAMERON: Yes.

DR LOY: And the New South Wales inquiry will be formally referred to us, I believe, but perhaps if you could send in the form of a public submission some of that supporting material and we could include that on our web site for people to see and to comment upon, if they wish.
DR CAMERON: Yes, we can certainly supply it to you.
DR LOY: Thank you.
PROF LOWE: I have also thought of one more question, which is a semi-technical one. Some submissions yesterday suggested that burying waste was not best practice and that long-term storage was more safely effected above ground. Do you have any technical comment on that proposition?
DR CAMERON: I think the technical analysis which has been done of burial suggested it's a very safe method for low-level waste and short-lived intermediate-level waste, and that's really a function of the activity and the period of institutional control versus the period when you would be relying on natural and engineered barriers to give you control, so I think if you read the IAEA documentation and if you look at what's happening around the world - in France, in the UK, in the US, et cetera - people are realising that that sort of burial process can be very safe. Again, if you look at the incidence relating to that, there are I think almost none, so it has been done safely and it can be done safely.
When you come to long-lived waste then you need to make sure because the waste is longer lived that the barriers have an increased effectiveness, and I think shallow burial would not be suitable for

long-lived waste because of that reason. You need to have more dependency on your engineered barriers and you need to be more dependent on both your near-field and far-field variables to understand what happens over much longer periods of time. I think the process that you would adopt for long-level waste would be different to that for low-level waste.
PROF LOWE: And just following that up, it was suggested to us by a previous submission that if we were concerned about the possibility of water ingress and leaching we should be thinking about concrete lining of the trench or packing of the waste, rather than disposing of it in the ground. Do you have any comment on that proposition?
DR CAMERON: Clearly that needs to be looked at in terms of the risk assessment, but part of the process that has been gone through in identifying this site indicates that it is an arid site; that it has a very low watertable and that the water in that watertable is not such as to be a concern in terms of drinking. We're talking about a period of institutional control, which is maybe 200 years. I don't think there is anything in our climate change predictions that would indicate that Australia is going to significantly change in that period of time.
However, if there was other information - I don't know of it - but the period of institutional control is very important because that's the period in which, as I said, the short-lived stuff becomes low-level and you could, essentially walk away from the process. That needs to be factored in in any particular risk assessment, but I go back to the point again. The reason this site was chosen is because its

characteristics are so good with regard to those things you would like to see in place.
PROF LOWE: Thank you.
DR LOY: Thank you very much, Dr Cameron. We will now have our lunch break and recommence at 2 pm. This afternoon we will be devoting to hearing from the applicant and obviously asking, I expect, quite a number of questions, so if we can resume at 2 pm. Thank you.
ADJOURNED
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DR LOY: This afternoon will be a fairly detailed session from the applicant, the Department of Education, Science and Training, about its proposal for a facility licence to site, construct and operate the national radioactive waste repository. How we will proceed is that there will be roughly, I understand, four sessions beginning with Dr Perkins providing an overview and some site details, followed by a presentation on hydrogeology, then we'll have questions from the panel; then a presentation on operations and design, followed by questions; a presentation on safety, followed by questions; a presentation on the inventory and waste acceptance criteria, and questions on that. We'll then bring it all back together and have a final question and answer session covering the whole set of issues. If members of the audience would like to ask a question, or would like to see a question asked, if you would jot it down on one of the Adelaide Convention Centre's nice pads, some of which are available down here, or on any scrap of paper and pass it to Colin Buckeridge, who is there, and Narelle over here, to pass it up to the panel, we may ask it in that final session, depending on whether it has been answered during the session or whatever. That seems to be the sensible way to be able to get questions from the audience in a reasonably straightforward manner. Without further ado, may I call upon Dr Caroline Perkins to commence on behalf of the Department.
DR CAROLINE PERKINS: Thank you very much, Dr Loy. As Dr Loy has said, we are going to talk today about Australia's national radioactive waste repository; our application to ARPANSA for a facility licence to site, construct and operate the facility.
I thought I would first talk a bit about the national repository and get it into context. What the Australian Government proposes to do is to site, construct and operate a national repository for disposal of low-level and short-lived intermediate-level radioactive waste at site 40A, which is

located about 20 kilometres east of Woomera in South Australia.
We put in a facility licence application to site, construct and operate the facility, which was submitted to ARPANSA in August last year, and the licence application was accepted by ARPANSA and complies with the requirements of the Australian Radiation Protection and Nuclear Safety Act. The Australian Government Department of Education, Science and Training - DEST - will be the owner of the national repository and will have the overall responsibility for the safe and effective operation of the facility. The radioactive waste management section in DEST has responsibility for the management of the facility.
39
What I want to do is give an overview of the proposed national repository. I want to also talk a bit about the background to the project, because this is a process which has been going on for many years. I then want to talk a bit about the site-specific evidence for site 40A, against the National Health and Medical Research Council's site selection criteria for the new surface disposal of radioactive waste in Australia. Then Peter Woods, from Parsons Brinckeroff will talk a bit about the hydrogeology, then - as Dr Loy has indicated - we will have a break for questions. Then repository operations will be addressed by Tony Ryan of Gutteridge Haskins and Davey. The safety of the facility will be addressed by William Rodwell of Serco and the design inventory and waste acceptance plan will be addressed by Malcolm Cooper of EnviroRad. I hope, too, as we go through we will pick up some of the issues that have been raised in public submissions and in questions that have previously been raised by the panel. Of course the panel will also have the chance to ask further questions.
What are the objectives of the national repository? To strengthen Australia's radioactive waste management arrangements by promoting the safe and environmentally sound management of lowlevel and short-lived intermediate-level radioactive waste and to provide safe containment of these wastes until the radioactivity has decayed to background levels.
To give an overview of what we are not going to do here: Radioactive waste generated outside Australia will not be accepted for disposal in the national repository. The national repository is not intended for radioactive ores from mining, which are disposed of at the relevant mine site. I should also note that the Australian Government is in the process of identifying a site for a national store for long-lived intermediate-level radioactive waste produced by Australian government agencies and the national store will not be located in South Australia.
What is the facility? The national repository will be a shallow burial facility for the disposal of lowlevel and short-lived intermediate-level radioactive waste. The site for the facility, site 40A, is 1.5 by 1.5 kilometres - that is, 2.25 square kilometres - and is located about 20 kilometres east of Woomera in South Australia, about 500 kilometres north-west of Adelaide. A map of the region is shown here - a part of Australia that you are all pretty familiar with.
I just thought I'd talk a bit about the area. Currently this part of South Australia is used largely for pastoral grazing, both sheep and cattle. There are also a number of mining towns: Roxby Downs supports the Olympic Dam copper/uranium mine; Andamooka is an opal-mining town; Woomera - which is the closest town to site 40A - is the administrative centre for the Woomera prohibited area, which is a defence area where various trials occur. It is also an area of pastoral leases. Port Augusta is the regional transport centre.
This is just a closer map of the site, showing the site and the access route. I should note the access route follows a route that was cleared by Aboriginal groups for heritage values. Lake Windabout is probably worth noting in the south-eastern part of the map there. That is a salt lake. A picture of the

site: The area is a gibber plain desert; it's a stony desert. It's characterised by small shrubs, not trees. There is a very deep, saline watertable. This characteristic is particularly attractive for the facility.
40
The facility will consist of disposal structures, both trenches and boreholes up to 20 metres deep in which containers, mainly steel drums, of conditioned radioactive waste will be buried for disposal. The disposal structures will be located in the central part of the site. Here is a diagram of the site. In actual fact most of the site will be an empty buffer zone. There will be a fence on the margin; that is, around the 1.5 by 1.5 kilometre margin. This will be a fence which is an exclusion fence. It will be feral-animal-proof, so we hope that the area inside the buffer zone will be able to regenerate in terms of flora and small animals. There will also be a security fence around the 500 by 500 zone. If I knew where the laser pointer was - here it is - I will see if I can use it. Here we go - so that is the outer fence; 500 by 500 metres has another fence around it.
The actual trenches and boreholes for disposal will be in the central 100 by 100 metre area. There will also be an access road from the corner of the site, some support buildings - most of these would be removed between campaigns - but there would be one building that would remain on the site permanently. As I said, there is a series of security fences. The main security fence is around the trenches here, but there are also other exclusion fences.
Just to talk a bit about the trench and borehole design: In the case of the trench, this structure here, as I mentioned waste is placed in steel containers within the trench. There will be some sort of clay base to the trench, mainly to facilitate the collection of water which could accumulate during operations, and there is a monitoring point for that, a collection point here. The top of the disposal cover will be clean material of at least five metres' thickness. This will be a multilayered and domed cover. The idea is to retard the infiltration of water.
My co-presenters will talk a bit more about this later on. This will consist of various layers of clay soil; a high-density polyethylene membrane will be part of it, too. After the disposal campaign is completed, the cover will be put on the trench and the stone covering will also be put over the trench, which is a very good natural protection for the landscape against erosion. In the case of the borehole disposal, once again the waste will be buried in drums. There will be a cover of at least five metres of clean material, multilayered cover and the diameter would be about two metres across.
The national repository is designed to accept about 10,000 cubic metres of low-level and short-lived intermediate-level waste over a 50-year operational period, and there will be a review after 50 years to determine whether operations should be continued.
Following closure of the facility - in other words, when waste won't be accepted any more - there will be a 200-year institutional control period in which access to the site will be restricted and the site will be monitored. There will be a disposal operation every two to five years and obviously this will be flexible, as the need arises for a campaign.
I note something has been made of the fact that waste producers will have to continue to use all their stores during the time between campaigns. In actual fact, a lot of the waste which is currently existing is a result of historical practices. In other words, it's not generated any more - for example, old exit signs in which tritium was used; things like radium needles. So in actual fact, once the historical waste is cleared out, I believe many of the existing stores in places like hospitals and universities essentially won't have any backlog of waste at all, and they're generating new sources at
41
quite a slow rate - a very slow volume.
The facility will be owned by the Australian Government. Operations will be oversighted by DEST and undertaken by contractors. Perhaps just in passing I should mention, of course we've given this model some thought. DEST has core capabilities in terms of management of contracts and of contractors. In terms of the way the facility will run there will obviously be periods of intense

activity before and during the disposal campaigns, between which there will be surveillance and monitoring of the facility. It won't be a continuous need to have people working day in, day out. In actual fact, the contractor model is quite attractive because, if you think of the range of skills that we need, we need health physicists, earthmovers, specialist security and transport contractors. Obviously, it's not practicable for us to put those people on staff for a short campaign and have them, essentially, if not fully active between disposal campaigns. The repository management system has a sophisticated system for documenting and retaining information to ensure that there is no loss of corporate knowledge between campaigns. In addition, the Australia Government also has a very exhaustive archiving system and all the documents relating to this facility would be kept indefinitely. I should also note that contractors would work under the direction of DEST and obviously would be included in the regulation and the licence given by ARPANSA, if Dr Loy makes that decision for the facility. There will be a charge for waste disposal. That this was to be the case was first mentioned in public documents in 1995. Obviously the cost of all the studies we've undertaken to get to this point have been quite significant. In terms of charging people for waste disposal, we don't intend to recoup all our costs. We'll probably aim to cover costs of most of the operational aspects of a disposal campaign, but there's also another reason - that we do want to encourage waste minimisation, so I think it's a good discipline for people to think that there is a cost. Obviously what they're doing is giving us the waste for long-term disposal and it's only fair that there should be some sort of cost associated with that. The facility will be under surveillance and monitoring during and between campaigns.

Now, conditioned solid waste would be accepted for disposal in the repository and the waste would be conditioned or processed or treated by waste owners for disposal prior to transport by Australian Government contractors to the national repository. Waste owners will need to demonstrate that the waste meets the acceptance criteria for disposal prior to the acceptance by the Australian Government for transport to the repository and for non-Australian Government waste the waste ownership would be transferred to the Australian Government at the time of collection for transport to the disposal site. I think a few words have been said about transport this morning by ANSTO. I just want to recap that radioactive materials are safely transported every day in Australia for use in medicine, industry and research, and over 30,000 packages of medical radioisotopes are transported annually from ANSTO and, over the past 40 years of transport of radioactive materials, there has not been a significant incident which has been harmful to people or the environment.

Transport of solid radioactive waste to the national repository would be safe. Radioactive materials would be transported in accordance with ARPANSA's 2001 code of practice for the safe transport of radioactive material, which is based on International Atomic Energy Agency regulations. According

to those regulations waste would be transported in containers designed not to be breached in the event of an accident. I should note, too, that the New South Wales Parliamentary Inquiry into the Transport and Storage of Radioactive Waste did note that:

The committee agrees with the views of both the Environment Protection Agency and the State Emergency Management Committee and fire brigade that the transport proposals for low-level waste can be safely managed.

To talk a bit about the types of waste that are going to the repository, there are three categories, which were defined under the National Health and Medical Research Council Code of Practice. Category A waste is things like contaminated laboratory waste, soils with low levels of contamination, such as the CSIRO soils that were transported and are actually stored at Woomera at present, and the material would be compacted in the steel drums for transport and disposal. Category B, which would include things like sealed sources or gauges, calibration sources, foils, some therapeutic sources, et cetera. The sources would be contained in metal housing, either their

own original housing or new shielding, if required - which would probably be stainless steel or brass - and then they would be embedded in concrete in a drum. Category C is bulk materials of higher levels of contamination than in category A. It includes things like soils and minerals waste, but mineral waste is historical. It's not stuff that's coming from mines at present because that's disposed of at the mine site, and surface-contaminated objects.
These would be transported with minimal conditioning in steel containers or, in the case of surfacecontaminated
objects, conditioned in a concrete matrix and placed in a steel drum or large steel transport container. All the steel drums are also going to be transported in shipping containers, as was mentioned this morning. The first disposal container, about 170 trucks would be needed to transport waste from around Australia to the national repository to clear the backlog of waste and more than half the existing 3700 cubic metres of waste is already at Woomera.
I just note that hundreds of trucks travel through most regional centres on a daily basis; for example, 760 trucks pass through Port Augusta each day and many of them carry flammable or toxic material, so really 170 trucks is not a huge number if you consider the volume of trucks that use our roads every day. Australia currently has about 3700 cubic metres of low-level and short-lived intermediate-level waste. We generate about 40 cubic metres per year and the waste is generated from the beneficial use of radioactive materials in medicine, industry and research, and I think something was said about that this morning.
Just the breakdown of waste - CSIRO Fishermen Bend soils that are stored at Woomera - about 2000 cubic metres; ANSTO has about 1320 cubic metres; The Department of Defence about 210 cubic metres; the States and Territories about 160 cubic metres - this is of conditioned waste. In terms of future arisings, about 40 cubic metres a year; 30 generated by ANSTO on a routine basis, and other Commonwealth agencies, States and Territories, about 10 cubic metres. At some stage in the future the HIFAR decommissioning wastes will be generated and the actual volume of this will vary between about 2500 to 500 cubic metres depending on which option is chosen for the decommissioning.
43
Australia's radioactive waste is presently stored at hundreds of sites across Australia, largely in buildings where storage space is limited and that were not designed for the long-term management of the material until it decays to background levels, and disposal of waste in a purpose-built national repository will reduce the cumulative risks of storing waste in numerous non-purpose-built facilities. The community and the environment will benefit from the establishment of the repository by ensuring that the waste is isolated as much as possible from the environment and people, and responsibly monitored and managed.
I guess there a few points associated with this. In many cases where waste is actually stored at present in universities and hospitals the responsibility to look after that material resides with one or two people, so to say that waste is stored in something like a safe - potentially the person who is responsible leaves the institution and the knowledge of where that radioactive material is may not be passed on to another person. There was an example of this a few years ago in Melbourne when a hospital was demolished and a safe was sold to a scrap metal merchant and he proceeded to cut it open in his backyard, to find there was some strange material in it and he was smart enough to investigate further and to seek some expert help, and it was found that this was radioactive source. That's an example of what can happen with radioactive materials in the long term if there's not a dedicated facility that is set up for the long-term management of the material. I think also there have been other instances, too, where radioactive sources have appeared on bits of scrap metal which have been exported. The reason for that is the sources have been lost track of, basically by the institutions who are looking after them and managed to find their way to a scrap metal merchant. It's really a

good argument to have a purpose-built dedicated facility. In addition, there's the principle of intergenerational equity: That what you can do safely now and manage now, you shouldn't put off to another generation. Of course, disposal of low-level and short-lived intermediate-level waste has been practised safely around the world for decades. At present there are over 100 facilities similar to the one we're proposing for the national repository in over 30 countries around the world, so it is an accepted and established practice to deal with waste in this way.

The process, of course, does have a long history. Even as early as 1979 I understand that the Commonwealth-State Consultative Committee on Radioactive Waste Management looked at possible options for long-term management of Australia's waste, which really meant disposal of the waste in a purpose-built facility, and put forward a discussion paper. In 1985, the committee - which is composed of regulators from all the States and Territories, as well as the Commonwealth and people with policy responsibility for radioactive waste management - recommended a national program to identify sites for the national repository. The committee clearly recognised that, given Australia's circumstances - we've got a small amount of radioactive waste, most of which is suitable for near-surface disposal - it would be technically and economically inefficient for all the jurisdictions to establish their own disposal facilities.

The recent South Australian Government audit of radioactive materials in South Australia also concluded that the current management is not a long-term solution to looking after waste responsibly, and they are thinking about - as, I think, Minister Hill said yesterday - some sort of purpose-built or dedicated facility. I don't think they have any argument that the current arrangements are not

satisfactory in the long term.

Coming out of that recommendation of the Commonwealth-State Consultative Committee, various technical studies were undertaken. In 1986, studies showed that most States and Territories contained potentially suitable sites and, although all Governments supported a national repository, only the Northern Territory expressed interest in hosting the facility. I guess this was a sort of volunteerism-type process. In 1988 the Northern Territory agreed to a Commonwealth-funded feasibility study, but in 1991 the Northern Territory advised it was not prepared to host the national repository, so that process concluded then.

The next step was that in 1992 the National Health and Medical Research Council published the code of practice for the near-surface disposal of radioactive waste in Australia. It was developed from international criteria and stressed the importance of natural site characteristics in providing an effective natural barrier to radionuclides from waste and to human intrusion. The criteria emphasised factors such as suitable geology, groundwater, arid climate and land use. The criteria were focused around siting a facility in an arid environment, because the key is to isolate waste from groundwater and an arid environment is excellent for such a thing.

The current project started in 1992. It was announced by the former Minister for Primary Industries and Energy, Simon Crean, and all States and Territories agreed. I believe at that time it also included a Labor Government in South Australia, which agreed to this national process. The process involved, stepwise, scientific assessment and community consultation. It has been quite an exhaustive process. I should say the process in the siting studies was that, for each phase, we released a discussion paper. I won't show you all of them. The committee has some of them, but we'd release a discussion paper and then we'd invite public submissions. We'd publish a paper subsequent to that, responding to issues in public submissions. That happened in three phases. The first one commenced in 1992. Phase 1 really consisted of developing a methodology using a computer based geographic information system to assess Australia against the 13 relevant criteria which had been documented by the National Health and Medical Research Council.

The response paper was published in 1993. In 1994 phase 2 commenced. What this involved was

the application of the site selection methodology to identify regions likely to contain suitable sites, and eight regions were identified. I'm just showing the map of the eight regions. The central north region was the region we ended up selecting in 1998. I should point out too that, in response to the phase 2 work, we invited public submissions again and published another document responding to issues raised. In 1998 phase 3 commenced. The central north region of South Australia was selected as the preferred region for further detailed investigation. This region was selected as, of all the regions, it contained the largest areas of relative suitability against the NHMRC selection criteria.
We, once again, invited public comment, and that response paper was published in 1999.
Just to remind you of the location of the region, it's here, and site 40A is shown just for comparison.
From 1998 to 2000 we undertook siting studies in the region.
We commenced a fairly extensive community consultation program. This consisted of information days. Indeed, from 1998 through to 2001 I think we had at least three phases of information days,
45
where we had experts go to various towns in the region and have an open day where people could come and ask questions. We also had established consultative committees, particularly the regional consultative committee, and people from key stakeholder groups - such as pastoral groups, industry groups and Aboriginal groups - were invited to participate in that. We also had an information office established for some time in Port Augusta. We also had a consultative committee with the South Australian government officials. In addition to all that, we had a whole series of bilateral meetings with various groups and people in the region during that time.
What we did during the siting studies was to identify sites for assessment on the basis, firstly, of geological and groundwater characteristics, initially on the basis of desktop studies. Then we had some investigation of those actually on site, to see if they could be suitable, and we sought Aboriginal heritage assessment of the sites. We had meetings with various Aboriginal groups from 1998 through to 2000 to discuss the proposal, and this involved groups both with native title claims in the area and also groups with heritage interests in the region. We had at least three separate phases of heritage inspections of sites during that period. As a result of the heritage consultations, work did not progress on many sites and alternative sites were pursued, seeking the advice of the Aboriginal groups. There was considerable seeking of people's views in identifying sites for work.
The drilling investigations on sites cleared for relevant stages of drilling by Aboriginal groups are listed here. In stage 1, which was undertaken in 1999, we drilled 11 sites. In stage 2, which was in 2000, we drilled five stages. In stage 3, also in 2000, three sites were drilled in more detail. All the stage 2 and 3 sites, including site 40A and the associated access routes, were cleared with respect to Aboriginal heritage, not only for drilling but also for the construction and operation of the national repository.
This is a diagram that just shows the site area of 1.5 by 1.5 kilometres. It just really shows the drilling pattern. For all the sites drilled in stage 3, we had 16 holes in all, eight around the outer margin and eight in the inner margin. Most of the holes were percussion drill holes, which excavate little rock chips, but we also had a couple of diamond drill holes on the outer corners, where there was oriented core work down, so we had a solid core of rock and a fracture analysis was undertaken of that material.
In the siting phase, we deliberately stayed clear of the very central area where we're going to dispose of the waste. The very simple reason is we didn't want to introduce any sort of artificial pathways for water potentially - and just to show notionally the concept, a block diagram of the site. As I mention, it's an arrowed area of low rainfall and high evaporation, so you're looking to minimise the amount of water that actually gets into the geological profile.
Mainly the site is a buffer zone with the disposal area in the centre. I'll talk a bit more about this later

on and my colleagues will, too. From isotopic studies we have determined it will take thousands of years for any water from the surface to go down to the watertable - in the case of site 40A, between 10,000 and 33,000 years. In addition, then for the water to migrate off the site to the nearest discharge area, which would be a salt lake, about 10,000 years. So we are really looking at thousands and thousands of years for any water from the surface to percolate down through the site to the watertable and then subsequently discharge. Of course, by that stage the radioactive materials would
46
be extremely dilute and at quite safe levels.

Following the siting studies, we referred the project for environmental assessment in January 2001. Three sites were referred under the Commonwealth's Environment Protection and Biodiversity Conservation Act, the EPBC Act. The Minister for Environment and Heritage determined that an Environmental Impact Statement should be prepared for the proposal. We undertook an EIS on three sites, site 52A, 45A and 40A. The three sites were dealt with equally in the EIS in terms of the sort of investigation we undertook. I don't know if many of you have seen the EIS but it's quite a huge three volumes of work. Part of that process was also consultation, inviting public submissions, and issues raised in public submissions were responded to in the supplementary report of the EIS.

The EIS looked at the repository, the existing environment, impacts and risks to the natural and human environments from the siting of the facility, environmental safeguards to minimise impacts and risks to the natural and human environments, and the regulatory regime and operator responsibilities. May 2003, the Minister for Environment and Heritage agreed that the national repository could be constructed either at site 45A or 40A. In May 2003, the Minister for Science announced that site 40A would be the site for the facility. Here’s another picture of the site. The reason for its selection was that 40A had better security, a less environmentally sensitive access route, more saline water which has no pastoral use, no proposed space activities which would affect the site.

Land acquisition: On 7 July 2003 the Australian Government acquired site 40A for the national repository and the associated access route. The Commonwealth urgently acquired the land because of the South Australian Government's intention to frustrate plans to establish the facility by declaring the site a public park. Land acquired for the national repository and the access route totals about 6.2 square kilometres, which is a minute proportion of the pastoral lease on which it is located or which surrounds it and the native title claims on which the land is located.

I now want to talk a bit about some of the site-specific evidence relating to site 40A. My colleague, Peter Woods, will then talk a bit more about the hydrogeological aspects which are relevant to this. A lot of work, as I mentioned, was undertaken during the siting studies from 1998 through to 2000 and also during the environmental assessment process, which was 2001 and 2003. The first criterion is:

The facility site should be located in an area of low rainfall. It should be free from flooding and have good surface drainage features and generally be stable with respect to its geomorphology.

I note that at site 40A the mean annual rainfall is about 175.2 millimetres. This is data collected both at Woomera and also prior to when data collection started at Woomera on Arcoona Station. So really, a fairly reasonable local measurement. The mean daily evaporation is 8.3 millimetres, so high evaporation. Once again, looking at the site it is obviously an arid area. We have done some projected climate change work which is reported in the appendices to the EIS. This was undertaken by CSIRO. What they have predicted is a small increase in rainfall over the next 100 or more years but also an increase in temperatures that will lead to increased evaporation. The moisture content of
47
the soil is therefore not expected to change markedly. So you may get more rain but it's going to

evaporate more quickly because of the hotter temperatures. CSIRO also did their modelling out to 10,000 years.
Rainfall and surface drainage characteristics: site 40A is on a watershed and would shed heavy and sustained rainfall rather than holding water to cause surface flooding. There is a small area of water catchment up-slope from the site but this will just drain off the site. I think my colleagues will go into this in more detail. In terms of the geomorphology - that is the surface land forms - the site is about 189 metres above sea level at its centre, with a maximum relief of about four metres over the 500 by 500 metre inner square. That's covered by a gibber plain - stony desert. There is a slightly elevated ridge, trending north-south, a cane grass swamp on the north-eastern boundary and a drainage depression that drains away from the western margin of the site.
The area where site 40A is located has had negligible increase in erosion rates since European settlement, a low erosion rate of about three tonnes per hectare per year or 0.107 millimetres per year. It is a very stable area. To have significant erosion you need to have uplift. This area really has been very stable over millions and millions of years. Watertable:
The watertable in the area should be at sufficient depth below the planned disposal structures to ensure that groundwater is unlikely to rise within five metres of the waste and the hydrogeological setting should be such that large fluctuations in the watertable are unlikely.
Now, the depth to the watertable in the vicinity of the 500 by 500 metre inner square ranges from about 63.6 to 68 metres, and remember, our trenches will have a maximum depth of 20 metres, so there is going to be at least 40 metres between the waste and the watertable. The depth of the disposal structure, as I said, was 20 metres deep. Large watertable fluctuations are unlikely. The reason for saying this is that isotopic dating has shown that the groundwater is at least 20,000 years old and the length of time for the unsaturated zone residence is 11,000 to 33,000 years. The time estimated for recharge of the watertable at site 40A to discharge at Lake Windabout is at least 10,000 years. So we are looking at thousands and thousands of years. Therefore, only a small amount of groundwater is replenished each century, which suggests that large water table fluctuations have not occurred over thousands of years.
The next criterion of the NHMRC code:
The geological structure and hydrogeological conditions should permit modelling of groundwater gradients and movements and enable prediction of radionuclide migration times and patterns.
As we mentioned, the length of residence time of water in the unsaturated zone, which is the zone above the watertable, is 11,000 to 33,000 years. The time estimated for recharge of the watertable is at least 10,000 years to discharge. All rock samples from site 40A demonstrate significant ability to absorb both cobalt and caesium radioisotopes. The time for radionuclide movement will therefore be significantly more than the time taken for subsurface water movement, so the dating work was

looking at the time it would take for just water to go through. What we are saying is if there is anything in the water, the rocks will absorb that material, so therefore the travel time for any radioactive material coming from the waste would be much, much longer than just for the water. I should point out that all this work is fully documented in the EIS.
We also, of course, should note the degree of movement of the nuclides tritium, caesium, cobalt is extremely limited. An adverse impact on the groundwater will not occur at site 40A due to the halflives of the radionuclides compared to the residence times and the times it would take for water to move, firstly down to the watertable then off the site to the nearest discharge area. Of course, the groundwater is very saline. It's not suitable for pastoral use or use by people. The next criterion:
The disposal site should be located away from any known or anticipated seismic, tectonic

or volcanic activity which could compromise the stability of the disposal structures or integrity of the waste.

We have no active volcanoes on the Australian mainland, though Australia does have one active volcano which is at Heard Island, close to Antarctica. The main thing about this area is that it is very old stable rock. The rock is Proterozoic in age. It's more than about 530 million years. The rocks have been undisturbed since deposition. They are sedimentary rocks so they were laid down under water. They are sandstones and shales, and that just talks about the grain size of the rocks. That varies a bit, but in actual fact you can see things like bedding structures in the rocks which originate from the original sedimentary deposition.

Now, if the rocks had been significantly buried, deformed, cooked, you wouldn't be able to see that sort of structure. They still are pristine sedimentary structures. The rocks are flat-lying. This has been a very boring place for the last 530 million years. The stratigraphy of the site: There is a surface area of weathering, clay and silcrete, and the actual sedimentary sequence is, there are two major sandstones, the Simmens quartzite which is a slightly weathered sandstone, and the Corraberra sandstone, and underneath that is the Woomera shale. The actual trenches will be in the Simmens quartzite.

Something was said this morning about seismic activity. Seismic activity occurs in the Torrens hinge zone, which is to the east of site 40A. The seismic activity where the site is located is of a very low magnitude. Can I switch to the overhead projector just for a second. The Torrens hinge zone tracks up from Spencer Gulf, going through Port Augusta, then through Lake Torrens, and it's this zone here. It's about 80 kilometres from the Torrens hinge zone to site 40A.

The Torrens hinge zone is a major break between the stable Stuart Shelf rocks, which are over here to the west, which are undeformed, and the Flinders Ranges area where there's a high degree of deformation. In fact, the Torrens hinge zone actually takes up the strain and stress along this zone and it's eased along that zone there. Over here it's very stable. As I mentioned, if there had been tectonic activity of any significance here, we would see the rocks were deformed, you would see evidence of major faults in the region. You just don't see that. This really has been a very stable area.

49

I should also note, too, that this matter was discussed in the EIS and it's in section 8.1.3 for those of you who are interested. In terms of the area where site 40A is located - which is west of the Torrens hinge zone - the magnitude of seismic activity was ML1 to 2. ML2 is the lowest magnitude able to be felt. Discussion with the South Australian Office of Minerals and Energy Resources has indicated that the cluster of predominantly ML1 recordings are likely to be related to blasting activities associated with mining at Olympic Dam and Mount Gunson - so low-magnitude activity.

Population density of the site: Perhaps we could go back to the PowerPoint, if that's possible. Thank you. The site should be in an area of low population density, in which the projected population growth, or the prospects of future development are low. As we pointed out, the nearest town to site 40A is Woomera, which is about 20 kilometres to the west. The population centres in the region are limited to key centres located on transport routes or supporting mining or defence activities. This part of South Australia has one of the lowest population densities in Australia. The projected population change is likely to range from slightly negative to slightly positive.

Groundwater in the region of the site which may be affected by the presence of the facility should ideally not be suitable for human consumption, pastoral and agricultural use. Groundwater at site 40A consistently has a salinity of greater than 15,000 parts per million. It's much too saline for human consumption or pastoral or agricultural use. I should mention that obviously during the siting studies, the EIS, we looked very carefully at the groundwater and measured salinity, et cetera.

The site should have suitable geochemical and geotechnical properties to inhibit the migration of

radionuclides and to facilitate repository operations. As we have mentioned before, the modelling indicates the degree of movement of radionuclides tritium, caesium, cobalt, is extremely limited and adverse impact on the groundwater at site 40A will not occur due to the very long residence times compared to the half-lives of the key radionuclides and the waste.
The site for the facility should be located in a region which has no known significant natural resources, including potentially valuable mineral deposits, which has little or no potential for outdoor recreational use. The drill hole samples that we took during the siting studies were analysed for a range of metals, and there was no mineralisation identified to depths of 100 metres where our deepest holes finished. Other available geological and geophysical information suggests that there's not significant mineralisation potential at greater depths below the site.
Site 40A has little potential for agriculture or outdoor recreational use. It was part of a property used for grazing sheep prior to its acquisition. There are areas unsuitable for growing crops. The site occupies a small area - 2.25 square kilometres - of the Arcoona Tableland, which is an area of some several thousand square kilometres. The site has no particular attributes that make it suitable for outdoor recreational use.
Access: The site should have reasonable access for the transport of materials during construction and operation, and for the transport of waste to the site. I mentioned before the access route, and this will be upgraded obviously prior to the commencement of operations at the site and after the upgrading it will provide satisfactory access for the use of the repository.
50
The site should not be in an area which has special environmental attraction or appeal which is of notable ecological significance or which is the known habitat of rare fauna or flora. A survey of fauna and flora undertaken during the environmental assessment showed that there's one listed threatened species that was identified at the site which is located, too, in the surrounding Arcoona Tableland. This is the Plains Rat. There are no vegetation communities with a recognised conservation status identified at or near the site. However, the small sub shrub *Frankenia plicata*, has been reported on the Arcoona Tableland. This plant is rated nationally endangered under the EPBC Act. It has not been found at our site, as I mentioned.
The site should not be located in an area which is of special cultural or historical significance. The site and the access to it were cleared for all works associated with the construction and operation of the repository by Aboriginal groups with native title and heritage interests in the region, and no items of European heritage value occur on the site.
The site should not be located in a reserve containing regional services such as electricity, gas, oil or water mains. Site 40A is located on land that has exclusively been used for pastoral grazing over the past 100 years, and the site should not be located in an area where land ownership rights and control compromise retention of the long-term control over the facility. As I noted before, the Australian Government has acquired the site and the access route.
So the site performs extremely well against the siting selection criteria, particularly with respect to the depth and salinity of the watertable, the hydrogeological performance of the site, and the stable geology and geomorphology and radionuclide migration times. The only criterion that needs significant additional work is the upgrading of the access road which will be completed prior to operations commencing.
Other matters of relevance are that the site should be free from flooding. As I mentioned, there's a small area of water catchment, and we will ensure that the water is actually channelled on the site, so away from the disposal structures. The trench capping has been designed to minimise water infiltration into the structure, minimise erosion, and I spoke about the water being channelled away from the disposal structures. In terms of rare fauna or flora, I mentioned that we had a feral-animal-proof fence on the outer margin of the site. In fact, a large part of the site is a buffer

zone, and we hope that will be an area of regeneration for small animals and native flora, and we will be monitoring obviously the fauna and flora on the site.
I will now hand over to my colleague Peter Woods who will talk a bit more about the hydrogeology.
DR PETER WOODS: Thank you, and good afternoon. I will go over some of the hydrogeological or the groundwater aspects of the project, a lot of which has already been covered by Dr Perkins but I'll fill in a few more details.
The hydrogeological work has been incorporated in the studies from just about the start because groundwater is one of the features of the site selection criteria and extensive preliminary work was done by various Commonwealth Government agencies and then, when it came time to pull the Environmental Impact Statement together, my company was hired and we did some additional work.
51
Dr Perkins has gone over the criteria, so I won't spend much time on these, but quite a few of them relate to groundwater and surface water, which can be related to that. The drilling went over three stages, as mentioned, and site 40A was one of those that had the most detailed work, as it met all the criteria very well. There were 16 bores drilled on the site, most of which were converted to groundwater monitoring wells. There have been water samples taken for a large number of different components. There has been testing of the aquifer - of the rock that the water is found in down at 60-odd metres.
There were tests done on material for capping the trench that is planned and then, on the interpretation side, the watertable contours were looked at and interpreted. The recharge - which is the amount of rainwater that eventually makes it down through the ground down to the groundwater - was calculated using some different methods and then, importantly, the movement of water and of any solutes which might include contaminants, if they get in there, was assessed as well.
I'll skip over this fairly quickly because Dr Perkins showed it, but it shows the drilling pattern with the inner square and the outer square, as they are called, and I will show some diagrams later that show the data obtained from this drilling at site 40A. The first one is taking a slice through the ground, so if you can imagine taking a giant knife and doing a slice down past the watertable. This shows the rocks that are found on the site. These are the soil-type materials up near the surface, and then the quartzite and the sandstone. The watertable is found at about 65 metres from the surface, give or take two or three metres, within the sandstone, and deeper down again there is a shale, and that shale is very impermeable to water, so any significant water movement in the aquifer occurs in this area here between the watertable and the shale.
The regional interpretation in taking a close look at the watertable contours suggests that a small lake known as Lake Richardson is the local groundwater sink, and some of the earlier work considered that it might be Lake Windabout. The reason the two lakes are mentioned is, just as the site is near a watershed for surface water, it's near an underground watershed, too, but looking at it in detail, the interpretation is that the water would eventually move towards Lake Richardson. However, none of the arguments change if it were to be that the water moved to Lake Windabout.
Because Lake Richardson is fairly small - I'll show its location in a moment - it's possible that eventually the groundwater goes beyond that small lake to Lake Torrens. However the transit times - and Dr Perkins talked about these already - are such that the suitability of the site is not affected by these questions. If I could swap to the overhead, please. This is a figure that's in the Environmental Impact Statement and it was prepared by the BRS - the Commonwealth Agency - and the site is here. These small lines show where the watertable is interpreted to be and underground water - just like surface water - flows downhill essentially and the water from here is interpreted to flow down to a little lake here, Lake Richardson. It takes many thousands of years to reach that. This figure is in detail. I know it's hard to read here, but it has been published as part of the Environmental Impact Statement. Could I have the PowerPoint back now, please.

So when the drilling was actually done on site the water levels were measured and the watertable
52
contours - or the lines - showing equal distance down to the groundwater and they show, just as the regional interpretation showed, the water at this particular spot moving to the south-west, so the detailed work fitted in with that regional picture, which gives us confidence that the regional picture was interpreted well. The groundwater is about 65 metres below the surface. The hydraulic testing of the saturated zone - so that's down where the permanent water is - came out at a value more like a silt than a sand, but not atypical for sandstone. If you imagine: Water flows fairly easily through a loose sand, like you might find in a river bed, but when that's compressed into a rock the water doesn't travel so easily and that's consistent with what we found on site.
The area is known for having some fractures - and I will return to that a bit later - but no major waterbearing
fractures of note were encountered during the drilling of those 16 holes. The groundwater quality - again this has been mentioned already - varies from 15,000 to 25,000 milligrams per litre total dissolved salts, and that's about half of seawater, up to about two-thirds of seawater, if you want a comparison, and it's too salty even for the hardiest of stock to drink and it can't be used for irrigation or for domestic use.
The natural background radiation up there is as found in most places. It's relatively low. We're not drilling in an area with a uranium deposit or anything like that. The methods used to estimate how quickly water moves from the surface down to the watertable at this site were largely based on chloride. Chloride is a component of common salt, sodium chloride, and tiny amounts of chloride are in the rainwater, even as it falls far inland away from the sea, so by comparing the amount of chloride in the rainwater and the amount of chloride either in the saturated zone - so down in the watertable - or in the soil and rock between the surface and the watertable, which we've called the unsaturated zone, you can get an estimate of how much of the rain soaks in and makes it all the way down to the watertable. Remembering that rainfall on average is about 170 millimetres per year, you can see that a very very small percentage of rain actually makes it down to the watertable. That's not surprising. The area has high evaporation.
Then when we do get decent rain, the rain soaks in a short distance and the very hardy shrubs that are there are very good at pulling that water back out again and, if it's prolonged rain, you'll get a lot of grasses springing up and they will, likewise, pull water out of the soil, so that's the reason why only a very small proportion of the rain soaks in and continues on down to the watertable. Because the watertable is so deep and the amount of water going down is very small you can do a flipside calculation and work out that the water takes something around 10 to 30 thousand years to make that journey from the surface down to the watertable.
Looking now back in the saturated zone, or the permanent watertable, the hydraulic conductivity used in calculations in the EIS is within the range measured on site, so we've got some site measurements that fit in with the regional estimates that have been done. Because we're dealing with a sandstone, not with sand, the porosity is quite low and the groundwater gradient - which is the slope on the watertable - is likewise fairly low. What that adds up to is that the water in the groundwater moves fairly slowly. The estimate is about two to three metres per year, so to travel the 15 to
20 kilometres to the nearest salt lake, the estimate is 5 to 10 thousand years, remembering that it has already taken 10,000 years plus to go from the surface down to the watertable.
53
That brings us to some of the modelling that was done from the site. One of the criteria is that the site is straightforward enough that modelling can be done with reasonable confidence rather than having a very complex geology that's hard to understand and model but, apart from the radiological aspects, the repository is like a standard waste landfill that we need in any city or town around

Australia. So to look at what the best design is for the repository a cap and liner seepage assessment was done using a standard technique that's well accepted throughout Australia to look at landfills. One of my colleagues, who is a geotechnical person, inspected the core from the drill sites as well as looking at all the published material that was available. There were some tests done on the local materials that are planned for the cap and they came back meeting the common design criteria for a landfill. The model that was used is called HELP, and it's used all over Australia and obviously elsewhere. It's a US EPA - the Hydrological Evaluation of Landfill Performance.

The HELP modelling looked at a number of cases, of different ways to build the repository. It also uses local information on the weather, the rainfall evaporation, the properties of the materials and the design, which is a domed cap. For well-designed caps the percolation, which is related to that recharge number, is below - because it's such an arid area, if you build a decent cap the amount of water getting through is very very low and comes out at a micrometre a year; a very small number. The least effective cap, which is not planned for the site, would potentially let a bit more rain through than the natural situation. So the reason this modelling is done is to help you pick what's the best design for a cap and a good design has been obtained. Just keeping in mind again that the natural soils let through 0.2 to 0.6 millimetres per year of rain equivalent compared to 0.001 for a well-designed cap.

Looking underneath the repository now, it was important to look at what could happen to any contaminants if they did get into the water that's moving down very slowly. Another model from the United States was used for this. The details are all in the EIS for anyone that's technically minded. All of this technical work has been reviewed as part of the Environment Australia, looking at the EIS. Any questions that they had were addressed in the follow-up document. It is also being looked at by people like the IAEA Review Committee that looked at the licence application recently, and ARPANSA have their own hydrogeologist who is helping them do a technical assessment.

So those are the things that are included in the modelling. One of the things is, well, what happens if before you put this you-beaut cap on that's so good at keeping out the rain you get a big rainstorm, like happened in 1989 when Lake Eyre flooded? What happens if that happens while the trench is open? The modelling looked at that as one of the scenarios and even under that scenario there's virtually nothing moving through below. When you think about it these things decay away to next to nothing in a couple of hundred years it's not surprising that when the water takes thousands of years there's nothing coming out the other end.

The model looked at three different radionuclides, some of which are strongly absorbed and one of which is hardly absorbed at all. It used notional, unrealistically high concentrations - so sort of worst case of worst case - and found nothing coming out down at 30 metres. As I said, that was no surprise but the model was done to corroborate that.

54

A little diagram to try and pull those numbers I've talked about together. The rain comes down and 99.99 per cent of it evaporates again. The little bit that's left - the 0.02 to 0.06 millimetres - very very slowly comes down to the watertable. The repository has a cap and the cap makes sure that the infiltration is less than nature. This number here is 8000 years because it is to do with the water moving from here to here, and that's shorter than from here to here. So that 11,000 becomes 8000 when you say, "Okay, we are starting 20 metres down."

The groundwater movement calculation is off to the side, and looking at 5 to 10 thousand years estimate to move away to the nearest lake. This is why the criteria were put together because these big travel times fit in well with short-lived radioisotopes to make the whole thing safe.

The conclusion of this work was that for an appropriately capped and maintained repository that there should be no detectable radiological impact on the permanent groundwater. Other points of interest. One is that because the unsaturated zone - so that's from the soil surface down to the watertable - is

quite dry, it only has a minute amount of water in it, even if there are fractures - and the area has been chosen because it doesn't have lots of large fractures - the water can't go through a big hole; it's all in the tiny little pores in the rock.
The site has avoided cavernous conditions where - you know, you've been in caves and you might see a drop of water falling off the roof. So they've avoided those sorts of conditions. Down in the watertable, fracturing is expected to be locally important. So if you are comparing boreholes that are 10 metres apart they might have somewhat different answers to how well the water moves because there's a fracture in that hole but not in that hole. However, when you get onto the scale of tens of kilometres it acts more like what's called a porous medium, and this has been an important point to try and think through.
The groundwater monitoring program: Since all the siting and the calculations all suggest that there shouldn't be an impact, however, we understand that nature is variable. People will say, "That's fine for you to say but nature does what nature does. What if something does happen?" So there is a groundwater monitoring program proposed, and it's really a demonstration program. The first phase. I mentioned there have been analyses taken of the area, but the number of samples so far aren't huge and so we want to extend the understanding of what the groundwater is like naturally and which way it's going and confirm which way it's going, how salty it is, how much metal is in it.
After five years, when the background should be well established, the plan is to reduce the monitoring suite but to continue to look for radionuclides, because they are the main things that are of concern; it is a low-level radioactive waste site. If anything unusual comes up then it's to be investigated and this is in the program for the site.
Another diagram of the site, not as colourful as some. It shows the original holes which were drilled and where groundwater was measured and then the ones that will be adapted for long term. So there will be a square of groundwater monitoring wells around the inner fence, remembering the repository is in the middle here. Down the gradient in the direction that the water is moving; we are looking at putting three permanent bores, and then one up-gradient, so that we understand the broader picture of
55
what's happening to the groundwater.
The water is to be analysed for a number of parameters and the full list is to be done during the five years, when we are making sure we've got good data for the background. The top view, down to the trigger parameters, are done for the longer term. So there are some - what we call in the game - general parameters, which are things like sodium and chloride and potassium and sulphate. PH is a measure of the acidity, because that affects how mobile metals are. Many metals are much more mobile in acidic groundwater than they are in neutral groundwater, and the water up there is neutral but it will continue to be checked. The radiation people have selected a list of radionuclides to be measured that reflect what's going into the repository or what might be a useful indicator of what's going on.
I might add, Dr Loy, that the monitoring schedule is subject to the licence, but what I've put forward is what is being proposed. It's for the first five years, which will cover the first campaign of waste disposal, annual monitoring for the full analytical suite. Then in the subsequent periods dropping back to five-yearly, with the reduced analytical suite. The reason we can look at doing it at those sorts of intervals is because of the very slow water movements. I would not be surprised if my granddaughter goes to her retirement having been the hydrogeologist on this down the track and has still seen nothing appear in these bores. That's the end of the hydrogeology presentation.
DR LOY: Thank you very much. Let's now turn to questions about the site examination. I know Dr Perkins covered more than that but I think we want to focus for the moment on site and siting issues. Let me take over and ask the first question, because I wrote it down. I noticed both the panellists wrote it down and I've received at least two questions from the audience about this one,

where there was a clear conflict between what we were told yesterday and what we were told today, and that's about the clearance by Aboriginal people, the heritage clearance. What we were told yesterday was the clearance was for drilling only and, Dr Perkins, you told us today that the clearance was for construction and operation of a repository as well. Could you respond, please?
DR PERKINS: Yes. What I said was correct. The clearance was for construction and operation of the repository, and that's clearly stated in our heritage clearance agreement with the Aboriginal groups.
PROF. LOWE: Can I ask you to comment on what the native title claimant said yesterday? What my notes say Roger Thomas said is: The Commonwealth asked Indigenous people to consider a range of possible sites. Senior lawmen and women found difficulty with all of them. We agreed to allow test drilling in good faith. We have not gone through the process of site clearance for construction at any of those sites. We do not want waste material put in this land at this stage.
DR PERKINS: I can only repeat what I said, that the clearance inspections were undertaken under a heritage clearance agreement. It was very clear in that that the clearance was for drilling, for exploration drilling, and for construction and operation of the repository. I should add too that native title claimants and various groups - not only native title claimants but also groups with heritage interests in the region - obviously have different views about the proposal. Between and within groups their views vary. I think the Aboriginal groups were keen to say that, at least some of them,

that the clearance didn't mean they agreed with the proposal. Nonetheless, the clearance was both the exploration drilling and the construction and operation of the repository.
MR JACK: Could I ask, is that documented in writing?
DR PERKINS: Yes, it's in the EIS, in the Aboriginal chapter, which I think is 11. I'll have a quick check. I can give you the exact section reference if you're interested.
DR LOY: Clearly that is a matter of fact that can be established insofar as what the writing says. Of course, what people's views are about the options that were facing people might be another issue. George, can I now throw it to you for questions about the siting issues?
MR JACK: Yes. I'll bear in mind the time. There is one question that bothers me. Accepting the statements about the salinity of the groundwater at the present time, I have also been told - and please, this is hearsay but I have been told - that many decades ago, perhaps about 100 years ago, there were people living in this area. There is evidence of that from half falling-apart former farmhouses or something like that. If this is true, I conclude that those people had some source of fresh water to supply themselves with necessary water, and I'm wondering where they got it from. I'm wondering if they got it from perhaps perched freshwater tables, and I'm wondering if, for example, if the climate changes - if you get severe rainfall events - whether perched freshwater tables could occur in this area and whether this has been analysed or how you would react to this chain of admitted supposition?
DR WOODS: If I may respond to that, and ask for the overhead projector to be turned on, please. Presented in the EIS is a regional salinity map, which shows how the salinity of the groundwater varies in the region. Some kilometres from the site is an area called the Pines, where there is groundwater that is fresher and can be used for stock and even for human consumption, although it wouldn't be very palatable to the modern tastebuds that buy spring water rather than use our perfectly drinkable tap water.
The other aspect, of course, is that rainwater is captured and stored for use. In recent years, it's the pipeline water coming up from the River Murray that's enabled the pastoralists to expand their operations. So in the area of the repository, which is in one of the saline areas, all the stock watering is by pipelines to small storage tanks and troughs, but there are some areas of better groundwater

elsewhere, and they would have been counted out of the site selection process.
MR JACK: Would those have been the source of fresh water for local dwellers about a hundred years ago, or could perched watertables have existed?
DR WOODS: Perched watertables are known in some of these areas, but there's been none that I know of documented in this particular area. The soil is quite saline, so that recharge water that's reaching the watertable is itself saline when it reaches the watertable, so if you increased the recharge by 100 times, the time for that water to reach the watertable might go from 10,000 years down to 1000 years or 100 years, but it's got to push all that salt ahead of it first. That's what's happening in other parts of Australia, where the increased recharge is pushing - although the recharge is fresh, it's

pushing salty water down to the watertable.
MR JACK: Thank you. Another question concerns the actual repository and the possibility of the severe rainfall event before the cap is put in place. Would you not be in danger, given that there's a clay liner and so on, of developing a nice bathtub effect, with all the associated negative effects?
DR WOODS: The immediate answer to that is in your question. It's during operation, so there are people there and the water can be put into the local evaporation pond that will be built on site. So while you're in operation, you can do things about something like that.
MR RYAN: Can I just say something there in terms of the clay liner? We're talking about a clay base to the trench. We're not talking about lining the walls.
MR JACK: Correct.
MR RYAN: So there's really no chance of the water building up under the proposed design; but I'll talk about that a bit later.
MR JACK: I think during Dr Perkins' presentation she referred to repeated requests for public input and comments and so on, and I'm wondering if that series of shall we call them consultations resulted in any significant changes to the proposal along the line? Excluding the ones that you mentioned, Dr Perkins, of the heritage exclusions, where you actually stayed away from certain sites because of heritage, was any of the other public input influential in changing the proposal along the line?
DR PERKINS: Yes, we consulted also with pastoral groups and particularly with people on various stations. We took note of their views with respect to landforms on the stations, and the very few places there are water bores where you can at times use the water in emergencies, in terms of extreme drought. We took that advice. So we took advice, I'd say, of local comment about the environment in the area from a range of people, not only Aboriginal groups but also pastoralists, et cetera.
MR JACK: I think I'll pass at the present time. I may come back.
PROF LOWE: Thank you. Just specifically about the site, I noticed that there were various recommendations by the interim review team - for example, the interim review team recommended that there be further analysis of the site: The geomorphology, the fractures, the hydrogeology and geochemical characteristics and a more extensive study of the geomorphology to explain how the site has evolved to the present day. It seemed to me that what we've heard today, while it appeared quite detailed, is what the interim review team saw and they suggested more extensive studies. I wonder if the applicants could comment on what further study they propose to do in response to the interim review team?
DR PERKINS: Thanks for the question. I should note too that of course the IAEA Review team have only as yet given us a draft summary report. We're still awaiting their full report and I understand that when that's provided to Dr Loy, he will forward that to us with any comments he might have on it, and, of course, we are thinking about the range of recommendations put forward. We do intend to do some more site investigation work as a result of that. The results would be fed into a safety case that we would produce. We already have prepared a safety case which is in the

documentation already provided to Dr Loy. What the IAEA Review team said was - there's a particular format and recommendation that they favoured which is an IAEA model and that we intend to restructure some of the arguments and put information into that safety case which would use the results of some of that additional work.

PROF LOWE: Thank you. The interim review team's draft report also said:

The management system is designed to be compliant with ISO 9001 and this gives confidence that the management system will be appropriate, but it did go on to say that the document is difficult to navigate and when the appropriate section is found many of the procedures are present as drafts or missing entirely. In addition to issues that might have been expected to be addressed, design control and independent peer review appear to be absent.

Do you have any comment?

DR PERKINS: As I said, we are obviously considering all the recommendations that have been put forward and we await the final report, and Dr Loy's letter to us and, no doubt, he will provide us with some sort of indication as to matters he feels are relevant to his consideration of the licence.

PROF LOWE: Presumably you have the same response to their suggestion that there be site based experiments to demonstrate the feasibility of the necessary repository barriers?

DR PERKINS: We have actually done some of that work. It is reported in the EIS. I presume they want some more detailed work to perhaps endorse the work that has already been completed. Yes, of course, we'll consider doing that in the context of getting the final IAEA report in Dr Loy's covering letter to us.

PROF LOWE: Thank you very much. More generally we were told in submissions by others that the EIS hadn't been peer reviewed and one submission said that you'd received over 600 submissions about the EIS which had not been made public. What can you say to reassure us that the EIS has been adequately peer reviewed and that its conclusions stand public scrutiny?

DR PERKINS: Okay, the EIS was prepared under the Commonwealth's environment legislation and the actual process was undertaken by the Department of the Minister of Environment and Heritage. I understand their assessment of the EIS involved their own peer review; they sought expert advice on various aspects of the EIS. Their report, as a result of that review, I believe is on the Department of Environment and Heritage web site, so that is all publicly available.

In response to the public submissions, we were asked to - as a result of the public submissions we produced a supplementary volume where all the submissions were listed and the key issues raised in them documented and responded to. At the time of the request by the relevant person for release of

the submissions - that was when the process was still undergoing assessment by the Minister for Environment and Heritage - at that stage it wasn't appropriate to release them. We haven't heard the request again until very recently, and at this stage, since the assessment by the Department of Environment and Heritage and their Minister is complete, we would have no trouble releasing the submissions.

PROF LOWE: Thank you. The one place where I had difficulty following the process in terms of site selection, was where you moved from the eight regions which were identified, to the central north region of South Australia as the chosen site. Could you explain to us the process by which that was chosen as the region on which you would concentrate and why the others were rejected?

DR PERKINS: Yes, the region was selected on the basis that it had the largest area of potential suitability against the criteria in the National Medical Health and Research Council code of practice,

so that was the basis. We focused our attention on what we considered was the best region of the eight.
PROF LOWE: One final point about the site: You said in your submission that the land was purchased urgently to frustrate the attentions of the South Australian Government to declare the area a public park. Can you understand why the South Australian Government see that as the Commonwealth riding roughshod over their views?
DR PERKINS: I think you've misquoted slightly. We urgently acquired the site because of the South Australian Government's attempts to frustrate the process by declaring the site a public park. Look, I know that the matter of the urgent acquisition is before the courts - the Federal Court considered the matter last year and found in favour of the Commonwealth on all counts. I don't really want to talk about the Act and its application because it's under appeal at present, but all I can do is go back to the basic process that was agreed by the Commonwealth, States and Territories in 1992, to find a site for the national repository according to the National Health and Medical Research Council criteria. It's a process South Australia signed on to.
It was a long, exhaustive process of community consultation and scientific assessment that really - you know, the South Australian Government had been party to that and then, at the end of the day, decided that they were not going to continue to be part of the process.
PROF LOWE: Thank you. They are all the questions I have that are specific to site selection.
DR LOY: Okay. I'll just actually take one from one that's been handed up. I think, again, it will be a question that has occurred to other people, too. If the site selection process was as rigorous and extensive as the Government attests, how does the department explain that it selected site 52A as the preferred site nationally when it is only kilometres from a live weapons testing range?
DR PERKINS: We referred for environmental assessment three sites. Site 52A was initially our preferred site and in the EIS we looked at the relevant risks associated with siting the repository there and we believed that the risk was not one which was significant enough to deter from the site itself. I note, too, that in actual fact intermediate-level waste is stored in a bunker a couple of kilometres from 60
site 52A, at present, and has been since 1995. So there is in actual fact storage of radioactive waste above ground on the Woomera prohibited area. However, the view of EA, when they reviewed the proposal, was they didn't accept that the risk was such that it was acceptable, and they approved the other two sites which were also excellent sites.
DR LOY: Okay, thank you. Let's take a break now. I hope some of the other presenters can really focus down, but I think we need to take this time and I also want to give some time at the end to make sure that somewhere in the discussion we've responded to the questions that have been handed up. I think we're going to be here beyond 5.25. I just ask for your patience, to endure that. If we could return now, please, at say 10 to 4.
ADJOURNED
RESUMED
DR LOY: The next presentation about operations and design is from Tony Ryan.
MR TONY RYAN: Thank you. Just addressing the operation of the repository, plus some design issues, to start off perhaps just a view of the topography. I do this because there have been questions raised in relation to site drainage. We can see the repository down here and the red indicates elevation. Just to emphasise, I'll show a cross-section going up towards Andamooka; that repository is basically on the top of a hill. Let's look at this cross-section up here. That's relevant, I think, when you look at the site flooding issues; but, in fact, there isn't really a flooding problem at the site.
I just want to address also the question of what the licence application is covering. We have gone for an application covering each of the conducts of preparing the site, constructing and operating. The question has been asked: Why have we done that? We have a look at the activities which we cover

by those conducts. You can see that under preparing the site, we'll be building an access road and site fences. Construction will cover the temporary facility, demountable buildings and services - water, electricity and sewerage - and operations really covers the disposal campaigns. The point to make here is that the work under "preparing the site" and under "constructing the facility" is quite inconsequential, but these activities for access road, demountable buildings in themselves are significant activities and, as a consequence, we look at it being just the one application both to prepare the site and to start operating the facility.

In terms of the operation of the repository I think it's been said before, we operate it on a campaign basis. It will be closed between campaign; campaigns are two to five years apart. It's worth noting that the structures won't be re-used when a campaign is ended. The structures will be permanently closed and they will not be opened for future campaigns.

In terms of who is going to be conducting the operation at the site, the key organisation is clearly DEST. They are the owner and they are the holder of the facility licence. We have heard mention of the repository operator; that is a contractor appointed by the Commonwealth to manage the physical work at the repository on behalf of DEST. Again, we'd like to emphasise that they will be working under the direction of DEST. There is also another important position in terms of the radioactive

safety officer. That is a person with duties regarding radiation safety.

Clearly, in terms of the repository DEST will be the people directing the work, managing the work. The physical work happens by contractors, as is commonly known in terms of outsourcing these days. The major task to be completed that will be contacted out will be facility construction and the waste disposal, the transport. They will be on a campaign-by-campaign basis. There will, however, be ongoing security in the environmental monitoring which will continue between campaigns.

We had heard mentioned earlier about the repository management system. There is in fact quite a complex management system which will become the knowledge that will continue on from campaign to campaign. This is both a quality system that covers safety management, it covers environmental management and it covers the operations. This is quite a comprehensive volume and it will be the source of knowledge that will remain with DEST from a campaign that will be referred to in the next campaign. It will contain the procedures for carrying out the work, the contingency and the emergency procedures. It will contain the records and also the performance and compliance reports on how the operations are going.

In terms of site infrastructure, there will only be minimal facilities on the site between the campaigns. Permanent facilities are mainly aimed at providing security and providing surveillance capability.

For a campaign there will be temporary constructions and these will be removed at the end of a campaign. I can tell you what the permanent facilities are: We are looking for the perimeter fencing, security fencing; there will be a single building which will house the surveillance equipment; the internal access roads; foundations; vehicle wash-down plant. These will be permanent facilities which will be on the ground and they won't be removed, but these are quite unobtrusive.

In terms of a campaign site facility we are looking to having demountable buildings, buildings to cover officers, messing, toilet, change rooms, workshops, et cetera. Again, site services are going to cover water, sewerage and electricity. The intention here is that by renewing these each campaign you are continually updating and keeping them, if you like, state of the art and you don't have any maintenance problems, and I guess between campaigns they wouldn't be used anyway, so you do have a maintenance issue if you do try to retain them.

Physical security: There will be permanent security fencing which will have an intruder protection system. This will be actively monitored between campaigns. We do have a security management plan to look at the security risk to the site. We have done a threat assessment and risk analysis and we've incorporated the results of that into the security management plan. The operations which will

be undertaken in the repository are really quite simple and quite straightforward. It's basically picking up the waste from the waste owner, transporting that to the repository, burying it and the ongoing waste management. I should add to that, there will be the excavating or preparing the disposal structures and closing them up after a campaign.
The waste owner is responsible for conditioning the waste to meet the acceptance plan, acceptance criteria, and they also need to package the waste to make it safe for handling, transport and disposal. We're not intending that there should be any repackaging on site, where a transport package is made into a burial package. The one package will cover both transport and burial.
62
As we said before, conditioning will be undertaken by the waste owner. There will need to be a fairly rigorous quality assurance process, that the waste which is presented to be taken to the repository does in fact meet the waste acceptance plan, the waste acceptance criteria, and that is part of the process that will be gone through when a contract is arranged between a waste holder and the Commonwealth. The owner will be required to not only say what waste they wish to dispose of, but what processes they will go through to provide verification that the waste does meet the acceptance criteria.
Prior, I think, to the waste being picked up by the repository operator for transport, it will need to be ticked off that, in fact, the waste acceptance plan is complied with. In terms of the packaging of the waste, the packaging must meet the acceptance plan, they must meet the code of practice for the safe transport of radioactive waste and also the code for the transport of dangerous goods by road and by rail. The packaging - the preference is to use a standard moulded industrial steel 205-litre drum. That is not to say that other containers can't be used, but they will be looked at on a case-by-case basis. We are looking for a standard drum to facilitate the handling arrangements.
Again, just reiterating, the loading and the transport of the waste from wherever, from the waste owner to the repository, undertaken by the repository operator - the transport will be by trucks over public roads. The control of the waste, as far as the Commonwealth goes, commences when they pick it up from the waste owner. There will be a specific transport plan prepared for each shipment. That will cover not only the arrangements for the transport operation but also any emergency response that will apply for that trip.
Site operations - again to reiterate - are fairly simple. The handling on the site will be limited to unloading the waste from the trucks, doing a check to make sure there has been no damage to the container in transit, and placing the waste into the disposal structures. The expectation is that the waste container will be the disposal container. There will only be limited repacking facilities at the site and this is mainly to cover should there be any damage done to the container in transit, so while the Commonwealth does retain the ability to inspect a package when it arrives at site, this will not normally happen. Basically the main point at which packages will be inspected, verified that in fact they meet the acceptance criteria, will be at the point of pick-up. Again, to reiterate, there will be a radiation safety officer and he will be oversighting any handling operations involving waste.
When we looked at the design of the disposal structure we looked at the NHMRC code requirements which Caroline went through a bit earlier. The key things where work needs to be done is in terms of surface drainage and in terms of site access. The site access is really building a new access road into the facility. Site drainage is to address the fact that there is a very small upstream catchment. Even though it's very close to the top of the hill, there are about eight hectares of catchment above the repository and this does mean that we need to have some table-drain around the disposal area to direct any water away from the disposal structures.
We've also made a decision that will have a minimum cover of five metres over the top of the waste. The NHMRC code does allow either two metres or five metres depending on the class of waste. It

has been decided we'll use five metres as a standard. I guess the other difference from what is in the
63
NHMRC code is in terms of activity concentration limits. As I pointed out yesterday, the limits in the code are generic, but the code does require specific limits to be defined for the repository. This has been done and that is contained in the waste acceptance plan.
Just summarising the features that make the site very attractive as a repository: We have low rainfall and this limits water infiltration. It gives few recharge events for groundwater. We also have a very shallow zone for seasonal fluctuations for the reason that Peter outlined earlier in terms of high evaporation. We do have high evaporation and we have high temperatures. This limits water infiltration. Again to reiterate, there is a deep watertable, which gives a long transmission time for any leachate. It also means that recharge events after rainfall are very infrequent. I think the number is that unless there are about 80 millimetres of rain in the month you don't get recharge.
Just looking at the flood catchment, people have talked about the return period for designing against floods. You can see that the repository site is on the edge of the catchment, just up on here at the top of the hill. As I said before, the catchment drain to Lake Richardson - which is at this point here - if we look at an extreme rainfall event, which is basically the one-in-a-thousand-years storm; looking at the single event, it puts around about 600 millimetres of water into Lake Richardson.
Again, putting that into perspective, the elevation of Lake Richardson is approximately 135 metres, the repository is at 189. We're talking about 50 metres of elevation which has to be flooded before the site will flood, and the one-in-a-thousand-years event will only give you 600 millimetres, so if we look at an extreme rainfall event as a single event there's no way the site will flood.
In designing the disposal structures we have adopted a multi-barrier approach. The first barrier is basically the waste condition and packaging. The second is the engineer's safeguard; that is to say, the disposal structure, which includes the backfill lining the drainage systems cover, et cetera, and the third barrier is the natural site conditions. Just in terms of the first barrier, the waste package is basically a disposal container plus any solid matrix in which the waste is immobilised, any absorbing materials.
The waste package is really only required to give you safe handling and to allow stable burial. Once the waste is buried the package in itself is not counted on as providing safety. If the drum rusts for reasons identified or outlined by Peter Woods earlier, we don't believe that is of any great consequence. Looking at the second barrier, this again is the disposal structure. It's the trench, or the bore, in which the waste is placed, and we're able to apply - and I'll go through them a bit later - some specific safeguards in designing those structures that enhance the safety.
The third barrier is the geology of the site. This contributes to the stability of the disposal structure and reduces the potential for migration of the radionuclides. Also important I guess in the third barrier is the fact that the site is both remote and also it has climatic conditions which are favourable in terms of water infiltration.
I don't want to spend a lot of time looking at the engineer's safeguard other than just saying we have looked at engineering safeguards restricting permeability, controlling the surface drainage, et cetera, and have an implementation method where we address that safeguard. Just to pick a couple: If we
64
don't control the surface drainage we're installing network surface drains to take water away from the disposal structure. In terms of depth of burial we are specifying our minimum cover of five metres; location markers, so there is some way of identifying the site in the future; access control to keep people away from there and from digging - double security fence, electronic security, et cetera.
We have also looked at the release pathways and looked at what sort of safeguard can be applied. Again just to pick a couple out, we have a discharge area of gas. We talk about permeability of the capping. We talk about discharge of groundwater by washing particles from the waste. Again,

restrict infiltration by restricting the permeability of the capping. Exposure of the waste through unintentional digging: We have a depth of the burial; we have location markers; we have access controls. We have gone through systematically and tried to identify how there may be contamination released from the disposal structures and a way to address that.
Just looking at a cross-section through the disposal trench, there is in this two elements, some of which are fixed and some which are going to vary, depending on the volume of waste that will be disposed of. Some people picked up on the word that we used - we called it a "concept design" - and wondered why in fact there may be design changes which may take place after the licensing process. I think in terms of the capping, from this point up here to the surface, that is fixed. The capping design will not change from campaign to campaign.
What may change though is the depth of the trench and also the angle of the batters. The reason these may change is that the volume of the trench will be dependent upon the volume of waste being disposed of. If we find that there's a small volume of waste then clearly you're not going to dig a deep hole when you don't need to, so this will be a campaign-by-campaign decision. Again in terms of the angle of the batters, this will depend on the ground conditions. If you find, for whatever reason, that there were to be local fracturing at an angle and the batter angle is not stable, then you will vary that to make it safe. Both those parameters are basically under the control of the operator, which will be determined campaign by campaign, but that which is more important in terms of safety - and again looking at the thickness of the cover, the cap design - no, that won't change.
We have talked, and people have talked earlier regarding leaching, getting water down into the watertable. We're looking to control water infiltration through the design of the capping layer. Peter earlier talked about the HELP model which was used to try and evaluate different capping designs. Peter also talked in terms of why don't we have an impervious base or wall linings to stop any contamination leaching out of the disposal site, out of the disposal structure.
We intend to avoid a phenomenon known as bathtubbing and basically bathtubbing is that where you have either an impervious base or an impervious wall to the structure, it is possible that water will come in through the top and with nowhere to go will basically accumulate and there have been instances known, I think overseas, where water eventually reaches the surface and contamination is washed out of the structure, so our decision is that we will do our best to stop water getting into the structure, but if water does get in, to avoid bathtubbing we'll let it escape and let it continue down as leachate.
As Peter pointed out, the transmission time for any leachate to reach the groundwater and continue on
65
is very long compared to the half-life of the waste and as a consequence we don't believe there's any - that's a detrimental wrong direction.
So the trench base will be - we call it unlined base. There will in fact - and I should perhaps go back and correct what was said before. At the base there will be a point where we dug a sample. Any water that may in fact enter the structure - there will be a monitoring point, and even though with the capping design we don't expect any or very little water to enter, there is a chance that some may get in and therefore have a sampling point as a first point of trying to see whether the structure is behaving in accordance with the design intent, so that in terms of the base there will be a layer of gravel and clay which will basically direct water to a low point from which we can sample.
In terms of the waste layer, the waste layer is the layer where we have the drums which will be stacked. They will be stacked in a configuration and fairly tightly packed to avoid big gaps between the drums which are hard to fill and which may lead to future settlement. We'll be recording the location of each waste package and we're going to backfill with a cementaceous material. The intention there is that if the drums are tightly packed, trying to put something between the drums and compact it so it doesn't settle in the future is quite difficult. A cementaceous material overcomes that

issue.
As far as the capping, five metres minimum. As I said before, it will be mounded to allow for any possible settlement in the trench. You will have a cross-fall to shed water. It will have a rocky material on the surface to increase resistance to erosion. The design for the capping adopted is the one which gives the least infiltration of water. It's about one-metre thickness of soil. There will be a high-density polyethylene membrane with a covering textile to act as an impervious layer.
On top of that there will be a 600-millimetre thick low-permeability clay. Both of those together are a bit of a belt and braces exercise but the intention is that water will not, at least in the short term, penetrate. It will go sideways and not go down through the disposal structure. Underneath the clay layer will be a 3.4 thickness of just general fill. That fill is mainly there to achieve the five metres of cover.
Boreholes are an alternative disposal structure. These will be used as an alternative to a trench. Their main attraction is that if there are small quantities of waste it's fairly inefficient to activate a deep trench. You have a large volume of overburden you have to take away for a small volume you're actually putting within the disposal structure. It may be more economical to do a borehole. When you have a look at what is the volume above the waste layer, it's quite small compared to the waste layer itself, and we think that may be economical in terms of construction cost. Again the depth of the boreholes will be down to a maximum of 20 metres.
In terms of the engineered barriers, they're a very similar size for the disposal trenches. The main differences are that we do have again vertical walls and I guess we also have the concrete collar round the lid. Thank you.
DR LOY: Thank you, Tony. Well, that opens questions then about the operations and the design of the repository. George.
66
MR JACK: Thank you. I think I might as well ask this now as any other time, but please intercede if I'm wrong, Mr Chairman. I'm interested in the line of responsibility and chain of command in all of this proposed operation. I understand DEST is the licensed applicant, but there's extensive use of consultants, contractors. For example - and I'm going to quote here out of a document:
Any review or comment by DEST on design documentation shall not transfer design risk to DEST.
This is on the repository operator's design, but I thought the repository operator was hired by DEST, and this seems to me like DEST trying to offload responsibility to a contractor. This worries me immensely from a safety point of view if that is the case, and this is fundamental. I see later on the safety committee is to identify emerging safety and radiation matters and advise on recommendations, but it doesn't say advise whom. Where does the advice go? I'm not clear about the radiation safety officer. Is he there as a line manager of some of the activities involving radioactive material or is he there as an expert health physicist on the side ready to intervene?
If he's there as a line manager, he's not sufficiently independent to spot problems in time to do anything about them. So I wonder if you can talk a little bit about this whole structure of management responsibility and how it's divided between DEST, the contractors and the consultants, because I also see that consultants are hired by DEST but managed by the contractor, and I'm wondering how that will work out in practice because I can imagine problems. Do you have any comments on any of that, please?
MR RYAN: Basically, overall DEST have that responsibility quite clearly as the licence holder, and they're the ones who are managing and have control of and responsibility for the repository. In terms of how they engage people to do any work on their behalf, it is clearly tightly controlled through the contracts they have for the individuals.
Now, in terms of whether this arrangement will work, I guess one can only sort of point to what's happening elsewhere, where we do believe this is not a unique arrangement, but basically one which

is quite common, and the problems which you're alluding to, which can occur, yes, have been addressed and it works quite well.
And again, just to point out, there was mention about the Mount Walton experience, where in Western Australia they do have a repository for intractable waste, which does take radioactive waste as well, and this again is how they do it. The department which is a State department responsible for that repository does engage in effect an operator to run the campaigns for them, to manage and to undertake their physical work, and that contract I think operates for a two or three-year period, and I think in the life of that facility there has been a change of contractor several times, so again those issues have been addressed and that facility works quite well. I mean, you are looking for DEST to define fairly closely in contractual terms what they expect of the operator, what his responsibilities are and what he undertakes. You also need to control fairly well the delegations in terms of what he can do himself without referring back to DEST. I don't see those as being insurmountable.
67
MR JACK: I am not suggesting for a moment that they're insurmountable, but I don't see in all the documentation that I've read so far this clear delineation of who is responsible for what and the spelling of it in detail. Yes, it can work; unquestionably it can work. It can also go very much awry. Go to the UK and talk to the nuclear installations inspectorate there and find out the problems they've had in the UK, because of overdelegation from licensees to contractors. We've had some of it in Canada, which we've taken measures to prevent getting worse. The US as well. There is widespread acknowledgment in the nuclear industry that undue delegation to contractors can lead to serious problems. When I see a lack of clarity and then a very clear statement that this does not transfer design risk to DEST, statements like that worry me.
"When will the documentation be clear?" would be one of my questions. Ultimately this is for Dr Loy and ARPANSA to decide, quite obviously, but how can they decide to issue a licence if they're just being promised documentation that will spell out the information?
MR RYAN: I think it goes a bit further than that. I think there has been a draft contract with the operator written which goes to a fair bit of trouble to try and define the scope of his work, his role, his responsibilities. I really think that is something which has been addressed in the documentation done to date.
MR JACK: Can I ask a related question then: How are you going to maintain or retain corporate memory between campaigns if they are nearly five years apart? Will the contractors change, perhaps, or will the radiation safety officer be different? Are there any thoughts given to how this continuity will be maintained between campaigns?
MR RYAN: Yes. That's the reason why there is such an incredibly comprehensive management system which is covering quality aspects, the safety aspects, environmental aspects and operational aspects. That, in effect, is the source of knowledge and the continuity; that in fact by having the detailed procedures of how things are done on a campaign, having close-out sessions - in terms of after a campaign we have the lessons learnt and writing that all down - you do have, for the next campaign, the recipe for how you did the last campaign and that puts you in a position to review it, see if it's still appropriate and make any adjustments you need to make, and then proceed forward.
MR JACK: I still don't know who the advisory committee advises.
MR RYAN: They advise DEST because DEST is the licence holder.
MR JACK: So they advise the program director.
MR RYAN: Yes.
MR JACK: Okay. I think I see sometimes - okay. Thanks for that answer.
MR RYAN: I guess what you've got to keep in mind is that the operations out there are not large. I

mean, you talked about the ongoing generation of waste being 30 to 40 cubic metres per year. That's not a large operation, so that the notion that you'll have project managers, radiation safety officers
68
permanently appointed by DEST between campaigns is not really workable. To have individuals appointed for five years or four years, not working, is not a good way either to conserve or pass on expertise. You'd have a massive deskilling if you tried to do that.
MR JACK: Another important question in my mind is the switching away from the responsibilities. When you get around to the second campaign and you start excavating the trenches and the boreholes for the second campaign, how are you going to ensure that you don't damage in any way or disturb in any way the waste that was put in there in the first campaign?
MR RYAN: You might do that by not reopening a disposal structure. In other words, you're not going to go in there very close to a closed trench. You'll know by the work in the first campaign where that trench is and, in fact, in the design done to date we looked at the spacing of the trenches to make sure that, if you work your way up from the batters, have a space in between, there is in fact no overlap. In fact, it is the knowledge you have from the first campaign which says, "Don't dig over there."
MR JACK: Yes, I agree you won't be digging into the actual first trench, but if you excavate away the wall that is supporting some of the first trench - how far away do you have to be to be safe? Surely the engineers who are designing this have some quantifiable estimates of the stability of structures under excavation and, if you have a trench here and you start digging here, at some point the wall may start falling away. How far is far enough? Have you any ideas of this?
MR RYAN: The batter angles to date have been based on the bore logs as interpreted by the geologist. They have said if it's that material, you should use this batter angle they think is appropriate. Using that batter angle, as I said, we have gone back down to the 20-metre mark, we have come up at that angle, you do have a buffer and you can go back down again. I think the geometrics of that are very straightforward.
MR JACK: Yes. Is this actually documented? Have I missed the details of some of this? Or is it going to be documented?
MR RYAN: The answer is yes, it is documented. If you look at the application there are drawings at the back which do show you a trench configuration.
MR JACK: This is a sample trench configuration, I understood. It was not definitely the final trench configuration.
MR RYAN: We are basically going around in a bit of a circle here.
MR JACK: Yes.
MR RYAN: Because part of the issue we do have is that you can't come up with your trenches until you know the volume of waste you're going to bury. We have looked at a volume for the first campaign and said, "We need one big trench for that campaign." We have looked at the volumes of waste being generated and said, "Okay, for the second and subsequent campaigns, based on a certain
69
spacing, you may need that volume to be buried," and as a consequence we said, "This is the geometrics of it." But we also recognise that in fact the actual volume to be disposed of won't be known until the campaign commences. You're not going to dig a trench until you have certainty as to what you're burying.
So that is why we say you need, on a campaign-by-campaign basis, to look at your trench layouts and work it out based on the reality for that campaign. I can give you very simply a layout which has been done, but you'd have to recognise that, if the volumes in the disposal campaign are not as expected, that layout won't work. You must recognise that there is going to be an iteration and you must accommodate - - -

MR JACK: Yes, obviously.
MR RYAN: - - - those changes, both in volume but also in the nature of the waste being disposed of for each campaign.
MR JACK: Thank you. I'll pass for the moment.
DR LOY: Ian?
PROF LOWE: I've got a few questions. One of them is that Prof Johnston suggested this morning that the Maralinga clean-up raised issues about project management and managing the work of contractors. Does DEST accept these criticisms and, if you do, can you tell us what has been done to rectify those deficiencies?
MR RYAN (GHD): I can't talk on behalf of DEST because I'm a consultant, but I'm not sure whether DEST do agree with that. I was involved in Maralinga and I don't accept that the project management did have all these problems. Peter Johnston wasn't here to explain why he thinks that, so it's a bit hard to respond to. I don't know if Caroline wants to talk on behalf of DEST.
DR PERKINS: Thanks, Tony. I can say DEST doesn't accept what Peter Johnston said. The only thing I want to add to what Tony said is the Maralinga clean-up achieved all its objectives. The final report of the scientific committee has actually been accepted by the International Atomic Energy Agency and has been published on its web site. So it was a very unique, successful project.
PROF LOWE: I think it would probably help us if at some point we could have something in writing that refutes Prof Johnston's critique of the Maralinga operation.
DR LOY: I think we also need to be clear that I don't think Peter Johnston was necessarily arguing with the outcomes of the Maralinga clean-up, but his critique was about the management and the relationship between DEST and the contractors. He saw that there were means by which the problems there, that were raised by that relationship, were in fact solved, but nonetheless the problems were there. So I guess there is a difference between the argument about the outcome which, of course, is still carried out in the community, but nonetheless Peter's view is that, "Yes. The outcome was okay, but in some ways it was achieved despite the structure rather than because of it."

PROF LOWE: There's a related question. One of the submissions to us suggested that the application as currently structured puts undue discretion in the hands of the proponents and operators to vary the quantity and activity of wastes. Do you accept that criticism, and whether you accept that criticism or not, could you tell us what process and criteria you'd use in relation to variations of the repository schemes, such as waste acceptance criteria or length of operation?
MR RYAN: Well, first off, no, I don't accept the criticism. In terms of varying the waste acceptance plan, we expect that if the facility is licensed, it would be licensed on the basis of the acceptance plan which has been put forward, and I think to vary that, one would expect to have to go back to ARPANSA as regulator and say, "We want to make this change. Do you agree?" and give reasons why. In terms of making design changes as we go, in terms of the inventory, I think I said before in terms of NHMRC criteria, it did talk in terms of generic activity limits and the requirement in that code to come up with a repository-specific design for the inventory, what you're allowed to put into the repository. We expect that you'll need, again on a campaign-by-campaign basis, to look at the waste being disposed of, and check that it does in fact meet your capacity, which had been licensed by ARPANSA for putting waste into that repository.
I think there is that little loop in terms of checking to make sure that for the structure and for the volume of waste and for the activity of the waste for which you're going to build on a specific

campaign, you do a check to make sure that you're still meeting your licence requirements, what you're licensed to put in there. There's a bit of confusion of there being the ability to change things. The answer is it is not the ability to change things. It is the ability to check that you aren't in fact violating what you're licensed to do.
PROF LOWE: Okay. There's a related question in the IRT report which suggested the exclusion from the management system of pre-receipt activities. It means you're dependent on the waste owners supplying waste in the form that you've specified. They suggest we need to give attention to how pre-receipt activities are to be audited and what sort of inspection process you propose to ensure that the waste that you receive meets the criteria of the waste acceptance scheme.
MR RYAN: I think the comment there is in relation to what are you doing to audit it. It is wrong to say that all the activities pre-receipt of the waste are not considered. Perhaps why it wasn't seen by that team was in fact there is a contract which has been drafted, which will apply between the Commonwealth and between a waste owner, which says, "If you want to dispose of waste at our facility, you need to do all sorts of things, one of which is have a good QA process in place so that you can demonstrate to us that you do, in fact, meet the waste acceptance plan." The question was asked by our team, "Well, tell me more about these procedures that you'll put in place to ensure that in fact waste does meet the plan." They were very concerned about how do we know with absolute surety that in fact no waste which is not low-level waste gets into the repository.
Our answer to that is, we think, the requirement both of the acceptance plan for verification, the requirement that we drafted into the contract with the waste owners, that required verification; that these do give you assurance, when you sign them off, that the waste which has been presented has been through a proper conditioning process. It has good records in terms of that to verify that the

acceptance criteria for the repository are met, and the intention certainly is that when you do accept the waste at the point of handover, you have been through a verification process and acceptance of the waste. It's not just, "Here is a drum. Please take it away." It has been through a rigorous and defendable QA process that gives you some certainty that the waste is what the waste owner says it is, and that in fact it does meet the acceptance criteria.
PROF LOWE: I suppose what I am seeking is some idea of what that verification process is. Presumably you don't say that this waste is acceptable because the contract with the supplier says it will be acceptable. Presumably there will be some inspection process that verifies that.
MR RYAN: Yes, there will. We basically write into the contract that not only is there a requirement for information that has to be provided that will give you that certainty. We're also writing in that we have the ability to audit the conditioning process, that we can go and inspect the waste while it is being conditioned. We're also looking in terms of what testing one would do at handover to give some confirmation. So basically, in terms of the information trail, in terms of inspections that can be undertaken, all of these will give you a good degree of confidence that the waste does meet the acceptance criteria, and it is what it says it is.
PROF LOWE: That's all I want to ask. Thanks.
DR LOY: All right. Thank you. Tony, there have been a number of questions handed up - and also I think particularly David Noonan's presentation yesterday - to be crystal clear about this issue of what it has proposed can be varied, subsequent to the licence if it were issued. I think I heard you say - and I want you to agree or disagree - first of all in terms of the waste acceptance criteria, the waste acceptance plan, that would be set within the licensing conditions and could not be varied other than by seeking change to the licence, and second, the design variation is only to respond to the size of the campaign and not to fundamentally alter the design campaign by campaign. Am I putting words into your mouth, or is that exactly what you're saying?
MR RYAN: No. That is how we see it; that in fact, as I said, the waste acceptance plan will be an

approved document which will require ARPANSA to approve any variation from it, and in terms of what are the key parameters in terms of safety - and I'm talking of things like the cap, et cetera - that in fact would be a ticked-off and approved design. What we're looking for is adaptation catering for volumes and that sort of thing. And I guess I would expect that ARPANSA would go through and identify what are the key parameters and they wouldn't change without approval.
DR LOY: All right. I think that's a helpful clarification. Thanks very much, Mr Ryan.
DR LOY: The next presenter is William Rodwell to talk about safety.
MR.WILLIAM RODWELL: Thank you very much, Dr Loy. Ladies and gentlemen, it is my pleasure to be asked to come over from the UK to talk about work that Serco Assurance has done on the safety analysis for this repository. I am going to talk about the long-term safety assessment of this repository. This is concerned with the period after 2052, when the repository is closed. I am going to talk about the factors making the repository safe; repository evolution under normal

conditions and the variance from those conditions. I am going to talk about the approach to the safety assessment we have undertaken and present a few example results in the summary.
We were mentioned yesterday as a company causing DEST some aggro – as one of their contractors. I think that was perhaps - as Tony has mentioned already - a little bit of misrepresentation of the way our results have been interpreted. I think it's worth saying at the start that safety and design is due process, so we've done a safety assessment and talked to DEST about the results of that safety assessment and they have made some changes to the design to accommodate those safety arguments; for example, now we have five-metre standard cover instead of two-metre standard cover, which was in the earlier NHMRC recommendations for certain types of waste.
We now have fewer sources - few of the more active sources - in, so the change in inventory, which was criticised yesterday, is actually a result of taking account of safety considerations and Tony has already said that we have developed activity limits which is repository-specific rather than the generic ones - radionuclides and repository-specific, rather than the generic ones which were in the earlier 1992 code and to do that was a requirement of the code.
The next few slides I think I can skip over fairly quickly because they have already been talked about in some detail by several previous speakers. I was going to go through the reasons that the repository will be safe after its closure, and these come down to the nature of the site, the waste inventory, the repository design, the imposition of activity limits and so on. I am going to take them in slightly different order from that list there and talk about the inventory first and come through to the sitespecific things later on.
I think it is worth just reflecting a little bit on the waste inventory because there has been some confusion about what's in there and it's useful I think to think about firstly if there is some short-lived radionuclides. This is a substantial proportion of the inventory, as people have said today, and those are innocuous after 200-year institutional control periods, and they really present no safety issues whatsoever because we can guarantee the safety of the repository over that period.
Then there is a sort of intermediate category of long-lived radionuclides that will decay while we are reasonably confident that the repository structure will be sound and then there are some low concentrations of very long-lived radionuclides, and these are essentially naturally occurring radionuclides - the things that have been dug out of the ground and we're putting back into the ground now. We can't really guarantee that the soil erosion of the site will not have occurred while that is still there.
Then there is a special category of sources that provide particularly high activity concentrations and we think we need to think rather carefully about the hazards they present if they're exhumed. This is in line with the sort of developments in international practice in some areas for the treatment of these sources in near-surface repositories. This graph reflects those considerations. This is showing how

the inventory changes over time. There's a whole lot of nuclides here that I haven't put in - the very short-lived ones which fill up this space here. They decay within 200 years, which is about here. We don't need to worry too much about those.
73
Then there are some which last a little bit longer - the tritiums, the strontiums, the caesiums - but they all decay within this sort of thousand-year period. We can be pretty confident, even out here, where we have got radium - we can be pretty sure that the repository structure will still exist - will still be covered there. Then we have got these two here - the thorium 232 and uranium 238, which are naturally carrying radionuclides, and they essentially last forever, so what we put in is still there at the end, and these other ones are just the daughters that in-grow, so they're all part of the naturally occurring radionuclide chain.
If we were in America we could just stop the calculations here because there licensing authorities only require people to think about the first 10 to the 4th years - I don't think Australia has that limitation, so we do need to give a little bit of thought to what happens out here. What happens as the site erodes or perhaps they're dispersed in other ways, but we can't really do sensible calculations that I think people would find plausible that far into the future, so we'll talk about how we might consider safety of the repository or acceptability of the repository at those long-time scales.
I just quickly thought about the design features that are relevant to the safety. These have already been mentioned, so I can skip through them quite quickly. The most important feature is the fact that it's buried under five metres of cover with reinstated ground surface to retain and enhance natural low infiltration rates. This is what Peter Woods talked about in some detail. We also count on low erosion rates and these mean that the waste is not expected to be naturally uncovered for at least 25,000 years, and that's probably pretty conservative. Some other measures of erosion rates suggest that it would be more than a million years before the waste is uncovered, but to be conservative we think in terms of 25,000 years as the period over which the waste will remain covered, and that really gets rid of all the radionuclides except naturally occurring uranium 238 and thorium 232.
The other feature of the design is the waste containers and grout conditioning. We take no credit for these in the safety analysis at all. We just assume that they provide the stability of the structure so that it doesn't cave in. As part of the safety assessment we have actually calculated - as I said before, we have recalculated the activity limits from the generic ones that were presented earlier. We have used the post-closure safety assessment to calculate these limits and those limits both for the repository as a whole and for individual drums - and I will talk a bit more about those later on. These provide safety by ensuring that you can't get more waste in the repository than is acceptable from the point of view of the hazards they can cause.
Site characteristics have already been presented and discussed in quite a lot of detail, so I won't repeat all those, except to draw attention to the fact that the consequence of all those characteristics of the site is that the very low infiltration and insignificant leaching of radionuclides into the groundwater means that effectively the groundwater pathway - which I'll talk about a bit later - is not a significant exposure route for this site. That's just a picture of the site to emphasise its remoteness - that really to put a 150-metre square repository in there - it would hardly be noticed because the site is so remote and this scenery goes on for kilometres.
To do a safety assessment one has to think about the transport mechanisms that can take radionuclides from a repository back to the human environment, and those are traditionally divided up into the groundwater pathway, which is leaching of groundwater and subsequent transport to the
74
geosphere. We have already said that this is not very significant for this. Migration of gases from the repository - some of these gases may be radionuclides. Human intrusion - this is the inadvertent actions of people that essentially bring the waste from the repository back into the biosphere. Then

there is a series of natural disruptive events that might perturb the performance of the repository. The groundwater pathway - you have already seen a picture like this from Peter Woods. The very long infiltration times - if you do the calculations and to allow for the travel time for the water and absorption of the radionuclides and the transport time for the radionuclides from the repository to the watertable, for most radionuclides it is more than a million years. There are one or two radionuclides, iodine 129, which is present in the repository in low concentrations, which will not be absorbed, but those are there in such low concentrations and will be diluted by this regional groundwater flow, so they also present no hazard, and the result is that the groundwater pathway is insignificant for current conditions.

The gas pathways - which I mentioned a moment ago - concern the transport of gaseous radionuclides by diffusion through the soil cover. This exposure is only significant if you build a house over the repository, so the radioactive gases can collect in the dwelling space, and the probability of a house being built in this area is extremely low, and this is the sort of pathway, this diffusion from the repository. The other gas of significance for this pathway is radon.

By far the most important exposure route for people at this repository, this near-surface repository in this arid environment is human intrusion. You can envisage - and I'll come to some examples later - a number of types of activity that might lead to this intrusion, but these are all very low-probability events and they're only likely to return a small volume of waste to the biosphere.

The other exposure which is natural disruption - we've had some discussion about seismic activity and I think the evidence is pretty clear that the seismic activity is insignificant for this site. The other natural disruptive event is climate change which could result in wetter conditions and modified land use. The studies that Peter Woods has presented show that infiltration is unlikely to increase as a result of foreseeable climate change, but we have considered in these assessments what might happen if there was a climate change and use of contaminated water occurred because of that climate change; despite the very low probability of this happening.

How do we carry out the assessments? The way that people traditionally do this is to choose a number of exposure scenarios. This is future evolutions of the repository and the repository environment. These evolutions should be representative or illustrative of all possible futures. We don't claim that we're actually carrying out detailed calculations of these futures, but we try and capture all the things that might happen, in an illustrative sort of way. To explore the effect of those different futures we have to identify the groups of people who are exposed by the events that occur. We have to define the behaviour of that exposed group in terms of how long they might have been exposed to the radionuclides, what their intake rates might be, et cetera. We have to evaluate the doses and compare them with targets, taking account of the probability of occurrence of that future.

What are the safety targets which we have to use to assess the safety of the repository? We're a little bit in the dark here since the regulations in Australia don't define those for us, as they do in some

countries, so we turn to international standards. For human intrusion scenarios we have adopted the approach recommended by the ICRP. They say, in their latest pronouncements, or suggest that we should use - or they recommend a dose based approach. They say that you should take reasonable efforts to limit future doses - and what they mean by "reasonable" is you have to take account of costs and so on. They suggest that if the dose is less than 10 millisieverts per year, that's acceptable for a human intrusion type activity. If it's above 100 millisieverts per year then some intervention to lower that dose might be required.

In making the assessment you need to take into account the probability of exposure. Clearly, if the probability of exposure is very low, then you might not give so much weight to that scenario as if the probability was higher. For non-intrusion-type events those naturally occurring scenarios, they suggested a risk-type target - say, 10 to the minus 6, though some people suggest 10 to the minus 5

per year, may be a preferable measure to the dose-type measure.
Then we come to what we do at very long times, say greater than 10,000 years - maybe 100,000 years - when all we've got left are these naturally occurring radionuclides. We don't really have much confidence in - and nobody I think would take seriously - calculations of human intrusion type events that long in the future, so we try and look for alternative measures of repository acceptability. What we suggest here is that we should compare the loading in the repository with what we might find in the natural environment. If we look at U 238 first, then we can compare the U 238 concentration in the waste with the U 238 concentration in ore bodies.
At the bottom there you see that in the repository with the design inventory we would expect about one times 10 to the 7th becquerels per metre cubed, which is about comparable with what is in Olympic Dam and less than in some other repositories, for example, Jabiluka and Koongarra. They've got an order of magnitude higher concentration of radionuclides in the natural ores. So we suggest that that far in the future, say more than 10,000 years, in comparison with those natural ore bodies, it suggests to us that what is in the repository is actually reasonably acceptable.
We turn to thorium 232. I found more difficulty finding data on thorium 232 because it's not mined in the same way as U 232, but there are places where in the repository where we've got about 40 megabecquerels per metre cubed. There are places where you've got concentrations as high as that in some thorite veins in Idaho. In Australia the main mineral containing thorium is monocyte. If you look at raw monocyte mineral grains that might have 2000 megabecquerels metre cubed. If you look at mineral sands with a 1 per cent monocyte concentration, then you might have 200 megabecquerels per metre cubed and I'm told this is sort of fairly typical of the heavy mineral sands that you find in Western Australia. So, again, we've got a waste loading which is significantly less than you find in natural deposits of the mineral.
Another way of looking at it is if you look at a volume of typical soil over a kilometre square, which is sort of comparable with the area that the Commonwealth has taken over in South Australia for this repository, to a depth of 10 metres, which is sort of the typical depth of the repository, then if that was eroded it would contain about the same volume as thorium 232, as the repository contains. So mixing that lot up, through natural erosion, would only sort of double the loading over that area of thorium 232. Again, that suggests to us that the loading in the repository of these long-lived naturally

occurring radionuclides is quite reasonable.
It's also worth noting that thorium 232 inventory - almost all of it is actually in a small volume of ANSTO waste, the thorium hydroxide, and if we'd left that out - if when ARPANSA looked at the doses we predict and decided they were too high, you could reduce the doses by about 90 per cent by just leaving out that small volume of long-lived waste, although we do believe it's actually safe to put it in the repository and it meets both the earlier NHMRC activity limit and the ones we calculated on the basis of our safety studies.
The next thing we have to do in carrying out our assessments is to define the scenarios we're going to consider for the future evolution of the repository. This can be divided up in the way I suggested earlier: Natural events, human disruptive events and natural relief type events. We have already sort of screened out the groundwater release pathway because, as we've shown, that's insignificant on the basis of the studies that Peter Woods reported and our additional calculations. Release of radon in gases - one of the things we should consider - we look at what might happen if the climate changed in two respects; the consumption of well waters, because if there was more water around maybe the repository would become - the waters in the repository would come back to the surface. We think, as I say, this is extremely unlikely and there's no evidence this would happen, but we did consider it as a scenario. This might also lead to a different type of agriculture occurring in the area.
We consider what might happen if there was gross erosion for some reason, if there was an ice age in

Australia in 10,000 years time. Again, a slightly incredible scenario, but it gives us a handle on worst cases that might happen. We also considered the site flooding. This is the bathtubbing-type event that was mentioned a little earlier. Again, unlikely in the current climate state, perhaps a little more likely if the climate changed.

Then we consider these human intrusion and outside activities, borehole drilling - that's quite a credible thing. People might investigate the area and boreholes might be drilled through the repository, probably with a very low probability, but nevertheless it could occur. People might dig up parts of the repository for some sort of investigation. We had road building as an activity. We should perhaps remove that now because that was in when we were considering a repository might have two metres of cover when the prospects of disturbing it through road building were slightly more credible than they are if you have five metres of cover. Archaeologists might go into the area and dig down to the repository. There seems no reason why they should but they might.

Longer-term exposures are exposures which are contingent on some of these things happening. If the waste is dug up for some reason and left lying around, other people might come into the area and be exposed. The last thing we considered is aircraft crashing into the repository, again a very low probability event, but something will be included in the scenarios. We think this selection of scenarios covers - I think reasonably representative of all the possible things that could happen to the repository.

To carry out assessments, also having thought about the pathways it might produce, might bring radioactivity back to the human environment, we also need to think about those people who might be exposed, and the three groups of people who we considered are settler groups that may settle in the
77
region for a number of years, nomadic groups that might come in for a little while and move away again, and then the workers who enter the repository location to carry out specific tasks, such as borehole drilling or building roads or so on.

And then, finally, to complete the picture, we need to look at the radiation exposure pathways, and these are pretty much standard things: External radiation, inhalation, ingestion of contaminated soils, ingestion of plant stuffs and for animals that have been contaminated; ingestion of contaminated waters, inhalation of radioactive gases. We can also intake through cuts and wounds, though, on the basis of all our past experience, we left this out as being insignificant compared with the other routes.

This slide is sort of a summary. I don't know if I need to go through it. Those are all the scenarios and these are the critical groups that corresponded with those scenarios. It's all fairly obvious. These critical groups are really defined by the activity. These other ones are the sorts of groups I talked about earlier, the settlers and the nomads and so on. These things, the wetter climate and the site flooding, are really contingent on climate change events. This just correlates the scenario with exposure route in a fairly obvious way.

To do the calculations we adopted the simplest representation of the scenario that captured the key features of the exposure pathway. We try to make conservative assumptions about parameters when we are uncertain, and if we make conservative assumptions and that demonstrates safety, then we didn't need to do any more, and that's been the case for all these calculations.

As I said earlier, we take no credit for the integrity of the packaging of the waste. The scenarios we chose we think include those with the highest exposures. To calculate the exposures you use standard health clinic models. We represent the concentration activity to which people are exposed by dilution factors, and those are supposed to represent the mixing of contaminated and uncontaminated material at the time of exposure and the proportion of foodstuffs from the contaminated area, et cetera.

In the assessments we used this simplified design. We only considered the trench design where we had five metres of cover and two metres of waste. In the assessments we've done so far, we haven't

considered the borehole configuration. We will do that shortly but I think we can say pretty confidently, on the basis of the way the calculations scale, that the boreholes would actually be even safer than the trenches because of the greater depth to which the waste is buried and the smaller area from which excavations can take waste to the surface.
A couple of example results - I'm just going to talk about two. The archaeological dig example: This just shows a dose as a function of time. Interestingly, the exposure is all dominated by these naturally occurring radionuclides. This is why the thing builds up here, because thorium 228 has to has to grow in from thorium 232. And really because it's these naturally occurring radionuclides that are the main contributors to the hazard, the concentration, the dose - the conditional dose - when I say conditional, it's conditional on the events of the archaeological dig having taken place. The probability of that happening is very low, but the conditional dose is pretty much constant in time because of the long-lived nature of the radionuclides concerned.
78
That's just for the smaller trench. This is a slightly more complicated example. This is radon release. This is complicated because over the initial period what happens is the radon decays, the dose is less than 10 millisieverts a year, which is within the ICRP guidelines, and this goes on up to here. At 25,000 years we assume that the cover has eroded away, which is why the dose increases. It increases because the cover has disappeared and because radon 226 grows in from the naturally occurring uranium 238.
Within this period here, we think you should not try and use deterministic calculations to estimate what the risk is or the dose is, because a lot more things will have happened than we've allowed for. It's likely that the waste will have been dispersed over a larger area by this time or will have infiltrated below the repository depth, so they won't be still concentrated in the trench so the doses will be significantly lower than we calculate. So we recommend in that sort of time frame, one goes over to a different measure, the comparison with naturally occurring uranium 238.
This is a summary of the results of the safety assessment. This is the dose, and you can see they're all less than 10 millisieverts except for this one, which is 50 millisieverts. We think this is acceptable, especially when you allow for the fact that, when you take into account the probability of this occurring, the risk is extraordinarily small, and that's the conditional risks. That doesn't take account of the fact that a wetter climate might not occur. That risk is assuming 100 per cent probability of a wetter climate occurring, so we think this is acceptable and this risk arises entirely from the naturally occurring
Thorium 232, and that's why I made the point that so much of that is in one very small waste stream, so if you didn't like that, you could reduce it by an order of magnitude by leaving out that thorium. These are sort of naturally occurring exposure routes, where a risk-type target is much more appropriate than a dose-type target, and again these risk are all very small, because of the low probability of the events occurring.
I thought it might be useful just to compare the sorts of targets. We don't have any guidance from ARPANSA about what they regard as a proper target for this type of facility, but they do publish - and this was drawn to our attention at the IAEA Review meeting - they do have safety targets for other sorts of nuclear facility, and these are the ARPANSA limits. This is the safety limit, this is a safety target, and this is dose and this is frequency, and these green dots are where our calculations fall. There are actually three up here. Two sit on top of each other, and these are the ones - frequency is one, because we assume in those scenarios that we're going to get the wetter climate. That's why the factor of one goes there, for the frequency. But you can see these all fall below the ARPANSA targets for other sorts of nuclear facility. And these are doses too small to be significant anyway. This is only a hundredth of a millisievert.
At the beginning I said that I'd talk about different types of waste, and I'm just going to talk briefly about

treatment of sources. The problem with sources is that they provide local concentrations of activity, so if you dug them up you might actually concentrate the exposure of people. It's quite widely accepted in some parts of the international community that for these sorts of things you need to think carefully about what you can put into a near surface repository, and that's what we've done.
We've actually thought about the exposures that might occur from excavation of these high concentrations of activity, and suggested targets or activity limits for these sources specifically, and this is why some sources have been excluded from the design inventory, and the design inventory is actually less than the earlier inventory because of this.
I think I perhaps covered this adequately earlier on when I said that we developed activity limits for the acceptance of waste into the repository. These activity limits refer to post-closure safety. There are other activity limits developed for transport of the radionuclides which I think Malcolm will talk about later on, and the operation of the repository.
For short-lived radionuclides, they will be much more stringent than the ones imposed here from the point of view of long-term safety. But we've used long-term safety to develop activity limits for the whole repository and for individual 200-litre drums and sources. We also require the aggregate target for the whole repository is met, and these are the limits for some of the key radionuclides.
You'll see that these are the nuclides that cause us most problems.
We have the repository limit and this is the design limit for the repository at the moment, and you can see the ratio of the repository - the inventory limit - inventory to the - this divided by this, is actually quite small. Only in these two cases is it more than a factor of 10 per cent. So there's plenty of capacity in terms of the repository safety to include all the radionuclides in the design inventory.
Similarly for the drum limit, these drum limits are also quite consistent with the sort of imagery you've got. Similarly, there are limits to the sources. These are the limits for the sources. By definition the largest sources still in the inventory actually conform to these limits because that's by design; we left out everything else that doesn't conform to those limits.
In summary, the nature of site 40A means that the normal evolution of the repository should lead to negligible exposures. We've looked at perturbations to the repository through inadvertent intrusion or climate change. Some of these events are considered highly improbable but the doses that could arise from them have been considered. For these scenarios the calculated hazards, we think, fall within acceptable limits. Far into the future we think the way to assess the acceptability of the inventory and the repository is to look at comparisons with natural accumulations of these radionuclides. We've used the safety analysis to determine activity limits that feed back into the waste acceptance plan and we believe the waste in the design inventory should conform to these limits. I think that's it.
DR LOY: Thank you very much, Mr Rodwell.
MR JACK: Thank you very much. A couple of questions: Zeroing in only on the intrusion scenario for the moment, the international - I think in one of your slides you said that you had followed the ICRP 81 guideline of less than 10 millisieverts and more than 100 millisieverts and yet I notice in the international review team's recommendations, one of the recommendations - and I think it's paragraph 17 - is a suggestion that ICRP 81 be followed. What happened here, or is there a chronology situation arising?
MR RODWELL: The comments, I think, by the international review team are slightly misleading. What we did - I mean, these calculations are what we presented before; it's largely a presentational

issue. In our safety assessment we provided a discussion of the different safety assessment targets. We talked about the NEA approach which said that probabilities was the thing to do.
Then we discussed the IAEA report which says for human intrusion type events - the thing we just talked about - it's appropriate. We said what we should do is present both and, indeed, if you're

calculating the probabilities you have to first of all calculate the dose, which is what they say, and then you calculate the probability, which we think you should do because that gives you a proper weighting of the dose. There's no point in calculating the dose without also considering some measure of the probability. It might be very qualitative; you might say this is a very unlikely event, but you don't just ignore it and say, "You don't give the same weight to a certain event as you do to one that is going to happen once in a million years."
What the ICRP says is, "You don't convolute those two and produce a risk at the end of it." We did that in the first instance and partly we did that because we thought - we had advice from ARPANSA which we thought meant that they wanted a risk target. We've since been told by ARPANSA that we gave too much weight to that advice. So we've actually done everything. It's a question of how you present it. We said that in the initial report. I think the international review team didn't read what we said quite carefully enough. It's true that to try to respond to what we thought ARPANSA wanted, we said we would give preference to the risk target, but in fact we ensured that we met both targets.
The activity limits for the drums were based essentially on the dose limit.
MR JACK: Thank you. The intrusion scenarios are the ones we're most interested in obviously. I'm worried whether the cap, which is designed to do several things, including keeping water out, but also to be a disincentive to intrusion, could actually be an incentive. It is going to be noticeably different from the surrounding terrain and therefore might stimulate attention from some future generation. I'm wondering whether or not thought has been given to the installation of some sort of monuments - you know, there are various discussions of this in the literature - cautioning people not to dig here in some way. Has this been considered, do you know?
MR RYAN: The quick answer is yes. We have monument designs that we use at Maralinga. The intention would be to use similar monuments at this site. They are not included in the design drawings, but they are referenced in some of the operation manuals.
MR JACK: Pictorial and other symbols are used.
MR RODWELL: It's a bit debatable how obvious it would be, I mean, in that remote area. When it's revegetated and it's got the gibber stones put on top and the cover subsided a bit and settled a bit, it's unlikely that it would be very obvious.
MR JACK: I agree with that, but I'm just wondering whether it was planned. Again, your slides showing the consequences of an archaeological dig show the doses resulting from the long-lived materials. I'm wondering whether the dose limit, the activity limits for the sealed sources - let's suppose they're sealed sources inside lead shielding, or something like that, which I understand is permissible. Have you calculated what the maximum dose would be if an archaeological dig did uncover a strontium or caesium source?

MR RODWELL: We have done that, yes. We've assumed, for example, that the source is dug out and pulverised and we looked at exposure to dust and so on - of pulverising of the sources. So we considered a variety of exposure scenarios from excavating a source.
MR JACK: Including just retaining it as a sealed source and - - -
MR RODWELL: Yes.
MR JACK: - - - hence the external radiation.
MR RODWELL: Yes.
MR JACK: What sort of orders of magnitude - - -
MR RODWELL: I can't remember the figures.
MR JACK: - - - were the results?
MR RODWELL: They are in the safety assessment report.
MR JACK: Yes.
MR RODWELL: Some of these sources, if held in the hand, would produce unacceptable doses, if

they were held for a significant amount of time. We haven't used "holding in the hand" as one of the criteria for leaving those sources out, because we have to take some credit for the fact that it's not - we can't just treat a source that we buried five metres deep in the middle of nowhere with a source that we might put in a Sydney street. We have to take some credit for that, so we haven't used that criterion, but we have said that if people dig it up or it gets pulverised or it's put within proximity of a person for a long period of time, and they don't realise what it is, that's unacceptable.
There's a little bit of inconsistency in leaving out the scenario where people are holding it in their hand, because that would lead to doses which we wouldn't find attractive. But this is a question of finding some judgment here about what is acceptable. One of the IAEA teams said to us he thought we were being too restrictive on sources because if you put them that deep, they're not going to get back into the human environment. We tried to take a balanced judgment about what was a reasonable measure and you could debate that measure.
MR JACK: Yes, and this is where I tended to go back to your probabilities as being a justifiable argument.
MR RODWELL: Yes.
MR JACK: However, if one bases the safety on the ICRP 81 approach, and if your calculation shows that the dose to a person who does actually keep the source - not in his hand but, for example,
82
in his pocket - if the resulting dose is more than 100 millisieverts, ICRP would suggest that something should have been done to prevent this, or something should be done to avoid it. I can talk from experience because this sort of exact scenario has happened where a source was found and kept in a small boy's pocket and with disastrous consequences.
MR RODWELL: But not from five metres under the ground.
MR JACK: True, but not from a place where you would have expected to find it either. All I am saying is that if that is a root of analysis and if you are basing your criteria on the ICRP approach and you get a consequence which exceeds the 100 millisieverts …
MR RODWELL: It comes back to judgment. I can always find some perverse scenario which will give me a dose that exceeds almost any target, if you try hard enough.
MR JACK: Shouldn't you then fall back on probabilities?
MR RODWELL: This is the difficulty. There is some difficulty with the ICRP approach and we try to take a balanced judgment. The ICRP approach is not mandatory. It's one measure we can use. We have used probabilities, as well, so I think we would present both and other people can take the judgment. We've offered our advice on the judgment we should make about these exposures.
MR JACK: The point I wanted to put into the record was that the slide showing the consequences were only from the long-lived radioactive isotopes and might not totally represent the possibilities.
MR RODWELL: If you look at the report we do look at exposure to the sources specifically as individual sources.
MR JACK: Yes.
MR RODWELL: That's detailed in the report, as well, and the doses are calculated. We talk about the probabilities of that occurring and there are measures. I didn't have time to go through that today, but the doses are discussed.
MR JACK: Thank you very much.
DR LOY: Ian?
PROF LOWE: I'm conscious of the fact that it's getting late and there are other issues we need to discuss. There's only one question I would like to ask you. The South Australian Government's report on climate change says that in the north of the state they expect to see increases in both frequency and severity of extreme rainfall events with a projected 20 per cent increase in flood frequency. The evidence is clear, I think, that the site is not flood susceptible, but could you

comment on whether there are any problems of water ingress if there are more frequent severe rainfall events?
83
MR RODWELL: I don’t think there are because I think - the studies that we've seen also show so. There will be more rainfall but the temperature will be higher and the infiltration rates will not change significantly - is our advice - and I think we could accommodate some slight increase in filtration rates anyway, but the complete advice is that the rainfall might go up, but so will the temperature, so the net effect on infiltration is zero.
PROF LOWE: I would be interested to see details of that calculation because, in my experience, it's not usually hot when it's raining in South Australia. It may be that the average temperature has increased and the evaporation rates over a year increase, but that may not mean that a severe rainfall event doesn't result in increased soaking of water into the ground. I suspect that it probably would.
MR RODWELL: The proportion of run-off you get in severe rain is probably higher than it is in more sustained rain. Low-level rainfall going on for a long time is going to result in more infiltration than a storm event, where most of it runs off because there is rapid saturation of the surface and then it all runs off.
DR LOY: Thanks, Mr Rodwell, for your presentation.
DR LOY: The final presentation of the forum is to be undertaken by Malcolm Cooper, who will be talking about the inventory and the waste acceptance criteria. We all make a plea for him to be as succinct as possible.
MR MALCOLM COOPER: Thanks, John. I will endeavour to be as quick as possible and I will trim down the 45 slides that I have got here.
DR LOY: Thank you.
MR COOPER: No, it's not that bad. What I have been asked to talk about today is both the design inventory and the waste acceptance plan, which is part of the licence application. Some of this material has already been discussed today, so I won't go into a great deal of detail and just give you more an overview of the process rather than detail of various aspects. In terms of design inventory, it is obviously important that one has a good knowledge of the inventory, both from the point of view of current holdings of waste materials and future arisings.
This is important from the point of view of both the design of the repository and to provide input into the long-term safety assessment for the repository. I got the impression yesterday, maybe mistakenly, that there was a comment that no inventory existed, or no knowledge of what was available existed. This is clearly not the case because an inventory was developed as part of the EIS process and the detail of this is contained within the draft EIS and supplementary materials and also within the licence application.
In order to gather that inventory questionnaires were sent to the principal organisations that would have a knowledge of waste currently installed and also the potential arisings of waste and the questionnaire covered the detail as listed on this slide in terms of the amount of waste, the type of waste, the activity and the physical chemical nature of the waste as installed. Waste owners that were
84
approached covered the States and Territories, with the exception of Western Australia because they have other arrangements in place to dispose of their waste; CSIRO, which has a holding of contaminated soil from mineral processing in the past, and a range of other sources that they used in their research and laboratory activities and ANSTO of course and the Department of Defence, which had a wide range of sources accumulated over many years.
To give you some idea of the sorts of material that are in the current waste inventory - there's a whole range of things and I don't necessarily have to go through this list entirely, but there's a range of sources which are used more for laboratory purposes and for use with the instrumentation, et cetera -

small sources.
The types of radionuclides of these cover the usual sort of culprits – strontium 90, cobalt 60, radium, caesium and radionuclides of that sort; some thorium, small thorium sources, et cetera. There's a whole range of miscellaneous sources, industrial gauges and spent sources from use in industry, either within the original housings or removed and stored. There's a whole range of historical waste of radium - mainly radium - in terms of luminous instrument dials and materials; light emitting devices, such as exit signs, mainly with tritium, and a whole bunch of other discrete sources like batches of smoke detectors accumulated over the years.
There are certain foil sources, electron-capped detectors used in instruments, radium needles, beta probes and a whole range of things, small medical applicators; for example, like strontium 90 sources for eye irradiation. There's a lot of bulk laboratory waste drummed, mainly residing at Lucas Heights from ANSTO's operations. There are again miscellaneous materials, such as resins, filters and certain contaminated materials most likely from isotope production. There's contaminated soil which has been stored in drums over a period of time and it's mainly uranium and thorium and all the decayed products.
There's other mineral processing waste from organisations which carried out studies of various mineral processing techniques and so forth. Again, historically, this is usually uranium and thorium. There's various bits and pieces - small chemical samples, ore samples - used in universities and other educational facilities, and there is some waste which has already been conditioned and encapsulated in concrete. Whether this waste would meet the acceptance criteria needs to be judged at some stage in the future. This information was used to put together a design inventory. The survey provided the current status and then we've had to consider what was going to arise from future activities.
In terms of estimating future waste arising, again that was information that was provided as part of the survey. We looked at other aspects, such as consideration of the waste management strategies, estimation of the conditioning factors and so forth in terms of coming up with overall volumes. In terms of future generation, it's likely that the use or the arising of spent sealed sources will decrease because of changes of attitudes and policies in terms of handling these spent sources and returning them to the original manufacturer. Radium sources are unlikely to arise in the future, because they're no longer in normal use.
It was assumed that there would be decommissioning waste from HIFAR. This is low-level waste arising from the future decommissioning of the HIFAR reactor. It was assumed, in terms of

operational waste, that they would remain the same, basically as at the present annual generation - in terms of ANSTO's operation, about 30 cubic metres a year - and other sources would be less than currently and maybe amount to about 10 cubic metres per year. There's some contingency for the sort of retrieval of lost sources that people weren't aware of in the past and future land remediation. In all, an estimation in terms of the current volume would be approximately 5500 cubic metres and a future arising would be, again, approximately 6000 cubic metres. An inventory was presented in the draft EIS, and it was modified subsequent to that. I think there was some criticism yesterday regarding the changes in these numbers, but there was some modification from the draft EIS because of a review of the information provided as part of the original survey. There was a misinterpretation on the part of some owners in terms of the waste categorisation under the code of practice. We reviewed some of these, and they clearly could be brought back into the type of waste that would go into the repository rather than be stored for a long period of time as category S waste. There were changes, but they were relatively minor.
In response to a comment yesterday, there was a misunderstanding of a particular tabulation of data

in terms of inventory, because that really referred specifically to sealed sources that would be present at 2052 and didn't encompass the whole of the different types of waste that would be in the design inventory. There were significant differences there, and some radionuclides were dropped off the list simply because they didn't exist as a sealed source and so on. That, I think, led to a sort of misunderstanding of the inventories in relation to the particular comment.

That briefly deals with inventory and how we develop the design inventory. I now want to quickly deal with the process in which we looked at and developed the waste acceptance criteria. The form of the waste for disposal is clearly an important component of the overall safety of the facility. The waste package provides one barrier to retain and immobilise the waste material. Particularly for short-lived radionuclides, it's an important barrier because the radioactivity can remain isolated until it decays to a level which would be acceptably low.

You therefore don't want materials that will degrade the waste package. You don't want other materials in the package which will degrade the actual overall matrix. The waste package itself also contributes to the overall stability of the repository. Again, you don't want something which is going to collapse under the weight of the disposal facility and, therefore, lead to slumping in the cover, et cetera, and then affect the overall long-term performance of the facility itself.

Therefore, it's very important to establish waste acceptance criteria which will meet these conditions to ensure the safety of the repository, both during operations and post-closure. The criteria need to cover the radioactivity content, of course, and the actual physical, chemical and biological properties of the contents. The fire resistance of the package, obviously, is important. Just the general configuration of the package is important, in terms of handling it: Ease of handling, ease and safety of transport and ease of safe emplacement in the disposal structure itself. Of course, documentation associated with the package is very important for identification of the individual items and for retaining a long-term record of what is actually in the facility.

As part of the licence application, a waste acceptance plan was developed and provided. It describes

not only the waste acceptance criteria but also the waste transfer processes and indicates the responsibilities placed upon the waste owner in terms of this waste conditioning and transfer to the repository operator. The actual waste acceptance plan, including the criteria, applies the guidance both within the code of practice for near-surface disposal of radioactive waste and also the current IAEA waste safety standards and guidance on waste classification, transportation, et cetera. As was pointed out, it's one of the main safety requirements that waste acceptance criteria are developed for the near-surface disposal of radioactive waste.

Also, there was a review of international practice - overseas practice - in terms of various facilities, which might help in the development of the plan, such as the South African facility, which is in an arid zone; the criteria established within the US Department of Energy and the Nuclear Regulatory Commission for facilities in the United States; the facility in the UK; the Swedish facility; the French criteria; and that in use for Mount Walton East in Western Australia.

In terms of the waste transfer process, there's a sequence of steps described within the plan: The original application by the owner to dispose of the waste; establishment of a contract between the operator and the owner; the actual process of conditioning and packaging the waste in accordance with the acceptance criteria; the inspection and verification of the waste packages, as was discussed earlier, to ensure compliance with the waste acceptance criteria; an audit of the actual process; a detailed review of the documentation associated with each package; and then, as part of the verification, inspection and monitoring of the packages to ensure that what is being disposed of is really in the package.

Then there's the need to prepare a waste transfer manifest and transfer the ownership of the waste to

the operator, which will occur at the point of collection for transport, so that the repository operator is responsible for the transport to the repository. Then there's the physical step of loading the waste packages and transporting them in accordance with the Australian regulations. At the site itself, there's preparation of the waste for disposal: Again checking the documentation; a visual check of packages and, if necessary, monitoring the package to ensure that there's no change of condition between the receipt from the owner and receipt at the actual facility; placement of the waste package in the structure; and confirmation that the waste disposal has taken place, confirmation to the original owner.

The waste owner of course has a number of responsibilities under the plan to have an established QA program for the treatment and conditioning of the waste. An established waste minimisation program should be in place so that waste disposal is the appropriate step for that particular waste; that the waste owner has considered other options such as retention in storage, return of sources where possible to the manufacturer for their handling and responsibility; to provide an annual forecast of waste arisings and to have an appropriate process for record-keeping and retention of the records for an established period of time.

In terms of the actual waste acceptance criteria, there's a list of the types of waste and waste materials that would be prohibited - of course a waste which contains radionuclides in excess of the established radioactivity limits for that category of waste; the absence of other hazardous waste such as acids, asbestos, biohazards, heavy metal; wastes which might emit toxic gases, and fumes and anything

that's highly flammable of course would be prohibited. Waste that would emit substantial amounts of radioactive gases; other things such as presence of organic liquids and unstabilised chelating agents, and of course finally any waste which is generated outside Australia would be prohibited from acceptance at the national repository.

In terms of the physical and chemical criteria, any liquid in the waste would have to be stabilised or absorbed onto a solid matrix; any waste that had the potential to generate gases would need to be treated to minimise that, and also further treatment of waste to minimise the presence of - or removal if possible of other potential environmental contaminants. There is, under the waste acceptance plan, a provision that the strictest requirement is the one that will apply.

Radioactivity limits, in terms of both concentration and total activity for the repository are being developed, as William has pointed out, under the long-term safety assessment, and this included individual package limits derived for the various waste categories under the code. Of course, because this long-term assessment looked at potential exposures after a significant period of time - it's 50 years - and then with the institutional control period, the package limits derived for short-lived radionuclides will be excessively high, simply because there's substantial decay during that period of time before the scenarios are assumed to occur.

Consequently one has to look at the other safety requirements, under operational safety, in terms of both normal handling of waste packages and accidental situations that may occur during operations to emplace the waste, and also the transport regulations contain limits upon individual packages in terms of the radioactivity content. So therefore, for short-lived radionuclides - an example is cobalt 60 - it's more likely that the operational transport regulations will be the most restrictive in terms of the radioactivity content.

This has been looked at in supplementary material provided to John Loy and where the approach is proposed for consideration of these other safety aspects to establish individual package limits in terms of both activity concentration and also for just the total radioactivity within the individual package. Again, the plan requires conditions on both the containment of the waste material, the stabilisation of the material within a suitable matrix, such as concrete, in order to achieve the objective of immobilising and isolating the material in the repository and also of course to meet the

requirements for safe transport. I won't go through that necessarily because it's just additional detail on what requirements are within the plan itself in terms of waste stability and packaging.
I think Caroline covered this too in her presentation, but examples of waste packaging for the various categories of waste under the national code - category A waste, which you've identified as mainly laboratory waste or likely contaminated soil. It's envisaged that there would be simple compaction in steel drums and grouting of some form or other to eliminate any void spaces within the drum itself. Category B wastes are identified as those small sources, and then there's a whole range of different types of these sorts of sources, and these it's envisaged would be encapsulated firstly in steel or copper, if that's practicable, and placed in a steel drum and then filled with concrete. There may be, in order to meet the transport requirements in terms of external radiation dose, additional lead shielding may be necessary as part of the packaging.
88
Category C waste, which is identified as being, I guess, contaminated soil with higher levels of activity, mineral processing waste and perhaps some surface contaminated objects, and this would be again solidified and necessarily drummed and grouted with cement to eliminate voids, and surface contaminated objects would be drummed in a concrete matrix. So this is how we envisage that the various categories would be handled in terms of waste packaging, and that's the end of the story.
DR LOY: Terrific. Thanks, Malcolm. George.
MR JACK: Thank you, and I remember your caution to him. I've only got two queries. One is, additional lead shielding may be included as you have just said, and yet one of the exclusions from the waste repository is heavy metals of which lead is one. So there seems to be an inconsistency in those two statements. Could you clarify it for me, please?
MR COOPER: Yes. This is an issue. I'm not sure exactly how best to answer that, because there is a considerable safety advantage in having the lead there as to provide both transport safety and operational safety aspects. I really don't know how we best address that, whether one has to offset, I guess, the safety aspects of having lead in that environment as against the whole safety of the repository or the handling of the waste itself. I think it is necessary to have - it may be necessary, let me put it that way - in practice it may be not a great issue, but with a number of sources perhaps it may be best to retain them in their original housing, which would contain perhaps some shielding, and it maybe simpler to do it that way.
It's a practical issue which I'm - well, I know we're certainly aware of, but I think in this particular case, because it's such an important part of the overall handling and so forth, one might have to tolerate small amounts of lead. I'm not saying that we have a whole lead-filled drum or something like that, it's just what would be required to reduce the external dose rates down to allow the waste.
MR JACK: I understand.
MR COOPER: That would be necessary anyway, because if you look at the activity limits under the transport code, when you do the calculation of the surface dose rates on the external surfaces of the packages, then we'd still exceed the two millisievert per hour which is what's required under the regulations. So some form of shielding. There may be alternatives such as whether one uses more steel, stainless steel or copper or whatever to provide the necessary shielding.
MR JACK: Yes. I'm not disputing the need for it from a safety point of view in transportation, it was simply that I noticed the inconsistency in the documentation, that it's stated specifically that heavy metals were excluded. However, thank you for the answer. The one I wanted to raise - it was coming back to a point that Ian Lowe raised earlier this afternoon, and is to my mind very important, is the quality assurance program that DEST will have or the contractor will have over accepting the waste from the waste owners - the waste generators. I hate to put it this way but will there be any actual sampling ever be done? It's all very well to get documentation from the waste generators, which purports to show that the waste is within the acceptance criteria that are specified and accepted, but if there's

never any actual testing that this is actually being done, there is then the possible perception that some people will deliberately deceive DEST or the contractor and that this would be not detected unless there is some perhaps occasional, but occasional, sampling methodology or some testing like this that could be held up as a deterrent. Have you any comments on this, please?
MR COOPER: I think it's very important that there is some sort of monitoring and testing of the packages. It's difficult when it's in a conditioned form, of course. To get a reasonable understanding of what's in the package from an external measurement of something which is surrounded by a significant amount of concrete will be difficult, but there are ways and means of that in terms of perhaps neutron detection and so forth.
MR JACK: But is this planned to occur?
MR COOPER: Yes, it's part of the plan.
MR RYAN: Can I just say the answer to that is yes. We're currently looking at what devices are needed when you do this handover, that you can do some sort of in-drum measurement to get some understanding of what's actually inside the drum. As Malcolm said, there's a question of how accurate a reading they get because of internal shielding, but having said that, there will be some capability to do testing.
MR JACK: "Some ability" is the operative phrase I hear. Thank you.
PROF LOWE: I've only got a couple of questions because it's late and there are some general issues that we need to look at. The first is how confident you are that you know the inventory of the radioactive waste. One submission yesterday said that the data in the application only says what it will be in 2052 rather than what it is today. Another submission yesterday suggested that some of the States and Territories are not confident they know what the waste is within their boundaries, so the obvious issue that arises is how DEST can be more confident it knows what's in the sovereign State of New South Wales, for example, than the government of that State is.
MR COOPER: Certainly there is a great deal of uncertainty in the inventory information that was provided. I think the answer there is that - well, first of all you had to rely on how much effort people would go to to find out the details of sources that are under their control in terms of the storage, and there is uncertainty in certain detail. The point is, I think, that the upper bound to that level of uncertainty is considerably below the total activity limits which are derived for the repository and therefore it's confident that we're not going to find a huge number of sources suddenly appear that we haven't accounted for and then we'd be over the levels that would be acceptably safe, in terms of the total activity that could be placed at the repository. To me, that's a reasonable assertion. Let me put it just in those terms.
PROF LOWE: Just one follow-up question: Is it fair to say that the volumes that were suggested to us indicate that the task of the repository is dominated by the waste generated by Commonwealth agencies and that, since that generated by the States and Territories only accounts for about 4 per cent of the total volume, the uncertainty in that is not as significant?

MR COOPER: I think there's the issue of looking at volumes and activities and the sorts of radionuclides that are generated. It may be in terms of volumes, but the volumes are dominated by large quantities of contaminated soil which are held, of Commonwealth origin, and the large quantities of historical waste at ANSTO, which is drummed waste. I think that's a little bit misleading, because there's a substantial amount of activity held within the various States of smaller sources and whether they're going to be accepted, because they may exceed the activity limits for individual packages, it's hard to say at this stage.
But there are a range of small sources held in the States. I don't have the numbers to say in terms of activity what proportion of that, but I would say that the states hold a much higher proportion in terms of activity than they do in terms of volume and, in terms of a future arising, that one doesn't

expect huge quantities of soil and so forth. As has been pointed out, it's relatively small amounts arising per year in terms of that. It's sometimes difficult to look at in terms of volume as against activity.
DR LOY: I might just ask one question that has come up a few times in the questions here. People are a bit unclear about what HIFAR decommissioning means in this context. I guess it's a pity that Dr Cameron has left, but could you at least in very rough terms characterise the potential, the sort of waste that you expect to arise from HIFAR decommissioning.
MR COOPER: I must admit I'm not an expert in this area. My understanding would be that there would be, certainly in the decommissioning process, what we would classify as low-level waste arising from various activities involved in decommission, and also maybe some surface contaminated objects which would be acceptable - you know, metals and so forth and other materials that might arise; but in terms of actual detail, I think this is a big unknown in terms of volumes of material as to what might come about from there.
Certainly one wouldn't envisage intermediate-level waste or activated materials, which would have substantial amounts of activity associated, being considered for disposal in the repository. It would only be those - I guess again clothing and so forth, the lightly contaminated materials of various forms that would arise. Other than that, I can't really answer that in detail. It is a big unknown. I think part of the volume estimated is a real estimate without much basis.
DR LOY: Presumably the notion that I think ANSTO favours is to look at obviously removing the fuel from HIFAR, and that would be treated in the way in which all the fuel is being managed and then leaving it for a period of something like 30 years for the short-lived radionuclides to decay. But as you say, you're looking at some parts of the reactor that have activated - because they've been in the neutron flux, and you'd expected them to be quite high activities. As you say, that probably would not be suitable material.
MR COOPER: I'm sure it won't be suitable.
DR LOY: But there would be other parts of the reactor structure and buildings and so on that would have low levels of contamination and that would be what you presumably are talking about.

MR COOPER: That's right, yes.
DR LOY: For winding up I wonder if, Dr Perkins, you could come back on the podium and try and answer some questions if you like about the project and presentations overall. I'll try and throw in some of the questions that have been handed up, though I'm not quite sure we will be able to get through them all, but perhaps, George, did you want to begin with some overall questions?
MR JACK: Yes, by all means. I'll start with a fairly general question of Dr Perkins and this concerns the overall documentation of the entire proposal, Dr Perkins. There are vast amounts of information in the documents. Some of the information has been altered or added to as a result of various triggering factors. It is not clear to somebody coming in at the end of it whether the latest document supersedes an earlier one or changes it. As one reads through the documentation, you find subtle differences and inconsistencies in areas where you would expect those not to occur.
I mentioned earlier this afternoon that the documentation didn't seem to me terribly clear about the relative responsibilities and I'm wondering whether you have any intention of producing, near the end of this preliminary stage of the project, a concise final version of the documentation so that everybody involved then knows exactly the documentation that applies to the project that you're really seeking approval for. Can you answer this in any way, please.
DR PERKINS: Yes. I think the answer is yes. One of the IAEA Review team's recommendations was that a safety case be put forward in a format they recommended, which was the Isham format, and I think that is really a consolidation of all the key elements which will feed into the repository, so I envisage that that would be the small consolidated document you talk about, probably with

references to other documents, but that would encapsulate the proposal and safety features, et cetera.
MR JACK: Thank you. My follow-up question would be that if you were to get approval from the regulatory authority and then you were to issue a directive to your contractors or to your own staff on how to behave, what documents would you tell them to abide by? At the present moment we've got this much and it's very difficult then for a member of staff to know what to do or for a member of the public to know whether you're really complying with what was committed. So this is the basis for my question.
MR RYAN: Okay. Let me just say two things. Basically, in terms of how is that being put together, we're up to about now, I guess, version 3 of how to structure it. You start off with your ARPANSA application package which gives information in this sort of fashion. We've had the supplemented questions to give in this sort of fashion. Now the IAEA review team has said, "Well, the Isham model is the way to go," and you keep on basically supplying data and, as a consequence, the volume of data gets larger and as you keep on saying the same things, these types of differences do creep in, there's no doubt about that.
So I guess in terms of whether we're going to rewrite it, the question is, "What model do we write it on?" We would need to sort of be told by ARPANSA, "Look, this is how we are finding what the documentation looks like." If we get that guidance then we can basically deal with it. At the moment we have virtually about three different versions of the application in the way that the information is

structured, and that's going to give you that confusion.
The second problem I guess is in terms of what goes to the contractors. The information written at the present time is an application for the licence. You need to then go through and say that some things fall away, because when you come to do the work with your contractors, the repository management system stays intact but the application itself is just for application only; it doesn't go forward into the future. Things like, though, the draft contract for the operator, a contract you're going to write for your waste owners, they will continue on. So there will be, if you like, a subset of what has been given to date which will continue on, and will have information added to it as you write your disposal contracts with the waste owners. It's going to be a living thing.
Certainly what has been presented will become information which will continue on and have its own life. But really, in terms of, "Are we going to rewrite the application on top of these sort of different versions?" at the moment we're reacting to requests and those requests do require taking that information and almost restructuring it and rewriting it and re-presenting it, and that's just a difficulty we face in trying to respond to ARPANSA's requirements.
MR JACK: Yes, I agree, but it's a difficulty that's faced by many licensed applicants in many countries of the world and it needs to be clear, I think, for confidence to be built in the general public and in other people, that everything is documented clearly. So thank you very much for your response, I appreciate it.
DR LOY: Ian?
PROF LOWE: I've got three or four questions.
DR PERKINS: I'm sorry, could I just add one other point. Of course, the management system for the repository and all the procedures will be very clear guidance as to what's to be done at the facility.
MR JACK: Yes, understood, thank you.
PROF LOWE: The interim review team said the application for siting, design, construction and operation of the facility in a single step overlooks the step-by-step approach that is considered to be international best practice and said that it precludes the iteration considered to be necessary to

achieve, demonstrate and give confidence in the safety of the facility and they recommended that alternatives be explored to take the licensing process forward in a step-by-step manner. Do you have any response to that suggestion?
DR PERKINS: I think, in a way, in part, that suggestion really is for Dr Loy. We have put in an application which is consistent with the Australian Radiation Protection and Nuclear Safety Act and it has been accepted. I also want to point out too that we have indeed had a very lengthy consultative process going all the way through this proposal, from the commencement of this project in 1990 to very detailed and lengthy site selection studies; that in a way the environmental assessment for the facility was indeed a sort of siting approval and that was a process that was conducted a few years ago. The nature of this particular proposal is such that to prepare a site, it is really for us, in terms of what ARPANSA is doing, is to construct a fence and an access road, and buildings and operation and construction, in a way, are one and the same.
MR RYAN: I guess, just to add to that, I think the IR team, when they looked at it, looked from the technical perspective. They were looking at how you evaluate the technical evidence and a step-by-step iterative process is what you would normally expect to happen. There is conflict, I guess, between the ARPANS Act which looks at putting in a single application which is reviewed by ARPANSA and is a one-step process - and that I guess is a legal requirement and there's conflict between the two. Technically, you would say, "This goes to an iteration process." Legally, it goes through a one-step application and, again, I think it's put back on - - -
DR LOY: There's certainly no requirement under the ARPANS Act that required you to put an application in to prepare a site, construct and operate it; no requirement whatsoever.
MR RYAN: No, I'm not saying that. I'm saying we're looking at putting a single application in for whatever, whereas what the IR team referred to was a technical assessment in a step-by-step process.
PROF LOWE: I have got three more questions of increasing levels of generality, I'm afraid. Dr Perkins, you told us this afternoon that the community and the environment will benefit if this proposal goes ahead because you said disposal of the waste in a purpose-built national repository will reduce the cumulative risk of storing waste. Are there any risk calculations that substantiate that or is that just a general feeling that you have as an applicant?
DR PERKINS: Well, it's a general feeling. I might ask my colleagues if they can comment on the calculations, but really what I'm saying is that under the current arrangements, particularly in stores from universities, hospitals, et cetera - these aren't set up for long-term management of material and there are examples - I gave a couple of examples where records of sources have been lost and safes or places where sources are kept have actually been sold to scrap metal merchants. So I guess what I am saying is there clearly aren't, in ad hoc storage as it is at present, arrangements to manage the material for the life of the radioactivity of the material, and it's under circumstances such as these where the sources can be lost.
PROF LOWE: I understand that but anecdotes don't make good science. I suppose what I'd like to see is some assurance that the process of collecting, transporting and storing these orphan sources around the country will reduce the cumulative risk to the community over and above what is posed by being in these different places now.
MR RYAN: In terms of someone sitting down and doing that risk assessment, that hasn't been done - the short answer is it hasn't been done.
PROF LOWE: Sure, okay.
MR RYAN: With a general belief, I guess, that that central storage, because of those sort of reasons, is a more satisfactory way. I guess it's interesting that when you look at the question of the inventory, there is a question about sources being reassigned because the information that was given to us in those questionnaires was not very precise, and the answer really is that it wasn't really precise. We

seemed to see quite clearly that a lot of the waste owners have had something on the shelf for quite a considerable time. It predates when the current occupant of the position looking after it entered that position and the knowledge of what's on the shelf is very poor. That to me, though, indicates the problems you get in basically having lots of small stores - that people lose knowledge, lose information in terms of what they have and, from that, problems arise.

PROF LOWE: Okay. Thanks very much. The other two questions border on the political and it may be that you are not able to comment, but I'll ask and see if you can. One is that the figures we were given this afternoon were that about half the 3700 cubic metres of waste involved in the short term is already at Woomera and the remainder is largely ANSTO waste; and that in fact only about 160 cubic metres of the waste is coming from States and Territories. Doesn't that suggest that this is really a Commonwealth problem rather than a national facility to manage the waste of the States and Territories?

DR PERKINS: No, I don't accept that. I think the facility is for both the Commonwealth and the States and Territories. Places like ANSTO are obviously better equipped for long-term storage but it's particularly in the smaller stores that we've spoken about before, in universities, hospitals, et cetera, where the long-term safety of the radioactive material cannot be guaranteed. So from a risk point of view they are the ones which in one sense will benefit more from actually taking the waste out of those facilities and putting them into a central long-term purpose-built facility. I think the answer is it's for both Commonwealth waste and State and Territory waste and, indeed, I think that was reflected in the decision by all jurisdictions to have a national facility, that there was benefit for all in having such a facility.

PROF LOWE: The final question is one that I should apologise for raising at this time but it was raised in the submission to us and I feel I have to air it. It was suggested to us yesterday that given the level of hostility in the local community in South Australia to this proposal, the Commonwealth should restart the process and seek to find a site with community acceptance along the model of what was done in South Korea. Presumably you would argue that there has already been extensive consultation and you don't want to restart the process but I wonder if you would concede that if the proposal does go ahead against strong local opposition there will probably be a perception in the local community that the Commonwealth is riding roughshod over the concerns of the local community, and whether you have any suggestions for how that sort of concern could be moderated?

DR PERKINS: Well, I mentioned earlier on we did have a voluntarism siting study in the 1980s that didn't progress. I'd say in countries where that sort of model has succeeded - and I think people were talking, too, about the Scandinavian countries but they have quite different circumstances to us in that really they are countries where there is nuclear power - there are major facilities - where they have had acceptance in terms of a vote. That's been at places where there are already existing nuclear facilities so presumably there is very direct major economic benefit to those communities. I really think the circumstances are somewhat different. I think the approach we have taken, perhaps, to reassure the public - obviously the licensing process is very important - that the facility is well run and that local community certainly has access to information about the facility.

PROF LOWE: Thank you.

DR LOY: Just a couple - I'm trying to draw together a few things that have come forward in the questions and I guess one is transport, and there's a reference in a number of questions, apparently, to a truck accident in the Blue Mountains today. I'm not aware of it but it has obviously stimulated some interest. Yes, I mean, we know all about the code and so forth and so on. I guess what would help in giving some confidence to people is what arrangements are there if things do go pear-shaped? In other words, what about emergency arrangements in relation to transport? There do seem to be views expressed in submissions yesterday that these are not in good shape and that the emergency

arrangements along the transport routes are not readily available to deal with something going wrong.
DR PERKINS: I think the point needs to be made that the transport of radioactive materials happens every day and there are emergency arrangements in place to deal with incidents. In the EIS we went through in detail various arrangements that the states and territories have in place in terms of who attends a scene of an accident. My understanding is in the first instance it's usually the fire brigade. They can cordon off a site. If they want to call in expert assistance from the regulators in States and Territories, they do that. Also the Commonwealth can be called in, in terms of radiation expertise if required. I think what we are proposing is nothing new. Every day there are many, many instances of transporting radioactive materials and routinely there are emergency arrangements in place to deal with any incident.
DR LOY: That message certainly doesn't seem to be getting through. That may be something that you need to take into account in preparing transport plans, certainly.
MR RYAN: Can I just add, though, John, in terms of where we are at, we had not prepared detailed transport plans for transport of the waste but then again, we don't have a licence so in terms of going ahead and preparing levels of that detail I don't think it is appropriate that we would have done so as yet. We have identified the issues. We know they are there but in terms of doing the work, to cover emergency plans for shipping waste from point A to point B, I don't think we can do that until such time as we are licensed to do so.
DR LOY: Well, yes and no. I think, sure, in terms of the precise transportation of this amount of waste between X and Y that's true, but I think transport is clearly a relevant issue and the fact that you are proposing a repository in South Australia means there is going to be transport. I understand all the protections that are built in, in terms of the material itself and the way it's packaged and so on and so forth, but again it is a matter of public confidence, particularly in relation to emergency arrangements, and there is a lot of disquiet expressed in a number of submissions about that. So I believe it may be an issue that you do need to pay attention to.
PROF LOWE: I think if I can add, it's related to the issue I raised of risk assessment. If you were to grant this application it would be on the basis that there is a reduced risk to the community and, it seems to me, that means you have to be satisfied that the risk to the community of collecting and moving the sources justifies the reduced risk for them being in a secure repository.
MR DAVE SWEENEY: If I might make a point of information in relation to those earlier questions

and submissions. Since this forum began, there have been two fatal truck accidents in the Blue Mountains on the preferred transport route. One of those involved shipping cyanide and the New South Wales Sydney base provides resources with the hazmat team - that is a very significant and a very sad set of events and it's also one that puts into stark relief the concerns that exist from southern cities to the site at Woomera.
That is why there is such concern, and I thank you for raising that and acknowledging that. That is why people are consistently unimpressed and consistently unsatisfied with the comment that says, "This is safe. This is proper. This is in the best interests, and yet we haven't detailed a plan of how we're going to move stuff there. We've done models of what might happen if you build a house there in 25,000 years, but we haven't planned what 140 trucks going through Katoomba might mean." Thanks for raising it.
DR LOY: Thanks, David. Let's move on. We have certainly flagged that issue. I guess the other thing is about contingency planning. You take all these precautions; you build a repository that is properly designed; the material is in its drums and its concrete and so on. What do you do if, five years later, you see some radionuclides in the sampling you take of the water at the bottom of the repository? What happens then? Something has gone wrong.
DR PERKINS: I think what you do is, if you get one anomalous measurement, you obviously

initially want to check it and try and work out what radionuclides they are, if the anomaly is only in one hole; if it's reproducible, if it's being picked up in other holes. I think what you would have to do, too, is - remember the waste is isolated in the centre of a large site - perhaps even potentially put in a few more bores to see if you can check progress in terms of movement of the radioactive material to determine whether it is going to be an issue with consequences of the site.

DR LOY: Are there specific plans within the management system, a kind of response plan to an event?

MR RYAN: There is no specific plan written in terms of how you would recover all the waste. Basically it's low-level disposal; it's recoverable. I guess in your investigations if you did determine that in fact the process was not going as expected, then you do have the ability to recover it. But in terms then of coming at it step by step or the consequences, I think you've got a fair bit of investigation you would do before you'd – to typify what the problem is - before you would entertain those solutions.

DR PERKINS: The answer is, detailed procedures would pick up exactly the chain of what would be done under certain circumstances.

DR LOY: Okay. I just wanted to comment on a couple of things in the questions. One person clearly misunderstood something Dr Perkins said. I think it's clear to me that waste of foreign origin will not be acceptable in the repository. Someone heard you leaving out the "not".

DR PERKINS: You're correct, Dr Loy.

97

DR LOY: Thank you.

DR PERKINS: Foreign waste will not be accepted in the repository.

UNIDENTIFIED MEMBER OF AUDIENCE: That is not what the Minister said yesterday.

DR LOY: I am sure it is. There will not be waste accepted of foreign origin. I think that's very clear government policy. There are a couple of questions here about the store. The issue of what happens with the spent fuel once it's returned from reprocessing in France or Scotland: That is intended for the store. Co-location of the store I suspect ultimately might have been a political solution. The siting criteria, some of them are the same but many of them are very different in my view, and co-location was not necessarily ever a good idea.

I hope we've done some justice to the questions. I accept that we haven't gone through them all, and I think, given that it's 6.30, I'd now like to draw the proceedings to a close, first of all by thanking Dr Perkins and all the participants for a very good exposition of your application, and certainly it makes clear where it is you stand on many issues, which is very helpful. Thank you.

Finally, let me just quickly sketch out where to from here. As I mentioned at the beginning, once Colin and his assistants produce a transcript, that will be published and made available so that people who didn't have the benefit of living through this experience can appreciate it. My trusted and well-beloved panellists will go away and write their reports. They will be produced hopefully in the next few weeks. Again I will publish those upon the ARPANSA web site for all to see. I anticipate receiving the complete IAEA Review team report shortly; whether "shortly" is a couple of days or a week or so.

I understand the review team has finished its task but they wish to put it through some process in the IAEA to get the tick from the agency; the agency owns the report and that is appropriate. When I receive that I will formally refer it to DEST with a covering letter that indicates some views that I might have of it, to assist them in responding to it. I will publish that, of course, and their response when it is received, as well as the reports by the Radiation Health Committee and Nuclear Safety Committee on the various issues that they are dealing with.

I believe I will need to have a final round of public submissions after DEST's response to the IAEA report is known and available. That then brings me to, I think, having all the information that I am

ever likely to get in front of me, and to be able to endeavour to make a decision. So that is a sketch of the future actions that I see relating to this further consideration of this application. Are you waving at me, David?

MR SWEENEY: No, I am just waiting patiently, Dr Loy. Just one procedural point from the floor, if you could be so kind, and that is that people very much welcomed the ability to write questions to DEST. It's unfortunate there perhaps wasn't time for a more discursive interaction with DEST, and just to honour that process I wondered if it might be possible if you could, as part of the formal and public proceedings of this, forward those questions to DEST for their response, so that that can then inform debate further, as well as those other parts that you put forward.

DR LOY: Yes, that's a good idea; happy to do that. There are one or two of them that I can't actually read but I am sure we will figure it out well enough in due course. Thank you for that suggestion, David. There remains no more than for me to thank you, the audience, those of you that have had the strength and courage to remain, but all of those who attended for some part of the public forum, and certainly I realise that during the presentations there were statements by many of the participants which different parts of the audience might have found provocative for different reasons, but I think everyone was treated with courtesy and respect. I think that is a very good outcome, and thank you for that.

I certainly thank all the presenters and submitters. I think the presentations were of a very high standard, and certainly very much brought out the issues. I thank the staff of ARPANSA for the support they provided to the forum, and finally the management and staff of the Adelaide Convention Centre for a terrific venue. So thank you all very much.

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