COMMONWEALTH OF AUSTRALIA

Official Committee Hansard

HOUSE OF REPRESENTATIVES

STANDING COMMITTEE ON INDUSTRY AND RESOURCES

Reference: Developing Australia's non-fossil fuel energy industry

MONDAY, 10 OCTOBER 2005

CANBERRA

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HOUSE OF REPRESENTATIVES

STANDING COMMITTEE ON INDUSTRY AND RESOURCES

Monday, 10 October 2005

Members: Mr Prosser *(Chair)*, Mr Hatton *(Deputy Chair)*, Mr Adams, Mrs Bronwyn Bishop, Mr Cadman, Mr Martin Ferguson, Mr Haase, Mr Katter, Miss Jackie Kelly and Mr Tollner

Members in attendance: Mr Adams, Mr Cadman, Mr Hatton, Mr Prosser and Mr Tollner

Terms of reference for the inquiry:

To inquire into and report on the development of the non-fossil fuel energy industry in Australia.

The Committee shall commence its inquiry with a case study into the strategic importance of Australia's uranium resources. The case study shall have particular regard to the:

a) global demand for Australia's uranium resources and associated supply issues;

b) strategic importance of Australia's uranium resources and any relevant industry developments;

c) potential implications for global greenhouse gas emission reductions from the further development and export of Australia's uranium resources; and

d) current structure and regulatory environment of the uranium mining sector (noting the work that has been undertaken by other inquiries and reviews on these issues).

WITNESSES

Committee met at 9.34 am

BORTHWICK, Mr David William, Secretary, Department of the Environment and Heritage

COCHRANE, Mr Peter Michael, Director of National Parks, Department of the Environment and Heritage

EARLY, Mr Gerard, First Assistant Secretary, Approvals and Wildlife Division, Department of the Environment and Heritage

HUGHES, Mr Alan, Assistant Secretary, Supervising Scientist Division, Department of the Environment and Heritage

JENDE, Mr John David, Director, Renewable Energy Policy, Energy Futures Branch, Department of the Environment and Heritage

JOHNSTON, Dr Arthur, Supervising Scientist, Supervising Scientist Division, Department of the Environment and Heritage

STERLAND, Mr Barry, First Assistant Secretary, Industry, Communities and Energy Division, Department of the Environment and Heritage

TINNEY, Ms Anthea, Deputy Secretary, Department of the Environment and Heritage

CHAIR (Mr Prosser)—I formally declare open the sixth public hearing of the House of Representatives Standing Committee on Industry and Resources for its inquiry into the development of the non-fossil fuel energy industry in Australia. The committee has commenced its inquiry with a case study into the strategic importance of Australia's uranium resources. The inquiry was referred to the committee by the Minister for Industry, Tourism and Resources, the Hon. Ian Macfarlane, on 15 March 2005. The committee is pleased to be conducting the public hearing this morning with representatives of the Department of the Environment and Heritage and other environment portfolio agencies: the Australian Safeguards and Non-Proliferation Office and the Submarine Institute of Australia.

Although the committee does not require you to give evidence under oath, I should advise you that the hearings are formal proceedings of the parliament. I further remind you that the giving of false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. I further remind you that the committee prefers that all evidence be given in public. However, at any stage you may request that your evidence be given in private and the committee will consider that request. I now invite you to make a short opening statement before we proceed to questions.

Mr Borthwick—I would like to make some brief opening remarks regarding the arrangements for the regulation of uranium mining. The regulation of uranium mining is very complex, and the management and supervisory arrangements can be difficult to untangle. As an introduction, I will outline the role of the Environment and Heritage portfolio in relation to

uranium mining and how our role meshes with other Australian government departments and the Northern Territory government.

The Environment and Heritage portfolio has four key responsibilities in relation to uranium mining: firstly, the assessment and approval of proposals for new uranium mines or the expansion of an existing uranium mine under the Environment Protection and Biodiversity Conservation Act 1999, known as the EPBC Act; secondly, the Supervising Scientist's monitoring, research and supervisory role in relation to uranium mining activities in the Alligator Rivers region of the Northern Territory; thirdly, the management of Commonwealth reserves by the Director of National Parks, including Kakadu National Park, which surrounds the Ranger and Jabiluka sites; and, fourthly, through the delivery of the Australian government's climate change strategy, a key interest in energy issues, including nuclear fuels.

These responsibilities are part of the Australian government's overall role when it comes to nuclear matters, which is the responsibility primarily of three portfolios: Environment and Heritage; Industry, Tourism and Resources; and Foreign Affairs and Trade. Of course, other portfolios, such as Health and Ageing through ARPANSA and Education, Science and Training in consideration of possible sites for the Commonwealth radioactive waste management facility, also have specific roles. I propose to limit my observations primarily to my portfolio's responsibilities.

The agreement between the Northern Territory and the Australian government on the regulation of uranium mining in the Northern Territory requires that, before granting or varying an authorisation under Northern Territory legislation, the Northern Territory Minister for Mines and Energy is required to refer the matter to the Supervising Scientist for comment and must not act until that comment is received. The Supervising Scientist may refer the matter to the Commonwealth Minister for Industry, Tourism and Resources and advise the Northern Territory minister that the matter has been referred. Where the Supervising Scientist has referred the matter to the Commonwealth Minister for Industry, Tourism and Resources, the Northern Territory minister must act in accordance with the advice of the Commonwealth minister.

The important principle here is the separation and independence of the Supervising Scientist's monitoring, research and supervisory role from the policy and specific regulatory responsibilities of the Australian government industry portfolio and the Northern Territory mines and energy portfolio. This separation of roles has been important in avoiding potential conflicts of interest as well as in enhancing accountability and, I believe, public confidence.

The day-to-day regulation of uranium mining activities is a matter for the states and territories and encompasses issues such as health and safety as well as environmental regulation. The monitoring, research and supervisory role of the Supervising Scientist in relation to uranium mining only applies to the Alligator Rivers region of the Northern Territory. The Department of the Environment and Heritage has not had a direct, ongoing role in the regulation of uranium mining in South Australia but does participate in a more arms-length role in consultative committees.

The proposed expansion of South Australia's Olympic Dam mine, which is currently under consideration, is the first uranium mine proposal to be considered under the EPBC Act. The

EPBC Act does provide a vehicle for the Minister for the Environment and Heritage to directly issue approval conditions to a proponent of any new or expanded uranium mine.

The portfolio is also responsible for the delivery of Australia's climate change strategy. While this does not involve additional regulatory responsibilities in relation to uranium mining or export, the potential greenhouse impacts and costs of uranium exports and nuclear power are relevant to climate change policy. The portfolio's submission outlines relevant background information on these issues, and we are happy to elaborate on this today.

In this introduction I would also like to point out to the committee that some material provided to the inquiry both in submissions and in evidence is factually incorrect, outdated or otherwise misleading. The department has identified a number of such matters that I would like to bring to the attention of the committee. For reference, these issues and responses from the department are contained in a supplementary submission, which I propose to provide now, if that is acceptable to the committee.

CHAIR—Yes, it is.

Mr Borthwick—Thank you. That concludes my statement.

CHAIR—Thanks for that. To your knowledge, how has the regulatory system for uranium exploration and mining in the Territory actually changed following the government's recent announcement that it will assume control of the mine approval process in the Territory?

Dr Johnston—As far as I understand it, the position is that the approvals process for any proposed new mine would be handled by the Commonwealth. Mr Early can expand on that if necessary. But from the point of view of day-to-day regulation it is my understanding that there has been correspondence between the Minister for Mines and Energy in the Territory and Minister Macfarlane, in which it is stated that the Territory accepts that it will continue to regulate all mines in the Territory.

Mr Early—Under the Environment Protection and Biodiversity Conservation Act, the EPBC Act, protection of the environment from nuclear actions is a matter of national environmental significance and therefore is subject to the minister for the environment's assessment and approval process. In fact, nuclear action is defined in the act as including mining or milling uranium ore—

CHAIR—You just answered my next question, but please keep going.

Mr Early—so you would expect that any proposal for a new mine would almost certainly require approval under the EPBC Act and therefore assessment and approval by our minister.

Mr HATTON—In general, do you think there are areas of federal regulation that could be simplified or amended to assist the uranium industry in what it is doing now and what it might do in the future, or is the level of regulation and clarity about right?

Mr Borthwick—That is an interesting question. As I said in my opening remarks and as is set out in our submission, under the EPBC Act uranium mining would be referred to our minister for

assessment and approval. It is up to that minister what environmental conditions are opposed on that mining operation. Those conditions could be fairly general in nature or very detailed and specific. It is really up to the circumstances of each particular instance and having regard to assessments of the impact. It is the EPBC role, which has not yet applied to a new uranium mine, which is the key. The minister has a considerable range of discretion in that regard. The role of the Supervising Scientist under this legislation only applies to the Alligator Rivers region. There is no role for the Supervising Scientist beyond that region. I think there is a question as to whether or not consideration could be given to expanding the role of the Supervising Scientist.

Mr HATTON—Would you like to comment further on that, Dr Johnston?

Dr Johnston—Currently, I believe the role that we have works, and works quite well. There are some who say there is too much regulation, but it seems reasonable to me, certainly in our case where the place that we are trying to protect is Kakadu National Park—an icon in Australia—that the measures taken should be such that one is very confident they are going to work. Of course, there are other issues. It is not just the park; uranium per se is a substance that is highly emotive and of great concern to the community. The other issue that is of great significance is that we are dealing with mining taking place on Aboriginal land. Those three issues come together to make it a highly significant area. But I find it interesting to look at some of the submissions. For example, the one from Energy Resources of Australia acknowledges that it is a fairly stringent regime but also that, in its view, it is appropriate. It is certainly an issue that this committee should consider, I think.

Mr HATTON—Mr Borthwick, your answer suggests that what will apply at any particular time is up to the minister and having regard to the particular circumstances, so they may be simple or complex.

Mr Borthwick—Exactly.

Mr HATTON—Can I take you to the question of the global greenhouse gas abatement strategies. What is the department's assessment of the part currently played by nuclear power? How significant is it relative to other proposed abatement strategies, such as increased energy efficiency and greater investment in renewables?

Mr Borthwick—I will make some observations from an Australian point of view and then from an international perspective. It is currently government policy not to develop nuclear power sites in Australia. In some measure, that is what this inquiry is about.

Mr HATTON—Not really. We have actually been told not to go there, but we have canvassed it.

Mr Borthwick—I see. It is very tempting to look at those issues, but it is not government policy. When it comes to Australia, where we have abundant reserves of coal and gas and increasing attention being paid to renewable energy, albeit on a small scale, you would have to figure out the commerciality of bringing uranium into the stationary energy sector. In our submission we use two examples. One is an OECD study and the other is a Massachusetts Institute of Technology study, and there are other studies. They show that the price would have to be considerably high in terms of purchasing, and probably even higher still than the examples

that we have given, if you look at nuclear power over a whole life cycle proposal. So it bears looking at. The question therefore would be: why is it that some other countries are showing increased interest in nuclear power? You would have to look at the specific circumstances of each country but, if you were a rapidly growing economy, as some of them are, with huge energy demands, you would take, I imagine, a portfolio approach. You would try to use gas and coal; you might hedge your bets with renewables, including uranium. In other words, I think some economies are taking the decision that their demands for energy are so large that nuclear power should be part of a broader portfolio approach. That is a legitimate decision for them to take, but at this juncture it is not a decision that I think Australia needs to take.

Mr HATTON—In terms of the broader question of how we deal with the greenhouse gases being produced and abatement, does the department have a view about the felicity of any particular strategy, whether it be nuclear, renewables, a modification of something we produce, such as cleaner coal, or using more gas?

Mr Borthwick—Basically, it is a technology neutral strategy. In other words, it is a best bet strategy: what makes sense from a commercial and environmental point of view? It is not backing one technology over another. Having said that, the government's energy white paper made it very clear that it makes sense for Australia to focus on those areas where we have a comparative advantage. In that regard, for example, it singled out coal and hot dry rocks as areas that it would pay for Australia to put most of its efforts into. It is likely that for many decades to come the world will be reliant on fossil fuels, primarily coal. Given our abundance of coal it makes a lot of sense for Australia to focus on technologies that will clean up that coal in a greenhouse context. But our policy, whether it is coal, gas, wind power, solar power, hot dry rocks et cetera, is essentially a technology neutral approach.

Mr HATTON—From an environment and heritage point of view, current usage is not neutral, though. If you look at the ecological impacts of burning fossil fuels—and we have been at it pretty hard since about 1788 or 1815 with the Industrial Revolution in Britain—it is now demonstrable that in the Northern Territory climatic conditions have changed. Areas of rainforest are starting to develop in the Kakadu region and so on. Climate change is on the move there. So that is what we have got happening with our heritage now. It is not just speculative. Going forward, those changes could be much greater and therefore we might have a lot less heritage to conserve. Given the government's approach, can we afford to adopt a neutral approach to the impacts of using fossil fuels? All we have been doing is cleaning it up a bit, and that is about it.

Mr Borthwick—The government accepts that climate change is real and is becoming increasingly apparent. People can argue about the magnitude of the climate change effects, but as each degree of science comes in it is quite apparent.

The argument about what the balance of the responses to climate change should be is not detracting from that point at all. There are legitimate differences of view as to what the correct response is. The government is going to meet its Kyoto target, one of relatively few countries that will do that from its own range of measures—other countries might be able to buy carbon credits.

In the longer term the world is going to be reliant on fossil fuels. There is no doubt about that; it is the dominant fuel. If you look at the stock of power stations around the world, which can

have 30-, 40-, 50-year lives, it is going to be the dominant fuel over the period in which we will need to adjust to climate change. So it does make sense to look at technologies by which you can clean up that use of coal in terms of greenhouse emissions. That is why the government is focusing on the $500 million low emission technology development fund, which is to lever $2 of private money for every $1 of government money. That is not specifically directed towards coal technologies; that fund is technology neutral. But I think it is going to be very important that Australia—and not only Australia—focuses very much on the greenhouse implications of coal technologies, because it is going to be here and it is having an effect now.

Mr HATTON—How far down the track do you think we are in terms of improving our situation with cleaning up coal, for instance? The work I did on the science and innovation committee in the last parliament would indicate that it is very early days and, although there is some promise, there are significant difficulties.

Mr Borthwick—It is early days. You are really talking about areas of known technology but there still has to be a technological jump forward and hopefully an improvement in the cost or commerciality of those technologies. That is why we have been focusing on that. In our partnership arrangements with a number of other countries we have been focusing on those possibilities as well.

Mr TOLLNER—Dr Johnston, there has been a lot of media about Ranger's safety performance and that sort of stuff. Can you comment on their safety record and compare it with other forms of ore extraction.

Dr Johnston—I will make my comments with respect to ERA's protection of the environment. There have been a number of comments over the years about incidents at Ranger and the number of times that incidents have been reported. Over the life of the mine there have been more than 100 or 120 occasions on which formal reporting of an incident was required. Until last year, when there were two incidents that occurred, our analysis of those incidents over the past 25 years has shown that there was one incident in which people were affected by a very small radiation dose and one other incident in which a number of birds died on a pond at the mine. We assessed all the other 120-odd incidents as being of negligible impact on the environment.

The two incidents that occurred last year were very serious in that they did indeed threaten the health of both people and the environment. The net outcome, however, was that despite the seriousness of the incidents we expect there will be no long-term health hazard for the workers involved and the environment was protected to a very high degree during the entire incidents.

In absolute environmental protection terms, the record of the company has been very good. It is my view that the reason why we have so many incidents reported is that it is more a measure of the stringency of the reporting regime that is imposed on the company by the regulations than it is a reflection on the company's performance. That does not mean to say that we are entirely satisfied with the performance of the company. I think you will have seen the reports that I have written over the last five years in which I have been highly critical. But, nevertheless, despite the occurrence of these incidents, the protection regime that is in place is such that the environment has not been harmed.

Mr TOLLNER—Have you any experience with similar ore-mining sites?

Dr Johnston—I have experience of Mt Lyell, for example. We were asked to do a significant program of research a number of years ago to look at the possibilities of remedying what has happened at Mt Lyell and, clearly, the impact on the environment from that particular mine. There are other examples where a significant environmental impact has occurred. I do not want to stray too far into that.

Mr TOLLNER—Fundamentally, I am trying to get to your experience of the effect of uranium mining on the environment in comparison with the effect of other types of mining. Would you say that they are all much of a muchness?

Dr Johnston—No. I would say that the regulations that apply today to uranium mining in Australia, as distinct from what used to occur, are such that the environment can be and has been protected to a very high degree. If one applied the same stringency to other forms of mining you could achieve the same result, but the other forms of mining do not receive the same kind of attention that uranium mining does.

Mr TOLLNER—You have answered my question well. Secondly, can you provide some comment on the pros or the cons of having your institute, ERISS, combined with another research institution, so that you would simply become a customer?

Dr Johnston—That kind of model has been suggested over the years and has been looked at on many occasions. In fact, we looked at it relatively recently ourselves. The potable water contamination incident at Ranger last year really demonstrated that the Supervising Scientist needs that expertise on hand immediately. We were able to respond instantly, essentially, to that incident. I was able to go out to Jabiru within days of the incident and assure the workers and the people of Jabiru that we had already measured the radionuclide content of the water and that no-one had received a significant radiation dose. That was possible only because I was able to turn to my institute immediately and say, 'I need you off. Stop doing everything you're doing and work on this.' Having that immediate capacity is very important.

Mr TOLLNER—Finally, can you explain to me your relationship with ARPANSA or whether there is any sort of connection?

Dr Johnston—ARPANSA, of course, has the national role for the regulation of Commonwealth authorities with radiation protection issues. It also has a role in trying to ensure, through discussion and encouragement, that at a national level the states have common approaches to radiation protection. On the other hand, we have a role in uranium mining per se. As the secretary said, it is restricted to a particular area of the country. We have a relationship with ARPANSA, but we do not get involved on a day-to-day basis. We would call them in sometimes to get expert advice on areas that we do not have expertise in, and we have done that regularly over the past few years. There is the potential to look at the organisations coming closer together, but I imagine that would be an issue that might be raised if there were a place at a national level for the kind of supervisory role that we have at the moment. At the moment, whilst we are restricted to the current regime, it has not been necessary to have much more than an ordinary relationship between agencies.

Mr TOLLNER—Mr Cochrane, can you comment on the interaction between Kakadu and the Ranger uranium mine to date? I do not want to talk about hypotheticals too much, but can you comment on the perceived relationship between Jabiluka and the park and whether you see any issues or problems there or any benefits?

Mr Cochrane—In terms of the risk issues that we deal with in managing the park and protecting its values, I would have to say that Ranger uranium mine and its impact on the landscape are very low down on that risk profile. There are a range of issues which are much higher priorities for us. It is not something that impacts on us greatly. I have every confidence that the Supervising Scientist and his staff prosecute their job with the utmost efficiency and effectiveness. Therefore, the mine, in terms of park management, does not have a major impact.

Mr TOLLNER—Is there anything complementary about the mine—for instance, the fact they have a township there and they are generating employment?

Mr Cochrane—I understand that nearly half the current population of Jabiru is associated with the mine and mineworkers' families, so the mine has a very significant economic benefit for the region. Clearly, the town is of a sufficient size to warrant the current school, health clinics and other key services which my staff and their families enjoy, as do Aboriginal residents of the park and the wider region. So the mine has a significant economic impact on the region.

Mr TOLLNER—Can you comment on the situation if the mine were to close and Jabiluka was not going to go ahead, and on what impacts that may have on Kakadu National Park?

Mr Cochrane—That is an issue that we have been talking about at the Kakadu board of management because, using the simple arithmetic I outlined before, if half the town population disappears with the closure of Ranger uranium mine then those services—presumably—will not be provided at anywhere near the current level. That would have an impact on the region and on my capacity to staff the park as well.

Mr TOLLNER—Do you have any figures to suggest what additional funds it would require from the Commonwealth or from visitors to the park? What revenue raising impacts would it have on the park?

Mr Cochrane—There has been a little bit of work done on that. I do not have those figures at my fingertips. The power generation for the town is currently supplied by the mine. That alone would be a significant impost in the future on some government or other entity that would be responsible for providing power to the township and the surrounds. I cannot comment on what a halving of the town population would mean for things like the viability of the supermarket or banking services et cetera. But my guess is that as soon as you start halving the size of the town you probably have a greater impact than halving the size of the associated services.

Mr TOLLNER—You would be as aware as I am of some comment by some people that it is not appropriate for there to be a uranium mine in the middle of a World Heritage listed national park. I am interested in your comments about the impact on the national park if the uranium mine were to go. Would you see any positives in uranium mining at Kakadu ceasing?

Mr Cochrane—As I said, it has, generally speaking, a very low direct impact on park management. The major impacts would be the regional effects of the drop in economic activity and the provision of services. In terms of the environment, the critical factor there would be the rehabilitation effort and how successful that was. That would be the major impact on the park. Kakadu is well known around the world for having probably the best managed mining operation in a World Heritage area, one which has a minimal impact on the area. There are a number of World Heritage areas around the world that are similar.

Mr TOLLNER—Additionally, the operators of Ranger mine pay considerable royalties, of which a substantial amount comes back to local Indigenous people in the Kakadu region. Have you any idea of the quantum of those royalties that come back to the Kakadu area? I think we have one submission which says that some of the local Indigenous people do not want the royalties or the mine. Can you comment on any of that?

Mr Cochrane—I am not in a position to tell you what the direct economic impacts are. The royalties must be on the public record somewhere. I understand over the life of the mine so far they are well in excess of $100 million. As you might expect, I am aware of a wide range of views amongst the Aboriginal community there as to the benefits or otherwise of mining. Some are against it, some are in favour of it and some are relatively agnostic. I imagine the same is true of almost any other community near a mine. But I cannot answer directly with a quantum; sorry.

Mr TOLLNER—But you can confirm that considerable royalties come into Jabiluka, Jabiru and Kakadu from the mining.

Mr Cochrane—Yes.

CHAIR—I want to follow up on answers you have given to my colleague Mr Tollner. You referred to the incident at Jabiluka in 1982 when two workers were exposed in the packing operations. Has there been any medical follow-up in regard to their health? Has there been any long-term effect on their health?

Dr Johnston—I cannot be authoritative on that, but my understanding going back a number of years is that one of the workers was fine and unaffected but the other one was psychologically affected. That is one of the problems with radiation—that, if people get even quite a small dose, despite the fact that we scientists might give them assurances that they need not worry because it is unlikely to affect their health, it is very difficult for those people to accept that. As I said, I cannot be authoritative on it, but I recall hearing that one of the people involved was psychologically affected by the incident.

Mr CADMAN—Have you made any assessment of what it would mean to Australia to start a processing industry?

Mr Borthwick—No, we have not.

Mr CADMAN—Wouldn't that be sensible, or is it off the agenda completely?

Mr Borthwick—It would primarily be a matter for the industry portfolio, not the environment portfolio.

Mr CADMAN—Would you then respond if a proposal was put forward? Is that the way it would work?

Mr Borthwick—Exactly, yes.

Mr ADAMS—I do not know whether my questions have been asked, Chair. You can pull me into gear if they have. I want to ask about the rehabilitation of mines. You talk in your submission about Kakadu in the fifties and sixties. What has been done to get on top of that and what still needs to be done to make sure that we have achieved all the environmental safeguards and levels that we need to achieve at that river and also at South Alligator River?

Mr Cochrane—There are some 20 sites in the upper South Alligator River that were either mine sites, processing sites or variously associated with mining in the fifties and sixties. A partial rehabilitation of some of those was done in about 1990-91, before they came into the park. The park lease sets out provisions whereby those will be properly rehabilitated by 2015. About five years ago, we started work on the planning for that. Working closely with traditional owners, the Northern Land Council, the Supervising Scientist and other key stakeholders—the Northern Territory government—we have developed a plan to remediate the simplest sites. That exists and has been agreed to by the traditional owners and the Northern Land Council, and we are currently well under way on what we are calling part B, which is dealing with the more complicated sites.

Mr ADAMS—Do you have adequate resources to deal with the rehabilitation of these sites?

Mr Cochrane—The scale of what is necessary to be done properly is beyond our current capacity.

Mr ADAMS—Okay. Dr Helen Caldicott submitted to the inquiry that Lucas Heights discharges more radioactive waste into the air and water than bigger and more powerful plants overseas, and that this reactor has discharged more radioactive iodine 131 into the air than the huge and dangerous nuclear fuel reprocessing and power plants at Sellafield in England. Is that an accurate claim? You are the monitors.

Mr Cochrane—No, we are not the monitors.

Mr ADAMS—But you have an act to work under, do you not?

Mr Borthwick—No. ARPANSA is the monitor of that site.

Mr ADAMS—Would you like to comment on that?

Mr Borthwick—I do not think we have any information bearing on it at all. We did not have an involvement in regulating that site.

Mr ADAMS—Your submission notes that the EPBC Act proposes that, if there is a large-scale disposal facility for radioactive waste, you would require an assessment by your department and the minister would have to make a determination about that, if it were to go ahead. Media reports suggest that there is currently radioactive waste stored in 100 sites around Australia. What level of assessment have those various sites had?

Mr Early—They have had no level of assessment, as far as I am aware, certainly at the Australian government level, because of course they were in place before the EPBC Act was operational. In fact, of course that is the reason the government was pursuing the radioactive waste repository to collect those. But, as we know, that fell into a hole last year and a new process is now beginning.

Mr ADAMS—Okay. Are you saying that is a state responsibility?

Mr Early—The states have withdrawn from the proposal that the Commonwealth was to build a national radioactive waste repository. They have been going for decades, I think.

Mr ADAMS—There is nobody assessing these sites. They are just sitting there. It is not your responsibility.

Mr Early—It is a state government responsibility.

Dr Johnston—It is mainly a state government responsibility, except for those sites which are owned by the Commonwealth, in which case ARPANSA is the regulator.

Mr ADAMS—Your act does not come into play at all?

Dr Johnston—No.

Mr ADAMS—You make no assessments of those sites under your act?

Mr Early—They are an existing situation, and they do not qualify as actions under the act.

Mr ADAMS—Right, they are prior to your act coming into being.

Mr Early—Yes.

Mr Borthwick—Mr Cadman asked a question about nuclear reprocessing facilities. Mr Early has something to add on that.

Mr Early—Section 140A of the EPBC Act reflects current government policy and actually precludes reprocessing facilities within Australia. Should that policy be changed then the act would have to be changed accordingly.

Mr ADAMS—You have cited two reports in your submission in relation to Jabiluka, if it were to be mined. The interpretation is that it suggests that waste could be stored underground from that mine. Is that correct? Are there any other major environmental issues that you have found with that proposal?

Dr Johnston—When the Jabiluka project was approved it was under the EPIP Act, but a number of conditions were imposed by the then minister. One of them was that all tailings produced from the processing of ore at Jabiluka would be returned underground to the mine area. So all of it was going to go underground. That was fully assessed in a report that we subsequently had to do for the World Heritage Committee, and the conclusions of that assessment were that there would be no impact in the very, very long term on the environment from the placing of tailings underground at Jabiluka.

Mr ADAMS—Thank you. I have no further questions.

Mr HATTON—I am trying to work out what you do in regard to gaseous emissions and so on, given that you do not have the role that ARPANSA has got. But your submission directly states that your department has set the environmental conditions to be met by the replacement reactor at Lucas Heights. The first question is: did you set the environmental conditions to be met by the existing reactor at Lucas Heights? Further, these conditions cover factors such as the reactor's gaseous emissions, the reprocessing of fuel rods, the disposal of long-lived intermediate level waste and so on. Can you give us an overview of the details of those conditions, particularly in relation to the intermediate level wastes and reprocessing of spent fuels and how this interacts with ARPANSA's regulatory role?

Mr Early—The replacement reactor was a system of the old legislation, the Environment Protection (Impact of Proposals) Act, as a result of which the environment minister, who I believe was then Senator Hill, made a number of recommendations to the Minister for Education, Science and Training. Those recommendations were implemented by way of conditions imposed by ARPANSA. We having raised the issues and the conditions, it is ARPANSA that actually regulates—ARPANSA is required to issue licences for the replacement reactor and they will be the regulator. We did not have a role under the old legislation. We were simply a recommending agency, or the minister made recommendations to what we then called the action minister. So the implementation of those recommendations is subject to the action minister, not the minister for the environment.

Mr HATTON—Can you give us a verbal overview of the supplementary report you have given us about mistakes, errors, factual distortions and so on that the department thinks has occurred in previous evidence?

Dr Johnston—I think there were a number of statements made in some of the submissions which were of slight concern. In particular, there were comments by the Australian Conservation Foundation about the position of the Supervising Scientist—comments about 'regulatory capture' of the Supervising Scientist by the ERA. The secretary and I, of course, were quite concerned that those things should not be left on the table unanswered. So you find in the submission a number of comments which address that particular issue.

There are a range of them but I find it strange that anyone could suggest that the Supervising Scientist has been captured by the industry when you look at the number of inquiries we have conducted over the last five years and at the reports that I have given to the minister, which have been tabled in the parliament and which have been highly critical of the ERA. Indeed, if you look at the water contamination incident that occurred last year you will see in the report that we wrote all the correspondence between me, the mining company and the Northern Territory

regulator. You will find that it is absolutely clear in that correspondence that I insisted that, before I would support recommencement of milling activities, I would need to be absolutely convinced that all necessary steps had been taken to ensure that an incident of that kind could not be repeated. As a result, the mining company could not operate for 14 days. That is a very significant impost on any operation and financially a very significant cost.

So I refute any suggestion that there was regulatory capture. It is not just a statement; I think the evidence is quite clear in the way we have conducted ourselves over the years and in the reports that we have written. That said, I would comment further that it is our policy to adopt a completely professional attitude to all stakeholders. We treat the mining company just as we treat the Northern Land Council and just as we treat the Northern Territory government—that is, in a completely professional, open way. That is perhaps perceived by some as getting too close to the company but I do not believe it is.

Mr HATTON—So most of that supplementary goes to those sorts of rejoinders?

Mr Borthwick—It goes through a number of submissions to the inquiry and identifies who said it, on what page they said it in their submission and our comment against. I hope it is very digestible and transparent.

Mr HATTON—It is a direct riposte from the department to criticisms of the department by people who gave evidence. Is it broader than that or is it similar to what—

Dr Johnston—There are some statements of fact that we have decided we should correct. One that comes to mind is that, in an incident at Ranger in 2000 where there was a leak of tailings water, the figure quoted by the particular submission was, I think, two million litres of water leaking and leaving the mine site. The figure was correct for how much leaked but the amount that left the mine site was very much less, and we have just pointed that out.

Mr HATTON—I think it has become evident to us in undertaking this inquiry that five years ago we probably could not have had the inquiry at all because of the mindset of a lot of people that you should not be talking about uranium mining, uranium activity or nuclear power at all. The evidence that we have had, particularly in the last two hearings, when you look at the two different sides of this, is markedly different not only in the amount of humour that there might be in terms of whether there is a sense of humour on one side or another but in terms of the different factual bases or the lack of a factual basis, which has also been evident in part of it.

Some of the people who are professionals in the nuclear energy area or the mining area who gave evidence indicated that part of their problem, and where they had really lost out over the last 20 or 30 years, is the fact that this is such an emotive issue and has become fundamentally an emotive issue. It is a case of: 'Don't ask any questions because you won't get any answers because you're not allowed to talk about any of this because it's all been decided previously.' In simply trying to defend themselves and put a factual base forward, there is an avalanche against that which is not properly scientifically based. It is, rather, based on a partial scientific approach which some of our presenters, I think, are specialists in. Do you want to comment on how difficult it has been over the past couple of decades for the department in terms of dealing with these issues and the fact that they are so highly charged and emotive?

Mr Borthwick—I will deal with it at one particular level, picking up a point I emphasised in my opening remarks, and that is the importance of having an independent supervisor from the department with either specific regulatory responsibility or specific policy responsibility. That is the arrangement that the Commonwealth struck both in our portfolio with the Office of the Supervising Scientist and in the Health and Ageing portfolio with ARPANSA. In other words, both the environmental and health aspects are separated out from those who are perceived as having a particular interest to push. We think it is absolutely fundamentally important to have those regulatory functions at the Commonwealth level separated from the policy promotional functions of public health and that those processes be transparent and open and that in our portfolio we have a supervising scientist in this area who can make a judgment.

I did point out that the Supervising Scientist's role was limited to the Alligator Rivers region. In response to a new uranium mine, our role will only be through the approval and assessment process. As we discussed, the minister may impose conditions, and they could be detailed or general, having regard to the context. But I think the principle is a very important one—that is, to have an independent, arms-length regulatory oversight of these matters. I invite your consideration of how that might best be done.

Mr ADAMS—The debate about greenhouse versus nuclear energy in the world is something that has come before the committee. Several submissions have said that if there is more nuclear energy it is not going to solve the greenhouse gas issue. If one looks at the expansion of China and whether they go towards coal or nuclear energy, that will make a difference, in my opinion. I would value any comments that you could give us.

Mr Sterland—We presented some estimates in our submission on two elements that are relevant. The first is on the life cycle impacts of generating electricity from uranium versus other sources. The bottom line of that information suggests that at current ore quality, they are beneficial—depending on what they would displace at the other end in the generation of electricity, of course. If you assume 100 per cent displacement of fossil fuels, we presented some estimates of the contribution that is made. There is a bit more debate as we move towards less high quality ores because the most greenhouse gas intensive parts of the life cycle of uranium are the mining and processing. The lower the quality of the ore, the more greenhouse gas intensity increases. At current qualities it is fairly low relative to fossil fuels. That depends on the displacement.

So it is a part of the mix, as the secretary said earlier. There is a portfolio of responses that other countries are using—generally, for reasons wider than greenhouse gases. It is generally to do with having a secure energy supply and having a wide variety of supplies to protect energy security. In the context of China and India, it is to do with massive growth in energy demand and choosing whatever instruments are available to meet that demand. Nuclear is part of the mix for them because it, no doubt, provides some elements to add to their mix.

There is no distinct policy position on this. It is just an observation that our uranium exports have that potential. It is not a claim that they are the main game in developing an effective world response. Clearly, any effective global solution to climate change has to involve all the major emitters and involve policies that cover all the major sources of emissions. So the Australian government is supporting a range of partnerships and approaches within those partnerships across the full range of energy production. We would never claim that Australia has a

comparative advantage in the area of a nuclear energy. The white paper shows that it is not there. We do not produce nuclear energy but there are other countries in the world and in the region that have much more technical capacity. It is not something we would presume to contribute much to. We tend to contribute to things in which we have a comparative advantage. A number of those are identified in the white paper: clean coal technology, solar PV and hot dry rocks. Nuclear is part of the mix but it is not something that Australia makes a strong contribution to. But our exports have an impact.

Mr ADAMS—The argument is that the industrialisation of India and China will have an impact if they both use coal and not, say, nuclear energy. That is what I was asking you, and I think you have answered by saying that there is a plus in their going nuclear rather than coal. Is that correct?

Mr Sterland—We are noting that uranium exports can reduce emissions if they displace other high-intensity sources. The answer is yes on that basis. The only qualification is that Australia has a very keen interest in technologies that can produce low emissions from coal. So it is in Australia's interests not to set them against each other but to talk about the contribution both can make.

CHAIR—With the proposed expansion of Olympic Dam as an open pit, the volume of waste rock and tailings can be expected to increase very significantly. We have had one submitter to the inquiry suggest that the tailings storage area will increase to something like 10 square kilometres. They maintained that the tailings storage pile was going to be something like 30 metres high. What is the department's assessment of the environmental and waste management issues if the proposed expansion of Olympic Dam goes ahead?

Mr Borthwick—I will refer the question to Mr Early but I will preface the remarks by saying that we need to be very careful here. We are going to have to formally assess this and we will have to rely on a lot of information that has not yet come to hand. Having said that, I will leave it to Mr Early.

Mr Early—The proposed expansion has been referred formally under the EPBC Act and has been determined to be a controlled action, which means it needs assessment and approval. We only received preliminary information on the proposal on 4 October. We would expect that it will be assessed at the highest level in an environmental impact statement and all those issues will be addressed. I think it would be premature for me to comment. Obviously, these are really important issues and they will be subject to a very thorough examination through the EIS process. As you know, there is a lot of public participation in that and a lot of expertise will be brought to the table. All those issues will be thoroughly examined over the next 12 or 18 months.

CHAIR—Thank you all for attending the hearing today. If the committee has any further questions, the secretariat will contact you in due course. Is it the wish of the committee that the supplementary submission received from the Australian government Department of the Environment and Heritage be received as a supplementary submission and authorised for publication? There being no objection, it is so ordered.

[10.40 am]

CARLSON, Mr John Albert, Director General, Australian Safeguards and Non-Proliferation Office

DOULGERIS, Mr Nick, Head, Nuclear Accountancy and Control Section, Australian Safeguards and Non-Proliferation Office

CHAIR—I now call representatives of the Australian Safeguards and Non-Proliferation Office. Thank you for agreeing to appear and give evidence at the public hearing today. Although the committee does not require you to give evidence under oath I should advise you that the hearing is a formal proceeding of the parliament and I further remind you that the giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. I also remind you that the committee prefers that all evidence be given in public. However, at any stage you may request that evidence be given in private and the committee will consider your request. I now invite you to give a short opening statement before we proceed to questions.

Mr Carlson—I refer to the submission which Mr Downer made to your inquiry dated 9 May. That set out the interests of the foreign affairs and trade portfolio in the subject of your inquiry. My particular involvement in this, which I imagine is something that your committee would want to explore in some depth, relates to non-proliferation and safeguards and the issue of whether the development of nuclear energy, and particularly the export by Australia of uranium, in any way poses risks in the proliferation of nuclear weapons.

My role is as a statutory officer so I am responsible for regulating the uranium industry in terms of Australia's treaty commitments for the non-proliferation of nuclear weapons. I regulate the government as a whole and in that sense I am independent of government, and theoretically could find myself in the situation of having to report industry or government activities to the relevant international agency, the International Atomic Energy Agency. So in that sense I have an independent, regulatory role. Part of that role also covers the arrangements that cover Australian uranium exports and ensuring that the agreements and arrangements we have for Australian uranium are observed by treaty partners, but I also have a major advising role in assessing the effectiveness of the non-proliferation regime and IAEA safeguards in particular. I report directly to Mr Downer and advise him independently of the foreign affairs department on those sorts of issues.

In practice my office works very closely with foreign affairs and trade—my staff are formerly officers of DFAT, so we have a very strong working relationship. The presence of the expertise in my office within the departmental structure ensures that diplomatic efforts and policy development proceed with a very solid technical base. But, ultimately, I can give independent advice and I have my own report to parliament, which I think you would all have copies of.

Australia has something like 30 per cent of the world's known uranium resources recoverable at medium-level cost. We supply something like 12 countries with uranium for nuclear power. We have 19 agreements, which cover 36 countries, plus Taiwan and China—a large number of

countries—due to the inclusion of the European Union, not all of whom have nuclear energy and not all of whom are buying uranium from Australia. Australian uranium supplies something like 14 per cent of the world uranium market and equates to something like two per cent of the world's entire electricity production from any energy source.

So Australia has a major place in the international fuel cycle. It is a place which has given us very strong standing to pursue non-proliferation objectives. We are a permanent member of the IAEA board of governors. We are very active in the development of non-proliferation mechanisms. We are particularly active in the development of IAEA safeguards. I have a personal appointment as the chairman of the international advisory group that advises the IAEA in the development of safeguards and making safeguards more effective. We have substantial influence through our position as a major uranium exporter. At this stage, I will simply refer to the submission and invite any comments and questions.

Mr HATTON—I thank you. In doing so, I note that this submission comes from the minister, the Hon. Alexander Downer MP. Did Mr Downer write the submission or did the department write it, given that Mr Downer is not here to speak to it?

Mr Carlson—Mr Downer was given a draft which was prepared by various people in the department and in my office. I think Mr Downer had some suggestions on the draft. The draft certainly had his endorsement.

Mr HATTON—Thank you for your courtesy in being here. Given that the minister's name is tagged to the submission, Chair, I think it would have been useful if he had come to give evidence to the committee in support of it.

Mr ADAMS—I wanted to ask about India's position on non-proliferation. I understand that there are some changes taking place there. Could you bring us up to date in relation to that? And could you give us the historical aspect of why they are not?

Mr Carlson—Looking at the history of it, what is distinctive about India is that it has never been a party to the non-proliferation treaty. India has consistently taken the view that it supports the objective of non-proliferation and it supports the objective of nuclear disarmament but it regarded the non-proliferation treaty as being discriminatory because the non-proliferation treaty recognises the five nuclear weapons states that existed at the time the treaty was concluded and makes no provision for any further nuclear weapons states. India felt that this was discriminatory—that the treaty should apply equally to every state—and has refused to join the treaty. That is something that successive Australian governments have pursued with India on many occasions, along with other governments. India very consistently says that it supports the objectives but not the treaty itself.

What has happened recently is that, in a meeting between President Bush and the Indian Prime Minister, agreement was reached on non-proliferation issues, under which the United States is prepared to extend nuclear cooperation to India. I have left a gap in my historical coverage, so I should mention that one of the consequences of India not being in the non-proliferation treaty is that nuclear suppliers—countries that export nuclear material and technology—have adopted what is called the full scope safeguards standard; that is, that suppliers will not supply to non-nuclear weapons states that do not accept full scope safeguards, which are safeguards on all

existing and future nuclear activities. India, of course, has a number of nuclear activities outside of safeguards. There are some facilities covered by IAEA safeguards, but the majority of the Indian nuclear program is outside safeguards, and part of it is a military program.

The situation at the moment is that nuclear suppliers' guidelines do not permit nuclear cooperation with India, except in the fairly limited area of nuclear safety. President Bush and Prime Minister Singh agreed that India will separate military from civil activities and facilities; it will accept IAEA safeguards on the civil facilities; it will strengthen its export controls for export of nuclear technology and will follow international guidelines on export controls; and it will support the concept of a Fissile Material Cut-Off Treaty, the treaty under which production of fissile material for nuclear weapons would be stopped. In return for these commitments, the United States has undertaken to broaden the level of cooperation that is possible, and it will seek to persuade other members of the international community to adopt that policy. Specifically the US is looking for the supply of reactor fuel and a broader assistance than is currently possible on nuclear safety issues. Where it goes from there remains to be seen.

The position of the Australian government is that we welcome very much that India has been prepared to commit to stronger non-proliferation standards. We are looking with great interest to see these commitments given effect. There are some other things we would like to see India do. We would certainly like to see India ratify the comprehensive test ban treaty, and we would like to see it cease the production of fissile material for nuclear weapons now. Basically, we think that what India has agreed to is positive and constructive. We will follow further developments very closely. The government have made it clear that our current policy, which excludes the possibility of supply of uranium to India, is not under review. That policy continues to stand. We are not considering the possibility of supply of uranium to India, nor, I might say, have we been asked to by India.

CHAIR—Thank you for that. We will proceed to questions.

Mr TOLLNER—Mr Carlson, what is your definition of nuclear weapons? Does it include dirty bombs?

Mr Carlson—No, I was just trying to formulate a definition that made that distinction, because that is an important distinction. A nuclear weapon is one that derives its explosive force from a nuclear chain reaction, from the fission plus fusion of nuclear material. That is distinct from what we call a radiation dispersion device—or a dirty bomb—which uses conventional explosives and radioactive material, not necessarily nuclear material, and its object is contamination rather than destruction by explosive force.

Mr TOLLNER—Can you briefly explain what is required to build nuclear weapons and what sorts of people, organisations and countries have that capacity? What is their capacity to develop nuclear weapons? What are the requirements?

Mr Carlson—There are many different elements required but first and foremost is possession of suitable fissile material. There is highly enriched uranium, which is uranium produced for weapons. It would need to be 70 per cent or more of uranium 235. What is normally described as weapons grade is 90 per cent-plus uranium 235. Otherwise it would be separated plutonium—plutonium that has been recovered from the reprocessing of fuel for weapons. A controversial

issue there is what quality of plutonium is required for weapons. What is described as weapons grade plutonium by international practice is plutonium that is at least 93 per cent of the isotope plutonium 239. This compares with what is called 'reactor grade', which comes from power generation—typically from light-water reactors—where the plutonium 239 content is around 60 per cent. So the first thing that a would-be weapon maker needs is fissile material of the necessary quality and in sufficient quantity, and on top of that there is also a very substantial technical capability.

Building a nuclear weapon, particularly a plutonium based one, is very difficult. In principle, building a uranium based weapon could be simple. The American weapon used in Hiroshima was a uranium based bomb which consisted of two pieces of uranium fired together by an explosive charge so that a critical mass was formed by forcing the two pieces of uranium together. In principle, that is a low-tech design. Its disadvantages are that it is very bulky, therefore not deliverable by missile, and it requires a large amount of nuclear material. The South Africans built weapons of that kind before they were in the NPT and in their case, because they had no legal prohibition on producing fissile material, the fact that these weapons required large amounts of uranium was not a significant issue to them. But for someone attempting illicit development of nuclear weapons, the amount of uranium required is a major factor. For plutonium the technology is quite different. It requires compression of plutonium—surrounding plutonium with an explosive charge which will increase the density of the plutonium in a uniform way so that a critical mass is formed by the effects of compression. This is actually quite complex technology. There is a lot of information in the scientific community on how to go about it; nonetheless it is still not easy.

In terms of who has produced nuclear weapons, we have the established nuclear weapons states—the US, Russia, China, France and the UK. We have what are called the threshold states or the nuclear capable states, India and Pakistan, who have both conducted nuclear tests, so they have demonstrated their capacity. There is the case of Israel, who refuses to confirm or deny that it has nuclear weapons. We have the case of North Korea, who says it has nuclear weapons. We know it has weapons grade plutonium. Our assessment is that it would be capable of making fairly basic nuclear weapons, but there is really no way to know whether it has actually done so. Beyond those countries, Iraq attempted to build nuclear weapons but had not acquired sufficient fissile material by the time of the first Gulf War. Iran is widely suspected of attempting to develop nuclear weapons but, at the moment, does not have the quantity of fissile material required. Terrorist groups have shown interest from time to time. The Aum Shinrikyo sect, for instance, the Japanese group that was responsible for the sarin attacks in Tokyo, attempted uranium mining in Australia in the early 1990s, if my memory serves me right.

Mr TOLLNER—There was a suggestion that they let off a sarin bomb in Australia as well.

Mr Carlson—There is no evidence of that, but there was that suggestion.

Mr ADAMS—Where did they mine?

Mr Carlson—In Western Australia. I have forgotten the area where they went. They took a lease on a cattle property, got an earthmover in and recovered a certain amount of uranium ore. They carried out a fairly primitive conversion operation; they separated up to about 20 kilos of yellowcake or yellowcake equivalent and that is about as far as it went. It clearly was not a

proliferation risk, but it has to be taken seriously as an indicator of interest. And there is certainly evidence of Pakistani scientists talking with the bin Laden group.

Certainly, the biggest barrier for people of that kind would be getting sufficient fissile material. Our assessment is that it would be beyond the resources of a subnational group to set up an enrichment plant or reactors and a reprocessing plant, or they could be detected. The fairly persistent worry has always been whether it would be possible for them to get hold of existing fissile material. The example that is usually brought out is from the former Soviet Union where, at the time when the Soviet Union collapsed, the controls over fissile material were fairly rudimentary. Basically, the Russian system relied on security over nuclear material—having nuclear material in remote areas with guards—without the development of an effective accounting system.

We found that the Russian authorities did not have a clear idea of exactly how much nuclear material they had and where it all was. There has been a substantial program to upgrade Russian capacities in this area, particularly funded by the United States, the EU and Japan. It continues to be something that gets high priority, let me put it that way. But certainly the known cases of trafficking in nuclear materials have never shown that substantial amounts of material are leaving Russia, and certainly nothing remotely like the quantities required for a weapon.

Mr ADAMS—They are using a lot of their material now in generating energy.

Mr Carlson—Yes. In fact, a substantial part of the world uranium market continues to be met now from the down blending of Russian high-enriched uranium. That is gradually coming to an end, and I think that is one influence on the uranium price. The uranium price is starting to increase fairly substantially because uranium production at the moment only meets about 60 per cent of the actual market and the difference is substantially being met by Russian uranium that is down blended.

The other story that was around was that there were Russian so-called ‘suitcase bombs’ that were unaccounted for. Certainly, I have never found any evidence for that and my American colleagues dismiss the story and say that there is nothing in it. To round off the story, a country or a group that want to pursue nuclear weapons not only have to do a substantial amount of research in weapon design because it is not simple but also have to have a way of acquiring fissile material of the right quality. Essentially that means, if they are not able to steal it, that they would need to have enrichment or suitable reactors. The conventional light-water reactor is not a good plutonium producer for weapons and they would need to have a reprocessing plant. If they are parties to the non-proliferation treaty, they would need to be able to run these activities while evading detection by IAEA safeguards, which is a challenge. It is a challenge for IAEA safeguards to find undeclared activities, but it is also a substantial challenge for countries to hide activities.

The main risk is with the technology known as centrifuge enrichment, which is a relatively compact and low-electricity form of uranium enrichment. The centrifuge technology is technically complex but know-how for designing and operating centrifuges has gradually spread, particularly through the efforts of Pakistani nuclear expert AQ Khan, who stole Dutch technology. He worked in the Netherlands as a dual national, having a Dutch wife, stole centrifuge technology in the seventies and used that as the basis for Pakistan’s nuclear weapons

program. In more recent times, he has been selling the technology to Iran, Libya and North Korea. In addition to Khan, there have been various European criminals, at one time or another, who have also dealt in stolen technology. The Iraqi program had help from individuals of German, Swiss and UK backgrounds who had been involved with the Urenco program—the European centrifuge program—in one way or another, as manufacturers of components or whatnot and had then set out to sell their knowledge to others.

Mr ADAMS—Is there any way that those people can be brought to heel under their own laws or the criminal court that has been set up internationally?

Mr Carlson—The short answer is yes and no. The Europeans have recognised that this is a serious problem and have now all introduced laws that would allow people engaged in this kind of activity to be prosecuted and given very severe sentences, but of course most countries do not apply laws retroactively, so most of these characters are still on the loose, I regret to say. Now the Security Council has put out a directive, known as Security Council resolution 1540, which requires all countries to legislate to make development of weapons of mass destruction and assistance in that activity a serious crime and to prosecute those who—

Mr ADAMS—Are you talking about Professor Khan?

Mr Carlson—Dr Khan. He is under house arrest in Pakistan, and the Pakistani authorities have refused to make him available to other countries to interrogate or prosecute.

Mr ADAMS—We hear about the former Soviet Union, Russia, having old nuclear submarines with reactors still there. Is progress being made on that? Is there a process of decommissioning?

Mr Carlson—Yes. This is something that I am not directly involved in, so my knowledge of this is fairly sketchy, but there is a program run by the Group of Eight, which are the principal OECD countries, to decommission the reactors and to ensure that the fuel is rendered environmentally safe, and Australia is one of the contributors to this program. We have funded something like $10 million to deal with one submarine. It is a fairly expensive operation, but it is certainly very active in tackling the problem.

Mr ADAMS—I think we had some evidence from Earth First to this committee that some of the uranium we have sold to France has been used in the production of weapons. You would refute that, I take it?

Mr Carlson—Certainly. There are a couple of issues here. One is the definition of Australian uranium. This is something that anti-nuclear activists are fairly agitated about. They feel that we should have a way of controlling atoms—that uranium produced in Australia should somehow be designated as Australian and that the batches of material should then be controlled through their life until they return to Australia or whatever. In fact, the nuclear industry does not attempt to work that way. Uranium is what is described as a fungible material. That means that any atom of uranium is indistinguishable from any other atom of uranium, and quite early in the fuel cycle process uranium from all different sources gets mixed. At the uranium conversion stage, where yellowcake is processed into uranium hexafluoride, which is the feed material for enrichment, the normal commercial process is that uranium from several different producers will be mixed together as it goes through the plant. So trying to track atoms in those circumstances is

impossible. The only way we could maintain control over atoms would be to set up the entire fuel cycle in Australia and do what the former Soviet Union used to do—lease fuel elements to countries with reactors and take the fuel elements back.

Australian policy since its inception in the seventies is that uranium is interchangeable. I have seen some of the witness statements to you claiming that the policy has changed, but this was always part of the policy and it has always been part of international practice. That is what is called the principle of equivalence. Any batch of uranium of the same quality is the same as any other batch of the same quality. What is described as Australian obligated nuclear material is a way of identifying a batch of uranium as it goes through the fuel cycle and ensuring that that batch is covered at all times by the treaty commitments which ensure that it does not go into non-peaceful use.

So in theory there is a possibility that Australian atoms might have gone into nuclear weapons. There is really no way of saying that is impossible because we do not have a way of tracking atoms; it cannot be done. But in practice most weapons states operate civil facilities that are quite separate from the military ones. The only point where atoms could jump from military to civil would be at the conversion stage—for instance, where there might be military material and civil material going through a conversion plant together and then you have a civil stream and a military stream coming out, and maybe in enrichment a similar situation.

Most of the weapons states never mixed material in that way. Either the civil facilities were totally separate or they operated on what was called a campaign basis, which was where they would run a plant for civil purposes, shut it down, clean everything out, put a batch of military material through and then clean that out and reopen it for civil use. I would have to do some research on France but my recollection—and Mr Doulgeris might correct me on this—is that at one time France had a conversion facility that was dual use. But that was a long time ago. I am not sure that any Australian uranium ever went through it. I reiterate: we do not try to track atoms. It is nonsense to even think of it.

Mr ADAMS—There is an auditing of the amount of our uranium that turns into plutonium, I take it.

Mr Carlson—Yes.

Mr ADAMS—The process is to audit the amount that is there. Is there an audit of the Australian amount in the world?

Mr Carlson—Certainly.

Mr ADAMS—And that equates to the audit?

Mr Carlson—Yes. That is a major part of my office's work.

Mr ADAMS—I have got your report. I took it home but I have not read it.

Mr Carlson—Okay. Let me explain briefly how all this works. As I said before, the agreements that we have cover what is called Australian obligated nuclear material. For the

nuclear material that is identified as being covered by an agreement, facility operators—in whichever country you are talking about the practice is the same—keep detailed accounts of all the nuclear material going through their facilities. The material is identified in batches and, as part of the accountancy for that, they record whether there are any safeguards obligations on that batch of material. In some cases uranium producers have no requirements, so it is what is described as unobligated material. Canada and the United States have requirements that are very similar to ours. Then there are some intermediate countries that put what is called a 'peaceful use' obligation on material but they do not attempt to track it as we do.

At the facility there are very detailed records of each batch of material and whether or not that material has a safeguards obligation. The accounting records will follow that material through the entire fuel cycle as it goes from conversion to enrichment to fuel fabrication, into a reactor and then into a spent-fuel pond, and maybe through reprocessing for the recovery and recycling of plutonium. Part of the formulas we apply take account of plutonium production, of course, so that Australian obligated nuclear material not only means the uranium we originally exported in its various forms as it goes through different processes but also covers material that is generated by using that uranium.

Our counterparts in the countries that are using Australian uranium prepare detailed reports to us of how much Australian obligated nuclear material there is at the different stages of the fuel cycle at different periods and how much material changed its form—for instance, became irradiated, produced plutonium, was enriched or whatever. We receive all of that information. We do a consistency check on it, cross-checking information from other countries. One of the features of the fuel cycle is that it is very international, such that there is a regular flow of material from country to country, so you can cross-check reports from one country against reports from another, and we also cross-check from our knowledge of the facilities involved. So we have our own appreciation of the burn-up in particular types of reactors, the plutonium production rates and so on, and we compare the reporting we get against our expectation of what should be happening in the country concerned.

The end result is that we have very detailed figures on the disposition of Australian uranium, and we have not found that there are any major concerns about any of that material being improperly accounted for, disappearing or whatever. I have seen some of the so-called evidence you have been given about Australian material disappearing and so on. I can assure you that it has not happened.

Mr HATTON—Mr Carlson, I want to sort some fact from fiction, and I will go to that shortly. One of the submitters, the medical people against nuclear warfare, argued in their submission that the later enrichment research at Lucas Heights now being carried out by Silex and supported in part by ASNO through its permitting the importation of uranium hexafluoride poses unacceptable proliferation risks and is inconsistent with Australia's public support for nonproliferation. I have asked this question in different forms a couple of times, and I finally have the people who can answer it: could you give us your view on that?

Mr Carlson—Uranium enrichment, as I said before, is one of the routes to producing fissile material. Therefore, uranium enrichment is what is called a sensitive nuclear technology and it needs to be controlled very carefully by governments. There is certainly nothing in the non-proliferation treaty that excludes the development of enrichment. Enrichment is a normal part of

the fuel cycle. All light-water reactors, which are the majority reactor type in the world, require enriched uranium, so enrichment is necessary.

One of the issues there is: should the spread of enrichment to other countries be controlled? The dangers there are highlighted by the Iranian case, for instance, where Iran is intent on pursuing enrichment in a powder keg area of the world. The other issue is: can the technology be adequately guarded, in the sense of stopping it from falling into unauthorised hands? The Khan history that I mentioned before, where this guy was able to walk out the door of a Dutch enrichment plant with blueprints under his arm, shows the dangers.

So there is no question that enrichment has to be very carefully regulated, and that is what we are doing. As regards the private sector project which happens to be renting space at Lucas Heights, from the point of view of my office we are very happy that they are there because the site security at Lucas Heights is very strong anyway. We find that this is a better situation than if they were at a totally different place, where they would have to establish something equivalent to what is at Lucas Heights from a security point of view.

We have designated the technology, what is called 'associated technology', under the safeguards act. This means that access to the technology is limited to named individuals who have been personally authorised through our permit system after going through security vetting. The Silex company has commercial dealings with American companies. In support of that the Australian and United States governments established the Silex agreement, as it is known, which came into effect in 2000 and allows for technology transfer between the two countries. Under that agreement, the technology is classified in American law as 'restricted data'. Some antinuclear critics have said this proves that it has a military application, because the designation 'restricted data' in the US is normally reserved for military technologies. In fact, this is the normal mechanism that would be used for protecting proliferation sensitive technology.

Mr HATTON—Is it particularly the case with this laser enrichment because it is more portable?

Mr Carlson—No. I was coming to that. As to how proliferation sensitive the Silex technology is, that is complicated. For a start, we do not know whether it can produce very high enrichment levels. The company has not sought to find out. We would not authorise it. But you cannot automatically assume that any enrichment technique can produce high enrichment levels. I would not take it as a given that Silex would lend itself to that.

On top of that there have been all kinds of claims about how laser processors are particularly dangerous because they are compact and can be hidden in garages and so on. The Silex equipment is in fact quite bulky. You can build a small laser application—as you know, lasers are used in all sorts of things. Even for demonstrating isotopic separation it would be possible to build something on a relatively small scale that could separate nanograms. But if you want something that can produce kilogram quantities, for a nuclear weapon you would need a minimum of 15 kilograms of uranium-235. If you want something that can have a throughput and that will give you that level of production, you would need to go into equipment which is much larger and have a plant which is a lot larger. Our assessment is that if you are looking at a plant—if we look at the Iraqi and Libyan experience we could say that the minimum plant size

to produce enough high-enriched uranium for one nuclear weapon in a year would need a plant which has an output of around 10,000 SWU a year, around 2,000 centrifuges.

If we assume that someone is attempting to build a Silex project that would give that kind of throughput, our assessment is that the plant would be larger than a centrifuge plant in fact and would need a small industrial building. It is not something that could be readily hidden. On top of that, the Silex process requires extremely complicated components which are very difficult to manufacture. There are only a handful of countries that are even capable of producing the various components that would be required. It is not really something that a proliferator would pursue. We would regard it as being an extremely difficult route to go down. Our concern is with centrifuge enrichment because the technology is easier, and unfortunately it is now out and about in the marketplace. We do not believe that the Silex process represents a substantial danger.

Mr HATTON—Thank you very much for that answer. I have been trying to get that kind of information into this inquiry ever since the allegations were first made. Part of the problem with dealing with this area is that separating fact from fiction is very difficult. I know that the committee wants to specifically follow up a number of statements. I know we are short of time but I want to take you to a couple of those so we can sort fact from fiction. The Friends of the Earth, in their submissions, have alleged quite strongly—and they were in fact called to order by the chair because of the manner in which they did it—that your organisation has made numerous false or misleading statements. They then put their own contrary statements up. They said, for instance, that reactor grade plutonium can be used in weapons and the US has done so. Do you know if that is true or false? That is their allegation.

Mr Carlson—The nicest thing I could say about what the US have done is that it is ambiguous. The US conducted a test in 1962 using what they described as reactor grade plutonium. In those days, there were only two grades of plutonium, weapons grade and reactor grade. Also, plutonium did not exist in the very high burn up levels that we have today with normal power reactors. The US say they acquired this particular plutonium from the UK. Offhand, I am not sure whether that is right or not. I know my UK colleagues have suggested that that is not true, in fact. But I am not sure what the official UK position is.

At any rate, the US have refused to reveal what the isotopic composition was. There is some evidence that it contained around 10 per cent plutonium 240. Weapons grade would contain less than seven per cent plutonium 240. What is now known as reactor grade has something like 20 plus per cent plutonium 240. In the 1970s, the definitions of plutonium were changed and a new category of what was called fuel grade was introduced. Now the categories are weapons grade, which goes up to seven per cent plutonium 240, fuel grade, which goes from seven per cent to 19 per cent plutonium 240, and reactor grade, which is 19 per cent plus. What is today reactor grade did not exist in the early 1960s. There are a number of American specialists who have assured me that the 1962 test was not reactor grade as it is now defined.

The antinuclear groups are trying to make too much of this issue. The reason I went into print on this in my annual report was because I was concerned at the assertions being made that Australian uranium is building up plutonium stockpiles around the world which equate to X-thousand weapons, the implication being that this is all weapons quality material which could be readily seized by the country concerned if it ever decided to pursue nuclear weapons. This is extremely misleading.

I think what is behind the US position on this issue, which is something that I agree with, is that clearly we need to take all plutonium very seriously as a material that could be misused. I do not believe that reactor grade plutonium has been tested as being capable of producing a nuclear explosion, but theoretically it could produce a nuclear explosion. It certainly could by a weapons state that has substantial experience—the United States, for instance, having conducted some 1,500 or 1,600 tests. If anyone could produce an explosion out of reactor grade plutonium, they could.

Mr HATTON—You would expect them to be able to.

Mr Carlson—Therefore all separated plutonium has to be subject to strong security. There is no doubt that, if any plutonium did go missing, it would be a worry. But that is quite a different proposition to saying that Australian uranium is generating massive quantities that are likely to be turned into nuclear weapons. I should not speculate too much here but, if any of the countries with major nuclear power programs did decide to pursue nuclear weapons, those that we could readily think of actually have at hand weapons grade materials, or close to weapons grade materials, in any event, and there is no way they would go anywhere near power reactor fuel; it is pointless. They would have something of uncertain performance; they could not be sure whether it would function as intended. They would go for something that is much more certain. You can see that in the way the nuclear weapons states themselves have proceeded. If power reactor fuel is so attractive, why have those countries set up special reactors with very low burn-up fuel to produce high levels of plutonium 239? Why have they done that if they think that ordinary power reactor fuel is just as good?

CHAIR—Gentlemen, thank you for your appearance before the committee today. The committee secretariat will contact you in due course to invite you to respond to some of the submissions that were made to the committee that we think may be advantageous to the committee if they are corrected.

[11.39 am]

BRIGGS, Rear Admiral Peter AO CSC (Retired), President, Submarine Institute of Australia; and Leader, Submarine Institute of Australia Task Force 2020

THORNTON, Mr John (Jock), Member, Submarine Institute of Australia; and Nuclear Submarine Adviser, Submarine Institute of Australia Task Force 2020

WEBSTER, Mr Derrick, Vice President, Business Development, Submarine Institute of Australia; and Member, Submarine Institute of Australia Task Force 2020

CHAIR—Welcome. Thank you for agreeing to appear and give evidence before the public hearing today. Although the committee does not require you to give evidence under oath, I should advise you that the hearing is a formal proceeding of the parliament. I remind you further that the giving of false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. I also remind you that the committee prefers all evidence to be given in public; however, at any stage you may request that your evidence be given in private and the committee will consider your request. I now invite you to make a short opening statement before we proceed to questions.

Rear Adm. Briggs—I will firstly introduce the institute. It is a not-for-profit incorporated association, with slightly in excess of 100 members. The objective of the institute is to promote informed discussion and research in the fields of submarine operations, engineering, history and commercial subsea engineering, otherwise called submarine matters. The membership covers a range of expertise, not just old and bold submariners whom you see before you today: maritime archaeology, diving and the conduct of underwater surveys, obviously submarine operations and design, the relevant scientific disciplines and international law. We speak today as informed laymen on nuclear power generation issues, with specialist knowledge on defence and the application of nuclear power to submarines, and on submarine matters in general.

I turn now to the submission. Preparing our submission required significant research into nuclear power generation and the issues surrounding it. I could not help but be struck by the extraordinary paradox that the ingrained rejection of all things nuclear has caused in Australia. In opposing the use of nuclear energy for power generation, it seems to me that there is consistent disregard of the realities, the risks and the rewards. We now have over 50 years of experience to go on in the world in general, and our submission endeavours to provide a balanced assessment of the risks and the costs.

There is also a failure to confront the reality that Australia is currently causing significant damage to the environment by using coal for baseload electricity generation and must find a way of reducing this while still meeting its growing future demands in an economic and environmentally responsible way. Yes, we must achieve better efficiencies. We must maximise the use of renewable energy—wind, solar and hot rocks—and clean up coal, but we have to be realistic about the risks, the costs and the real limitations of some of these measures. These measures alone will not suffice. The paradox for me is that the very people who would protect the environment have caused and continue to cause such damage by their blind rejection of the

realities. I can but echo the calls from thinking environmentalists such as Peter Gilding in the *Australian* newspaper on 23 August in calling for an honest debate with full accounting of the cost of each option, including that of doing nothing. There have been several other well-known names echoing this plea.

Another major point is the energy white paper *Securing Australia's energy future* issued in June 2004. I submit that this has been overtaken by the reality of world demand for energy and the impact that this has had on the price we must pay for it. Regardless of the economics, the paper was seriously flawed in not considering nuclear power as a source of energy. Introducing nuclear power is not something that can be done quickly. The lead time is probably 10 to 15 years. This makes the priority to revisit this policy all the more urgent. Whilst this issue is probably outside the committee's terms of reference, your inquiry has sparked serious debate on the matter and I urge you to take any opportunity to cause a review of our policy to occur.

There can be no doubt that Australia's uranium resources are a significant and growing strategic asset. The restrictions on development of the industry reflect those illogical fears of all things nuclear I spoke of earlier. By failing to take the sensible opportunity to value add, possibly by preparing fuel pellets ready for use in reactor, we deny Australia the income and the broader knowledge base of a more mature nuclear industry. We also add that there is the proliferation risk as end users develop these capabilities instead.

I turn now to our particular area of expertise: the submarine aspects of the strategic importance of Australia's uranium resources and relevant industry developments. The institute is considering the future underwater warfare capability likely to be acquired by Australia in the period 2020 to 2050. We have considered the various technologies likely to be available—in particular, the key issue of energy sources.

There is no doubt that nuclear propulsion for submarines offers significant operational advantages in the regional security environment likely to prevail in the medium term—15 to 20 years and beyond. Nevertheless, the introduction of a nuclear powered submarine would be difficult to achieve without commensurate expansion of the nuclear support industry beyond that established for the replacement nuclear research reactor at the Australian Nuclear Science and Technology Organisation. Such an expansion would require a whole-of-government commitment to a nuclear energy program.

Establishing a capable industry upon which to develop a nuclear powered submarine using current technology would take 10 to 15 years from a decision to initiate a nuclear energy program. This places it outside the current time scales envisaged for the next generation of Australian submarines. I should also make the point that the cost in capital, manpower, through-life support and the overheads attaching to nuclear powered submarines would be significantly greater than Australia's current conventionally powered submarine capability and would require a commensurate increase in the allocation of defence resources or an increase in the defence budget. We are not here today arguing for nuclear powered submarines. Rather, we wish to make the point that a nuclear industry base is an essential starting point to create the opportunity to consider such a capability. We welcome the opportunity to assist the committee with any of the issues raised by our submission.

CHAIR—Thank you for that. I would like to take you to your submission. In section 6, 'Nuclear energy as a power source for ships', which you touched on just a moment ago, you state:

Small reactors, operating on similar principles to the Pressurised Water Reactors used in Western, second generation power stations have been used to provide energy (steam) to propel merchant ships, surface warships and submarines for 50 years.

You go on in dot point 2 to state:

- More recently, submarine reactors have been designed to operate for the life of the vessel, 30-40 years without the need to refuel.

Would you expand on that?

Rear Adm. Briggs—Let me do so briefly and then I will ask Mr Thornton to take up the detail. It is possible to have a reactor which will run for 30 to 40 years—the life of the submarine—by designing the reactor and by achieving the required level of enrichment in the core. There is clearly an energy budget that has got to be managed, but I expect we will hear from the expert that in fact there are very few restrictions—you could run it at full power for a significant period of that time.

Mr Thornton—Refuelling a nuclear submarine reactor has always been one of the limitations, based on the fact that it requires invasive engineering in opening up the reactor. This, in turn, takes time and costs a lot of money. It also takes the submarine out of service for a significant period while they are defuelling the old core and refuelling the new.

CHAIR—What sort of period?

Mr Thornton—Sensibly a refuelling refit would not be less than about a year and could, if combined with other things, be greater than that. Also, inevitably, for the work force working on the refuelling, there is a level of exposure which has to be kept as low as reasonably practical. From a military perspective, the life-of-the-submarine designed reactor keeps the submarine in service for the maximum period throughout its life. It will still require refits, but they will not be driven by the core life; it would be driven by other normal submarine issues. It reduces the impact on the work force and it cuts down on the amount of fuel processing that is required, because it is a one-hit for maybe 25 or 40 years. It is a win-win situation for the operator: he gets his submarine with minimum downtime. For the refitter, his exposure is reduced. Also, it saves money because you are dealing with only one fuel load.

Part of the problem with a nuclear reactor is how the core ages throughout its life. One of the reasons why reactor cores have had to be changed at an earlier period is that the geometry of the core changes. As the uranium is converted to fission products, you end up with a different material inside the fuel plate, so one of the drivers has always been that the change in geometry has to be limited, and it has always been dealt with extremely conservatively. As 30 to 40 years of reactor technology have advanced, the understanding of what happens within fuel plates has improved and therefore the ability to extend the core life to make more use of the fuel that is available has improved. That is one of the key reasons why core life has extended the way it has. It is just an improved knowledge of what goes on inside a reactor fuel element. That is part of

the developing understanding of an industry that comes from having a continuum of development and understanding.

CHAIR—Measured over the life of a sub—in this case, you are speaking about 25 years—in percentage terms, how much more expensive in running costs and billing costs would be a nuclear powered submarine that could have a reactor that would last the life of the submarine?

Mr Thornton—Compared with a conventional submarine?

CHAIR—Yes—compared with the Collins class, say.

Rear Adm. Briggs—While Jock is gathering his thoughts, let me say that it is a simple question but that it has a complex answer, of course. You have a much bigger crew size. Collins has a crew of 45. Very few nuclear submarines get around with fewer than 100, and a lot have more than that, because you have a lot more men in the loop controlling systems in the nuclear submarines. For every submariner at sea you have backup. You have a huge regulatory regime that we would all expect, but it is much more involved and complicated than for a conventional submarine which does not—

CHAIR—From a military point of view, is a smaller submarine—a la the Collins—more advantageous than the larger one?

Rear Adm. Briggs—In some of the situations we operate in—in littoral waters in the region, which are shallow and where manoeuvring might be a bit more difficult—a 3½ thousand-tonne Collins is easier to handle than a 7,000-tonne Virginia class. But the French produce a 3½ thousand-tonne nuclear submarine, so you can build them smaller.

CHAIR—And the crew size?

Rear Adm. Briggs—I would have to check the crew size for you, but it is not that much larger than for a Collins—probably 65 to 70 people.

Mr Thornton—The driver on crew size in nuclear submarines is the requirement for a nuclear watch-keeping team, which tends to be about eight to 10 looking after the propulsion plant. The rules regarding the watch-keeping period are very strict. We require three watches on board, so they would be working eight on, 16 off. In order to operate, you have to be qualified so you have to take your trainees to sea as well. So you would have three qualified watchers and a watch of trainees, because you cannot allow a non-qualified person to watch-keep on the plant; the only way to learn that is to be at sea. The numbers then go up by another 25 per cent.

Coming to costs, I did an exercise in looking at the nuclear submarines that are available on the market—that is not quite the right word, I guess. It was an exercise in looking at the cost of a US or a UK hunter-killer submarine, a fast attack submarine. They come in at about $2 billion per ship. The British government, in particular, have learnt very hard lessons about the cost of making nuclear-safe infrastructure. I estimate that you would need about the same amount again for the cost of one submarine to provide infrastructure that is capable of withstanding the safety case that has to be made through the regulatory body that would have to be set up. With regard to through-life costs, I reckon that, for four boats over 30 years at current prices, it would be about

$3 billion. If you had four nuclear submarines over a 30-year life at current prices, you are talking about a range of between about $10.5 billion and $14 billion. That is based on looking at the costs of the ships and at some of the infrastructure costs that were particularly onerous when the British case was extended down to a new shipyard.

ACTING CHAIR (Mr Hatton)—Why would you go for nuclear rather than conventional? What is the fundamental advantage?

Rear Adm. Briggs—The fundamental advantage is mobility. The nuclear submarine has basically unlimited electrical power. It can proceed at full power for days, weeks—months on end. A conventional submarine uses batteries as its energy storage and source, and it uses diesel generators to recharge those batteries. In current generation conventional submarines you also get air-independent propulsion capabilities—fuel cells to provide a period when you do not have to expose yourself—but every time you need to recharge your batteries you have to stick up a mast in order to suck in air to run the diesels. The difference is quite stark in terms of the covertness—the ability not to have to put up anything for days or weeks—and the ability to proceed with unlimited mobility, really, in the nuclear case, compared with the conventional submarine, which probably works very hard to make a good 12 knots, compared with an SSN in a hurry, which will transit at 25, or over twice that speed.

Mr Thornton—And without having to slow down.

Rear Adm. Briggs—And he just does not slow down. If the problem is 2,000 miles away, he just puts his head down, winds it up and away he goes.

ACTING CHAIR—And they are quiet.

Rear Adm. Briggs—Yes, they are quiet. If he runs across the wrong person doing 25 knots and there is a Collins in his way then he has probably lost the day, but he would probably take steps to avoid that situation. But they are still very quiet in moving around. In the patrolled area he does not have to expose anything if he does not want to. He puts up the antenna to listen and periscopes to look and so on but he does not have the problem of having to recharge batteries. In a modern conventional submarine, you can avoid that situation as well. You turn on your air-independent power plant, which will support you and let you move around at four or five knots for perhaps two weeks, 10 days, but it does not have the mobility that you get from the nuclear plant.

ACTING CHAIR—So that is driving why you would say, in terms of our capability going forward, that if we want the best we should possibly be looking at that.

Rear Adm. Briggs—Australia faces a unique set of circumstances for its submarine use. Our operating areas are 2,000-plus miles away from our bases. Every day you spend transiting to get to where the action is is a day wasted. In getting to the scene of the action and providing submarine coverage, the efficiency is much higher with nuclear mobility. Once there, if you have fitted the submarine with air-independent propulsion and it has enough fuel to support its patrol time then you have less of a difference between the two but you still have the very distinct advantage that, if you need to relocate it, the nuclear submarine moves much faster in covering a new problem that has emerged.

Mr ADAMS—So it is all about hiding—not identifying where you are. What about the heat source being located? Isn't that the play today, with infrared technology and all that sort of stuff?

Mr Thornton—The infrared scars. That has been around for many years, with people saying that it is the end of the nuclear submarine as we know it as a threat. The fact of the matter is that if a submarine is a couple of hundred metres underwater, by the time the scar is visible from space, the information is processed and they have worked out what they are going to do about it, it is probably fairly old data. I would not be worried about an infrared scar if I had a choice of going to sea in a conventional or a nuclear submarine. The conventional submarine would provide the same kind of infrared data every time it snorts. Someday somebody will probably come up with some technology that will limit the nuclear submarine, but I do not think it is there yet.

Rear Adm. Briggs—You are quite right. It is a covert platform. One of its strengths is that you do not quite know where it is. Therefore it requires a disproportionate effort either to try to locate and restrict it or to work out where it might be and what it might be doing.

Mr ADAMS—They do that with aeroplanes and helicopter platforms these days, don't they?

Rear Adm. Briggs—Yes, that has been common for a number of years. We have all operated in those sorts of situations and survived to tell the tale, I am happy to say.

Mr Thornton—Again, it depends on what the mission of the submarine is. With deterrent patrol submarines the primary requirement is to remain undetected. You have very long detection ranges of any potential seaborne helicopter carrier; the game is to avoid it and to stay undetected. In a more aggressive posture, you are talking about war fighting, and that is part of the risk of war fighting.

Mr ADAMS—In your submission your concern is that Australia maintain the capacity to produce people that can take part in the nuclear industry. Do you want to make a point on that?

Rear Adm. Briggs—Australia has lost the capacity it did have, with the nuclear engineering school having closed in the late sixties. There is no doubt that part of the process that would have to be undertaken if you were to contemplate a nuclear power generation industry would be to re-establish the engineering capacity that once was there but which has been, as a matter of policy, closed down.

Mr Thornton—And it is important to move beyond the research reactor stage to understanding the scale of the kind of engineering that is required in civil reactors in the nuclear power generation business. It is a combination of very high standards and big, old-fashioned engineering. Having that technology and experience in-country will enable the right answers to questions that you gentlemen and other areas of interest would want to ask. It is a very large industry. As well as looking at the atom at one end it is looking at the power turbine at the other.

ACTING CHAIR—There is the capacity of a nuclear powered sub to get around faster, to get to the action. We could buy them in the appropriate size or combination of sizes to replace our current capacity. Putting aside the question of the nuclear industry and building that in Australia, why would we not go to the US, the UK or France, as we have done with the Abrams tank, the

Tiger helicopter and the rest, particularly if they could build one with a fuel plant that would last 30 or 40 years? We could say, 'Thanks very much, we'll have that.'

Mr ADAMS—Buy it off the shelf.

Mr Thornton—Yes, and if you buy off the shelf, as you say, you do not need the fuel technology. But you are going to be operating this mobile nuclear reactor in Australian waters. You are going to be maintaining it. This 20-year core, from the moment it is taken critical for the first time, must be cooled throughout that 25 to 30 years. For safety reasons you have got to have more than one method of cooling; once you start, the fission fragments emit decay heat. So you have to have an understanding of both the plant and its infrastructure to support that plant, and that means that you have to know your industry. Buying the submarine would be the first five years of the 30 years. You then have to support it throughout its life. That means there is work to be done on in-service inspection of the plant, which one would want to have done by Australians, because that is where foreigners tend to make a lot of money. You need to have that knowledge yourself, in country, to manage your own plant.

ACTING CHAIR—But if you look at the examples I gave you, most of those have technology agreements associated with them. The argument is that the maintenance would be done in Australia, in part. If you look at the Collins, we bought the technology from other people and we built the vessel ourselves in order to provide ourselves with a new industry. But would it be possible, under the sorts of arrangements that are available with those other craft and with the advanced warfare destroyer and so on, to do it in another way?

Rear Adm. Briggs—If Australia's strategic circumstances warrant it and Australia is prepared to spend the resources, and, as we have just heard, they are significant—well more than double what it currently expends on its conventional submarine capability—then there is no doubt that you would be able to fast-track such a program by going to those sources. If you continue to operate it without that industry growing up alongside it, I think you would experience a steadily rising support cost. The nuclear engineers you need to operate that plant, supervise it—in uniform—have got to come from somewhere. At the moment you do not even have a university that is going to be able to train these people. Yes, we can put them on a plane and send them to the UK or the US, but we know from our experience with the Oberons that that becomes an increasingly expensive overhead to bear. So for practical and strategic depth reasons, you would want to see such a capability backed up by a power generation industry which produces the bulk of graduates and provides the engineering experience that you need in through-life support for the submarine.

Mr ADAMS—Will hydrogen fuel cells in 30 years do what a nuclear reactor can do for a submarine?

Rear Adm. Briggs—No, I do not believe so. The power levels you are talking about are sufficient to propel a Collins at five or six knots, not to drive it at 20 or 25 knots. One of the main problems with fuel cells—there are a number of problems—is the efficiency of storing the fuel. Hydrogen is an extremely difficult material to work with. It is explosive. In an atmosphere mix of more than half a per cent you have got a bomb in your hands. So storing it in a safe way is extremely difficult. It is currently being done in a hydride chemical bank that holds the hydrogen until you release it. In that circumstance the efficiency is absolutely appalling. You

have got a kilo of hydride for a fraction of the hydrogen that comes out of it. There are real limitations in the submarine use. The European application of fuel cells in submarines is devoted to very short endurance submarines. If you are moving around the Baltic or even the Mediterranean, your distances are much shorter. It is a much more practical proposition to transit several hundred miles and settle into a patrol area, switch on your fuel cell and, two weeks later, head back home again. That is not the geographical situation we face in Australia, with these big, long transits. So whilst AIP and fuel cells are an option for reducing the conventional submarine's exposure in a patrol area, that is actually a disadvantage in the transit because it is just weight and space that you have got to cart with you. It is also very expensive.

Mr Thornton—It still has the same problem that if you want to increase speed the amount of power you need to put down the propeller shaft to increase that speed actually goes up in what I think is a cube law. The best example is that a conventional submarine at very low speed will have an endurance of, say, 100 hours; at high speed it has got one of, say, 100 minutes. The same applies to any kind of power generation system. The advantage of nuclear power is that you have got a lot in the tank.

ACTING CHAIR—In terms of the experience with the Collins class submarines, we made the decision to build the boats here, to build the industry here and to build the associated capacity here. That has been reflected in the recent decision that Adelaide is going to be the base for building one of our newer classes of ships, so we get a continuation of that kind of embedded experience. Is that one of the key fundamental drivers in looking at that capacity: the way to rebuild our industrial capacity here as an integral part of our own defence?

Rear Adm. Briggs—It is extremely important that you have got the capacity to support the platform here. It is a long way to send a submarine to Europe or North America or, indeed, to bring that capacity here if you have got a problem that needs to be fixed. The chances are that when you have a problem they have got a problem as well, so they are not available. It is therefore fundamental to be able to provide the submarine capability that you have got—that in-country capacity to support them. Secondly, as we have been discussing, our operating environment is quite different. Today you have predominantly two or three European conventional submarine builders to choose from. They are designing to a different requirement, so there is always going to be a need to grow from the smaller, shorter range, shorter endurance platform to something like a Collins class one. That was a bloodstained experience but we learnt a lot from it.

ACTING CHAIR—It is also the kind of experience that you get with any new class of vessel or aircraft.

Rear Adm. Briggs—Less so in the case of something that you are basically taking off the shelf. In the case of aircraft, we are operating a platform that is in service elsewhere, so there is a different order of challenge as to through-life support. You are dealing with a much more complex vessel in a submarine. The density of the systems, the number of systems and the environment it operates in are all much more demanding than those of even a modern surface ship, so there is a special case to justify what we put ourselves through in doing Collins. We have come up a curve and we do have an absolutely world-class capability to support that platform and to contemplate where we go to next.

ACTING CHAIR—So, going forward from there, you are working on that. Can you see any developments in the conventional area that would allow a conventional submarine to be developed to suit Australia's purposes that would be as good as—or close to as good as—or would even come near to a nuclear propelled submarine?

Rear Adm. Briggs—The answer is no, and we have laid out the pluses and minuses. Can you build a conventional one that meets the requirement? Yes, you can but you have to accept that it is not going to get there as quickly as a nuclear one and that once it is there it has got a shorter endurance in a covert fashion than a new nuclear one. If you, as the requirement should be described, want to be able to keep two submarines on task at, say, 3½ thousand nautical miles from their base, that leads you through a calculation to say you will need so many submarines. That calculation would look different if you had the mobility of a nuclear one. There are other factors in deciding how many you build but what I am saying is this: on the future capability, yes, you can design a conventional that will meet the requirement—I am quite sure of that—but it will not be as agile and as mobile as a nuclear one and you will probably need to build more of them.

Mr Thornton—The sheer size of a nuclear one enables, for example, the weapons load to be very significantly enhanced as to the number of weapons it can carry. Again, you must match what the capability requirements are: what the strategic analysis says is the requirement for an undersea capability versus the best fit from a military perspective as well as a financial perspective. One of the issues that we had in the UK was that when we were expanding the submarine force we ended up with nonvolunteers because we could not expand quickly enough and match the volunteer element.

ACTING CHAIR—The press gangs were in operation again.

Mr Thornton—Absolutely. It put an imbalance into the rest of the core structure. The surface navy tended to feel very much that submarines were taking all the resources and that was actually true because it is a very expensive business. The UK is looking at future submarine capability beyond its next build of nuclears and it has not excluded returning to conventional submarines—based on the balance of bang for a buck, I guess.

Mr ADAMS—What is the biggest submarine built at the moment, in terms of tonnage?

Mr Thornton—The Russian Typhoon nuclear submarines are 24,000 tonnes.

Rear Adm. Briggs—That is a ballistic missile submarine.

Mr Thornton—Yes. The size of the average SSN fast attack submarine has now gone from 3,500 tonnes, which it was when they first came in 30 years ago, up to about 8,000 or 9,000 tonnes. In the middle you have got the cruise missile submarines, like the *Kursk*, which was up at about 18,000 tonnes. It did not carry ballistic missiles as much as shorter range missiles.

Mr ADAMS—How far can a ballistic missile go?

Rear Adm. Briggs—Anywhere you want.

Mr Thornton—I believe the range of Trident is over 5,000 nautical miles.

Mr ADAMS—But the satellites will blow them down.

ACTING CHAIR—In terms of the broader industry question, we could take a series of decisions which you have argued for. You have argued that we need to look at nuclear industry again in Australia and start the steps to rebuild, and this is one part of that. We heard evidence earlier today that the Russians leased their fuel rods out. They kept complete control of the process and learnt that the leasing process will actually work. You can not only keep control of it but also make a great deal more money out of it that way. You suggest there is a possibility of making fuel pellets here and so on.

Rear Adm. Briggs—Ex-Prime Minister Hawke has suggested that.

ACTING CHAIR—He has just recently. Times change, but one of the underlying problems that have been there for the past 20 or 30 years is the whole emotive nature of the question of anything that is nuclear. So there are two aspects. One it that, yes, it might be possible, but decisions are then taken because of that emotional and emotive atmosphere to close down mining and to not look at propulsion. Decisions have been taken in New Zealand that they will not have any nuclear powered ships there. From your nautical experience dealing with British, European and American powered vessels, how much did people have to fear during those 20 or 30 years from those propulsion systems, with nuclear powered submarines or other vessels coming into their harbours? Was it a real concern? Do you think people have overreacted?

Rear Adm. Briggs—The first major point in my opening remarks was that I think there has been a huge overreaction. The price we are paying is significant. The committee's activities have caused the debate to be reopened, which I think is very useful and very encouraging. I am quite heartened to see some of the conservationists who were earlier so trenchantly opposed coming to the realisation that, if it is not going to be nuclear, what is it going to be? It really cannot be more coal. From the power generation point of view, people who are thinking about it are realising that they seriously have to go back and realistically re-examine what the options are. That is the catalyst that this committee ought to be able to build on to take this forward.

The second part of your question was about the degree of risk from a nuclear propelled submarine in a port situation. Nuclear submarines visit Australia from time to time. A very well established routine is followed to clear the particular port and to set up arrangements to cope with whatever might happen with the submarine. I am not aware, in all the years that that has been in place, that there has ever been an incident. I was involved, as the commodore in Western Australia, with one of the ports that were frequently visited by nuclear powered submarines. From our perspective there was a set of routines that had to be put in place and there were checks that had to be made. We were dealing with a probability that was extremely low. The submarine, once it was alongside, shut down and plugged into shore power, was a very benign, well-managed vessel.

Mr Thornton—Part of the problem is perception. In order to be responsible, the industry has to look at risk. It is impossible to say that there can never be a nuclear accident. As soon as you make that statement, it becomes emotive. It is the responsibility of the industry to ensure that the general public's concerns are recognised. I have heard statements like: 'How can you say you are

safe if you need accident procedures? That means there must be a possibility of an accident.' You can argue that you fly with Qantas and so far so good, but they have accident procedures. They have primary and secondary safety, and so do we in nuclear submarines. The emotion that is conjured up by the word 'nuclear' is real. People fear nuclear because they cannot see and touch it. Therefore, it is incumbent on the industry, whether it is in the civil nuclear power industry or in operating naval nuclear reactors, to recognise that people are concerned. The best way to do that is to have the regulatory environment in which you work visible and capable of making pronouncements to the general public where appropriate—there will be areas where you cannot—to put their minds at rest. It is the responsibility of any responsible operator of any kind of industrial plant. The emotion is worse because of the word 'nuclear'.

Rear Adm. Briggs—The emergency response plan for having a nuclear ship visit Australia is a public document. We engaged concerned groups in the community to encourage them to come and talk, question and understand what processes were there. In general, handling a nuclear vessel on a visit requires the Qantas safety briefing and a set of procedures, but once it is tied up alongside and shut down it is very much like any other submarine.

Mr Thornton—I was the engineer officer of a nuclear submarine that regularly went overseas. We had very strict rules about what we were and were not allowed to do. The rules are identical for visiting a UK port and visiting an overseas port. There are intergovernmental agreements established as to what information is and is not to be made available to the local authority, but the absolutely fundamental rule is that you apply at least as good nuclear safety procedures when you visit a foreign port as if you were visiting your own country. A very strict regime was imposed on British nuclear submarines, and I know the same applied for American nuclear submarines.

ACTING CHAIR—Thank you for appearing before the committee today. If the committee has any further questions, the secretariat will contact you.

Resolved (on motion by **Mr Adams**):

That this committee authorises publication of the transcript of the evidence given before it at public hearing this day.

Committee adjourned at 12.24 pm