COMMONWEALTH OF AUSTRALIA

Official Committee Hansard

HOUSE OF REPRESENTATIVES

STANDING COMMITTEE ON ECONOMICS, FINANCE AND PUBLIC ADMINISTRATION

Reference: Australia's manufactured export and import competing base now and beyond the resources boom; Current and future directions of Australia's export industries

THURSDAY, 15 MARCH 2007

MELBOURNE

BY AUTHORITY OF THE HOUSE OF REPRESENTATIVES

INTERNET

The Proof and Official Hansard transcripts of Senate committee hearings, some House of Representatives committee hearings and some joint committee hearings are available on the Internet. Some House of Representatives committees and some joint committees make available only Official Hansard transcripts.

The Internet address is: **http://www.aph.gov.au/hansard**

To search the parliamentary database, go to:
http://parlinfoweb.aph.gov.au

HOUSE OF REPRESENTATIVES

STANDING COMMITTEE ON ECONOMICS, FINANCE AND PUBLIC ADMINISTRATION

Thursday, 15 March 2007

Members: Mr Baird *(Chair)*, Dr Emerson *(Deputy Chair)*, Mr Ciobo, Mr Fitzgibbon, Ms Grierson, Mr Keenan, Mr McArthur, Mr Secker, Mr Somlyay and Mr Tanner

Members in attendance: Mr Baird, Ms Bird, Ms Grierson and Mr Keenan

Terms of reference for the inquiry:

To inquire into and report on:

The state and future directions of Australia's manufactured export and import competing base, focusing on, but not limited to:

- Australia's dominance in commodities exports and the impacts of this on the economy following the resources boom;
- the state of the country's manufacturing sector (and the goods and associated services) including opportunities and challenges from the expansion in global trade (in particular by China); and
- policies for realising these opportunities.

WITNESSES

Committee met at 10.43 am

BINKS Dr Peter Nicholas, Chief Executive Officer, Nanotechnology Victoria Ltd

CHAIR (Mr Baird)—Welcome to today's hearing on the manufacturing inquiry. The committee does not require you to give evidence under oath but it has the same standing as proceedings before the parliament.

Dr Binks—I am aware of that.

CHAIR—The committee has not received a submission from you to this inquiry. Do you wish to present a submission?

Dr Binks—Not at this stage.

CHAIR—Can you give us your views on this inquiry? You are probably aware that the inquiry has a charter, requested by the Treasurer, to look at the manufacturing sector and the services sector in terms of the issues confronting them post the resources boom—we certainly hope it continues long—as well as the shape of the other sectors and what we should be doing. Obviously your involvement in one of the segments of the industry will be interesting to us. We are looking at not so much a description of the industry sector but what we should be doing to encourage these sectors in particular.

Dr Binks—Thank you. I run a small organisation called Nanotechnology Victoria, which was set up nearly five years ago. Our role is to focus on the commercialisation of nanotechnologies. The reason we were set up was that the Victorian government at that time perceived that nanotechnologies may be important to the economy going forward. They also perceived that it was at that stage largely in the domain of the universities and the CSIRO and that industry had very little exposure to or use of nanotechnology, and that was something that they wanted to change. The government was particularly concerned because there were major initiatives emerging elsewhere: the US, Germany and Japan. A whole host of other nations now have very coherent nanotechnology activities and are using that as one of the future stimuluses for their industry.

I have been running the organisation for about four years. We are owned by the universities but we effectively work with industry. We run a series of projects which are for either collections of industry players or for individual companies which are looking at nanotechnology and asking how they can incorporate nanotechnology within their business.

Let me step back a little and try and give a view on what nanotechnology is. It is essentially engineering. It is manipulating materials and processes but not at the macro level that we are used to with large physical objects. It is right down at the molecular level. There are some very different things that happen at the molecular level. There are fundamental changes in the properties of materials because quantum effects start to overlap with what we see as classical effects. Over the last 15 years we have started to get the instruments and the manufacturing technologies to use that. So something that would have been done 15 or 20 years ago within a lab can now be done, to a limited extent, within a manufacturing process. There are now a number of companies around the world which are starting to incorporate nanotechnology in their

structure by introducing new products that do involve nano-structured materials or devices like that.

Within Australia, we spend about $100 million a year across all activities on nanoscience and nanotechnology. More than half of that is spent on the research of nanotechnology. It is spent by almost all of our major universities, some of our CRCs, CSIRO, the Department of Primary Industries, ANSTO, DSTO and places like that. A smaller amount is spent by about 70 or so companies that are working in this field. They range from equipment manufacturers through to materials producers and biotechnology companies that focus on what materials can do within biological systems.

The evolution of nanotechnology is really, at this point in time, focused on material sciences. Companies like BlueScope Steel, Amcor, BHP Billiton and Rio Tinto are all looking at nanotechnology activities, not necessarily investing right now but keeping a watching brief and developing relationships which will support that. A significant portion of the growth of nanotechnology will be around the microelectronics industry but Australia will not be a major player in that, although we use some of its benefits in downstream devices. The real goal is around pharmaceuticals, therapeutic products and around medical treatments that involve molecular manipulation. Essentially, a number of the problems that we face in today's society have a molecular origin, so when we look at the diseases that are becoming quite prevalent—cardiovascular disease, cancer and neurological diseases—many of those have their basis in molecular changes and need to be addressed with some molecular tools amongst others. So a lot of the investment that is going in, particularly in the US, Asia and, to a certain extent, Europe, is around developing new forms of treatment for cancer, new diagnoses for Alzheimer's and other diseases that are based on being able to spot and manipulate smaller and smaller amounts of the devices that need to be changed. That is where nanotechnology is going. Is this an appropriate time to pause?

CHAIR—Yes, that is a good start. Michael, you can lead off with questions.

Mr KEENAN—Thanks, Dr Binks—that was very interesting. It is obviously a very exciting area. What we are interested in as a committee is how the government can give support, whether it be to the services sector or manufacturing. I suppose we can do that in various ways. In one debate we heard conflicting evidence about whether the government is better off providing tax concessions for R&D or making specific grants to complete specific research and development. I don't know whether you have a particular view on that.

Dr Binks—Yes, I do. My view is that the biggest challenge that we face between the nanotechnology field and the Australian manufacturing industry is the translation of the outcomes into the manufacturing environment. I am not convinced that we need more R&D performed within our fundamental research institutions. They are reasonably well equipped with financial resources and infrastructure at the moment. There has been considerable investment over the last five years in that area; the NCRIS scheme is just one. The big gap is being able to support industries in evaluating new technologies like nanotechnology, being able to test them within their own systems and then being able to build the skills to handle them. We play a role within that, although it is relatively small.

A company like Amcor, which I mentioned before, will say, 'We are looking for new forms of packaging; is there something Nanotechnology can provide?' It is being able to provide what in the agricultural field are called the 'extension services'. That is the on-site advice and demonstration and access to the resources to say, 'This is what you can do with it. This is where it can help and where it cannot help. These are some of the things you ought to know about it. This is what the regulatory environment is. These are the OH&S concerns. This is where you find nanotechnologists for your future activities', etcetera. My view is that the best role, in particular, for the federal government is around creating the infrastructure to support the uptake of those technologies.

Mr KEENAN—What form would that take?

Dr Binks—I think support to the educational sector is quite important. The educational sector is now starting to develop nanotechnology programs. It is starting to appear in, for example, the VCE curriculum. Both biology and chemistry now incorporate nanotechnology. There are a number of graduate degrees being offered. There are mechanisms by which the information around nanotechnology is being transmitted, including our mechanism, the Australian NanoBusiness Forum, and various working groups et cetera are starting to do that. It is more of those information and coordination activities than necessarily direct investment.

Mr KEENAN—Okay. So essentially you are reasonably happy with the role that the federal government is playing, although you would like to see greater emphasis on education?

Dr Binks—The federal government's role has been evolving over the last two years, in particular. There has been a working party for PMSEIC which has talked about the major supports that are required. There were outstanding issues in terms of addressing OH&S concerns, public awareness, and some of the other soft infrastructure issues.

Mr KEENAN—Are there particular OH&S concerns for the sector?

Dr Binks—Yes. Nano particles are different from macro particles. When you reduce a particle down to the level where it is very small, two things happen. First, because it is very small, it is actually very hard to control. It becomes something that you need different kinds of equipment to handle, package and contain. Second, it has a much higher surface area compared to its volume, and that makes it in essence more reactive than a bulk material would be. We have already seen this in a number of other materials—for example, the sand blasting issues around silicosis. The same kinds of issues can occur with very small particles. It means that you need to have different handling equipment, different assessments of what exposure there is and essentially modifications to the regulatory environment. The process of developing those is under way at the moment.

Ms BIRD—I find this interesting. I have had a view that the future of our manufacturing industry will be in specific problem solving type production, rather than mass production. There is a manufacturer in my area that used to mass produce gears and that was taken over by Tenix and does big gear problem solving type manufacture. Linking them with some of the groundbreaking research that is problem solving is what the nanotechnology is doing, isn't it—specific problem solving?

Dr Binks—Yes, you are exactly right.

Ms BIRD—When I visited this site they had never thought of wandering over to the university. Wollongong University has a big engineering section and does some nanotechnology. It really surprised me—this was only six month's ago—that these major manufacturers, who are starting to find a niche for themselves in the world, do not think to make that connection to our research institutions. Are you are saying the federal government could get more involved in the linking up and creating those opportunities?

Dr Binks—I think that governments as a whole do have a role to play where there is the market failure that you are talking about, where you have a manufacturing operation that has a product that will be looking for enhancements to that product or ways to compete better. Gear manufacturers will want harder and harder surfaces so that they wear less. They will want better lubricants and corrosion resistance. They are often looking for lighter, tougher materials. Nanotechnology can help provide all of that. You are exactly right in saying that they will say, 'I want a gear that behaves differently, that performs better under these circumstances'—on oil rigs or whatever it may be. There is a real challenge finding the information to get that product improvement. So I come back to the point that mechanisms where the government can help people find information and get access to the technologies on, at the very least, an informative and demonstrative basis is the most important thing that can be done.

Ms BIRD—It is basically what the Irish did and what has driven their boom at the moment.

Dr Binks—Exactly. So it does not necessarily mean more research. We do not find Australian industry short of the intent to invest in technologies. We have been extraordinarily impressed with what the textiles industry has done, what the materials industry has done—the steel manufacturers and other manufacturers—and recently the glass industry, which has been looking at new technologies. Both big companies and small have been very eager to say, 'If there's an opportunity to do something different that allows us to compete better, we're all ears.' They will invest to do that. It is not often seen as money and it does not have to be money. It is more access to their production facilities, their test personnel and their marketing guys to say, 'Can we take this into the Australian market?'

Ms BIRD—But you need that conduit. Universities are so research focused, and not commercially focused. I do not know that we would want to change that because we might then lose some of the innovation that they do. But your organisation seems a very good way to connect that through their have a dialogue.

Dr Binks—Yes. I would agree with you about the role of the universities in the sense that we would like the universities to produce more and more good stuff. It needs to be made more available and better organised so that you can go into the University of Wollongong—which is one of the finest nanotechnology groups around—and say, 'We're looking for this. How do we do that?' We try and play that interface role where we will work with a gear manufacturer and say, 'What would be of value to you? We think we can help you find that.'

Ms GRIERSON—I visited a company earlier this week that are doing biomass research. I am from the Hunter, so coal is huge. They were employing people from the university to do some of their research work—graduates of the university. But they also expressed to me some concern

that sometimes what they have been discussing ends up as someone's research paper. So there does seem to be some work to be done between the commercial groups—the business—and the universities. I do not think it is confined to my university; it is probably a real experience all around Australia. Are you aware of that? Have you been an academic?

Dr Binks—I have not been an academic for 20-odd years. The rules are murky and we tend to work on a very commercial basis. We like to have contracts so when we are working with an industry partner and a research partner, we put a proper legal agreement in place which handles the intellectual property, the publications rights and all that.

Ms GRIERSON—So you would assess the small business like that to negotiate with research?

Dr Binks—Yes. But there have to be rules on both sides, and the rules can support both sides. When we put these agreements in place we encourage publication because we think it allows the researchers to get something back out of it and it also then provides a benefit to the company. As long as the intellectual property is published, it is already protected. Protecting it does not cost much; it takes a little bit of time and a little bit of work. But if the intellectual property is protected, the researcher can publish it. It improves the standing of the institution and the research group. A small company can then go back and say, 'This is based on university research.' They can trot out the paper. There are benefits all round from doing things in a proper commercial context.

Ms GRIERSON—Do you see climate change as an opportunity for us in terms of nanotechnology? I am thinking of polymers with solar paint et cetera—those sorts of things?

Dr Binks—Yes. A lot of it is the real simple stuff. It is things like having energy efficient glass. Being able to stop the energy leakage from buildings is very important. It is about being able to better use the energy that we have, being able to reduce greenhouse gas emissions, even through having things like lighter materials. A lot of our work is around having lighter materials that are stronger or that do not collect other gunk along the way. We also work with wind turbines. Being able to get better blades that are lighter and more efficient involves nanostructured materials. There are a lot of things that contribute to it. They are all part of the equation without being a bold solution.

Ms GRIERSON—Are there equivalents in the United States of your type of organisation or are you the groundbreaker?

Dr Binks—Not yet. It is interesting when you talk about the roles of government. The federal government is playing an overview role in looking at what I talked about—that is, the soft environment. The state governments are playing quite a hands-on role, and it varies from government to government. I would say that the Victorian and Queensland governments have been the most proactive in trying to get this work. Part of it is aligned to what they are doing around their own manufacturing industries in their biotechnology sector. I think we are all experimental. I like what we are doing in Nanotechnology Victoria but I know it has many flaws and can certainly be improved upon. The good thing is that all the parties are talking and trying to learn from each other.

CHAIR—I am interested in where you got your PhD from.

Dr Binks—I am a physicist by training. I was brought up in Tasmania. Tasmania has a very strong physics basis. I studied overseas, in England, and then came back to Australia to work. My passion is around getting technology into the community and into industry. I have never worked post-doc. I worked with BHP before BHP Billiton and with Telstra. I see Australia as being very much in a global market where each manufacturing industry cannot stand still. It has to constantly look at what its competitors are doing, what its suppliers can do better and what its customers are asking for differently. I think technology is just one of the things involved. Nanotechnology—while I work for a nanotechnology company—is only one of a number of platforms that can help us do better.

CHAIR—In terms of our deliberations, are you basically saying that you want us to emphasise this as being an important component of the way forward in manufacturing, rather than saying, 'You should be doing A, B, C and D in assisting this industry'? Is it about lifting the profile and highlighting this as one of the areas in which we have developed strong expertise and should be encouraging supporting?

Dr Binks—That is exactly the answer. We had a forum about two weeks ago which was entitled: How can nanotechnology save Australian manufacturing? I had to apologise to the group. I said, 'Nanotechnology can't save Australian manufacturing.' Nanotechnology is one of three or four things that over a long period will help keep Australian manufacturing competitive, but it cannot change China and it cannot address a whole lot of other different things. The companies and the industries that are approaching this in the way I support are saying, 'We have to do a whole lot of different things and over the next five to 20 years nanotechnology is something we have to keep an eye on.' We will develop skills around it. We will be asking the universities and CSIRO what they have for us and we will make the time to go and find it. So there is no sudden benefit. The kinds of recommendations I would like to see come out of it would be that nanotechnology should be on the radar screen and over time the practical means should be developed whereby nanotechnology can be made available to Australian industry.

Ms BIRD—Part of that is to do with university funding. Part of the feedback you get from universities is that they are funded to deliver education and that whenever they do anything that is commercial they are trying to fund that out of the provision for providing education. My view, and I put it to you, is that we beef up the Commonwealth funding of universities to support commercialisation. That does not mean the research; I mean the people who are liaison officers, people whose job can be talking to industry.

Dr Binks—I would agree exactly with what you are saying. The only thing that I would add is that sometimes universities think of commercialisation as making money for the universities. So they say, 'If we can do a $10 million deal that can bring in all these royalties, then we can fund all this extra research,' and then they try to drive a really hard-nosed deal. I have negotiated agreements with universities that have taken three years to complete; they should not have. Their stance has been protecting something that is of enormous value to their bottom line. I think that that is taking it too far.

Ms BIRD—Yes, which is why I am saying to change the nature of federal funding so they do not feel driven to be running on that model. I think you are right: that model is prohibiting us as a nation from making an economic benefit out of the research we do.

Dr Binks—It is. The small companies that we talk to say, 'Look, we funded that research through our tax dollars. We just want to know where it is and how we can get access to it. We do not necessarily want it for free, as we are happy to pay for developments and things like those, but just knowing where it is and how we can get to it is really important to us.' So, yes, I agree with you.

Ms GRIERSON—Dr Binks, I have to put this on the record. About three years ago, Professor John O'Connor from Newcastle University's physics department rang me and asked me what I knew about nanotechnology. I said, 'Nothing.' He said, 'We want you to come out,' so I got a short course in nanotechnology with equipment and presentations et cetera. There are always key people to influence. Members of parliament are some of those key people. There is certainly a role for educating not just the manufacturers and business people but also parliamentarians. That helps too, because we do not get much time for that, yet it is groundbreaking work with the most amazing potential that I have ever seen.

Dr Binks—I want to try and show nanotechnology, but it is always hard. One of the simplest demonstrations concerns a normal paving brick. A normal paving brick absorbs water. That means that within two or three months it will grow mould and do a whole lot of other different things. If the brick is part of a hospital facility, it will be a source of infection. There is a nanostructured coating that is essentially just a couple of molecules thick. That dramatically changes the way that the brick reacts to a fluid. That is a dinky little example. While it probably does not change the economics of the paving brick, it means that garden furniture, pools and all those kinds of things now have a different kind of concept.

Ms BIRD—Aren't you getting rid of the inbuilt obsolescence that makes us replace all our furniture and everything else every three to five years?

Ms GRIERSON—You will be on someone's hit list soon, Dr Binks.

Dr Binks—It may mean that a surgeon's gown can never hold blood and it may mean that bandages do not become sources of infection going forward. It may mean that corrosion can be eliminated from certain kinds of structures or at least deferred for a period of time. That is not worth an awful lot of money. It is not like curing cancer, but a manufacturer can do some very different things with that.

Ms GRIERSON—A Central Coast manufacturer was working with Newcastle University's physics department on the drip system for hospital patients. He was redesigning the drip system so that it is almost attached to the patient rather than being something that is carried around. There are amazing possibilities.

Dr Binks—If you look at cancer, you note that you cannot detect cancer in the human body until there are more than a million cancerous cells in it. Otherwise, you cannot see it. We are trying to push that down, to about 10,000 cells and below, by having nanoparticles that can seek

out cancerous cells and then fluoresce or be seen very differently under certain kinds of imaging, which is the endgame.

Ms BIRD—In the old movies, wasn't it the little guy in the little—

Dr Binks—That is right

Ms GRIERSON—I have to say that if my professor of physics were here he would be talking about the need for people to go into medicine, science and physics.

Dr Binks—One of the things that I like about nanotechnology is it is actually cool for kids. When I talk to primary school kids, they say—

Ms GRIERSON—Generally they know more than us.

Dr Binks—Yes, they do. If we can encourage some primary school kids to say, 'Yeah, look, science isn't as daggy as I thought it was,' and that science is cool, that will actually build something bigger, even if they do not end up as nanotechnologists. We are seeing a lot of nanotechnology in movies, cartoon strips and things like that now.

Ms GRIERSON—The engineering and science challenge started at Newcastle University. I think it is now national. We have bowed out of being the driver of it. That program really is attracting great young people.

Dr Binks—Yes, there are wonderful ideas.

Ms BIRD—As feedback to you, I would also like to see industry do some more partnerships with secondary schools. I think we do not do too badly in inspiring primary school kids as to science. I have two sons who have just gone through the secondary system. We kill science in the secondary system through textbooks that are 20-years-old and labs that do not look anything like modern labs. One of my sons has gone back to be a science teacher. He hated science at school. It made no sense. If industry is looking for opportunities, I think that getting involved in the secondary system with young people is really important. We are losing them in maths and science.

Dr Binks—You are absolutely right.

CHAIR—Thanks very much for your evidence here today. It provides us with a lot of interest and focus. I would be very surprised if we did not see some reference to nanotechnology in our report. Thank you for coming, Dr Binks; we appreciate it.

Proceedings suspended from 11.10 am to 11.17 am

RAFF, Dr John William, Deputy Chairman, Starpharma Ltd, and Chairman, Healthfarm Foods Pty Ltd

CHAIR—Welcome, Dr Raff. In what capacity do you appear before the committee?

Dr Raff—I was the founding CEO of Starpharma. I am now the Deputy Chairman of Starpharma. I retired in July last year. Also, I am the Chairman of Healthfarm Foods and was formerly that of Nutrihealth, which is a business very much involved in innovation in the food industry and also the canola industry in Australia. I am also the Chairman of the BioMelbourne Network, which is the industry body in Victoria representing the pharmaceutical, food and agricultural industries.

CHAIR—You might be aware that although the committee does not require you to give evidence under oath it still has the same standing as proceedings before the parliament. We have not received a submission to the inquiry from you. Would you like to make an opening statement to the committee before we then proceed to questions?

Dr Raff—Yes, Chair. I can say something about all three hats that I am wearing. Starpharma is a listed Australian company. It is a medicinal chemistry company involved in nanosized structures called dendrimers. We are using those dendrimers for drug development. The diseases we are targeting at present are genital herpes and HIV—their prevention. Starpharma is 10-years-old. It was spun out of the Biomolecular Research Institute in Melbourne. The initial funding was put up by me and some friends. The business has been built up to 50 staff. We purchased a company in Michigan, in the United States, called DNT, a pioneer in nanotechnology in the United States. We are the first ones to take a defined nanostructure through the US regulatory system for pharmaceutical development, which is quite a feat. We are quite proud of that.

The products are in clinical trials. We have had a lot of support from the Australian Government through R & D Start programs, Commercial Ready and P3. We have had far more support from the US government through the NIH programs. The US government has probably contributed more than $US50 million to that program. We are leading in the world and we are the only group to take a compound of that type through development. We are also the first group to take a preventative product for genital herpes through the US development system. About 26 per cent of American women now have genital herpes, so it is a major issue.

I have also been involved in the canola industry. I established a canola seed company called Dovuro 20 years ago. We pioneered and grew a blackleg-resistant canola seed in association with the Australian canola industry, and sold that business to Nufarm last year. We had a major market share of the canola industry. So I have been very involved in all the issues affecting the canola industry and its growth in Australia.

I also established a company called Nutrihealth 10 years ago. That company initially focused on speciality canola, which is a heat-stable frying oil. There has been extensive publicity over the past week about healthy frying oil. We developed a world-first non-GM product in Australia

and it is now the number one product used by McDonalds, KFC et cetera. Once again, we sold that business last year.

CHAIR—What do you mean by the expression 'trans fatty'?

Dr Raff—The term is 'trans fatty acids'. It refers to a heat-stable oil that when cooked does not produce trans fatty acids. It is also low in saturates. Australia has extensive experience in the development and the manufacture of the product and the issues and problems associated with introducing an innovative product in the Australian and international markets.

We now have a sesame breeding program in Queensland involving mechanically harvested sesame. We produce tahini and are developing a range of providers of tahini spreads in Australia. We also are involved in export, particularly to China and India. We also have a seed company in India. I could share a range of experiences with the committee. We already have a manufacturing base in the Australian food industry, unlike the biotech industry generally.

Huge changes are occurring in the food industry, with the supermarkets sourcing home brands from overseas. All the second-tier brands are being removed from the Australian market. That is making the introduction of innovative products very difficult. The amount of money required to effectively market a product in Australia and to establish it as a top-tier brand is prohibitive. I am very keen and I have been talking to the major supermarket chains about what they intend with regard to establishing innovation sections for Australian products in their stores. That would enable products to become recognised in the marketplace. I have been involved in both innovation and development and I believe that the greatest limiting factor is at the market-pull end. There is far too much emphasis on research push in Australia with very little understanding of the processes involved in development, manufacturing, marketing and product positioning. Many of my thoughts on policy development are designed to address that balance between providing appropriate resources to assist companies in the growth process, which is necessary to have a viable commercial product—

CHAIR—What do you mean by that? Are you talking about government assistance or tax write-offs in terms of getting professional advice?

Dr Raff—All of the above. I can list a few of the issues. For example, there are no regulatory standards imposed on food products coming from China. Certificates can be bought for anything for a very small amount of money. However, Australian companies are subject to the full range of food industry standards. Therefore, the level playing field does not exist because imported products are not required to meet the same regulatory standards, although there may be changes—

Ms GRIERSON—Representations are made to me about oral products—bridging devices and so on—and no-one really knows what they are made from. However, because they are not something that is consumed and because they come from China, they are not subjected to any regulatory framework. They are things people put in their mouth—bridges, dentures and so on.

Dr Raff—We export the other way as well and we know the barriers that we have to go through in a lot of those countries in order to try and get our product in there. It is a completely different ball game. I remember that I lost the unlosable court case in India because the judge got

$50,000. So the support and backup for Australian companies going into foreign markets is a very important part of it as well.

Then, to answer your question, there are a whole lot of other issues. I have had a lot to do with government departments and there have been some really good things. Starpharma came from a public sector organisation. But we managed—I picked up on the Peter's comments and I fully agree with them—to create a them-and-us approach between industry and the public sector in Australia; much worse than it was 20 years ago. So there is far less collaboration going on now between organisations like CSIRO and the industry than there was in the past.

That happens for all sorts of reasons. One is the funding base for those organisations. A lot of money is going into them—which is fine; I fully support having a strong research base in the country and all the rest of it—but they were encouraged to see industry just as a source of funding and to get that top-up funding for their organisations. As a result of that a whole series of strange behaviours have developed. The buzz word of 'commercialisation' came into those organisations. I know that in the medical area there is not one example in Australia of a successful product being developed within a public research institution. This is after billions of dollars have been spent. It just cannot happen. It will not happen because the range of skills required to take a product through development are not the skills which are within public sector organisations. The whole discipline, regulatory standard approach and everything else required in drug development is such that everywhere else in the world has decided that companies are the best entity for doing that activity.

Ms GRIERSON—One of the approaches is for a university to set up a company. Wasn't it the bionic eye or something we saw? Was it in Queensland that we saw a lot of work on ocular procedures? That seems to be the alternative: they set up a private company themselves, sometimes with a joint venture partner rather than what is already happening out in the marketplace driving it.

Dr Raff—I am also an investor and I have probably about 20 start-up companies. I have got quite a lot of thoughts on venture capital and the funding associated with that, as well. There is an evolving period for a company. It starts off as a university-based company with some scientists being the key people within the company but there are very few examples where it has stayed that way. You really need to evolve into a company with a whole range of other, different commercial skills and development skills within the company itself. The more they are linked with the parent institution the less successful those companies are, historically. So there is a really important role for universities and CSIRO in feeding the technology into companies. But getting rid of the notion that they can do the commercialisation and development themselves—

Mr KEENAN—It just surprises me. As you say, at the University of Melbourne some clever scientists have come up with a particular technology. They have a business school there and it is amazing that they cannot manage to properly commercialise something. They must have people who have that sort of expertise somewhere else on campus, even if it is not within that particular faculty.

Ms BIRD—But they are not paid to do that.

Mr KEENAN—No; but there is a commercial return for doing so. They might not be directly paid by the government to do it but if it is a commercial technology surely they can get a return for that. I am just curious as to why that would be the case.

Dr Raff—It is not unique to Australia; it is worldwide. We have spent a lot of time in the United States and it is exactly the same there, but they have woken up to that. I really like the NIH model—because we get a lot of funding out of them, for one thing. The NIH is the biggest medical research organisation in the world. They recognise the role of companies and respect that role right from day 1. When an institution in the United States says, 'I'm in a hepatitis institution in the United States and we want funding from the government for hepatitis,' the NIH insists that they establish development facilities within their institute which meet the regulatory requirements for the FDA drug development process, animal testing and other pre-clinical aspects, even if they are running clinical trial components. They are actually funded by the government to set up a facility which meets the regulatory standards, so you can use the results in a dossier for drug development.

There are two ways to get access to that government funded resource. One is to pay full price for it. The big pharmaceutical companies will go in there. They know that that is a top-class facility doing regulatory standard work. You can pay full price or you can get what they call an 'ARB number', which is basically the government saying, 'We think this particular company is strategically important therefore we'll give them free funding access to that resource'. We have used those ARB numbers in the United States institutions extensively. Starpharma have got well over $20 million-worth of funding out of that process. There is absolutely no institution in Australia, which is conducting animal tests in any disease area, that would be suitable for an FDA dossier. And that is just crazy.

Ms BIRD—I was talking to one of the oncology specialists who work with the University of Wollongong, and they are fund raising to build a mouse house because testing on mice is the first stage and they cannot get funding. They have to fundraise out in the community to build a mouse house to do that level of testing to get it to that point.

CHAIR—Could I get you to drill down as this is a committee that is meant to be proactive and not just listen to what is happening? It is very interesting to hear a range of areas in which you are involved, and it is useful, but could you drill down in terms of where you think the government is operative—and you have thrown a number of things out there—in terms of commercialisation? That is the first part which you think is failing. Obviously, we take your comments on board about the lack of commercialisation in a number of the research areas. What do you think the government should be doing to assist in that process?

Dr Raff—I will attack it from two areas: one is the company area and the other is the public institution area. I think we have to take on this whole issue of why we have a huge gap between the companies and the institutions at present. To tell you the truth, I think the biggest thing is to make institutions accountable for their behaviour, which they are not at present—processes of showing that they are actually assisting companies rather than competing with them. It is not about more buildings, more animal houses, or more money; it is the way in which they are responsible and accountable for the resources that they have at present. That does not mean taking money from the universities and basic research activities; it is just doing everything we can to encourage the linkage between that capability and the companies themselves. So it is

more to do with a policy statement, 'You'll get your funding next year if you can demonstrate that you're relevant to product development and the innovation process, and you are working with companies—preferably Australian companies.'

The organisation I have had the most trouble with is the CSIRO. You will hear the same thing all over. It was because of the lack of accountability. They were given a mission to go out there and raise money and do their own commercialisation. As a result, they completely alienated, competed with and did all sorts of things to companies. So the major competition for companies in Australia was with the CSIRO in a number of different areas. And they destroyed a number of companies. So from a government policy point of view, it is saying, 'That's not acceptable; your role is to assist companies.'

Ms BIRD—Why would we say that it is not acceptable for CSIRO to generate economic activity through competition? I am not saying that you are wrong; I am just asking you to explain to us why it would be wrong for CSIRO to be competing if they are successfully generating economic activity.

Dr Raff—I do not think they are. I know there is a heck of a resource and a heck of a capability in the cotton seed industry, which they promote extensively—I must remember that I am being recorded at the moment—but the notion of CSIRO, which is funded by the taxpayer, going out and becoming a commercial entity in its own right beside companies that are completely self-funded, is a problem. We really have to hone in on the notion of what commercialisation is and who operates commercially and say that commercialisation is for company structures and not for publicly-funded institutions; therefore, the role of the public institution is to assist companies in that process. From a policy point of view, it is having that philosophy over all policies.

Ms BIRD—I understand what you are saying, but behind that is a philosophical view rather than a hard-delivery view. For example, in the education sector, yesterday we had the private education providers complaining about public education providers. But public education providers are very good at generating economic activity through education products. I want you to explain the model of the private sector only, without there being competition from the public sector. What outcome makes that the better model?

Dr Raff—I think education is a very special situation. The infrastructure of education is within public sector organisations et cetera. Perhaps you are going to allow a little bit of private industry into that—

Ms BIRD—It is significant.

Dr Raff—but most of the resource there is within the public sector. I just go back to the point that it is hard fact that I have not seen anything associated with a manufacturing based product, a food based product or products from those other industries, which are very big industries, where there has been successful commercialisation through a public research institution—and that includes CSIRO with some of its different areas of operation.

CHAIR—I was just having a side conversation with my colleague. I understand that CSIRO is more of a research organisation—with PhDs in science, engineering, biotechnology et cetera.

In terms of marketing applications, I can understand that taking a product to market will sometimes require a completely different skill set. But, if you are just selling a patent offshore—

Dr Raff—That is different. That is not commercialisation; that is getting rid of your IP early. That is of very minimal value. Certainly, if they want to do that, we are not objecting to it—although it is a pity if they cannot do it locally—but that is a very different situation.

CHAIR—We saw CSIRO in Newcastle, but it might be worthwhile if we spoke to them again.

Secretary—We have them coming next week.

CHAIR—That is very interesting. It will provide a useful background to that. I was also interested in the assistance that is given when you take a product offshore. What is the problem with Austrade? I would have thought it would be natural for them to assist you. You talked about your Indian experience. Obviously, they cannot help you with a court case, but why can't they help you as you try to access commercial markets offshore?

Dr Raff—Export development grants et cetera are all very good for companies and there is a lot of assistance. It is not an area I am particularly critical of. In fact, I think a huge amount of money is being spent. How efficiently it is being spent is a different story.

CHAIR—That is another question.

Dr Raff—In the past there were cocktail-circuit type things and there was far more comfort with larger companies rather than with smaller companies. A lot of major government organisations are far more comfortable dealing with a multinational-sized company than with a small company that might go bust. So there is a philosophical thing there again. I would like to see far more, I suppose, nurturing and love for the smaller structures, which are the innovators coming through, than for the larger, established organisations. I am just trying to think of an example.

The monola story is probably the best example of the competition issue, which I would really like to get to the bottom of. We developed that and it was completely privately funded. We funded it. I had the house on it and everything else, back in the early days. It looked really promising. Then some people in the US started to do the same thing in the United States. It was a healthy frying oil. There is some really good evidence coming through that the No. 1 issue in health in the community is smoking, the No. 2 issue is quality of fat intake, the No. 3 issue is car accidents. And you go can down the track from there; all the diseases are way below it. So there is nothing much more important than this, and that is why it is getting all the publicity now.

But, if I look back at the history of that project, one of the things that happened to me about six or seven years ago, was that I was invited to a meeting by the state department of agriculture to tell them about monola and what we were doing. They had tested the product and they thought, 'Gee, this is pretty interesting and pretty good.' So I went along. There were about 30 people in the room and they questioned me for three hours on monola: what we were doing with the product and how we were going to develop it. That was fine, but two days later they went out and signed a contract with Cargill, the multinational, to set up a competing program. And CSIRO

has done that dozens of times to people. So the distrust which develops in that process is the problem. There is this whole idea of understanding that innovation comes from smaller companies—and I will hone that all the way; it does.

Ms BIRD—That is a good example.

Dr Raff—Worldwide, larger organisations are not the innovators. The whole biotech industry internationally is founded on that principle.

CHAIR—Along a similar line, I chaired the inquiry into the retail sector a few years ago. We talked about the dominance of Coles and Woolworths at that stage, and it still is the reality of it. When you have all-powerful buying groups that do not want to innovate, to what extent do you think that holds back commercialisation of some products? I just had six weeks in the States and looked at the penetration of the organic food chains, which have become huge. I just wonder to what extent the way in which the Australian market is structured might impede the development of some new innovative products.

Dr Raff—Hugely, and I raised that issue earlier. Once again I go back to monola. We tried to release it in Australia as a retail product. At that stage we were a company of seven people. We subcontracted out and we had a breeding program. We put it on the supermarket shelves and the supermarkets were cooperative in the sense that they thought it was interesting and different. Then one of the multinational competitors hired a team of 12 people to push our bottles to the back of the shelf. The supermarkets will say that we needed a budget of $5 million to effectively promote that brand. In the food industry the money you spend on advertising is absolutely critical to get consumers to accept the product.

So after a two-year effort the product was removed from the shelf. We could not make inroads, yet I believe that is the most innovative product in the Australian food industry by a long margin. Now the importance of the product is coming through. In the process of doing that we found that the moment you have a product, all the government people move away from you. They say, 'It is a commercial issue now; we can't touch you. There are no programs,' and all the rest of it. But innovation has to be taken into the marketplace. It does not stop at the research place.

CHAIR—Let us stop you there and ask: what would you expect a government to do?

Dr Raff—I started the process of trying to run a clinical trial to demonstrate how important these things were to the community, as a demonstration of the health aspect of such a product. In the monola situation it was all about having credible organisations with a credible voice to say, 'This is something which is really beneficial to the community.' In the fats area at that stage there were so many claims being made by all sorts of people which were absolute rubbish in terms of the really critical health issues associated with products. And CSIRO was not a voice that you could go to and say, 'Look, this is an important product.' The health department was not a voice to go and say, 'Look, fats is a major issue and this is a very important product.'

So it is about having credible people to endorse the product. It does not mean endorsing the brand but the product type. It is an opportunity missed. We did very well financially out of it—we sold it for a lot of money—but there was still an opportunity missed six years ago because we

could not get a partnership between government and a company in Australia at that particular stage to do innovative things.

CHAIR—I still do not want to let you off the hook in terms of what you think the government should have done. It is difficult for government ministers to be endorsing private products. We have had one of our parliamentary secretaries, in the last week, talking about transfats.

Mr KEENAN—It was the assistant minister.

CHAIR—Yes, the assistant minister—I am sorry. I can see that for the generic grouping of products you would want that, but whichever government was in power it would have difficulties coming out and endorsing a particular product. I am sympathetic to the need to try to get innovative products into the marketplace, especially given what our brief is, but I am just looking at it in realistic terms.

Dr Raff—As a practical example, I am talking at present to Woolworths at the board level. I have raised the same issue within that company. They are growing very rapidly in the imported food product sector. They are making a lot of money out of bringing in products from China, India and the like.

Ms GRIERSON—I actually think that government policy should be around getting people into supply chains and assisting them in that way, because getting into a global supply chain is vital. That should be an aspect of trade agreements as well. If you have a good product, it will be very hard for you to get it up in Australia at a commercial level when there are competing products, as you said earlier, that can come from all over the world much more cheaply. Can you perhaps suggest to us ways that we can help companies to get into global supply chains, whether it is through our free trade agreements or whatever? It seems to me that that is one of the barriers out there for businesses like yours. I am sorry; I should not have interrupted. Tell us how your discussions with Woolworths are going.

Dr Raff—I agree. They have a problem because they are going to have a whole lot of adverse publicity. They just have to have one safety standard issue coming through—

CHAIR—Is that Woolworths and Coles?

Dr Raff—Yes, Woolworths and Coles and anyone else who is doing mass imports of products from a country where there is no real regulatory process.

CHAIR—If you want to bring it into the country—

Dr Raff—They have the paperwork, but the rest of it is very different.

CHAIR—I chair the trade committee and our committee has just had a briefing on what AQIS does. It is pretty thorough. I would be interested if you have evidence to present to us about where you believe it is slack, because I would have thought that we are almost into the overregulation area. I listened to their story. You might see it differently.

Dr Raff—It is totally different. We have the highest regulatory standards in Australia, by a big margin—much higher than the United States—in the food industry. Our factory is inspected once every fortnight. There is no doubt whatsoever that Australia has a very high regulatory standard. It is not up to me to give evidence on it and I certainly do not want to get into the political side of it, but if you go to India, China, the Middle East and any of those countries where we are sourcing a large amount of product—

CHAIR—When they come into Australia they have to go through AQIS. It is a tough regime that they have to go through.

Dr Raff—It is absolutely minimal.

Ms GRIERSON—Do you mean GM and things like that? That is tough.

Dr Raff—It is much tougher to get a product into China than it is to get it into Australia.

Mr KEENAN—In fairness, I think there is no evidence to suggest that things that have been imported into Australia have had any systematic problems.

CHAIR—There has been some question about prawns from Thailand and other places.

Ms GRIERSON—There have been some recalls just recently too.

CHAIR—That is one area that has been—

Dr Raff—In the tahini area, which we are involved in directly—

CHAIR—In which area?

Dr Raff—Tahini is a sesame paste which we manufacture. The reason why we got into the New Zealand market in a big way was because of a whole lot of contamination problems with the tahini coming in. There is no quality control. The only part of the McDonald's bun which does not have quality control is the sesame component. Currently, they are harvested and dried on the side of the road and then pooled and exported. Part of our business is to get mechanically-harvested, Australian-grown product coming in. In the tahini area there are regular problems with the contamination of product coming from those places.

CHAIR—Are you are arguing for a tougher import regime?

Dr Raff—I was involved in an inquiry into the contamination of horticultural products at the Victoria Market about 20 or 30 years ago. If you look for the problem and you have an idea where the problem is coming from, you will find a contamination problem every time. We had up to 10,000 times higher than the legal limit on a whole range of products. If you go into the market basket survey process you will very rarely find a problem. So it is matter of the approach that you have, whether you are really serious about trying to identify the problem that exists.

In the horticultural industry in Australia, 30 per cent of the people who grow horticultural products cannot read English and yet they put 20 sprays a year on their crop. The political

sensitivity is about going in there and saying, 'We insist that the same quality standards are used in the growing of crops as in a factory environment.' Politically, it is a very difficult position. But that is the reality and there is still major contamination issues going on. Broccoli has a huge problem; strawberries have a massive problem. If you target the particular area where you know there is a problem, you will find a problem.

If you go into China and identify all of the different food products coming out from a range of different areas and go into the factories and deal with them, and you see the conditions that they are coming out of, it is a very different situation. It is not a level playing field as far as standards. In Australia we can differentiate our products by being seen to be secure in our product development. That has two elements: one, we have to clean up our act in the areas where we have a problem in Australia—quality systems are a big driver in the food industry in market differentiation—and, two, we have to be serious about insisting that the same standards are on our imported product and, if they are not the same standards, give them a hard time. I do not know what these organisations are saying, but if you talk to anyone in the food industry you will get the same answer you got from me about there being a very variable standard.

CHAIR—It has been very interesting and certainly challenges us to think of a number of issues in your sector of the market and what needs to be done, so we appreciate that input.

Dr Raff—I have one final comment about VC. Ninety per cent of all financing of smaller innovation companies comes from private placement financing. It does not come from the organised VC industry, so tax policy and other policies within government, anything to make it more attractive for individuals through the private placement network—and there is a huge amount of money going into do-it-yourself super funds at present, so there is a wash of cash out there. So anything to encourage that funding to be available for innovative small companies, on a direct personal basis rather than as a multinational VC company basis, would be very attractive. That is a very important area. There is a lot of money out there.

CHAIR—Thank you very much. Thank you for coming today; thank you for your input. We will send you a copy of the transcript within a week. If you have further issues, send your input to our secretariat. Thank you for coming.

Proceedings suspended from 11.54 am to 1.08 pm

HANSEN, Ms Effie, Market Analyst, NEC Australia Pty Ltd

McMANUS, Mr Brendan John, Senior Executive Corporate Planning, NEC Australia Pty Ltd

CHAIR—I now welcome representatives from NEC Australia to today's manufacturing hearing. I am sure you are aware that although the committee does not require you to give evidence under oath, these hearings have the same standing as proceedings before the parliament. The committee has not received from you a submission to this inquiry. I see that you have a submission now.

Resolved (on motion by **Mr Baird**, seconded by **Ms Bird**):

That this committee accepts the submission from NEC.

Mr McManus—Apologies for reading from my business card to find out what title I have.

CHAIR—I do the same myself.

Mr McManus—I retired some years ago from NEC but I have been brought back in a part-time capacity and advise on a range of issues. Strategic planning was one of my particular interests when I was at NEC and it was relevant to many of the matters which I am going to talk about today: NEC's move from being a manufacturer working with its hands to assemble products, into a company which is focusing on research and development as its broad activity.

We have provided you with a PowerPoint presentation. I will not go through that in detail. I will leave it for you to look at. But I would like to draw out a few points to start with. NEC Australia was a company of some $583,000 million last year. Business this year will be down to $560 million approximately. Our research and development activity, though, will grow from some $43 million to $47 million, and exports will be of the order of $65 million during the current financial year.

In looking at those turnover figures—for research and development and export—I want to contrast NEC Australia with our parent company, NEC Corporation of Japan. We are one per cent of their business. I think it is a credit to everybody at NEC Australia that we have been able—only having one per cent of the business—to attract the attention of our board in Japan and to become one of five global centres for research and development in NEC's empire.

I would like to go into just how we have achieved that research and development and export business, and I refer you to the second last overhead—a graph—in the presentation material. The research and development activity since 1990 is shown in blue and the export business is shown in orange. Looking firstly at the research and development activity, you will note that approximately half of that is locally funded and half is contracted from Japan. Normally speaking, we do not seem to rate very well in the *Business Review Weekly* tables of companies doing the largest amount of research and development in this country, and it is because they do not account for the fact that we are doing $20-odd million research and development work which

is fully funded from Japan. All up, we are doing about $47 million this year and we are employing some 400 engineers in that research and development program.

Ms GRIERSON—Is that locally or internationally?

Mr McManus—That is in Australia—400 here in Melbourne—and 10 per cent of those engineers are qualified as either masters or PhDs. We are focusing on improving that percentage all the time to ensure that the research and development work remains at the forefront of the worldwide technology required for the products that we want to design. You might ask how this happened. It all started back in 1990 when the then minister for industry, Senator John Button, travelled to Japan and asked our president to sign up for the then Partnership for Development program. We were one of the first Japanese companies to do so, and we committed to doing no less than seven per cent of our sales as research and development work and not less than half of the imports as exports. You can see from the graph that we did in fact achieve that over the first seven years of the program. But following the end of the program, we did not drop off the R&D; there have been some ups and downs but, broadly speaking, we have achieved an ongoing increase in the research and development program. We were able to do that because we focused on complete projects. We did not do subcontract work from our parent's large project areas, such that when the Partnership for Development program ceased the small projects would have simply been taken back to Japan. I believe that happened with many of our competitors.

We focused on the DSL product, which of course is part of the internet-broadband revolution, and mobile phones. With broadband, one of the great success stories, we succeeded over the 10 years in the business in selling some 4.7 million lines of DSL on the worldwide market to Hong Kong, where we sell a TV variant. They want television over the internet-broadband DSL. PCCW, a subsidiary of Telstra, purchases that product and uses that product in competition with a cable TV operator. This product has been available for quite some years. We have also been selling the product in Turkey, Singapore, Thailand, Malaysia, Russia and Hungary, and we have sold over 1.7 million lines to Telstra, though we are no longer the contractor to Telstra.

We are of course continuing with the business—and I was told this morning that over the last three months we have put six tenders out and are awaiting the results—but we are moving the business away from the DSL copper product into DSL-plus, the fibre optic product. We are doing that with the assistance of the NEC Corporation, which is getting us to design some of the product for its worldwide market.

Ms GRIERSON—Was the spike in exports in 2004 linked to some new product or new market?

Mr McManus—That was an AusAID-EFIC funded project where we exported some fibre equipment to China. It was a once-off. It was a major project at that time.

Ms GRIERSON—Thank you.

Mr McManus—With the mobile design group, we have focused again on being at the forefront of technology. We noticed that in Japan there was a significant shortage of what were known as digital signal processing engineers. We worked with the Japanese parent to ensure that they were part of the standards fora that there are around the world in engineering and

telecommunications these days. If you are not part of the standards body that gets your product included in the international standard, it is virtually impossible to sell it. You must be part of that international standard so that, by owning your own IP and freely making it available to the group that are part of that international standard, you exchange your intellectual property and in that way you do not pay the royalties; you have access to the market royalty free. It is essential that we remain part of those standards fora and we work from Australia to keep our Japanese parent up to date with what is going on in those international fora.

How do we continue to remain in business? We remain at the forefront of the design technology but, most importantly, we focus on what is wanted in the market. We ensure that what is being designed can be commercialised. We have strong project management and we work on time, to budget and ensure that the product is fully tested. We have staff who are multilingual and the projects have fortuitously been frontline projects, meaning our engineers are very keen to have those products on their CVs. They are very involved with them and they do a lot of international travel associated with implementing the projects in various countries.

You might be interested to consider the broadband product from the point of view of the percentage of the value of R&D within the total business. Over the last 10 years we had a total revenue of some $617 million from the DSL sales. Over that time we spent $170 million on research and development, essentially cutting costs, adding functionality and making it more receptive to the various customers with the various facilities it had. You would understand that research and development is quite expensive and relatively high risk, but we have been successful in that we have ensured that the products we worked on were commercialised in the market.

What about the future? Everything, as I keep saying, depends upon commercialisation. You will have noted perhaps that there are many amalgamations going on in the ICT industry worldwide: Siemens amalgamated with Nokia, Ericsson took over Marconi, and Lucent and Alcatel have recently joined together. The same is occurring in the research and development areas, where NEC, for example, is joining with Texas Instruments and Panasonic to effectively cut the total cost of research and development and develop the more complex products on a more efficient basis.

For NEC Australia, our best linkage is with our parent. Our parent tells us what is going on in the market and the products required, but we are also keen to establish linkages with the various research institutes here in Australia. There are not many companies that we can work with because there are not many others in the ICT sphere. There are one or two that we are working with but, by and large, we are looking to the CSIRO, National ICT Australia and the universities for joint research and development activities. I am pleased to say that all are becoming more receptive to the need for increased work in the applied research field. Most of the universities focus on pure research activities, as that is their mission in life, but we would prefer that they worked more in what we call applied research where they would apply their research activities to a solution for a particular product that has been selected from a market and where we believe that we can commercialise the product. So we have spoken with CSIRO. We do not have any agreements with them at the moment although they are one of the largest wireless R&D centres in Australia. The current head, Mr J Gower is a former associate of NEC in doing research work, and we are hopeful of striking some joint research activities with them.

From speaking to the CEO of National ICT Australia, Dr David Skellern, I know that his work is at the moment focusing more on the selling of intellectual property and the development of smaller, newer companies, not so much on working with companies such as ours, although in discussions with him he has acknowledged that that will be one of the directions that National ICT Australia will take up in the future. So we have not reached any agreements and we are not doing any joint research work there.

We have visited quite a number of the universities. It has taken me some three or four years to get a relationship going with the University of Melbourne. I started off by sponsoring the final year engineering students' prize night. We have given them a lot of information on what sorts of PhD projects they might put their students on. We have been inviting the lecturers and students to work with us on six-month sabbaticals. I am pleased to say that, working with Professor Rob Evans, of the National ICT Victoria node, and Professor Rod Tucker, of the Centre for Ultra-Broadband Information Networks, we have recently achieved an ARC linkage grant of some $300,000 over three years. That is a relatively small amount, but it is important in that it is a project which will involve extending the range of fibre optics into the rural involvement and it will involve NEC Australia engineers working with lecturers and PhD students at Melbourne university.

The project started off with two or three PhDs, but National ICT want to join in now with their laboratory facilities. NEC Corporation is quite interested and is thinking of perhaps joining in addition to any NEC Australia input, and our research node at Princeton University will possibly assign an additional person. So the project is growing but it is early days. We have not signed the agreement yet; we have not agreed on royalties. But I am hopeful this will be the first of many projects where NEC, in its need to work with other organisations successfully, begins to work with Melbourne university and, in particular, focuses on applied research activities which are appropriate to a product which can be commercialised.

Ms BIRD—Is this the first partnership with the university that NEC has undertaken?

Mr McManus—It is.

Ms BIRD—From a government perspective, is there any feedback you can give us at this point about what may have been policy hindrances or things we can look at to make sure that sort of process is able to happen more regularly?

Mr McManus—It is early days in my study of the situation. Quite clearly, the universities are focused on teaching. We accept that and we would not want that to change. We are very pleased with the quality and quantity of engineers we are getting, and the PhD graduates as well. From the point of view of the work that the ARC grants are focusing on, it is a broad judgement of mine that that is focusing quite clearly on pure research activities. There are some applied research projects, and the linkage program is certainly working with the applied research, but I want to see more of the government funding applied to what I would call the applied research area. With regard to the economic benefit that is derived from the several billion dollars that is applied to government research in Australia, I would guess that less than 10 per cent of that ever turns up as a commercial outcome. If we were to look at applied research—

CHAIR—You are talking about funding to government institutions as opposed to R&D assistance to companies?

Mr McManus—Yes. Looking at the applied research, I think that the particular advantage we have, and the reason I would claim that we are getting better results, is that at NEC, as I say, we focus on a commercial outcome. It is the first thing we do; we do not look back at any pure research, try and design something and hope it will be sold in the market. NEC Corporation, our head office, would never allow us to work in the pure research field. They work in the pure research field, but we do not. We must work only in applied research and very much on the development end of it, so that we are quite clear in ensuring ourselves that we will get a commercial outcome. I must say we do not always achieve that. In my time on the board at NEC we wrote off a considerable amount of money on products that were far too slow for the internet. We were just too slow in getting them to the market. It is not a perfect recipe, but my recommendation is that the government look at refocusing what some of the universities, CSIRO and NICTA are doing, to ensure that there are outcomes which originate from the commercial end of the market, not from the pure end of the market.

CHAIR—I think it is important that we focus on that. Can you give us a further definition of projects that are developing from the commercial end of the market? Obviously you have got the university stream and the CSIRO and others producing the research; how are you differentiating where the research comes from? Do you mean the idea comes from the commercial area and you find a solution and work through it?

Mr McManus—Yes. At the applied research end, the idea comes from a clear market requirement. The hardest part of any business is doing the marketing to determine what is wanted. But when our marketers say to us, 'The future is the internet, the future is mobile phones, the future is bringing the two of those together,' we then say to ourselves: 'What are the products that must fit that? What have we got to develop from there? What will be the applied research we need to solve the problems to produce those products, get their costs down, get them increased functionality and get them onto the market?'

CHAIR—So you are saying that too much is pure research without looking at the commercial aspects of it?

Mr McManus—Yes. I do not decry any of the work—I see it as valuable—but I question the efficiency of it for a country like Australia, which has one per cent of the world's action in this area. I am not saying nothing comes of the pure research; I am saying a relatively low percentage result would come from the billion to several billion dollars across all industry sectors that is—

Ms BIRD—In your particular field I think you are saying we are just never going to compete on an international basis on the pure research stuff and we would be better with a strategic focus on applied research in the ICT area. Do you think it would be worthwhile for the government to look at the fields in which we excel in pure research and focus on those and look at the areas in which do we not compete in pure research and focus instead on applied? Some of the breakthrough medical stuff has come not out of applied research but out of blue-sky type stuff. My feeling is that it would depend on the industry.

Mr McManus—Yes. It would undoubtedly depend on the industry. I certainly hear what you are saying about the medical industry, but I have tried to sit down and put numbers around it and I still find, from the total amount of money in for the total money out, the percentage out is quite small. What I am saying is: if it is focused on the applied end, the efficiency of the result is far higher. Certainly in the case of NEC it is.

CHAIR—How do you ensure, with bodies such as CSIRO, that you start with the applied end? Is it the board composition or is it interaction with industry? What is the problem?

Mr McManus—I am actually on the board of the Centre for Ultra-Broadband Information Networks at Melbourne university. I am one of the industry representatives on the board. My role is to inform them as to what I think the market wants. I keep emphasising that that is where it all starts from. I am able to indicate to them what we perceive the market wants.

CHAIR—In some cases, of course, the market might not be aware of what it wants until it sees the product developed.

Mr McManus—True.

Ms Hansen—In terms of emerging technology, look at 3G or 2G in mobiles, for example. We have gone from 2G to 2½G and we are now doing 3G, and there are different applications and functionalities that are involved with that. But the market and technology does not stop there. So a lot of our people are now moving into 4G, something that is not in the market but will be in the market because technology is moving at that rate.

CHAIR—If you go back to the development of the Internet, obviously that did not relate to—

Ms BIRD—Market demand.

CHAIR—market demand: please give us the Internet! But I am sure that is very much the minority; what you say is absolutely right.

Ms BIRD—I am grappling with what you say about pure research not necessarily having efficiency outcomes. It depends what it is we decide we want from pure research. Do we just want commercial value? The other side of it is—and I am talking about Wollongong academics at my university—that the freedom to simply explore and not be driven by a commercial imperative is often for pure researchers who choose to take the low wages that are offered at universities rather than in research and development. That is what they value, and to some extent I think we could lose that if we turn them completely to a focus on applied research. I think what you are saying has is very interesting; the word of warning is that we have to be a bit careful about that, because you spend a lot directly on research and development and maybe that is to some extent where that should occur. Why in universities and public institutions would we not just leave it to the research and development sections of companies?

Mr McManus—One of the things that we want to get from Melbourne university is an ability to up-skill, based upon their knowledge of what is the latest possible thing in whatever designs or whatever software.

Ms BIRD—That makes a lot of sense.

Mr McManus—We see value in that and to some extent we have them work on some of the less risky activities for us.

Ms GRIERSON—And less commercially sensitive areas? Do you have any problem in working with public institutions because of commercial sensitivities?

Mr McManus—No. I am not quite sure what the question is but certainly in terms of confidentiality, or secrecy about what we are doing, no. We are normally able to accommodate their requirements to publish papers on what they have done. Obviously we tie up the Internet intellectual property. We jointly own it. That is our approach. We would have first right of use and we would obviously restrict it to our exclusive use once we began to use it.

Ms BIRD—I have just one last question on the personnel theme, which is what I am particularly interested in. I think you said that 10 per cent of your engineers at the moment are at PhD level. Do you have a program within the company to support your existing staff to do further training and so forth?

Mr McManus—Yes. We have an extensive program. First of all when we get a basic engineer from a university we probably keep him attached to an experienced senior engineer for about two years. In that time he would generally learn the basics of project management, keep up with what he is doing, and get up-skilled in the specific areas we want him to work in. There are continuous training programs for that person and, as is the case of this project with Melbourne university, one of the persons we will assign to the project is a person wanting to complete a PhD. So yes, we would support them in that.

Ms BIRD—How do you support them? Is it a time off type of thing? Do you pay their fees?

Mr McManus—We pay them fully while they are doing it.

Ms BIRD—It is interesting because a number of companies we have had before this committee talk about the shortage of engineers and the skill shortage issue. There does not seem to be a lot of reinvestment. Government can do the entry-level stuff. We can look after that, but for a mature-age person to take on a PhD the extra costs or whatever are sometimes quite prohibitive. So it is good to hear that you have that commitment to that.

Mr McManus—By and large we do not have a problem getting and keeping them. As I said, we are working on frontline products and the engineers are very keen to put on their CVs that they worked on that product on a worldwide basis.

Mr KEENAN—Given the map provided, yours is a global organisation with various arms. How do you find the operating environment in Australia? Why did NEC choose to establish one of its research hubs here? Was it as a result of an Australian Government policy? What advantages does the company see?

Mr McManus—Is that purely as a research and development activity, or are you referring to the environment? In what context are you using the word ‘environment’?

Mr KEENAN—In any way you like. For example, with regard to regulation, how does NEC find operating in Australia as opposed to operating in other parts of the world from all the aspects that make a successful company?

Mr McManus—To answer the question about why we have an R&D global centre here, it is important—

Mr KEENAN—It is a two-part question. How do you find operating in Australia compared to other places, and why did you choose to base that facility in Australia?

CHAIR—Part three of the question relates to what we should be doing to ensure that it continues.

Ms Hansen—Parts one and two of the question can be answered by saying that it is important to note that from an NEC perspective there are global R&D centres around the world: Japan, the United States and America—

CHAIR—The United States and America?

Ms Hansen—Sorry, Japan, the United States, Germany, China and Australia.

CHAIR—Why were they chosen?

Ms Hansen—Australia was chosen because we have the expertise to develop the products which the market deems it requires, which we can commercialise and for which there is potential. In our case, that is broadband DSL and mobiles. If we did not have the expertise, we could not do the R&D. So we stand alone in that sense. From a cost perspective, we are fairly competitive. Therefore, cost-wise with the R&D we stand pretty well—although China is obviously knocking on the door. We hold our own there and that is very important.

What Brendan said is also relevant; that is, we are self-sufficient in the sense that the R&D money we spend is covered by the sales that we achieve. So, if we are self-sufficient, if we have the expertise and if we are making a profit, we then plough that profit back into our DSL and mobile areas. If we are doing it at a reasonable cost then Japan says, 'You are okay.' The minute any of those elements of the equation is severely out of balance, we must answer to Japan, because, as Brendan said, we are 1 per cent. So, we hold our own because we answer questions one and two.

CHAIR—And question three?

Mr McManus—One thing I will mention briefly is that our business plans—which we submit to the board—do not include any allowance for the R&D tax concession. We do not include it because we are not confident that the Government will retain it at any particular time. It has been varied significantly over the time that we have been involved in R&D and exports. We would want a commitment covering 10 years during which its conditions would not be decreased or touched if we were to include it in our board financial documents. At the moment, it is an after-the-act collection by the accountants and it goes into general revenue. Essentially, it does not affect the R&D activity.

CHAIR—So, the big problem is lack of certainty.

Mr McManus—Yes.

Ms BIRD—In 10-year terms?

Mr KEENAN—Putting that aside, NEC still finds it valuable to do the R&D in Australia. So that does not affect your business case, as such.

Mr McManus—When I talk to the Japanese, one of the things I say would be, 'What is industry policy? What sorts of things are the government saying to help you out?' You are grasping for things to say and that is one of the things that you do say.

Mr KEENAN—Is there an example elsewhere in the world where they do have a good industry policy?

Mr McManus—I cannot answer that question, I am not an expert on NEC's R&D.

Mr KEENAN—I am just curious. What we are looking at is the sort of policy settings that the federal government could have to encourage the sorts of things that you guys are doing. Obviously, a good way of looking at that is what has been successful in other parts of the world. I thought with a global company that it would be interesting to know where you find it easiest and best to do business.

Mr McManus—I am not an expert. I have just had our president and chairman in Australia and they are encouraging us very strongly to pursue our linkages with Melbourne university. In fact, I took the chairman to Melbourne university and he was very impressed with the activity and said, 'If this works out, there will be more.'

CHAIR—Can I go back to the decision to set up the research centre in the first place which John Button from the other side of politics was involved in. How did that program work? Obviously, it must have been pretty attractive for them to set up the research activities.

Mr McManus—I have to say it was not attractive, no.

CHAIR—Okay.

Mr McManus—It was more or less a stick, more or less do the necessary conditions or you do not get government business. That was the broad context which was put over. That was back in those days. It essentially got us over the 'not invented here' syndrome. The Japanese could not believe that we were capable of doing anything well, in quality, as they were doing.

CHAIR—So it worked, in fact?

Mr McManus—It worked, yes. It broke the nexus, it ensured that there was a commitment from the managers in Japan, where they wanted to sell the products here, that they had to do something here. We had to work with them to find those activities. It was not easy. We were fortunate that we had a contract with Telstra to start off the DSL activity and we were fortunate

that our mobile business took off very well at the same time. Based around business from both of those, we were able to kick-start the projects, we recruited the engineers and everything came together as required.

CHAIR—While it is a fairly draconian measure, do you think that there is still room to talk about government purchasing in that way to encourage people to invest in R&D facilities here or do you think that is a pretty blunt instrument?

Mr McManus—Probably the days are over. I understand that in one of the free trade agreements it is going to be rather difficult. We certainly feel the pressure from our competitors, the Chinese particularly. We cannot prove it but we have our own ideas as to what is going on there with the pricing, such that they are able to provide competitive product into the market against our product.

CHAIR—I am sure those who are members of this committee have been lobbied by Toyota. They have a plant in my area so I might see them more than some others. We were talking about how they are actually competing against other Toyota branches all over the world and so they have to remain competitive which is something we need to bear in mind. That is something we cannot affect really because of exchange rates.

Mr McManus—I go back to my second point. The first point was to keep up the supply of engineers and the quality of PhD graduates.

CHAIR—Are there enough?

Mr McManus—Yes, at the moment there are. There are odd problems here and there but, by and large, the HR manager has said to me there is not a significant problem. What I really do believe is that we have to get the tertiary institutes, CSIRO and NICTA, which are moving down the path towards the applied research, to come together with industry and ensure that what money is being spent on R&D is going to have a commercial outcome. I can recall talking with the head of the equivalent ARC body in the UK, two years ago. I said, 'How do you get the universities interested in working with industry?' He said, 'We are starting on that road. The first thing we do is simply ask the universities when they apply for any grant to write on the rear page of their application a statement that they have spoken to a particular company and the company has said that they can see that there is an opportunity to commercialise what they are doing. No matter what it is, whether it is pure research or whatever. It is important that a company has at least reviewed the situation and said that there is a possibility.' It is the first step in focusing the universities not just on producing. The head of CUBIN at the University of Melbourne said, 'Yes, I really did well this year—I did so many papers and so many exhibitions and I had so many PhD students.' I felt like saying, 'Yes, but how much did you commercialise?' That never got a mention.

Ms GRIERSON—You are talking about this applied research. Do any of the other research areas or the other NEC nodes that you talked about overseas, like the US, do joint ventures with public research?

Mr McManus—Yes.

Mr McManus—They do? So it is just that we have not done it here in Australia before, but the US, Japan and Germany have?

Mr McManus—Yes, Japan must certainly.

Ms GRIERSON—More successfully?

Mr McManus—It is a highly structured program of placement of PhD students and professors et cetera inside NEC. It is picking winners and doing everything that we do not seem to want to do here. It is highly structured.

Ms GRIERSON—So there is no resistance from NEC as a company to working with public research institutions? It is just that it has not been the favoured model in Australia—is that what you are saying?

Mr McManus—Correct.

CHAIR—But it is changing?

Mr McManus—It is changing.

Ms GRIERSON—You are changing it?

Mr McManus—Yes. I would have to be honest—I am getting some resistance from my own people. They are saying, 'We're so busy, we haven't got time to talk to anybody else.' They are flat out doing whatever they are doing. I have had to work with them carefully to bring the two groups together. I am getting there.

Ms GRIERSON—It is delicate diplomacy. Do the 400 who do work here work as a silo or do they work with any of the other teams overseas?

Mr McManus—Most certainly with the teams overseas.

Ms GRIERSON—So they do interglobal research and they work together?

Mr McManus—Yes—

Ms GRIERSON—They are working on projects where people from those five different centres might be?

Mr McManus—Yes. They would frequently go to Japan or the US to discuss progress with what they are doing—interconnecting and relating what they are doing. There is quite a bit of exchange. There is an exchange of Japanese engineers to Australia to work jointly on the projects as well. It is quite a favoured spot to come to.

Ms GRIERSON—I do not know if anyone has ever done it, but it would make a great PhD study, I think. How come Ericsson had to be shut down and pulled out but NEC survived? What do you think some of the differences might have been?

Mr McManus—I believe that one of the key points was that we focused on complete projects. In looking at what was done by many of our competitors, I saw that they did good subcontract work out of what was a bigger piece of project work. It was relatively easy to pick that up, take it back and reform it back inside Ericsson or wherever else.

Ms GRIERSON—But they did not have any ownership.

Mr McManus—Yes—whereas, with the DSL product here in Australia, you would have to pick the lot up. There was no-one working on it in Japan. We sold the idea to Japan and they actually onsold it to the Japanese government and all of the schools. But it was the NEC Australia design. So it was not possible to simply pick that whole group up and transplant it somewhere else. I think that was the key point in ensuring that we kept the activity here.

Ms GRIERSON—Self-preservation.

Mr McManus—Plus there was the high level of skills that we put together and the project management. I keep emphasising that. It is very important. We did things on time and to budget. The thing worked well.

Ms GRIERSON—What is the communication flow like between the Australian NEC and headquarters?

Mr McManus—It is every five minutes.

Ms GRIERSON—Good.

Mr McManus—There is an ongoing exchange of staff, right from the very top. We had a chairman and president here and other members of the board have been out in the last few weeks. It is a great place to play golf.

Ms BIRD—Did you hear the previous witnesses talking about business tourism? We should have matched the two of you up.

Mr McManus—Yes. The communication is daily. We have videoconferencing with the US.

Ms GRIERSON—You have said that there is now a centre in China. We have always been fearful of Korea and Singapore in particular taking on the role, them being closer to markets and therefore us being left out. What risks do you see? Do you think you are facing risks of that sort of thing happening all of the time?

Mr McManus—Yes, daily. The Indian companies go to Japan and simply make an offer to do the work cheaper than we can do it for. The biggest problem with China is that whatever is done there is closer to the market. We have to work very hard with the engineers we have. They are

Mandarin speaking and go over there and work with the sales teams to ensure that our products remain in the market.

Ms GRIERSON—Your advantage would be reliability, quality and knowledge. Do you still have the edge in those things?

Mr McManus—Yes.

Ms GRIERSON—Do you think the day will come when you do not have the edge in those things?

Mr McManus—We work continuously at upskilling. That is all we can do. The market is getting bigger. It is more competitive price wise. We have approval to go on for the next 12 months or so, but who knows what will happen beyond that. It will be a year-by-year approach of, yes, we are going to make profits.

Ms Hansen—On the importance of human capital, as we were saying before, we all know China and India make boxes cheaper and no-one can compete. But they want to improve and they do not want to just stay manufacturers. The governments in both those countries are putting in a lot of infrastructure—supporting them price wise and with education, in every way—to make sure that these two countries transition from manufacturers to R&D specialists. We are competing with that. When you ask how we keep running and how we stay ahead of that because they put in so much effort, it is because we are putting a lot of effort into the human capital.

Ms GRIERSON—That is where government can assist to make sure you do not have that shortage, as the mining and engineering sector has that shortage during a boom.

Ms Hansen—It is critical, yes. It is the knowledge economy that is important.

CHAIR—That is a very good point. That is something we need to stress in our report.

Ms Hansen—We are not saying that there is no basis for pure research. Of course there is a need for it, and wonderful things have happened from that. We are saying, from an industry point of view and as a good player in the industry, that the industry will benefit if there is greater collaboration between the universities that produce the knowledge and the industry that commercialises it. If you have the two working in sync then the pie will be bigger, and that is how we will stay ahead of the pack, if you know what I mean.

Ms BIRD—That is what we were told before lunch.

Ms GRIERSON—That is why I asked whether they were working in research silos or whether they were doing international research. I think that is terribly important because we lose so many of our best and brightest overseas in search of that experience. I am pleased to hear they can experience that through NEC.

Ms Hansen—They can go to the universities and then to us and other companies and industries here. Why lose the IP? It is win-win long term and sustainable long term, if you know what I mean.

Ms GRIERSON—Thank you.

Ms Hansen—We would like to extend an invitation to the committee to come to Mulgrave and see our R&D facility. It really is amazing.

Ms BIRD—We will be sending an invitation for you to visit our universities in my area of Wollongong where we have a new innovation campus.

CHAIR—Thank you. It was very helpful.

Mr McManus—Thank you for the opportunity to speak.

[1.54 pm]

BARKOCZY, Associate Professor Stephen, Faculty of Law, Monash University

CHAIR—Welcome. Do you have anything to add about the capacity in which you appear?

Prof. Barkoczy—I am also a consultant with Blake Dawson Waldron.

CHAIR—Although the committee does not require you to give evidence under oath, the proceedings before this committee have the same standing as proceedings before the parliament. The committee has not received a submission to this inquiry from you. However, you have a strong interest in the area. We ask you to make an opening statement, then we will proceed to questions.

Prof. Barkoczy—First of all, thank you very much for inviting me. My background is not in manufacturing but in taxation law. In particular, I have developed a keen interest in venture capital law. By way of background, I understand the inquiry is interested in venture capital incentive schemes to encourage venture capital investment in Australia. I have been involved in quite a major study with the Department of Industry, Tourism and Resources—

CHAIR—By the way, we have our Treasury rep here, who will understand all of these things, we trust.

Prof. Barkoczy—I have been involved in this study, which basically examined Australia's venture capital programs and compared them with another 10 or so countries around the world. That was produced late last year and was delivered to the government in a 250-page report. It is very technical. I thought the committee might be interested in me giving an overview of how Australia's schemes work, what is venture capital, what are the issues that arise, why we should be supporting it, and perhaps coming to some conclusions about ways that we might be able to provide further incentives and make venture capital happen more in Australia.

I have also produced a book with my colleague Daniel Sandler, who is one of the leading scholars in North America, on government venture capital incentive schemes. I understand that you have access to that as well. I do not want to go into the detail, because it covers many schemes, but I thought it would be beneficial to give you a background on our research, which took two years to do. I will define the concept of venture capital, which is a very nebulous, rubbery concept. It is something that governments all around the world, we have found, are trying to encourage, because I think they see it as being so vital to innovation, to entrepreneurship and to the development of their economies. To be competitive, Australia really needs to look at our schemes and make sure that they are world's best practice schemes.

Very briefly, a lot of people mix up the concept of venture capital with the concept of private equity. Private equity is really the larger set. Venture capital is a very subset of private equity. Venture capital is really focused on identifying high-growth businesses with high-growth potential that need capital funding to expand and develop. This includes biotechs and new and emerging technologies et cetera. It is focused on what we call in our book the 'gazelles'.

Identifying what these businesses are requires quite a bit of specialised knowledge. You need venture capital managers, people who can identify what these businesses are. These businesses are not listed, of course; they are unlisted businesses. In several instances, the technologies may come from universities. I was very interested to hear what was being said before. Venture capitalists are often involved in developing ideas and technologies that originated in universities by people who are not really good at commercialising these things.

Venture capital is all about matching money with commercially viable products and inventions. The government has been trying to do this by encouraging venture capital investment through certain schemes, which I would like to talk about in a few moments. The key point is that venture capital investment occurs at a very early stage. It is not really at the mature private equity stage, which is usually a much later stage. Venture capital investments really occur at the seed and start-up stages. It is at the very early stage that the greatest potential for growth exists. It is about finding which businesses and technologies are the ones that are appropriate to invest in.

The problem with small to medium sized enterprises, especially when they are just starting up, is that loan debt capital is not viable for them. They are not producing any widgets yet. They are not in a commercial phase yet. They cannot support the repayments of the loan. It is much more appropriate I think to have equity capital investment in these entities. Obviously there are issues about whether there is a gap between those people who perhaps have the funding to make these investments and those who have the viable technology and the ideas that are out there. And it is a question about how the two meet, essentially. Australia has tried to establish pooled vehicles that encourage venture capital investment, so investors get together and invest either in pooled development funds or in what are now venture capital limited partnerships—or soon to become early stage venture capital limited partnerships, which I will discuss in detail in a few moments.

Ms BIRD—Before we move to that next stage, when venture capital goes into these very early stage things, is it with a view to only invest until it is at the point where it might move into another mode of being financed? Do they have a short-term view of it?

Prof. Barkoczy—No. Venture capitalists are there principally for the medium to long term—up to five years. My colleague in the United States says some may be in it for up to about 12 years as well. It is a longer term investment. It is basically providing the seed capital for these enterprises to do, first of all, their preliminary R&D, then to look at commercialisation and then to actually start the production stage. Venture capitalists usually have an exit horizon. They basically want to get out at maybe an IPO, when the company is at a stage when it is ready to float. Alternatively, they might get out by selling back to management or to third parties.

Ms BIRD—What do they get out of it at that stage?

Prof. Barkoczy—Huge gains. They get in at the grassroots level when there is nothing there other than an idea, usually. Typically, in the case of venture capital investment in university spin offs, for instance, the universities have incredibly clever people who have incredible knowledge in particular areas, but they do not know how to commercialise things. They are not business people and require venture capital investment and advice to develop their technologies.

Ms BIRD—We all know them.

Prof. Barkoczy—They need business people to be their business partners, and venture capitalists are these people. I get the impression that there is some reluctance in this. All of what I am saying to you is truly only anecdotal. There has been no study on what funding gaps exist. There has been no data on what business opportunities have been missed.

CHAIR—That is interesting from our point of view. Are you recommending to us that we should be seeing some research?

Prof. Barkoczy—Absolutely. There is no hard data. There is only anecdotal evidence about this.

Ms GRIERSON—Anecdotally, it was suggested that there was plenty of money around until the Asian recession took a lot of those speculative funds out. Is that true?

Prof. Barkoczy—I think every market crash would have that effect. It is the high-risk end of the market that usually suffers the most. But I suppose what we really need to be conscious of in Australia is that countries around the world are all trying to support venture capital investment. They realise that if they do that small businesses will turn into large businesses. There is plenty of literature around with the stories about Google, Intel and Microsoft. They all benefited from venture capital investment. Without that kind of investment, these enterprises might never have got off the ground. The big issue of course is working out what is viable—what to invest in and what not to invest in. That requires good fund managers who can work out exactly what type of—

Ms BIRD—How does Australia do in terms of that?

Prof. Barkoczy—The statistics for our venture capital industry indicate that it is increasing in size. Our venture capital programs have had a few success stories. There have been a few companies that have invested in some successful ventures. By and large, venture capitalists here aim for the home run. They might invest in a number of different ventures and there is only one that really comes home, but that may be enough to fund all the failed investments.

The literature that I have read seems to indicate that Australia has quite a risk averse investment culture. In particular, our greatest pool of investment lies with our superannuation funds. These are classic long-term investors, because superannuation funds are designed to invest moneys for their members in the long term. One of the submissions that I will be putting to you a bit later is that this is one of the things that Australia could do. We have two different tax incentive schemes. We have one to encourage venture capital investment and one to encourage superannuation. Why not merge these together, bring them together, so that—

CHAIR—If there were a small percentage in it, it would provide some sizzle in the superannuation industry too.

Prof. Barkoczy—Exactly. However, you would not want your super fund to invest wholly in venture capital. I certainly would not want that.

Ms BIRD—No, unless we want to work until we are 90.

Prof. Barkoczy—I would not want mine to do that.

CHAIR—But a small one or two per cent investment—

Prof. Barkoczy—Absolutely. Having a small percentage of superannuation investment and being able to encourage superannuation funds to invest in venture capital is very important. The amount of money in superannuation is growing, and it will grow with the government changes that are coming through in 2007. The potential places where superannuation funds can invest mean that they will go overseas if they do not have alternative investment opportunities in Australia.

Ms BIRD—Access Economics was saying that to us yesterday.

Prof. Barkoczy—Venture capital is a classic example of where these funds might want to invest one or two per cent, as you say, of their investment capital. In relation to the importance of venture capital, I should also mention to you that people have different views on what is and what is not venture capital investment. But I would like to highlight that it really is the start-up, seed type, investment as opposed to the development capital that comes later down the track. Without this venture capital investment, a lot of companies will not get off the ground; they will not realise their full potential. The real issue is selecting appropriate businesses.

What I would now like to do is to give you an overview of how Australia's schemes have developed over the years, where we are currently at and where we are going in the next year with this new Early Stage Venture Capital Limited Partnership program. Then, if the committee is interested, I can give you my thoughts on where we could tinker with these programs to make them better.

CHAIR—Sure.

Prof. Barkoczy—I have a set of slides here that came from a conference paper that my colleague from Canada and I presented earlier on this year, so the information is a bit dated. I will take you through how I understand the policy to have developed in Australia in relation to our venture capital schemes, then I will show you how they work and, finally, I will examine some of the statistics. I will also very quickly give you some observations and my views on where we could tinker with these reforms.

Australia was quite early in developing schemes to encourage venture capital investment. You will see in the second slide that there are four programs mentioned. The MIC program no longer exists. But, in very simple terms, what we had there was a scheme where there was an investment company, a licensed company. Investors purchased shares in that licensed company and the licensed company then used that money to search out and invest in appropriate small to medium sized enterprises. There were all sorts of criteria about what kinds of enterprises they could invest in. But, typically, when you look at schemes around the world, you find that they are seeking to support innovative enterprises, high-tech enterprises—enterprises that do not get funding otherwise. Retail is usually excluded from these schemes. Land development is excluded from these schemes.

Ms BIRD—Can you give us one example of something that might have happened under that program?

Prof. Barkoczy—I did not chase that through, to be honest with you. It closed down in about 1992, so it was a long time ago. Essentially, what they were doing was investing in enterprises that were capitalised to a certain amount. In the new scheme, under the PDF program, $50 million is our cap. You will find, very interestingly, that most PDF investments are at the lower end of the scale of, say, $5 million up to $15 million. That indicates to me that there is this need of small companies which are capitalised only to the extent of $5 million to seek venture capital funding.

I mention this old scheme not solely for historic reasons but because it shows the difference in philosophy that has been developed by the government in recent times. Under the old scheme, what happened was that an investor got a deduction for investing in one of the schemes. Management investment companies basically had to seek funding from the private sector. The private sector invested in these entities and got a tax deduction. So it was an up-front concession. The government, I think, saw this as being a cost without any guaranteed success at the end of the day. Also, there was the potential issue of people doing it on 30 June just to get a tax deduction.

We have moved completely away from that. That was a front-end concession. We have moved to rear-end concessions under our other schemes. Under our PDF program we have a corporate vehicle. This corporate vehicle, like the MIC, pulls investments from a number of investors and then invests that money in eligible entities. It is basically companies which are capitalised under $50 million. That is a key requirement. Secondly, those companies cannot be involved in retail or land development. In other words, there is no black list of entities that these enterprises cannot invest in, other than retail sales and land development. The Australian government, I suppose, has taken the view that it is up to the private sector to work out what to invest in. They are not going to necessarily narrow down into particular fields. It is obviously a policy issue as to whether, if you want to support a particular type of investment, you would narrow it down or whether you would leave it to the private sector to determine that issue.

On page 3 of the slides that I have given you, you will see that up the top you have investors who invest in the PDF. The PDFs can essentially invest their money in the SMEs—all these eligible enterprises or companies, essentially—or in bank deposits while they are looking for investments. You will notice that the gains that they make from these investments are taxed at low rates, not at the corporate tax rate of 30 per cent. In other words, if an SME declares a dividend or if they sell the SME and generate a capital gain it will only be taxed at 15 per cent, not 30 per cent. Interest will only be taxed at 25 per cent.

To ensure that that concession flows through to the investors, what happens is that dividends paid from PDFs are exempt from tax. Likewise, when investors sell their PDF shares they are going to be exempt from tax. So the objective of this scheme was essentially to pool the money of a bunch of investors so that there would be a substantial pool of money, to find eligible SME investments and then to invest in those particular companies with a view to making gains in the medium to long term. After these gains were taxed in the hand of the PDF at low rates, the dividends et cetera would flow through on a tax-free basis.

Ms BIRD—Is that for ever and a day?

Prof. Barkoczy—Yes. In fact, one of the issues with the PDF program is this: because PDF shares are exempt from tax, someone can go out and purchase second-hand shares in a PDF today, when they have not actually capitalised the PDF, and get the exemption from tax. In a way, I suppose it creates the opportunity for secondary trading in tax exempt shares. But of course if you did not give that opportunity then the exemption from tax would not be worth as much as it was to the original investor. If the next investor has to pay tax on the investment then obviously that will affect the value of that concession.

You will see when I talk about the new programs that have been introduced that we take a very different stance. What is interesting about the PDF program—and I should mention this from a policy perspective—is that it gives you a back-end incentive. The only time when PDF concessions are available is if the underlying investments in the SME are successful. The government changed its policy back in 1992 to encourage the giving concessions only where the underlying investment is successful. So gains on the sale of PDF shares or dividends flowing from PDFs are going to be exempt from tax.

From a timing point of view, it costs the government less because it does not have to fork out the concession up front. Losses cannot be claimed under the PDF program, so there is no risk there. It is a very clever program in the sense that you can imagine that the only way PDFs will generate high returns is where the underlying investments have been successful. So the government effectively can recoup the cost of this program through the gains in the underlying enterprises, which arguably would not ever have grown without this venture capital investment. Therefore, it will collect tax from these underlying enterprises, the SMEs, at the 30 per cent tax rate. That, in a way, funds the concession. I see it as a self-funding program in that respect. I will take you back to the first page again. The next program is the VCLP program—

Ms BIRD—Why was it frozen in 2006?

Prof. Barkoczy—Because we are replacing it now with a fourth program, which is the one announced in 2006, the Early Stage Venture Capital Limited Partnerships program. To understand that, you really need to get an understanding of the VCLP program.

The VCLP program uses a very new kind of vehicle for Australia, one that is really world's best practice, which is an incorporated limited partnership. In the middle slide on page 4 there is a very colourful diagram of how the VCLP program works. The interposed investment vehicle is not a company but rather a limited partnership. The limited partnership has both general and limited partners. The general partners are essentially the venture capital managers. The venture capital managers manage the partnership. The limited partners are the investors, who do not take part in the partnership at all. This entity, unlike a corporate vehicle, is a flow-through vehicle. What basically happens is, instead of tax being trapped at the entity level, if gains flow through to foreign residents—and we call those 'eligible venture capital limited partners'—then they will be exempt from Australian tax. So it was designed principally to encourage foreign investment using this special kind of flow-through vehicle.

What we have now done—this is the latest initiative and this was announced in the 2006 budget—is that we have introduced a similar program to the VCLP program, but focusing on the

small end of the market, called the ESVCLP program: Early Stage Venture Capital Limited Partnership program. It is very similar to the Venture Capital Limited Partnership program. The big difference is going to be that the investee companies in which they can invest have to be valued under $50 million, whereas with the Venture Capital Limited Partnership program it could be up to $250 million. The other thing that seemed a bit strange to me with the Venture Capital Limited Partnership program was that you could acquire second-hand shares. That does not actually provide any equity capital into the eligible investment. So it allowed for second-hand shares, unlike the PDF program, in which you could not do that unless you had PDF board approval.

The ESVCLP program, and that is the latest model, you will see on the slide in the middle of page 5 that again we have a flow-through vehicle very similar to the Venture Capital Limited Partnership vehicle. What will happen is all gains and losses will flow through to the investors and they will be totally exempt from tax on any gains. They will not be able to claim any losses. Likewise, any dividends or capital gains that are made and flow through to the ESVCLP will be totally exempt from tax. So what we have here is a world's best practice model. It is based on the limited partnership structure, which is what is being used in many jurisdictions over the world for venture capital investment. It uses the flow-through vehicle. We use an incorporated partnership vehicle because it allows, amongst other things, for fund of funds investment. What was happening overseas, as venture capital funds became bigger and bigger, was that we basically had the development of fund of funds vehicles—funds that do not just invest in venture capital but invest in other venture capital funds. By using an incorporated limited partnership you actually can invest from one vehicle into another.

I will make some observations on this, because they are very technical schemes and they have all sorts of qualifying criteria. What I should mention about these schemes, the ones that exist—the PDF, which is now frozen, and the VCLP and ESVCLP schemes—is that they all reward success but also penalise failure, because both gains and losses are exempt from tax. Venture capital is an inherently risky type of investment. What you are effectively doing by having these schemes which, whilst symmetrical, exempt both gains and losses, is saying to the investor: 'Sure, we'll exempt your gains'—and every investor goes into an investment with a prospect of a gain—'but we are not going to allow you any deductions or capital losses, in particular, for your losses.'

Ms GRIERSON—So it is better for you to make a return?

Prof. Barkoczy—If you do not make a return, you do not get the tax concession that any other investor would get.

Ms GRIERSON—So it is incentive based.

Prof. Barkoczy—It was put to me that one of the reasons for this is that it is symmetrical. The whole purpose of an incentive scheme is not to be symmetrical but to give an incentive.

Ms GRIERSON—To make you buy into the whole venture.

Ms BIRD—But won't that drive the success of the vehicle? Because if you have got your capital to invest and you are looking at various vehicles around the world to invest in, the more successful the vehicle, the more likely you are to attract that capital.

Prof. Barkoczy—With these schemes, there are only a few that have been set up under the VCLP program, and we have not even got the ESVCLP program yet. But what you will find is that it is going to depend on success of the fund managers and the fund managers' track records. Foreigners simply are not going to invest in these vehicles until they see that there is some underlying track record of success. So we are going to need to see some success. But ultimately what the policy seems to be, to me, is not just to try to encourage investment in early stage enterprises and money going through to these SMEs but more so to develop fund managers in Australia who are competent and capable of identifying appropriate venture capital opportunities. Because it is all good and well to have these opportunities at the ground level. Unless you can get people who are in a position to be able to select the appropriate investments—and hopefully that is what a mature venture capital fund management industry would achieve—then venture capital investment will fail.

CHAIR—What percentage of venture capital activities result in success?

Prof. Barkoczy—This is precisely the data that we need to get that you were suggesting before. We just do not have this data. There is data, but—

Ms GRIERSON—There is not data on the returns?

Prof. Barkoczy—I will tell you where data comes from. There are three places where I have got my data from. The Australian Bureau of Statistics produces a venture capital report, although that does not really distinguish between what I call true venture capital and private equity. To me—and many people have commented on this—those figures are not really useful. The Pooled Development Funds Board—which I suspect will now change its name to the venture capital board—which administers these programs together with Treasury produces an annual report that has details of how much capital has been raised and how much has been invested. For instance, close to $900 million of capital has been raised under the PDF program, so it is moderately successful, I would say.

CHAIR—For us, because you not only work at the university but you are on a law firm looking after the commercial interests of your clients as well, is this driven at genuine driving of new ventures in Australia or is the motivation tax breaks for your clients?

Prof. Barkoczy—Firstly, you only get breaks if you succeed. In other words, there are tax risks if you do not succeed. Secondly, because these schemes are very highly regulated, it means that you can really only invest in specified kinds of activities. The question becomes: to what extent do you want to blacklist or whitelist the type of activities these entities can invest in? The PDF program, for instance, merely says you cannot invest in retail and land development. The VCLP program is a bit broader. There are finance type things that you cannot investment in as well. We are yet to see how the ESVCLP program will be categorised but it is designed to make investment decisions really lie with the investors. The policy behind this is that governments realise that, if they are the ones making investment decisions, they might be behind in relation to current thinking on what the next technology is. I suppose what the government is doing is

putting faith in the venture capital managers to work out what are the more appropriate ventures subject to limited exclusions.

CHAIR—But you are not suggesting that those restrictions, for example, on real estate development or retail be changed?

Prof. Barkoczy—Absolutely not. Those ventures are not starved of funding at all. In fact it may well be that you might select particular risky ventures and allow losses to be claimed if the investment is perhaps in biotech. Let's say biotech, for argument's sake, is the area that you really want to fund—

CHAIR—We are backing winners of course.

Prof. Barkoczy—Exactly. Or you might even given them bonus losses if that is the case too, because at the end of the day these are all costs, but you have to incentivise these type of investments—

CHAIR—I think there is merit in that.

Prof. Barkoczy—otherwise it just will not happen.

Ms BIRD—We had Access present to us yesterday that there has been a lack of knowledge internationally about what a high-functioning nation we are in terms of investment experience, largely driven as a result of our huge superannuation holdings. They said they are about to put out a new booklet on venture capital. What is your view? What they are telling us is that in terms of fund managers and so on we have got really highly skilled and internationally competitive people in Australia. What about managers of this sort of vehicle?

Prof. Barkoczy—I am not sure that there is evidence of whether you have depth in that area yet.

Ms BIRD—It would seem to be the critical factor as to whether this works.

Prof. Barkoczy—That is why they are trying to establish fund vehicles. This is what we call 'formal venture capital' rather than 'angel capital'. We are not supporting the wealthy entrepreneur who can pick a winner, because that does not have broader benefits for the community; it only benefits that entrepreneur. With these pooled vehicles you are creating fund managers who have this expertise and, as a result, these schemes are designed to try to help to improve the skills and the opportunities for fund managers in this area.

CHAIR—On page 6 of your PowerPoint presentation, you have the possible reforms that you see as being key.

Prof. Barkoczy—Would you like me to take you through those quickly? Firstly, you should call these things by the right name and perhaps merge the programs into one program so that you do not have a million different programs operating, because people just do not understand different titles. ESVCLP does not roll off the tongue too easily. A classic example is with the PDF program. When I first encountered it and tried to do some research on it I typed it into

Google, which is what I do when I start PDF, and I got a million documents. I thought that it must be the most written about topic in the world, and of course I got links to every PDF document that had ever been written. So these things have to be sold to industry as well as to investors.

One of the most important things is to have some links with these programs and perhaps to superannuation. Superannuation to me seems to be where massive amounts of money are available and where super funds could risk small amounts to invest in venture capital. One of the problems with venture capital investment is that there is a high cost involved in searching for appropriate investments. These entities are not easy to find. It is also difficult to do due diligence et cetera in relation to this. It is important that we have significant amounts of money going in there and that we have vehicles such as superannuation funds which could spend small portions of their investment capital investing in this area.

I think the fact that losses are not allowed to be claimed is really quite a disincentive in relation to the scheme. There is no data which says that, if losses were allowed, more people would necessarily participate in these schemes, but it is certainly a disincentive. The question is whether you should allow losses or perhaps allow them only for particular engines like superannuation entities or for particular kinds of investments.

There is also something that occurs in other jurisdictions, in particular in the UK and in the US. Under their various schemes they have allowed all sorts of deferral relief. So perhaps what might be able to be done is to allow a form of CGT deferral where, for instance, someone might make a gain on a particular kind of asset, and if they roll that gain into an eligible venture capital investment the result might again be deferred for a certain period of years or until they later exit this interposed investment. That is operating in the UK and it has operated in the United States. I see that as another way of incentivising this. You have to drag the investors to these schemes. You are going to need to see track records and especially when these schemes start there is not going to be much track record there. So I see these as being some of the avenues for improving the schemes.

Ms BIRD—That is a very good question, and perhaps you might like to take that on notice and provide the information back to us. I am interested in an emerging area in which it seems we could have a lead-in—that is, climate change technology. There is a wave-generation machine sitting off Port Kembla, and I know the guy there had to go to Germany to get capital investment because we are not a signatory to Kyoto, so there was no incentive for companies here. I am interested to know about that. I am happy for you to provide brief written information to the committee about opportunities that you see there and perhaps some of the barriers that we have got in this nation. That would be tremendous.

Prof. Barkoczy—Sure. This is an example of where, in the future, you might have all sorts of incentives to prevent global warming—and merging in with venture capital at the same time. It is my view that government seems to have all sorts of different schemes with different policies and that when there is an opportunity to merge them, like with superannuation and venture capital, it should seize the opportunity—and likewise with climate change and venture capital.

Ms GRIERSON—I would like to add advocacy. You would be very welcome to come and visit Newcastle. When regions do not have a chance to access venture capital, it is really very

difficult. Twelve months ago a group was started in Newcastle with insurance and the investment bank, plus Neville Sawyer, who was a former chairman of ACCI and the owner of his own company. He eventually moved on and has retired. This is a manufacturing area with lots of innovative SMEs that have no idea how to get their product to market. So there is a need for some localisation of those sorts of approaches too. You can have great national schemes, yet it can be really hard to access them.

Prof. Barkoczy—We say in our book that everyone thinks the United States is the hub of venture capital. But it is quite interesting: it is on the east and the west coasts where venture capital is happening and there is all this stuff in between where no venture capital is actually happening. So it is localised even there.

Ms GRIERSON—We will have to get you to come and talk to them.

CHAIR—That was very interesting. Obviously we have been speaking to an expert in the area. That will stimulate us. It is also not an area that we have spent a lot of time on in this inquiry. It is very relevant and important. Thank you for your contribution.

Prof. Barkoczy—Thank you for having me. I will be delighted to help in any other way.

CHAIR—Is it the wish of the committee that the PowerPoint presentation provided be accepted as an exhibit? There being no objection, it is so ordered.

[2.34 pm]

HOBBS, Dr Robert, Science and Industry Adviser, Australian Synchrotron Project, Australian Synchrotron

LAMB, Professor Robert, Science Director Designate, Australian Synchrotron

ROGER, Mr Max, Director, Australian Synchrotron Project, Australian Synchrotron

CHAIR—Welcome. Is it the wish of the committee that the documents from Australian Synchrotron be accepted as evidence? There being no objection, it is so ordered. Although the committee does not require you to give evidence under oath, I should advise you that these hearings have the same standing as proceedings before the parliament. We have not received a submission to this inquiry from you, but undoubtedly you will present us verbally with your views on the subject of this particular inquiry.

Mr Roger—Thank you. It is good to note the diversity: venture capital in one breath and technology in the next. I will very briefly introduce my colleagues. I think we were invited by the secretariat to appear so we did not prepare a submission. Really, our purpose is to give you a little bit of information and then respond to questions. Very briefly, I look after the overall project. Professor Rob Lamb on my left is the incoming science director for the facility and he will be in charge of the national science and research program for both pure research and industry research. His background is as a long-time user of technology and manufacturing and in particular of synchrotrons. Rob and his colleagues have been very successful industrially and hold a number of worldwide patents. So he is the sort of person we need to be involved in this activity. Rob Hobbs on my right is former Director of Research with BHP. I think he ran the Wollongong laboratory for about 10 years.

Ms BIRD—I thought there was something familiar about him!

Mr Roger—And then for his last four years with BHP he ran their national research program. Again, Rob has a lot of familiarity with the use of technology in developing manufacturing. So the good thing is for me to shut up and pass over to them. Very briefly, this synchrotron, when it is finished in the next couple of months, will be about No. 20 in the serious synchrotrons in the world. The major OECD countries each have one or several synchrotrons. Europe has about seven; the US has four. So Australia's entry into this field is probably well and truly overdue. Industry and academia have been working for about 12 or 15 years to finally get it done, but probably their timing is pretty good because the technology is at an excellent state of development now.

The other main thing to mention to you is that it is very much a collaborative project. So, whilst Victoria initiated the project following a lot of work by the Commonwealth and the states, we now have investors from all state governments, most universities, CSIRO, ANSTO and New Zealand. So, basically, the hub of research and development activity in Australia are now all involved as investors and therefore as partners in the project.

My colleagues will talk briefly about the industrial use. But I think Peter Doherty the Nobel Laureate, who is from more a medical and biological background, nevertheless says, as Rob will explain, a synchrotron is a light source and it can be used for anything. Really, the only limiting factor is our imagination and capabilities in those areas.

I will hand over to my colleagues. Before I do that, I will repeat an invitation that, if anyone is interested at any time, just give us a yell. We would be delighted to take you through the facility. We are starting to get a stream of politicians and interested industry leaders and we would be delighted to do so.

Ms BIRD—Do you have an actual date to switch it on?

Mr Roger—It is effectively switched on now. As you see in that little diagram in front of you, the synchrotron comprises the machine, which generates the light and the beam lines down which the light travels to be used in experiments. We are just in the process of commissioning the first five of the beam lines. So light is actually going down the beam lines effectively from early July.

Ms BIRD—So sometime after that, if we wanted make a visit to actually get a real sense of what—

Mr Roger—You would get a real sense now. In fact, we have not had anyone visit who has not gone away a bit goggle-eyed.

CHAIR—We started off having tours of various research facilities and manufacturing, but it is just time consuming.

Ms BIRD—Plus you get caught up in the excitement of the thing rather than focusing on the questions we are supposed to be asking.

Mr Roger—I might ask each of my colleagues in turn just to briefly—

Prof. Lamb—I think the most important thing to remember is that this is just a light source. It is a tool which people use to investigate things.

In a number of talks that I give now I refer to it as a super torch. It has a beam of light which is millions of times brighter than the sun and has every frequency—in other words, every colour from the infrared all the way through to hard X-rays. This morning somebody said, 'I am amazed that it does all these things,' and I said: 'Well, it is not that difficult. If you think about it, you can shine a light on anything and because it is so bright the observation is that much better in fine detail.' We have examples, particularly in industry. The famous one is the relenza drug, which is the flu drug. It has gone out of favour a little bit lately—you take it if you feel you are going to be unwell—but it is now coming back because it turns out that the shape of this particular drug, which in fact fits into the virus, is the same shape as that which fits into the virus of avian flu. The idea is that you use this light to look at the shape. That is what they did and they commercialised that drug.

The other thing is that, if it is bright light and you can take the entire intensity, you can cut up things with it. So there is a manipulation. Literally, it is an observation and a manipulation of light. In respect of manipulation, the thing that we are doing at Synchrotron at the moment with one of these lines, which is essentially the filter line that says, 'I only want this bit of light or that bit of light,' is cancer therapy. We are using the beam. Because it is so powerful, you can deliver many, many more times the intensity into smaller and smaller spots. The idea is that we limit collateral damage but at the same time we are building a clinic.

Ms BIRD—Professor Lamb, did you ever work with synchrotrons somewhere else? Were you brought back for this?

Prof. Lamb—Yes. As Max said, there are 20 of them in the word. Interestingly, I started using them about 20 years ago as an industry beam line when I worked in California at IBM. I used their industry beam line to look at thin coatings on microchips. Ever since then, and certainly since I came back to Australia in the early nineties, I have been travelling back to all these other synchrotrons. The community, as a whole, got federal funding in 1995 to develop a program where we sent people overseas and we have been doing that for the past 10 years. Everybody who uses a synchrotron travels overseas, and it has gone from something like 20 to 300 registered users. The fact that we are building one now is because we have literally run out of options overseas and we are getting picky. We want one because there are things that you just cannot do over there. It is the same with the problems, particularly in the US at the moment, with security. None of our samples go through to a synchrotron without going through Alaska. On many occasions we are in Chicago at a synchrotron and our samples are in Alaska.

Ms BIRD—As a piece of infrastructure investment, why would people invest in it? How much is government investment? Is it a public/private partnership? What would they get back out of it? As with telecommunications, there are new forms of infrastructure we will need in the future. This is an example.

Mr Roger—It is a good example. Around the world, typically, synchrotrons fall into that category of public-good infrastructure investment. The easiest example is in the US, where there are four major synchrotrons, all of them funded by the US Department of Energy and the National Institute of Health but 80 per cent to 90 per cent by the Department of Energy, partly for historical reasons. The Office of Basic Energy Sciences in the US funds those facilities. It is the same in the UK and in Europe. For example, one of the biggest synchrotrons in Europe has 14 member countries. Generally, government provides the basic infrastructure. In Australia we have done it in a slightly more complex way by bringing in universities. But if you look at it, fundamentally it was the Victorian government originally, each of the state governments and the universities, and now the Commonwealth is involved through the National Collaborative Research Infrastructure Scheme.

Ms BIRD—What about that money?

Mr Roger—At the moment about $220 million has been raised from all of those sources and that will build.

CHAIR—How much from the federal government?

Mr Roger—Fourteen million, plus $5 million each from CSIRO and ANSTO. Of course it could be argued that some of the university funding is Commonwealth sourced funding. In that sense, it is genuinely collaborative—probably the first.

Ms BIRD—If you were one of the public investors, do you get free access to it?

Prof. Lamb—That is a good question. The total access will be 50 per cent merit based access, so 50 per cent open to all comers. Thirty per cent will be directed to the 11 funding partners so that they will get 2.7 per cent and about 20 per cent of it is for paid direct access by industry and for special projects. It is roughly 50 per cent, 30 per cent and 20 per cent. To come back to your original question, why would a government or a university put in money, this is break-through technology. This takes researchers—my colleagues can describe it better than I—from there to there. Without it we are falling around down the bottom in areas like drug design and in a lot of the areas of manufacture and research. There are two reasons for doing it: to get access to the time and the other so that we have actually got one.

Ms BIRD—At the moment, would those places be for paying a fee to access ones overseas?

Prof. Lamb—It is done under the Australian synchrotron research program, so it is free to use internationals. They are funded for their travel and accommodation and through arrangements with international synchrotrons we get free access. We put in some capital. In that sense, synchrotrons are generally free if you are prepared to get into the merit system and apply and get your time.

Ms BIRD—On the presumption that the outcome of what you have done is going to be freely available to everybody?

Mr Roger—Yes.

Prof. Lamb—We see it as about 15 per cent of those who could use a synchrotron in Australia are actually now using one overseas. So by having one locally we see ourselves as growing.

Ms BIRD—That puts the cutting edge of our industries that bit further.

Prof. Lamb—Yes, that is right.

Ms BIRD—I have never heard of a synchrotron but I can see, from having read the background provided, that this is great in terms of our manufacturing industry across its forms. It is a tremendous thing for keeping them at the cutting edge, innovative and how we maintain a manufacturing industry. Are there other forms of fairly significant infrastructure like this, that we do not have in Australia, that would produce the same role? Following from that, do you think that there are some barriers to getting this happening that might now apply to other technologies and that we should be looking at recommendations perhaps from this committee?

Dr Hobbs—There is another piece of infrastructure that is very similar to the synchrotron that is complementary and that is the neutron reactor at Lucas Heights. That is being built and will be opened in a month's time. Those two provide a very comprehensive range of capability and there is nothing else on the horizon that has got the versatility of those two. There are other bits of

infrastructure but they are much more specialised. The thing about the synchrotron is that it is so flexible that it is relevant to industry right across the board, from biotech right through to minerals and to advanced materials and so on. These are rather unusual pieces of infrastructure.

Ms BIRD—So those two will position us quite well?

Mr Roger—With the two of them in a position to be opened within just a few months of each other, it is probably unique in the world. Others have both but it is seldom—

Ms BIRD—Is there some advantage to the slight lag we have in Australia? I notice you said that by the time we got into the synchrotron thing we actually were getting in at a good point in terms of the technology development. Is that lag not a bad thing?

Dr Hobbs—Our synchrotron is a third generation machine so it has been through three iterations over 20 years. The current design is so much more capable than previously. We are very lucky in terms of the way the technology has developed. The synchrotrons talk to each other. There is an international collaboration, so on the design of our synchrotron a lot of contribution came from Europe and from America into the design of the facility. We were able to capitalise on all of the latest developments. It is unlikely that the synchrotron will have a fourth generation which is such a radical change as has happened in the first, second and third generations. We would have liked to have had it earlier, but as it turned out, the technologies—

CHAIR—How many people can access it at any one time?

Dr Hobbs—As we start up we are going to run nine beamlines. Each beamline does something different. It runs 24 hours a day seven days a week, so it is very productive. Depending on the experiment, people will come and use it for a couple of days or so. We have people constantly running through it. Usually there will be a team of two or three who will come and use the machine at the one time.

Ms BIRD—They take away their data and look at and come back.

Dr Hobbs—Exactly.

Mr Roger—They generate huge amounts of data. One of the other more recent developments is that through some of these Commonwealth programs we hope that it will be fairly substantially e-science enabled so that in the mid-term a research team in Perth could send maybe one or two people to the synchrotron and the rest of them will be able to watch it on screen in real time and make suggestions et cetera.

CHAIR—Which programs are you looking forward to having access to?

Mr Roger—Mainly the National Collaborative Research Infrastructure Strategy. The first projects under that were announced in November last year. We will probably be one of the first to get going simply because we were well down the track.

Ms GRIERSON—Does government want cost recovery from this or is it an investment?

Mr Roger—It is an investment. The worldwide experience is that it is simply an investment. It is such a fundamental tool of all areas. There will be some who will pay because they want to retain their IP but, as my colleagues have said, it is such a flexible instrument that you would want some people who are using it who are at the real cutting edge and there will be very important use just for repetitive testing of thousands of samples. There is a good example from New South Wales. There is a company in Sydney called Fermiscan which is looking at commercialising a test for breast cancer based on the analysis of human hair. They are using the Chicago synchrotron, with which we have very close ties, to do all their preliminary testing while they determine and prove up the science. If that works then they will use synchrotrons worldwide. It is a fantastic time with those sorts of things beginning to happen.

Ms GRIERSON—For you to have 24/7 usage, what resources does it depend on for continuous use, or is that one of the beauties of it?

Dr Hobbs—It is mainly people and electricity that are critical.

Ms GRIERSON—Is the energy source electricity?

Dr Hobbs—Yes, that is right. It uses about five megawatts, so it is a small substation that runs it.

Mr Roger—Once it is in operation then you keep it operating and you top up the energy twice or three times a day.

Ms GRIERSON—That is very exciting. Well done.

CHAIR—You have been focusing on cutting-edge technology and from our point of view it seems highly important that we have got this into the Australian scene. Are there impediments that you have experienced that we should be looking to overcome or recommend a different approach? What other incentives are needed?

Dr Hobbs—We have got a great start and we will have nine beamlines. It is very versatile. The facility can take at least 30 beamlines once it runs.

Ms GRIERSON—With repeat functions or different? Are there only nine functions or more?

Dr Hobbs—In some cases we think the beamlines will be overloaded so quickly that we will need to build a parallel one with the same capability. There are other things that we have not been able to do in the initial suite of nine that we will want to do later on. One example of a beamline that we are considering is one that is very focused on the minerals processing industry. I am very interested in this myself. This beamline is not in the initial suite of nine but there is a lot of industry interest in this one. The advantage of this is that you can look at individual grains of minerals and do about three or four different experiments on the one grain at the same time. You get so much more information than you can get any other way.

Ms GRIERSON—Would it be commercially viable to put in those extra beamlines?

Dr Hobbs—In a case like that one there would be some industry investment and industry would pay rights to it, but it is very important generally for geological research and exploration research in the country. It will be partly industry and partly for the earth sciences people.

Ms GRIERSON—Are there any ownership, control or IP issues, and are they all easy to sort out? Have they been sorted out?

Mr Roger—I think they are reasonably sorted out. To come back to the Chair's question and to come to yours, this is somewhat unusual. It is a national facility, worked from the ground up by the states and the universities with Commonwealth involvement. But it is a little unusual. Normally, with an animal health laboratory or a reactor, it is fully funded and it happens. In this case, it came up a bit the other way. So the collaboration, I think, is an absolutely vital part. We have to have these sorts of things in Australia or we will be left behind. So collaboration in the research and the capital and the governance model that has been set up—governance for a national facility—so the facility is actually controlled by the 10 investing partners plus Victoria. It will have an expert board and a council of members that overlook it. So we have tried to put in place a national governance model that will lead, long term, to a collaborative national facility.

Ms BIRD—NEC made the point to us of how important it is that applied research is beefed up as opposed to just pure research, which was interesting. Is there any industry participation in your board?

Mr Roger—Yes, there is and will be. In fact the chair, I am sure, will be someone from an industry background, and that is why we put the emphasis here on the industry examples. These are versatile tools. They do fundament science and they do really applied—looking at a chrome plating example or a drug design.

Ms BIRD—I would argue that applied science just means somebody has snapped to the value of research.

Mr Roger—The sort of thing that my colleague has done in developing coatings, water shedding and cleaning coatings for buildings, uses synchrotrons; is saleable, is the sort of thing that we are good at in Australia. The board will be an expert board of up to nine from right around Australia but they are being chosen for expertise in science, industry, finance et cetera, as you would expect. It will actually be run by a company. One company will own the assets and there is an operating company.

Prof. Lamb—One of the things that I have found over the last 20 years of working in these facilities—I am based in Australia now and I go over to the synchrotron three or four times a year—is the fact that, because it is the one source that people use bits of, at any one time, you have a cross-section of the entire scientific and technological community of Australia and overseas. It is something that we tended to overlook early on but this is a great mixing point. What got me going was when you said about 'snapping to applied science'. Yes, I did that. In fact I did that when I was in Germany at a synchrotron because people said, 'You know, you could make something out of that'. That is the other aspect of this. Because of the fact that there are three to four groups at a time on each of the beamlines. There is drug design—

Ms BIRD—Instead of their little silos back in R&D in a company or in a university.

Prof. Lamb—Absolutely.

Ms GRIERSON—So it is an investment into the intellectual capacity in a community.

Prof. Lamb—More so than in any other place that you could ever be, including a university, where the silos are simply departments.

Ms BIRD—That is interesting.

Dr Hobbs—It is such a great melting pot. You have got nine separate groups working on different aspects and working around the clock, so that is all thrown together and a lot of good ideas come from the loungers around the outside, sort of thing.

I would like to make one other comment: you asked what is required to keep it running 24 hours a day. Apart from people and electricity, it is money basically because it costs about $20 million a year to run the facility. At this stage we have sorted out funding to keep us going for a little while. But in fact long-term funding is a key issue for us, which is not resolved yet and which we hope the Commonwealth continues.

CHAIR—Are you looking at alternative energy sources to drive it?

Dr Hobbs—Windmills out the back of it!

Mr Roger—It needs a very precise electrical supply with absolutely no gaps or interruptions.

Ms GRIERSON—And what about through-life maintenance? Is it such a fine system that it requires lots or not much at all?

Dr Hobbs—Part of the $20 million is regular maintenance. The facilities are typically maintained and shutdown is about four times a year. So there are quite a lot of parts that have to be updated.

Ms GRIERSON—You plan for that.

Mr Roger—In respect to the operating funding I think it is accurate to describe it as the subject of ongoing discussions between the science community, the Victorian government and the Commonwealth.

Ms BIRD—Does that $20 million include the fee-based stuff coming in? Or is the $20 million above and beyond the fee-based stuff?

Mr Roger—The $20 million keeps the facility operating—

Ms BIRD—It is not a big amount of money. In the fees that you would be charging, I imagine you would be able to cover $4 to $5 million of that in the fee-based stuff.

Mr Roger—International synchrotrons aim to raise five to 10 per cent of their operating from fee paying, because so much of industry research is done through the providers like CSIRO and ANSTO and universities, and they can basically access it free.

Ms GRIERSON—Its life usefulness, is that finite or is it something you are constantly upgrading and constantly adding to and embellishing?

Mr Roger—You are. The theoretical life is about 30 years. Most international synchrotrons are upgraded—

Ms GRIERSON—We would not like to think of how things will be in 30 years, would we?

Mr Roger—No. Typically though, you are upgrading and enhancing them all of the time. It is like any piece of fine technology, you have got to keep it at cutting edge or it loses—

Ms GRIERSON—And that is what is being done with the original ones? They are still running on that sort of model, they can keep upgrading? Or do they shut them down?

Dr Hobbs—The original serious synchrotron was built in England, in Manchester. It has been running for about 25 years and they have only just decided to shut that down and build a new one, a much bigger one.

Ms GRIERSON—It gets to the point where it is easy to do that.

Dr Hobbs—That is right.

CHAIR—Thank you for coming, it was very interesting. We will send you a copy of the *Hansard*, and that should arrive within a week. If you have any issues or if you want to provide any input to the secretary please let us know. Thank you very much.

Resolved (on motion by **Ms Bird**):

That this committee authorises publication, including publication on the parliamentary database, of the transcript of the evidence given before it at public hearing this day.

Committee adjourned at 3.02 pm