



HOUSE OF REPRESENTATIVES

STANDING COMMITTEE ON INDUSTRY, SCIENCE AND TECHNOLOGY

Reference: Effects on research and development of certain public policy reforms

SYDNEY

Thursday, 30 April 1998

OFFICIAL HANSARD REPORT

CANBERRA

HOUSE OF REPRESENTATIVES
STANDING COMMITTEE ON INDUSTRY, SCIENCE AND TECHNOLOGY

Members:

Mr Bruce Reid (Chair)

Mr Beddall (Deputy Chair)

Mrs Bailey	Mrs Johnston
Mr Martyn Evans	Miss Jackie Kelly
Mr Richard Evans	Mr Marek
Ms Gambaro	Mr Allan Morris
Mr Jenkins	Mr Nugent
	Mr O'Connor
	Mr Zammit

The committee will inquire into and report on the effect of public policy changes, over the last ten years, in the areas of corporatisation, privatisation, outsourcing and competition policy reform on the matters listed below:

the amount of R&D being carried out in Australia;

the nature of the R&D being undertaken (that is, basic or applied);

the relevance of the R&D to the commercial needs of industry;

the level of investment in research infrastructure and equipment;

the scientific and technological skills base and the demand for scientists, technologists and engineers; and

the education and training opportunities for future research staff.

WITNESSES

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Present

Mr Reid (Chair)

Mr Beddall

Mr Jenkins

Mr Richard Evans

Committee met at 9.27 a.m.

Mr Reid took the chair.

CHAIR—I declare open this hearing of the inquiry into the effects on research and development of public policy reform. I welcome the witnesses and others in attendance. We will be taking evidence today from the University of Western Sydney, the University of New South Wales, Australian Photonics CRC and the rural R&D corporations. I now call the witnesses from the University of New South Wales.

CAIRNEY, Professor Trevor Henry, Pro Vice Chancellor, Research and Development, University of Western Sydney Nepean, PO Box 10, Kingswood, New South Wales 2747

MARCEAU, Professor Jane, Pro Vice Chancellor, Research, University of Western Sydney Macarthur, PO Box 555, Campbelltown, New South Wales 2560

CHAIR—Welcome. I remind you that the hearings today are legal proceedings of the parliament and warrant the same respect as proceedings in the House. The deliberate misleading of the committee may be regarded as a contempt of the parliament. The committee prefers that all evidence be given in public but should you at any stage wish to give evidence in private you may ask to do so and the committee will give consideration to your request. Would you like to make an opening statement before we proceed to questions?

Prof. Marceau—I would just like to emphasise how important this inquiry is. R&D is not all of innovation but it is an essential part of innovation. I think all the international evidence is that innovation is going to be the key driver of growth in the coming decades and we need to look at it in that context. I would also like to make two or three points, one of which is to emphasise the fragility of the amount of R&D that is done in Australia. As you know from many submissions, I am sure, the business sector of Australia does relatively little R&D in international terms and it may well be that that amount is now decreasing. It is very important that we do not let it decrease, because the driver of growth is definitely innovation and R&D is a critical part of that innovation.

I would also like to say that the committee in dealing with its terms of reference is dealing with extremely complicated issues on which we do not really have good data at the moment. They are very complicated issues because much of the impact of the kinds of policies which you are considering is indirect impact rather than direct impact. It is mediated through what the organisations concerned are doing and the change in their focus.

For example, one of your terms of reference relates to the amount of R&D that is performed. It seems likely to me from ringing around various places that the amount of money spent on R&D may not be decreasing in the privatised utilities, for example, but the focus of the R&D is changing quite dramatically. It is going much more towards market research rather than technological investment. I think that is a very important shift.

The second thing that is happening is a shift in organisational structures, which means that many of the new units are really too small to conduct serious technological R&D. I think that there has been this shift to breaking up business units in a way which is familiar to the new people who run the enterprises but which may not be the most appropriate for enterprises which essentially are technologically based.

The third thing relates to what I said at the beginning—that is, relatively few companies conduct R&D in Australia. Telstra, for example, is by far the biggest. In 1996 it spent 10 times more on R&D than the tenth biggest. Telstra and BHP together conducted 12 per cent of all business related R&D. So what happens to those big spenders is extremely important.

CHAIR—Professor Cairney, do you wish to make any additional comment?

Prof. Cairney—I did not hear all of the first comments, so I will not attempt to at this stage. It is a very important inquiry and that is why we are pleased to be here.

CHAIR—Thank you very much for your attendance. There are a couple of things I would like to ask. On page 2 of your submission you say that anecdotal evidence suggests that the reduction in the tax concession rate to 125 per cent has caused the drop in the amount of R&D conducted by around 20 per cent overall. I just wondered if you have any hard evidence on the effect of those changes, particularly with the changes to the R&D start program and the implementation of that.

Prof. Marceau—I do not have hard evidence. That is anecdotal in evidence from companies essentially. The big drop—the 80 per cent drop—is due to the change in rules about feed stock. That seems to be fairly well accepted, because you can no longer include feed stock as part of your R&D. This has caused a big drop in what was previously classified as R&D. It is hard to decide what is R&D in many areas. I think that is one of the things which is really important to think about because there is R&D about processes and R&D about product. They are very different kinds of R&D and they impact in very different ways in the economy as a whole.

Prof. Cairney—It is quite clear that a number of comments of that kind have been made by companies with whom we deal. There are individual companies for whom I know there has been a reduction. The figures that are suggested there are figures that Jane has derived from another report.

Prof. Marceau—No, they are from conversations with people who do the tax returns.

Mr BEDDALL—I have a number of dealings with people who are involved in this. It seems to me also—I am not sure of the new system—that getting a grant becomes increasingly difficult. You have to have great perseverance. A friend of mine is involved in a \$750,000 grant. I think he is in the third attempt of getting it. Is that a common experience?

Prof. Cairney—A common comment from companies is that at 125 per cent, it is hardly worth the trouble and effort. The differential is hardly worth continuing to be involved in seeking.

Mr BEDDALL—I am talking about government grants. He will go six times, because, in the end, he always gets the grant.

Prof. Marceau—It is hard. It is a competition and because it is a competition the rules change slightly every time. They are not necessarily consciously changing but you look at different things as the applications come before you because rules are general. You have to look at each application and the competition is amongst those applications that you actually have on the table. I think it is very difficult. You cannot always read the committee's mind. You do not know what the competition is.

One of the things that is happening is that there are more R&D companies. There are companies which are being split off, as are indeed companies from larger enterprises in some cases. So in a way there is perhaps more competition for grants because those companies have to operate differently. They do not necessarily get the internal funds that they used to get when they were part of a larger enterprise. There is more competition for the grants in that sense, I suspect. Again, that is anecdotal evidence; I cannot say for sure.

Prof. Cairney—There is also enormous variation in the ability of companies to be able to organise themselves to apply for grants, even a tremendous variation in the amount of knowledge of grant possibilities, especially when you get the small to medium enterprises.

CHAIR—You make mention in your submission to us that universities and other R&D providers conduct relatively little commissioned research for industry. Would you like to elaborate on that a bit and tell us why that is happening?

Prof. Marceau—If you look at the international statistics, in some countries industry commissions a great deal more than it does here. One of the reasons for that is to do with the industrial structure that Australia has. There are relatively few technologically innovative companies and relatively few companies that use science as the basis for their product development. There are very different relationships between universities and industries according to stage of technology, level of technology and trajectory of technological development. Much of the demand, as it were, that comes from industry is due to the basis on which that industry is operating. Much is not done in Australia because we have, by OECD standards, one of the lowest technological industry structures of the advanced countries. We are kind of above Greece and Portugal but not much else. That is a major problem for us.

Prof. Cairney—Having said that, we are at a critical time when universities are undergoing great change. People recognise that universities are in a better position than they would have been before in terms of their willingness to enter into innovative alliances. There is a great window of opportunity as we reform higher education and as universities realise that there have to be different types of institutions. If we can have an alignment of policy which relates to industry at the same time that universities are

undergoing such great change there are quite real possibilities here for us. But it will take good policy development to ensure that both of those significant changes are brought together. Our university increasingly has companies that are approaching us to talk about quite creative alliances, relationships and partnerships. But a lot more can be done.

CHAIR—I want to return to another part of your submission. You are saying that you have anecdotal evidence of smaller electricity companies selling at below cost price to compete for market share, saying that that practice is unsustainable. Obviously it would be if it continued long term. I wondered on what you based what the companies might be that are selling below cost price.

Prof. Marceau—It is entirely anecdotal evidence. It is from companies in the field. It was just told to me when I was making inquiries in order to write the submission that these are some of the things which are happening. There does seem to be a consensus that the kind of R&D that is being done has changed to customer focus. That might be part of this.

CHAIR—Was that the reason why they were saying that they were ceasing their input into R&D?

Prof. Marceau—Yes, it might be. It is only anecdotal evidence, that is all I can say. It was just too early to tell in many cases. Companies still seem to be developing different strategies to deal with their new situation. It is a very turbulent time.

Mr RICHARD EVANS—I am interested to know whether you would have a view on the amount of research done commercially for Australian companies as compared to, say, multinational companies based in Australia. In other words, are multinational companies based in Australia researching in Australia and, if they are, how does it compare with Australian companies?

Prof. Marceau—You mean Australian owned multinationals?

Mr RICHARD EVANS—No, I mean overseas multinationals.

Prof. Marceau—Overseas multinationals doing research in Australia. It depends on the sector to some extent, but mostly multinational companies do research at home; it is one of the core competencies they keep at home. That is changing, and it is partly changing because of costs. A lot of R&D is going to India in the software industry and those kinds of things. I think that is partly a cost issue.

Mr RICHARD EVANS—What sorts of costs?

Prof. Marceau—Scientific personnel costs, which are just so much lower.

Mr RICHARD EVANS—So it is manpower costs.

Prof. Marceau—It is manpower costs, but they are really dramatically different; it is not a marginal cost. That is not happening in most industries. Many industry simply keep it at home. Last year I did a small survey of the biomedical device industry in Australia and I was actually quite struck by the multinational companies that said to me, ‘Well, we are not allowed to spend more than \$1,000 here without permission from headquarters’ or ‘We do not even look at innovations that come to us here, we just automatically send them back to the US or wherever.’ I had really thought that that was past but it is obviously still there. But companies like Ericsson do a lot of research here and they commission a lot of research from universities, so it varies a lot really.

Mr BEDDALL—What about when Telstra stops buying from Ericsson, which it seems it will now do? It has already indicated clearly that, because it is privatised and it is global, it is much better to buy off the end of ATT production for a switch panel than to build it. That must have a huge impact on R&D in Australia.

Prof. Marceau—It will have a huge impact, undoubtedly. Whatever Telstra does will have the biggest impact of everything on the amount of R&D. It was \$260 million in 1996, and that was ten times the tenth largest provider. Ericsson’s is also changing all its strategies worldwide because it is beginning to operate in a deregulated telecoms environment worldwide. I know that, for example, in what they do about chip development what they are doing now is buying all their chips from NEC and they just have a small bit which is Ericsson’s IP in the corner, as it were. Then they can adapt that to whatever country they are operating in. I know that Ericsson’s worldwide is dramatically changing its corporate strategies in relation to R&D and where it puts its intellectual property. All of these things are intertwined, I think.

Mr BEDDALL—You said the second highest was BHP. It is hardly in a position to be increasing R&D development.

Prof. Marceau—No, it is not; absolutely not. Those two were 12 per cent of all business related or business conducted R&D in Australia. It is just a huge concentration.

CHAIR—When we visited Telstra’s research laboratories recently in Melbourne, we were advised by management that most of the reductions in expenditure had been in the middle management area. Do you have any comment on that?

Prof. Marceau—No, I have not looked at what Telstra is doing in detail recently; I have only looked overall. I have looked a bit more at Ericsson’s and I do know a bit more about what Ericsson’s is doing.

Mr BEDDALL—Telstra may keep its own R&D going to some degree, but Telstra was a big outsourcer, wasn’t it?

Prof. Marceau—Yes, it was. The reason that we have Alcatel and Ericsson's and quite a big equipment industry relative to the size of the market is the strategies Telecom had. OTC was actually particularly interesting because OTC was early in outsourcing, as it were, to the region or getting into the region. What they did was use a lot of local companies. For example, in Vietnam they set up a ground station and then they brought in a whole lot of Australian companies to service that and to set it all up and to do all of these things. That is not happening anymore to the same extent, as I understand it.

CHAIR—Professor Cairney, do you have a comment?

Prof. Cairney—I do not have specific knowledge of Telstra except that I am involved in the cooperative multimedia centres, and I know they are certainly maintaining their strong commitment, second only to the Commonwealth government, in that particular research enterprise. I think one of the dangers here is that it is quite unrealistic to expect large multinational corporations to be doing huge amounts of research and development in Australia.

While reports like Jane's show quite clearly that there are a small number of companies that are involved in large-scale research and development, a major part of the game for us has to be to encourage research and development at all levels, and it is in those medium enterprises where far more can go on and, far more realistically, it can go on within this country rather than being lost and exported elsewhere. But it is there where industry policy is so critical for ensuring it stays.

We may well get some of the major multinational corporations to do some focused niche research and development here, as many of them still do, but that will come only if the right climate is there to encourage them to stay rather than continuing to do it wherever—Orlando, Atlanta—

Mr RICHARD EVANS—The right climate is money, is it?

Prof. Cairney—Government policy and incentives of the research and development tax concession kind will certainly help. It depends whom you are looking at. When you talk about the smaller organisations, often it is very basic level support which enables them to bring together their various companies—

Mr RICHARD EVANS—What sort of support, though?

Prof. Cairney—Some of the government initiatives that we have had in the past have been killed off. For example, the REDOs were funded up until two years ago and were attempting to bring together many small to medium enterprises, encouraging them to work together not just in research and development but commercially. That low-level support is very important, as well as chasing the large multinational corporations. We will get quick returns if we can get IBM and several others to bring billions of dollars worth of

investment here, but over the next 20 to 30 years we are going to get a lot of long-term return from investment at the other end as well. I think it is dangerous to lose sight of that end of the game, and our response makes reference to that.

Mr BEDDALL—You talked about tax incentives. What about tax disincentives? There has been a view growing amongst investment consultants that Microsoft, for example, could never grow in Australia because of the capital gains tax regime. Bill Gates would have a 50 per cent tax liability on his shareholding. There is an argument that Memtec—I think it is Memtec—has relocated to the United States because of the capital gains tax regime. For small R&D companies, all they have is their growth and their growth is a capital gain. Do you think that is an area government should look at? I do not know what the capital gains tax is in the United States, but it is certainly not a marginal tax rate of 47c.

Prof. Cairney—I think we have to look at everything that is necessary. Memtec is something close to our heart and it grew out of Richmond. To see it—a key, young, small enterprise that grew to a medium enterprise—needing to go overseas—

Mr BEDDALL—It is a \$60 million company, isn't it?

Prof. Cairney—Yes. It is now doing quite exciting things, but it has needed to go overseas; and it never wanted to, frankly.

Prof. Marceau—One of the problems in that particular case was reluctance by public sector organisations to actually test it and use it.

Mr BEDDALL—Yes. In this city.

Prof. Marceau—That is right. I think you need to look at several sides of the equation, and Trevor's point about needing a whole range of support activities is very important. We have a thin line of high-tech activity, but we have all the rest and the capacity of that rest of this technological industrial structure needs to be upgraded, and you need different kinds of policies for different kinds of things. We need to be a lot more subtle and sophisticated in the way in which we support enterprises. One tax rate for everybody is not the right approach, because not everybody will be able to take advantage of it, it will be irrelevant at different stages of technological development and it will be irrelevant in different sectors in different ways and to different size companies in different ways. So I think we need to get a lot more sophisticated about this.

One of the things I have just been looking at, in answer to your question, is the network program that AusIndustry ran which has just been cut. It was quite clear to me that one of the things that is happening is that the networks are encouraging small firms now—and it is just beginning, ironically—to conduct more research because they have got a bit more scale. Scale is a critical issue in Australian industry. Having five companies

gradually developing the trust to work together and invest in R&D collectively is inevitably a slow process. Companies—small companies in particular—think of themselves as isolated entities, and one of the problems with privatisation and the emphasis on competition policy is that it reinforces the boundaries around enterprises when they should be thinking much more collectively in terms of networks, collective investment, collective infrastructure, technological infrastructure and R&D infrastructure. Some of the networks I looked at were just getting to that point, and they probably will survive and actually do it, but a lot more could have got to that point.

CHAIR—Would you like to tell me a little bit more about how you see that collective infrastructure with firms operating? You have alluded to it in your submission.

Prof. Marceau—One of the things that is enormously important and enormously underestimated in Australia is design. We have virtually no training in design; we have very few design houses. We do not focus on the design elements and that is often where a lot of the R&D can be done. Generally in manufacturing internationally, the services end of manufacturing is actually leading the manufacturing process and the upgrading of manufacturing processes.

CHAIR—That sounds familiar.

Prof. Marceau—It is true: design houses are very important. Project management skills are really important. One of the things that people told me when I was talking to the utilities is that they are beginning to lose project management skills so they cannot collect the information and do the R&D that other people are doing and put it into practice in the things that they are actually doing. So we need to think about those kinds of support structures, and to some extent those are collective—education and training courses and R&D facilities. For instance, the manufacturing centre in South Australia is clearly leading some of the activities that are going on in manufacturing in Australia.

Prof. Cairney—It is worth while saying that universities have a key role to play in that particular area, and in a number of other areas. It is no accident that design, for example, is an area within our university from which we have just spun off our first two companies, which are both focused in design. One is an advanced design research centre; the other one is an industrial design company that will be working, hopefully, with a variety of manufacturers in Asia. There is a crying need for it. If we can cleverly bring together expertise in the industry sector and in universities, there are great opportunities. But there is a lot to be done.

CHAIR—Has the area of design been neglected in academic circles over the last few years? This is the second inquiry we have undertaken where we have received comment about Australia's inability to participate in the design stages of a lot of major projects.

Prof. Cairney—It is just emerging now. Yes, there has been a neglect, but in a number of places there is an emerging interest and expertise in design. The critical thing is to be able to bring together university expertise, infrastructure, et cetera with sharp-edged industry knowledge and expertise. The cooperative multimedia centres are an example on the edge of that: there is an attempt to bring together industry and universities. We need more endeavours of that kind.

Mr BEDDALL—In the commercialisation-privatisation debate, there has been a great silence from the people who oppose these things, not for the sake of public ownership. When I was in China the people kept saying, ‘Where has Pacific Power gone?’ It was very active in China and all of a sudden it decided to compete against itself. The debate has not taken account of the vast opportunities lost. Austa took up those opportunities from Queensland, but now it is going to compete against itself, so it will disappear from these emerging markets. Is there any need to get the debate focused on the fact that not only is it good to have competition but we need to have critical mass so we can compete on world markets for critical projects? We did some very good things in China in retrofitting power stations and all of those types of things that we are very good at.

Prof. Cairney—That takes time. Jane mentioned the time element in relation to technology networks. It takes time for any of these things to work. The REDOs were seen almost as a complete failure, but some of them were only just starting to do decent things at the end of their funding. It does take time. It takes a long time for companies to start to think about someone who might be just several kilometres away as not just a competitor but a potential ally in a different game. That will take a considerable time.

Mr BEDDALL—There is a great irony in what Jane said about the networks disappearing, seeing as I created the networks in the first place: at the time I am leaving politics, they are disappearing with me.

Prof. Marceau—To add one thing to what Trevor said, I think the issue of scale is really very important and should not be in any way underestimated. It seems to me that there are three critical issues. One is that you need to work out how to make sure the biggest are also the best and that is, in a sense, what sometimes privatisation competition policy might be about. Secondly, you need to be sure that you can get any players—that you are not actually creating barriers to the entry of new players. The third issue is scale, because so many of our new companies are small to medium sized. That scale issue is really a critical issue.

Mr JENKINS—Professor Cairney, can you give us examples of where REDOs have assisted medium to small businesses?

Prof. Cairney—Of just those that are closest to me and in terms of networking and bringing together small to medium enterprises, the western REDO, for example, has

recently been able to do a variety of industry audits, which have then been disseminated to small business and industry and medium enterprises to encourage them to look at where there might be gaps and where there might be opportunities.

I have to think of the Western Sydney REDO. I do not have a close association with it, but that particular group has taken a number of years to be able to develop the contacts and the confidence and the skills within its own staff to be able to work closely with local industry and business doing something that is not readily done elsewhere, that universities do not do and that government does not necessarily do—fitting in between.

Even in terms of networking, western Sydney is a special case in that we have a good history of having lots of organisations that do not necessarily work together—and that includes government departments—of many players but not necessarily great coordination, and they began to fulfil a role of being able to bring together players. The North-West REDO and the Western REDO have both done that.

There are times when major companies have come knocking metaphorically on the door of western Sydney and it is the REDO that has managed to get the players at the table just to talk when there was really no other effective mechanism to do that. There have been several important examples of that which have not led to the relocation of the industry, unfortunately, but where they have been facilitating that. Long term, I am sure, you have got to be involved in lots of that work before some of them are successful and they have played a part. That is not the only way that can be done, but it is one group that is doing it, and in its absence someone else has to be attempting to do that.

In western Sydney, where we are negotiating all of that, the state government is closely involved. They have created a new ministry. They have created a new office for western Sydney. They have located on one of our campuses, which I think is a first: for a government department to locate itself on a university campus. What they are trying to do is work closely with the university because they understand that knowledge and skills transfer and technology diffusion is critical to the region's development and that the university has a part to play in that. So there has been an attempt to bring together government and the university in one place.

We have located our major research institute on the same campus—the Western Sydney Research Institute—which, again, is an attempt to bring together government, industry, business and the university in one major research organisation. It is those sorts of innovative approaches which will enable business and industry to start to understand how they can work together rather than always needing to see that they are just simply in competition.

Mr JENKINS—From your institution's point of view, how do you go about marketing what you have to offer? You talked about it getting to a stage, say, in design where you have set up corporations—that is about structure and everything—but at some

stage how proactive are you at trying to interconnect with places where you think there is potential?

Prof. Cairney—Much more active than we were, let me say. We were not active at all a few years ago, but I would say we are very active in doing it now. The main way you sell your capabilities is by delivering. So the first thing that we have tried to do as a university is to show that we have knowledge, we have information, we can manage information and we can share information—which no-one else is doing. So we, for example, produce numbers of economic indicators for our subparts of the region. So we have basically said to business and industry, ‘We can show you the information, we can show you where there are gaps, we can show you where there are opportunities and we also have some expertise which can be used as well.’

It is by being able to deliver something which they need that they start to become aware of capability. I believe that all of our contacts in the last two years and that many of the things that are happening are only because, first of all, we have contact—we have created some structures which enable that to happen—and we have actually delivered on some products and some research, which has shown to industry maybe there is more to the university than it thought. That is the basis upon which the university will build those relationships.

Mr JENKINS—What is the balance of the research that you are involved in that is applied on a product base as against pure basic research?

Prof. Cairney—I think this paper makes the point very nicely that to keep thinking about basic and applied as separate categories which are totally removed from each other does not necessarily help us. We are involved in basic research and we are involved in applied research. We probably wish we were involved in more basic research because we receive more federal funding in that area. We are involved in a lot of basic research and increasingly involved in more applied research. But many of the issues and problems that face our region require you to move back and forward from basic to applied. As this paper shows, there is no sense of a linear process.

We often start at the applied end and we see opportunities working backwards to go back to basic research, which is important. Industry will turn up and want a very practical problem solved, which is almost at the level of consultancy. That might be the beginning of the relationship. So we have set up programs where a student might be involved in a very applied project. We have worked back from that to major projects, and we have worked back from that to basic research. You may well establish a credibility to business and industry by having the best basic research unit in a particular area in the country or internationally. So it is a complex process. We do not seek to be involved in primarily one or the other. We are seeking increasingly to become a university that recognises that there are problems that we need to address and that we can do it with industry and with business. That may sometimes require us to be involved in high end

basic research or very applied work. I think learning economies require that from universities.

Mr JENKINS—Is that mirrored in the training efforts? You have identified the types of students that you should be training.

Prof. Cairney—Increasingly. I would be less than honest if I said that is always the way that universities have worked. It has not been, but increasingly that is the way it is happening. We are looking at the research effort and the training effort being combined. I will give one practical example. We just set up a major mechatronics facility on our Penrith campus. That mechatronics facility we believe is the best in the country on a university campus. It is focused on manufacturing. It is designed to enable undergraduate students and postgraduate students to be involved in one of the best facilities in the country. Fanuc designed it. We have worked with Rolls Royce on it. It is a major facility. It is a training facility, but it is a research facility. It is a networking facility within the region. We have created a metals network with manufacturers focused on that facility. We are moving from training to research and back again—back and forward all the time.

Mr JENKINS—Is it likely that the competition between tertiary institutions will lead to gaps in appropriate training of undergraduates?

Prof. Cairney—Possibly. It is hard to know. If universities do their job, they will be finding those gaps quick fast and filling them. That is certainly what we are doing. We are trawling the courses of the country. We are trawling the research efforts of the country, and we are looking for gaps all the time and seeing if we are capable of filling them.

Prof. Marceau—There is a problem when everything is student centred. For example, UTS had the innovative manufacturing degree, which they have now had to cease because there simply was not the student demand for it. In a sense you have to have the demand from students matched to the demands from industry matched to the capabilities of the universities, and that is a very complicated issue. At 17 or 18, students often do not know what career structures there are in manufacturing, for example. They do not know what choices to make so they go for the obvious choices like accountancy, which is really much more familiar and straightforward. They do not go for the more complicated choices which involve a lot of long-term thinking and knowledge.

Mr RICHARD EVANS—For those who are graduating, are there careers available in Australia or do you find a lot of scientists are moving offshore?

Prof. Marceau—The number of scientists employed in Australia has risen more or less at the same rate as the investment in R&D. Companies have been taking on scientists. They have not been taking on engineers, which suggests that they are doing R&D on the science end but not on the engineering product development end. Which companies they

are I cannot tell from the statistics. You would have to look in great detail, but I know the Institute of Engineers is quite concerned about the development end of R&D rather than the research end. We essentially train scientists, and there seem to be opportunities for scientists. It is harder for engineers, I think.

Mr RICHARD EVANS—You talked before about Western capital going to places like India. Are they taking Western manpower or are they using Indian manpower?

Prof. Marceau—No, they are using Indian manpower.

Mr RICHARD EVANS—You talked about the company Memtec going to America. You were saying one of the reasons why was that people in Sydney were not using their product. Why would that be?

Prof. Cairney—There is a risk involved in investing in anything, and they judged that there was a bit of risk in being involved with a fledgling company. It was a bad decision. They should have been involved.

Mr RICHARD EVANS—What I am trying to get to is what needs to be in place to overcome that risk? Is there a mental block against Australian innovation? That is the question I am probably asking. Is it better if it has an American stamp on it? Is there a feeling within Australian industry that Australians cannot produce, invent or whatever as competitively as things from overseas?

Prof. Marceau—There are scale issues to some extent. Often people think reliability is associated with scale, and it is much easier to use the familiar, with all the after sales and the relevant technologies well established. I think that is very important. To some extent privatisation encourages that view. You do not take so many risks.

Mr RICHARD EVANS—How do we overcome that? You mentioned dollars and government policy before. Obviously it is an evolutionary process, but what sorts of things do we need to be putting in place to change the culture in 20 years time?

Prof. Cairney—I do not know. We have had a number of reports that have put the boot into management and, to some extent, maybe we do need a different type of management in this country that is prepared to take different sorts of risks. It is not surprising that at times companies or even government authorities are not prepared to take risks and might well look to international companies which perhaps have longer track records and have been seen to have been delivering in that area.

Mr RICHARD EVANS—In management training at universities, we have to put more emphasis on R&D within management training. It has to be not just the cursory unit in the first year of management but a stream within management training.

Prof. Marceau—You could argue that, but the proportion of managers with degrees are still very low in Australia—outstandingly low.

Mr RICHARD EVANS—It is probably to do with the quality of the degrees.

Prof. Marceau—In international terms there is a table here—it is a little out of date now and it has changed a bit but not substantially—which shows that we have something like 20 per cent of senior managers who have degrees, as opposed to 80 to 90 per cent in the US, Japan, France and Germany. That is a big difference. That is not to say that degrees are everything; they are not. If you are going to think about technologies, you have to have a receptor. You have to have some knowledge that enables you to see what the value of a particular technology can be. It is very important that organisations have this internal capacity to understand what is happening outside so that they can assess the risks better.

You need engineers to understand what engineers are telling you. You need scientists to understand what scientists are telling you outside. I think the answer to your question is a very complicated one, because it is associated with a whole range of institutions which surround the enterprise—one of which is the banks and what the banks expect as the bottom line. People say that the banks now expect a profitable bottom line not three months down the road but one month down the road. The whole way in which the financial system operates is very important in how people assess the kinds of risks that they can take.

Mr RICHARD EVANS—We might have a low rate of managers with degrees in Australia, but I think what universities must look at is how to get these managers re-entering tertiary institutions. At the moment it is almost impossible to do that in regard to cost, time and appropriate training. That is my personal view as to why a lot of managers probably are not re-entering the tertiary side.

Prof. Marceau—I think we are trying to become more flexible and provide more customised courses for companies, but the companies also have to recognise the value. Since the end of the training levy, the amount of money devoted to training by companies is falling.

CHAIR—May I suggest not only companies but also the individual managers themselves have to recognise that.

Mr BEDDALL—We are only days away from a federal budget, and maybe nirvana will come and there will be a whole lot of money for research, but probably the converse will be true. The Mortimer report recommended a cut of \$146 million to \$20 million in CRCs and more from universities. If these things are taken up and implemented, what do you see as the prognosis for research and development in Australia? How successful, in broad, do you think the CRCs have been?

Prof. Cairney—I think it would be a very retrograde step to take significant funds away from the CRCs, which are really one—

CHAIR—Mr Beddall was speculating.

Mr BEDDALL—But it is a recommendation from Mortimer.

Prof. Cairney—I do not expect that to be taken up. It would be fairly foolish because we need more money put into those sorts of innovative approaches. I think broadly the CRCs have been successful. Again, it takes time. Some of those CRCs are going very well; some are going not so well. But that is what research and development and business is all about: you let a number of hares run and some of them will fall over and hit the wall and they will die. You cannot afford too many of those, but I think overall they are doing very well. But you don't want to put all your money or all your emphasis into that one strategy because there are only certain companies and certain universities that are involved in those areas; you need to keep going out from that. That is the high end type of government expenditure. There are many other things to be done.

CHAIR—A final comment from Professor Marceau?

Prof. Marceau—I would like to support what Trevor Cairney has said, but I think also we need to be a bit more innovative about the kind of research programs that we offer. There is a move internationally to a more flexible research team effort, some of which includes members of universities, business, community organisations, government—all kinds of things—and those teams are much more transient than CRCs. CRCs tend to build walls around themselves in a way, and many of the issues can only be addressed in other ways. We should not take away anything to with research in Australia because we do so little relatively speaking, but also we need to be more imaginative and think about more flexible ways of doing things—like having joint industry-university things which go for three years, for instance, or the particular set of problems may be identified jointly between the two, and then do that research and have another set of partners.

CHAIR—I think we probably need to move on. I note that you have brought a number of publications with you. Would you care to table those and then I can move the formal receipt of them as exhibits or submissions?

Prof. Marceau—Yes, I would like to do that.

CHAIR—Would you like them as part of your submission or as exhibits? As exhibits is probably the most satisfactory.

Prof. Marceau—Okay. This report, which is the one that Derek Sicklen and I did last year commissioned by the Australian Business Foundation, runs through many of these issues and is referred to in the Institution of Engineers submission to you, for

example, and I think several others. These are just summaries of that report. I have one further document, which has some extra tables in which you might be interested.

Prof. Cairney—I also leave with you information on the Western Sydney Research Institute as an example of a university business enterprise.

Resolved (on motion by **Mr Beddall**):
That the documents be received.

CHAIR—Thank you for providing the evidence and answering the questions for us this morning.

[10.15 a.m]

COOK, Mr Peter, Director, Research Office, University of New South Wales, Sydney, New South Wales 2052

CHAIR—I call the representative of the University of New South Wales. Welcome. I remind you that the proceedings here today are legal proceedings of the parliament and warrant the same respect as proceedings in the House. The deliberate misleading of the committee may be regarded as a contempt of the parliament. The committee prefers that all evidence be given in public, but should you at any stage wish to give evidence in private you may ask to do so and the committee will give consideration to your request. Would you like to make an opening statement to add to your submission before we proceed to questions?

Mr Cook—A very brief statement. My colleagues from the University of Western Sydney very eloquently made the case and in part stole what thunder I had to present to you today. I would like to say that we need to recognise that during the 1980s and early 1990s government policy did mean that industry and universities, and to some extent the larger public authorities in Australia, did develop a collaborative research culture, and government policy forced it in that direction. The benefits of that across the country are still coming out.

However, there has been a perceptible shift in the last five or six years in the sense that, with the increased privatisation of public authorities, with the economic situation in a range of industries across the country, short-term motives and investments are the sorts of issues that are now at the forefront in those privatised organisations, and it is increasingly difficult to get them to focus on medium and longer term research processes. From the universities' perspective, it is far more difficult now to negotiate with industry or the privatised public authorities and to get them to focus on the longer term issues.

There is also a perceived move in government policy, and I give an example of that in that there are currently considerations in the Industry Research Development Board that the very successful AusIndustry R&D START program for collaborative programs between universities and industry should refocus, with the funds not being provided in a collaborative way to universities and industry but strictly to industry and then industry in some way contracting back to universities.

Those of us in universities, and in fact a number of people in industry, see that as a retrograde step in the sense that it relies on the myth that industry has now reached a stage that it can and will take up the banner of research. The reality in this country has been that, without the involvements of research and development institutions like universities with industry, local industry has not taken up those medium term and longer term objectives.

CHAIR—Thank you very much. You said in your submission that there had been a trend to R&D expertise being obtained from overseas, bringing an offshore element into that. Do you have any hard figures that might support that contention? You repeated it again in your opening remarks.

Mr Cook—No, I do not, and I do not think those hard figures exist. It is anecdotal evidence at the moment. But the University of New South Wales has a long tradition of dealing with industry and has built up strong working relationships with industry and also the larger public sector authorities. With their privatisation, a lot of those organisations now import technology and do very little local research. It is easier for them to buy something off the shelf from America or Europe and then attempt, often with some difficulty, to customise it to local conditions without actually doing the research and development in Australia themselves.

Mr BEDDALL—I am aware of some lateral thinking taking place in this area, and a very high tech company I know is now looking to overseas partners as investors in their R&D for reciprocal arrangements where they will be distributors for Asia, or whatever. Are the universities starting to look at that sort of scenario? There are many Asian corporations, despite the current meltdown, that are still very financial that do not have the R&D capacity or the universities to do the R&D. Australia does have some very good universities and, despite the Indian competition, I think we still have some of the cheapest engineers in the world by a comparative process—

Mr Cook—And the most innovative.

Mr BEDDALL—Yes. So is there any of that lateral thinking going on that you are aware of?

Mr Cook—Yes, but it is embryonic. The difficulty is that, at the moment, there is such a huge change happening in industry across the country because of government policy. With the various reports in the last six months, there has been some uncertainty about where research and development will be placed on the agenda, and industry has paused. Universities are still talking to them and trying to make sure that research and development remains on the agenda. The University of New South Wales is, in a sense, in a fortunate position in that it has a long history of having overseas students, particularly from South-East Asia, and the large push of our international office and my research office is to get into Asia to develop those links which we already have. A number of our graduates are now in very senior positions both in government and in industry. We are certainly moving to try and further those links so that we might actually take on offshore research and development for them.

Mr BEDDALL—Have you got a comprehensive register? A lot of universities had to go back and redo it because they did not keep it during the Colombo Plan.

Mr Cook—We are fortunate that our alumni association has maintained very good records and we have made good use of them through our international office.

CHAIR—In your submission you talked a fair bit about people in public sector organisations not training the engineers, scientists and research people that perhaps they should be. There has been a massive input of financial support, funded by taxpayers, to training those people. Do you think that should be continued or do you think that private industry should be playing a greater role in the training of those people?

Mr Cook—I am an example of it; I went through university and did engineering on an industry funded scholarship. That culture has certainly been lost in this country, and in the last 20 years government has had to take up the culture, if you like. It certainly behoves government to give incentives to industry and, for that matter, to the larger public authorities—electricity, water supply, where they are not yet privatised—to enable them to provide cadetship and scholarship funding for undergraduate professionals, whether they are in engineering, accountancy, science or any of those sorts of areas which, in reality, are going to produce that sort of shift in Australia.

CHAIR—Even without scholarships, the public sector employers were probably subsidising the training of engineers and scientists. How do you see that in comparison with what is happening today? Do you think that has diminished, or do you think that it is running at about the same level?

Mr Cook—I think there was a culture about 20 years ago where there was not so much a sense of research and development in the country but there were big infrastructure projects which drove the larger public authorities. With the maturing of those infrastructure projects in recent years and, in fact, cutbacks in the larger scale projects, public authorities and industry have not seen the need for supporting engineers or scientists, for example. They still work in collaboration with universities. For example, the University of New South Wales runs a cooperative undergraduate program where we work with industry to identify needs across a broad range of disciplines and get industry to fund scholarships for students. We have something of the order of 600 students across the university who are on private sector funded scholarships—to produce the graduates that industry actually wants.

CHAIR—So you think that we have moved to another stage, particularly in the electricity and water industries, where we have done a lot of the infrastructure, which is in place, and that that was a training period and we have now moved on. Much of that infrastructure is working and the requirements of those organisations is not as strong.

Mr Cook—That is part of the case, but the reality is that technology moves on, and I think universities are fearful that in the electricity sector, water supply area and telecommunications, as technology moves on, those industry groupings are not going to have the expertise within their work force to be able to continue the research and

development that is going to be required. All that we will be doing is bringing into the country technology from overseas which may or may not be relevant to Australia. There are a number of examples. For example, in the electricity supply system in Queensland there have been problems recently. It could be argued—I will not attempt to argue it in full—that part of that is to do with the fact that they were privatised and they are not interested in research and development; they are not necessarily interested in doing the research that is required to implement overseas technologies. If you want to look at the Victorian ambulance supply system, again it was overseas technology with no local research and development, and we paid the price.

CHAIR—The telecommunications area is considered one of the fastest growing areas in the world at the moment. That may not apply to the water and electricity industries to the same extent. Is that your own view of where those industries are at the moment?

Mr Cook—Telecommunications is a strong industry sector in Australia and there traditionally has been research done by the multinationals. You heard in the previous submission that Ericsson's and others are here largely because Telstra was a big player and clearly was a major supplier, and so research was done within this country. The trend, and again it is anecdotal, is that that is becoming largely not the case and that in future what will happen is that those people will wind down their research operations in Australia. Just to repeat what you were told before, since its partial privatisation Telstra has reduced substantially its in-house research and has markedly reduced its outsourcing of research to universities and other parts of the research and development community.

The other difficulty is that senior people in research in these organisations, and Telstra is an example, no longer have jobs in that sector. In fact, in some cases they do not have jobs. So when at some stage in the future research and development cooperation between universities and those organisations might re-establish itself, they do not have a culture anymore that allows that interaction to proceed in an efficient way. Often when we deal with privatised public sector organisations they do not have the personnel to understand what we are talking about any longer because it is not a priority of that organisation, and research and development has been wound down.

Mr BEDDALL—To say that the electricity industry is a sort of dinosaur industry in many ways belies the fact that there is a big movement in the United States to have electricity carriers become telecommunications carriers because they have infrastructure. I notice there has been some talk of the electricity corporations in Australian doing that. Are you aware of any research they might be doing to progress that, or are they going to be buying off the shelf?

Mr Cook—I am personally not aware of that, but I would be surprised if any local research was happening in that area. If you look at the Optus example, Optus has not done any research and development in Australia in any real sense and probably never will, and

that is probably where Telstra will eventually go. In terms of trying to optimise public infrastructure in using power systems in telecommunications, whatever is produced elsewhere in the world is probably what we will end up doing. That in a sense may not be such a bad thing, except that what we need in this country is people in those organisations ready to do the research and development that brings that technology into Australia in a way that suits us, and that simply is not there anymore.

Mr BEDDALL—I think it is a fact that Australians do not realise how big a telecommunications market we are. In 1994—the last time I checked—we were the eighth biggest telecommunications market in the world. We are not a small player. We are a bigger telecommunications market than China, which is why Ericsson and Alcatel, et cetera, were here. They were using that as a springboard for exporting to the region. I think you are right. That is the only reason I opposed the privatisation. The example is New Zealand. There is virtually no electronics industry left in New Zealand; it is gone.

Mr Cook—That is right.

CHAIR—In your submission you made a comment about the University of New South Wales perhaps missing out on some private development because of the suggestion that Pacific Power is going to move to a privatised entity. How dependent are you on funding for that project and who is the funding coming from? Why is it in jeopardy? Could you elaborate on that?

Mr Cook—We are fortunate to have a research team in solar cells in the University of New South Wales, which is at the leading edge and has the leading researchers in the world. That project has been going on for nearly 20 years. A spin-off company, which the university is a part owner of and the researchers are part owners of, is Pacific Solar. Pacific Solar had entered into extensive negotiations with Pacific Power in New South Wales to have model generation plants in terms of solar sourcing across the state. With the splitting up of the energy industries and partial privatisation, what is likely to happen is that they will not see that as a focus. What they will see as a focus is the bottom line of their books. Those sorts of large demonstration projects which could lead to the sale of this technology around the world are unlikely to proceed.

The university is fortunate in that we have sources of income both for that research and for the development work that happens at Pacific Solar from around the country and, increasingly, overseas. While it may be a hiccup in the short term, in the longer term I do not think it will affect Pacific Solar or the university.

CHAIR—You said it is likely to occur. Why is there likely to be a cutback in research if you are looking at something that will improve their bottom line? As I understand it, solar cells are fairly efficient and they would improve their bottom line.

Mr Cook—Solar power is still expensive compared with thermal generation. Even

though there is now something like a 25 per cent efficiency in solar cells produced by the university—and that is the most efficient solar cell in the world—the reality is that the production of solar power, because it is still small scale, is much more expensive than thermal generation. The large power generation companies and distributors find it difficult to make big investments in that because when they sell the power through the various green power programs that there are in New South Wales at the moment, the take-up rate by industry and by the public is very low.

CHAIR—What about in remote areas of New South Wales?

Mr Cook—I think I would agree with you. I think there is a case to be put that in remoter areas of New South Wales, in terms of small-scale generation projects, there is still the need for that to happen. Again, it depends on whether a company rather than an authority sees that as a good investment for the bottom line.

Mr JENKINS—Your submission mentions Memtec. You were here when the University of Western Sydney talked about Memtec. Quite rightly, your submission indicates that the emergence and the R&D work done by Memtec owed a lot to public support. Of course it stalled at a critical stage in growth and had to go offshore. There are lessons about the early stages of Memtec but there are also lessons about the latter stage. Do you wish to expand on the comments made in the submission?

Mr Cook—I think a critical issue would be to just reflect upon how Memtec actually got going in the first place. They did a lot of the research in collaboration with the Garden Island naval dockyards. Part of the research focused around filtering and cleansing processes for bilge water from ships. There was a true sense of collaboration between government, the dockyards and the university in that process, which really led to the development of the IP, which is now worth billions of dollars around the world.

Turning your question around, for example, if we were to approach Garden Island dockyard today—and we have—the cleansing services have now been privatised, so they are not a part of the dockyard's funding by the government. The response from the privatised cleansing services is that they are not interested in research. They are there to provide a service for a fee and research does not play a part in that.

If we were starting with Memtec today, you could argue we might find another source to collaborate with us, but the reality is that that source would more than likely have to be a public authority and, as public authorities are increasingly privatised and looking at the bottom line, that would be difficult to find.

In terms of what happens with Memtec once established in Australia, the points that you made from that side of the table before with western Sydney are true. I do not think Australian industry in general, or managers in Australian industry, have an understanding of what this country is capable of in research and development and its

technologies. How you change that, I do not know, but there is still the feeling that if you buy something from Europe or the United States then it has to be better than what is produced here and in lots of cases it is not. I do not know how you change that.

Mr RICHARD EVANS—Australians are renowned for being innovative and clever, yet we still have this cultural blockage about R&D. You mentioned buying technology overseas before. Why would a fairly reasonably sized company in Australia bother to set up an R&D section in their company if they can in fact buy the technology from overseas? What is the motivator there? Is it a financial motivator?

Mr Cook—I think it is largely a financial motivator. Obviously in a small economy like our own you have to be strategic about what research and development you do. If you are going to start building a car from scratch, you do not necessarily do all the research and development here; you learn from the best around the world. However, in any major project there are issues which relate to the use of that technology or the development of that process in Australia which are precise to Australia.

It is those areas of strategic research for Australia that companies are still not clever enough to identify for themselves, so we do not always have the best solutions; we have best-fit solutions using overseas technology. As an example, when I go back to the office I am negotiating with a range of companies for the Australian Research Council collaborative research program grants. You find that you really need to spend hours upon hours with people to convince them that there is a better way of doing what they are doing, which will pay off in terms of economic benefits in the medium term if they would collaborate with us on research.

We have been successful in getting that message across to a range of industries, but in terms of dollars input into those grants by industry they are still very low. Mind you, we are dealing with small to medium enterprises and we are also dealing with some of the larger ones. I have one on my desk at the moment which is with BHP and they are putting only \$20,000 towards it. You might argue at the moment that they are having problems.

There is another project which involves leading edge meteorology for the world. At the University of New South Wales there is a team doing research work which is leading edge; no-one else in the world is doing it. The partner from industry in the broad sense is the Bureau of Meteorology and only \$5,000 is their commitment.

Mr RICHARD EVANS—You would be arguing—if I am reading this correctly—that there should be some sort of R&D infrastructure in Australia which is hopefully in the long term self-funded but needs venture capital from the government initially.

Mr Cook—Under the AusIndustry program there is an innovation fund which is about to get going. If it works and if the resources continue in that program over the long

term, it might end up providing a source of it.

Mr RICHARD EVANS—But you would also argue that the infrastructure for such an R&D corporation, let us call it, is already there for the universities.

Mr Cook—It is true.

Mr RICHARD EVANS—Which means that we have to commercialise the university aspect of R&D.

Mr Cook—I think if you do that you destroy the whole R&D environment in universities. Universities are not just about development and applied research; universities are about the full spectrum of research from pure research right through to consultancy. There are outstanding examples around the country of universities that have been able to do that, ours being one. You have to have a level of independence in universities that allows them to get on with pure research. You also have to provide an ability for universities to interact in an equal, collaborative way with industry.

As I said, during the 1980s and early 1990s that in fact was a culture that was developing through government policy and through the various ARC collaborative programs, the original teaching company programs and the CRCs. But there is a perceptible shift at the moment that says that industry has now grown up; industry can do it itself and contract back to universities. There is no evidence of that.

Mr BEDDALL—We also could have a national authority. To quote Barry Jones, I think in the early 1950s, he said that the CSIRO had two projects going: one was on these new things called computers and the other was to make it rain. They had to decide on one, so they decided to make it rain. Now we import our computers and they still cannot make it rain. Is that notional psyche that we put so much research into the best cow in the world compared to high-tech still there as much? Or has that washed away a fair bit?

Mr Cook—To answer it in another way, if you look at innovation in Australia and the cost from the beginning to the end of development of IP in Australia it is done at far less cost than it would be done in Europe or the United States. The approach in the United States is that you throw a billion dollars at something and something might come out. The approach here is to throw a few cents at something and, because of the innovation and the hardworking research more in the public sector than in the private sector, we have been very efficient in what we do in research. Our achievement in the last 20 or 30 years has been remarkable.

Mr JENKINS—Should we have an emphasis on export oriented innovation research and development? I take Mr Richard Evans's point that in a way we have a cultural hang-up and a low self-image in terms of how some companies view our R&D. But, in reverse, we have a high reputation, especially in the region—you take the various

versions of a people's car in neighbouring countries, if they ever get everything together—and we have great potential as providers of R&D in those types of projects. Should there be a greater effort in encouraging companies that want to do that for overseas consumption?

Mr Cook—I think the more basic question is to get people in the private sector to do the research in the first place. If you can actually get through that then clearly an aim of that should not only be in terms of the local benefits of that research but also the export market. It is kind of like the chicken and the egg. We have not changed that culture. We began to change it and it stalled. If we can get it going again then I think what you are suggesting certainly should be a focus.

Mr RICHARD EVANS—You have said it stalled, and you have mentioned it a few times. Why do you think it has stalled?

Mr Cook—Part of it I guess is because of the uncertainty of government policy in the last 12 to 18 months. That is understandable. The government had to step back and work out what was the most effective way of doing things. It has taken a long time since the handing down of those reports for government to respond. I think Minister Moore's comments in Adelaide a few weeks ago about the CRC program have certainly created a sense of there maybe being a future. Certainly in my institution people are excited about hopefully the continuation of the program at the same level if not at higher levels rather than cutbacks. So the enthusiasm is there but people simply have not had clear direction from government.

As well as that, part of our submission addressed the issue that a lot of collaboration in the past with industry has in fact been under the broad heading of industry/public authorities. In large measure, public authorities being privatised or forced to look at the bottom line rather than looking at medium to long-term goals are no longer out there willing to do research.

Mr RICHARD EVANS—Therefore, as a person in the industry you would want from government a bipartisan 20-year plan for R&D.

Mr Cook—Exactly. We need long-term policies; we do not need the stop-start we have had in the last 10 to 15 years.

CHAIR—Thank you very much for your attendance and for the free manner in which you have responded to the questions.

Proceedings suspended from 10.45 a.m. to 10.58 p.m.

SCEATS, Dr Mark G., Chief Executive Officer, Australian Photonics CRC, Suite 101, National Innovation Centre, Australian Technology Park, Eveleigh, New South Wales 1430

CHAIR—Welcome. I remind you that the proceedings here today are the legal proceedings of the parliament and warrant the same respect as proceedings in the House. The deliberate misleading of the committee may be regarded as a contempt of the parliament. The committee prefers that all evidence be given in public but should you at any stage wish to give evidence in private you may ask to do so and the committee will give consideration to your request. Do you wish to make an opening statement before we proceed to questions?

Dr Sceats—Yes, I would like to make a statement. The paper that we have submitted looks at some of the drivers of public policy reform in the last decade and how they have impacted on R&D, with particular emphasis on cooperative research centres and telecommunications. We know that these drivers are globalisation, competition and, in telecommunications, the information revolution and technology convergence. These are well-known issues.

Phase one of the debate was in the 1980s when economic rationalism had the ascendancy to a large extent. But I believe we have seen a change and a rebirth of the ideas of the mixed economy. There are emerging partnerships between the public and private sectors. That brings me to the CRC program, which is an outcome of that partnership concept. There are 67 centres in the CRC in six sectors. The idea there is to harness the innovation in our public sector research organisations, universities and CSIRO and move that technology and innovation through to commercial outcomes—transfer to end users.

The program started in 1991 as an outcome of the Labor government's 'Clever Country' platform. It was reviewed in 1995 by Sir Rupert Myer at the request of the government. The resulting report was entitled *Changing research culture*, which really summed up the status of the program. It has been reviewed recently by Don Mercer as part of an interdepartmental committee of the Department of Industry, Science and Tourism. That report is not yet public but we expect that something will happen as part of the outcome of the budget session. Nevertheless, the minister has announced that the program will continue at full funding. That announcement was made two weeks ago. The CRCs, as a program, have strong bipartisan support: they were an initiative of the Labor government and have been continued. In fact, they are a direct outcome of the public policy reforms that have been occurring over the last decade. They are indeed a wise investment of public sector funds.

I move now to our Australian Photonics Cooperative Research Centre, which deals in the area of telecommunications. Photonics is the technology that has enabled optical fibres, which are the enabling technology of the information revolution. We are one of

eight CRCs in the IT sector. We are now a consortium of 18 partners. We have just inducted eight new industry partners. Telstra is a key participant in the centre and it is with their assistance that we have brought more industry partners into our CRC. We will talk about the reasons for that.

There is a long history, obviously, of R&D being done in Australia in telecommunications. Before 1988 that activity was primarily carried out by government sector organisations. Pre-war it was the postmaster general's department. They did a lot of national interest work—providing independent advice to government as required. Telecommunications is part of our constitution, which singles out telecommunications. Telecom and OTC established large R&D groups charged with preparing those organisations for rapid changes in technology. The early roll-out of an optical fibre backbone in Australia in 1980 has been remarked on by senior people in Telstra as being what you might call today a 'brave and courageous decision'. It was made when Telstra/Telecom was in the hands of engineers at the time. It probably would not happen today.

Post 1988, which is the time this committee is looking at, Telstra and OTC were merged. As part of the public sector reforms even then Telstra and OTC started to outsource some of their requirements for expertise and established centres at the University of Sydney and at the University of Melbourne which have gone on to become core parts of the Cooperative Research Centre. Already we see that the number of technologies required for telecommunications is beyond that of any one organisation to manage effectively. A role then emerged of public sector involvement in supplying good and timely advice to telecommunications companies.

Competition policy then saw the introduction of new carriers. Almost unique to Australia was the concept of technology neutral legislation in telecommunications. I want to divert a little and talk about that and what it has brought to us. Consider Optus: Optus really has no access to independent technology advice, no corporate R&D activities in Australia and very few linkages to Australian public sector organisations. They embarked on an ambitious roll-out of a hybrid fibre coaxial network. They did that as a way of using pay TV to access telephony. That is what they wanted and it has been a disaster.

They have almost no customers doing telephony on their networks for technological reasons. That is, it was doomed more or less from the start. It is not irreversible; something will happen, but in fact it came from poor technology advice, in my opinion. It led to the importation of out-of-date technology. That has an impact on balance of payments and a loss of opportunity for Australian firms that were not given the time to build up expertise in these areas. It was a sudden, overnight commercial announcement that this would happen and, bang, it had to happen.

Telstra responded in time with its own hybrid fibre coax but was smart enough to realise that bunging telephony on that was a loser, and they never have articulated that

they would try to merge those services and they had no reason to anyway. It led to aerial cables—a bit of a blight, according to some. It is a waste of resources. One optical fibre on a street can deliver all conceivable communications needs. It is a little bit difficult to understand how competition policy which is encouraging companies to roll-out dual infrastructure can cope with the fact that it is technically unnecessary. I understand the commercial drivers but technically it is not required.

A technology neutral approach in this case failed to deliver to the consumer the services promised by the service providers, for technology reasons that in fact were foreshadowed. There are some lessons there. Technology neutral legislation is probably no panacea. The market is no wiser than government in many of these decisions and often has a shorter term view. Competition policy needs to be accompanied by technology astute licensing of carriers. Both government and commerce need sound advice on technology.

I turn now to higher level issues of R&D. We see that business investment in R&D in Australia is growing and probably is a result of good public policy in Australia over the last decade. In the CRC program itself industry funding has increased from 13 per cent in 1991 up to 25 per cent in the latest round, and there is an expectation that that will continue. In my mind that is good public policy. Public policy reform is affecting R&D organisations. There are many aspects that are still to be covered. I refer in our own experience to the need for venture capital to move technology from research and development. We recognise that the innovation investment fund of the government has been a good step in that direction, but more is required, particularly with respect to what may occur in the forthcoming political debate over capital gains tax issues, and that Australia is not competitive with other countries because of our capital gains tax laws with regard to technology investment. This is an example of where public policy is required.

Public policy, telecommunications and the IT industry and the privatisation of Telstra: Telstra will and probably must continue to vacate public interest research and development. Telstra is shifting the need for infrastructure R&D to its suppliers, but its suppliers are headquartered overseas. The CRC is attempting to develop an Australian photonics industry, and we need the assistance of Telstra to do it. With the demise of the Telecommunications Industry Development Authority, there is really no industry development policy for telecommunications that at least I can discern. The White House in America has been the champion for the roll-out in the US of Internet 2, but there is no equivalent Australian initiative, despite the clear impact of electronic commerce and other technologies through Internet 1, which we all know is barely struggling yet it is starting to have that impact. With the privatisation of Telstra, government can no longer expect Telstra to lead in providing advice in the national interest.

The CRC is trying to fill the vacuum created by the exit of Telstra from this public interest R&D in its area of expertise and telecommunications. It is doing that in partnership with Telstra. This is not a confrontational issue for us; this is market forces at work. Telstra is assisting in bringing its companies into our Cooperative Research Centre

and working with us. Nevertheless, this work requires support for long-term R&D. The companies are not going to pay for that. That, coupled with the training initiatives for the future generations of technologists that will be required in this area, indicates that there is a need for government support for these activities.

In summary, I have talked about competition policy and the privatisation of Telstra on research and development, the reduction of Australian R&D and infrastructure research, the reduction in infrastructure initiatives, unless there are short-term benefits, and the long-term process of building the nation's R&D capabilities and skills, training in critical technology for Australia and for the networks required for Australia's Internet. We can only do this with the support of Telstra and other carriers. The Australian telecommunications industry will be involved, but there is a need for government to broker these partnerships for the national interest.

CHAIR—Thank you very much. You are obviously in a very specialised area of communications. Where is it all heading with photonics, with fibre optic cable and its compatibility with, in most instances, the copper pair that goes into a household? Can the services that you referred to be provided in that system, or is further research required in that area? Do you see any impediments to research and development in that area?

Dr Sceats—The issue of the end connection to residential properties is what you are referring to. I think there will always be a diversity of connections required. People will get the bandwidth delivered by whatever means is required. If somebody wants to upgrade to very high performance bandwidth, the carrier will come along and install that at a rather modest cost, I would imagine. There is further research going on in this area and more is required, but we do see that there will be diversity there.

Inevitably, in 100 years time or whenever, fibre optics will be the medium of choice because of the enormous bandwidth that it carries, but it will be a staged evolutionary approach. I think the issue is about interconnectivity, about making pipes available. At the moment the Internet barely works. I think if more than a few per cent of Australian homes logged on to the Internet the network would crash because it does not at this stage have the capacity. We are doing a lot of work on the core network R&D to enable the bandwidth of optical fibres to be unleashed. We use our buried infrastructure in optical fibres to less than 0.1 per cent of its capacity.

Mr BEDDALL—Some time ago Telstra was doing a research project—not ISDN but something along those lines—delivering digital service through copper pair.

Dr Sceats—Yes, ASDL.

Mr BEDDALL—Is that still ongoing research?

Dr Sceats—Yes. There are now commercial products available, and I believe that

has been implemented in several countries. It has some disadvantages. It requires a lot of electronic processing to get the data in the format that it can be delivered and then decoded at the end. It is probably an interim solution that will be around for possibly 20 years or so.

CHAIR—When the committee visited the Telstra Research Laboratories, we were told that the cutback in research had been mainly in administrative areas. Is that your view of the situation?

Dr Sceats—No. I think what they may have been referring to is that the total R&D activity has been maintained. It has shifted very much into the services end where Telstra is expected to be very competitive. The R&D in the core technologies is an area that they have, by and large, vacated.

CHAIR—They were saying that they had moved away from hardware based stuff to software programs and that they had made administrative cuts to compensate for that. They are still applying the same amount of dollars and effort into R&D. Is that compatible with what you are saying?

Dr Sceats—I think that is broadly correct. The issue for Australia is who is going to be doing that R&D in those core technologies. That is the guts of the issue. They have vacated that area.

Mr BEDDALL—In your CRC, your submission states, cash support from Telstra is down by one-third. Has that been taken up by other participants? Is that why the other nine or eight people—

Dr Sceats—That is right. We worked in partnership with Telstra to bring in their systems suppliers because they are the ones that Telstra are expecting to carry the burden of R&D in these technology areas. It has been really important that Telstra have opened doors to us to the transnational headquarters to make the linkages to R&D groups there. That is where the technology decisions will be made, and it is quite understandable.

Mr BEDDALL—What level within Telstra is R&D focused? Is there a specific assistant general manager for R&D, or is it much broader than that across the spectrum?

Dr Sceats—Telstra keeps changing its structure, but I believe that the director of research of Telstra laboratories, Dr Hugh Bradlow, now also has responsibility for technology strategy within Telstra. So there is a person within Telstra who has that brief.

Mr BEDDALL—At a senior level?

Dr Sceats—At a senior level.

Mr RICHARD EVANS—I was interested in the comment you made that R&D is growing in Australia and that it is good policy. We have heard evidence to the contrary; that it is decreasing and that the policy is no good. Why would there be a different view from yours?

Dr Sceats—The statistics show that there has been an increase in expenditure in R&D in Australia. I think that is irrefutable, to tell the truth. It is having its impact because where that has been spent and how it has been spent has changed—that is, the universities are being stretched. There are now many more universities than there used to be, many more people who wish to do R&D that cannot. Through the system under which they were nurtured, they would have an expectation of doing it.

In essence, there are more people that want to do research than there used to be, and the dollars have not increased to an extent to enable it. Also, through public policy the government's resources in R&D are being more directed now than ever before. There are risks and rewards in that. I think public policy is about trying to get a balance. You do need to support the blue sky research—those areas that are building expertise in Australia across a whole lot of areas—but you also need to be putting R&D dollars into areas where there can be a substantive, observable net national benefit from economic activity generated.

Mr RICHARD EVANS—What is your view about the reduction of subsidies from 150 to 125?

Dr Sceats—I do not think that has been a particularly good policy. It has not worked well. My view would be that when Australia hits the OECD average of business investment in R&D you might think of cutting that. I think that the difficulty is about perception: many things were being claimed as being tax deductible R&D expenditure and, if you were to ask some of us whether that should qualify as an expenditure, we would have said no because we would not have been able to recognise it as research and development. To a large extent, some of what people called the rorts were occurring because of the definition of R&D being too broad and because of a difficulty of getting accountability into the system. I think that there was a perception by the incoming government that this scheme was not working for those types of reasons. I think it was a little bit premature to jump to lower that.

Mr RICHARD EVANS—By implication you are saying that you would favour a return to the 150 on the basis that there is a better definition of what R&D comprises—

Dr Sceats—The type of it, yes.

Mr RICHARD EVANS—and therefore take it out of the hands of the taxation people and move it more into the hands of the scientists.

Dr Sceats—There is an IR&D board in the Department of Industry, Science and Tourism which has a brief in those regards but the way that they can act is really determined by the legislation or the way that legislation is set up; that is, I do not think that they are really given a brief to accept or reject particular investments in R&D—I am not quite sure about that.

Mr RICHARD EVANS—I understand the difference between 25 and 50 per cent—that is an obvious difference—but, as for a 50 per cent rebate compared with a 25 per cent rebate, 25 per cent still seems to me to be generous. One hundred and twenty-five per cent seems better than 100 per cent.

Dr Sceats—While I do come from a background of mathematical training, I am told that the 25 per cent rebate turns out to be, after all the sums are done, more like eight or nine per cent. It is a rather complex formula. It is not all that it seems.

Mr BEDDALL—It is the same with the play of the 50 per cent which will be reduced.

Dr Sceats—That is right. It is less than it seems. The difficulty for many companies is this: if the marginal benefit is less than, say, 10 per cent, the effort of going through and doing the paperwork and all of that becomes less attractive. The real benefit to people like myself of having 150 per cent up there was that it was easy for our champions in those companies to argue with their accountants that this investment in R&D was a good thing.

Mr RICHARD EVANS—So the return on the dollar is greater than, say, whacking it into an investment account somewhere else?

Dr Sceats—That is right.

Mr RICHARD EVANS—So you are arguing that 25 per cent—and, Chair, we might try and get those figures and what that breakdown might be—brings about only an eight per cent return in the dollar?

Dr Sceats—Something like that, yes.

CHAIR—Going back to your submission about the duplicate cable roll-out and opportunities that may have been lost to establish other new technologies, can you elaborate on what other technologies could have been introduced?

Dr Sceats—People announced overnight, for commercial reasons, that there would be this network, and they had to start rolling it out as quickly as possible after the announcement. Therefore, they had to determine what technology to go with before the announcement, under tight security, I would imagine, and they had to go with a

technology that was on the American market today. That meant all of the components could be sourced essentially only from the United States, and so we had the jumbo jets landing and offloading a lot of 1970s technology which we now have proudly on our telephone poles. There was no time for Australian industry to respond; that is, the time from the announcement to the time that they had to start rolling it out to get the competitive advantage was too small.

CHAIR—Did you argue at the time that technology was outdated and outmoded?

Dr Sceats—We did.

CHAIR—And you did not receive any encouragement?

Dr Sceats—No. I think that is politely put. These are commercial decisions and the licences given to carriers are technology neutral, so there was really nothing that anyone could do about it. As long as it was a sound commercial decision, which technology the carriers chose was up to them. It was a problem, and it was actually not fully anticipated that this would occur. Hybrid fibre coaxial was not on people's horizons to a large extent when a lot of groups like the Broadband Services Expert Group—

CHAIR—What technology would we use today?

Dr Sceats—The world is moving obviously to a fibre based solution. Hybrid fibre coaxial is halfway there. The challenge is that you would need to hook an Australian decision on to decisions of a major country like Japan or the United States to ensure that some of the critical components have become sufficiently cheap to make it affordable. A country like Australia cannot become the first country to adopt the technology, but it can be second.

CHAIR—Due to the size of the domestic market?

Dr Sceats—Yes. It is too small. We are about two per cent of the global market. You really cannot do that in Australia for a large-scale roll-out, but by being observant and working with other countries things can happen. You can be No. 2 quite effectively and still have an edge.

CHAIR—Where does our R&D effort come into that specific area you are talking about?

Dr Sceats—Our centre coordinates 80 per cent of Australia's research and development in this area.

CHAIR—And coordinates that with international players as well as domestic players?

Dr Sceats—Absolutely. We have strategic links to four or five other organisations that are working in this area. We are developing commercial opportunities offshore whereby we are setting up joint venture companies and others and moving Australian technology overseas. We are getting a benefit by being an owner of that, to access large markets in those countries, which you could not possibly do from an Australian base.

Mr JENKINS—That is not through the members of your CRC but through your strategic alliances with like bodies elsewhere?

Dr Sceats—As well as the fact that our partnership has formed a technology marketing company which coordinates all of the intellectual property, enters joint ventures and forms start-up companies. The point is this: many of these large telecommunications supply companies like Siemens, NEC and Ericsson have become what are called systems integrator companies. They supply systems to telecommunications service providers, and they now source their core key technologies from a whole range of other smaller companies. There are now flourishing market opportunities available to small start-up companies making critical technologies. That did not exist five to six years ago. Five to six years ago, these big companies made almost every component in the systems that they made. So our CRC strategy, developed with the assistance of our transnational partners, has been to form start-up companies, enter joint ventures and get those companies to supply critical components to them.

I will give you an example. Our first start-up company, Indx Pty Ltd, is making components that are destined for the big undersea Sea-Me-Wee 3 cable, the world's biggest undersea cable. The point is this: in two or three years time every telephone call you make from Australia is going to go through a component researched in our centre and licensed to our start-up company. That is a great achievement when you think that years ago people said, 'Don't bother in Australia. It will never happen.' But in fact it can happen.

Mr JENKINS—What disincentives are there for you taking that step to create the start-up company?

Dr Sceats—The biggest, really, was about the lack of access to seed venture capital. We had to rob the research funds—take a loan on the research funds, looking three years out—to invest in that company as seed capital and get it going. Then we had to sell the equity in order to pay back the loan. That was not our preferred strategy for a long time. We tried for 18 months to raise seed venture capital.

But here's the rub: you are trying to get seed venture capital into a company to make a technology for which a market does not yet exist. It is not replacement for anything that exists. It is something new. It is very hard to get the Australian investment community used to that. The way that they evaluate risk in these ventures is not conducive to that type of innovative technology. We believe that the innovation investment fund will

assist that. It has been a good initiative of the government, but it is still a very small amount of money compared with what is really required. I guess we hope that the success of that will show the way to others—that there are good marketing opportunities.

Mr JENKINS—You mentioned Internet 2. Is it too late to make decisions? What is the lead time? What has to happen?

Dr Sceats—It is very interesting. Internet 2 is really about the White House orchestrating a consortium of 100 universities in the US to adopt a technology which is here right now. The technology for Internet 2 has been established.

In Australia we actually have some interesting opportunities. We have a smaller number of organisations that ought to be able to put into place something that does not take years to orchestrate like Internet 2. Indeed, there was an announcement earlier this week by Energy Australia that they are putting in a broadband link between Sydney and Newcastle. One of the objectives there is to link up the four universities in Sydney and the universities and TAFE in the Hunter region with something that I would call, if the technology comes off, Internet 4. We can use some of the technologies invented in our CRC that are being made by our companies right now to put together something which is even better than the American Internet 2. There are these possibilities. So we are working with various groups to try to make this happen.

Mr JENKINS—Does it require there to be a broader application within the Australian community?

Dr Sceats—Absolutely. I think the educational institutions are just lead customers, in a way, for this. They already have large demands for bandwidth through the activities that they have. They are sophisticated users of the Internet and the World Wide Web.

Mr JENKINS—In your field is there—we were discussing it earlier—a sort of cultural cringe about using Australian technology?

Dr Sceats—Less so than there was five years ago. The successes of CRCs and other smaller companies now is showing that hopefully that will improve.

Mr JENKINS—Would you be concerned that, say, privatised players, because they are going for the bottom line, might not only have the cultural cringe but also have that as a reason for not picking up new technologies?

Dr Sceats—Unless there is an all of government or government initiatives in these areas, you cannot form the consortia that are required. They do not spontaneously happen. They never have in the past and they never will. Internet 2 was orchestrated by the White House. It is as simple as that. It is a matter of pulling in favours, getting players around the table and getting them to make a commitment to get this to happen.

The universities and the supply companies in the United States are all doing it for a strategic advantage. Let us be quite sure about that. It is not the bottom line of where the company is going to be in the next 12 months; it is where the company is going to be in the next five to 10 years. That requires the CEOs to play a role. You will not get the lower level management to sign on to that. It does require leadership to make that kind of thing happen.

CHAIR—Thank you for being so forthright in your responses to our questions, and also for your submission and appearing before the committee today.

Dr Sceats—Thank you very much for the opportunity.

[11.38 a.m.]

SCHULZE, Mr Ralph Robert, Executive Director, Cotton Research and Development Corporation, and Executive Director of Committee of Chairs of Rural R&D Corporations, c/- Cotton Research and Development Corporation, PO Box 282, Narrabri, New South Wales 2390

Mr Schulze—I am Executive Director of the Cotton Research and Development Corporation, which is based at Narrabri, but I am representing the committee of chairs of the R&D corporations, of which there are 15, and they cover the whole spectrum of rural research and development.

CHAIR—Thank you, Mr Schulze. I remind you that the proceedings here today are legal proceedings of the parliament and warrant the same respect as proceedings in the House. The deliberate misleading of the committee may be regarded as a contempt of the parliament. The committee prefers that all evidence be given in public, but should you at any stage wish to give evidence in private, you may ask to do so and the committee will give consideration to your request. Would you care to make an opening statement before we proceed with questions?

Mr Schulze—Thank you. Actually I am more comfortable answering questions than trying to highlight things from the submission. The committee of chairs of the R&D corporations is an informal sort of arrangement. We at the cotton corporation are one of the small ones. We have just taken over the responsibility.

The submission was drafted when the dairy R&D corporation performed that role, and certainly I am familiar with the content. We had input into the development of that proposal, along with a number of other government initiated inquiries like responses to the Mortimer report—they go on and on. But I think the theme that shows there is fairly straightforward: the rural research and development corporations—and it certainly has been acknowledged overseas—are a good example of international best practice in that they are a combined partnership between government and industry. Rural producers contribute an additional tax—or a levy, in this case—that is then matched by the federal government. That in effect funds the rural research effort. It is duly accountable—accountable to the farmer commodity organisation on the one hand and to the Minister for Primary Industries and Energy—currently John Anderson, who is our local member—on the other.

It does two things. The introduction of industry in this corporatisation model gives it a very strong focus on relevance to an industry. I think that has had an impact on a lot of the research providers—various universities, CSIRO, departments of agriculture and natural resources; groups like that—in that it has allowed them the benefit of strong industry focus rather than purely what is academically challenging. At the same time I think the government input—here we acknowledge that John Kerin was one of the great

architects of this particular legislation, and it has been supported by both sides of the House—has allowed the government, through this corporatisation model, to ensure that rural R&D corporations address things which are to the common good and where flow-on benefits to the broader community are certainly taken into consideration. So I think it is an ideal example of working in partnership.

We could talk a lot about why rural research and development is different from industrial research and development, particularly because of market failure, but you have probably heard all those arguments before. I am much more at ease in answering questions, so I feel very relaxed about a discussion on the matter.

CHAIR—Thank you very much, and thank you for your attendance. Having represented the rural and regional area of Bendigo for some years, I have some appreciation of the work that is done in this area. I am pleased to hear your comments on how we are meeting world's best practice in many spheres in the rural sector. Thank you for those comments. In your submission—I think it was on page 9, if you have it handy—you talk about the pre-RDC structure and how it is being dominated by research interests rather than there being a greater emphasis on industry benefits. Perhaps you could elaborate a little bit on that. Exactly how does industry set its priorities and provide funding for the 14 parts of your group?

Mr Schulze—Right. I was a part-time member of the research council—I was in private enterprise, but I was a part-time member. All the positions were part-time. Half of the membership was made up of the institutions doing the research and the other half represented producers. Institutions that were represented on the council would use the opportunity to try to divert, attract, research funds to their particular institution. There was nobody in a more corporate model standing back and asking, 'What is best for both government and industry?' There was just a 'them and us' attitude to the research funds.

I have been associated with this, as I said, in a part-time capacity in my prior life and now in a full-time capacity and see the change and the change in attitude that has come particularly from rural producers. When it first started, there was an attitude that this was just an additional tax that the government was taking from farmers, because in most overseas countries, of course, governments pay for rural R&D. Not only do they do that, they also subsidise their agriculture, in the Common Market, the USA and other places. So there was some reluctance amongst primary producers when this move was first initiated by Miller and Kerin.

It has now being going for just over eight years in an operational sense for all of the corporations, although a couple of them did start a little earlier as models. The primary producer end of it is very satisfied. It sees that, yes, a lot of this research does need to address long-term strategic issues like sustainability and the government is helping them achieve that. I think we are seeing an outcome which is good in the long term for the industry and is good in the long term for the nation. The only criticisms at the work face

that I will come into are those farmers who say, 'We are contributing all this money and we want a quick return.' Research, as you have heard, is not a quick return area.

Certainly we support some of those comments that were made by an earlier speaker on cooperative research centres. We think that they have been a very effective catalyst and mechanism to keep Australia not necessarily the smart country but not slipping further down the less smart ledger as we have tended to do over the last couple of decades.

CHAIR—After eight years of the operation of it, you have probably had the opportunity to examine now the industry driving quite an amount of the research. Are there any down sides of the industry driving the agenda rather than the researchers driving the agenda? Just what are the pluses and minuses of that? You might care to elaborate on that.

Mr Schulze—The producer side, the farmer side, cannot actually drive the research. All the farmer side can really do is isolate where they see problems and prioritise where they see problems. Then you have to sit around a table, if you like, and negotiate with a research provider, whether it is CSIRO or universities or a combination, to see whether those problems can realistically be addressed. That is where R&D corporations are very much in that design area, mixing those two things together, to then design the project and to manage it. By managing it I mean it has got to reach agreed milestones and outcomes so that that money, both the public money and industry money, is well used. I think there is almost an obsession within the R&D corporations to stretch the value of the research dollar. I think that has been another good by-product of that corporatisation model.

CHAIR—When the group is sitting around trying to look at the objectives—they have got a problem and set a certain standard of objectives which they want to try and reach—it is obviously a fairly commercially oriented part of it to try and overcome that problem. But do you think that might be sacrificing some of the public good research that the organisation could be doing, or do you think that is fully considered in your deliberations?

Mr Schulze—Two things come into play there. One is that each corporation has a government appointed member, and the chairman is appointed by the minister. Both of those have the instruction to ensure that government policy and directives are adhered to. The thing I would volunteer there is that I think over the period the R&D corporations have been lucky in that they have had some very supportive ministers through that period.

One of the more subtle achievements with the industries themselves has been the abilities of R&D corporations to convince their industries—and this is particularly so in the smaller focused industries such as sugar, cotton, dairy and groups like that—that there needs to be a reappraisal of some of old ways we did things. Some of old ways we did

things may be were not technically very sound and when you really boiled them down they were not sustainable over the long term. They did not take into consideration the impact on the broader community.

Certainly in our own case, one of the tremendous things is that we have been able to change the view of research. The industry itself today is very strongly supporting what I would call 'public good' type research. It is probably best if you give an example, rather than talk in generalities and cliches.

For example, perhaps you are doing work on pest management in the cotton industry, and that is my background. That is okay so far as the research is concerned. You find new chemicals that work here and new chemicals that work there. Then, as you do that, the pests develop resistance. The pests are brighter than human beings so they develop resistance to a lot of these traditional pesticides, even the ones that a person uses in their backyard garden. The scientists then look at integrated pest management, which means using biological controls, some chemical controls when necessary and other production practices as a package to try to minimise the use of traditional pesticides.

The growers will support that because they can see the development of resistance to their traditional pesticides. Once that happens, lo and behold, there might be some overseas company with a brand new one, but it is five times the price in Australia that it might be anywhere else and it destroys your competitive advantage. They can see that it pays to conserve the pesticides we have now. One of ways of doing that is to reduce their use by having more reliance on integrated pest management techniques.

Then that further develops into—and this is the way we are going and I know the grain, dairy and sugar industries are going the same way—the development of a best management practice system. That is getting all of that research and trying to coordinate it in a way that a farmer can adopt and adapt it in a practical way, so that he is not just using ad hoc bits of research. Again, that is the leverage and leadership that has come from R&D corporations that pooled a lot of that research together into that best management practice type of concept and delivery system.

CHAIR—Within the industries that you have just mentioned in responding to that question there have been a number of corporate changes over the last five, six or eight years in structure and the way they operate with the privatisation of some of the dairying companies and activities like that. Have you noticed any impact upon your R&D corporations and the research effort that they may have put in as a result of those changes to private ownership? Is there any visible sign that that has increased or decreased? How do you see that situation at the moment?

Mr Schulze—It does not really come into it that much at all in our case, or in the cases with which I am familiar. It depends if we are looking at this word 'reform' or if we are talking about change. It would certainly decrease the ability of the research providers

or institutions to undertake research if in fact you tried to fully privatised groups like universities, cooperative research centres, the CSIRO and departments of agriculture in the various states.

We are seeing something else, and that is that governments, both state and federal, on both sides have over the years been reducing the amount in real terms and in proportionate terms that they are putting into rural research and development. So you will find that a lot of work that used to be done by the department of agriculture is now having to be picked up by an R&D corporation.

CHAIR—Is it being taken up by the private sector at all?

Mr Schulze—That is a good question because you can think of some examples where what you are getting is, rather than just a generalist extension person, like the district agronomist of Bendigo telling you what to do, you now have some specialist individuals that are privately employed. Some of them might specialise in fine wool or horticultural, such as cotton and sugar. These field consultants are, in effect, private agronomists. They are giving a far more detailed service to the farmer than the former extension person did.

I think we are seeing a shift in that regard in that private field consultants are carrying more and more of the load that used to be the traditional role of the extension person, the government employed farm adviser. What is happening is that the government employed farm adviser is now concentrating more on big issues like sustainability and the viability of regional development. It is a good change, and you cannot argue that one is better than the other. It is the way they combine that will help us in the long term.

CHAIR—If somebody in the dairy industry in a private company runs into a problem, where do they go to seek some research into that particular problem?

Mr Schulze—In a dairy manufacturing company?

CHAIR—Yes.

Mr Schulze—Before when there were cooperatives that were farmer owned, they would automatically go along to the government person. Now they are much more likely to engage a private consultant. They are much more likely to do that competitively, seek the best and pay for the best, rather than get the government person who had that responsibility foisted onto them because that was the way it was done in the past. I think you are seeing a lot of that these days.

CHAIR—Has that been pretty well received by the rural community?

Mr Schulze—Yes. I certainly have not heard any bad feedback in that area.

CHAIR—With good results?

Mr Schulze—It is pretty hard to say because it is a moving feast. As cooperatives go down this path of not privatisation but of a changing structure—and it does change the way they go about things—in most cases they have been good, but there have also been some that have fallen over. There is risk involved, and there is probably still an advantage for cooperatives as another form of corporatisation to perform in some areas—again, where you have true market failure. I do not know whether I really addressed that question.

CHAIR—I am probing that area because there has been quite a bit of evidence given to us about the change of corporate structures from public to private that has had an impact on the level of research and development that has been done. I just wanted to get another slant on how your industries may or may not be affected by it. I think you have been quite helpful.

Mr RICHARD EVANS—You said that there are 15 centres.

Mr Schulze—There are 15 R&D corporations. To be precise, 14 of them are full R&D corporations and one is a research council.

Mr RICHARD EVANS—Of those 15 is there any definite indication as to which ones are advancing greater than others? Which fields of primary industry are advancing in R&D as compared to others?

Mr Schulze—That is a good question, but it puts me into a judgmental position which I really cannot get into. I can just give private views of industries that I think are doing well. We are looking at industries that are doing well, and R&D is only part of that. If you looked at the dairy industry in Australia 30 years ago, it was almost subsistence agriculture. Its level of productivity, its level of technical know-how was very low. In fact, in Victoria, most of the coast of New South Wales, southern Queensland, South Australia and WA, it was an impoverished industry. If you look at the dairy industry today, it is really opening up some tremendous export markets. It is a very viable industry.

I have never been involved in the dairy industry. I am looking at it as an outsider. I believe they have got their act together and they have done it well. You can see how R&D has helped them get over that knowledge threshold, which individual farmers could never have financed or even dreamt of. Because it was able to be done collectively, they were able to do it. I would say that is one of the most important things. If you remember back 20 or 30 years ago, the industry was heavily subsidised by the taxpayer. We even had quotas on things like margarine production.

CHAIR—And milk production.

Mr Schulze—Yes, quotas for milk. The one that got up my nose was oil seeds because cotton is also used as an oil seed. All those things have gone, and it is now as close to a level playing field as you can get and doing very well. Sugar is another one. Horticulture has lots of great examples. I think cotton, which has come from nothing in 1960 to the fourth largest rural exporter right now, is one of the big success stories of agriculture. There are also frustrations. The frustrations are in the wool industry and the beef industry.

Mr RICHARD EVANS—You have not mentioned the fisheries. I notice from your attachments that you have all these achievements about all these other corporations but you have not mentioned the fisheries corporation.

Mr Schulze—Fisheries is fairly young, let me put it that way. It is still going through the formative process. I would say that it is moving along very well now. Some of the work they have been doing in aquaculture, fish farming, et cetera, some of the work they have been funding on endangered species in some areas has certainly helped the delineation of areas that should be excluded from commercial heavy fishing. They are not as old as the other corporations, and that is probably why they have not got a comment there.

CHAIR—I would like to pick up the point that Mr Evans has raised. You were talking about aquaculture and how it is comparatively new to Australia but in some countries, for example, China, it is a very old industry. Where does our R&D effort go in an industry like that, where Australia might be lagging but other countries are leading? Can your R&D corporations get into that with international partners? Is that a trend that is emerging within your activities?

Mr Schulze—We do not get into the commercial end of things. We are, in effect, providing information and the research that individual farmers, governments or even private enterprise can pick up and develop those commercial opportunities. It is a hard question, because if you look at aquaculture in Asia it has been part of subsistence small holder agriculture for centuries. If you look at it in that light, you cannot extrapolate it to Australia. In Australia when looking at aquaculture—and I am a cotton person, not a fish person.

CHAIR—I am sorry to get into a technical area, but I wanted to source out how one of your R&D corporations might approach that, knowing that other countries have perhaps greater expertise in that area.

Mr Schulze—We certainly fund a lot of international exchange work. We do not fund any research overseas, but we will fund researchers to go overseas or bring experts and do an exchange, particularly in areas where we feel we are a little behind the eight ball. In aquaculture you have to look at the species that are adaptable to Australia, and you have to look at crayfish and things like that. We just do not know a lot. When they

worked out what were the right conditions to farm these fish or crustaceans, it has been a backyard hobby industry. Nobody has the science right.

If we are going to take the load off the sea fishery, the natural and non-sustainable fish population, then teaching people how to more efficiently do this in a farming sense to me is a good objective. You have to do that in the Australian environment in the localities where you are doing it. One we have just been talking about with the Fisheries R&D Corporation is in the Ord River area looking at what they might need from their rural produce as artificial feeds for fish farming in the Ord River.

CHAIR—Mr Evans is from Western Australia and has a real interest in this topic.

Mr RICHARD EVANS—Yes, I have. It is interesting that we are an island nation yet we have not got this great technology, marine technology or fishing technology. We are the biggest island in the world, I think.

Mr Schulze—It is true that in most countries that depend on fisheries it is traditional fishing in small holder agriculture, isn't it? It is not the way we in Australia go about things.

Mr RICHARD EVANS—I am interested in a couple of things that you said in response to that. I would imagine that, because Australia is such a harsh continent and country, our agriculture, primary industry and in particular our cotton technologies—and I have seen some of the stuff they are doing at the CSIRO in Canberra regarding that—are technologies worthwhile exporting. I was interested in two things that you said. First of all, you have some sorts of alliances overseas and you swap information. Then you said your groups are not interested in commercialisation of the knowledge that you have. I wonder why that would be the case. Why aren't we commercialising the technology that we develop in Australia and selling it overseas? If your group is not responsible for that, who should be responsible for that and looking at those export opportunities?

Mr Schulze—I was probably a bit glib in the way I used the word 'commercialisation'. The interchange of information throughout the world with the electronic systems we have today is very rapid and effective. I will use the Cotton R&D Corporation as an example. We were the instigators of the first world cotton research conference held in Brisbane in 1994. That was the very first time that worldwide cotton researchers had got together to swap views.

Our way of looking at that was that the Australian industry is very quick to pick up new innovations. Our competitors, whether they are in the United States, Argentina or Uzbekistan, are very slow to pick up technology. So if we in effect sit around a table and share information, we are an disproportionate beneficiary because we can quickly run with the new knowledge a lot faster. That has been our track record in our industry. I think we have got what might be a wholesome view but also what might be quite a mercenary view

in the exchange of information.

Mr RICHARD EVANS—I accept that and I am one for abundance thinking and the benefits associated—better crops, better harvests, et cetera. Agricultural policy, as I think you mentioned before, is subsidised overseas in Europe and also in the Americas. If they did pick up this technology and they did have greater harvests and equal harvests to what we have I wonder whether we are going to be ultimately affected in policy areas other than what you are developing at the moment.

Mr Schulze—Yes, that is true.

Mr RICHARD EVANS—Are there patents on some of the stuff we are doing? If we do pass this abundance thinking technology to America, do we have some sort of a licensing arrangement where there are some bucks coming back to us?

Mr Schulze—The answers to that are yes and yes. What I meant by commercialisation was going out and forming little spin-off companies to do it. Our corporation is probably a good example. We do not actually do that, but you ensure where it is warranted that it is done. Yes, we have been down the patent route with new technology. At the same time we paid overseas people to grab their licenses and apply them in Australia even though that is extremely costly, particularly with people like Monsanto and the new pest control biotechnology. We are developing some alternative technologies to that. I was in Canberra yesterday going through with CSIRO some of the promising developments there and agreeing on the commercialisation route—who you should talk to. The difficulty here is that, while a cooperative research centre, a university or even CSIRO might do it, if you are going to commercialise that worldwide, they do not have the infrastructure.

Mr RICHARD EVANS—So there is no-one driving it—is that what you are saying? There is no infrastructure or development in Australia which can see the commercial opportunities and drive it?

Mr Schulze—We can initiate it, but we then have to pair up with another commercial operator to make it happen. In this case, it was a range of different projects. You select a different commercial partner who can then take it overseas, and you worked out the return on royalties that might come back to the Australian research effort.

Mr RICHARD EVANS—We heard evidence earlier about there being some negativity amongst Australian companies to look in a positive sense to Australian technology—they tend to look overseas first, for some unknown reason. Is that the same in agriculture? Are Australian companies seeing the commercial opportunities of commercialising the research that we are doing over here in agriculture or do you need to get overseas companies to initiate it?

Mr Schulze—No, the vast majority of research that we do—again, we are typical—would be for direct application by primary producers. Whether that is a new technique in pest management or better monitoring using neutron probe technology—which we are certainly strongly into with irrigation timing—that technology is being sold by an Australian company overseas right now. So I think we have built up levels of expertise in Australia that create commercial opportunities for companies.

Mr RICHARD EVANS—So in this whole industry the relationship between your research areas and the commercialisation of that may be a model that other industries could perhaps follow? I am talking about the relationship in particular. Is that something that has been recently developed? How would you explain it as compared to other industries?

Mr Schulze—I think you could only explain it by saying that the R&D corporations are young—they are only 10 years old—so I do not think that we can place too much weight yet on these examples. Things are looking good. As I say, there is that shared thing. When we come to exports I think there is a very strong commitment that we cannot allow the Australian primary producer to be disadvantaged, so there is a limit to what we want to put out into the marketplace worldwide. At the same time, if you can get back a return from that that can help offset the Australian research effort, the Australian producer is a winner.

It was not too many years ago that we had a ban on the export of merino semen. But when you think of world technology today what did we really achieve? I think we have got to say, ‘Yes, we’re in the world interchange, but we’re not silly about it. We don’t give our things away. We’ll use them to barter if we want something of someone else’s. If we feel that there is something that might disadvantage the Australian producer if we let it go overseas by licence, patent or even public publishing, then we will certainly ensure that that does not happen.

Mr RICHARD EVANS—Is our patenting process an easy process to do?

Mr Schulze—No patenting process is. The growth industry for making megabucks is to be a legal attorney specialising in patent law—it really is. Seriously, to get to the first step is not dear, and the first step is a provisional patent. Once you move into applying for a provisional patent, then you claim a position in the market. It is all to do with saying, ‘You can’t publish before you do that,’ and all this sort of thing.

Mr RICHARD EVANS—Is that initial fee off-putting?

Mr Schulze—No, it is several thousand dollars.

Mr RICHARD EVANS—Would that stop people from applying for patents?

Mr Schulze—No, not if they are valid patents. But with patenting you have to be very precise about what you want to patent. It should not be off-putting if the technology is suitable for patenting. Some other technology is suitable for plant variety rights. We in the cotton R&D corporation do share in royalties coming from the Australian breeding program because of that connection. It is very similar to patent law. But to take patenting through to the international scene—to patent something in, say, the United States or Europe—is just the start of it. The real difficulty is to get it through the various use restrictions—whether it is the American food and drug administration or the national registration authority that we have here in Australia. There are equivalents throughout the world. They say it costs something like \$60 million to \$80 million to put a new agricultural product onto the market.

Mr RICHARD EVANS—I have one final question. I was told by some good friends of mine in the wool industry in Western Australia that the original idea for the automatic robots in the Japanese car industry came from the Australian wool industry in the development of automatic shearing. Would that be correct?

Mr Schulze—I would not disagree with it. Robotics has been around as a science and a technology for a long time. I would say that they both developed from international university based physics rather than saying that the Japanese picked what we had in Australia and vice versa. I think they are both drawing off engineering innovation.

Mr RICHARD EVANS—Automatic shearing is not far away. I have seen one up—

Mr Schulze—Yes, you said that, but I have heard that for 30 years.

Mr RICHARD EVANS—No, I have actually seen a sheep go through one recently.

CHAIR—I wonder if I could ask one final question. I do not know whether Mr Jenkins has any.

Mr JENKINS—I do, Mr Chairman. Mr Schulze actually answered one of my questions in response to Mr Evans's question about commercialisation. He put in perspective that the research and development corporations act on behalf of the industry, so there would be perhaps some disincentive to willy-nilly commercialise and give competitors an advantage overseas. But I think the way you explained it as being a bit of a give and take thing is a realistic view.

The Mortimer report talked about amalgamating all the corporations, and you have put your strong opposition to that fairly succinctly in your submission. I note that the Rural Industries R&D Corporation already crosses a few sectors and, as I understand it, it

also looks at prospective and emerging sectors. Do you envisage, as these emerging areas begin to get enough momentum or size themselves, that they would set up by themselves, or is it really that the Rural Industries Corporation is a model that perhaps suggests that, within the Mortimer suggestion, there might be some amalgamations that might go on without amalgamating all the corporations together?

Mr Schulze—As a quick reaction to Mortimer—and I will wash my mouth out with soap and water—the anti-rural chapter, chapter 6, showed up, to me, what one would regard as the typical Department of Finance/Treasury driven, dry, anti-rural bias. Whether it was due to Mortimer himself we will not know. To me, there are two things in the country that are not negotiable: one is the diesel fuel rebate and the other one is the matching grant for rural research, and John Anderson would agree with that.

The point, though, with respect to RIRDC, is that it does cover just those emerging industries. Let's say it might be the deer industry. The deer industry might be one of those fads that last for a year or two and the initiators get rich and the follow-up people lose their money or it might be a sustainable, significant industry for Australia. If it developed and became a significant industry, the farmers themselves—the producers of that product—would then say, 'We need to have more input into what's happening with the research.' So they would initiate discussions, probably through the political system or with RIRDC itself, to, in effect, break away or set up as a council that works under the administrative imprimatur of RIRDC in the way that rice—which is a significant industry—and also dried fruits are being set up. They do not have to have their full infrastructure. They can use the infrastructure of RIRDC but still have a small discrete group that looks at their particular needs.

I think it will be an evolutionary thing whereby RIRDC will spawn new industries and, as those industries become more substantial, they will form either an R&D council or an R&D corporation if they became very significant, and it will be that process.

CHAIR—I would like to ask one final question just to get it on the record. In your submission you said that up until the 1990s the research base was pretty well dominated by the CSIRO, universities and government agencies but since then it has become much more diversified. You also indicated that the supply of research capability is not as large a problem as is often claimed. Would you like to elaborate on that?

Mr Schulze—The supply of research services?

CHAIR—Yes.

Mr Schulze—There are some very good, top performers in Australia. I think that is what is meant by that comment. If we are looking at a particular problem—let us say it might be in diseases or it might be a soils mycorrhiza type problem—we know who in Australia are the lead performers in that area, who has an experience base to build on and

who is most likely to be able to apply the right expertise to it. So I think we do have a very fertile research community in Australia which is able to do those things. Sometimes it does worry you that their infrastructure and their viability are not as good as you would like, and that has come from federal and state governments cutting back funds to those groups over time, so sometimes you have to kick-start them again.

I can give an example where we have looked at a particular problem here in Australia and asked, 'Who can solve it?' and we have not been able to identify anyone who can solve it. We have gone to the group that comes closest to it and then set up an international exchange to bring in an outside person to work with that university, in this case. This time it was on textile work.

CHAIR—Does that happen very often?

Mr Schulze—No, I would say that is relatively rare, but we cannot go to either extreme. You cannot have the cultural cringe where it is no good unless it has an American accent. At the same time, you cannot have the opposite where unless it is done here it is not worth knowing about. It is mixing and matching to get the best end result.

CHAIR—Thank you very much. On that note, I thank you for your attendance. I appreciate your time and effort, particularly the way in which you have responded to our questions. It has been very helpful.

Mr Schulze—Thank you very much, and I thank the members of the committee.

Resolved (on motion by **Mr Richard Evans**):

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

Committee adjourned at 12.22 p.m.