



# **HOUSE OF REPRESENTATIVES**

**STANDING COMMITTEE ON INDUSTRY, SCIENCE AND TECHNOLOGY**

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

**CANBERRA**

**Thursday, 12 March 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	Mr Allan Morris
Mr Richard Evans	Mr Nugent
Mr Forrest	Mr O'Connor
Ms Gambaro	Mr Zammit
Mr Jenkins	

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**

**HEYDE, Dr Thelma Elizabeth, Principal Secretary, Government Business and International Scientific Liaison, Commonwealth Scientific and Industrial Research Organisation, PO Box 225, Dickson, Australian Capital Territory 2602 . . . . . 49**

**RADCLIFFE, Dr John Clive, OAM, Deputy Chief Executive, Commonwealth Scientific and Industrial Research Organisation, PO Box 225, Dickson, Australian Capital Territory 2602 . . . . . 49**

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*Effects on research and development of certain public policy reforms*

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Present

Mr Reid (Chair)

Mr Beddall

Mr Richard Evans

Mr Martyn Evans

Mr Marek

Committee met at 1.00 p.m.

Mr Reid took the chair.

**HEYDE, Dr Thelma Elizabeth, Principal Secretary, Government Business and International Scientific Liaison, Commonwealth Scientific and Industrial Research Organisation, PO Box 225, Dickson, Australian Capital Territory 2602**

**RADCLIFFE, Dr John Clive, OAM, Deputy Chief Executive, Commonwealth Scientific and Industrial Research Organisation, PO Box 225, Dickson, Australian Capital Territory 2602**

**CHAIR**—I declare open the second public hearing of the inquiry into the effects on research and development of certain public policy reforms. I welcome the witnesses and other people in attendance. We will be taking evidence today from CSIRO.

I remind you that the proceedings 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?

**Dr Radcliffe**—Yes thank you, Mr Chairman. The position that we come from is that the benefits to be realised from public policy reform really need to outweigh the costs. It is within that framework we would like to describe some of the activities in R&D that are currently proceeding. You have four specific areas, as I understand it—telecoms, water, gas and electricity—which perhaps are given particular attention. Whilst I do not want to go into a lot of details in those areas—indeed, I am not necessarily all that competent to do so—I might just make some comments as seen from our perspective.

In the telecoms area, the Telstra Research Laboratories have been seen historically as something loosely equivalent to the US Bell Laboratories. They were transferred to become a private laboratory in 1992. There had been perhaps a bit of a perception at that time that they were becoming a bit remote from the then Telecom's business. By 1996 their staff had been reduced by 30 per cent. There has been some concern about that from the indigenous telecommunications equipment and service provider industry in Australia, but we find that they are in fact moving towards CSIRO as an alternative source of advice.

There are other sources of advice. For example, Professor Mike Miller is Director of the Institute for Telecommunications Research in Adelaide and I am aware, from having recently visited him, that he has a number of overseas contracts as well as Australian ones, for example with Ericsson's. We have the CRC for signal processing, which also relates to that. And Australia is developing a number of small companies who are primarily, I suppose, involved with speed to market as their principle force. They do

add extra value to what is available on the Australian market, rather than just importing things from overseas, so there is a small technological interest arising from that.

Overall, we would say that as there is a degree of disaggregation of some of the larger entities, the smaller regionalised organisations or agencies perhaps find it much more difficult to afford research and development departments or else they may have reduced those departments or have outsourced the function. This is perhaps evidenced by what has happened in the electricity supply industry. There is an Electricity Supply Association of Australia, which traditionally involved the major state electricity agencies. They had a background of collaborative research, of funding research. An example—perhaps a minor one, but one that I am familiar with—was that they funded research in our division of forestry and forest products into preservation chemistry for wooden poles.

I am advised by our people dealing in the energy area that it has become much more difficult to develop collaborative research with those various disaggregated agencies. Their primary orientation at the moment, which I suppose in a sense is one of the objectives of competition policy, is to push electricity out of the door at the lowest price. But there are research issues on the horizon which probably are not being addressed. There are the greenhouse issues, the issues of efficiency of carbon dioxide production and generation, the possibility of tradeable entitlements for CO<sub>2</sub>, new technologies that they might adopt, the issues of sustainable energy versus the traditional technologies. We find that CSIRO now has to try to broker some of these projects between the agencies, and it is rather more difficult to do that than it perhaps once was.

On the other hand, if we look at the water industries, we are finding that the water industries are providing opportunities which were perhaps not there before. The Water Services Association of Australia has been formed. The executive director is John Langford, who was the former head of water resources in Victoria and a former Murray-Darling Basin commissioner, and he is very effectively brokering opportunities between the water agencies. We have some direct research with people like Sydney Water and Melbourne Water, so the position is varying there.

In the case of some of the state agencies, there is a joint venture with CSIRO, which operates the Centre for Groundwater Studies. That has traditionally involved the state governments in South Australia and Western Australia providing funding, but they have been joined by United Water, the South Australian private sector water service provider, and that has added a strength to that particular joint venture.

Both in the electricity industry and in the water industry we are beginning to see the impact of international companies. They are becoming much more important, so perhaps, as a result of the policy changes, we are seeing the introduction of a small number of international global companies on the one hand, and then perhaps a group of small Australian regional groupings who will not have a lot of R&D capability and will need to depend on external providers.

The issue of competitive neutrality in competition policy was also discussed at some length at the standing committee on agriculture and resource management—which CSIRO is a participant in—at its meeting in Hobart a week or so ago, and if there are any issues there you would like to explore I would be happy to talk about that.

I can talk at some length also about my experience in interfacing with the state agencies in research and development—I should say that I have some degree of background in state R&D; I was Director-General of Agriculture in South Australia until I joined CSIRO about five years ago—and the states do support a lot of R&D in the agriculture and environment area. There is a grouping of the states that meets to discuss the funder-owner-purchaser-provider philosophy which is being pursued in some states but not in others. It meets about every six months, it has had about three meetings and a number of progressional developments have occurred there. If you would like to explore those, we could do that as well.

There can be conflicts in the introduction of some of those policies with other research funders, such as the research and development corporations in agriculture, and that is an issues that you could explore as well.

There have been impacts in forestry, which is not one of the four major areas you are discussing. Some of the forestry agencies have moved progressively to corporatisation or, in some cases, to privatisation. There are examples where either the R&D has been reduced or has been spun off into private entities.

One of the bottom lines in all of this is the extent to which agencies such as CSIRO are doing public good research vis-a-vis private good research, the extent to which the research can be appropriated either generally or by specific private sector interests, and there are quite a few questions in that and in how one interprets that—the costs and the benefits.

The point of view is that the real issue in R&D is that Australia is ultimately competing on the world stage, that we have to be able to trade in a globally competitive manner, and that means that we need to be innovative in the technology that we are using in our production, distribution and trading networks. That having been said, science, too, is also a world based competition, and we have to ensure that we are best able to compete on that world stage with our science to underpin our own industries. The simple fact is that we represent two per cent of the world's science, but if we can get a disproportion of that adopted by our own industry, it is to our advantage.

Within Australia there is an increasing tendency for the best science to be joint ventured between agencies. The Cooperative Research Centre program is, to a degree, an example of that, but there are many other examples outside the Cooperation Research Centre program. I could express the view that driving competition policy too strongly between the individual agencies within Australia has a risk of diverting effort which might

be better generated jointly in the pursuit of advantages that can be adopted.

I was recently present at a presentation made by a representative of one of the major big six accountancy firms. I inquired of him what the benchmark costs of competition policy were when applied to research and development, and I was told that they ranged between eight per cent and 20 per cent. It did seem to be quite a high rate of transaction costs. I think we do need to look closely at where the benefits and advantages are. Public policy reform has generated advantages, but there are also costs.

**CHAIR**—Thank you. Would Dr Heyde wish to make a comment?

**Dr Heyde**—Not at this stage, thank you.

**CHAIR**—The committee visited the Telstra Research Laboratories on 19 February. We had an inspection and had a discussion with the principals of the laboratory. One of the things that they suggested to us was that recent cuts to the research laboratory staff were mainly concentrated in the administrative areas and that their actual R&D budget had not changed substantially. One of the other things that they also raised with us was the change in the type of R&D that they were doing and the shift from hardware type R&D into more software and IT applications. Do you have any comment on that, seeing that in your submission you were suggesting that the Telstra Research Laboratories had adopted a narrower research focus? Is that what you were referring to, or is that a broader comment?

**Dr Radcliffe**—I would prefer not to offer detailed comment on that particular issue, since I do not have a lot of personal background in that area, although I might ask Beth whether she has any comment. I will address the two issues that you raised. Firstly, with regard to generating more effective management structures which reduce the proportion of money invested in administration versus actually conducting R&D, I would say that CSIRO has also followed that approach. For that reason, we have combined something like 33 divisions over the last 12 months into 22 divisions, bringing together two or three divisions in several cases, with the basic aim of reducing the infrastructure that an individual division needs and, in that way, producing more money that can go to R&D. Certainly, the philosophy espoused by the Telstra labs would be quite congruent with the sort of view we have taken of that.

Secondly, the other point to be made in regard to the issue of moving from hardware to software, of course, is that that is a basic change that has taken place in the telecommunications industry. You no longer have the rotary mechanical exchanges. The whole thing is driven by software, and I am sure that they would have had to make that change.

**Dr Heyde**—My information is also second-hand, but the evidence appears to be that companies are turning more to CSIRO; and so we are seeing more interest in what CSIRO can provide for them—needs which previously may well have been satisfied by



Telstra. That is the sort of evidence we have.

**CHAIR**—In what particular areas?

**Dr Heyde**—I could not answer that. If you needed further advice on that, we would have to seek that from people who are actually working in the area.

**CHAIR**—That would be helpful.

**Mr BEDDALL**—One of the largest projects ever undertaken by R&D in Western Australia is the Hi-Smelt project by CRA-RZT, a cooperative effort with CSIRO in Melbourne. A major part of that research is now being done through CSIRO.

**Dr Radcliffe**—Although it did not get very much recognition in the supplement that was in the *Australian* about three or four weeks ago, I notice!

**CHAIR**—During your opening statement you also got into a couple of other areas: electricity supply and water industries, and the changes that have occurred there, particularly at state level. You made a comment about the new providers of electricity being simply interested in the lowest price. That might stand up for a period of time, but the technology that they are using is going to age. How are those electricity supply authorities that are in existence now as suppliers—whether private or public—going to become involved in upgrading their equipment? Who is going to do the R&D for that? Is it being done? If not, where are the prospects for the future? If they are simply interested in the lowest price, they will have to keep up with modern technology and the latest developments and research in that area.

**Dr Radcliffe**—The point that you make is very well taken; and you then have to see what the drivers will be that will induce them to recognise that there are other issues to be followed up. Some of the major drivers will be environmental ones. The first one, and the one that has had a reasonable amount of recent attention, is the outcome of the Kyoto Conference. Whilst Australia had a reasonably good outcome, that really represents a relatively short-term outcome, and there are much longer-term horizons.

I am sure that we will increasingly have obligations to address the issue of CO<sub>2</sub> emissions. It is likely that when the processes are resolved—and they are far from resolved—the issues of CO<sub>2</sub> emission accounting will become an important issue. If we get into transferable entitlements, there will be incentives for the companies either to purchase entitlements they need—which in a sense is not solving the problem; it puts off the evil day and is a short-term solution—or else to address the new technologies which are required.

One of the problems here of course is that Australia is very dependent on coal as an energy source. Indeed, the extent to which we use renewable resources is actually

reducing, because we have a relatively fixed production from hydro-electricity in the Snowy and, I guess, Tasmania; whereas the increase in demand is tending to be fed by coal and more recently by natural gas. We could overcome that difficulty by moving to nuclear power generation. Indeed, the Japanese have perceived this to be their proposal from the outcomes of Kyoto, and I understand that by the year 2002 they have in mind generating from 20 nuclear power stations. I will be interested to see whether the Japanese community finds that an acceptable policy direction. I would not immediately see, from where we stand, a great increase from the present level of zero nuclear power stations in this country.

There will need to be new technologies. I would like to think there would be some new technologies in the coal industry, but our perception is that the coal industry is a very mature industry and it therefore does not have a strong R&D driver. It tends to be driven by the idea of producing more coal for less cost.

**CHAIR**—Am I correct in saying to you that CSIRO had an involvement in coal burning research?

**Dr Radcliffe**—Yes. We have a fluidised bed process, for which I personally do not have a lot of technical details—

**CHAIR**—Is that still continuing?

**Dr Radcliffe**—The technology is available, but we are looking at the possibility of the Division of Coal and Energy being renamed the Division of Energy Technology, with greater emphasis being put into renewable sources of energy, energy storage and things of that nature, because we would tend to see changes over a period of time in how the energy industry operates.

**CHAIR**—So you have an ongoing program of research and development in that area?

**Dr Radcliffe**—Yes.

**CHAIR**—Is the coal burning research done nationally, or in each state?

**Dr Radcliffe**—Basically, the headquarters of the operation are in North Ryde in Sydney. Indeed, we are currently exploring whether there might be more appropriate locations for the headquarters.

**CHAIR**—I am not so much concerned about the headquarters as about whether the R&D is being done in each state.

**Dr Radcliffe**—As I understand it, we would not be doing much in the way of

brown coal R&D, which has tended to be done by the old SECV laboratories, which have been privatised and now have a name that I cannot recall at the moment.

**Mr BEDDALL**—There is a CRC black coal lab in Newcastle. Is CSIRO involved in that?

**Dr Radcliffe**—I believe so; yes.

**Dr Heyde**—I believe we are. In general, CSIRO does not spread its activities around Australia unless there is good reason to do so, but often it will centralise research that serves many different areas throughout Australia, and that is the case with this one. There are some interesting hybrid—

**CHAIR**—Can I pursue that? If you are doing research on that coal burning technology, is it available to all of the states?

**Dr Radcliffe**—Yes. Indeed, the division has a coal industry newsletter, established only a year or so ago, which is distributed.

**Mr MAREK**—Still pursuing this line of coal, and being aware of the Kyoto agreement and where we go with our 10- to 15-year window, wouldn't it shed light to start looking and focusing on alternative power sources rather than continuing to focus just on coal?

**Dr Radcliffe**—Yes, that is what we are doing.

**Mr MAREK**—It is just that, by the way you said that, you sounded as though you were focusing more on coal.

**Dr Radcliffe**—No, the chairman was addressing a question to the coal industry. The point I was making was that in fact we are changing the division from a division of coal and energy to a division of energy technology, with increasing emphasis on renewable resources and storage resources for power, and things of that nature—fuel cells and so forth. So there are a number of strings to the bow, with perhaps a less dominant impact of coal. Although it will be a significant commodity for Australia for a long period, there are other areas of technology which are rather less mature which would perhaps benefit from additional R&D effort.

**Mr BEDDALL**—In terms of the move for commercialisation/privatisation of energy generators and distributors, how much of an impact do you think somebody like Mercury in Auckland is having on their need to say, 'All of a sudden we have bought the infrastructure but the infrastructure may not be up to stream?' Will anything like the catastrophic event of the loss of power in the central business district of Auckland flow into research?

**Dr Radcliffe**—I would have thought that the issue of the Mercury power exercise in Auckland is an issue of capital asset management, and I am sure there are alternative technologies available. Whilst I am hardly qualified to comment on this area, my understanding is that the technology that was involved in the four cables is relatively old, and indeed some of the technology is so old that it really cannot be repaired, as such, and that is the problem with two of the cables.

**CHAIR**—It appeared to be old technology which had been in place and which had been serving a need, but that there had been no alternative.

**Dr Radcliffe**—Yes, like in the water industry, there will parts of infrastructure in the power industry that have been in place for 50 or 60 years.

**Mr MAREK**—How do you see the effect of public policy reform on the demand for scientists and engineers and on education and training opportunities for future staff? Is that too far reaching?

**Dr Radcliffe**—I suppose there are two parts to that: the impact of public policy reform on the stakeholder population—the clients; and the extent of the impact of public policy reform on the R&D agencies themselves. Let us address the first part, which is the impact on the actual clients. As clients change, we have an obligation to recognise that they change, to identify that new clients may have different demands and to meet them as best we can. Some impacts of that may be that we have to learn how to interface with some of the smaller agencies in regional environments and with the larger multinational companies, some of which may well have access to technologies from elsewhere. This means that our R&D has to be up with the world's best, as best we can be, although we cannot aim to be all things to all persons, and there are some areas where we probably should not be because there will be other providers from overseas who might be better. I think you kid yourself if you try to meet everybody's needs for everything.

On the second point, the impact on the R&D agencies themselves, I think our primary concern is that, depending on the development of the public policy reform policies and the extent to which things such as competitive neutrality are introduced, there is a level playing field between all the R&D agencies, which would include CSIRO, the state agencies and the universities. There would be some aspects of policy reform in that area, particularly in the public good R&D area, where we think competitive neutrality is not necessarily advantageous to provide, whereas we are engaged in consulting work, potentially in competition with private sector people—as we are in a few odd jobs—and it probably should be provided and introduced.

**Mr RICHARD EVANS**—You said in your opening statement that we are two per cent of world science. How is that measured? Is it measured in dollars or what?

**Dr Heyde**—I think probably it reflects numbers of publications. We would need to

check with the parts of the Department of Industry, Science and Tourism which look after these sorts of figures to give a more accurate answer than that. But, basically, that is about the only measure that can easily be taken that involves the whole of the university sector throughout the world.

**Dr Radcliffe**—It is really a measure of output from science as distinct from money invested because, if money is invested and there is no output, it is not measuring, I suppose you could say, simplistically.

**Mr RICHARD EVANS**—R&D in Australia, in a management sense, probably has not been considered of great importance. In recent years, there have been financial incentives to encourage people to move into R&D in a fairly significant way. Are financial incentives the only things that we can use to encourage people into R&D? If there are others, what other incentives can we use?

**Dr Radcliffe**—I would have thought you would need to differentiate two components there when you say ‘move into’. Do you mean by that investing in R&D or do you mean by that creating R&D agencies or structures or whatever?

**Mr RICHARD EVANS**—I would think creating R&D structures rather than just investing.

**Dr Radcliffe**—I guess the question would be to what extent one should create new structures versus making the present ones more effective. Let us have a look at the Cooperative Research Centre program. The original concept of the cooperative research centre program was to bring together collaborative agencies so that they would generate synergies in their approach to research so the outcomes would be achieved more effectively than if they were separate. That was the original philosophy which the then chief scientist Ralph Slatyer espoused and was the primary goal in the opening round.

But, in more recent times, there has been perhaps more of a move towards making the cooperative research centres independent agencies themselves. That does have a pretty high transaction cost to it because you then have 61 cooperative research centres, each with their chief executive and boards and all the infrastructure costs and all the rest of it—CSIRO is in 51 of them, I think. So we do see quite a diversity. Sometimes if you generate such entities, the director of the cooperative research centre is perhaps, if he or she comes from outside, strongly motivated to create that as a completely new entity rather than as a collaborative venture to achieve things more effectively than the original participants.

So there is a risk, I think—a downside of fragmentation—if one pursues things too far in generating additional entities. I suppose I come back to my comments originally that, increasingly, the research agencies are tending to operate together collaboratively, sharing resources and facilities. I could give you a number of examples of that in South

Australia and Queensland.

**Mr RICHARD EVANS**—Is that internationally as well? Is there an alliance? You were talking about niche R&D development. Science is just too broad to be trying to do everything in Australia so should we be specialising? Are there opportunities for alliance with other countries and their—

**Dr Radcliffe**—I think there are two levels. You can have an alliance at the research agency level and you can also conduct alliances with international companies. In the latter case, if you have an environment in which, say, one multinational company has a particularly dominant position in a particular field of science—I could name one but perhaps will not—you then have to think, ‘Would there be other companies that would be interested in supporting R&D perhaps to offset the dominance of a particular first company?’ In consultation with those, you can get those companies to then invest jointly in research with CSIRO—we are doing some of that, particularly in the biotechnology area—so that new technologies are available in Australia which can be used as offsets to perhaps buying enabling technology from North America or wherever. That is an increasingly developing field and it is a very difficult field in negotiation terms but I think an important one.

In terms of interaction between research agencies, this very much increasingly revolves around intellectual property management versus the freedom to scientifically publish. There are often a lot of informal relationships between scientists internationally so that, say, the division of plant industry in the CSIRO in Canberra might have close relationships at the scientific level with the John Innes Institute at Norwich in the United Kingdom, which is one of the major biotechnology research institutes over there.

When it comes down to jointly working on science, it is probably more difficult in the sense that one starts to then get into issues of international law liability and patent management. It would be very difficult to joint venture with an agency in North America because of the legal ramifications and the liability insurance costs, and so forth. One is more likely to interface with the private sector in Australia, albeit they may be international companies, than to have formal relationships with research agencies overseas. That would be my perspective. Would you like to add to that?

**Dr Heyde**—Yes. We know that the CSIRO has of the order of 650 project level interactions internationally and that covers a very broad range of countries. I think that the country with which we have the greatest number is the United States, but it runs right through the Asian countries and Europe, of course. So it is a rich network. Many of those would be at a scientific level between colleagues. Some of them would have commercial—

**Dr Radcliffe**—Yes. They may be funded by AusAID or the Australian Centre for International Agricultural Research. The philosophical position of something like ACIAR

is to fund research to which both sides contribute. It is not to send people from A to B, or B to A, at great expense to sit there, but rather to encourage them to collaborate and provide funds so they can occasionally visit. They work on common problems. So it is a facilitation process and that seems to be pretty effective.

**Dr Heyde**—There is another type of evidence coming back to the publications. There has been an independent study done of the publications by CSIRO over the last several years that shows that the international connections in those publications are very rich indeed. Most of them have them.

**CHAIR**—I just want to follow up a question that Mr Evans asked and it was in relation to the alliances being formed between the research agencies and, particularly, some of the public authorities that have been privatised. You have mentioned a couple already—the water industry and the electricity industry. Do you think that the same level of research and development has been done by those alliances of the research agencies in those two particular fields, or do you think that some of the research may have moved offshore to some contracted services overseas?

**Dr Radcliffe**—It would be very difficult to give a definitive answer and I think any comment I made would have to be considered as subjective. I suppose I would subjectively consider—but I would probably be hard pressed to really justify it—the view that within the water industry probably the level of research has been maintained. Indeed, it may even have been increased. Perhaps it is being undertaken more by different combinations of agencies than was previously the case, so that some of the agencies which have now been privatised may have fewer resources in-house doing R&D. Perhaps they are investing a bit further outside of house, which would mean to the CSIRO or, perhaps, to something like the cooperative research centre for water quality and treatment that Professor Bursill runs. There are alternative structures being used, but in the water industry I would say the research effort is probably being maintained. In the electricity industry, I would not be so confident of saying that, but then it is an industry that I tend to know less about anyway, I suppose.

**CHAIR**—There has been a bit more publicity about some of the more controversial elements, particularly in Queensland, with their power failures.

**Dr Radcliffe**—It is a question of whether that is a matter of R&D though, or the viability of pre-existing technology and whether it has been adopted.

**Dr Heyde**—As a general comment, there is some evidence that outsourcing by those smaller utilities does tend to focus more on troubleshooting rather than the longer-term research. I think one of the messages in this whole area of public policy reform is that there is a value in maintaining the more strategic and longer-term core research activities that can underpin whatever is needed in the future.

**Mr RICHARD EVANS**—The perception in our terms of reference is that not a lot of commercialising of R&D research is being done in Australia. It has to go offshore to get commercialised basically. The perception also is that a lot of our good scientists and engineers are moving overseas as well because the opportunities are greater over there. Is that a reality? If it is a reality, what do we need to do to reverse those trends?

**Dr Radcliffe**—It is easier to develop, market and commercialise technology with larger companies and agencies. There are larger innovative investment markets in larger countries like those in North America than you will find in Australia. Gene Shears was one example where, to a degree, the technology could not be developed in Australia. It has continued to be developed by consortium which is involved with some overseas entities and CSIRO. That probably just reflects the fact that very large innovative technologies tend to have an international market. It may well be that small Australian companies cannot really support the investment.

On the other hand, there may be niche levels of quite important research that can be developed by small and medium enterprises. Indeed, CSIRO has encouraged the spin-off of small companies from technology we have. There have been 60 of those spun off in the last three or four years. They might be quite simple bits of technology. The only issue if you spin off a small or medium enterprise organisation with a piece of new technology is that you then have to ask: will it be able to develop the infrastructure to continue to develop that ongoing technology with new products or is it a one-trick organisation that may tend to become displaced by other technologies in due course? Of course, some SMEs do not survive beyond the first generation of technology. As far as staff go, do you have figures on that?

**Dr Heyde**—I do not have figures, but it is a natural part of the career progression of scientists to move internationally. Certainly there is concern among the scientific community about career prospects for scientists. There has recently been a forum on that topic. Some interesting papers written by the Department of Employment, Education, Training and Youth Affairs have been under consideration by the Coordination Committee on Science and Technology. It is a live issue. In essence, you want not just public sector demand for these people. The stronger the private sector becomes, the more career opportunities there will be. There is not any simple answer to what you need to do to fix that, unfortunately.

As far as CSIRO is concerned, we endeavour always to get benefit for Australia in commercialising our research results. Sometimes that will mean a small percentage of the total benefits simply because we have to work with overseas groups. We always seek to get some return and the more the better.

**Dr Radcliffe**—I would like to suggest that there was not necessarily a great net brain drain overseas from Australia. There are some conspicuous examples. One I can think of is the director of the Australian Wine Research Institute. He was given an offer



he could not refuse by Gallo, the biggest winemaker in California in North America, and he accepted. He was an individual who had worked in the Australian industry for 25 years. You will get occasional examples. The current chief scientist in the United Kingdom is an Australian. He has worked in North America, but he comes back to Australia and interfaces with our scientists in several divisions. I do not think that is a serious issue.

A lot of scientists early in their careers go overseas to do higher degrees and pursue other opportunities. I did so myself. I do not think it is a problem. It may be more of a problem in a country like New Zealand. We bring in quite a lot of scientists from New Zealand and that is a concern to them. Their public policy has been a concern to their own scientists. The Royal Society of New Zealand did a review of the attitude of scientists to the science reforms that have taken place over the past five or six years in New Zealand. Whilst I cannot recall the specific figures, something like 80 per cent of the scientists felt pretty dissatisfied. It must also be said that, whenever any change is raised, people will tend to feel a bit unhappy. It may be a report which could be worth your while to explore.

**Mr MARTYN EVANS**—I found it interesting that you mentioned that you were less confident about the electricity authorities than you were about the water. It brought out a point that I was thinking of asking you about. Clearly, with the water authorities there is much less portability of the product. You can put electricity on the national grid. You can generate that capacity in Port Adelaide and you can sell in Victoria; you can do it from Victoria into New South Wales.

**Dr Radcliffe**—There is a fair bit of portability in the water from Queensland to South Australia.

**Mr MARTYN EVANS**—That is true, but with the water authorities at the moment there is much less of that immediate competition. Obviously, once electricity authorities are competing with each other on price, there is some benefit to them if they can obtain a competitive advantage through R&D which they do not transfer to their colleagues interstate. That will give them the edge in their competitive position; that is not what has applied in the last 100 years but it does now. Should we be looking at models which involve precompetitive R&D—if you like the Sematech example in the US where the semiconductor industry gets together and competes at the base level, a precompetitive level?

We are going to suffer from this issue of isolation of research and the fact that people will have a profit incentive to keep it from their competitors interstate and within the state. On the other hand, if we are looking at how to address some of those consequences, should it be perhaps at the precompetitive end?

**Dr Radcliffe**—I would say that an organisation such as the Electricity Supply

Association of Australia would, as an association, invest in the precompetitive end of energy R&D. When you get to technologies which can be appropriated by one or another then there are problems and, at that point, the individual entities will individually interface with an R&D group to fund work if they believe it is worth their while. My understanding is that at the moment that is not happening to any great degree. But, as you quite rightly point out, their initial driver is the impact of competition between them, which is what it is supposed to be. Their initial competition must be on the basis of the infrastructure they perhaps inherit from where they start.

**Mr MARTYN EVANS**—It would be in our national interest to have them all efficient. If there was some new technology which made electricity generating one per cent more efficient or something, it would be in our national interest that they should all pick that up and then compete on other internal efficiencies—management efficiencies, distribution efficiencies and the like. It is in our national interest that they all operate at the best level that they can and yet still compete, not that they can obtain a competitive advantage for one authority and reduce their cost at the cost of all the others. Is that a reasonable—

**Dr Radcliffe**—That is a perfectly reasonable point of view. We have examples of that in other industries. Another example of that is the wheat products cooperative research centre which has in it eight inherently private sector participants who all fund precompetitive research, but as soon as it gets to a competitive environment those individual millers or whoever they are will then try to interface with one or other of the individual R&D agencies. Someone like Goodman Fielder for example will come to a CSIRO division if they see a particular piece of research they might want done. That is the sort of thing that will happen.

The model you suggest is quite appropriate. The issue then is who pays and is there an incentive for the electricity supply authorities to form some sort of an industry R&D corporation as, say, the agricultural R&D corporations have been formed upon the initiative, I guess, of the federal government on the one hand and the peak agricultural bodies such as the Grains Council of Australia in the case of the grains R&D corporation? Is there that incentive in the electricity supply industry? My suspicion at the moment is there probably is not yet that incentive but there may well be an incentive in the long term. The next question is, 'How do you nurture that incentive?'

**Mr MAREK**—On the CSIRO issue, are you aware of the significant downsizing of staff and scientists, particularly in Queensland, such as in the Rockhampton Tropical Beef Centre? I believe that they downsized quite a lot of the CSIRO functions in Queensland because they wanted to refocus their research direction. Area you aware of this?

**Dr Radcliffe**—I am aware of some of the general issues. I am not familiar with the specific figures, but I could certainly comment on the issue. I think that this derives

from the fact that for quite some years CSIRO has been encouraged to have at least 30 per cent external funding across the whole organisation and it then depends on our ability to attract funding from various research clients, if you want to call them that.

**Mr MAREK**—For instance, for meat research.

**Dr Radcliffe**—And the question of how much money they actually have. There are two industries, the wool industry and the meat industry, that have had a particular set of difficulties. If you address first the wool industry, which may not be a hot Queensland issue but is a real issue and the first one that we faced, the then Wool Research and Development Corporation had an income which was based on a levy on production and the production was actually sold at a floor price which was set by the industry at 875c per kilogram, or whatever it was. When that was deregulated after they had five million bales in the stockpile, having been busily buying their own wool, the price, in a free market, dropped to about half that, which effectively dropped by half the R&D funds, which the Wool R&D Corporation then was able to collect.

At about that time also the actual structure was changed to form the International Wool Secretariat, or became part of the International Wool Secretariat, which meant that there was also competition between R&D and promotion as to how that money would be spent. The question had to be raised as to how the money had been used and where it would be put in the future.

The bottom line was that, say, the division of wool technology in Geelong had been 60 per cent funded by that source, that money was not there any more—and the same in the division of animal production. Then we had, perhaps more recently, downturns and changes in the beef industry and the same sorts of issues arose with the Meat Research Corporation. Of course, now the structures are being changed so that the Meat Research Corporation and the Australian Meat and Livestock Corporation are being put together in a new agency. Indeed, I see a chief executive who came from Berrivale Orchards has just been announced as the new operator of it.

Those changes also can mean that the funds will cease investing. The Meat Research Corporation, although it was still responsible, did not actually fund any new projects for quite a considerable period until it knew what was happening. It has funded some new projects recently. But with reduced money, and then not investing during a period of restructuring of the industry arrangements, it has meant that CSIRO simply cannot obtain the funding to maintain research in those areas. We really have the very unfortunate circumstances of having to identify where our priorities lie.

Certainly, we also do look at priorities, and in the old division of tropical crops and pastures, which is now part of tropical agriculture, there was a major change, say, over the last six or seven years into sugar research because the Sugar Research and Development Corporation had been developed. There were other industry funds that were

demanding and willing to fund research. So that division moved from something like four or five per cent of its total effort in sugar to 25 per cent of its effort in sugar. That really reflects the fact that we have to respond to the market that is out there. Sometimes you cannot turn a beef geneticist into a sugar physiologist.

**CHAIR**—Just before we conclude this section of your evidence, when the public authorities, some of which you mentioned today, were privatised or corporatised—or whatever their change of structure—did CSIRO have any background knowledge or information about what happened to the intellectual property that some of those organisations may have had within their large structure when it was a public authority before it was privatised?

**Dr Radcliffe**—I certainly would not. I do not know if you could offer any comment on that.

**Dr Heyde**—I would not either.

**CHAIR**—What would be your thoughts about where a lot of that intellectual property might have gone to—say, SEC in Victoria, which was broken up into a number of different components. Would the intellectual property have remained—

**Dr Radcliffe**—I do not know how that was addressed, but the SECV laboratories in fact became the Herman Laboratories—the name I could not recall earlier. Whether the intellectual property which was generated was transferred to that entity I do not know. But it would seem to me that intellectual property is an asset that would need to be addressed in the process of disaggregating the entity, in the same way that physical assets like power stations needed to be addressed. I have no knowledge of how it was addressed or whether it was addressed.

**CHAIR**—Okay. On that note we may have to conclude. Thank you very much for the free and open way in which you responded to our questions and also for your comments beforehand. Thank you, Dr Heyde, for the comments that you have placed before us. We will certainly take your comments into consideration. Thank you for your cooperation. If we need to contact you again for any additional information, Russell Chafer, our secretary, may be in touch with you, and perhaps you could provide us with the additional information.

**Dr Radcliffe**—We are happy to provide any further information you might like to have.

**CHAIR**—Thank you very much.

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 1.51 p.m.**