



**TRANSCRIPT
OF PROCEEDINGS**

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PRODUCTIVITY COMMISSION

INQUIRY INTO ENERGY EFFICIENCY

**DR N. BYRON, Presiding Commissioner
PROF M.C. WOODS, Commissioner**

TRANSCRIPT OF PROCEEDINGS

AT CANBERRA ON MONDAY, 22 NOVEMBER 2004, AT 8.59 AM

Continued from 17/11/04 in Brisbane

DR BYRON: Good morning, ladies and gentlemen. Welcome to the public hearings of the Productivity Commission's inquiry into energy efficiency. My name is Neil Byron. I've been appointed as presiding commissioner to this inquiry, and my fellow commissioner, Dr Mike Woods, will be arriving shortly. We've conducted public hearings on this topic in Sydney and Brisbane last week and we'll be having more hearings in Melbourne later this week, on the 24th and 25th, with video-links to Adelaide and Perth. We'll then be working towards completing a draft report for public comment in early April next year and we'll be undertaking a further public consultation with interested parties after they've had time to read that report.

We like to conduct all hearings in a reasonably informal manner, but I remind participants that we are taking a full transcript and, for this reason, comments from the floor can't be accepted, but at the end of the day's proceedings I will provide an opportunity for anyone who wishes to make a brief presentation. The transcript will be available to participants for verification and then, as soon as possible, on the commission's web site after the hearings. Copies can be purchased using the order form available from the staff here today.

I would now like to welcome Neil Gow from Australian Trucking Association to the hearings. If you'd like to briefly summarise your comments, Neil, we can then discuss that. We did meet earlier during our informal round of visits. I've allowed probably 45 minutes or so for this session, if that's okay with you. If you'd like to just outline the main points for the record, we can then discuss them for a while. Thanks for coming.

MR GOW: Thank you, Mr Commissioner. I've appreciated the opportunity to speak with the commissioners previously in an informal way, and since that time the ATA has developed a draft submission which we finalised after today's session and sent to you. The key points of that submission are that the Australian Trucking Association - which represents the Australian trucking industry as its peak body, based in Canberra, and with a range of membership from state trucking associations, sector based trucking associations, national trucking companies and the Transport Workers Union - has a significant interest in the subject of your inquiry.

The national fleet is some 450,000 heavy trucks. By that, I mean those over four and a half tonne GVM, so that ranges from two-axle rigid trucks through to the multi-trailer road trains that our outback is so famous for. That fleet, of course, has considerable energy use, both in its vehicles - which are principally powered by diesel fuel - and in the supporting officer, storage and logistics activities that are also conducted by what we commonly call trucking businesses but the evolution over more recent years has seen them diversify their operations more and more into logistics and storage, and so there is significant energy use within that part of their activities.

Given that basic interest, the ATA wished to address the aims of the inquiry, which is seeking comment on improvements in energy use which are cost-effective for individual producers and consumers, have the potential to enhance Australia's economic prosperity and, at the same time, lower Australia's greenhouse signature. The ATA's basic position on that question is that our industry is energy efficient. That situation needs to be considered against the particular geography and demographics of Australia in a very large continent with long distances to move primary products, retail goods, fuel, and all the requirements necessary for communities in regional and rural Australia, and to move the export goods - both primary and manufactured - to ports and airports as a key part of Australia's trade.

I'll just mention a few very brief statistics. That truck fleet travels some 12,505 million kilometres - I think some people actually would call that 12 and a half billion kilometres - per year and carries 1.5 billion tonnes of freight in Australia. There are some 32,000 trucking businesses in the hire and reward sector and, of course, a considerable number of other businesses which have trucks ancillary to their operation. Trucks account for 21 per cent of Australia's greenhouse emissions by total road vehicles, which the primary amount of course comes from the 10 million cars in Australia compared to a truck fleet of 450,000, and accounts for some 2.6 per cent of total greenhouse emissions.

There are strict engine and fuel standards set by the Commonwealth government and operating standards set by state government and, finally, access to infrastructure is not unimpeded. There are restrictions which sometimes add to trip time and/or limit loads on roads and bridges around Australia under state and local government regulation. Because fuel consumption comprises some 25 to 30 per cent of the operating costs in line-haul trucking, in hire and reward trucking, then the trucking industry is well apprised of the need to control its consumption for business as well as environmental reasons, and the specific responses made by industry in the context include driver training to ensure that appropriate gears are engaged, acceleration rates, and of course braking; route selection - for example, the difference in fuel consumption running from Brisbane to Melbourne down the flat Newell Highway is significantly different to coming down the coastal area due to a number of factors, one of which is simply that the gradients are much less on the flatter inland route; also through maximising loads through consolidation for individual trips, and appropriate vehicle tasking.

The appropriate vehicle tasking also impacts on acquisition policies in trucking businesses to ensure that the best combinations, particularly involving tare weight of trucks, are achieved for the tasks. Also trucking operators seek permits to allow higher productivity vehicles which usually are restricted to operate on specific routes and sometimes just with specific tasks. The ATA runs a TruckSafe program and it consists of four modules and it includes a truck maintenance module, which not only provides schedules for safety features of trucks but addresses fuel and efficiency as

well in those schedules through fuel system maintenance.

Under Commonwealth legislation, the announcement made by government in June of this year will require recipients of business fuel credits under the Energy Grants (Credit) Scheme of more than 3 million a year to participate in the Greenhouse Challenge program. That will ensure that any trucking business that's not currently involved in that program, receiving more than 3 million of credits, will be incorporated in that program to measure and manage their fuel use and other energy use. Also any business using more than 0.5 of a petajoule of energy will be required to audit their energy usage and publish the results publicly for perusal. This is estimated to equate to diesel usage of greater than \$10 million per year.

The regulatory framework is complex for trucks in Australia, given our federal system, but both under Commonwealth and state law there is regulation of technical requirements, emission standards, vehicle loading and access and dimension, and of course local government, as I've mentioned, also has a role in providing or restricting access to roads and bridges, which can increase or reduce transit times and payloads, which translates into increasing or reducing the quantity of fuel used. The primary regulation for truck technology is under the Motor Vehicle Standards Act, the Commonwealth act, and under that Australian design rules are developed. There are many of those but the relevant ones relate in this case to engine standards. And under separate legislation fuel quality is set, under the Fuel Quality Standards Act.

The current engine emission standards set under ADR80/00 equate to the Euro 3 standards and equivalent North American standards and they have been delivered with approximately neutral effect on fuel efficiency, although some of that has been gained by reducing tare weight of trucks. However, the standards that will be introduced in 2007-08 under ADR80/01 will not be met without increasing fuel consumption and this is of concern to industry. Two possible technologies to meet their higher engine standards that may be available are the selective catalytic reduction or engine gas recirculation systems. The latter will definitely use more fuel to achieve the higher engine standard, by having a higher combustion temperature to basically burn off the pollutants that are addressed in the standards.

The former does deliver a small fuel efficiency gain but requires a catalyst - at this stage identified as urea or ammonium - to be inserted into the exhaust system of the engine to neutralise the pollutants. The cost of the extra equipment of that system and the catalyst itself will be at least as great as the diesel that is saved - the 2 or 3 per cent - which will probably steer trucking operators towards the EGR system, which doesn't have any external componentry and therefore would seem more attractive for maintenance, so it would appear that this regulation would result in increased fuel usage in order to meet the government's desired emission standards.

The quality of the fuel itself is also being tightened but this would not appear to

be having any impact on fuel efficiency or engine efficiency and won't of itself reduce energy efficiency. Mass loading of trucks implemented by state and territory jurisdictions are based on the national loading regulations but there is considerable variations between jurisdictions. The basic thesis here is, the more freight that can be put onto a truck within agreed safety limits will deliver greater fuel efficiency, not only in the case of individual trucks but for the development of new classes of trucks.

In that matter the opening up of Australian route-specific access to B-double combinations, which carry approximately 20 tonne more than a six-axle articulated combination, has delivered considerable fuel efficiency. That vehicle has an average fuel consumption to distance ratio of 1.6 kilometres to a litre of fuel, whereas the six-axle artic, what has been the standard workhorse of the trucking industry, is approximately two to one. So for the doubling of payload, from approximately 20 to 40 tonne, there is a considerable fuel efficiency dividend delivered from two down to 1.6 kilometres per litre.

The trucking industry continues to work for the increase of mass limits on trucks within safety requirements, especially as the agreement relating to the rollout of higher mass limits on trucks with road-friendly suspension has not been uniformly or widely rolled out since 1999. Particular gaps in the Australian higher mass limits network are New South Wales and to a lesser extent in Queensland. The delivery of higher mass limits nationally across Australia would undoubtedly deliver energy efficiency to the industry and to the community.

There is a current proposal for the National Transport Commission to include a nationally consistent incremental mass-loading system based on charges additional to the current system of recovering heavy vehicle road use costs, and the ATA supports incremental charging as long as the increments are measured from the current standards for both road-friendly and non-road-friendly suspension vehicles. The ATA supports infrastructure improvements, both through upgrading of existing roads and construction of new roads, because both can reduce transit time and improve gradients, address those transit times and fuel efficiency.

We believe the current proposals under the AusLink national transport plan has the potential to contribute in this area, but the construction improvement of new road infrastructure does not in itself deliver such improvements unless there is access to that infrastructure by the trucking industry and access charges are appropriate. The ATA supports the decision of the government announced in August to cap the effective life for depreciation purposes of trucks at 7.5 years. Although the current period is five years, the ATO proposed an extension to 20 years for this period, which would have completely reduced fleet turnover and the incorporation of new, more fuel-efficient and environmentally friendly trucks into the fleet. The ATA looks forward to the arrangements to cap truck effective life at 7.5 years being put into place from 1 January 2005.

The Australian trucking businesses, as I've mentioned before, are energy users in their operations and including their depot lighting, heating, et cetera. I can't provide the commission with an exact or even a high-order estimate of that energy usage but could provide details for individual businesses. Given the low average margins of the Australian road freight transport industry, opportunities to improve energy efficiency, particularly with fuel usage, is a key driver for these businesses. It also constrains greenhouse gas emissions in an environment where the freight task is rapidly growing. Any measures considered by government should reflect the contribution of the particular energy user against the national situation and be commensurate with that contribution.

It's noted that the terms of reference of the inquiry canvass suggestions about policy options for improving transport-related energy efficiency, including but not limited to urban planning, congestion, pricing, intelligent transport systems, travel demand management and increased efficiencies in the business, with freight sectors including opportunities for better matching of transport choices with transport tasks undertaken.

It's evident that the road freight transport industry has considerable motivation and expertise to introduce increased efficiencies into its operations, and encourages responsible authorities to consult with the industry in addressing issues of urban planning and congestion. Any discussions about or proposals to develop measures to address urban congestion, if applied to the road freight transport industry, need to be approached with caution and assessed against the overall economic situation, for it's unlikely that such measures will have the potential to enhance Australia's economic prosperity, even if they are believed to lower its greenhouse signature. Thank you, Neil, that's the end of my opening or introductory comments.

DR BYRON: Thank you very much. That's very interesting and very helpful.

MR GOW: Transport and fuel efficiency in the transport sector is just one of many components to this inquiry, but it's certainly an interesting and challenging one for us. Could you just elaborate a little bit more on the trend in fuel efficiency of trucks over the last 20 years, or 10 years, or some time period like that, and give us some idea of the variation in fuel efficiency of the current fleet. You've given us the figures for a B-double compared to a six-axle, but could you just flesh out a little bit for us both the variation across the fleet and the improvements, if any, in fuel efficiency over the last 10 or 20 years.

MR GOW: Yes. Certainly the trend of fuel efficiency per net tonne kilometre has been considerable. It's not only because mass has been increased on individual vehicles. To use the six-axle artic example again, over that time it's gone from a general as-of-right mass loading from 38 to 42.5 tonnes, but also because of the

introduction of more efficient combinations which can carry more than that amount, particularly through the B-doubles and truck and dog combinations as well, where a single-engine unit is actually moving more freight. As I said before, you'd assume that carrying twice as much freight, you'd actually have a halving of energy efficiency, but the figure only moves from two to 1.6.

So that fuel efficiency has been achieved through those two areas within vehicles, but it has also been improved through the increased logistics efficiency of the industry to make sure that trucks are fully loaded as much as possible, that deliveries are coordinated and that waiting time is also reduced. In relation to other vehicles and their fuel consumption figures, I don't have those to hand, but I'm happy to flesh those out in our finalised submission.

DR BYRON: Thanks very much. You made the point in your remarks earlier that because fuel represents 25 or 30 per cent of operating costs, companies are very conscious of energy efficiency and have a whole range of measures to keep on top of that. The area that I'd like to explore a bit further is: to what extent are further improvements in fuel efficiency coming simply because companies can see that it's going to save them money and help the bottom line, and what the role of government is in facilitating further improvements in fuel efficiency.

MR GOW: In my opening remarks I flagged the increasing tension between the government's objectives to improve fuel efficiency and therefore particularly address the signature of greenhouse gas in Australia with the trend established since the mid-90s to legislate for tighter environmental controls on emission standards.

DR BYRON: Nobody else has pointed out that trade-off. In fact, I think it's been usually implied that technologies would both reduce emissions and improve efficiency and reduce greenhouse emissions as well as other air pollution types of concern, but your discussion there is exposing quite clearly that chasing cleaner exhaust emissions can actually increase fuel consumption.

MR GOW: Certainly that's what we expect when we move to ADR80/01, the Euro 4 and equivalent North American standards. As I said, it is known that the exhaust gas recirculation system does use more fuel because the engine is running harder and hotter - it's basically got two turbos on it, rather than one - as the exhaust gases are recycled through the engine to burn remaining pollutants to ensure the emission standards are met.

The other system, the selective catalytic reduction, although it does deliver a small fuel efficiency gain, 2 or 3 per cent on the current figures, I'd emphasise those systems are not in general operation even in Europe and so operational experience of them hasn't been done yet - and of course in Australia we have distinctive operating conditions - and that the cost of the reagent will at least negate that fuel saving. We

expect there to be, therefore, an interest in the EGR technology which uses more fuel, but there is less componentry to the engine.

Of course, the government is moving to legislate for an even tighter standard, the ADR80/02, the Euro 5 and equivalent North American and Japanese standards, and there will be even more tension in meeting those two policy objectives. So if we are going to continue to move to tighter engine standards, the only way we're going to get greater fuel efficiency is by addressing the technology of the rest of the truck through its tare weight, depending on the load. In express freight one can use light materials like aluminium to construct trailers and save weight, but not with heavier material that needs more sturdy construction; or the overall increase in mass limits of trucks which will be, and has been over the last 20 years, a significant factor in increasing fuel efficiency.

DR BYRON: Can we just go on a bit: you mentioned Queensland and New South Wales having gaps in the higher mass limit network. Can you elaborate on that a bit for us, please.

MR GOW: Yes. There is a paper back at the office on my desk on incremental mass charging which has a very useful table in it showing the amount of the network in each state that is open to higher mass limits. It's 95 per cent in Victoria. I can confidently state that. At the bottom end - I can't recall the statistic for New South Wales, but the fact is that the only part of the national highway system, to be the AusLink network, that is open to higher mass limits in New South Wales is the Newell Highway from the Victorian to the Queensland border. That is the only area where higher mass limits can run in New South Wales. That could be as low as 2 or 3 per cent. I can have that figure checked, but you can see the - - -

DR BYRON: That's interesting, given that the use of B-doubles is one of the greatest improvements in fuel efficiency in trucking, that their application in New South Wales seems to be constrained a bit.

MR GOW: No, that's not exactly correct. The concept of higher mass limits is to be able to put some extra mass on a B-double or other truck, if it has the appropriate suspension system - - -

DR BYRON: Suspension, yes, sorry.

MR GOW: - - - which has been proved to create no more road wear than steel-spring suspension or non-road-friendly suspension. So B-doubles do run in New South Wales, but they run at a maximum gross combination mass of 62.5 tonne, rather than picking up the extra even if they have road-friendly suspension, and that would take them out to 68, so there is B-double access, but not with the extra mass on, and of course a six-axle artic would go from 42.5 to 45.5.

DR BYRON: Okay, so those are the suspension changes.

MR GOW: Well, the fact is that 70 per cent of the fleet in Australia now has road-friendly suspension. Those that have the older suspensions are usually doing local or intrastate work, and that's just become the standard equipment that people buy, particularly because working on interstate work they do require it for where access is available. The adoption of higher mass limits more extensively in New South Wales and Queensland and the continuing rollout in South Australia, which has progressed well as roads are assessed and bridges are assessed and upgraded, if necessary - and this process has been assisted by Commonwealth funding and there's more money on the table to the states to assist in this in the AusLink program. It's specifically identified for extending the higher mass limits network.

To go back to your original question, we don't expect that fuel efficiency is going to be delivered by engine technology. The engine technology is becoming more complex. The fuel efficiency in the trucking industry is going to be delivered in these other ways.

DR BYRON: Good. Thanks. I understand that a bit better now, I think. As you have probably imagined, a lot of people have raised the issue with us in hearings last week about the extent to which trucks "pay their way" in contributing to road infrastructure. You've made the comment earlier about road access charges. I'm aware of, I think, in Germany and Switzerland where they have sort of electronic tolling and transponders and GPSs and so on on the trucking fleet, and whether this can tie in with user charges or even congestion pricing on major highways. Does the association have any view on those sorts of pricing issues?

MR GOW: It's a fundamental interest of the association and has been since the first charges determination was worked through and implemented from 1995. Since then there has been a second heavy vehicle charges determination which was implemented from the year 2000, and currently we're involved in the process of the third heavy vehicle charges determination. Put very simply, there's a complex and transparent methodology run by the National Transport Commission to recover that amount of road construction and maintenance costs which are attributable to heavy vehicles through the payment of fuel tax on diesel, not on alternative fuels, and on registration charges. The former is collected by the Commonwealth, the latter by the states and territories, and in round figures that's currently about \$1.5 billion a year recovered from heavy vehicles for their attributed costs to the road. In fact, there is overrecovery because at the lower end the rigid truck fleet is fully recovered through the net excise payment. However, they also pay registration charges to the states. So there's overrecovery from heavy vehicles in Australia, and a considerable amount of money.

The example you raised of Switzerland and Germany indicates a totally different context for heavy vehicle charging. With the instruments that are used in Australia of a fuel tax and a rego charge, which work in an island continent, until we have a tunnel to somewhere where vehicles that don't pay a rego charge to an Australian government or don't pay tax on the fuel that they buy while they're in Australia, these are suitable if somewhat blunt instruments to collect. I only say "blunt" in the sense that they're based on averages for each vehicle class, so that trucks between 4.5 and 12 tonne pay a registration charge, the same registration charge, so we feel for simplicity reasons there shouldn't be different rego charges if the GVM of a truck varies by a tonne, but within a range.

Switzerland and Germany have transiting trucks who pay neither rego nor necessarily buy fuel in their country. How then do you recover the cost of road usage from those vehicles? You've got to look at other instruments. Traditionally, they have used those two instruments. It's not working particularly as the economy of Europe has been opened up and especially now expanding the European Community to include the Eastern European countries. The relevance of using such a charging system in Australia has yet to be proven as far as the Australian Trucking Association is concerned.

The other fundamental question is whether you have a system to recover the money spent by governments on roads and bridge construction attributable to heavy vehicles or whether in fact you construct a theoretical model based on science and engineering principles, if you like, that isn't related to road expenditure but to a road-wear formula and factors, and possibly end up with a charging regime based on that. The ATA feels that to consider going down such a mass, distance, locational charging system based on theory is very likely to totally undermine transport in Australia and the whole economy. We believe that heavy vehicles should have their attributed road-wear cost recovered from them, and we're satisfied with the current system.

The externality areas that you mentioned in Australia are being dealt with by regulation; ie, air pollutants, et cetera. These are being dealt with by regulation - for example, higher engine and fuel standards - and we support, with the reservations I've made before, that general approach to the issue of environmental externalities.

DR BYRON: Along with the question of equity between heavy trucks and other road users, the question has been raised a few times about the relative efficiency of road and rail freight. Some people have suggested to us that there's some sort of systematic bias that favours road freight as opposed to rail freight, when in fact rail freight - particularly over long distances - is said to be much more fuel efficient and greenhouse friendly. I guess the National Transport Commission also looks at road use charges in comparison to rail.

MR GOW: No, that's not correct, in the sense that for road charges the National Transport Commission runs the methodology and recommends charges to ministers. The rail charging system is fundamentally different and not uniform.

DR BYRON: That's right. You said the road charging is based on collecting a certain amount to cover the costs of road and bridge construction and maintenance.

MR GOW: Correct.

DR BYRON: So what rail is doing isn't part of that calculation at all.

MR GOW: Definitely not, no. The NTC does not develop recommended charges for rail when in fact the infrastructure for rail is in a number of different hands, with either private or corporatised government ownership. To try to make some comparison of the charging systems between road and rail is very difficult. I would emphasise though, the charging system for road is transparent; it's a consultative process and does deliver to Australian governments \$1.5 billion a year.

DR BYRON: You mentioned that the governments have typically relied on regulation to pursue their environmental objectives and fuel efficiency objectives, but it seems possible that governments have quite a large number of different objectives including road safety, for example, and the importance of logistics in moving freight around for the efficiency and productivity of the whole economy and so on. Is there a problem that pieces of regulation to encourage one aspect cut across other aspects of government policy? You've mentioned that the fuel efficiency objective and the cleaner exhaust emissions objective may be contradictory or not entirely compatible at times. Are there other areas where decisions of Commonwealth or state or local government, for different reasons, end up being incompatible with encouraging the fuel efficiency objective? I guess the weight limit thing is one of them.

MR GOW: Certainly weight limits is one of them. The other one I highlighted in the introductory comments was the depreciation regime set under Commonwealth tax law.

DR BYRON: Yes.

MR GOW: Although following due process the ATO recommendation that this be changed from the current five to a proposed 20-year period and then, after some consideration, reducing that to 15, of course was resisted strongly by the trucking association and the decision of government recognised the lack of symmetry between that recommendation to them, and particularly in the area of fuel efficiency.

DR BYRON: Yes.

MR GOW: But also newer vehicles are safer, they have better braking systems, better visibility, cabins are more comfortable and contribute less to driver fatigue through just the comfort of the cabin furniture and reduced noise. We want to see those new vehicles out on the road.

DR BYRON: Yes, that was a very interesting example that you raised, because I don't think we would have been aware otherwise of how decisions like depreciation for tax purposes can impact on the composition and performance of the entire trucking fleet. Yes, that was a very interesting example. Just one last question on the intermodal area: are you aware of any significant impediments to greater use of intermodal approaches, such as rail and truck, or sea/truck combinations? Are there any opportunities that we're not taking?

MR GOW: There are various - one of these is interoperability of IT systems. The freight industry still has large paper based transactions and although businesses may have developed IT solutions within their own business, or even possibly with prime contractor businesses, those systems are not necessarily interoperable with customer systems or other parts of the supply chain. That's been identified for some time and has improved, but that side of it is not just the physical issues - the information flow is an important area. The physical issues are highlighted, of course, around the principal ports, but also rail - intermodal exchange of freight with rail - and that particularly relates to containerised freight.

We're considering the growth of the freight task, reflecting Australia's growing population and GDP, and of course the AusLink document identifies that the freight task is growing faster than GDP, although in other forums when economists have been questioned why that is, they've said, "Well, it just does," but there has been a well-established figure for some time of that freight task growing at 1.3 times GDP, so therefore you apply that mathematically and it will double from 2000 to 2020. So the physical facilities to get freight off trucks onto trains and vice versa in the urban areas is a problem.

Of course, there are regular articles in the news about trying to develop new or larger intermodal areas, particularly around Sydney and Melbourne, but Brisbane also has these problems, and in its own way Perth, because of the location of its port, and restricted access area around Fremantle. One solution that has been proposed, of course, is to make those exchange areas well inland and there is some of that being done at Parkes in New South Wales, where there is container exchange based basically on the crossing of the highway system and the rail system, and that's being further developed.

But the biggest issue, of course, is urban distribution of freight where containers need to be opened, goods need to be then delivered in less than containerloads. The efficiencies of that often mean that if those goods are coming

over a shorter distance it's possibly inefficient to containerise it in the first place, but send it by truck in palletloads so that multiple pick-up and deliveries can be done, not only within the capital cities, but where the population is concentrated on the eastern coastal rim at communities along the way, both for retail and businesses purposes. So it's just building larger intermodal facilities, and that begs the question of who finances and owns those, of course.

DR BYRON: Yes.

MR GOW: And that's a very big question. Just doing that alone will not necessarily achieve or ensure their success, because one needs to fundamentally look at how much of the freight is potentially possible for intermodal use rather than staying just on one mode, whether that be road or rail. As you have identified, rail is effective over long distances with bulk produce, and grain to port facilities is a classic example there. So intermodal is a complex area. There is no easy fix. But these facilities where goods are transferred from rail to truck or vice versa can be addressed, and increasingly there are suggestions about shorter, more frequent or smaller, more frequent trains and train service so that the service issue of freight delivery can be addressed, which of course trucks do extremely well: they're very flexible, can move smaller loads.

DR BYRON: Yes. That's a long-term competitive advantage there. That's about all the questions that I have. Is there anything that you wanted to say by way of wrapping up?

MR GOW: No, thanks, other than to thank you for the opportunity to speak with you today and to say that if there are any further inquiries during your deliberations, please feel free to contact us. I'll amend our draft submission to reflect the concerns you've raised in your questions as well.

DR BYRON: Thank you very much. That has been very helpful.

MR GOW: Thank you.

DR BYRON: We will pause for a minute.

DR BYRON: Thank you, ladies and gentlemen. We can resume now with the representatives from the Royal Australian Institute of Architects. If you could please introduce yourselves for the transcript and then summarise the main points in the submission, which my colleagues and I have read quite carefully. Thank you very much for coming.

MR BUTT: Thank you. I will commence by introducing myself as Eric Graham Butt, commonly known as Ric. I am a past president of the institute, a long-time member of the institute's environment committee responsible back in 93 for the development of our environment policy, and currently the chair of the ACT environment committee and a representative of the national environment committee, and I am here today representing the chair of that committee, Lindsay Johnson.

DR BYRON: Thank you, Ric.

MS WOODS: I am Heather Woods. I'm with the Royal Australian Institute of Architects, a staff member. I'm the national environment committee manager, recently appointed to the position, but I'm working with Ric and the committee that he is a member of. Ric will be making the presentation. I am essentially just going to take some notes, although I am aware that there is a transcript available later.

DR BYRON: Thank you. Ric?

MR BUTT: Thank you. I was really going to turn our report upside down and begin at the end, just to talk very quickly about the role of architects, as set out in point 4.29 in our submission.

At a time when there are great problems facing the world, when new solutions are needed, who better than architects to provide the creative leadership that is needed to come up with new solutions? Our training is training in dealing with unknown issues, undefined problems with unknown outcomes, going through all sorts of regulatory and authority approvals, hurdles, et cetera. There is a real role for architects here. We have been taking a lead for a long time, as has been documented in the report. As item 4.28, Leadership, sets out in our submission, we see there is a real problem of leadership and of political support for the initiatives and the needs there and we hope that your report will be able to help address this situation in Australia.

Referring then to item 4.27, Information, one of the major problems that we see is a way of educating the public and a way of communicating to building owners about the value of the role of architects and their contribution to that, and these are not included in the report, but I have brought along two diagrams which I am happy to leave with you, one of which indicates that when one starts talking about life-cycle costing, the role of architects, et cetera - if I can ask you to turn to the pie chart to

begin with.

Fees as a percentage of the life-cycle costs of a project: you will see that design and documentation fees of a standard commercial project are about 0.1 per cent and that there are a lot of management and operational costs after construction. What that indicates to me is that if you can make a saving in the latter 80 per cent and that incurs a cost in the first 0.1 per cent, then that would be a good investment for any nation. If you then turn to the second diagram, Total Life Cycle Costs, the important point to indicate there is that the impact from the life cycle of a building is greatest at the beginning and reduces, as that curve shows, across the end, and the cost to change a building has least cost at the beginning, as you will see by the flat line. It then goes in the Z-shape up, and I've put a dashed line across there to indicate that probably the costs to change actually just keep on going up and up.

There is a lovely book by Stewart Brand, the author of the Whole Earth Catalogue, called *How Buildings Learn*. It talks about how buildings change over time. They begin with the stuff of buildings, like chairs and tables and things. They change daily, if not weekly. Then there is the space layout, and so you'll have internal partitions and workstations changing on a monthly basis, through to services which change regularly on about a five-year basis as technology advances, as standards creep up. So stuff, space, services. The next item of a building that can change quite regularly is the skin. The skin of buildings tends to change about every 20 years, particularly in Australia where we have 10-year commercial leases; so a 10-year lease plus a 10-year option. At the end of 20 years your building is out of date.

We have an example here in Canberra of a whole multistorey building being stripped back to its structure and refurbished. The last item to change is structure. That changes about every 50 years in Australia because it's at about that time that is considered to be the commercial lifetime of a building; and then of course your site, and your site can only change once the structure and all of the other building components have changed. If you add up the cost of all of those changes then these graphs are even worse, because what it indicates is that the costs of operation, including those additional costs to change and upgrade structure and services, as a comparison to the initial design cost makes the initial cost very, very small.

The two examples that I like quoting are that the initial design and construction of a standard two-storey office building is in the order of 10 to 15 per cent. So the total cost to design the building, finance it, get it up and running, get the real estate agents to let it out, et cetera - 10 to 15 per cent. For a capital-intensive building like a hospital, a major infrastructure item, the 20-year cost of the design and the construction is 3 per cent. What that indicates to me is that of the remaining 97 per cent of the hospital, approximately 50 per cent of those costs are running costs, and that includes energy, so if you could make design improvements at the

outset to reduce those running costs you are having an impact of perhaps 50 per cent of 97 per cent, which is quite a big multiplier.

There is a section within our submission about life-cycle costs at point 4.18, which does talk about some of these issues there. If I could just emphasise the point made on page 13 in the middle of 4.18 that there is a need to give first priority to solving operational energy implications over the life cycle of a building because we see that there are enormous possibilities of savings in that area there. How do we get those savings into place? Architects. Those that are educated and keen and committed and knowledgeable will be able to tell you, but it goes back to the points at the end of our submission about the need for education and information to be put to the public, the need for further training within the industry, for there to be research done; and the Australian Greenhouse Office has commenced to provide basic statistics about the implications of building design.

But we have to make a change. There is a point in our submission: we have to do something more than just introduce the stick approach, contrasting with the carrot. We've had energy rating in the ACT, where I come from, and practise here, since 1 July 95 and you cannot see a discernible change in the type of dwelling that has been built here during that time, the implication being that energy ratings are not having an impact on buildings and building design, building outcomes. What is having an impact are clients who are committed to reductions in energy use, reductions in greenhouse, as one can see from Lend Lease, who began with the Sydney Olympics and have now opened their new headquarters in Sydney - The Bond - as a world-class leading example.

They have done that both from a marketing perspective but also from a financial perspective because Lend Lease has recognised that there are dollars to be made by being green and by reducing energy consumption, as well as a corporate profile to be made by being a good citizen in this country and by demonstrating and leading and showing how to reduce greenhouse gases. That has caught on. The Green Star rating: now for the first time in the ACT, one of the new buildings at the Canberra Airport has received the Green Star, the highest rating there - I think it's a three-star - and is being actively promoted and tenanted on that basis there.

But I think that the most important point that I would like to emphasise to the commission in our submission is contained in point 4.25 on page 16, and it talks about the importance of pricing, the positive incentives there; resource pricing at true cost; electricity pricing at its true cost; water pricing at its true cost. This is a huge political issue in any country all around the world. If the true costs - and that includes an allowance for environmental cost and resource depletion - if you added those in, that would be wonderful, but even if we just took the true cost of the resources like water and electricity that we take for granted, then you wouldn't need too many incentive programs, you wouldn't need too many regulatory schemes,

because the marketplace will adapt very quickly.

The marketplace is finely tuned, as you can now see by an acceptance that water must change with the current drought situation. I know that here in the ACT I've been consulting and working with people in Western Australia about water pricing and water initiatives. It is time to really address the problem of the true cost of these infrastructure-type elements that impact on energy use in Australia, and as set out in that point there, then reciprocating with tax breaks, concessions, education to overcome that conservatism, where people still don't believe and don't understand the things that we've been talking about. I've been involved now for 29 years in promoting low-energy buildings in architecture and I still have people say to me, "If it's such a good idea, why isn't everyone doing it?" So there's an enormous problem in getting it across there.

I think that's the single biggest area there, and once the pricing buttons are pushed, not only will that impact on residential and consumers, but also on commerce and major constructions. I think that then people will start to understand the importance of life cycle, but not until then, because there's no incentive for people to change from looking at initial cost to the life cycle, costs of the long term, costs that are involved there, and it's not until we get that appreciation in Australia will there be an interest in holistic design, integrated design approaches where architects work with engineers to be able to achieve better outcomes, and it's only after we've got through that hurdle I think that we can then start to look at regulations for embodied energy for appliances, equipment, hot water, refrigeration, lighting, the other elements that have been included in our report there.

And then we can talk about a more bioclimatic response, responsive design, a design that relates to the climate. I think that it's the greatest tragedy that authorities, regulators, planners don't commence with the site as being the basis of all design, because with every site that you buy, for free you get a piece of climate, and if you can work out how to use that climate, which is what bioclimatic design is all about, then you can take all the benefits from that in being able to provide human comfort, which is I guess the total aim that we're talking about, to achieve a relationship between the climate in which we operate, the buildings and the human comfort for the activities that are going on in those buildings, and if you understand the climate which comes for free, then you can even out the highs and the lows.

You can, for instance, in Canberra do buildings that don't need any heating at all for no additional cost if you begin from the same basis. You can do buildings that don't need any cooling, but it requires a different approach both from the design, and sometimes a different approach from the occupants, or incentives and subsidies to allow things like computerised building management systems which are still lagging behind, to take over that very active role. Passive buildings need active management, and it's in that area that I think we are falling behind as a nation

because we aren't promoting enough passive buildings, unlike Germany, Holland, England, the European countries, and we have greater resources.

We have more sunlight, we have cleaner air. We're able to take in fresh air, we're able to use natural light. If they can do low-energy buildings that don't need heating in England, where they have an average of one hour's sunshine per month in the winter, then why can't we do something in Australia where in Canberra, for instance, we have an average of eight hours of sunshine per day in the winter. So we have to ask why those measures aren't included and what are the costs.

As architects in the institute, we've been supportive of increased building regulations in this area, both within the BCA and in terms of other rating systems. However, we have to indicate that we are not particularly happy about the outcomes from those regulations and about the amount of regulation that is now occurring. It appears to be regulation for regulators' sake. The outcomes are not assured there, as I've indicated with regard to the house energy rating schemes and the impact. We do need to look at other measures there, and they are the incentives.

So regulation should cut out worst practice, be right at the bottom of the bell curve, and cut off those laggards. It should bring all the laggards up to the base line. There should be plenty of incentives and an allowance for the leaders to go way ahead of the pack. Unfortunately, some of the regulations now are making it impossible to lead in the area because the leading designs do not meet the prescriptive regulations, and it is now becoming almost impossible to get beyond that.

BASIX, the New South Wales government scheme that has been introduced allows - the only way to escape with a leading design is to go through a very long, individual approvals route, possibly even involving the CSIRO to validate the new designs. However, we would support BASIX as being an appropriate approach. It appears to have more capacity to impact on our profession than any of the energy ratings scheme and, from our point of view within the environment committee of the Institute of Architects, we would love to see something like that go national, both because of its positive benefits but also because of the problems of practising in this country across state boundaries, where every state and local council has different legislation.

The proliferation of regulations in our buildings environment is substantial and is one of the biggest negative impacts and, as we see more regulations coming in with regard to energy use, this will become a greater problem, so if there can be a national standard like BASIX, we would support that. I don't think I have anything immediately to say but - - -

DR BYRON: That's an excellent start. Thank you very much, Ric. You've already

raised some of the things that I want to talk about. I think the pie chart that you've handed up is a classic example of one of my favourite bumper stickers: that good design doesn't cost; it pays. Getting the design right the first time has a very, very small cost compared to the great string of costs that you'll incur over the next 20 or 50 years if you get the design wrong.

MR BUTT: Yes. The point that I didn't make with regard to Stewart Brand's book, *How Buildings Learn*, relating to the different stages of a building, was that he supports the notion that architects have called Long Life Loose Fit, which ties back into that; that you can also design a building so that it can adapt to change, evolve without needing its demolition and the energy, embodied energy and environmental issues that relate there. So if I could emphasise: the reason for telling you about Stewart Brand was Long Life Loose Fit.

DR BYRON: I was thinking last night about the house that I used to own here in Canberra. We built it in 79 to be passive solar and so an enormous amount of work went into the selection of the block, the siting, getting the eaves right, getting all the north-facing windows glassed, the thermal mass of the building, the solar hot-water system. It cost absolutely nothing to cool in summer and almost nothing to keep warm in winter. It was the most comfortable house and the best house I've ever lived in.

When we went to sell it about 12 years later, I mentioned these incredible sort of comfort and convenience benefits and the huge saving in operation costs to the real estate agent who was selling the property for me and he said, "Don't mention that. Nobody cares about that stuff. People are much more interested in the colour of the tiles in the kitchen or the bathroom," or something that I thought was trivial. The energy rating scheme has been around since 95, but the ideas for good design of residential housing to take advantage of Canberra's superb winters, et cetera, that's been known for a long time, and yet still what we actually see being put up in the suburbs is nothing like what we know is possible.

We've had lots of conversations in the course of these hearings about what are being referred to as McMansions: just big ugly boxes in which you compensate for the lack of design by putting in the biggest reverse-cycle airconditioner you can find and the sort of brute force of that compensates for the profound ignorance and the lack of thought that has gone into designing this place. Of course, having thousands of these sort of industrial-grade airconditioners in the suburbs creates enormous loads on the distribution transmission substation and electricity network. So it seems to me in the residential area, and design, we've been going backwards for a long time.

In Brisbane last week I was looking at the classic Queenslanders and thinking how perfectly designed they were for that climate, and yet they stopped building them 50 years ago. But that - sorry for the long ramble - sort of comes back to the

central theme of this inquiry: that we know there are things out there that make really good sense, that improve energy efficiency, improve standards, productivity and everything else, and for whatever reasons, we're not doing them. Why is it that, given that we've known how to design much better houses and buildings for quite a long time, we continue to see so many new going up that don't take advantage of that knowledge?

MR BUTT: If I may propose a few answers, one of them is that the housing market in Australia appears to be driven through the rear-view mirror - is the term that we use. That is, both the real estate agents - the market - people only do what they know. There is an innate conservatism that permeates the industry. It is fuelled by the way that I believe the housing stock of Australia is financed, particularly by large, very conservative financial institutions. I know with my own designs, Australian Design here in Canberra, we have problems at times with our clients gaining finance for our buildings, because bank valuers and bank managers say to them things like, "But for the same money you could get a larger house elsewhere." That's very symptomatic.

I think there's a very conservative approach both in how we value buildings and in how banks, et cetera, look at them. For instance, I've had clients come back to me and say that they're going to reduce some of the energy saving measures because they get no benefit from them through the bank. The bank is only interested in the initial cost and the fact that that initial cost doesn't cost them more than whatever the regulations are, 25 or 30 per cent of their weekly income.

DR BYRON: Yes.

MR BUTT: What the running costs are is of no concern to the bank. In America they're now bringing in green credits, where financial institutions will take into account the reduction in running costs and say, "If you're going to have, as you have just related, almost no heating costs, almost no cooling costs" - and the average in Canberra is 2000, 2500 now per annum - "then there is an allowance made back into what you can afford to pay."

DR BYRON: Afford to pay for the mortgage.

MR BUTT: And I think at a commercial level some of the commercial developers are starting to see that and they're being forced to by some of the larger tenants who are setting out requirements. They're actually driving the market far more. We don't see that happening in the residential market and I think one of the reasons is that there aren't enough facts and figures out there, which is what we say in here. We'd like to see more research and publication and promotion of the good stories about your house, one of my houses and what it can do in the Canberra climate.

Those same stories relate around Australia. You talk about the Queenslander which died and is no longer promoted. In Darwin - and I think Cyclone Tracy had an impact there - buildings that were climate-related there are only just reappearing. Canberra never had a tradition of climate-appropriate housing.

DR BYRON: Yes.

MR BUTT: It is being developed, but it's very much fringe. So there is that educational side of it and the idea of promoting good examples and, in the meantime, unfortunately what we do is try and create little rules and regulations to just tweak the existing stock. As I've tried to point out with the energy rating regulations here in Canberra, for instance, they haven't made a substantial impact. I think the next big wave, though, is that - I can assure you now that if you were selling your house in the ACT today there would be a far greater interest in those passive benefits, passive energy benefits that you have mentioned, than there would have been back in 91 or 92 - so even in the last 10 years.

As the educational system within our country produces more and more children who are aware of this issue, we are going to have a better informed clientele asking the question: "I've read about this, I've learnt about it. I've done a sustainable building project in high school and I know about these things." More and more questions are being asked, so I think we have some hope there. But having been involved with the institute, having been involved with promotion of everything from energy rating schemes and the idea that they will all help, I now come to the point set out in here at - I think it was 4.25 - that pricing seems to be the only way to go.

DR BYRON: That's what I was just coming to. This is again fairly central to what we've been looking at, but it just intuitively seems to me that with both energy efficiency and water use efficiency, it's very hard to tell households or companies that they should treat this resource as if it's very scarce and very valuable, and they have to use it very carefully and efficiently when in fact the price signal they're getting in the marketplace is that it is as cheap as dirt. So we're trying to use regulations and encouragement and education and persuasive measures to encourage people to be very, very careful and efficient and conservative, but the price signal is just flying in the face of that.

The corollary is that if we could get prices that truly reflect the cost of the energy or the water, taking into account all the environmental costs, then presumably people would become much more focused on ways of being more energy efficient or water efficient and all the benefits of using recyclables or the benefits of distributed energy or whatever, and we wouldn't have to have dozens of government departments around the country going around trying to regulate how to improve or proposing particular bits of technology because, as you say, the market would start to pick up all these things if the price signals were there.

MR BUTT: Indeed.

MS WOODS: Could I just add something here - and this is from personal experience, rather than from the institute; I don't know whether you touched on it as well, Ric. I think there is also a very real problem in our local planning authorities that there's no uniformity, no consistency between planning authorities about what is good and desirable energy efficient and energy saving usage. For example, my partner is working on a building project in Queensland. He's tried to arrange with the development application for much of the internal water to be recycled, and the local planning authority wouldn't allow him to do it. That's really strange, isn't it? But that shows a level of understanding, or lack of understanding, which is actually out there in the authorities which are looking at and approving - - -

DR BYRON: The commission has another parallel investigation going on at the moment, looking at the Building Code of Australia. One of the issues that has come up over and over again is, even though we've tried to have a uniform national building code, in many cases local councils are coming up with non-conforming requirements, or things that are acceptable everywhere else in the country suddenly aren't acceptable in one shire or one municipality, and so on. So that undermines the whole point of having as uniform, as sensible - - -

MR BUTT: What it indicates, Neil, is something that the institute has been advocating for a long time now: a national development code for Australia to parallel the Building Code of Australia.

DR BYRON: Because the code doesn't pick up the planning and siting type of issues, does it?

MR BUTT: No, and there is a thing called DAF - the Development Assistance Forum - that the institute and all of the building construction industry parties - MBA, HIA, et cetera - belong to, which is an offshoot of COAG, but it is grinding along very slowly because of interstate rivalries about who will give up their approach to planning in order to get a national approach. I can remember, going back many years, how we got a national building code. It required - I think the term was - harmonisation of legislation, then uniformity of legislation, and finally I think the third step was a Building Code of Australia.

In the development assessment area, we cannot even get to harmonisation. That highlights the point that Heather has made about rules and regulations. On the energy issue with regard to local councils, because of their lack of resources and therefore lack of skill base, we are finding that they are requiring things like the SEDA Australian building greenhouse rating which is a post-occupancy tool to measure the effectiveness of a building. They are requiring that to be submitted with

plan approval, so they're trying to use it as a predictive tool for a design.

When pointed out to one of the authorities about the problems that this incurred because you didn't have the statistics, what they did was sit down and ask for an industry get-together to agree on the assumed figures to be put in. So if you didn't have figures, well, we'd have to assume them - "We'd better have agreement and a meeting to all agree on what we will assume." There's more time and effort spent there, so if we could come back to the uniformity, Heather's point is a real issue in operating in this whole area because it does cross authority guidelines. If the BCA could be expanded to include these development assessment requirements, that may be another very simple way of sort of starting up a parallel course, a brand-new one.

Maybe the BCA has to increase and go from being a building code to being a building and development code, or maybe it should be just called the Development Code of Australia and have its front end expanded to take into account all of these other issues, because if you want the outcome of a building to be safe, environmentally friendly and low energy, as you've indicated yourself with your story about your house, it begins with siting, it begins with an appraisal of the climate, and then it begins with trying to match the structural requirements, fire and other health and safety issues with the environmental requirements. It's very challenging; that's the joy of architecture. It's putting all those competing things together every time it's new, because every site is different, every client is different, every budget is different.

DR BYRON: Exactly. The problem there is having a very large piece of regulation that's supposed to cope with all of these unique opportunities for construction. Having a thick rule book seems to be the opposite of allowing flexibility, innovation and creativity.

MR BUTT: It depends how it's done. There is a thing called AMCORD - the Australian Model Code for Residential Development - and it's on the basis of the West Australian planning regulations, and it was hoped that that would get adopted across Australia. It was a thickish rule book about housing development, but what it did was set out objectives which we often see in things like the building code now as performance criteria, and then it had other measures which weren't called "deemed to comply", because the deemed to comply is a minimum. It was a much more flexible approach, and it said, "These are the objectives. These things might help you." The BCA has gone down a slightly different route, where it's a little bit more prescriptive, but it does still allow you to argue the objective.

DR BYRON: On the proliferation of rating schemes, that seems to have come up quite a lot, where each state seems to have a variety, and then we've got NatHERS and BERS and the Greenhouse Building Rating Scheme, and so on. We've had a couple of submissions - one from a company called Exergy that are appearing this

afternoon, and one from Dr Terry Williamson of the School of Architecture in South Australia - that basically are fairly critical of rating schemes that are based on computer simulations or ex ante estimation of how you think the building is likely to perform. They're both arguing very strongly for ex post measures where you actually record the performance of the building in the first 12 months after commissioning, to take into account that in many cases performance depends on how the building is commissioned and how well the occupants actually manage the facility. Do you have any thoughts about ex ante and ex post assessment?

MR BUTT: Yes, I do. I know both of the authors and they're world standard members of the industry. Terry Williamson is on our national environment committee as the South Australian representative.

DR BYRON: I didn't know that.

MR BUTT: I know of his views. I haven't read his submission. I'm a designer and I'm not a rating tool boffin. There's a whole new industry out there - ABSA, for instance; the Association of Building Sustainability Assessors.

MS WOODS: They're actually organising the new tool in Queensland.

MR BUTT: There is an Association of Building Sustainability Assessors, so anyone who does ratings now really needs to belong to yet another organisation. As a design architect, I quite like the old Pareto principle - the 80:20 rule - and I want something that is going to come close to telling me where the big problems in a design are. I don't want something that is so fine that it's predicting down to how many joules this building is going to take to operate, and I don't believe, for the reasons that you've indicated, commissioning and occupant activity both can undo the best designed building.

So while we've got a lot of very good minds and a lot of energy and a lot of money going into predictive tools in this country, we've had very little follow-up and monitoring research of what is actually happening in those buildings. So we're not getting a feedback loop back into the development of the programs or back into the development of new building types, new building materials, new building technologies. The old solar hot-water heater: the biggest boost that the solar hot-water heater has got in Australia in the last decade, in my view, was from the Sydney Olympics and the development of a gas-boosted one because there was a specific requirement, there were 600 units to be ordered, and the manufacturer went out and did something for that one instance that is now available in the marketplace.

I'm not sure if I have answered your question but it is worrying, as a designer, that once upon a time I could understand the architectural science of prediction and rating and we used to actually calculate energy gains and heat losses ourselves. It

was post the slide rule era; I missed that era, but programmable Hewlett-Packard calculators were all the rage at that time. Now I wouldn't even dare step into that field because it has gone way beyond and yet the results aren't necessarily any better for me as a practitioner to use.

DR BYRON: One would think that there would be a good correlation now between the ex ante predictions of building performance and the ex post measurement and that people would have gone back and compared why it didn't deliver what it was planned to deliver and so on, and that eventually the two would have converged, but the evidence we are getting in some of these submissions is that there is still no good correlation at all between the ex ante predicted performance of the large commercial building and its subsequent actual performance. That sort of surprises me. You'd think people would go back and say, "Well, why didn't it perform as predicted and what can we do about it?"

MR BUTT: Yes. I think that's an area of need within Australia. It's an area of need for government to help with funding. The Australian Greenhouse Office and the Department of Environment has been very supportive in developing new schemes and new approaches - the "Your Home" approach, et cetera - but there has been very little that I'm aware of, of post-occupancy evaluations.

DR BYRON: Well, speaking of post-occupancy, you talked a bit in your submission and in your opening comments about retrofitting. Would I be right in thinking that if the basic design, siting, structure was not good then it's going to be incredibly difficult and expensive to retrofit a major building?

MR BUTT: No. May I contradict you - - -

DR BYRON: Great.

MR BUTT: - - - and say that there are a range of measures. It's about the order of level and if you go back to Stewart Brand it can even be in space planning within the building to, for instance, not have - sorry. An analysis of the building might indicate that the fully-glazed western front of your international-style glass box gets very hot in the afternoons and that that is where all of your tenant complaints are coming from.

DR BYRON: Yes.

MR BUTT: Turn that side of the building into corridor activities that don't require people to sit there and work with the sweat dripping off them because the airconditioning can't operate. So playing with the space and the stuff within the building is an approach that does not need a lot of money.

DR BYRON: Okay.

MR BUTT: For instance, on a house in Canberra, my approach to retrofitting comes back to human comfort, to identify two categories: how do you reduce summer heat gain or get rid of the heat, and in the wintertime how do you increase your heat or reduce your heat loss? I am sure that there is an assessment for commercial buildings in general, as there is for houses, but in general for houses in the ACT - and I think it's pretty much the same across Australia because we adopted 18th century building practices from England - the air changes per hour are far greater in a house than they need to be, which has been very good for healthy houses in the past. As we seal up our houses we are seeing more and more asthma and other health-related issues from the products that we are putting into buildings now.

But for instance, in the ACT, one of your best energy measures in retrofitting is to go and buy a whole box of No More Gaps and plug up all the gaps, to go and buy draft tape for every door and window, and I've seen a 20 per cent reduction in energy costs in winter heating from simple measures like that. That is without having to take out the chainsaw and chop up the northern brick wall to put in glass to increase heat gain. There are simple measures, like shading western-orientated facades that had to face the road, as they did back at that time, and the creation of a front verandah with appropriate shading. The same applies, I believe, in a commercial building. It's about doing an audit, and there are some very, very simple and effective measures that can be done.

DR BYRON: I was looking at that list and I was assuming that we'd have to change site, structure and skin but you've convinced me already that just by changing stuff and space, a lot can be done to ameliorate the work space. So it's not necessarily a question of just ramping up the horsepower of the airconditioning unit.

MR BUTT: No. Services again: things like motion detectors in rooms to turn lights on and off. Those kinds of changes are now here. We talk about the benefit of the PLC lamps, the compact fluorescents, and what they can do. If you haven't come across Amory Lovins and the Rocky Mountains Institute - - -

DR BYRON: Yes. I know him well. I've been to the Rocky Mountains Institute.

MR BUTT: Yes. Fantastic guy, great little stories, and the one in here about, you know, one light bulb saves a barrel of oil a year - I think that's fabulous.

DR BYRON: Yes. One of the other things that you sort of alluded to that has come up a bit and I'd like your opinion on is the problem of split incentives, that the property developer or the one doing the construction doesn't particularly have the same interests as the eventual occupants, the users. You may have five or six different parties involved in a major commercial building. The project developer of

the building and so on are looking at ways to minimise their costs without thinking of what it does to the subsequent operating costs of the final occupant. Are we getting closer to getting those incentives lined up?

I mean, we are starting to see the emergence of some major commercial green buildings because tenants are saying that that's what they want, but the majority of the commercial building construction still seems to be looking at initial construction costs rather than life cycle. I gather from talking to a number of architects that there is a frustration that you have the enthusiasm and the capability to design environmentally friendly, high-performance buildings, but the customers are not always on the same wavelength.

MR BUTT: No, that's right. I think that a significant shift has occurred at the big end of town and the alignment that you talk about I actually do see in some of the major property trusts that are operating in Australia, and that includes some from overseas that have now come in and are operating here. They really know their stuff. They know about life-cycle costs because they end up being the primary facility manager, the owner long term, and that seems to be the way that a lot of building ownership is going at the big end of town. At the medium and the small end the frustrations that you have outlined exist there because the developer has no other incentive other than to get the building up and fully leased out and then sold on possibly to the owner-occupier investors and they have to shoulder the ongoing costs.

But again, to introduce regulations to cover these cases - I think that pricing: if a tenant can see that in one building their annual costs are going to be less than in another - I'm a great believer in letting the market have more of a say. I mean, you use regulation to remove worst practice, you have incentives to promote best practice, and the rest in the middle there, it's done by basic economics. That may need some education as to what is possible. The market is lacking knowledge about what is possible and everybody assumes that in the ACT a low-energy building is going to cost you 10 to 50 per cent more than a normal building, and I've never had a client that has had more money to spend on those things than anyone else. The banks, as I have related the story, sit behind them levelling it all out anyway.

DR BYRON: That problem of split incentives: as you say, I would have thought that the commercial tenants, assuming that they have accurate metering of what their costs are - why aren't they shopping around for more energy efficient buildings? Why aren't they telling prospective new developers, "We will only be interested in leasing space in your new development provided it meets these sorts of conditions"? Maybe it's a question of educating the customers, or it may be that the electricity costs are so small that they are not interested; they are more concerned about the colour of the tiles in the bathroom.

MR BUTT: Yes, I think that's the case, and also I believe that some of the building

owners are using incentives like, "We'll cover the energy costs." The increases in leases don't cover increases in tariffs, for instance, as one of the incentives to go in there. I must say, though, that increasingly it's the large accounting firms, the large legal firms, the large stockbroking firms - it's those educated firms that wish to show that they are both a good corporate citizen and have an environmental policy that are starting to lead. The Commonwealth government does, with the leasing of its buildings, but in some instances they pay lip service to it because they state all of that but then when it comes down to the bottom line, the dollars, they do jettison those ideals, those requirements.

Interestingly, in some of the major building developments in the green area in Australia, one of the incentives has been to meet tenant and client requirements that have been postulated by the staff association or the staff union of that organisation, so it's actually an interesting thing, where the members within the groups are companies that are paying heed to their employees, are some of the companies that are then going on the champion green buildings on behalf of their employees, and I think that's very interesting.

DR BYRON: Because they're healthier and more productive places to work in.

MR BUTT: Yes. I'm not sure whether you've come across it, but in the States, going to conferences on green buildings over there, green buildings in the States are promoted not for their economic benefits in terms of reduced energy costs but for the economic benefits flowing from increased productivity, reduced staff absences, sick leave, happier environments, et cetera. I'm a firm believer that there's a therapeutic benefit from low-energy buildings, both in having sunlight in a building in the wintertime, just on the psyche, to having the healthier building that relates more to the biorhythms of the human body.

The temperature band in the ACT to a Commonwealth government building must be between 21 and 24 degrees Celsius. If it moves outside that band, then they don't have to pay rent. 21 to 24 might be a nice band of temperature for comfort in spring and autumn, but in the summertime when it's 30 outside, or higher, then have a band that goes up to say 25, maybe even 26, and in the wintertime if people were educated to dress more appropriately, it could be a far healthier situation. So we have these myriad rules, and people try and set the one rule without taking into account the differences in climate.

The other great problem in all of our commercial buildings across all of our cities is the Monday morning start-up problem, and if we had better designed buildings that related to the climate, then I don't think you'd have this problem of the whole building sinking over the weekend and having to be cranked up again at 4.00 and 3.00 on a Monday morning to have it comfortable by 9 o'clock.

DR BYRON: Yes, that's a very good point. I think I've finished all the questions that I had in mind. Are there any closing remarks that you'd like to make?

MR BUTT: Yes, I think there's one we haven't touched on: just some of the simple technologies. I'm very much an advocate of low technology rather than high technology. For instance, we don't often ask the question: why do we need a light bulb? Too often we're asking questions about which latest light bulb will we use with which computer management system, et cetera, going for that low-energy approach.

But there is a real role for technology in the management of buildings, in the monitoring of a building. For instance, what if our energy rating scheme, our predictive tool, were able to be built into a computer management program that said the designers of this building, "There's the little green line waving from summer to winter, showing what this building was designed to reach. Now, here's your building management program. It's built in, it's hard-wired into the building. It's locked in there. We can now see how you're going"? So their building manager could do that. That could then be displayed outside the lift in each building and tenants would get incentives for saying, "Gee, how are we going today? There's the graph line there." So we need things like that.

We also need to continue the subsidies and the incentives for the development of things like photovoltaic electricity and its incorporation into buildings in a way that, while being an add-on, is really good for retrofit, to be able to be built in as part of the design and not necessarily stuck on as an eyesore afterwards, to just promote the benefits of some of those technologies where even when house owners build in photovoltaics and the PV is just used to generate during the day and they draw upon the grid at night. It's during the day that our nation has its greatest load, so it's actually helping to balance the loading, and I think there's an enormous benefit. With 10 to 12 panels in the Canberra region, we have houses that are electricity neutral, and that's an investment of at or just under \$10,000. There are other people who say that that buys a lot of electricity.

I guess one final anecdote: normally when we're introducing new technology, new building styles and building designs, we have the trickle-down effect where you go to the leaders of the market, the biggest corporations, the richest family. Their new house wins all of the awards and then within 10 years that's now become an industry standard for whatever was in there. That tends to be how the industry works.

Unfortunately, with energy, we seem to be having no success at all, and there appears to be an attitude out there that says that, "Yes, I'm interested in green, et cetera, but I want a particular comfort and I can afford to flick the switch. I don't have to be like all of the others." That's why it's really good to see some of the

leading members of society, both corporate and individual, champion low energy, because it's not a common element out there.

DR BYRON: Thank you very much. It's been extremely interesting and very, very helpful.

MR BUTT: Thank you very much.

DR BYRON: Thank you for the written submission too. We'll adjourn for morning tea and come back after 11.00.

DR BYRON: Thank you very much, ladies and gentlemen. We will now resume with the Department of Environment and Heritage. If you could introduce yourselves, and then if you'd take us through the key points of the written submission which Mike and I have both read and appreciated, then we can talk about it. Thank you very much for coming.

DR WRIGHT: If I could commence, my name is Diana Wright, and I'm the division head of the industry, communities and energy division in the Australian Greenhouse Office, which is now part of the Department of the Environment.

MR McGLYNN: I'm Gene McGlynn, the head of the energy efficiency and community branch.

MR HOLT: My name is Shane Holt. I'm the manager of the equipment and appliances team.

MR BYGRAVE: Stephen Bygrave, manager, energy efficiency policy team.

DR MARKER: Tony Marker, manager, buildings, government efficiency and transport.

DR WRIGHT: We appreciate your time this morning and also that you have read our submission. What we'd like to do is just go over the key points in the submission, but also address questions as to why government should be involved in the issue of energy efficiency. From a Department of the Environment perspective there are two broad classes of barriers for greater energy efficiency: market barriers and organisational barriers. There seems to be a key role for government in each. Market barriers is well known as a role for government; organisational barriers are possibly less so, and we'd like to tease out those issues for you.

From our perspective there are significant economic benefits that will accrue both to individuals and companies and to the economy from energy efficiency - over a billion dollars per annum - and only half of this would be harvested by the first stage of the National Framework for Energy Efficiency. There are significant environmental benefits: 50 per cent of our current greenhouse gas abatement is derived from energy efficiency and that is delivered at a net benefit of around \$30 per tonne, so it is the most cost-effective source of greenhouse abatement and has the additional benefit of delaying investment in power generation. So that also, from an environmental perspective, allows more time for technological development to address climate change. Having said that, I would like to hand over to my colleague Gene McGlynn, to just go through the key elements of the submission and then to take your questions.

MR McGLYNN: Thanks. As Diana says, there are two broad classes of

justifications for government action which we want to talk about. The first is market failure which I think is widely accepted as a common basis for government action. There is a whole range of market failures that exist in the energy efficiency area, the first of which is information barriers, where there is a lack of awareness of how energy is used and what it means. It's not lack of information only for energy consumers, but in fact some of our experience has been that even manufacturers of energy-producing equipment are sometimes unaware of how the energy efficiency performance of their products compares internationally.

There are sometimes significant transaction costs with finding information and some of the government programs, particularly things on labelling and MEPS, are addressed at those - and there are some barriers for new players to enter into things like the energy services market, because they don't have the same information that the energy providers currently have. The second big area of market failure is split incentives and this is particularly apparent in the building sector, where the tenants of buildings and the owners of the buildings don't have the same incentives and the management of energy is often not aligned with those who have the incentives for saving energy there.

There is an externality argument. Energy is by far the major contributor to greenhouse emissions, and so there is a clear issue there, but also it is a major contributor to air pollution in many areas and so there are a number of externalities there. Another important area is the issue of the signals that energy markets provide. Under the current arrangements, these markets don't provide the proper price signals in all cases - in many cases - for energy efficiency or for other efficient investments. There's a lack of cost-reflective pricing in the transmission and distribution system in many cases.

The regulatory and the policy settings in the market have tended to favour capital investment in new generation and transmission rather than demand-side management, including energy efficiency, when meeting growing demand, and this is an issue that was identified quite clearly in the Parer review of energy markets. There are a lot of users who receive inadequate or no signals for managing their peak demand or their overall use because of the smoothing out of energy costs. There is little incentive to reduce losses because of the way that these are priced into the system.

But having said that the energy markets are a very important issue, it's also important to say that fixing energy prices on their own probably isn't a particularly helpful conclusion from this inquiry, in that I think a lot of these issues have been identified in the past. There are processes under way to address them but those processes will take some time. It's not clear that we'll have a perfect energy market. There is also considerable evidence already that even with the energy pricing other people receive, the response to those is not always full and therefore fixing the

pricing system probably isn't going to be enough.

The final area of market failure is financial barriers and certainly through our processes of developing the National Framework for Energy Efficiency, stakeholders have raised with us issues about tax incentives which basically, for example, encourage upgrading existing equipment rather than replacing it with new and potentially more efficient equipment, so there seem to be some issues there as well.

Again, I think government does have a clear role in addressing a lot of those barriers. While some of the methods the government uses to address them will be beneficial for firms themselves, it's not always the case and I think the clearest example of that is our regulatory process for minimum energy performance standards, where for any individual or firm it probably wouldn't be worth engaging in that process, but when those benefits are aggregated over the whole economy, they come out very cost-effective and all of those processes undergo very rigorous regulatory impact statement processes which confirm that. I think in fact the Office of Regulatory Review has identified some of those RISs as best practice RISs.

Then, in terms of organisational barriers within firms, there are a number of barriers here as well. There is generally poor understanding by senior management of the potential for energy efficiency. In many firms there's really no effective energy monitoring at all, so there is no ability to understand what is possible. There are rarely people who are responsible specifically for managing energy expenditure. There is a perceived risk of new technologies or processes that are required to improve energy efficiency, and there is often a perception of energy efficiency seen as a cost rather than an investment, despite the fact that it has the same impacts as other investments potentially.

So for all these reasons companies themselves also miss out on opportunities, but I guess the question is: does government care about this and why? Again, the answer to that is, as I think Diana has already flagged, that the economic benefits are very large and at a billion dollars it's larger than what Parer identified as the potential for demand-side management. It's big enough to constitute an element of micro-economic reform on its own that affects the whole economy and so by missing out on these the economy misses out, and also there are very significant environmental benefits, as already mentioned.

In terms of addressing all these barriers it's difficult sometimes to address all of them directly and so one of the things that was the basis for setting up this sort of inquiry was a question of whether other or more direct incentives for energy efficiency might be justifiable. It's interesting that when BP sought to increase its energy efficiency performance it wasn't enough just to identify the benefits, they actually had to set up some separate systems of incentives for people to actually learn about those opportunities and take advantage of those - and that may be a model.

However, in doing that, we need to make sure that anything government does is very cost-effective and is well justified.

Some of the other benefits that come out of energy efficiency: it does delay the requirement for investment in new power generation, which has cost savings, but also allows that new investment to happen at a time in the future when lower emissions technologies may be more available. It does deliver half of the abatement so far from government action in the energy sector and it is clearly the most cost-effective option for greenhouse.

Our evidence to date is that many of our energy efficiency measures deliver a net benefit of about \$30 a tonne, and this compares to an environment in which abatement that costs less than \$10 a tonne is seen as low-cost abatement, and yet here it is delivering net savings of \$30 a tonne. So there's an issue that if we don't pursue energy efficiency to its full potential, we may be taking up more expensive abatement options. Now, the picture is not quite that clear, because some of the abatement activity that happens is not focused on short-term abatement but on developing capacity for the long term, but it's still clear that energy efficiency has a big role to play, and there are some air quality measures.

To go back to the beginning, energy efficiency clearly has very large economic and environmental potential and government clearly has a role in addressing the many market barriers. This huge potential means that it shouldn't necessarily be limited to that, but it may need to address some of the internal barriers as well. I guess that's where we see the role of this inquiry come in: looking at the costs and benefits of those possibilities. With that, we're happy to answer any questions that you have.

PROF WOODS: We may as well start at the front end of the process: terms of reference. In a number of places - including the key points, the introduction, through it, and in the summary - you raise two issues that I'd be interested in you elaborating on. One is your reference to interpreting the terms of reference broadly. You seem to get stuck on the phrase "cost-effective for individual producers and consumers", which appears not once in our terms of reference but many times - at least three that come to mind. It's not there accidentally, otherwise it wouldn't have been put in that many times. That's the first filter through which we need to look at things. The question is then, how much of the rest of the paddock do we look at, given that we have a particular part of it that is our focus. I'd be interested in your views on that.

But then to flag my second question: there seems to be a tone in your submission that you encourage us to look at transport. I mean, transport is in our terms of reference. It's in our issues paper. Is there some message that I'm not fully appreciating that you think we've overlooked that as a term of reference? I don't understand why the tone comes through in your paper that it does. It keeps drawing

our attention that we've got to look at transport and, yes, we do. It's in our terms of reference; we will deal with it.

MR McGLYNN: Maybe it's easier to answer the second question first in terms of transport. I think what we're flagging there is, as I imagine you're aware, the terms of reference for this inquiry are quite large in many respects.

PROF WOODS: Yes.

MR McGLYNN: So our feeling is that clearly transport - well, stationary energy is probably a first focus given its importance, both in terms of the economy and the environment. Having said that, we don't want to say that transport has a bigger focus than stationary energy, but it is important to address it, and I guess what we're flagging is that in doing that it would be worth having a look at the issues of how the approach to energy efficiency in the stationary and the transport sectors compare as a basis for trying to see how that works. Clearly there are some different issues in those two sectors, but there are also some points of comparison which I think would be valuable to draw.

In terms of the first part of the question, the terms of reference, I guess what we're indicating is that, from the government's perspective and from Australia's perspective, if we limit ourselves to looking at options which are only cost-effective for individuals and firms, then in fact we won't be achieving the best outcome for the economy as a whole.

PROF WOODS: Remembering that it's the government who actually gave us our terms of reference.

MR McGLYNN: Yes. There are many opportunities for energy efficiency that will be cost-effective for firms and they're not being taken up. Clearly that's a good first perspective. But to limit the entire terms of reference to that - and I understand that the Productivity Commission has a general mandate to examine beyond its terms of reference where that's necessary to achieve its broader objectives; I guess we're indicating that in this case that's probably the case. Again, it's very difficult to find options which are always effective for every player involved, but there are a lot of potentially greater optimal improvements in the energy efficiency area, and basically the Productivity Commission can look at the full range of those.

DR WRIGHT: Could I just add to that: from the analytical work that was done for the energy white paper and the first stage of the National Framework for Energy Efficiency, it quite clearly shows that that will garner only half of the potential economic benefits. If we're talking about a billion dollars per annum, then it would seem to be not looking sufficiently broadly, if one was blind to the other \$500 million worth of potential savings to the economy. So what we're putting on

the table is that there is a need to look more broadly because there may be a need for some generic measures, not those that just impact on individual firms.

In addition, if you look at the knock-on effects in relation to climate change - and, although we're going to meet our Kyoto target, emissions will increase significantly after then - what we could be doing is forcing the economy to adopt a higher cost abatement later on, rather than accruing earlier abatement which delivers net benefit to energy efficiency and, because of the mix of organisational and market barriers, it needs government assistance to address those now. The analytical work done to date shows quite clearly that, whilst companies do pick up some of the benefits, they're not picking up sufficient of them to make this big difference.

So we have two things: we have a cost to the economy if we don't look further as to how we can harvest the whole of the billion dollars per annum, and the second is the knock-on effects and a likely bigger cost to the economy further down the track if we don't maximise the economy's ability to harvest the savings from energy efficiency now.

DR BYRON: The Royal Australian Institute of Architects that were here just immediately before the break were saying that, despite all the knowledge, research and so on that has been done, there have been very, very few advances on the ground in terms of energy efficiency for commercial buildings and residences, in spite of all the architects' best endeavours. The point that came out of that is that if we're having so much difficulty in getting industry and households, property developers, to adopt measures that are immediately in their own commercial self-interests, that are commercially viable right now, even at today's very low energy prices, if we can't even get over those barriers, how on earth are we going to get to the wider set of measures that are worth doing on a social and environmental basis but are not immediately commercially viable to the decision-maker?

My interpretation of the terms of reference is that we're asked first to look at the barriers and impediments that are preventing the realisation of all these things that, on the surface, look like they should be happening spontaneously.

PROF WOODS: That are in their own self-interest.

DR BYRON: Yes, and if we can't get them to do the ones that are already in their own self-interest, how on earth are we going to get them to do the next stage? That's why I think at the moment, at least for a start, let's concentrate on getting over these barriers and impediments to the things that are immediately apparently in their self-interest. One of the things that I think we need to do there is to confirm that the pay-offs to the individual decision-maker are as large as experts tell us they are. Sometimes what looks like a hundred-dollar bill on the ground is actually only a 20 cent coin and that's why they're not bending over to pick it up, for example. Do

we need to go on with the terms of reference much further or can we get onto the more interesting bits?

MR McGLYNN: Well, I guess I'd question the beginning of the statement that it hasn't been happening in the building industry, but maybe we can come back to that later.

DR WRIGHT: And also that's taking it from a technological basis for new developments, when 98 per cent of built stock is already in existence and we know how to make homes five-star rating or four-star rating with insulation and fluorescent globes in the lighting. There are a whole series of barriers, including informational barriers, which could be addressed to fix that, so it's not just a question of technology. Banks do not currently question, because the information isn't nationally available, what sort of house you are buying when they offer you a mortgage. They don't check it in relation to your ability to repay that mortgage because it's highly energy efficient. There are a number of breaks in the information chain that make it very difficult to make the assessment that you suggest and therefore it doesn't happen.

DR BYRON: What the architects were saying is that we have actually known how to build five-star houses for at least 30 to 35 years but very few of the new houses being built have been. So it wasn't lack of knowledge of how to do it; it was basically that the customers refused to become interested in it, in spite of our attempts to persuade them.

MR McGLYNN: I guess that's directly relevant to the terms of reference question. It's open to interpretation, but if you look at the question of whether the mandatory building standards that will come in over the next couple of years, which will mean that we will be building four and five-star houses, it's unlikely, if you looked at those from the perspective of an individual household or an individual builder perhaps, that you'd say, "Oh, they're justified for them." However, for the economy as a whole the benefits are clearly very significant and are justified, so that measure is one which already could be seen to be stepping beyond the terms of reference.

I would also say that, with the development of the national framework of energy efficiency and where the energy white paper came to, there is a recognition that there are some barriers in terms of making people more aware of the options they have. The real question was: is that going to be enough or, as some companies have discovered, do you need to provide some more direct incentives, at least in the intermediate term, to make those opportunities manifest themselves and change the way in which people look at energy efficiency, so that you need a more direct incentive for a while to bring about the cultural change and that then means they will feed on themselves for some time?

DR MARKER: Could I contribute on buildings, please? In terms of the residential market, the architects' view that we have always known is, "Yes, this is true. Efficient housing: if you don't have it in Sweden you die in the middle of winter." So the need for energy efficient housing are well known around the world. Given our climate and the cost of energy, there hadn't been much of a driver. We have survey data from Victoria, from Melbourne. Houses of 1991, prior to Victorian insulation rules, averaged less than one star on this scale that we are talking about. The insulation rules were supposed to get houses to three stars but a sample of houses from 1999 showed the current practice was about 2.2 stars. The rest of the country has caught up with the ACT and pushed on to four stars in 2003. Victoria is not all smooth but it's pushing on.

The reason it has happened is regulatory. The information costs for individual builders to go out and learn how to do something better than their competitors when they are competing in a market where consumers don't value these things - again, the information cost to consumers to find out how to build a better house or to work out why to have a better house are too high. The industry therefore has absolutely no incentive to go ahead and learn how to build a better house, even though the handful of architects who are out there designing wonderful houses could tell them how to do it. But with an industry with 100,000 one-man companies all competing for a dollar, none of them really had time to go out and learn how to do a better job. Consumers didn't want it, so regulations served the purpose of pushing the bar up.

As soon as there was a need to find out how to build a better house, yes, the builders managed to do it. Those regulations and a greater awareness of the environment has led consumers to ask for more thermal performance, more sustainability, whatever it is. So as soon as consumers know more about it, builders learn more about and we move up the scale. Publications like the "Your Home" suite of publications serve both builders and consumers. It teaches consumers the questions to ask. It teaches the builders how to answer the questions. This publication is used in universities, architects' training courses, building design training courses, HIA, GreenSmart, TAFE courses. It's become a standard textbook.

For an individual owner, for society, houses are going to be around for 70 years. If their thermal performance is better from day one, there is a long-term benefit. The owner of the house might be there for the average seven to 10 years, so for them not only did they not have the information but perhaps individually there wasn't much of an incentive, either. They couldn't see that if they made their house more efficient they would capture a higher capital cost in the future and so on, so they didn't investigate it, but now with growing standards, likely to be increasing standards, more awareness, consumers know that if they make a better house now they should be able to see a better capital value in the future when it comes to be sold.

In terms of commercial buildings the energy performance standards will come into force in 2006. The same sorts of arguments: a very competitive building industry, a lot of players, a huge gap between the final tenants and their landlord, several changes of ownership, a whole range of different risk profiles between the developer, the builder, the bank, the first owner, the superannuation trust that buys it, a second or third owner, and finally it gets a tenant - no communication between the tenant and the original design. So that competition in those first few layers means that there is no feedback from the long-term benefits of energy efficiency to the economy because individual decision-makers are just so totally disconnected.

DR WRIGHT: In addition, society and the economy is now experiencing quite a problem with electricity supply because of these poor standards in energy efficiency in the past. Peak demand for electricity is now in summer in most states and is going to require huge capital investment in baseload power generation to meet electricity requirements for just a small part of the day. One baseload generator is going to cost you \$2 billion and there is currently high risk because of the need to abate greenhouse gases, and there is a reluctance in the market to make significant investment in generation to meet that load because of the uncertainties and the lack of a clear carbon price in the economy.

So that takes individual issues and puts it on a much bigger basis. We are now moving towards a national electricity market and this issue was addressed to some certain extent with Parer. So there are significant consequences, as you followed, down the stream or go back upstream.

PROF WOODS: I am sure we will debate the sort of mix of regulation, information and market pricing and which one works best in what circumstance and which one you use for what reason, but a comment you made earlier I just want to come back to because I think it illustrates a useful point. That was your comment about whether banks do or don't - and they don't - check the energy efficiency of houses before they consider whether a mortgage should be approved or not.

If energy consumption relates to about, say, 2.5 per cent of the average household expenditure, and if some of that is in fixed charges so only a portion of the 2.5 per cent in itself is a variable charge, then the difference between, say, a 10 per cent variation in energy efficiency in a house, we're talking about a quarter of 1 per cent of household expenditure. Compare that: people's household expenditure is greater on alcohol than it is on energy, and even tobacco expenditure is sort of starting to get closer to energy expenditure, so there are lots of opportunities for people to make discretionary behaviour in their expenditure and energy seems to be somewhere down the bottom of the pile.

So I can understand why banks at this stage, through their own choice, don't give an exceedingly high value to looking at the energy component of a household's

expenditure in working out whether people can or can't afford to pay their mortgage, rather than looking at whether they smoke or drink. Doesn't that sort of illustrate some of the issues that we're trying to grapple with?

DR WRIGHT: It does in a way, but I think my point was, there are many reasons why banks don't do that, and one of them is that there is no uniform way that they can access that sort of information.

PROF WOODS: But even if they had that information, in your view, unless it was mandated - and this why I want to get onto it - would you have to mandate that the banks take that into account for them to actually take it into account? I mean, even if the information was there, what would they voluntarily do with that as a way of assessing the capacity of a household to repay its mortgage? Aren't they going to look at the security of tenure of the employment and the history of repayment and the credit of the individual and things first?

DR WRIGHT: I think Gene can also talk to this. The point I was trying to make is that it would be an easy thing for banks and individuals to do, if they had access to the right information. I used it as an example of the fact that it's actually difficult to do because there are significant disconnects in the information chain, and equally it gets to the issue that appears three times in the terms of reference: what is good or significant for the individual is different when you look at it on an economy-wide scale and particularly if you then link it to environmental consequences. So there may be other reasons for doing it in addition to the fact that it would deliver some benefit to the individual and, as Tony said, we're also talking of up to 70-year life for houses.

MR McGLYNN: If I could just add on a different tack: there are in fact some credit unions and banks who are looking at energy efficiency mortgages of some sort.

DR WRIGHT: Bendigo.

MR McGLYNN: I think there are a couple of issues there. One is that one of the potential structures for something like that is to basically allow a bit extra on the mortgage in the beginning in order to fund some energy efficiency things, recognising that the ability to pay that back over time is there, and so there are some innovative products and things that are available.

DR WRIGHT: I think Bendigo Bank is one and there is one in Queensland as well.

MR McGLYNN: Yes. But I think the other issue is that - and we often get into this with energy efficiency and with greenhouse - you can take numbers and they look like small percentages, but I think even that quarter of a per cent or half a

per cent, when you look at that as a percentage of a household's actual income, that they can actually decide, as disposable income - - -

PROF WOODS: Disposable income, yes.

MR McGLYNN: It actually can be quite a significant portion.

PROF WOODS: Yes.

MR McGLYNN: When you take out all the necessities and taxes and the various other bits, it actually is a significant part and even if it's \$50 or \$100 a month, that's important in terms of what the ability to service that mortgage will be.

PROF WOODS: Isn't that the path we need to start going through to identify, in that case, what is the discretionary component and what can we do to provide information? But it's then a next step to say, "Well, let's start employing market interventions" - eg, looking at the pricing of energy - and then it's a very large step to say, "Let's mandate that all households must go through this hoop." Now, mandating the provision of information, as per the ACT's sort of rating and in other jurisdictions as well, is one thing. Mandating behaviour starts to become another thing. We need to tease out very carefully what are the benefits to the individuals and what's the collective benefit to society before we start working our way up through that menu. Sorry, I'm taking over. Do you want to respond? Yes, please.

DR WRIGHT: If you consider - and this is again linking it to greenhouse - that globally it's now considered that a 50 to 60 per cent cut in emissions will be required by the end of the century in order to stabilise emissions at twice pre-industrial levels, and if we're talking about the difference between \$10 a tonne, which is currently considered to be a reasonable cost for abatement, by a range of measures to a \$30 a tonne net benefit for energy efficiency, then over time those numbers are going to add up. It is significant if you take a long-term view rather than a short-term view. Sorry, I interrupted you.

DR MARKER: Could I just add there, on again residential houses, the building code rules in terms of building efficiency account for about 15 per cent of energy greenhouse. A lot of the other energy in houses - running the car, running the refrigerator - depends on a whole lot of other things; it's only heating and cooling in the houses. Small, yes, but the house is around for 70 years. We do regulate it through the Building Code of Australia with the support of the industry. We also regulate health and safety issues. Houses are expected not to fall down on the people that pay for them. Sewerage systems are expected not to spread bubonic plague.

If you have a problem with regulating the performance of housing, why? We regulate the performance of the safety, the health. Why not extend it to energy

performance, where modest changes make for a more comfortable house? Give consumers a long-term pay-off - yes, a long-term pay-off - but, generally, sit with all those other regulatory requirements that our society deems appropriate. When we buy a car we expect, irrespective of how fast it goes, that it will have brakes that stop it. When we drive out of the driveway in the morning, we know which side of the road we are going to be driving on. We live in a society where there are lots of rules. The energy efficiency is an important component of contributing to long-term reduction of greenhouse impact, and it provides benefits to consumers.

PROF WOODS: Yes, but that's the point about regulation. You have to individually justify them. You can't say, "Because we regulate some areas and people are used to regulation, therefore let's just keep extending the regulatory reach." We've had evidence from factories in the food area and they say that occupational health and food quality are absolutely paramount, and that that drives the focus of management; that whatever else, they have to meet occ health and safety and food quality. You can understand that that is their driving perspective.

They say energy efficiency has to then take place amongst a whole menu of other things - training of staff and recruitment and supply relationships and distribution chains and picking up the latest plant and equipment and making a profit out of it all - and that they have usually flat management structures; they work on a single site so you don't get economies of scale and all of these sorts of factors. They say that nevertheless, despite this, a lot of companies in their industry actually do go into Greenhouse Challenge and do good things.

So they say do things like make the programs simple for people to understand, stop having a plethora of programs that change their names and their criteria and last for three years and all of these things, because this takes up a lot of management time and they haven't got it. They don't want to read a 40-page document at 10 o'clock at night when they've still got to sort out their suppliers for tomorrow and all the rest of these things. So we have to be very careful in just what is the justification for extending the regulatory reach, not just to accept that there is regulation.

I mean, yes, there is, and each one has to be justified in its own right and occ health and safety has to be justified, as does food quality and safety and things, and so to move energy efficiency to become a mandated behaviour of those firms, that's what we're doing in part. We're saying, "Is the benefit from energy efficiency such that all of the other options" - information, market pricing, et cetera; go through the menu - "is it as a last resort that we have to look at regulation that justifies the benefit that will be achieved through this process?" That's what we're engaging in the debate on. So we don't take it as a given. We're exploring the arguments to see if that's the conclusion that we come to.

MR McGLYNN: Yes, and I think we are as well. Again, to repeat what was said

before, it's clear that there is a very significant environmental economic benefit that can be offered. It's quite clear that the range of programs that we have in place, where there are some regulatory elements but there is also a lot of information provision, are not going to deliver that full potential, so we know there's a big benefit to be had from going further. But the question is: what are the costs of going further? That's what needs to be assessed.

In terms of regulation, I guess where the National Framework for Energy Efficiency got to was that, well, it wasn't regulation which was seen as the next step. It was seen as something which was more of a general incentive for energy efficiency. That was what was being discussed. I mean, that has regulatory elements to it, but it was trying to look at potentially a more market based approach to energy efficiency, where those incentives are delivered in a more generic sense, which isn't the same as the regulation. It's only your regulatory underpinnings, but it's a question of whether there's something else that's needed.

DR BYRON: Yes. I'd like to go through some of the sub-inquiries, in terms of transport, households, businesses, manufacturing and so on, but if I can just start with the general point that was in your opening comments, and they're in the submission on page 8 under "Barriers to energy efficiency", particularly the split incentives, the information asymmetries and the organisational and cultural barriers. I can't help thinking that we've known about the existence of these things for a very long time. I started writing about them in the early 70s, but I'm sure other people knew about them long before that.

The fact that the way people behave, or businesses behave is not always optimal or in any particular sense or dimension: do we accept that as a sort of fact of life; that we know that a lot of businesses don't achieve optimal levels of energy efficiency or water efficiency? They probably don't have optimal levels of human resources management or they probably don't have optimal financial management either - you know, a lot of households and companies that have money sitting in zero interest cheque accounts, when it should be sitting in another account making 5 per cent or invested in the stock market making 10 per cent. So there are all sorts of dimensions of normal, everyday life in business where decision-makers don't get everything as ideal as possible, and we tend to accept that as normal, not necessarily as a problem that has to be fixed by governments.

The companies that do things well tend to do everything well, as you said in the submission, I think. They are continuous improvement companies. It's not only that their energy efficiency is sort of best practice, but you'd probably find that their personnel management and OH and S and their waste disposal and their marketing system is also best management, and the marketplace rewards them, and the ones who are not particularly good managers, who have lousy energy efficiency and also have lousy personnel management and marketing and quality control, are the

businesses that tend to go down the gurgler.

What I'm struggling with is, why do we use the lens of energy efficiency as the one particular dimension to pick out the companies that are going to be winners from the companies that are going to be losers, because there are a number of different dimensions that we could have looked at? It's not obvious to me that we can say, "Well, we have to have special programs to encourage households or businesses to adopt measures which we believe are in their own self-interest anyway" - that are going to make businesses even more profitable than they are already.

Coming back to the regulation discussion that we just had, governments all over the world are obliged to restrict or ban things that are hazardous or dangerous, but I'm struggling to think of examples where governments restrict consumer choice because, "Actually, this is going to save you money in the long run, and one day you'll thank me for it." I can't think of too many examples where we try and regulate or even have fiscal incentives to encourage people to do what market forces would have them doing every day anyway.

PROF WOODS: The closest you'd get is MEPS, I guess, but that's only cutting out the bottom level; it's not regulating their actual behaviour.

DR BYRON: I'm sorry. There's supposed to be a question at the end of that.

DR WRIGHT: Could you repeat the question, please.

DR BYRON: The question was, you've listed organisation and cultural barriers and you've listed information asymmetries, and I agree that all of those exist but I'm not entirely convinced that they're problems that have to be fixed by government, and particularly by government through regulation. A lot of them just seem to be the way the world works normally. Nobody has perfect information on anything all the time: nobody manages every resource optimally all the time.

MR BYGRAVE: The basic question is then why governments intervene in the situation, which I think Gene touched on in the opening.

DR WRIGHT: There are a number of issues. On some of the other attributes that you mentioned, the individuals and the companies do have the information on which to base choice. They don't necessarily make those choices. So from first principle, at least if one addresses the informational barriers, then you have the opportunity to operate optimally or not. That's a first premise. Do you want to add to that?

MR McGLYNN: I guess I risk repeating myself, but I think one of the issues is that the energy system is interlinked and, if we can go back to the example of peak load maybe as an example of why you do it, what most users currently get is a signal

of somewhere between 12 and 15 and in South Australia 18 cents a kilowatt hour to use their airconditioner any time of day. The cost of actually delivering that electricity at peak time is going to be some dollars per kilowatt hour on peak days, and they don't get that. That then means that there's an incentive for people to increase their airconditioning use, for example, the peak load, and that then has flow-on effects to the whole economy.

DR BYRON: Absolutely.

MR McGLYNN: That's one of the reasons. Then of course there's the environmental - - -

DR WRIGHT: In addition, there's the perverse incentives that those that do have energy efficient buildings or practices are actually cross-subsidising those that don't.

DR BYRON: That comes back to what is on the next page of your submission on page 9, under the paragraph, "Current energy market arrangements do not deliver appropriate signals for efficient use of energy," and I think that's absolutely right. But surely what we've got there is a case to make the necessary reforms soon, and I would put that in the category of government failures rather than market failures, because it's state governments in every case that are distorting the final price that the end user sees and holding it down to prices that nowhere near reflect the full cost. They don't even reflect the fluctuating wholesale prices that vary on a half-hour basis. We've got a system set up by governments to deliberately mask the real cost of using energy, so how can we be surprised when energy users make what you and I agree are the wrong decisions?

MR McGLYNN: I think that's an easy example in some sense because it's just so clear. But I think the analogy with the general energy efficiency picture is very much the same: that there are opportunities to be more energy efficient generally within both business and households, but for the whole range of reasons that we've talked about, people don't act on those. Those then have flow-on effects to the rest of the economy in the same way. So there is an economic externality, if you will; that's the justification. The evidence we have is that that level of economic benefit that's not being realised is very significant on an economic basis. Again, to risk repeating myself, the greenhouse benefit that's lost from not realising those opportunities is also very much and, if we don't realise that opportunity in meeting future greenhouse targets, we're forced to do other things which - - -

DR BYRON: More expensive obviously - - -

MR McGLYNN: - - - are less effective.

DR MARKER: To address the earlier question, the broad question, by regulating

energy efficiency I agree that, yes, there are many companies out there and many individuals for whom energy is a low priority. So a company operates to optimise its utility according to the priorities. If you're an aluminium smelter, you're obviously very interested in energy efficiency and pricing because it's a major part of your business. If you're in other businesses, if your ongoing success doesn't really matter about your staff, you're probably pretty sloppy on HR, and for each and every business there will be core priorities where they have to focus in order to stay in business. Some of these are health-driven, occupational health and safety, public safety - all those sorts of rules - so people rank their risks, rank their costs, and decide where to put the managerial effort and resources, company resources.

For many companies, energy isn't all that high up the list. For many households, partly because for many of them they simply do not have the resources to invest in finding out what the issues are, the government has decided to introduce policies to abate greenhouse gas emissions and, even though for many of these companies energy is only a small part, the role of regulation can be ascribed to government policy focusing on greenhouse, focusing on those companies who perhaps if they weren't paying big insurance premiums for, say, professional liability would be pretty sloppy consultants.

If there is no other market mechanism that keeps people focused on all those core things of their business, there is some sort of market failure. If the government wishes to abate the greenhouse gas emissions, there's a role for energy efficiency to be used as a policy instrument, especially when it goes through RIS processes that in fact show that it's a no-regret strategy; that, overall, the consumers are better off after than before, and government policy gets delivered.

MR McGLYNN: Maybe a simple way to look at it is that, as the white paper identifies, energy efficiency is a national priority and it's there for reasons of greenhouse, for direct economic benefits, for its abilities to defer investment and smooth that out, for the peak load issue - for a whole range of issues - and the question is how to align private incentives with that national priority. I think that's where the discussion is - how to make those two line up a bit better, because they don't seem to be very well aligned to date. Related to that is the fact that, over the past 20 or 30 years, the evidence is that Australia's energy efficiency performance is lagging behind other countries. We haven't kept up with other countries. One of our key comparative advantages is our low energy prices, but if that comparative advantage is itself dissipated through less efficient use of energy, in fact there's a significant long-term risk to the economy.

PROF WOODS: You make reference to the national energy efficiency target in your submission. Some of it to me reads quite reasonably: you're talking about there can be savings through uptake of eligible energy efficiency activity, so it suggests that there could be menus of activities that could conform to a target. But then you

talk in the next paragraph: "Analysis done for the NFEE shows that a 1 per cent target would deliver increasing consumption," et cetera. What worries me is that for administrative simplicity a target might be imposed that said 1 per cent, 2 per cent - whatever. On what base: the base that's average of the industry or the base of where individual firms are at, so those who have done well today, to penalise further those who haven't done well today, who have got fat? It's like the old productivity efficiency cuts that Finance lovingly imposes on departments: those who had a little bit up their sleeve didn't sweat too hard, but those who had actually worked hard to become more efficient suffered more pain.

Maybe you're only using that phrasing to illustrate quantum but weren't actually thinking of it as a form of target mechanism, but could you elaborate your thinking a bit further for me.

MR McGLYNN: I might let Stephen talk a little bit more about that. That analysis was done as part of the National Framework for Energy Efficiency. The 1 per cent target, which was an example that was drawn out, was basically based on the concept of improving the overall energy efficiency of the economy by an additional 1 per cent beyond the - - -

PROF WOODS: I guess what I'm asking though is what is behind that? Is that therefore the direction of your thinking as to how it would be applied? I understand that it's there for illustrative analytic purposes, but what I'm curious about is what is your thinking as to how such a target might actually be constructed?

MR BYGRAVE: There's a long and a short answer to that. The short answer would be that there are multiple ways you could design such a target, and this was, as you said, an illustrative approach to mention one example. That analysis was done as part of the National Framework for Energy Efficiency. I think the advantage of a national energy efficiency target is that it does provide a market mechanism, so therefore it sets a target and then allows the liable parties to respond on the most cost-effective basis.

PROF WOODS: But it's only market instrument if it then becomes a tradable thing.

MR BYGRAVE: That's right.

MR McGLYNN: That was very much the thinking.

MR BYGRAVE: Yes. One model could be exactly that, similar to the mandatory renewable energy target. You have a tradable certificate scheme, so certificates are applied for energy efficiency gains and then traded as a commodity in a market.

PROF WOODS: Is that your preferred thinking at this stage, or have you not developed your thinking?

MR McGLYNN: At this stage I guess we're looking for some advice from you guys on that. The issue is that, when you look at it, something like it has a lot of attractions. It does provide that sort of broader incentive for things; it does drive a lot of things and take the government out of trying to be very specific about a lot of things. We were of the fact that it still needs some thinking through, and particularly we need to look at some of the transaction costs and some of the other issues to see whether in fact it is a justifiable next step in terms of energy efficiency.

MR BYGRAVE: Yes, and I think where the national framework is at is that it recognises that the current measures - existing measures and those agreed under the NFEE stage 1 - will only get you a certain portion of, I think Diana mentioned, 50 per cent of the energy efficiency savings that are potentially available, and that an additional mechanism is required to capture the full energy efficiency savings. We'd be interested in the PC's advice on a NEET or other mechanisms that could achieve or capture the full potential.

DR MARKER: Just on the NEET, the idea of tradable certificates in energy efficiency does have some analogy with the greenhouse tradable scheme for electricity retailers in New South Wales, which has huge information costs. What is the baseline you're measuring from? The idea of some sort of pure, if you like, form of tradable energy certificate - so-called white certificates in energy efficiency literature - hasn't really come. No-one has really found the way to do it. France is really very interested in it and trying to make it work. Because 70-odd per cent of power in France is nuclear, a carbon trading regime is not so hot for France and they're looking for an efficiency trading scheme, and I think Italy is also another country that is looking to get some sort of tradable instruments in energy efficiency.

DR WRIGHT: I think, to just sum up those points, with the issuing of the energy white paper, government was keen to see what approaches there were to garnering the other \$500 million per annum in economic benefits and we are progressing discussions through the NFEE process, but it's not necessarily the case that we see that there is one approach that will fix this. It could be that regulation, NEET, won't necessarily touch the residential sector; it won't fix the market barriers in the electricity market. So we don't see there's a silver bullet but there may be some measures that would send a clear signal and help change other attributes in the longer term.

DR BYRON: One of the things that surprised me in that paragraph is "and reducing electricity prices to end users". I would have thought that any measure that reduces electricity prices to end users makes them even less inclined to be interested in conserving water and electricity. Maybe what we need to do is to increase electricity

prices to end users to focus their mind on conservation and efficiency options?

DR WRIGHT: I think it's not necessarily that simple, and there are different classes of energy users, whether we're talking about the industrial that have long-term contracts or retail market.

MR McGLYNN: Basically that result is out of modelling that was done under the National Framework for Energy Efficiency of over 1 per cent. It's more electricity costs, I suppose, in some cases than prices, but what it showed is that if in fact you could deliver a significant leap in terms of energy efficiency performance of the economy, in fact it does deliver lower energy prices. That was the result through macro-economic modelling and I think that reflects this issue of investment and basically using your electricity assets more efficiently in terms of the overall use.

DR MARKER: Yes. The energy efficiency literature is full of estimates of rebound effects, that if you do improve it there will be more available and more consumed.

DR BYRON: Diana, you have mentioned a couple of times the billion dollars of potential savings. How firm, how concrete, is the number?

DR WRIGHT: The initial modelling was done under the National Framework for Energy Efficiency and then, as part of the Energy Taskforce process, further modelling was done that was internal to federal government and that's where that figure comes from. My recollection is that businesses were also consulted and that they signed up to the fact that that was a reasonable estimate.

MR McGLYNN: Yes. That number is based on two stages of work. One was a sort of industry-by-industry analysis of what options are available. That then was fed into a macro-economic model on an assumption of, "Let's assume that half of the opportunities with paybacks up to four years" - having an average payback of 2.2 years, I think it was - "are actually taken up." That's where that billion dollars comes from. As Diana said, that scenario was developed in consultation with industry and that was felt to be a pretty reasonable assessment of what, even with the current set of incentives, would be what most industries would be willing to take up. So in that sense it's a conservative estimate, I guess, in some cases. It's certainly not an edge-of-the-envelope estimate by any means, it's very much in the middle, and it's seen that at least a billion dollars is what is available through a reasonable take-up of energy efficiency.

I'm not sure if you can see this. We can provide you with some of this detail later, but this in fact is a chart of what the model impact of the 1 per cent target was. Basically, this is the electricity price under the "business as usual" and then the bottom line shows that in fact it does lead to a reduction in energy prices because of

that reduction in demand, and that then flows on to changes in terms of investment patterns as well. So we can provide you with more data.

PROF WOODS: Yes. If you could leave us with your set of models, it would certainly be helpful.

DR BYRON: It does sound like demand-side management is a very important part of the whole strategy, so one of the things that we are going to have to spend a fair bit of time thinking about is the incentives and disincentives for the various players in the national electricity grid to be involved in demand-side management and what you can do and how much it costs and so on. One of the points that somebody made to us fairly early was that if by demand-side management you simply mean redistributing the peak loads through time and space so that the aggregate amount of electricity usage is the same or greater, you haven't done anything at all for greenhouse emissions, and so what we really need to do is to reduce the amount of consumption, not just shift it. Is that right?

DR MARKER: Yes, and when it comes to a house, by making houses more efficient the airconditioner will be turned on less often. Through minimum performance standards we're making the minimum performance better, of the airconditioner that can be sold. So, yes, there will be greenhouse savings between those features but, no, we as energy efficiency regulators are in no position to tell people whether they should or should not turn their airconditioner on and cause a blackout on the hottest day of the year. We can contribute to reduction of greenhouse gas through more efficient buildings and more efficient appliances within them, but this, in the first sort of tranche, as it were, or the first step, only has a small impact on the peak.

In other areas of the electricity market, because losses are not traded in the national electricity market, there is market failure. The efficiency of transformers is now regulated because of the market failure. We were looking at an industry that, perhaps for 40 or 50 years - transformers sit around on poles on the ground for perhaps 40 years. They are eventually replaced. They've had all sorts of problems, but they are really a very, very efficient piece of equipment. But we are looking at situations where the new ones were going to be less efficient than the old ones - a 40-year-old bit of equipment - because the market had changed. No longer were electricity networks put together by the state with a long-term view in mind but they had gone to a market and first costs were starting to drive issues like replacing 40-year-old bits of equipment with something that was less efficient.

MR McGLYNN: I think the question you are asking is are demand-side management energy efficiencies the same, and they are clearly not the same. I think over a couple of years people have realised the relationship is a lot more complex than, "This helps and that doesn't." Some demand-side management does help

energy efficiency and vice versa; some doesn't. In terms of its greenhouse impact it's almost case-specific in many cases. Having said that, all the analysis that we refer to is energy efficiency analysis. It looked at real energy efficiency savings in the sense of actually reducing the energy required to deliver whatever output you are looking at. Demand management could be additional to that as well, or peak shifting.

MR HOLT: If I could just add that rebound actually was trying to be captured in all of the regulatory impact statements. For example, a refrigerator that's on 24 hours a day, seven days a week throughout the year is still modelling rebound in terms of people putting in additional fridges and with running them in the garages and the like. Actually, that sort of number has stabilised but certainly on climate control - airconditioners - it seems that the rebound effect is quite substantial in the sense of you buy a window box, you upgrade to a split system, you upgrade to the entire home. The number of days you find you use the airconditioner ranges from 10 or 12 right up to several months throughout the year. So that impacts on what we have been thinking.

DR WRIGHT: Certainly, also in the disconnect in the pricing and investment system it's not just the electricity, the baseload power generators. As Tony said, it's all the infrastructure and the capacity of the interconnects and the like to cope with peak load. So it's really quite broad brush in terms of if you are doing a cost-benefit analysis and looking at the market values. Every point in the chain needs to be connected to actually make a difference.

PROF WOODS: Yes, and that's why things like building commissioning and the like is part of that chain. It's significant. Just my last question - I'm conscious of the time and that others are due to appear before us. Your second-last paragraph in the main body of your submission, talking about energy generation, and you were hoping that the PC would give "some guidance on the technology choices that will deliver cost-effective energy efficiency gains", which seems a curious perspective. For one, I'm always reluctant that experts should be picking winners, and this starts to smack a little bit of that, but to give you the benefit of the doubt and presuming that you asked the question because you had some sense of what the answer would be, I am curious as to what you think the answer is.

MR BYGRAVE: The intention of that really was to ask the Productivity Commission to look at what initiatives or what technologies might be put in place over time to deliver energy efficiency and really it was an open question. I mean, we can come back with some further advice on that.

PROF WOODS: Yes. Don't spend a lot of time, I suspect.

MR BYGRAVE: It certainly wasn't about picking winners.

MR McGLYNN: I think it's a sense of, without an understanding of the context of where technology is going - - -

PROF WOODS: A different question, yes.

MR McGLYNN: Things like distributor generation may then also - - -

PROF WOODS: Yes, I understand that debate. I just wasn't quite sure that this phrase does get us to that point. We'll look at it.

DR BYRON: We have a few engineers on staff but not enough. I think we will continue the conversation perhaps at subsequent meetings and without the transcript, but in view of the time we probably should keep moving, but can I thank you all very much for the effort you have put into this and for coming today and straightening us out on a few things that we were not straight on. Thank you very much.

DR BYRON: We now have Mr Gallagher. If you could just introduce yourself for the transcript, your organisation, and then talk us through the main points of your submission. Thank you very much for going to the trouble to produce that.

MR GALLAGHER: My name is Brian Gallagher. I'm the director, trade and economic policy with the Plastics and Chemicals Industries Association. I should start with an apology, in that this submission was only drafted by me yesterday.

DR BYRON: It's fresh.

MR GALLAGHER: It has got some typographical errors because I use a dictating program because I'm such a bad typist, but I'm probably just as bad a proof-reader of my own copy, so I apologise.

PROF WOODS: I'm sure you'll submit to us a final view in the near future.

MR GALLAGHER: I will, and I'll correct a few mistakes I've noticed as I've been listening.

PROF WOODS: Yes. We'll take this as a draft.

MR GALLAGHER: I'd like to leave it to you. The substantive part of the submission is some seven or eight pages. Is it easier for you to read through it?

PROF WOODS: If you just highlight the main points, rather than read through the whole thing, and then we can pick up the conversation from there.

MR GALLAGHER: Okay. Let me start by saying that the first part of it is just a general introduction to the industry. The point I'd make is that it represents about 10 per cent of manufacturing, so it's quite a large part of manufacturing. It's mostly a supplier of intermediate goods for other industry. It's predominantly a supplier to the food and motor vehicle and building industries. It's essentially an import replacement industry. The trade balance is about three and a half to one in favour of imports versus exports, but that is actually an improvement from some years ago; an improvement, I might add, that seems to surprise most of the industry.

PROF WOODS: Is that because they don't have a good handle on what is happening on the ground or that they question the data?

MR GALLAGHER: I think it's because they see themselves as import replacement, and are still suffering from the fact that duties have dropped from 30 per cent to 5 per cent over the last 20 years, and they still have that view of things to a considerable extent.

PROF WOODS: We tried to get rid of the last 5 per cent as well, but not yet.

MR GALLAGHER: The section that starts on page 2 is worth going through in a little bit of detail. These sectors in Asia have experienced fairly significant growth in past decades, and this growth is expected to continue. Developments in technology have seen the size of many plants in the chemicals and petrochemical areas increase, in some times to operating capacities that are several times larger than the plants of only 10 or 20 years ago. Improved energy efficiency is typically a major feature of these plants.

While this technology offers potential for reducing costs, it creates some significant issues for the Australian industry. In many cases, the size of modern plants is larger - significantly larger - than the Australian domestic market, and the development of plants in Australia could only be contemplated on the basis of some confidence that export markets can represent a substantial proportion of output. Freight costs and tariff barriers by other countries in the region often preclude Australia from these markets. It's also the case that Australian producers typically face higher costs for capital developments, safety, environmental and social requirements than other suppliers in the region.

It's also a very volatile market, with price and supply volumes fluctuating significantly during the economic cycles. Markets are influenced by the large scale and high fixed costs of structures in the industry. At times of surplus capacity, producers will sell any excess production at marginal cost or less, as it's typically cheaper to do this than to scale back plants. This phenomenon has a particularly acute impact on international spot markets, where new production capacity in a developing country is protected by tariffs and other measures, and those countries endeavour to sell their output above their local consumption demand at whatever price can be obtained.

The point I'm trying to make, and which I think is very important for the industry, is that they do have the capacity to utilise some of the latest technology and expand, but there is an inherent volatility in world markets and this will continue to be the case. While they can continue to supply the domestic market at very low or zero rates of import duty, presence in the market, access to low-cost energy and feedstock sources and the opportunity and time to adjust and improve productivity of existing plant, together with a capacity to supply if there are slumps of the volatile market, are crucial to survival, but it is the case, nevertheless, that these industries will remain essentially import replacement industries and, as I have said, centred in brownfields developments in or near capital cities.

I don't wish in this submission to go into a great deal of detail, looking at all of the issues discussed in the Productivity Commission paper. PACIA generally regards the issues paper as a very useful introduction to the subject and we would not

have any problem with it being a very good summation of the terms of reference and of the issues that the industry faces. I make the point that sometimes the distinction between energy efficiency and conservation can be very difficult, and I use an example where an industrial process requires less heat, the higher the capital and material costs. Energy efficiency would require a very complex analysis of the lower direct energy costs against the energy costs of higher capital and materials use. In practice that sort of analysis would never be done.

For the most part, energy conservation identified in this sort of situation would be considered by the industry as an improvement in energy efficiency. It's equally the case that energy efficiency does not necessarily involve reduced greenhouse gas emissions, and I think that's a fairly evident statement. There can often be the most obvious examples where people convert from gas to electricity because of price considerations, and electricity has typically got a higher greenhouse signature than gas.

The other point that I think is quite relevant to this industry - and I've used an example to point it out - is that it's very difficult to measure energy efficiency, and you can get a misleading example. The example I gave was of high-density polyethylene, which has a higher cost to produce than, for example, polyethylene. Polyethylene is the everyday plastic that everybody uses. It's the most common plastic. High-density polyethylene is the thin-wall stuff that's used for food containers, and therein lies the point. The HDPE containers have thinner walls and, while on a per kilo of output basis HDPE requires more energy to produce, on a per bottle basis the situation is reversed. When the cost in energy content of transport, storage and even the recycling are taken into account, these factors all mean a significant difference in both the economic and energy efficiency of the use of, for example, HDPE in particular applications when compared with polyethylene and, indeed, many other packaging materials. I think it's an important point.

While life-cycle analysis is necessary for many products if the energy efficiency is to be accurately assessed, there has been a long-term trend towards the use of plastics and chemicals, and it would be our submission that this trend and current technology would suggest that there will be ongoing and increasing substitution of plastics and chemicals for other materials for economic, energy and environmental reasons. Plastics, particularly, are more a part of the solution for energy and environmental efficiency and less of the problem, which is probably contrary to a lot of popular media comment.

I have referred to a study that's been recently produced by a group called - and I won't try the German pronunciation - the Corporation for Comprehensive Analysis based in Vienna, which has done a very comprehensive study for the Association of Plastic Manufacturers in Europe of the energy impact of substitutable products with plastic. The study found that, for 21 per cent of its uses, there is no substituted

alternative for plastic. For the other 79 per cent of the uses of plastics in Western Europe, the study found that, if alternatives to plastics were used where a substitute is available, the energy use for the production of those products would be 45 per cent higher; that is, if plastic was taken off the market, there would be a 45 per cent increase in energy use. This represents a 31 per cent saving in energy were no plastic available.

It also found that if plastics products were substituted to a maximum that they can be within the economy, there could be an energy saving of about 28 per cent achievable, and this could represent a saving of about 42 per cent of the greenhouse emissions created by the production of those products. The study was based on the total life-cycle analysis of plastic and alternative products. Of the savings the study identified, it found that 58 per cent of the difference in the energy use relates to the primary production of the product, 34 per cent to the end use phase, and 7 per cent to waste management. I've made a copy of chapter 5 of the study available to you. It's a very large report of several hundred pages, full of econometric analysis which you're welcome to. I've given you a copy on a CD and it can be printed if you want it. It's in English. Some of it is a bit stilted, too. I have to say that, Neil. It's probably a translation.

I have made some comments about the lack of coordination in federal and state energy and environment policies, and I suspect it's a point that's probably made fairly often and frequently through this inquiry. One of the concerns that it has in terms of my experience with this inquiry and with some other initiatives at the moment is that I detected a discernible yawn from industry when it comes to this issue. Whether it's just a culmination of a whole lot of things all hitting at the same time or not, I don't know, but I find it very difficult to get anybody to really focus on energy issues at the moment, and I suspect that it's just - - -

PROF WOODS: Yes, could you elaborate on that, because we've just had the Australian Greenhouse Office as part of the Department of Environment and Heritage, and they're focused, committed and driven on these issues, and say that there's a billion dollars of savings and if you churn out half there's another half to go. How does that contract with the actual perspective of on-the-ground and, in some cases in your industry, fairly large users of energy? Are they pursuing efficiency to the nth degree because it goes directly to the bottom line and it's in their interests, or what's getting in the road of it?

MR GALLAGHER: There are two things: the first is that there are two ways in which as I understand this industry can fundamentally approach this. Many of the sorts of areas where they can or might improve energy efficiency require substantial plant shutdowns or plant refurbishments, and they will accommodate those at the time that a regular major maintenance is undertaken on plants. For a lot of the cracker-type activity in the petrochemicals industry, you're looking at something

between seven and 15 years as to the cycle of a major refurbishment.

PROF WOODS: In so doing those refurbishments, energy efficiency will be primary in their incentive and they will ensure that the refurbishment is focused on energy efficiency?

MR GALLAGHER: No, I wouldn't say that at all. I think it's purely economic. There are often positive energy improvements and a lot of the drive and the change in technology - use of different catalysts, use of different methodologies to use of dry processes instead of wet processes so the products don't have to be dried off and so forth - is driven by energy, but the ultimate decision as to why they make these changes to their plant are economic not necessarily environment. There can also be important considerations due to local environment rules, where what appears to be coming out of a smoke stack or whatever is often more important than what actually is, and they're driven by that sort of requirement by local councils. You know, they have to accommodate those regulatory requirements, but beyond that, in terms of what drives a company, I would say it's undoubtedly economic, not environment.

PROF WOODS: So that was one side of it, the refurbishment and the time frame. Are there any other?

MR GALLAGHER: The other side of it is essentially what I'd call the finetuning and it's obviously more thorough than turning out the lights at night, type of thing, and I have referred to that. Most of the industry are members, directly or indirectly, of the Greenhouse Challenge program and we also operate a couple of programs which are endorsed by that program but are run rather more as part of the Victorian Sustainable Energy Authority programs. We continue to run those programs and, as I have said here, the studies that we've done as follow-up to those programs indicate that some of those programs identify energy savings of about 11 per cent in total, about 9 per cent by particular companies outside of the major companies, but that only about 20 to 30 per cent of those are reductions, so you're looking at a 1 or 2 per cent reduction achieved in the first couple of years of operation of those programs. The details of that are set out on page 7 of this submission.

PROF WOODS: Thank you.

MR GALLAGHER: PACIA accepts - and I'm talking about the implications of an emission tax - that either a tax or a levy on greenhouse gas emissions, or a trading regime for scarce emission entitlements would cause a reduction in emissions and energy use and probably also cause an improvement in energy efficiency. We are concerned, however, about two critical elements of any tax or trading regime. Given that atmosphere and climate change are global issues, global approaches are imperative and to the extent that greenhouse gas emissions are identified in economic terms as an externality, we'd like to ensure that those externalities are only equal to

the economic cost and not seen as a means to change behaviour in some other way.

Energy represents a substantial cost to most producers in these sectors. A lot of the producers have energy costs of around 20 per cent of their total production costs. I've done a small calculation which is set out in the middle of page 8 which just gives you what I think is a perspective on emission taxes which is not generally understood. The essence of what I've said is that a \$10 a tonne carbon dioxide emission tax based on a cost of energy of about \$80 per megawatt hour represents about a 3 per cent increase in production cost for an energy-intensive part of this industry. That is, a very modest carbon dioxide tax would represent a cost to these industries which is probably greater than their current profitability before tax ratios.

But the important thing about it is that if you compare that to what a \$10 a tonne carbon dioxide tax would do to the price of fuel, petrol for cars, it's probably about one cent a litre. The impact of a one cent a litre tax on petrol, I suggest, would be marginal at best. The point I would like to make is that while a carbon dioxide tax may well seem to be a way to achieve a certain outcome, the impact on manufacturing industries, and particularly on a sector like this, which is highly energy intensive but also very much exposed to import competition, could not only mean that it has a very substantial economic impact, it could also lead to substantial movement of resources out of Australia and to overseas. Of course, the transfer of this production from Australia will achieve nothing in terms of economic or energy efficiency and will probably have an adverse effect on environment efficiency, given that supplying countries in Asia are no more efficient in energy production, and supply to Australia would probably involve increases in transport and other costs.

The other thing that I skipped over as I went through - and I did that by accident - is that I did endeavour, as part of preparing for this inquiry, to ask the larger companies in PACIA for some indication of what energy efficiency achievements they'd made over the last decade or so and their perception as to what improvements might be possible. I've summarised the outcome of that in attachment 2. Essentially it suggest that the efficiency gain over the last decade, in rough terms, has been about 4.5 per cent per annum on average, and that they identify at the moment gains of about 2 per cent per annum in terms of their current plans. I should emphasise that the number of companies that were involved in this was quite small. They were large companies, but I wouldn't be confident that this is indicative of either the existing performance of the industry, or the outlook. I included the figures because I sought to get - - -

PROF WOODS: Illustrative value.

MR GALLAGHER: It's illustrative only, yes.

PROF WOODS: An interesting point you made, though, is that this sample is

predominantly large companies and therefore presumably with larger overheads and therefore they have specialised engineers and other departments that can look after the energy component. Does that differ with small, single-site businesses and would you expect the behaviour there to be a bit different?

MR GALLAGHER: I honestly couldn't answer that. In the chemicals industry, small companies tend to be specialty-type producers and I don't have an answer to your question. For most of the plastics industry, they are small and medium-sized enterprises, and mostly they are using off-the-shelf equipment. You know, the machines that are used to extrude and mould and blow plastics are bought from Germany or Japan and you buy it and you plug it in.

PROF WOODS: Buy your feedstock, buy your equipment and find a customer.

MR GALLAGHER: Yes. I would suspect most of them would just not see this as being part of their horizon. They get the motor that comes with it and, you know, you don't put a Holden motor in a Falcon. Don't even try.

PROF WOODS: Yes. I was attracted to your concluding comment, I must say, that given that some of the broader agenda is global, even though we have a particular term of reference, the consequence of any activity which drove some of our activity offshore - I am reminded of the tariff debate and all the doom and gloom - but even putting that aside, if it does drive it offshore maybe we're not driving it to more energy efficient producers, in so doing, so there's a point there that is at least worth noting.

DR BYRON: It could actually add to global emissions.

PROF WOODS: Yes.

MR GALLAGHER: To the extent that it probably involves higher cost of transport and so forth, I'd say that's probably true. I think the other point to make in that is that there are probably incentives, even if they're only persuasive at this stage, for Australia to improve the energy efficiency and the greenhouse gas efficiency of its baseload electricity and gas production. There doesn't seem to be the same sort of incentive on most of the countries in the developing part of South-East Asia, with the possible exception of China.

PROF WOODS: You also drew an example of conversion from gas to electricity. Would that be a common behaviour within your industry, or are you just thinking of a particular case study that came to mind? This is on page 4. You talk about, "Equally it's the case that energy efficiency does not necessarily involve or produce greenhouse gas emissions. Conversion from gas energy to electricity could improve energy efficiency but increase emissions," particularly with the brown coal-fired

power station churning out what it does. But did you have a particular instance in mind? Is this in fact a trend happening in the industry, or just a theoretical point?

MR GALLAGHER: No, at that point it's a theoretical point. I guess there would be other examples where this happens. A couple of examples that have been given to me are of cases where the process of manufacture involves the use of heat, for example, and a change in process that involves less heat often has a much better greenhouse gas signature, simply because of the change in that outcome. But that may well involve a conversion from one form of energy to another, and that can have an adverse effect.

PROF WOODS: Okay, but there's no discernible trend in the industry to move that way. In fact, I would have thought with the freeing up of the gas market that that may move - - -

MR GALLAGHER: I can't give you a comprehensive comment. People say to me that in areas like Botany in Sydney and the western suburbs of Melbourne the energy uptake of these industries would suggest that there is a significant potential for cogeneration-type plants which integrate a whole range of things, but it's in the nature of the structure of this industry and the economic pressures on it, that they are not going to be the ones who are going to undertake the sort of capital investment that that involves. It's not their mainstream activity and there isn't the sort of scope to do that.

DR BYRON: I thought your discussion on the HDPE was a very interesting little example. It sort of raises the question, when we were talking about something being more or less energy efficient, compared to what and over what scale? Not all comparisons seem to be made over the full life cycle of the product. Is that one of the main points I should be taking from that example?

MR GALLAGHER: Yes, I think so, but I don't think it even requires an examination of the full life cycle. Full life cycle tends to identify the use phase and the disposal phase and it tends to put a lot more focus on that. In a lot of cases what I think we're talking about is a transfer of energy cost from one part of the process to another part of the process of the manufacture of the good.

Another example that was brought to my attention is that there is a process to make film for packaging foodstuffs and by a process that involves a much higher energy input in the original stage of making the film. The film is thinner and also has much greater capacity to preserve foodstuffs and to stop them deteriorating and it's that benefit in terms of the greater shelf life of the product that is worth - you know, exactly how you calculate the energy total output of that, I can't tell you, but in fact the company that makes that film is one of the companies that responded to this survey, and it's the company that has a negative energy outcome per tonne of product

as a result of what it's done in the last decade.

DR BYRON: Not the same sort of product?

MR GALLAGHER: Well, it's the same sort of product, if you're going to describe it in terms of food film.

DR BYRON: Can I move now to what you've got under the general heading of Lack of Coordination. A few other people have talked to us about the multitude of the policies within a state, the comparisons across states, in some cases the Commonwealth and state policies sort of cutting across each other or even where they seem to cover similar territory. It seems to make two different sets of paperwork to report the same sort of thing. The example of the mandatory assessments, opportunity assessments, and what the Victorian EPA already does once again is a good example: is that the only case of that sort of thing, or is it just one of the more spectacular ones?

MR GALLAGHER: I don't even know that it's necessarily the most spectacular. The New South Wales government also has a range of programs in place whereby companies can get involved in the GGAP program, which is about trading in emissions. In fact, it is public knowledge that Orica are involved in that process and did so voluntarily because they could make money out of it because they were on a program of substantial change to major parts of their activity in New South Wales that involved I think a 25 per cent reduction in their energy consumption, so there was a credit for them in it.

But again, to the extent that they will inevitably be picked up in the mandatory audit activity, they have to satisfy a whole range of different criteria in terms of achieving the outcomes of the New South Wales program and what they will be required to report under the mandatory energy efficiency opportunity assessment. Well, I should qualify that in saying that we're not quite sure what they will be required to do under the mandatory one, but they seem to be covering the same ground with clearly different objectives. Also, there is not a great deal public about it, but the state governments are pursuing an agenda very actively at the moment of some sort of a trading regime. You find reference to that in the New South Wales greenhouse strategy. You find reference to it in the Western Australian greenhouse strategy, where it says, "We'd love to do this, but we can only do it if all the other states do it at the same time." That's a different policy objective to what the federal government is doing and industry is left in this hiatus about whether they have to start taking notice of state government policies in three years' or six years' time.

DR BYRON: If all the states come up with a harmonised emissions trading scheme, then does that mean that Australia has one, irrespective of what the Commonwealth position is?

MR GALLAGHER: I don't know the answer to that.

DR BYRON: It could create some interesting practical operating difficulties for companies that operate across jurisdictions.

MR GALLAGHER: Yes. I really shouldn't be answering your question because I don't claim to be an expert in it. I would comment, though, that as I understand it, an important advantage of a trading regime is that it gives you access to an international trading regime under the Kyoto Protocol, and for the states to implement it, it would not provide access to that opportunity, for whatever value it is. So it wouldn't be the optimal trading regime anyway.

DR BYRON: You were in the room when we were talking to the people from AGR about the NEET, the national energy efficiency target.

MR GALLAGHER: Yes.

DR BYRON: Does PACIA have any views on NEET and any ideas on how it might be implemented or what effects, if any, it might have on the members of your association?

MR GALLAGHER: We don't, outside of stating the obvious principles and the underlying sort of things that if there are to be mandated energy costs which increase costs of production beyond those which would be indicated by a purely market-driven decision about investment decisions and marketing decisions and production decisions, then that distortion is a cost on industry and on an industry that is exposed to import competition, where changes of a few percentage points in costs could be and will be critical.

DR BYRON: You were talking about, I think, Orica, a company that makes major energy efficiency savings: the question of what the baseline would be if we were to bring in a target, whether the baseline was taken as their level of energy efficiency as of the day the scheme came in or whether they had credit for prior actions that they had taken.

MR GALLAGHER: Well, we, along with I think most energy-intensive industries and certainly with the Australian Industry Greenhouse Network, who I presume have presented a submission to you and will be appearing before you, strongly support the view that if there is to be such an approach taken, there has to be a recognition of achievements that have been made over the life, at least, of the Greenhouse Challenge program and perhaps even before that, where companies have made conscious decisions to improve energy efficiency.

PROF WOODS: An analogy to energy efficiency might be recycling because of the externalities and benefits involved in undertaking it. Are there any lessons to be learned from the way in which the plastics firms have embraced recycling and the fact that it probably yet isn't at the maximum achievable level but that there are all sorts of incentives and costs involved? What can we learn from recycling to look at energy efficiency?

MR GALLAGHER: I don't know that I can give you a firm answer on that. A lot of the work that's done on recycling of plastics is done by my colleague in Melbourne. If you would like to hear more about it and where it comes from, I am happy to ask him to come and talk to you about it.

PROF WOODS: Well, it would certainly be useful if he jotted down some points, looking at this particular inquiry, because it's also trying to encourage a good thing that has benefits. What has recycling shown us that we could learn from?

MR GALLAGHER: I will ask him to do that.

PROF WOODS: Do you have any observations yourself that you would like to offer this morning?

MR GALLAGHER: My understanding is that a lot of the recycling effort doesn't necessarily have a very strong basis in economic efficiency; it's to do with perceptions about what's responsible practice in terms of a community standard and so forth. The other comment that I think probably has to be made in relation to plastics is that plastics are not as recyclable, in terms of being reused as plastics, as a lot of people would imagine. You are probably looking at about a 25 per cent recyclability at the optimal. It's in that order. Because significant parts of plastic were used in food production and so forth, the quality of it means that that is limited.

Probably the greater potential for the use of spent plastic, if I could call it that, is as a fuel in furnaces to produce heat for other products such as cement and the conversion of iron ore to iron, where these products do have a quite high coefficient of energy. They take high temperatures to burn them but there is very little waste. I mean, they are predominantly carbon and hydrogen.

PROF WOODS: Part of the carbon cycle.

MR GALLAGHER: Yes.

PROF WOODS: Indeed. Also, the relevant energy efficiency of producing plastics from original feedstock versus recycling would be an interesting question.

MR GALLAGHER: Yes. Look, I shall ask if I can get some information on that.

PROF WOODS: Thank you. We are not looking for a submission of the high calibre that you have produced, but some additional points would be helpful.

DR BYRON: Could I just come back to I think it was a Greenhouse Challenge exercise that involved about a dozen of your members, that identified significant savings through energy efficiency measures. I think at the heart of this whole inquiry is: if there are measures that are cost-effective and immediately commercially viable for companies to take up, why weren't they picked up earlier? Why does it take a government program for people who are managing business to look around and say, "Oh, yeah. We could do that. That will make us more money." Are they too busy, too preoccupied or, even though these things are profitable, their time is spent on other things like market development or sales staff or something that were even more profitable?

MR GALLAGHER: I honestly don't have an answer, other than to say that it may well be that it's a question of awareness; it's a question of basically going through the process of identifying efficiencies. It's often a case of these things having some sort of a coincidence in time, so it means that at a time when people are looking at a refurbishment of a plant or a review of operations in a plant, energy and greenhouse gas emissions type issues has a higher focus, purely because there is seen to be a responsible citizen type issue that identifies it as an issue that they might address and they find that it's economically worthwhile doing as well.

DR BYRON: The other explanation that a few people have offered us is that if you didn't have a system in place for actually measuring precisely, or if you weren't continuously monitoring and benchmarking, then you might not know how inefficient you are - you know, "The factory has always looked like this. It's always run like this." So what makes you suddenly realise that actually it could be 20 per cent more efficient, unless you have some trigger?

MR GALLAGHER: My understanding is that for a lot of the industry that uses standard technology, particularly in plastic extrusion and the like, that sort of analysis wouldn't be done. They just simply operate machines on the basis that that's what they have. In the chemicals industry and in polymer production, as I understand, there are bodies around the world that look at the engineering performance of different types of plant, different types of technology, and compare them at some detail in terms of their energy potential, and it is often the case that that can change because of development in things like catalysts and the like, that will often have very significant benefits in terms of ways to reduce the amount of heat that is produced or the amount of drying that is required, or whatever the process is. These things are picked up as and when companies are in a position to do it, which might not necessarily be immediately the technology is identified, for the reasons we talked about.

DR BYRON: So timing can be important.

MR GALLAGHER: The other side of it that people tell me is an important driver - and this is the greater concern about water and wastewater for these industries. People are looking for ways to reduce their water use and reduce their water consumption in waste. That often drives critical issues about efficiency as well.

PROF WOODS: Now, that's interesting. Why is that driving them more than energy efficiency? Is it because of the price of water? Is it because of the environmental constraints on the water emissions? Is it because of sheer scarcity and therefore they are being given targets of reduced consumption? What's driving them that way and not to energy efficiency?

MR GALLAGHER: I didn't say it's driving them more than energy efficiency. I am saying it is a factor that often co-aligns with energy efficiency and adds to the impetus to - - -

PROF WOODS: It would be interesting to see if they are responding to either the same signals or different signals and if there is anything that could be learned from the water story to migrate across to the energy story. If you find any more intelligence out - - -

MR GALLAGHER: I don't have an answer to that, but again I can - - -

PROF WOODS: No, but if you come across some information we would be grateful.

MR GALLAGHER: They often do seem to run in the same direction: that reduction in water consumption often means reductions in drying off and so forth.

PROF WOODS: Yes, absolutely.

MR GALLAGHER: And so there is a win-win on both sides. I don't know that there are any direct incentives or sanctions that are being applied by state governments particularly that are driving this, but there is a lot of political pressure, obviously, for companies particularly to reduce their waste. I might be arguing from the particular to the general but a couple of companies I spoke to in the Port Botany area of Sydney have got a particular problem in this area in that a lot of their water use is actually to dilute their chemical solid wastes down to an acceptable level, which means the same amount of chemical actually finishes in Botany Bay but with a whole lot more fresh water, and there is an obvious argument that flows from that.

PROF WOODS: A bit of perverse behaviour. You see, you respond to incentives,

don't you? If you have to get the particular ratios down, then use more fresh water to do it.

DR BYRON: Well, I think on that note we probably should draw this to a close. Did you have any closing remarks or anything else you wanted to add?

MR GALLAGHER: No, I don't have any particular closing remarks, other than to say I appreciate the opportunity to come and see you.

PROF WOODS: Can I respond by saying the commission is always grateful that PACIA does give its time and efforts to assist us in our inquiries.

MR GALLAGHER: Some of the larger companies in the industry do probably have a reasonable history of what they have done and what they are endeavouring to do. If you wish, I can encourage them yet again to come and talk to you.

PROF WOODS: Or even just to put in some written material, but we are particularly interested in what drives them - what works, what doesn't work, how they would respond to different - I mean, if you look at information improvements, if you look at market drivers and if you look at regulation, what we are looking for is real case studies of where energy efficiency fits into those and how they respond.

MR GALLAGHER: I appreciate that, and I'm sure you can appreciate that sometimes by law it's the area that PACIA simply can't get involved in, because their involvement with how they are making their financial decisions and so forth are the sorts of things we can't discuss in public forums as part of the Trade Practices Act, of course.

PROF WOODS: Yes.

DR BYRON: Of course.

MR GALLAGHER: It's the sort of area where an association like ours doesn't have a great deal of involvement.

PROF WOODS: But if you could encourage your members to come - - -

MR GALLAGHER: I will see how they are placed. It's Wednesday in Melbourne, isn't it? If they have any spare time they can come and talk to you.

DR BYRON: Well, thank you very much for coming. We can adjourn now and resume at 2 o'clock.

(Luncheon adjournment)

DR BYRON: We will now resume the public hearings of the Productivity Commission's inquiry into energy efficiency, with Dr Paul Bannister. Thank you very much for coming. If you'd just introduce yourself for the transcript and then summarise your submission, thank you.

DR BANNISTER: Yes, I'm Dr Paul Bannister. My submission relates to, I suppose, mechanisms for measuring energy efficiency in buildings as that might relate to potential incentive mechanisms. The basic thesis that I'm placing in the submission is that you have to measure the performance of a building in operation, to be guaranteed of actually achieving any energy efficiency benefits from that building. The background for this is that I've been working in the field of energy performance in buildings for some time. I work as an energy auditor. I spend my time going to buildings and trying to work out what is wrong with them and what can be fixed in them. One of the things you become familiar with very quickly in that area is that buildings don't work as well as they should. In fact, there's always a large range of imperfections in their operation.

Those imperfections range from simple things like poor commissioning, so that the plant that was put in there doesn't actually operate the way it was intended to; crazy things - a plant that was put in there doesn't make any sense at all, and I've seen that happen on a number of occasions; poor workmanship; issues of design detail so that people came in and said, "We're going to do such-and-such and this building is going to be wonderful," and you go in and look at the details and say, "Well, they didn't look at the detail in the design and so what actually happened completely frustrated that intention"; issues in particular with airconditioning control - it's a very, very tricky area and one in which I would have to say there is a very limited amount of expertise in the industry and it's the bane of many buildings, in terms of energy efficiency; poor handover, so people have no idea how the building was intended to work and so it never works that way; actual in-practice management practices, maintenance practice as well; and last - and to some extent least - tenant energy use issues. We'll talk about those later.

Part of my background in this area has been the development of the Australian Building Greenhouse Rating scheme, which is a performance based rating for office buildings. I highlight here that this submission isn't about ABGR, but it's the experiences we've had from that which are useful. In ABGR we developed a performance based rating which just takes the electricity bills and some normalising factors and converts that into an assessment of energy efficiency. It's being used nationally, really, with the exception of Tasmania, as a means of rating the performance of office buildings.

PROF WOODS: Used by whom?

DR BANNISTER: Portfolios are actually one of the biggest users, the actual

owners of the buildings. We are also now seeing tenants asking for the information, so they're using it to select, or to assist them in the building selection process. It's being used by technical people from the point of view - and importantly in the context of this submission - as a means for getting a front-up assessment on how efficient a building actually is. You go and do an assessment and it comes out at two stars, well, that means there must be a lot of opportunity and one of the repeatable experiences we've had with it, as you walk into a two-star building, there is something wrong with it, and if you didn't see it the first time, you have to go back and find it, and you'll find that there is something wrong with it. So there is a repeatable correlation between how good a building is and its star rating and it's very important, that that is there.

The scale that we're talking about - between one star and five stars, or one star and four star, because four stars is a more practical limit - is a factor of about 2 or 3 in energy consumption, and that is the range that real buildings deliver performance over.

PROF WOODS: Per floor square area?

DR BANNISTER: Per metre squared. For me that is square normalised for hour of operation and climate and a whole bunch of other stuff. So there's a factor of 2 to 3 in terms of the energy consumption that is available between the worst performing buildings and the best performing buildings. If you're in a one-star building, there's a very good chance you can move it up a star or even two stars by just working on a lot of the issues I've mentioned, in terms of making the building work properly, fixing the things that were never delivered properly in the original design, getting the controls working correctly, et cetera, so actually making the building do what it's meant to do.

The other general introduction issue was the issue of computer simulation. I'm a user of computer simulation and I've been involved in computer simulation since the early 90s. One of the things I've learnt over that time is that the relationship between what you simulate and what you get is a little bit loose, to say the least. Typically, actually, simulated building performance tends to be rabidly more efficient than real buildings are, and particularly in the area of well designed buildings - like a good quality modern building. On the ABGR scale you would expect it to typically come in at four and a half to more than five stars as a simulation. If you then compare that with the real building population of comparable design, none of them basically does above four stars.

So there's a significant gap and what's more, it's not just that none of them do better than four stars, the average is two and a half, so there's almost a factor of 2 difference between what you're getting in the simulation in your average delivery point. That doesn't mean to say that there is no relationship at all. I tend to see the

simulation as being an upper limit that you could theoretically get somewhere close to - although we've yet to see it. There is a round of buildings happening in Sydney currently which I think have a good chance of getting much closer because people are specifically aiming for performance targets and are therefore looking at all the issues that might interpose between their design and the achievement of the desired target.

PROF WOODS: Is this a place like Darling Park, the third tower and things?

DR BANNISTER: Yes, that project is aiming for a high star rating. I'm actually currently reviewing the design of that building. People are - - -

PROF WOODS: I think it's going up.

DR BANNISTER: Yes, it's happening, that's right. With that building and with a number of other buildings people are looking at it and saying, "We want to deliver a four and a half star building." They recognise that doing the simulation is not enough; they then have to think about how they turn that into reality. There is a whole bunch of delivery issues, about control issues, about commissioning issues, monitoring issues, necessary to turn that theoretical potential into an actual performing building at that level.

PROF WOODS: Is there a danger that the theory is a bit wrong? For instance, you use postcode for climate but I would have thought whether you're in a shade footprint, whether you're wind exposed, whether the road orientation allows a north-facing - and all of those sorts of things - is a more important postcode.

DR BANNISTER: There are a number of things. Firstly, the simulations don't represent many of those things either, so the theory doesn't work very well. Actually a lot of those factors are much less important than - I mean, most of those factors are sort of 10 to 20 per cent factors.

PROF WOODS: Yes, it's just that when you put postcode - - -

DR BANNISTER: But they don't explain the - - -

PROF WOODS: - - - I thought, "Mm, that's a bit blunt."

DR BANNISTER: That's right, yes. Actually the difference in the total energy use between a building in Sydney, Perth, Canberra, Melbourne - in fact, any of the major centres south of Brisbane, including Brisbane - is plus or minus 10 per cent of the same value, so the climate is in aggregate a lesser impact. It's a bit different in office and commercial buildings than it is, say, in houses where there is very little happening inside the house, as it's very exposed to the outside climate. Whereas in a

commercial building, the energy consumption is very heavily determined by what happens inside the building and by the mechanical systems in there.

PROF WOODS: It's driving it, yes.

DR BANNISTER: Yes, the mechanical systems are very important. There are a number of items here that I've raised, along the lines that good design and good performance are not the same thing - I've got a study here that I've done a little graph of - this was work I did for the Building Codes Board. The basic issues to take - there is a figure 1 in my submission - from that, the first is that if we look at our highly performing, you know, well designed buildings which are probably 60 to 80 per cent plus on that design score scale, the blue diamonds which represent the actual building measurements, vary over a very wide range, including one zero-star building with a 70 per cent design score, which is actually a well-designed building with lots of things going right in it, in terms of its design, but it's completely failing to deliver in terms of performance.

Also significantly the average of those is sort of in the two and a half to three-star region, which is basically the same as it is for buildings of poorer design. This was a relatively crude study. The Americans did a much more refined study over a much larger sample and reached the same conclusion; that they couldn't actually find a correlation between design features and actual performance. The other factor to note is that at the top of that set of data, in say the 60 to 80 per cent region, are simulations and those simulations are all performing at four and a half plus stars, except for the ones where we've heavily modified the operation to try and make it perform worse. We've actually broken the simulation, if you like, and tried to make it perform worse and even there we're not really covering the full range of degradation of building performance relative to what has actually occurred.

That is my first piece of evidence: that good design and good performance are not the same thing. I think, from a more anecdotal perspective, quite simply you go to the centre of Sydney and look for buildings doing four and a half stars - well, there aren't any. There is one building which performed close to four and a half stars and got to four and a half by buying some green power, but in terms of its pure technical performance - no, it was below four and a half stars. So most of these buildings - I mean, all of these sort of modern, well designed buildings should in theory be doing four and a half, five - well over five stars - but they're not, so there's definitely an issue and there's a gap that needs to be explained. As I say, we've got some buildings out there of those sorts of levels of design that are doing one star and worse and we're talking double the amount of energy that they should in theory be using.

The design industry is very good at passing off a lot of this as being somehow not their problem. This is one area which I think is particularly important in the context of some of the measures proposed in the National Framework for Energy

Efficiency and other sort of issues. There is a tendency to argue that all these issues that make buildings not perform are somehow basically the fault of tenants. I've heard this thesis many times before, "Our building is - we've got a perfectly good building but the tenants have ruined it."

There are two factors that I would note here. One is we've done the theoretical study, which I've cited in my submission, which looked at the impact of tenants - going from a lightly loaded tenant who switches off most of their equipment at night, through to a very heavily loaded tenant who leaves everything on overnight, or large amounts of equipment on overnight - and the difference about average was plus or minus point 3 of a star. So this certainly wasn't enough to explain the difference between four stars and one star, or even between four and a half stars, as a sort of nominal average for simulation, and two and a half stars being the sort of nominal average for what really happens.

So it's not the tenants' fault, and that's also backed up by the reality that we've got a - we have this repeatable experience that buildings that are - when you go into a building that is two stars you find stuff wrong with it; you know, it's not working correctly; it's not "The tenants are really bad", it's that the building has got major problems, some of which are fixable and some of which may be too expensive to fix because the building was fundamentally badly designed in the first place.

I've highlighted in here what are the issues that drive us. Poor commissioning is a major issue. Commissioning is the process by which things go from being a lump of equipment to being a lump of equipment that is actually meant to be doing something. Commissioning processes in Australia are pretty awful, and it's generally something done at the last minute and the commission agent does it at the very last point in time, and there's only a week allowed in the schedule, that sort of stuff, so people pretty much get handed the building the way the builders sort of left it while they were packing up their bags. That often has a major impact.

A classic example is going into buildings where we found that air handles were just not turning off because no-one had ever checked that when you click the button on the screen saying, "Turn this off," that it runs through to a relay which actually turns off an air handle. It doesn't just run to a relay that does nothing. These sort of really simple basic things aren't tested, and ultimately the only way to test that sort of thing is in the actual performance because like a lot of maintenance-oriented things it's quite hard to write something that is bullet proof, in terms of somebody not just fiddling it and just saying, "Yeah, yeah, I did all that." It's quite hard to actually have concrete proof in that area.

Poor workmanship is definitely an issue. Somebody highlighted an example recently of a building in Canberra which was meant to be designed with all sorts of fantastic levels of building envelope performance, and I found out about this from a

guy who was actually engaged on the site as a carpenter. It was meant to be a very well sealed building envelope, and he was putting up strapping and lining on the walls and he says, "Oh, look, I can see through the walls into the outside world. What do I do?" "Just fill her up." And so it went up with holes in the outside of the building. They just put the plaster on the front of it and hoped for the best. And that happens all the time. It's a real world. The theory and the practice don't quite match up.

An important issue in this area is also design robustness, and this becomes very important when you're considering the relative value of things through simulation. It's possible to make buildings very robust; that is to say that there's less things to go wrong in them, and when things do go wrong they make less impact. To take an extreme example of this, the building I worked in in New Zealand had opening windows and a single thermostatted electric heater in each office, and it was very efficient, and there was nothing terribly efficient about the design per se, but it was very efficient because there was almost nothing to go wrong in it.

The biggest range where something could go wrong in it was one room, whereas if I take a standard multistorey airconditioning system, let's see, if we take a building that's got 30 storeys and it typically has four or six air handlers, each servicing a facade or the core, and let's have one zone go wrong in that. Okay, so one zone has a VAV terminal and that terminal breaks, and that's responsible for controlling the temperature in that zone. That sends a signal back to central control that this zone is failing to control. The central control then goes, "We'd better change the temperature that I'm supplying the air at to 30 storeys." That then causes the temperature to change, and let's say it makes the temperature lower, which often happens. Well, all the other zones then start getting over-cooled, and they often have little electric heaters in that click in to compensate for the over-cooling, so we've now got the situation where one failed unit has caused 30 storeys of little electric reheats to come on, and that could be several hundred kilowatts just chugging away.

The particularly problematic thing about this is that because the system has got the compensation in it, nobody notices, because everybody has got comfortable conditioning, so the situation just goes on and on and on, and that's an example of a design which is very robust in terms of comfort but very non-robust in terms of energy efficiency. This is an area where it's very, very difficult to pick up in theoretical simulation the difference between the two. The particular issue of what's called reheat in commercial buildings is a major issue.

I don't have any scientific evidence on that but, anecdotally, when I see buildings with large amounts of reheat in them, you generally find buildings with problems. It's as simple as that, and the more complicated the types of reheats are, the more complicated the problems become, to the point that when I'm working on new building designs, the advice is always: try and avoid having reheats at all

because they cover up the failures and they also increase the likelihood of parasitic energy consumption in the building.

The issue of robustness is difficult to simulate because simulations necessarily look at a building as if it's working perfectly. They don't really tell you very much. So you can have buildings which look in theory really good which will never perform at that level, and you can have buildings which look in theory not quite as good which have a much higher probability of performing at that level, so it becomes an inappropriate assessment of the parity of the two designs, and we've seen this with clients, where you go back and say, "Yes, this building you've designed actually doesn't simulate as well as a conventional VAV building, but it's far more likely to perform at the level it's simulated than this VAV building," and it's a difficult message to understand; it's a difficult message to get across.

The other issues: airconditioning controls highlight how poorly that's understood. The design industry understands it incredibly poorly. Even in the control industry the understanding is very patchy. There's a tendency from these areas to consign things that they don't understand into "doesn't matter", that somehow it's a temporary, unimportant feature of a building, as opposed to actually being a critical feature. One of my concerns is if buildings are assessed - for instance, if you assess a building on a simulation, the simulation assumes a certain pattern of control which may or may not be reproduced in the actual building.

There is definitely a shortage of understanding of the implications of that. I've sat in front of the terminal of a building and taken nearly 20 per cent off the energy consumption of a building in an afternoon by fiddling set points. Does that make it trivial or does it make it incredibly important? The answer is probably both. It certainly is not a factor you should just ignore, which I feel is a risk.

Maintainability and operability: there are certain systems out there - if you've got a system which relies on having a hot-water valve up in the ceiling about there above your desk, it's going to be difficult to maintain because somebody is going to have to come in with a set of steel caps and clamber over your desk and pull out the ceiling tiles, dust, and they don't want to do that any more than you want it to happen above your desk, so it doesn't happen. So if your system performance is relying on that valve, then your system performance is going to go to pieces.

That's why I'm concerned about the assessment of design as opposed to performance as an indicator of the energy efficiency. In terms of economic outcomes, obviously if we have no guarantee that a good design produces a good performance, then we're sending a very distorted economic signal to the marketplace, that you put in these features and you get a better building. You're assigning economic value to something which is not delivering economic value, which would obviously be a very perverse outcome.

You've probably gathered from what I've talked about that this is a very complex field, there are lots of issues. Any form of design assessment is necessarily going to simplify that, and as soon as you simplify that, the things which are not counted just get discounted. So by having a design assessment that, let's say, says, "Well, glazing is really important, but we won't worry about control," then everybody is going to worry about glazing and not do anything about control, because the value has been assigned entirely to the glazing. It would be very, very hard to deliver a design rating that covers everything, and in fact I don't think the industry is capable of delivering a design rating that could do that, and if it could, it wouldn't be practical to assess because it would be too big and too expensive and too difficult to do.

By contrast, performance based ratings do deliver good economic outcomes because of the direct proportionality between the quality of the economic outcome in terms of the saving achieved, and also it's flexible in terms of innovations. If you achieved it by doing something - you know, if you found an efficiency box and you just patented your new efficiency box and you slap it onto the side of the building and it makes it 50 per cent more efficient by whatever mechanism, that's treated as valid, whereas in a design rating, until your efficiency box makes it onto the design rating, it's not counted as being a valid mechanism.

So a performance based assessment methodology delivers you an assessment methodology which is actually proportional to the economic outcomes and encourages innovation rather than pushing innovation. It's particularly important because - I know this has been discussed as well in the context of compulsory disclosure for buildings, and my question in this area is why would you have compulsory disclosure? Well, there are two key transactions you'd have compulsory disclosure out of. One is sale and the other is leasing.

In a sale transaction I think it highly unlikely that a commercial entity is going to rely on a government-owned design rating to provide their due diligence. They're going to undertake proper due diligence on this building. They're going to understand how it works; they're going to have maintenance consultants crawl all over it; they're going to have a thorough technical understanding of this building, so for them a design rating is of very limited value.

For an incoming tenant, they want to know how well the building is working, not how good it could be if somebody actually got round to making it work properly. So it's important for the tenants that they actually find out how it's working, and that is a performance issue, and we're seeing a strong uptake by the tenancy market in terms of using ABGR but I say this is not an advert for ABGR. They're using performance as an input into their assessment of the building, and to some extent actually there is a broader correlation there. Contrary to what some people might

say, buildings that use a very large amount of energy generally do so because they're also delivering poor conditions because they're actually suffering from poor maintenance and they're actually falling to pieces or were very badly designed in the first place.

I feel that performance disclosure is a very useful thing in this sector. I recognise other sectors it may not be appropriate but in this particular sector, where I don't believe you can separate the design in a meaningful manner from the building as an entity, I think performance is incredibly important. I know also that performance benchmarks have been used in the context of new buildings, and I also know that that has happened in a way that has encouraged the market to jump completely off the rails in terms of its traditions, and deliver some highly innovative buildings.

The one that everybody raises is the Lend Lease headquarters, which has thrown away the book on a number of areas and put in a new airconditioning system that no-one else has used, and has a very, very good chance of outperforming the rest of the building stock by 25 per cent, and that was only achieved, I think, because they actually aimed for a level of performance. If they'd had something which says, "Tick this, nice bit of glass, nice chiller," they'd have done that and nothing more would have happened, so again I don't think it delivers the innovation; it doesn't deliver the challenge.

I just raise the issue as well in my submission, "Well, why can't commercial buildings be rated as cars and fridges?" Some people have made the argument that we should be able to stick a label on the front. Well, there's two things: one is that commercial buildings are individual custom-made projects, they're all unique, and the other is actually that cars and fridges are actually rated on the basis of performance. It's just that the performance is extrapolated to a whole production run. We don't have that luxury. Certainly cars and fridges are not assessed on design.

In terms of boundary issues, none of the above is intended as an argument against component ratings for things like chillers and motors and fridges, because, after all, if you've got a chiller in a building and that building is efficient, well, great. If that building is inefficient and it's using the chiller all sorts of times that it shouldn't be, well, you've still saved energy relative to having put a less efficient chiller in that environment.

I don't believe this argument translates effectively into the domestic sector where it's driven by behavioural issues as opposed to technical issues, but it is relevant to any situation where you have got large numbers of items of equipment interacting to create a system-wide result; almost all forms of commercial building, offices, retail, hospitals and in fact a lot of industrial processes, as well. As soon as you start looking at that system-wide performance, the issues that I'm talking about

become very, very relevant.

In summary, what I have submitted is the correlation between design and actual performance in commercial buildings is very poor. As a result, if one was to base economic incentives or whatever on those design parameters by themselves, you end up with something which is quite distortionary in the market. It doesn't have guaranteed economic outcomes, whereas a performance based assessment is actually based on delivering actual outcomes in terms of saved energy and therefore saved money and therefore an economic result.

Performance based labelling of buildings in the case of compulsory disclosure I think needs to be performance based, not design based, because that meets the needs of the marketplace. I wouldn't deny the role of design based assessment as an adjunct to performance based assessment, but it is secondary and it's not the driving object.

DR BYRON: Thank you very much. The submission was very clear and easy to follow. The comments that you made talking through that have helped even more. One thought that occurs to me is that you talked about the possibility of seeing a one-star building as an opportunity to rehabilitate it and get it up to three or four. Have you any sort of experience or observation on whether it's likely to be cost-effective to do that, in the sense of how much it costs versus how much it saves? I guess I'm thinking particularly that as long as electricity remains very cheap, even if you make the place more technically efficient, the savings will have to be fairly small. That means you would have to have relatively low-cost fixes.

DR BANNISTER: The answer is, it depends. I would say from my experience of energy auditing that most sites have a 10 per cent saving available at practically no cost. Some of your one-star sites have substantial opportunities at sort of mid-range paybacks.

PROF WOODS: Mid-range being four years or - - -

DR BANNISTER: Mid-range, two to four years, yes. In the energy auditing profession you rarely get a brief to look at a building with payback periods of longer than four years. Thinking through the buildings that I've been through over the last while, I mean, yes, I've seen 50 per cent savings potential identified on a two to four-year payback, so that's available and in fact that's a figure that has been identified from other sources as well. There are exceptions to the rule. A building I worked in recently, the lighting system - which was its major problem - had been set up in such a way as to be almost completely impossible to retrofit and so there was just nothing we could do with it. It would take, I think, 15 per cent off the energy consumption of it, but it would need to be halved relative to a good design. That's probably the exception rather than the rule. If we walk into a one-star building, there

will be stuff you can do at a good payback.

PROF WOODS: And are they all accepted by the building owners? Do they say, "Oh, that's terrific. I will now do that"?

DR BANNISTER: That's another issue entirely.

PROF WOODS: Why? I mean, if the saving is there and if the payback is within four years, presumably it's going directly to the bottom line.

DR BANNISTER: Yes.

PROF WOODS: So why aren't they doing it?

DR BANNISTER: Well, this is the big question, I would say. There's an issue I think with the energy audit process, in that you have an expert who comes in and makes pronouncements on a building and that's not very easy to internalise for an organisation, so they come out of it going, "Oh, yeah, what does he know?" sort of thing. There is a skills gap there. I mean, I did some work looking at control savings. This is an interesting case study I think to bring to your attention. I went through about 20 buildings in Sydney looking at control savings. We estimated probably 15 to 20 per cent of savings through relatively simple control measures over quite a lot of those sites and I happen to know as a fact that none of them were implemented, although some of them are beginning to happen. They have been put into the "when we do our next upgrade" pile and "we'll get around to it".

PROF WOODS: I don't understand.

DR BANNISTER: Why wouldn't someone do it? Perceived risk I think is a big one. Because we have a poorly informed industry, they go back to their airconditioning control people who go, "Don't know about that," and nothing happens, or they might not even go that far and you get the sort of credulity issue that people just go, "I don't really believe it." Certainly I had one project where the response to a report where we had identified substantial savings was a 10-page response saying, "No, we can't do this because" and "No, we can't do this because". Probably 80 per cent of the reasons why were not valid and demonstrated a lack of understanding of the controls. That I think is an issue of failure to internalise.

I see that skills and skills transfer issues as actually being one of the most overriding issues, but also the risk is definitely an issue. I mean, we were involved in a reprogram of the controls at the Children's Hospital at Westmead recently. Now, that has occurred in the framework of an energy performance contract and it was very clear, talking to the hospital engineer, that the thing was acceptable because he could see the risk transfer and if it didn't work he knew who he could blame, and he

could shuffle it back onto the performance contractor and make his life hell; whereas I think there is a fear of spending the money putting in these things and nothing happening.

Somebody's characterisation of the public service to me once was, "Well, if we get something right, we don't get any credit. If we get it wrong, we get blamed forever." I think the same happens in the management of buildings. There is also just an enormous inertia to activity. We were involved with a portfolio recently where the chief executive officer commanded from above that there shall be a program of energy work and we're going to do something and middle management killed it by saying basically, "We can't be bothered." There's a lack of connection to the result.

Some of that in the commercial property sector is because of net leasing, where people are passing the energy costs on, but I've seen this happen in gross leasing situations, as well, where in spite of knowing that they're going to get the benefit, they don't do anything. Some of it I think is just because it's perceived to be trivial.

DR BYRON: What about sort of arbitrage possibilities where somebody hires someone like you and says, "Go and find us a one-star building that we can buy for X, do it up and sell it for 3X in 12 months' time," because they've got the confidence that you can remedy whatever was causing it to be one-star?

DR BANNISTER: Yes.

DR BYRON: And the confidence also that they will be able to sell a three-star building at a much higher price than a one-star building, for example.

DR BANNISTER: Yes. I don't think in that particular transaction that it's perceived as having that much market value yet. The nearest there is to that model is the energy performance contract model where your experts come in and they guarantee the savings. That's perceived as having value, but - - -

DR BYRON: But there are the same issues that you mentioned before about perceptions of risk and risk management and the contracts.

DR BANNISTER: Yes.

DR BYRON: We have spoken to a number of people about the energy performance contracting.

DR BANNISTER: Yes, they are real issues. I don't think it's a solution for all. It's certainly not a solution for everything out there. There is this fundamental question of, "Why do people not do things that make sense economically?" and the answer is,

"They don't."

PROF WOODS: It's just that we're trying to tease through some of this.

DR BANNISTER: Yes.

PROF WOODS: We have got information opportunities, we have got market pricing opportunities, and then there's regulation. There are some people presenting evidence to this inquiry that are saying, "Because people won't do what is good for them, we will mandate what they must do" - ie, you will drive their business through the lens of energy efficiency.

DR BANNISTER: Yes.

PROF WOODS: Maybe there is a role for that in some limited situations, like taking out of the marketplace the least efficient performing machinery so that market choice is limited to that rather than that.

DR BANNISTER: Yes.

PROF WOODS: But I would want to be confident that that is the most efficient and effective measure to achieve energy efficiency and that energy efficiency in itself warranted that sort of behaviour before I recommended that step.

DR BANNISTER: Yes. I think the experience we have had with ABGR is very relevant in this respect, in that there we specifically set out to create information that would inform the market. One of the issues before the creation of the greenhouse rating scheme was that people didn't actually know what an efficient building was. I mean, even energy consultants would sort of make bland claims about, "This is an efficient building," or, "This isn't an efficient building," with no real concept of what efficiency was or wasn't.

By creating an information tool, I believe that we've created a major transformation in the market, particularly in New South Wales - less so in the other states. It's just by providing the information and allowing that then to create the market value, which then creates the activity, and we're seeing activity arising from it. Personally I'm not a big fan of the economic incentive model, because if people are not doing things economically rationally now, bunging more money in their direction seems unlikely to change their behaviour a great deal.

PROF WOODS: It depends how easy it is to pluck the money off the tree.

DR BANNISTER: Yes. For instance, most of the governments at one stage or other have had a loan scheme and got the New South Wales GEEP and things like

that. I mean, there's the bureaucracy around getting the money. The uniform experience I have had is that they have problems getting the money out of the bank. I don't feel that money is actually the driving issue. It's something more fundamental.

PROF WOODS: Does that mean we rely on regulation? We actually start dictating how they will run their businesses?

DR BANNISTER: I feel there is a role for regulation, but I tend to agree that I think it's limited. Australia is in some areas becoming a dumping ground for low-grade equipment and that does bring, I think, economic costs. I am actually not a fan of trying to regulate at a high level with nothing else, because I don't believe that it can deliver high-level regulation of bits of equipment and things like that. We can cut out the worst, but we can't deliver the best.

Personally my feeling is that we need to be getting more - in the sectors where it's appropriate - market based signals out there that actually provide something recognisable that creates a potential for market value. The problem we have at the moment is that market value is determined purely on the financials and the financials are then looked at in the context of, "Yeah, I have a \$25 million building. It costs me \$50,000 a year to run." Right, well, that's really important then, isn't it? One of the overriding issues is, "I've got better things to do with my life."

PROF WOODS: If you made a 10 per cent saving, you're talking about \$5000.

DR BANNISTER: That's right, so it's not perceived by people as being important, because they have got other things which are much bigger. One has to find a way of creating value that makes people relate that to their core business values, but I tend to agree that you shouldn't hammer that down people's throats. It should be in a mechanism that allows the market to - I mean, we have an enormous amount of enthusiasm in the marketplace for green stuff and energy efficiency and all this sort of stuff, but very, very few mechanisms by which people can realise that.

If you are moving into a commercial building prior to what we had with ABGR, how would you tell it was efficient? The answer was, nobody knew. People just may say, "Well, this is an efficient building." "Why?" "Because I put some nice lights in it."

PROF WOODS: Can I just ask one clarificatory question?

DR BANNISTER: Yes.

PROF WOODS: You said that ABGR is one of two significant performance based rating tools internationally.

DR BANNISTER: Yes.

PROF WOODS: Does that mean that it is used somewhere else, as well, or just that it is only used in Australia?

DR BANNISTER: It's only used in Australia.

PROF WOODS: Why not Tasmania?

DR BANNISTER: Tassie really hasn't had the money to make it happen. It relies on state sponsorship to make it happen.

PROF WOODS: So this one and the one in the US are the only two that you are familiar with?

DR BANNISTER: Yes.

PROF WOODS: Okay.

DR BYRON: I used your submission to bounce some ideas off the Royal Australian Institute of Architects this morning when they were sitting where you are now, because they were I think arguing very strongly the case for design as the answer.

DR BANNISTER: Yes.

DR BYRON: We also have a submission from a Dr Terry Williamson of the School of Architecture in Adelaide making very, very similar points to you: the problems of ex ante computer simulation of what a building will do, as opposed to all the things that can go wrong. So the representatives of the RAIA agreed that, yes, there was a very large gap between ex ante and ex post performance, and then we got onto the same issue of the proliferation of ex ante rating schemes. Does each state seem to be wedded to its scheme - or each jurisdiction?

DR BANNISTER: The proliferation question is, I think, a political rather than a technical issue. Basically, in the commercial buildings sector we have two rating schemes - three, I suppose, if you count one which is not actually running currently. We have ABGR, which rates the performance of office buildings from a greenhouse perspective. We have Green Star, which is an environmental thing, it is entirely design based, and although it is looking at an existing buildings assessment, an existing buildings assessment will also be design based and not consider in situ performance, as far as the best information I've been able to determine has told me, and we have the National Australian Built Environment Rating Scheme by

Environment and Heritage, which I declare my involvement in, which is performance based and only deals with performance issues.

I would make the point that basically ABGR and NABERS sit, as far as I am concerned, in the field of being demand-side tools. That is to say, they are there and their primary stakeholders are people who use buildings, whereas Green Star is a tool primarily designed by people who design and develop buildings and very, very much set up to provide a tick-off, a check list, of things to do. As the head of the Green Building Council put it, it's important to him as a designer to have a set of boxes to tick because performance, as far as he is concerned, gives him professional indemnity risks and to some extent the purpose of Green Star was to shield designers from professional indemnity risks.

As somebody who is very committed to delivering performance in buildings, I have a fairly dim view of that personally, but as I say I actually think design tools have a very useful information role in the marketplace and there is nothing quite like going through something like Green Star and going, "I'll have one of those and one of those and one of those and one of those," and it's actually quite handy. But it doesn't necessarily deliver performance. So the use of the term "proliferation" is being driven by certain people with an interest in there being only one tool.

The problem is, if there is only one tool it will either be a supply-side tool or a demand-side tool and you can bet your bottom dollar that the supply side of the market would like to control all of the tools and therefore, by default, have control of the definition of what a green building is.

DR BYRON: Yes. That's what we are finding out about the definition. That has been very, very helpful. Have you got any more questions, Mike? I think in view of the time we are going to have to let you get back to work. It has been very, very interesting.

DR BANNISTER: Thanks. Well, any further questions, just let me know.

DR BYRON: Yes. Thank you very much.

DR BANNISTER: Thanks for your time.

DR BYRON: Next on the program is OceanResearch Pty Ltd. When you are ready if you can just introduce yourself, and affiliations, and then when you are ready give us the highlights of your submission. We have read the documents that you have sent in already.

DR ROWDEN-RICH: I am Murray Rowden-Rich. I was a civil engineer up until about 15 years ago then I, for some reason, got involved in the glaciology program at Melbourne University and I've been involved in that primarily since. I have some connection with ANU doing a linkage grant proposal with them for the glaciology project that I'm working on. The reason why I wanted to register a submission was that I'm in receipt of a lot of information on climate change. As an extension of my glaciology research, it became fairly popular about 12 years ago, this question of during the Ice Age there being catastrophic collapses of the ice sheets periodically, about every seven or eight thousand years, and these had huge swings on the climate. They generated changes as much as 10 degrees Celsius in a decade and my particular research project is related to working out the mechanism for that process. But anyway, that's just by way of introduction.

The reason why I thought I would make a submission is that I'm very well aware of the climate change issues and that there is a lot of confusion in the public and with people in the government and bureaucracy, and there are many points of view on the climate change. It seems to be that the observations at least are pointing towards a very significant downturn in world temperatures. I can table papers by Landscheidt and there is another paper here by Wojick and another two papers by Kininmonth. I can table them. I have other copies.

What seems to be happening is, because of cycles in the geomagnetic outpourings from the solar system, these seem to correlate with rapid swings in temperature and the little ice ages. This particular paper by Landscheidt I understand was discussed at the Academy of Science meeting, I think it was last Friday. The government have actually asked the Academy of Science to review this topic for them and to give them a report, and there seems to be a downturn which will probably come to a low point in the climate cycle around about the year 2030. This means that there will be a lot of pressures on the issue of energy efficiency because we will actually be using a lot more energy.

Because the world is getting a lot colder, there will be more energy used, so there will be more demand on the economic driver to reduce the cost of that, which means more energy efficiency. There will also be economic forces trying to reduce certain parts of the economy which use a lot of energy. Now, as a side issue of the climate change phenomenon, if there is a downturn in temperatures by the year 2030, this means there will be pressure on water resources, both rural water resources and urban resources, and it would make a lot of sense to actually use the water that is locked up in the Antarctic for supplies in Australia.

I did a lot of work with Melbourne University, about 1985 up to about 1990, and using conventional vessels like tugs fuelled by crude oil, et cetera - using liquid fuels - there is a logistics problem as to the keeping up of the supply of fuel to those vessels. This could be overcome by using a nuclear ice-breaking class polar vessel, which would tow the icebergs into the current and then they would be set adrift and picked up by smaller vessels operating out of Adelaide and Perth. They are the two main cities which are short of water supplies. I've done a lot of work on the economics of that. It would appear that the cost of supplying water by that means would be the same cost as reverse osmosis by desalination, which is around about \$1 or \$2 a tonne.

Because desalination uses a lot of energy, it might be politically appropriate to shift the use of that energy; in other words, not use fuel supplies - conventional coal-fired power station supplies - to supply that energy. It could be shipped offshore essentially by using nuclear vessels. So the energy would be supplied, rather than domestically in Australia, by vessels using nuclear power. I haven't really fleshed that out in a lot of depth there, but I have kind of introduced that topic.

PROF WOODS: Thank you very much.

DR ROWDEN-RICH: I've got more copies of my submission here. There are papers there that I wanted to table.

DR BYRON: As you are aware, this inquiry isn't into the science of climate change, although there are a few people who have suggested there could be such an inquiry done by somebody else; nor is it a question about the pros and cons of Australia ratifying the Kyoto Convention. I think the scientific issues that you have put on the table are probably relevant background to our consideration of what are the economic and environmental benefits of pursuing greater energy efficiency at the moment. The sort of research that you were talking about there - the scientific publications - does this have implications for what we do about energy policy at the moment?

DR ROWDEN-RICH: Yes. I think it's an important issue. It's going to be an important issue in the economy in Australia in the next 30 to 50 years. Science has something to offer to this debate and what science has to offer is the information that we're going into a cold cycle. The Academy of Sciences had a meeting about this, as I understand, last week.

DR BYRON: This seems to be totally at odds with what is the sort of conventional wisdom of global warming, et cetera.

DR ROWDEN-RICH: Yes, sir, and that's why I wanted to make a submission, because basically I'm a scientist and I'm quite familiar with all the issues involved in

that - and I have been for the last 10 or 15 years - and there's basically a vast amount of nonsense talked about global warming. While it's important to have energy efficiency, it's important to do it for the right reasons. I feel it would be a great detriment to the country if the Australian government went on a wild-goose chase about some phenomenon which is actually very small, and there are other phenomenon going on in the climate which are actually much more significant and actually have a much bigger bearing on the economy.

DR BYRON: I guess the difference is that the sort of climate change that you're talking about is a natural phenomenon of the kind that's happened for the last four and a half billion years, and the sort that the environmentalists are talking about is human-induced. I think they realise that the climate isn't static and never has been, but I guess the argument about how much of it is anthropogenic or because of human actions - but, yes, I guess you're not the first person to put a sort of flashing red light up about it. The science is by no means cut and dried.

DR ROWDEN-RICH: Yes, that's right.

PROF WOODS: You made the point though, that energy efficiency as a separate issue may or may not be worth pursuing. I wasn't quite sure what line of argument you were taking on energy efficiency as such, putting aside the question of climate change.

DR ROWDEN-RICH: Yes.

PROF WOODS: But energy efficiency in its own right: do you perceive that to be a useful thing to be pursued as a policy?

DR ROWDEN-RICH: Yes, certainly. It's what has been happening to industrialised economies for the last several hundred years. People are becoming more and more adept at using energy more efficiently and that's been driving the economy. This big agglomeration of people in cities has basically been driven by the availability of cheap energy, so the technology keeps changing the civilisation. There's obviously demand, forcing greater energy efficiency, because basic economics dictates that if you can do it for less, they're going to be better off; everything is going to be better off.

DR BYRON: Thank you very much for coming. At this point I normally ask if there's anybody in the audience who wants to come forward, but I don't see any takers at the moment, so we'll declare the hearing adjourned to Melbourne in two days. Thank you.

AT 2.58 PM THE INQUIRY WAS ADJOURNED UNTIL
WEDNESDAY, 24 NOVEMBER 2004

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