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**HOUSE OF
REPRESENTATIVES**

STANDING COMMITTEE ON ENVIRONMENT AND HERITAGE

Reference: Sustainability charter

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HOUSE OF REPRESENTATIVES
STANDING COMMITTEE ON ENVIRONMENT AND HERITAGE

Friday, 13 April 2007

Members: Dr Washer (*Chair*), Ms George (*Deputy Chair*), Mr Broadbent, Mr Entsch, Ms Hoare, Mr Jenkins, Mr Kerr, Mr McArthur, Mr Ticehurst and Mr Wood

Members in attendance: Ms Hoare, Mr Jenkins, Mr Ticehurst and Dr Washer

Terms of reference for the inquiry:

To inquire into and report on:

Key elements of a sustainability charter and identify the most important and achievable targets, particularly in relation to:

1. The built environment;
2. Water;
3. Energy;
4. Transport; and,
5. Ecological footprint.

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Committee met at 9.11 am

CHAIR (Dr Washer)—I declare open this public hearing of the House of Representatives Standing Committee on Environment and Heritage inquiry into a sustainability charter. This is the third public hearing of this inquiry. It follows the committee's inspection yesterday of the Woolnorth Wind Farm and the Lake Margaret Power Station. I would like to place on record the committee's thanks to the representatives from Hydro Tasmania and Roaring 40s who made themselves available to meet the committee yesterday and who assisted with our tour of their sites. Today the committee will hear from various submitters from this region.

[9.12 am]

HARRISON, Mr Aubrey John Weston, Chairman, Association for the Advancement of Sustainable Materials in Construction

CHAIR—Welcome. Is there anything you would like to add about your background and the capacity in which you appear today?

Mr Harrison—I am a scientist and an economist. I am the inventor of eco-cement and I am also the Managing Director of TecEco. I am in partnership with Professor Cuff on what we call ‘Gaia engineering’, which is basically a very simple and cheap solution to the whole problem of global warming—

CHAIR—Sorry; before you start: although the committee does not require you to give evidence under oath, I should advise you that these hearings are formal proceedings of the parliament. Consequently they warrant the same respect as proceedings of the House itself. It is customary to remind witnesses that giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. Would you like to make any opening remarks?

Mr Harrison—Yes. I believe we have 40 minutes, and I would like to spend a lot of that in discussion, in that I am fairly knowledgeable in scientific and economic areas, and I have been a pioneer in materials science for some time, and also earth systems science.

There are really two aspects to this whole sustainability debate: the cultural side and the technological side. The last year has seen an amazing, an enormous cultural change. One questions to what extent sustainability is actually becoming a sort of a religion. If you look back in history at how religion evolved, it usually started when agriculture started. People who were more knowledgeable than other people were able to predict when the rains would come, when to sow the seed and so on. These people eventually became the religious leaders of the community. Generally, throughout history, politics and religion have been separated, and that is one of the issues that we have to face here in this inquiry into a sustainability charter.

Right now, the grassroots are changing very quickly. Some people who worship people—Mohammed, Buddha, JC or whoever—are very frightened about that, because they see people drifting away from the church and moving into this new religion called sustainability. But it is where our roots are, because right back in the beginning people would look at the stars and say, ‘How did they get there?’ They became the wise men and eventually they became the leaders. Without getting into religion too deeply so I have my head shot off, it is a natural process where people are realising that it is this planet that sustains them, that it is the health of this planet that is their health and that we had better get our act into gear. It has roots that are very ancient.

I will talk very quickly about the technological side, because I see sustainability as being a direction where culture and technology meet. You could consider culture as being the deviser or creator of the demand curve and technology being the provider of the supply curve for sustainable technologies. One of the problems with having it driven by politics, as it is at the moment, is that politicians tend to grasp onto the first bit of hopeful science. Then you have all

these lobby groups that push that. The next thing you know, some pretty weird stuff is being promoted as being the solution and the way forward. A lot of it is driven by economics. There are a couple of very good references I will give for that. A movie worth watching is *The Death of the Electric Car*. If you remember, in the late 1990s, EV1 was out and there were a lot of electric cars around. The petroleum industry got wind of this and absolutely hammered the GM board. They pulled EV1 off the market. The next thing we knew, electric cars were out.

The long-term future is in the experiments going on in France. This country is not a supporter of those, but the major six are. These experiments are to do with fusion power. We should get into that. There is a \$13 billion experiment going on. If that is successful and we can get fusion power then we will have abundant nuclear power. At the moment, we are all talking about good old fission reactors, which have all their associated problems.

Technology is the other driver—the supply curve of the whole thing. Where I am at, I preach the importance of materials because underneath that huge materials flow on the planet—some 500 million or 600 million tonnes—is the flow of molecules. I call them ‘moleconomic flows’. When you get to pea soup chemistry—a bit like the chemistry going on in that coffee cup—it is not so much the thermodynamics and the kinetics that drive it; it is actually the supply and demand of molecules as well. You have to envision what is going on with this molecular flow underneath the materials flow in terms of economics as well as chemistry. It is that molecular flow that is damaging.

We are very unnatural, in that in most of nature there is a balance with carbon. Trees build their homes with carbon; shellfish build their homes with carbon. The fossil record indicates seven per cent of the crust is limestone. This represents about four billion years of sequestration. By far the majority of all carbon has been put away in that manner—not as coal, not as petroleum but as fossil limestone, dolomite, magnesite and so on. It should be understood that the biggest proportion of this huge materials flow of about 500 million or 600 million tonnes is in the built environment. That is where we can make a lot of difference.

Materials start to become very important—and this is AASMIC’s view—because you can have flows that have less damaging take impacts and less damaging waste impacts. I call that the techno process: this process of taking resources, manipulating the molecules, making things and then wasting them; throwing them away. We are learning that there is no such place as ‘away’ and that these things eventually disintegrate and get into the global commons. That is either as CO₂, heavy metals or some other impact.

What we have got to do is not just reuse, recycle and rebuild but also try to change the materials flows so that the underlying molecular flows are not damaging. That you can either do by balancing flows—if you are producing carbon you have to have a lot of things going on that sequester carbon—or you can just change the materials so they do not incorporate damaging elements; for example, you can slowly start to exclude heavy metals out of plumbing.

That kind of change can happen. We have proved it, for example, with the ozone hole. Back in the late seventies a couple of US scientists said: ‘Hey, guys, we’ve got a problem. There is this hole and we’ve done our theoretical work and we think that this is going to be a problem, because a lot of infrared radiation is going to come to the earth.’ I think it was the Montreal protocol where a number of countries got together and it snowballed and we have solved the

problem. The hole is closing. That same model worked with sulphur dioxide in the States. In fact, we noticed global warming going up when sulphur dioxide started going down when they put a price on it. Sulphur dioxide is a global cooling gas; it is not warming gas. As Tim Flannery said, we have got to the point now where we are the technology providers. The culture is rapidly changed, saying: 'Hey, guys, we want some leadership here. There are problems. We can see them.' I live on the water and I know that the levels of the highest tides are rising.

What can be done? There are a couple of models that have demonstrated that things can be done. But back to the problem. This inquiry is about whether we should leave it up to our statesmen to give the direction or whether we should try to get together a sensible charter. Those who would be arguing for, which I think on balance is myself, would be saying, 'Look, if money was controlled by politics, what would happen every time we had an election?'

Let us look at the mechanisms that can deal with these sustainability issues. Again, the thinking in regard to dealing with them goes back to Plato and Aristotle. I think Aristotle said something to the effect that 'That which is common is of least value, because it is not owned'. It went back to the *Epic of Gilgamesh*. He was one of the Sumerian kings way back. They were one of the earliest civilisations, by the way. It was their own lack of sustainable practices that led to the downfall of that 4,000-year-old civilisation. First off forestry, followed by agriculture, followed by irrigation, followed by salinity, followed by downfall. We do not seem to have learned from these lessons. We still use and reuse and reuse the same water and are pumping salts into our soils and killing them. We are starting to understand that in Australia.

There is this problem of 'externalities'—let us call them that, because that is the term an economist would put on them. Some of the thinking has been that the marketplace can handle that—'Let's put a price on carbon, let's put a price on sulphur dioxide and the market will handle it.' But unfortunately markets are not perfect, as Adam Smith pointed out when he first came up with the idea. They are not perfect and we are discovering more and more that they are not perfect. There is a quote in this book, for example. By the way, I would recommend it as a jolly good source book. It is terribly difficult reading, though. You have to read it about four times over, I think.

Mr TICEHURST—That is a job for the chairman!

Mr Harrison—It is the sort of book where there is just so much detail that you start to miss the trees. But it is a resource book of stuff for governments. There is a quote in there from the World Bank pointing out that, 'Look, we have come to the view that globalism is jolly good, but it needs to be cherry-picked and we need to understand that some of our issues are not here and now easily dealt with in the marketplace; they are of the future.' You spew out CO₂ today and it is in the atmosphere for 100 years to 50 years—that is the half-life; we are not quite sure whether it is 50 or 100, but in that order. So the problem is one that is not dealt with in the marketplace. You manage to get from A to B in your motor vehicle and you buy the petrol and you get the function out of it. But that transaction in the real, here and now marketplace does not deal with the externalities. They are ex-market. If you look at some of the definitions of externalities—I think I gave one in my presentation there—that is the problem.

First of all, we have to understand that the grassroots are starting to seriously look for solutions. Coming up on 7 July we have the 'Save the earth' concert—Al Gore has been doing a

great job—and you cannot turn on 74.7 without hearing something about the environmental debate. There has been the CSIRO report commissioned by the New South Wales government and of course there are a couple of inquiries going on into carbon trading at the moment at both the state level and the federal level, and so on.

I would be very interested in how this inquiry came about because I guess you are vexing with the same issue: do we leave it to our statesmen or are statesmen people who are going to enshrine the values in some sort of charter so that it can move on? Under TecEco's name, we have just put in a submission to the inquiry into carbon trading at federal and state level. I think I did the state level one under AASMIC and the other one under TecEco. Carbon trading is just the tip of the iceberg. When you get to know about these things you realise that everything is connected. Carbon trading is just one of the issues. For example, if you promote more sustainable buildings that have lower lifetime energies and lower embodied energies and emissions in their materials and so on then it has lots of other impacts other than just reducing the total emissions over that building's lifetime—the LCA of that building.

In summary, and I have put a lot of thought into it, I feel that I do not trust politicians because they work on three-year cycles, and we are dealing with an externality. It is very easy for a parliamentarian who lives in a particular electorate and wants some big project, like some in Tasmania who want to build a pulp mill. That project may be very important in that electorate, but if you then multiply that by the number of parliamentarians you have, I just cannot see it working within the political system. Everybody should stand back a little and realise that this is a global problem, that we all have to play the global game—this country included. I go along with Sir Nicholas Stern on this. I am quite happy to send a copy of his presentation to the Press Club to anyone who wants it. I got a copy on the way from the Press Club. It cost me a lot of money, but they said I could give it away. It would be fine to give it away because there would be no copyright problems. If I charged anyone for what it cost me that would be a different issue.

Carbon trading is just the edge of the whole sustainability debate. To really make it work effectively, it has to pick up on where the culture is moving in the country and around the world. It is not just about carbon; it is about learning from nature, trying to live with nature and understanding her ways and mimicking them, if you like, and adopting them. For example, I refer to my own particular efforts at Gaia engineering—Professor Cuff's company. He used to be dean of science at James Cook University. He has discovered how to get abundant magnesium from sea water and I have invented eco-cement. It is just very simple. The solution to global warming is to use carbon. If you look at a tree long enough, it will actually tell you exactly the same thing. Go stand on the seashore at Clifton Beach—which is where I might suggest you should have gone for your expedition yesterday; I would have loved to have taken you there—and look out to sea, and realise that there is 1.29 grams of magnesium in every litre of sea water. On your right you would find magnificent limestone cliffs that were probably put their during the late Permian—which, from memory, would make them about 450 million years old—and underneath you everywhere would be seashells and behind you trees.

This is the message: the cation is in the water to capture magnesium. There is billions of years worth in water at our current needs of sequestration. And guess what? There is a lot of water on this planet. It is 70 per cent of the surface of the planet, for a start. I do not have the exact number in my head, but I assure you it is a googol. It is a big number. So there are very simple ways of solving the problem; I just do not trust the political system to get there because you have

all these lobbies, like the petroleum lobby pushing hydrogen. That is why the electric car died in the late 1990s.

Why hydrogen? Because you can crack your oil to get hydrogen and then you have this massive problem of what you do with the CO₂. We are back to doing what we were doing 50 years ago during the Cold War—investigating the crust: ‘Let’s pump it down there.’ During the Cold War we were looking at putting our natural gas into natural storage somewhere near our cities and using it—Professor Cuff was involved in that and I know a little about it because I am a geologist and I am nearly 60—but it did not happen because we figured that the earth was far too much of a cracked earthenware pot: it might last for 50 years or 100 years but there was no one who could guarantee it for much longer than that because the earth is constantly moving. We Tasmanians are saying goodbye to the mainland at about 1.5 to two centimetres per year. This slowly builds strains and stresses and eventually things crack and resettle. This will happen. So the gas argument is nonsense, but this is all politically driven by the oil industry. You have the CO₂CRC essentially funded by the oil industry. The leader of it, Dr Cook—I know him—is also head of the oil CRC.

Do we need a charter? On balance, yes. But the problems are having the statesmen to properly frame that charter without too many political overtones and then working out what the framework for that charter is and what the powers are. I think it should be a lot more broadly based than just carbon and I think the power has to be substantive.

One of the areas in which Australia could actually make a lot of money, and which should be enshrined in the charter, is a job we do terribly badly. It was a question asked of Nicholas Stern by one of the press: why does this country have such a shocking record on bringing forward technology that seems to evolve here? I think the answer is that government do a moderately reasonable job of supporting R&D, and the 72B clawback has been extremely useful to this company, but not when it gets to actually using their purchase power in the marketplace to bring in new technologies that can move the dynamic forward; for example, neon bulbs compared to the old incandescents—five times the energy saving, gentlemen.

There are a lot of leapfrog steps we could take in technology that could help solve the problem but the system does not allow it because all the current players in this imperfect marketplace have that wonderful advantage of economies of scale. Our roads and petrol stations and everything else are designed for the gasoline car. What frightened the hell out of fuel companies when EV1 came along from General Motors was the thought: ‘Hell, we are not going to be able to control the energy going into these vehicles anymore.’ That is why the car, along with Honda’s and everybody else’s, is not on the road anymore.

So we have the problem of the externalities. It is a long-term issue that is not dealt with in the marketplace. It should not be political because of this problem of every member wanting to deal with his own backyard or otherwise he does not get in. The political system is too imperfect to handle the problem of externalities, given that they are a long-term issue and not something that voters can see tomorrow so readily—although that is changing. So I think the charter is the way to go but I do not envy your job as to how to frame the damn thing. I think that is going to be very difficult and I would like to get into discussion about that. Maybe I can contribute, maybe not.

CHAIR—Thank you. I might start that off. What we hope, as you know, is to get a commission and a commissioner which will outlast our three-year terms and do it at arms-length to us regardless of what government prevails in Canberra. That is the aim, and the charter really is something for them to build on.

Mr Harrison—To try and start the ball rolling and then go back to parliament from time to time for more power or change?

CHAIR—Absolutely. That is what we are looking at.

Mr Harrison—A think tank?

CHAIR—Yes. Could I ask specifically about two things you mentioned? One is your eco-cement—and I saw a little diagram in your submission about absorbing carbon.

Mr Harrison—Yes. It is pretty simple actually.

CHAIR—Could you tell us a little more about that? You also mentioned magnesium and water with the implication that they had some carbon capturing capability.

Mr Harrison—Yes, I will explain that in great detail because it will also solve the salinity problem of this country, which is a major issue.

CHAIR—If you could explain both those things I would be grateful.

Mr Harrison—Could I ask what your science background is?

CHAIR—I am a medical doctor but I understand chemistry.

Mr Harrison—And the rest of you are interested enough in science?

CHAIR—Yes.

Mr Harrison—I will try and keep it as non-technical as possible.

Mr TICEHURST—My background is electrical engineering.

Mr Harrison—Then you will follow it, to an extent. This is actually all about electronics.

CHAIR—Kelly is a fabulous cook, so—

Mr Harrison—You will understand the pea soup chemistry side of it, then.

Ms HOARE—Use the KISS principle, please.

Mr Harrison—We will start with where the magnesium comes from, because that is where it has all got to begin. First of all, magnesium is the eighth most abundant element in the crust, just

after calcium. It is in sea water, or brine; I am talking about underground brine. It is a resource every country can get to, in sea water or brine. So it is something the everybody can do, which excites me. Because all of a sudden you have got a level playing field in relation to the resource. Water is one of the most marvellous substances there are. If I put my finger into the ocean just down here, I would be connected electronically to the water lapping on the United States. If only George Bush would stick his finger in the water at the same time, we might be able to get through to each other.

So water has this amazing structure. It is polar; it has an oxygen end and two hydrogens. It just happens that the two hydrogens are rather strongly positively charged and the oxygen end of the water is very negatively charged. Water is connected; every water molecule connects to four other water molecules. This is where all the scientists have got it wrong, and I am talking about Dillman, Lipman and the whole bunch of them who have written about this. Hundreds of people have broken their backs on why you cannot precipitate dolomite, for example, in the lab. You cannot do it. What they did not understand was this: they thought it was surface chemistry. You see, when a crystal forms, it is its own catalyst. It says, 'Come here, magnesium, I have got just the electronic slot for you,' or, 'Come here, carbonate, I have got just the electronic hole for you.' So these ions pop into the surface, because the very surface is attracting them. That is how crystallisation occurs. But that was not the problem; the problem was water.

Because water is so strongly polar, it hangs on to ions that are in it. Of all that water on the planet, only about 1½ or maybe two per cent is pure, fresh and drinkable; the rest is all polluted or full of salts, which are soluble ions. The main ions in water are magnesium, calcium, chloride, sodium, sulfate and carbonate. The minor ones are bromide, potassium and so on.

Where the secret lay is in the question: how do you make water release the ions that are in it? That way you could purify water very simply. The way they do it with reverse osmosis is using this good old thing called energy. You get a very fine molecular membrane and you shove water through it. The membrane is just the right size that the water pops through and those ions stay behind because they are too big. But what you have got to overcome is the attraction, the electrostatic; it is actually called Van der Waal's force. It is a polar bonding thing. There is a Van der Waal's force between the positive and negative areas on water and the respective charge on the respective ions. For example, magnesium with a double positive charge is a small ion with a big charge, and it is hanging on to the oxygen very solidly. So you have to use energy to push the water through the membrane and leave the magnesium behind. That is how reverse osmosis works. Everybody says: 'Ah, wonderful. We can make fresh water with this stuff.' But we are consuming a bucketload of energy to do it.

It is actually very simple. The trick to make fresh water and at the same time solve global warming is to depolarise water. Think of that water molecule: now, if you tack a proton onto it, which is the H-plus, it becomes something else. When scientists say 'H-plus', when they are referring to acids, they are actually talking about H₃O-plus. It is positively charged, but it is non-polar. It has a uniform positive charge density, a hydrogen sticking off equilaterally in three directions. So if you depolarise water with strong water acid and then bubble CO₂ through it, all the ions precipitate out of it. The extra proton comes out of the sodium bicarbonate, and you are left with substantially pure water. So what do I get? I get buckets of carbonate.

It just happens that all those carbonates are a lot more valuable than just letting salty water dry as they do to make table salt and so on. For example, sodium bicarbonate is a very useful input mineral for making sodium hydroxide, so valuable commodity minerals are by-products. This is Australian technology. It is very new, it is only just patented. Hopefully, that is reasonably confidential for about another two weeks and then there will be a public document on the patent.

What happens next? You need only pumps. You do not need that energy to push it through a membrane to overcome the polar-bonding energy. And, by the way, the polar-bonding strength of water—the hydrogen-oxygen bond—is quite high and magnesium oxygen is about the fourth strongest polar bond out there. They are not as strong as ionic bonds or covalent bonds, but they are strong bonds. All of a sudden, you can precipitate massive carbonates. We are saying that you have to build with those precipitated carbonates. There is nothing wrong with building with magnesium carbonate. I have proved that. I then have two other technologies that all fit together in what are called this Gaia Engineering technology. We call it a tecology because it is an ecological pump. It is not just industrial ecology. We have a tec-kiln. How does that work? It is very easy to break down magnesium carbonates to make magnesium oxide, which you need for cement. You will not do it with all that carbonate that has been precipitated out of sea water; you will actually crunch up lumps of it and make bricks and the link panels and cast them in these shapes. Those are the building components, but you still need the glue to glue it together and that is what cement is.

Our kiln technology is unique in that it can occur in a closed system so we cannot release the CO_2 ; we can feed it back into that process to get the carbonate from sea water. We can use solar energy to do it. Why? Because it just happens that the thermodynamics of breaking down magnesium carbonate, decarboxylating it, can occur at—the equilibrium temperature is 520—a very low temperature. The other trick we undertake is what is called calcining. We calcine and grind in the same vessel, so we can capture the CO_2 . But let me point out that, when grinding, virtually 100 per cent of that energy ends up as heat. Some of that energy will cleave the mineral but, when you cleave a mineral the ionic energy—which is called lattice energy—holding that mineral together is released as heat. So all the energy of grinding ends up being heat.

If you go along to a cement plant or a lime plant, or any other industrial places, around one-third of the energy is in the grinding rooms. We consider that it is nonsense to be applying heat to calcine limestone to make lime, because in the grinding room you are cooling the minerals as they are getting overhot. So we do it together in the same process which, straight off, makes that 30 or 40 per cent more efficient. We end up with a cement. We have a whole range of them. We theorise that Portland cement was an imperfect material. We strongly believe in mineral binders, and many companies also do, because for sustainability purposes there is a big movement away from unnatural binders. What is called 'sick building syndrome' is one example: 10 years ago in a new building you could smell the vinyls and the polyurethanes and all these other unnatural binders. That led to some illness, some feeling of unwellness and so on. So people are realising that and saying, 'Let's stick to the natural chemicals,' and they are coming up with all sorts of binder systems.

Mineral binders fall into that safe binders slot, and magnesium happens to be a very good one for a number of reasons. Firstly, it is a little atom, so you can attach a lot of CO_2 to it. Secondly, the minerals that form like nesquehonite are, essentially, almost 80 per cent of CO_2 and water makes up the molecules. You get a lot of bangs for not so much buck in magnesium. So I

invented eco-cement about four or five years ago. Fred Pearce of the *New Scientist* magazine said it all in one phrase. He said, 'Think of it: cities absorbing more CO₂ than the Amazon forest!' So you can get your magnesium atom from sea water, you can make massive amounts of carbonate and, by the way, the current global flux, as of about a year ago, was about 12 billion tonnes of CO₂. That was the excess annual CO₂ in the atmosphere.

I have calculated that out: you need 22 billion tonnes of magnesite to use all the CO₂ we are producing from jet engines, cars, power plants and so on. But when you consider the amount of 22 billion tonnes to the flows—which is why I started off with flows at the beginning of this talk—in the built environment, it is actually a number that is in the same order of magnitude. My suggestion, my preaching, that the solution is in using CO₂ is actually quite doable because you produce a similar solid material. I assure you, humans, rats, mice and cockroaches and the rest of the entourage that live in buildings are not going to notice the difference. It is a profitable process—very unfunded, I might say; I fund it myself and I have to work very hard to do so too.

As I said, the volume is in the same order of magnitude. Consider concrete for a moment. We make about 16 to 17 billion tonnes of this stuff every year. That is a huge amount. I am talking here about seven cubic kilometres. It is by far the biggest flow on the planet, which is why I started in that area. All it is, is the shift from silicate to carbonate—as long as you get the carbonate from seawater. That is an indefinite supply because the half-life of magnesium is about 60 million years—we think—on the rock cycle. With replenishment you could consider that resource as continuing. In any case, we are looking for a 50-year fix for the CO₂ problem because, hopefully, in about 50 years time we will have mastered fusion, and there is a lot of heavy hydrogen and water so we can get all the energy we want for nothing. In the meantime, we have to get very clever about using the energy from the big nuke up in the sky. So that is how the flows work.

And there are the cements. I have proved eco-cements. I should have brought a sample with me but I can certainly send somebody a brick if they want one. Basically, you bind together aggregates with carbonate—which is man-made carbonate—and you can use them for the goo that binds together the lumps of carbonate we produce from seawater, the mortars that put together the bricks, the renders that cover them over to make them look pretty and so on. Imagine a carbonate world where it is all starting from seawater and moving through to building. It is profitable because even the biggest by-product, fresh water, is something we desperate need in this country and all over the world.

One-third of the world right now is stressed for water. I assure you, with global warming, this is going to get a lot worse. My people have done studies on it and I could send you some slides. The major rivers of the world come from the Himalayas and when you think about where the rice bowls and major populations are on this planet you will see that they are very used to a system where you get the monsoonal rain and annual river flow to flood your rice fields. When that starts changing dramatically, as it is already starting to do, the estimate that I have referred to in there is that about two-thirds of the world is going to be stressed with water by 2025.

Look at all the global problems—water, energy, the CO₂ problem, sickness and health, wars and the various cultural problems we have; we can start fixing some of those. I cannot do anything about the religious problems—the Muslims or whatever—but I assure you, if we can start fixing some of the other damn problems then there is a really big flow-on effect, which is

why you have to take this holistic view and have a charter where people can sit down sanely and think free of politics, and move the agenda forward. There is this interconnectivity of all the problems. I pointed out that we can solve the CO₂ and the water problems by very simply using the magnesium iron, and to some extent the calcium iron, in seawater or brines to build the environment, and as a by-product produce fresh water. That would do a lot but there are so many other scientific areas that are not being applied.

CHAIR—I will stop you, if I may, for a second, because we are going to run out of time. Would you mind taking just three short questions?

Mr Harrison—I would like the opportunity for three minutes on porous pavement, if I could.

CHAIR—All right. We will give you that, but committee members might like to ask questions.

Mr JENKINS—First of all, a comment: after nearly 20 years on this committee I would say that you should not be as cynical as you are about the political processes, because the committee process is very much a counterbalance to that phenomenon that you have talked about: individual constituency members only fighting for their constituency. I think that there is a realisation that the problems that confront us now are of such great magnitude that we have to take that longer term view. As the chair said, where this committee is at the moment is that this is an inquiry that grew out of our sustainable cities inquiry, which very much took a holistic approach—something that was given to the House of Representatives environment committee became not just an inquiry about ecological footprint. I was just flicking through here, and the last time I actually attended something—which does not mean it was the last time the committee did something—we had a whole host of health experts in to give input into what a charter should mean. So I think that the need for longer term thinking is well understood, and we are looking for mechanisms that would take it at arm's length to a political process. You have cottoned on to the realisation that it would have to come back to parliament to be ongoing, in a check and balance.

Mr Harrison—I think you have got to continuously empower it.

Mr JENKINS—Can I ask about your invention, eco-cement. I think you may have done an informal briefing to the committee a few years ago.

Mr Harrison—I cannot remember: were you there?

Mr JENKINS—Yes; it went, I think, through Duncan.

Mr Harrison—Duncan Kerr; correct.

Mr JENKINS—It would be interesting if you would expand on the impediments you faced in trying to grow that product. I think that it probably is the need for cultural change.

Mr Harrison—And it has changed so much in six months or even since that.

Mr JENKINS—But that is what I am saying to you: we have found, since the start of the inquiry until now, that so many things have changed that there is a great deal of hope.

Mr Harrison—I have noticed it. For example, we have a website and the hit rate has now gone exponential. Just recently we climbed through 100,000 a month. So our graph of the hit rate on our website—

Mr JENKINS—But how do you get to the decision makers for your product?

Mr Harrison—We took the view initially that we needed to try and get the scientific world on our side, and we have done a reasonable job of that. I have a huge scientific network and most people follow it. Occasionally, we have had some big money spent to try and discredit us—that has occurred in the UK—because I think two years ago companies were seeing new technologies like ours as a threat. That is changing now, though. I spoke to the AP6 committee about our cement, which is to do with the concrete side of it. I thought I would be looked at as a maverick in the concrete industry and almost thrown out of the room, but they were all going, ‘Yes, mmm, that’s not such a bad idea.’ I thought, ‘Jolly good; things are changing rapidly.’ And they are.

Our biggest impediment is trying to get into the marketplace, because we do not have an economy of scale at all. And when you are looking at cement, you are looking at a material of which 2.1 billion tonnes are made. Yet only 1.5 million or 1.6 million tonnes of reactive magnesium are made, which is what we need for our cements.

The interest is huge. I have just been invited to speak at the master builders conference. A couple of weeks ago, I spoke at a thing run by DIER, the Tasmanian Department of Infrastructure, Energy and Resources—the construction wing of the Tasmanian government. That is wonderful. They have all got files on us! But where are their dollars being spent on us?

The biggest thing that government could be doing is following through their support of research and development, particularly in the built environment area, with real purchasing power in the marketplace. I am working with Materials Australia; I am very close with them. They are another major organisation. I do not think that they have a submission in to this inquiry. Through me, they are going to be starting to put submissions in. This is not followed through by support in the marketplace—purchasing policy. Government is 25 to 35 per cent of the economy—you tell me. It has a tremendous power to move the agenda forward. There is some wonderful technology coming out in Australia that can help with that supply curve for sustainability, but it goes overseas. I have been asked overseas. I have even been asked to go to Victoria because the activity in Victoria is so much stronger than here.

CHAIR—That is overseas?

Mr Harrison—That is overseas for us Tasmanians. Purchasing power.

CHAIR—I agree.

Mr JENKINS—This is not a question, but I do not know whether you have looked at the House science committee’s geosequestration inquiry that is ongoing.

Mr Harrison—We put a paper in to that. We work damn hard, but it is a difficult and uphill job. It is very hard.

CHAIR—I want Ken to be able to ask some questions and I want to give you that three minutes that you wanted.

Mr TICEHURST—It is fascinating the way that you are linking in agriculture, religion and the whole—

Mr Harrison—I do not want to go too deep there.

Mr TICEHURST—I thought it was fascinating that Cardinal Pell said that global warming and climate change were reasons why so many people went into church on Good Friday. The whole debate about climate change has got out of hand. It has been hijacked by environmentalists and now we have environmentalists-cum-political operators who see this as the great way forward. Even today, looking at the news this morning, the first thing on the agenda for the COAG meeting is climate change and carbon tax. That is a total distraction from the real function of state governments, which is to provide services. I am from New South Wales, and you saw what happened in the New South Wales election. Some people call it the worst government since 1788 and they are still there—they got another four years, and they have stuffed up so many things. This is a problem. We have got away from reality. I agree that we have to start looking at the long-term view.

There are some other areas in sustainability. If we look at water, I would like to know your opinion on local or state governments talking about funding people to put in 5,000-litre water tanks. Nobody calculates just how little rain you need to fill that until the water runs down the gutter again. Talking about sustainability for the built environment, in New South Wales, we have the BASIX requirement for housing. They all tell you how wonderful it is to set up solar electric energy. However, it costs you a fortune to put in a system like that and feed power back into the mains. Some of these things are to me a distraction. They are forcing householders to provide the things that should be provided by a state government—clean fresh water and electrical energy. We should be able to get those things from the state government, rather than imply to people that it is up to them to provide for themselves on a very small scale, which is totally inefficient.

CHAIR—John, could you answer that on water, because I want to give you that three minutes—and this lady on the right will beat the hell out of me if we do not finish by 10, which is in less than three minutes!

Mr Harrison—We need a much more holistic view. For example, on my website there is a paper about streets and what they are really for. I believe that our water problems are there. When it rained six weeks ago on Melbourne, we got two inches in about three hours. Port Phillip Bay went up five inches. All of the pollution that was on the streets and everywhere else was in the bay just like that. We have failed to understand what roads really are. For a start, they dissect all our natural drainage, and so when the rain falls on them we need huge infrastructure to carry away this stormwater. What is stormwater? Rainwater; good, fresh rainwater, plus pollution.

There is a fundamental water dynamic which is that the further water flows and the more energy it picks up or the more it flows—the more energy I think is the right word—then the more pollution or salt it picks up. If that understanding got in behind our salinity problem, our pollution problem and our water problem, a lot of that would go away. Underneath that is this need for a porous pavement so that, when we build roads and our streetscapes, we can much more naturally mimic nature. I can refer you to a presentation on our website about that. I am sorry that I do not have much longer to speak about it. It is a very important dynamic. People have to understand the water cycle and then think about that in relation to our streetscape and also why we have a salinity problem. The water dynamic is very important. If I had an opportunity to speak on that I would love to one day.

CHAIR—That would be great.

Mr Harrison—The porous pavement idea is that we realise that roads are not just for traffic—they carry the gas, electricity, water and everything else. We have to think of them much more holistically.

CHAIR—That was a fabulous presentation—thank you very much. I read your submission and it was excellent. I learned a lot and I am sure that everyone else did. We are very grateful.

Mr Harrison—I hope to have more of an input as time goes on. I am always available. Our website is very comprehensive with information. My associates and I—I see Margaret over there—work very hard in these sorts of areas. We have done a lot of work on it. We see solutions to most of our problems, including salinity, water and the CO₂ problem, as actually being easy—it is all here, or most of it.

CHAIR—Can I ask you one quick question. What type of acid do you use?

Mr Harrison—Waste acid—it can be sulphuric or hydrochloric. It is the protons we are after. Probably it would preferably be a mixture because you have to work out what salts you want to precipitate. You have to get the bicarbonates coming down to get rid of the extra proton. That is where some of the tricks lie in the process.

CHAIR—Can you read out the name of that book you recommended?

Mr Harrison—It is very heavy reading, but—

CHAIR—Was it *The Natural Advantage of Nations*?

Mr Harrison—Yes. What I will do when I exit is get somebody to give me a photocopy of this and I will try to bring it back to you if you like.

CHAIR—Thank you very much.

Mr Harrison—I would also suggest that the talk given by Sir Nicholas Stern at the Press Club is well worth listening to two or three times. He is a great thinker.

CHAIR—Thank you again for an excellent presentation.

Mr Harrison—Thank you for your time—I wish I could be here a lot longer. There is a lot left to talk about, I think.

CHAIR—Absolutely. Thank you.

[10.04 am]

STEADMAN, Ms Margaret Amy, Executive Officer, Sustainable Living Tasmania

CHAIR—Good morning, Margaret. Although the committee does not require you go to give evidence under oath, I should advise you that these hearings are formal proceedings of the parliament. Consequently, they warrant the same respect as proceedings of the House itself. It is customary to remind witnesses that giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. Would you like to make any opening remarks? Before you do, Margaret, happy birthday.

Ms Steadman—Thank you very much. I would like to make some opening remarks. I want to describe what our organisation is about and explain why I think it is relevant that we be here. I have given Pam some descriptions of our organisation to table. I did not bring enough copies for everybody; I thought I would just give some to the chair. I then want to make some general comments on the work you are undertaking as a committee which, as a citizen, I really value. I accept that the committee process is an important one. Bringing people together is really what our organisation is about.

We are a small community based organisation that used to be called the Tasmanian Environment Centre, but a few years ago we decided that sustainable urban environments and what people did in their day-to-day life was basically what was going to save the forests, rivers, oceans and our urban environment. So we changed our focus to talking about sustainable living, and lifestyle and community choices that could drive the community towards a sustainable future. I have brought with me the catalogue of one of our recent environmental home expos. We run an annual Sustainable Home Expo. We run workshops on running an energy-efficient home, and we are working very closely with people to inform them about the risks of climate change and the sort of lifestyle changes that will help to avoid the worst impacts of climate change. We are really a community based organisation.

The main reason that I wanted to speak with you this morning was to let you know that community organisations, individuals and the community as a whole—and I am not saying that everybody in the community is as ready as we are—are looking for leadership in sustainability issues. In the last six months, it has really been driven by people's understanding of climate change. It has, to a degree, captured the agenda. In my notes here I have written, 'Has global warming overrun sustainability?' In a sense, it has. But it has become the tool through which we can actually speak to people and get some traction on sustainability issues. I think it is global warming that is bringing people to our centre. It is getting them onto the telephone to say: 'Can you help us to organise a community gathering. We want to get our little community together to talk about climate change and what we can do about it.'

What resolves climate change also contributes to sustainability. They are not different, but it is the issue that people want to talk about. We are kept very busy responding to that need at the moment. We do see that as a critical issue. The next 10 years are really critical for our communities and our planet. Particularly in Tasmania, we live in a little piece of paradise that is in some ways quite insulated from the worst impacts of environmental damage and the early

evidence of climate change, but we still want to be part of the movement towards genuine sustainability. That has to be a global movement and needs to take into account global issues.

Our organisation has about 250 members and a much broader impact and audience. In principle, we support a national sustainability charter. We think this is a really useful process and we would welcome leadership in that way. There is nothing in the recommendations in the discussion paper to which we take exception; although we would suggest that all the public education and awareness programs that are mentioned in your recommendations should not be yet more pamphlets—even though I have tabled a couple of our own! They need to be well-researched and look at current understanding about how to communicate and change behaviour. We listen a lot to the community based social marketing agenda that has been researched in Canada and find that really useful.

We think it is really important that the sustainability charter take a whole-of-government approach and therefore that it should be driven from the very highest level. It should not be tacked onto an environmental department; it should be at the highest level. It should report to the Department of the Prime Minister and Cabinet nationally and to the departments of premier and cabinet in the states. It should therefore be capable of integrating all of the governments across the nation. It needs to have short-, middle- and long-term goals and targets so that it can be under a process of constant review. I think one of the questions you ask in the document is: should it be an aspirational document? Yes, we think it should, because you need to have a sense of what the world would look like if it was sustainable and what a sustainable Australia would look like so that you know where you are going. It is also really important to have short-, middle- and long-term targets so that you can measure that you are going in the right direction. That will ensure that it is more than a form of words.

One of the things we would like to observe is that the key elements that you identify of water and built environment and so on do not include any reference to what we would see as something that is really significant and important, and that is community resilience. Most of the statements about sustainability that we work from talk about not only the environmental, ecological sustainability but also the social capital that can sustain that and work towards it. One of the things that we work towards, and the paradigm that we work to, is of bringing people together. We are very much an organisation that is not into driving conflict or adopting a conflict driven view. We are very interested in bringing people together and arriving at a shared value. I think that there were some really quite striking and dark messages that appeared when watching the footage of Cyclone Katrina a couple of years ago when we saw a community basically disintegrate. One of the things that I think need to be built into sustainability is fostering community resilience—encouraging people, as difficult issues are dealt with, to work together and have a sense of support, equity and increased skill and not be driven by fear and selfishness, to put it bluntly, but by a larger community view and to know that they can count on the support of the people they live with. I think that is really important. I think the Western Australian model is a very broad one and very useful.

I wanted to bring to your attention too, if this has not already occurred—and I will give you a copy of it—the Tasmania Together document. I am not sure if you are familiar with the Tasmania Together process. It is certainly not a perfect process by any means. It involved a long time period of community consultation that a lot of people feel was not totally honoured in the implementation of Tasmania Together. But it is a process of setting goals, targets and

benchmarks that show very clearly to the community how things are being measured. The targets are reported on by government departments and agencies that have signed on to Tasmania Together. There is a reporting process and a five-year review process that can test the vision. It is a model of how to present it to people that I think is quite useful, and I wanted to bring it to the committee's attention.

In terms of aspirational models, I assume that you are familiar with the Earth Charter, which has very highly principled and lofty statements of aspiration around sustainability for the planet. I think that is at a level that is too lofty. It sounds strange to say that, but I think in fact it is not grounded, down to earth or brief enough. But it does have the energy of a lot of idealism that needs to be captured by a sustainability charter.

I also wanted to comment on the Melbourne Principles for Sustainable Cities. There are lots of models that have come out of local government, and I think possibly local government is the place where a great deal of this work is being done nationally. That is probably a good place to look into the repertoire of visionary statements.

That is really all I wanted to say, other than that our observation is that the community is really ready for something like this and is looking for leadership. People really crave government leadership that is visionary and future looking.

Ms HOARE—I have a few points here. I will try to be brief with my questions. I will go in the order of your presentation. When you are talking about community education and Sustainable Living Tasmania promoting energy-efficient homes, are you able to do that in such a way that it is also economically efficient for families?

Ms Steadman—Yes.

Ms HOARE—Can you speak briefly about how you do that?

Ms Steadman—In fact that is the hook that we actually hang it on most of the time—that you can save money on your energy bills and, by the way, this has an environmental benefit as well. We are very much into presenting energy-efficient workshops. We do this in government departments with home energy efficiency workshops for their staff. We do it for refugee groups. We do it in community houses for Women Tasmania and for our own membership. We have done lots of these home energy efficiency workshops and produced a do-it-yourself home energy audit which is on our website. The attraction for many people is that it will save them money on their power bills. But now that Tasmania is linked to the national electricity grid via Basslink and because our dams are at their lowest level historically ever, we are buying from the national electricity grid and therefore using energy that is being produced by coal-fired power stations on the whole rather than by our really benign hydro dams. So there is a direct energy conservation message that we give to Tasmanians now that this is a really important contribution they are making to decreasing CO₂ emissions.

Ms HOARE—Do you think education should be part of this national charter? I have a strong belief that this type of education should be compulsory in school curriculums. What are your thoughts on that?

Ms Steadman—When you say ‘education’ are you talking about the school curriculum?

Ms HOARE—Yes.

Ms Steadman—I think, to be honest, that sustainability is embedded in the environmental science courses. From my knowledge of the curriculum in Tasmania, there is a good deal of emphasis on these sorts of issues. I have a certain reticence about making these things compulsory. I think there should be curriculum guidance and really accessible resources for teachers. I would hesitate to make such things compulsory at the school level. My experience as a teacher is that, if you make something compulsory, you have killed it before you have even started, to a degree.

Ms HOARE—Are there readily accessible resources at the moment?

Ms Steadman—I do not think there are. There are a lot of teacher generated materials and there is a lot of website material. There is a lot of material around, but it is not necessarily easily integrated into curriculum.

Ms HOARE—There is no syllabus that somebody could pull out of a drawer?

Ms Steadman—Not to my knowledge, because we are often resourcing teachers. I cannot speak for other states. A national curriculum is another one of the issues. But I think there is a need for really accessible and clever resources for teachers.

Ms HOARE—I just want to make a final comment briefly. You mentioned looking at local government processes. I think that is really important for us because there are a lot of local government issues that we are looking at here in the whole development process. If we can look at what they are doing already then that gets them half on board. Thank you for those comments.

Mr TICEHURST—What you are trying to do is interesting. Are there other organisations in Australia similar to yours in other states?

Ms Steadman—Most of the conservation councils in the other states are involved in similar work. They are much bigger organisations with more strings to their bows. I know, for example, that Environment Victoria has a sustainable living arm to its machine. I was going to say ‘repertoire’ but you do not have an arm to a repertoire, do you? Most of the organisations like the conservation councils do this sort of work. We have always been an educational, awareness raising, information providing and networking organisation rather than a lobbying organisation. In Tasmania we are a bit unique, I guess, in that regard.

Mr TICEHURST—How is your organisation funded?

Ms Steadman—Like most such organisations, we lurch from one funding crisis to another, as you can imagine. At the moment we get a grant, which will expire in a couple of years, from the state government. That is a core funding grant that pays the rent, the bookkeeper and those important things. We get a small amount of money from Grants to Voluntary Environment and Heritage Organisations. The rest we get from project funding such as Envirofund. We have some project moneys from the Australian Greenhouse Office because we are working on a community

project in the city of Glenorchy. We are just starting that. We sell books and we have membership. We take donations. We do fee-for-service work. I have recently done an environmental training program with the defence department in Hobart, actually, training their civilian staff in environmental issues. So we work really hard earning project money and fee-for-service money, and we are constantly writing grant submissions.

Mr TICEHURST—I noticed driving around Tasmania out in the country areas that you see huge, big wood piles. What is the effect of the wood piles? What proportion of heating in Tasmania would be wood fires?

Ms Steadman—I cannot give you exact figures, but I can give you trends. It used to be a decade ago that the majority of houses were heated with wood. This trend has changed dramatically in the urban areas. People are moving to electricity and gas—those who are connected to the natural gas pipeline. The air quality in the urban areas has been really impacted by wood smoke, particularly in Launceston.

So there is a shift to electrical heating in the urban areas but in non-urban areas, in small villages and so on, most people would use wood fires and we know from talking with people who sell the really efficient wood heaters that people will fiddle with them so that they can burn them all night. It is still a big issue in Tasmania. There is the sense that wood is a renewable resource. So it is a tricky one; Tasmanians are very fond of their wood fires.

Mr TICEHURST—I live on top of a hill and people in the valley have wood fires. You can see this haze in winter and you think these people are breathing this stuff and they probably do not even realise it.

Ms Steadman—It is a very serious health problem, particularly in Launceston. The medical authorities can quantify the number of people who will die every year, excess deaths in Launceston, from wood smoke. It is an environmental issue of some significance and a sustainability issue therefore.

CHAIR—I have an old friend back in Western Australia who has looked into wood fires. He is an environmentalist with quite a bit to do with the University of WA. He says if we put some scrubbers into these chimneys—it is not that expensive to do—they could burn their wood and it would take out soot, smoke and all those things fairly inexpensively and that would be a good way to go. You may know a little bit more about that than I do. Have you heard about it?

Ms Steadman—I have not heard about chimney scrubbers but there is a device called SmartBurn which we had at our home expo last year that chemically cleans the smoke from within the firebox. It lasts about a season and then you replace it. You put it into the firebox. I am not sure chemically how that works, but there are ways of making wood fires cleaner. The most important thing is to use them efficiently. People who want to leave the fire going all night bank it up and leave it smoking away like mad all night so that they can just arc it up in the morning and get warm. That is not good practice, but you can adjust a really efficient heater to make it so that it does not conform to the standards.

Mr JENKINS—In 2005 you adopted the business name Sustainable Living Tasmania. Could you fill out the background to that? How much was it uniquely Tasmanian or how much was it in

the context of the changing understanding of processes and the need to be holistic rather than concentrating on ecological issues?

Ms Steadman—I think it was the latter really. It was increasingly clear to us. With a small organisation, the person who is the executive officer really puts a major stamp on it. I guess that the urban environment was much more my interest and competence, and adult education was much more my interest and competence than school based education. There was also a commitment not to be driven by conflict but by consensus and agreement and to bring people together and work with people who were not committed environmentalists but who wanted to move in that direction and could see the global issues.

It was seeing an opportunity. It came out of our environmental home expo. I had the idea that we could run an expo and I met with other people with similar views. It was one of those ideas whose moment had come in Tasmania to actually look at the urban environment. It came out of seeing how much enthusiasm there was and the thirst for information that sprang out of the environmental home expo. It grew from there and we realised one day that that was principally what we were doing, so we had better give ourselves a name that reflected it, and that this was a big issue and we needed to be part of that.

Mr JENKINS—Just flicking through the Tasmania Together document, we see that it is a rather ambitious document in the detail that it goes to with the markers and things like that. I have the thought that our charter would be broader with some key markers. You said that there was a bumpy ride to get there.

Ms Steadman—Yes. There was a bit of community consultation exhaustion. Also, there was some cynicism. To be frank, the community consultation would have driven an end to clearfelling of old growth forests much faster than the government has committed to it. That was one of the issues that caused some cynicism, but there has been a sense in the community that people do not know about it, that the document is ticked off at the end of the year when government departments have to report against their Tasmania Together targets and that it is fairly token. But there is energy that has gone into it and the people who are involved in driving it are absolutely passionate about it. I think it is a model that has some real potential if we can keep developing it and it honours the community consultation and the community energy behind it.

I am not necessarily suggesting that the sustainability charter should go down that very lengthy path of starting from the grassroots with intensive community consultation and then saying, 'This is your document and we will put in it what you say.' That created an expectation that we were all going to get what we had asked for which, of course, is never going to happen. But I think the setting of the targets and the benchmarking say that this is the vision for Tasmania, this is what it would look like against these key areas, these are the things that will tell us that we are actually getting there and ask: how can we tell we are making progress? That is one of the key things that would be needed for a sustainability charter: do we have a vision of where we want to go, what would a sustainable Australia look like and how can we tell that, day by day, we are making progress toward it? I think that is quite a useful model, but it is very detailed.

Mr JENKINS—As an outside observer, given that state politics in Tasmania has been very much economic versus environment, anything to avoid that conflict is to be attempted. One of the issues that we are looking at is the notion of an ecological footprint. There is discussion around that being able to be done on a whole host of levels. You could break it down to people's personal footprints. Then that leads to some notion of trading part of your footprint. I cannot quite get my head around that, but I am told that in the United Kingdom, even if it is not on the ecological footprint aspect of it, people get some credits or something individually and they start trading them around. I have always thought that we should be looking at community or city level or at some aggregation level. Have you ever thought about that and what is an appropriate level to look at for some of these benchmarks?

Ms Steadman—We have used the personal ecological footprint idea as part of an education tool, both school based and for adults. It can be a challenging and focusing thing to do to confront people with how many planets would be required if everyone lived as we do as individuals. That can be a really focusing idea. It is a useful concept, but I am not sure how practical it is in the realm of aggregations of cities and so on. It needs to be really well calculated and I have absolutely no idea how it is calculated in the aggregate or even, for that matter, as an individual. It must be very complicated and it must be possible for people to make progress against it so that you see that there is some possibility of achieving some sort of sustainability. As long as we are over one planet we have almost lost the plot anyway, so that concept needs to be quite carefully used. But I think the aggregate level is the way to go—lots of cities. Cities is the obvious one. One of the questions I wanted to ask was whether the sustainability charter is at bottom a charter for sustainable cities or whether you see it as being a charter for Australia nationally. The areas that you have selected are ones that most directly relate to urban life.

CHAIR—This is my vision, and I will get other committee members to comment: basically, it is a charter for the overall concept. The footprint which we involve reflects the city and beyond, and surrounding areas. Cities affect agriculture and other urban areas—forests and national parks, the whole lot. Eighty-five per cent of our population live in cities now and people are the ones who are changing the planet. So we are focused on that but we are looking at the effect way beyond those cities in the footprint phenomenon—the whole lot.

Mr JENKINS—Chair, that was a great answer. That was similar to what I was going to say but I wanted to have a look at our terms of reference to see if we had led people astray.

Ms Steadman—No, you have not led us astray. But in the *Sustainable cities* report that you made, the areas that you selected—the built environment, water, energy and so on—very directly relate to urban life but not necessarily, say, to agricultural practice, except insofar as the ecological footprint is impacted by farming practices. I think the ecological footprint is a very clever idea that is quite difficult to use really well. But I know lots of cities, like London, are using the ecological footprint as a tool, so it is important to look at whether they are making it work. And if they can make it work, I think it is a good idea. But I have my doubts.

Mr JENKINS—I am trying to come to grips with the notion of food miles.

Ms Steadman—That is another concept. There are restaurants in Hobart that attach the food miles to their menu because they want to promote that they are using local produce. I have not seen a menu. Those restaurants are a bit out of my price range. It is the idea that your food has

been flown in from Thailand and what sense does it make to eat asparagus all year round when for half the year it has to be flown from Thailand or California? It makes no sense, and this is part of the community education about sustainability. I think it is an educational process to make people more aware of the impacts of what they are doing. The food miles idea is a neat little concept that people are paying attention to now.

Mr JENKINS—Chair, Margaret has explained to me why I have not bumped into food miles.

Ms Steadman—You do not get the right restaurants.

Mr JENKINS—Yes, in the eateries of the electorate of Scullin we do not have that—and that is not a criticism of them. Can I make a final comment about the concern about climate change overtaking sustainability. I think at the end of the day climate change is very much a result of our lack of sustainability. I am really excited, as you are, that it has captured people's imagination and I think that then assists us on this journey about sustainability.

Ms Steadman—Absolutely. Over the next few weeks I am involved in a series of community meetings in the Huon Valley in Tasmania—and if you are here for the weekend you should go and see that gorgeous place. Lots of little communities are getting together to talk about sustainability, but the hook, what is bringing them there, is Al Gore. They are all going to watch the movie and we are going to talk about what it means for living sustainably. So the two things are totally connected, but climate change has been the thing that has made it real for people. And we are not driving this; it is being driven by the community contacting us and wanting our help to do this. One young father who was collecting a whole lot of posters from me said, 'I don't want to look back in 20 years time and think that I didn't do anything'—and he had his two little tackers at his heels when he was telling me this. This is very much where people are at.

We have recently been helping with some free screenings of *An Inconvenient Truth* because there was so much interest. We had 10 screenings at a theatre in Hobart and we filled that theatre—standing room only—because people are really identifying with this issue and want to feel that something is being done. So it is a really motivating issue, but it does drive the sustainability agenda broadly. It is all the same thing, really.

CHAIR—At this point, Margaret, we might have to say thankyou for that because the manager on the right here says I have run out of time—

Ms Steadman—Kicking you under the table!

CHAIR—That is right—and you always obey management! But we would love to join you for a cuppa if you have time to stay and have a further chat.

Ms Steadman—Thank you very much; that would be nice.

Proceedings suspended from 10.42 am to 11.04 am

HARRIS, Professor Graham Paul, Private capacity

SANDERS, Mr Richard David, Private capacity

LENZEN, Professor Manfred, The University of Sydney

Evidence from Professor Lenzen and Mr Sanders was taken via teleconference—

CHAIR—Although the committee does not require you to give evidence under oath, I should advise you that these hearings are formal proceedings of the parliament and consequently they warrant the same respect as proceedings of the House of Representatives itself. It is customary to remind witnesses that giving false or misleading evidence may be regarded as contempt of parliament. Would you like to make any opening remarks? Graham, we will start with you, if we may.

Prof. Harris—Good morning, and thank you for the opportunity to address you. I will make a few brief comments then hand over to my two compatriots. I am assuming that you have all read the submission, so I will not go through that in any great detail except to make some introductory comments. The submission strongly supports the concept and adoption of a sustainability charter and a sustainability commission. I think all three of us have concerns about the biophysical carrying capacity of the planet and the fact that we are exceeding it.

Over the last six months there has been a very great change in the debate in this country and around the world. Indeed, many of the things we put in our submission are now becoming more widely accepted, certainly in the last six months. It is worth remembering that we live in a time of enormous change, and sometimes when you are in the middle of enormous change it is a bit difficult to see exactly where the end of it is. So it is hardly surprising that we are making up a whole bunch of things as we go along. Even today we have COAG discussing carbon trading and a 60 per cent reduction in carbon emissions by 2050, or whatever it is. We are seeing huge changes in the global debate, and I think those of us involved in this submission would like to see Australia take a greater leadership role in that debate and in putting in place systems to manage our affairs more sustainably.

We make the point in our submission that we no longer run what is called a ‘one-planet economy’. If you add up all the demands that we place on the biophysical systems of the planet, it comes to something like 1.2 times the planet’s capacity. So we are already beginning to exceed the carrying capacity of the planet. Australia, along with other major Western nations, has got about a three-planet economy. So inevitably we are in a very privileged position, and we could not sustain our lifestyle without there being both rich and poor, and without there being many people who do not enjoy the kind of standard of living that we do. It is worth remembering that poverty makes very poor choices.

In agreement with a lot of the statements made in the last few months, we would say that the challenge of achieving both national and global sustainability is a major challenge that makes most of the other challenges facing the human species kind of puny. The focus is on biophysical constraints on our activities, remembering that climate change is a classic example of market

failure. We have kicked into the atmosphere all the products of our advanced economies, and we are now seeing the results of doing that on a global scale.

In addition to there being a major shift in the debates around things like climate change and constraints, it is worth noting that there is a very considerable intellectual change going on as well. We are now starting to move towards concepts of tipping points, of precariousness and of the resilience of the global system. It is worth noting that today, even, we are putting into the Department of Education, Science and Training in Canberra a plan for what is called the Terrestrial Ecosystem Research Network—the first piece of scientific infrastructure that would begin to actually measure the vulnerability, resilience and precariousness of this continent. So while the national economic and other debates are changing, we are trying to underpin that with research in other infrastructures to provide better policy, better management decisions and a better focus on some of these issues. Right across the spectrum—from research right the way through to policy—we are seeing huge changes.

CHAIR—Thank you. Over to you, Manfred.

Prof. Lenzen—My task is easier since Graham has already summarised a lot of the challenges very well. In addition to what is written in our submission, I would like to make one point. As you can see in the documents, you mentioned the ecological footprint as one measure for setting targets and monitoring progress. As you may know, the ecological footprint is perhaps most well known for the fact that it communicates sustainability issues very well to the general public. And it is here where I see a particular challenge in what the sustainability charter could deliver. If you look at a few driving factors for some environmental indicators, global population and per capita affluence are probably amongst the most outstanding ones. If you then extrapolate the trends, say, to 2050, you can imagine how challenging the task is going to be to bring the global economic system to a one-planet economy, since population is expected to grow by about 50 per cent by 2050 and per capital affluence is set to double in some parts of Asia.

In addition to actually looking at what we do at the present time, we also have to compensate for these future strong driving factors that lead to ever-increasing trends. We know from the past that technology has not managed to compensate for that growing population and per capita affluence. The latter two factors will always outstrip technological improvements, be it in agriculture or the energy system. It is here, I think, especially in democratic systems where decision makers have limited scope for imposing regulations and law, that the public plays a crucial role. It is important that the sustainability charter and what it encompasses communicates in a realistic way to the general public what these challenges are and what it means to reduce, say, greenhouse gas emissions from energy or the ecological footprint by, say, 50 per cent by 2025, as outlined in the study, and that this encompasses behavioural changes on a major scale. Such things as certainty are not being met solely by initiatives such as Earth Hour. They are certainly good for raising awareness. I see a good role for the charter in spelling out things that are essential to educating the general public. I will leave it at that.

CHAIR—Richard, do you wish to make a statement?

Mr Sanders—Yes, thank you. I would like to thank you for the opportunity to appear before your inquiry. We support the idea of a sustainability charter, and we feel that the idea of a one-planet economy is central to this. This is the same policy as the UK's sustainable development

policy. The challenge as we see it is that we live, in a sense, on a spaceship and, a bit like Apollo 13 when it was going to the moon and its life-support systems exploded, we have this problem where the life-support systems on our planet are being rapidly eroded. On a daily basis, we are seeing more and more evidence from the scientific literature as to the nature of our plight. Indeed, each day the picture looks a little worse.

I think the challenge for humanity and planet earth—spaceship earth—is that we have to operate the planet within what is called its ecological design specification. It is a bit like when you are flying a plane, a spaceship or a car: you have to keep the instrument in the green part. You cannot redline the motor all the time. I think we are essentially redlining the motor. The way in which we propose to address the situation is through a national system of biophysical accounts that actually specify the rate and quantities of critical forms of natural capital that can be consumed every year. These would need to be considered on local, regional, national and indeed international scales, and all those scales would have to be commensurate.

The essence of our submission is that we need to move rapidly towards specifying the design parameters and the physical budget we have to operate our economic and social systems within and use the sustainability charter as the educative vehicle through which this can be articulated to the population. I think the primary role of the sustainability charter and commission should be educative. I would hope that we can initiate, quite rapidly, a national conversation amongst the public—a serious deliberation—to look at our plight and to work through how we might address it. It is fundamentally important that we as a society envision the kind of society that we can create within the design limits of the planet and that we move rapidly towards articulating that vision, sharing it, talking about it, whether it is around the kitchen table, in the media or elsewhere.

Mr JENKINS—My question is directed to Professor Lenzen, who has had an interest in the ecological footprint. Can I clarify something in the submission. It states:

Ecological Footprint analysis ... of the global economy is now 1.2 times the planet's bio-productive capacity. Wealthy countries like Australia, the USA and the UK are 'three planet' economies ...

I am just trying to understand the '1.2' and the 'three.'

Prof. Lenzen—We have an imbalance between the developing world and the developed world in the appropriation of bioproductive resources of the planet. Overall, we are using about 1.2 times or thereabouts. If you look at certain countries, for example, Australia—because we are wealthy in Australia, much wealthier than average global citizens—you will see that we draw on many more resources than, say, the average Indian or Chinese. That figure of three or four refers to the fact that if everybody on the planet lived like an Australian or an American, then we would need three planets. Does that answer your question?

Mr JENKINS—I now understand. There has been a query about how we can get an agreeable notion of the ecological footprint. Do you believe that sufficient work is being done so that we can clearly set the types of parameters to create a benchmark for an ecological footprint for the nation under a proposed charter?

Prof. Lenzen—It is an interesting question. I should make two points. First of all, the ecological footprint is not the explain-all indicator. It is still being developed, and standards are being developed whilst we speak. For example, water abstraction is not yet included in an ecological footprint. Having said that, the ecological footprint is of course an indicator that deals with land and emission and aggregates them into one indicator. I believe that the footprint can be one indicator in a suite of indicators that include water, materials, and maybe also social indicators, because all decisions are made with economic and social objectives in mind. So a well informed, multi-criteria framework would probably be most desirable so that we can learn about trade-offs of possible policies and how they could improve the situation on one indicator but deteriorate the situation on another. That is good for planning.

The second comment relates to the question of measurement and accuracy: is it good enough to be a benchmark? We have to bear in mind that there is always a trade-off between scientific accuracy and urgency to act. Depending on the requirements for accuracy we might put the bar so high that we have to wait until 2100 before we have enough certainty so that we are comfortable enough to act. We have to live with a certain degree of uncertainty about rejections and still act on them, because otherwise, because of inertia in the systems, it might well be too late.

Mr JENKINS—Thank you very much for that answer. It is really very helpful to have that expansion about the problems and the opportunities of this as a marker. Before I allow my colleagues to ask some questions, I have one more question about the notion of a specific landscape physical indicator. Somebody is going to have to help me with what that really means.

Prof. Harris—Let me see if I understand your question correctly. What we are seeing with the drought in this country at the moment is huge stress on particular areas like the Murray-Darling Basin. We know that biodiversity is going down and salinity is increasing, so at the landscape scale there are a number of biophysical indicators of stress. We are proposing not only to measure and monitor those—and this is where this term ‘infrastructure’ comes in—but also to set some targets for improvement so that we will be looking to improve the situation on salinity. The real debate that we perhaps need to have is about where we set the targets and how quickly we start moving in a new direction. What is different about what we are trying to do now—and this is where the intellectual game is changing—is what we have heard Manfred Lenzen talk about. It is that we are now into both stocks and flows, in that you have actually got to look at the imports and exports, both nationally and regionally, to get an idea of whether you are sustainable or not.

Mr JENKINS—That helps me. And I think Manfred’s point about urgency versus precision is a very good point.

Prof. Harris—It is a decision that society has to make, essentially.

CHAIR—Mr Sanders, do you want to comment on Harry Jenkins’s question?

Mr Sanders—There was a question that was something to do with landscape.

Mr JENKINS—It is to do with the submission's notion of a specific landscape's physical indicators. I think Graham has satisfied me with his answer but by all means add to it if you wish to.

Mr Sanders—I might just elaborate a little further. The landscape is the fabric on which we live. It is essentially our life support system and it is a complex, living system ultimately. So it is very important to monitor its health, much as you would, say, a person's health and so you have all of these indicators that you monitor, and most of them are fairly familiar in terms of acidity and salinity et cetera. But the point I would like to emphasise here is that, as human development has progressed across the landscape—when we first came to Australia, for example, the landscape was more or less 100 per cent what you might call ecosystem infrastructure. It was just a naturally functioning ecosystem with relatively low levels of human influence. What has progressively happened over the last few hundred years is that human infrastructure has displaced the ecological infrastructure, and if you do that until there is no ecological infrastructure left at all then basically you have no planet. You cannot sustain yourself. You cannot live. So at some point—and I suggest that point is approaching now if it has not already passed—you must actually strike some kind of a balance between the amount of human infrastructure within a region and the amount of ecological infrastructure to underpin human existence.

Mr TICEHURST—Graham, you mentioned the proposal to reduce CO₂ by 60 per cent by 2050. Do you think there is any rationale or justification for a target like that?

Prof. Harris—The answer to your question is yes. Let me explain. I have recently written a book called *Seeking Sustainability*. It will be published by Cambridge University Press in a month's time. In that, I took a pretty critical look at the whole greenhouse and climate change and global change evidence. There is a lot of debate still and there are still people who believe that the science is flawed, if you like.

I think the best way to look at what is going on on the planet is to look at what is actually happening. What is the empirical evidence for change? On this planet we are now seeing events, particularly at the poles, which we have not seen since the last ice age. So we are now looking at changes to the planet and, as somebody said earlier, there is increasing evidence of change on almost a daily basis—certainly, things that have not happened in the last 15,000 years.

Now, we have come through a period of relative climate stability since the last ice age which has allowed us to build the human civilisation that we presently have. The situation that concerns those of us who follow the data in particular is that the prospects of change over the next 50 to 100 years are quite stark now. In terms of changing climate, I think there is good evidence that the drought that we are presently experiencing in Australia has strong roots in anthropogenic climate change. And it is not just the rainfall decrease, which has been slight, but also the drastic decrease in run-off that we are suffering from, and that is because it is now warmer than it was 25 years ago—more evaporation, the same amount of rainfall, less run-off. So what we are looking at is a concatenation of events which in my professional judgement has got to the point where we need to do something.

It is now well known that CO₂ is one of the major drivers of climate change. We were discussing earlier that there was a paper in *Nature* this week looking at the last 420 million years

of history of the planet and showing that the kinds of CO₂ effects that we have seen in the last 100 years apply over the last 420 million as well. So the evidence linking CO₂ to human activity is good. The evidence linking CO₂ to climate change gets better by the day. Therefore, we need to think seriously about constraining our global CO₂ emissions in a variety of ways in order to bring this planet back into balance.

Many people still fear that kind of change, but I think we should see it as an opportunity. The structure of the economy is going to change—but, let's face it, the structure of the economy is now totally different to what it was even 50 years ago. Instead of resisting change, there are many of us who would argue that Australia should grab a first-mover advantage here. We are a small population on a big, dry continent. If we can get it right we have actually got huge opportunities to export skills and technologies to the rest of the world. So I think many of us are a little frustrated at the moment and wish government would move a little quicker because we actually see it as an opportunity not a threat.

Mr TICEHURST—What other factors do you think we should be looking at?

Prof. Harris—I will let my two compatriots come in on this one as well.

CHAIR—Professor Lenzen, do you want to make a comment on that?

Prof. Lenzen—Yes, I would like to briefly comment on the question of targets, the 50 per cent, and how we would justify this. If you look at it in terms of the point on emissions that Graham has made already, it is a pretty lenient target. The recommendation of the IPCC is that in order to stabilise global CO₂ concentrations we need to bring global emissions down by, say, 50 or 60 per cent by 2050. As I said, bringing global emissions down is a technological problem. But, given that current per capita emissions are unequal across the planet, we cannot really be telling people in India or China to reduce their emissions by 50 or 60 per cent by 2050 because they want to undergo the processes that Americans and Europeans and Australians have undergone in the past 50 or 100 years. On equity issues we cannot really be telling them to reduce by the same amount as we do. They have made that point very clearly. India has a very strong academic community that makes the point of inequity, and this is very clearly linked with emissions reductions. What they are basically saying is: 'Let's reduce overall by 50 per cent but so that in the end we are all equal.' What that means is that Australia, America and Europe would have to reduce by 90 per cent so that those countries have the opportunity to grow while overall emissions are reduced by 50 per cent. So this is much more challenging than the target we have mentioned in our submission.

Mr Sanders—May I add to that. It is my view, based on the literature I am reading, that the 50 to 60 per cent figure by 2050 is indeed highly conservative and that much greater reductions are probably needed. To go back to my analogy of a car: if you are redlining the motor for too long you will destroy the car. The problem we have to grapple with is what is known as a runaway greenhouse effect. If global temperatures rise beyond about two to three degrees centigrade, there is a very rapidly growing view that we will see a lot of positive feedback loops coming into play—for example, as the Arctic ice melts. A year ago it was being suggested the Arctic ice would all be melted by 2060. By about September last year they were talking 2030—that was in the summer. I have seen a report more recently suggesting it could be as early as 2015. So that is another example of the picture apparently worsening. As there is less ice and

there is less white reflection of the sunlight off the polar regions, the Black Sea absorbs more and more heat, and that speeds up the heating process.

We know that methane is now starting to escape out of the tundra, where it has been locked up in ice for millions of years. The warming that we are seeing in those Arctic regions is of the order already of four or five degrees: the warming up there is very much greater than the global average. If that methane—and there is trillions of tonnes of it—leaks into the earth's atmosphere, it is 20 times more greenhouse gas effective than carbon dioxide on a kilo per kilo basis and this could lead to very severe temperature rises which could completely destabilise the whole planetary system. This is a very real concern.

The challenge is really to rapidly reduce carbon production in what I would see—and as Al Gore defines it—as a planetary emergency. I really think that the time has come where we have to move towards the concept of bipartisanship in government, more or less along the lines of a war cabinet type of situation, where we can provide leadership and muster the people of not only Australia but also the world to improve very much more rapidly than we are at the moment. I fear that, if we aim for the 50 per cent to 60 per cent target by 2050, we will well and truly miss the boat.

Mr TICEHURST—With the National Competition Policy, how do you think Australia can provide world leadership? Graham mentioned that we should be able to develop technology and then export that technology. But, to have a significant impact on global emissions, we really have to get the major countries—America, China and India. How are we going to get them to reduce their emissions by the proportions that are needed?

Prof. Lenzen—You made the point that Australia, being a small country, has only a minor percentage of global emissions. This is true. I would like to suggest to you another way of looking at the problem. We all acknowledge that climate change is a global issue. Let us look at it on a per capita basis. On a per capita basis Australians are amongst the highest emitters in the world. I think this is a better picture when looking at it in terms of the urgency to do something about it. The argument that Australia contributes only 1.5 per cent of global emissions has been used in the past as a justification for not having to do much and passing the buck to, say, the United States or China or other countries.

Australia certainly has a few opportunities simply because of its landmass. The Japanese have already taken some of those opportunities by entering into contracts with landholders to reserve land to plant trees and to sequester emissions. This could be an income source for Australian farmers. If global commodity prices for particular commodities fell and if a market for carbon sequestration established itself, I think it would be a fabulous income source. Australia is in the favourable position of having quite a large landmass compared to its population. We can afford to put land aside for these purposes. For the Japanese that is absolutely impossible. Maybe my colleagues will add some more examples of such opportunities.

Mr Sanders—I think the issue here really is one of leadership. As Manfred was saying, India and China have developmental aspirations and they are not going to act in the way that they will need to if countries such as ours that are already wealthy do not take a leadership role. I think that, as world leaders, we have an obligation to set the right kind of example. It has to be on a

per capita basis because that is what counts in the end—it is the total that each person contributes that creates the problem.

Looking at solar hot water heating in Australia, I think something around five per cent of Australia's water heating for domestic use is through solar, and in a country like Australia that is ridiculously low. I think there needs to be a program—and we set a target in our paper; I cannot remember it off the top of my head—to rapidly move to 80 per cent or 90 per cent of domestic hot water being produced by solar in five or 10 years.

I think we can achieve this. The cost of a solar hot-water system at the moment is, on average, around \$3,000, but if we were to produce them on the scale that would be required to achieve those targets then the price would probably come down to around the \$1,000 mark. The greenhouse gas reduction in emissions through just a simple measure like that would be huge. So there are lots of ways in which we can take a leadership role and show the world that a wealthy country is not only able but also willing to do what needs to be done.

Mr TICEHURST—I would like to support you on heating, because I think about 30 per cent of our energy goes into hot water heating—

Mr Sanders—Correct.

Mr TICEHURST—and to provide a subsidy for that makes much more sense to me than providing subsidies for people to put in tiny, 5,000-litre water tanks.

Mr Sanders—Thank you. I have to agree with you.

Prof. Harris—To pick up on that question, there are some classic examples of the way competition policy has been used to drive water infrastructure and water reform. Precisely the same could be used to drive energy policy reform. It is about leadership and it is about strategic investment.

Tim Flannery often gets criticised for leading the debate on climate change, but at the end of his book he points out that there are many things that individuals can do to reduce their demand. We could almost achieve our 50 per cent goal from demand management alone. That means incentives and signals and market mechanisms—anything that government can provide to get the demand down. As Manfred said, we then have opportunities for sequestration and we have opportunities for renewable generation in hot rocks, solar and things that other countries simply do not have. Government could use its purchasing power in a much more creative way than it presently does. If you leave things solely to the market you often do not get the kind of leadership that we need at the moment. So I think we would advocate a much more mixed economy than is presently popular in this country.

Ms HOARE—I would like to get back to your submission in relation to what should be in a sustainability charter and how that should be monitored. We have just touched on the incentives and the way that government can provide encouragement for individuals to change their own behaviour. I believe that the Australian public have woken up and are already having the conversations around the dinner table, and I believe that the government needs to show that leadership because people are saying: 'What can we do? We must do something. We do not have

the \$3,000 to put in the solar hot-water system but we would like to if we could.’ If we can provide \$4,000 for every new baby born in this country, we can provide \$3,000 for people to put in solar hot-water systems.

I would like to throw it open to all of you. There is a lot of detail in your submission; how much detail should be in a sustainability charter? Would the detail become part of the educative process, and how would that be monitored? Would it be a reporting process? Would it be up to the commission to do the monitoring? I agree that if we do have a sustainability charter—and everybody is agreeing that we should—then it is initially up to the federal government, of whatever persuasion, to provide and show its commitment to that sustainability charter.

Prof. Harris—Richard, do you want to lead off?

Mr Sanders—Thank you, Graham. The actual charter itself should be very brief in its aspirational statement. It needs to be something that everybody can relate to in much the same way that we can relate to something like the national anthem. Then there needs to be a whole institutional structure that underpins this. I would see the absolute foundation of this as being a national system of physical accounts, because ultimately it is keeping the economy and the society within those physical limits that is the thing that has to be achieved. And that is absolutely not negotiable—nature just does not negotiate on these things; we have to play by nature’s rules here and live within those limits. That is the thing that has to happen. There is no option.

The way in which this would be done is that you would have different budgets for each different critical form of natural capital, and these would be progressively tightening budgets over time, so that you are slowly contracting the material and energy throughput of the whole economy through time. I would see the sustainability commission operating in much the same way as the National Competition Council. It would provide incentives and competition between states to move to meet these declining targets of throughput—and would penalise them, indeed, if they were not able to meet those. I think in the simplest analysis that is how I would see the charter. It would have to have some kind of legislative force, I believe, to ensure that the whole country and its institutions were in fact committed to the achievement of those targets.

Ms HOARE—Thank you. Manfred?

Prof. Lenzen—I think Richard has answered that question quite well.

Prof. Harris—I make one point. It is very clear from the work of the National Land and Water Resources Audit, from the recent *State of the environment report* that was just released and from other roles I play on Commonwealth committees and so on that we actually need to do a much better job of measurement, monitoring and indicators—getting our physical accounts, as Richard would say—sorted out. The *State of the environment report* is actually bedevilled by lack of data. We simply do not have at the moment in this country enough data to really indicate what the trends are in many cases. When you actually compare it to the amount of information that we have on the economy, where you get stock prices every 10 minutes and the value of the dollar twice a day and so on, we simply do not have that kind of environmental and biophysical information. One of the critical needs is to put in place systems—we have a lot of technology now which can come to our aid—to actually show how progress is being made against the

various physical accounts that we would need. Again, it is an opportunity for us. If we can get it right, there is an export opportunity there, too.

Ms HOARE—Thank you.

CHAIR—Who would like to comment on other forms of trapping of carbon other than trees? Are there other methods that you can see?

Prof. Harris—I will have a go at starting. With carbon sequestration, there are a number of things which are presently being tried. This is an area that is moving extremely quickly. Again, I do not think national leadership and governments are moving as fast as the global situation. There are a number of opportunities. One of them is to literally put plants on the back-end of your coal-fired power station, algae in water tanks and so on, to absorb the CO₂ and turn it into things such as biodiesel, fibre and other assorted useful products.

We are already pumping CO₂ back down into oilfields. Already around the world there are actual costed, financially viable opportunities for CO₂ sequestration under way at the moment. For example, CO₂ is being used to increase the pressure into oilfields to pump the oil out. So what with undersea storage, geological storage, storage in the oil fields and various other kinds of ways of renewing CO₂ and recycling it, there are a lot of quite viable financial opportunities. This is where putting even a small price on carbon would dramatically change the financial and commercial opportunities around the world. As I understand it, at something like \$30 a tonne for carbon all kinds of new businesses suddenly become viable and you would see innovation run rampant.

We are actually hindered at the moment by the fact that there is not a market for this stuff. If there were a market, you would see all kinds of new technologies coming on stream. I mentioned earlier even Rio Tinto is investing in what is called artificial photosynthesis. Plants are only one per cent efficient at turning sunlight into carbon. If we could do that at five per cent efficiency artificially, you would actually jack it up by five per cent. There is quite a bit of research being done around the world in taking CO₂ straight out of the air. You will be aware that Richard Branson has this £25 million pound prize to really stimulate some innovation. Does anyone else want to have a go at that one?

Mr Sanders—If I may just put a slightly different perspective on this, the first thing we need to understand is that the problems confronting us with respect to energy production are not just the poisoning of our planet through carbon dioxide or the warming that results from that. That is just one dimension of the problem. The other more serious dimension of the problem is that we are completely transforming the face of the planet in ways that are fundamentally ecologically unsustainable from the clear-felling of forests, through the way in which we plough our land to the harvesting of the fishes of the sea. Indeed, I think a very substantial percentage of the ocean fisheries have now gone extinct or are close to it.

The problem here, as Professor Will Stefan from the ANU would put it, is that even if we were to create a perfectly clean, benign energy source with a magic wand that had zero impact in the production of the energy, if we continue to use the volumes of the energy that we do, we will destroy the ecological basis of our existence simply by the ways in which we use that energy to transform the face of the planet. So the challenge is not really how we continue to produce this

much energy and reduce the amount of carbon dioxide in the process. The challenge is in fact how we learn to live on this planet with a very greatly reduced consumption of energy. Some of the figures that have been put around are of the order of running the planet on about 10 per cent of the amount of energy that we currently consume on a planetary basis. If that is the case—and I believe the arguments are extremely strong in this regard; just the simple laws of thermodynamics make this quite clear when you start to look into it from a theoretical perspective—then I think we are really looking in the wrong direction.

We are trying to live in a 19th-century economy and society where the whole idea is to have massive levels of industrial production and consumption. One way of looking at the whole sustainability problem on our planet is that we are actually consuming the planet to death. Human consumption of the planet's natural capital is at completely unsustainable levels, so the whole challenge is to greatly reduce the amount of material and energy consumption. To look at how we can continue to produce as much energy as we can to sequester that carbon away is, I think, very flawed thinking. It is trying to keep us in a 19th-century economy rather than moving us to a 21st-century economy based essentially on solar energy, which is what all energy is anyway. All of the fossil fuels are stored solar energy.

Two weeks ago I had the pleasure of spending a week with Professor Lovegrove from the ANU, who is leading Australia's development of solar thermal electricity generation. The figures on renewable energy sources such as that are showing that their rates of uptake are extremely rapid; we are talking about things like 30 per cent per year. If you look at the exponential growth of those, it is only 15 years until we can have the majority of our energy needs being met on that kind of basis.

Furthermore, if the target we have to reach is to be consuming only 10 per cent of the energy that we are currently consuming—this implies a very efficient society and economy, of course—then in some states we are already a significant way along that path. I think close to seven per cent of the energy production—I am not sure if it is in Victoria or South Australia, or possibly it is in both—is already happening or under commission. So we really need to reframe the whole problem away from, 'How can we continue to use as much energy as we are, and then how can we have some kind of technology to bury it?' We have to remember that if we do bury this under the earth or under the oceans there is a very grave risk that at some future time, invisibly, it will rise back into the atmosphere and create a global warming for some future generations, possibly thousands of years in the future, who have no idea why all of a sudden their planet is heating up and who have no way of stopping this stuff just bubbling out of the planet or from the oceans. So I think we have to be very careful. Thank you.

CHAIR—Manfred, have you got any comments on that?

Prof. Lenzen—Richard mentioned the need to live with less consumption. As I mentioned earlier, in the last 30 years technological improvement has never been able to outstrip growth in population and affluence. Population is the major driver in the developing world, and affluence growth is the major driver in the developed world. That leads me to the conclusion that, indeed, behavioural changes are necessary if we want to reduce present levels of environmental impact to levels that are closer to sustainability than they are now.

What it takes is yet unclear. I want to mention a piece of research. People have to look at what they call the knowledge-concern-action paradigm. That is quite interesting; people have found that while there is a good link between knowledge and concern—that means that if people know about it a lot of them become concerned—from studies there is almost no discernible link between concern and action. You look at the actual greenhouse gas production of, say, people who are concerned versus that of people who do not even know about the greenhouse effect, and you see there is virtually no difference.

That of course is a challenging problem because it means that we have to find a way to provide good leadership to make those decisions that people, for whatever reason, cannot make—maybe they feel they cannot do anything for themselves and that prevents them from action or for other reasons—and to implement those things that people by themselves do not want to or cannot implement. Personal circumstances have to be considered in this too because it has simply not worked so far, and we need personal behavioural changes to complement the technological change, otherwise we will not get there.

Mr Sanders—I can add briefly to that. I agree completely with Manfred that the whole sustainability issue is one of behavioural change rather than technological change. That is not to say we do not need technological change, of course we do. The primary focus must in fact be on behavioural and social change. There is an emerging body of literature of which you are probably aware that revolves around Jared Diamond's recent book *Collapse*, Ronald Wright's *A Short History of Progress*, in Canada, Thomas Homer Dixon's *The Upside of Down* and Robert Costanza and others' *Sustainability or Collapse?* This literature looks at why human societies historically have collapsed and they identified the primary reason. What humans do when they come up with a problem is that they solve it by moving to a more complex mode of social organisation, usually through some form of technology. The society becomes more and more complex and, as it becomes more and more complex, the amount of resources that it needs to prop it up increases exponentially per capita until the region in which that civilisation existed is no longer able to sustain itself.

Part of our thinking must be not how we displace the problem and ultimately exacerbate it through moving to more and more complexity not only in our technologies but also in our modes of social organisation. You only have to look at the law or legislation to see how it becomes more and more complex until it becomes incredibly inefficient. This is the real challenge. We are becoming incredibly technically inefficient through moving always towards higher and higher levels of complexity in our social and technological organisation. Part of the thinking that needs to be brought to bear here is how to actually move to less complexity and to simpler ways and systems of doing things rather than more complex ones. Thank you.

CHAIR—Thank you, Richard, and thank you, Manfred. We need to wrap it up. Thanks for your participation. Graham, thanks very much. We really appreciate all the effort you have put in.

Prof. Harris—Thank you.

[12.07 pm]

SCANLON, Mr Andrew, Environment and Sustainability Manager, Hydro Tasmania

WOOLFORD, Mrs Corinna Mercy, Renewable Energy Policy Analyst, Hydro Tasmania

CHAIR—Welcome. Although the committee does not require you to give evidence under oath, I should advise you that these hearings are formal proceedings of the parliament. Consequently, they warrant the same respect as proceedings of the House itself. It is customary to remind witnesses that giving false or misleading evidence is a serious matter and may be regarded as contempt of parliament. Would you like to make any opening remarks?

Mrs Woolford—Yes. Thank you very much for having us here today. Hydro Tasmania is Australia's largest renewable energy producer. We produce over 60 per cent of Australia's renewable energy. We are also internationally recognised for our expertise in sustainable hydro power production as well as wind energy production. We support the establishment of sustainability charter for Australia. We think it is a great idea. We really support the aim of it—to ensure that sustainability is an important part of all government, industry and community activities throughout Australia. We believe that the charter should build on existing policies and programs that increase sustainability and aim to enhance the ability of these to help us towards a sustainable future.

Our submission, as you would be aware, outlines our views on a number of the terms of reference. But in particular today we would like to highlight for you a couple of issues that we believe to be particularly important, the first being sustainability in the energy sector. The energy sector is vitally important to environmental, economic and social sustainability, particularly due to its contribution to climate change and the contribution that the stationary energy sector has on climate change due to greenhouse gas emissions.

In particular, we note that the cost of responding to the carbon abatement challenge is going to be far greater if we delay action as opposed to starting to put some activities in place now that are going to combat it. In light of this, you would be aware of the Prime Ministerial Task Group on Emissions Trading that is currently doing some work on an emissions trading scheme for Australia. We have made a submission to that, which we invite you to look at, which has a number of our views on these issues. We propose within it that a national strategy should be introduced that encourages early action to transition to a lower emissions economy and facilitates all possible emissions reduction activities, including alternative energy sources such as renewable energy, energy efficiency measures, carbon capture and storage, and the whole suite of current technologies and options that are available, rather than just focusing on one area.

A strategy should improve the financial certainty for new and existing zero- and low-emissions technologies. That includes investment in new assets as well as refurbishment of existing assets. For example, our hydro assets are zero-emissions technologies and if they are not sustained into the future then they may be replaced with a more emissions-intensive source such as gas. So it is important to incorporate the role of those in any future strategies we have.

In particular, mechanisms that we see are required for zero- and low-emissions technologies as part of a sustainable future include support for research and development, which could be by funding or special programs that are introduced, and market mechanisms that encourage the deployment of near deployable technologies. The mandatory renewable energy target is a prime example of how such a measure could work, and we believe that measure should be built upon. At the moment the renewable and sustainable energy industry is looking at the form of a future zero- and low-emissions technology measure that can be used to encourage renewables and a range of other technologies as well. We would be pleased to communicate that to you once the industry has come to a landing on that, because we are quite heavily involved with that process.

A third element of a national strategy should be a long-term carbon price signal in the form of a national emissions trading scheme. This will provide investment certainty. There is a lot of uncertainty for business at the moment as to questions like: 'Are we going to have to put in more low-emissions technologies?' or 'Is the government going to hold back?' I think an emissions trading scheme is viewed to be a key part of a sustainable energy future in Australia. I will hand over now to my colleague Andrew for a couple of other areas we would like to talk about.

Mr Scanlon—I will talk about our broad sustainability program in Hydro Tasmania and then focus particularly on the water issue. I will also mention cultural heritage issues, specifically around the power station that you visited yesterday at Lake Margaret.

We have a sustainability policy. We have a unique assessment process around our policy and we report publicly on our sustainability performance. That in part has been built off our involvement with the international hydropower industry. We have a large consulting business and we operate around the world. We are involved heavily with the International Hydropower Association, which is the major industry body for hydropower, and we have led the development of a sustainability guideline. I have brought some copies of it, if you want them. It is a guideline for sustainable hydropower and a protocol for assessing how sustainable a project is, be it an existing project or a new project. That is being rolled out around the hydropower industry at the moment. We have got a conference in Turkey in a month or so, and a large number of people coming and being trained in the use of these things.

The general message here is that the industry broadly is very keen to see that hydro power development, reservoir development and dam building are done in a sustainable way. We believe they can be. We want to discourage poor practice in two main areas. One area is in resettlement; there are some bad examples of that around the world. We believe that is a process that can be done well. It is always going to cause angst and difficulties but it can be done well. The other area is the environmental change that is associated with the development of a reservoir. There are lots of strategies around avoidance, mitigation and enhancement. We believe that can be done well; not in every instance—there are things that should be avoided. But we believe the industry is moving to try to get a much more consistent global high-standard performance in the construction of freshwater reservoirs and dams associated with hydro projects. That is the first point.

The assessment protocol that we have handed out has a scoring system that we actually use to build on our own sustainability policy and an assessment process on how we perform as an organisation. So we have a number of major points in our policy built from this but focused for our own business. We assess our performance. It is a score that rates from zero through to five,

five being about world's best practice and zero being very poor performance. We publish this every year. We rate ourselves across our nine sustainability policy points as around a 3½ sort of performer. We think we have lots of areas for improvement. In fact, the process is a driver for improvement in our business. We are very pleased with it and it has also won awards for its innovation—it is a new sort of process. That is the broad sustainability program for the hydro.

I thought I would talk about water. We are a very big water manager—I think in terms of volume we are the biggest in the country. We have 44 large dams and we have a major water management responsibility. In the process of doing that we have adopted a voluntary consultation process with the community. We have a thing called a water management review program where we go catchment by catchment, work with the community, find out the major issues and look at the environmental flow issues, the social, recreational and economic requirements and the other users. It is a multiple use resource. We are trying to engage with the community, then we are conducting a scientific program to research various aspects that are identified and then we have made voluntary adjustments. We did not want to be in a situation where we waited for a regulator to tell us what to do. We wanted to be in a situation where we could put our water management on a sustainable footing where the perception is the reality and where the community accept it as well as the scientists and regulators.

We have a process that has been happening over a period of time. It is happening in our two big catchments first. We are doing other work in other catchments that will then be rolled out into the same process in the future. We have made changes to the way in which we manage our lakes—a change in the level which we manage them at. We have made changes to the environmental flows. When we built our system, there were very few other people and other users. We have pretty sweeping powers in this state to develop and we took most of the water. We are in a situation now where we know more. We are doing these studies and we are returning some of the water to the environment and working with other users in terms of what they need. That process has been a good one, we think, and it has been one where we are voluntarily changing what we do with our water.

In terms of climate change and water and the drought that we are in at the moment, we have a very big aquatic environmental program. We have monitoring and unfortunately—I do not know whether you have seen any of it—we have a whole lot of lakes now that are really very low, so we have a big monitoring program to look at that. Looking into the future, we are doing more detailed climate modelling than is available through the normal processes so that we can predict what might be the circumstances for our state and for our water storages. Tasmania is probably in a more comfortable situation according to the modelling than other parts of Australia and other parts of the world.

The level of changes is predicted to be lower here. We are going to have drier summers and autumns and wetter winters over most of our catchments. One of our big catchments is going to be dry. So there is a slight net our way but more variability. That is the sort of information we have so far, but we are not comfortable with the modelling we have done so we are upping the ante and doing more modelling using more models. That is something we will be continually watching.

I think it is an interesting issue in terms of reservoirs and water management, though. The world generally is looking at more variability, more periods of drought, drier areas and less

water security as a result of climate change. The actual construction of reservoirs is and should be one of the options that people are seriously looking at in lots and lots of places. Hopefully, if those things are done, they will be done well in terms of good sustainability standards.

The other specific issue I wanted to mention was the Lake Margaret Power Station, which you visited. We have had a bit of an interesting time with the people on the west coast. We have a station that has been deemed to be unsafe by our engineers in terms of that pipeline. It is very old. It has served us well but it has passed its use-by date. We shut the pipeline down. We were going through consultation with the community, but there was angst in the community that we had not made a commitment to the future development of the station. There was also confusion about how we would redevelop it. I am not saying there was confusion for us necessarily, but we were still working on it and we had not communicated that very well with the local community.

The issue is compounded or complicated by the MRET scheme. The local community clearly wants us to restore the woodstave pipeline. That is a given. We will be doing that—not the one that is there but a new one. They want to keep the station operating as it is. It is a significant heritage piece. The best heritage value is if it continues to run as is. But the MRET scheme has rules in it around making sure that they are not funding refurbishing schemes but, rather, that they are funding new ones. To get full MRET for that scheme—and it really changes the economics if you do—we had to shut it down for three years, which is a bit of a waste. We had to spend 50 per cent of the value to classify it as a new station.

There is another issue that sits there. This is a high heritage value station. If you refurbish it and preserve the heritage value, that is certainly what the community wants there. But the MRET scheme provides an economic disincentive to do that—a very strong disincentive. We are of the view, along with the West Coast Council and others, that perhaps there ought to be some special exemptions in the MRET legislation around this—and these things are not common; there would be few things that would get the exemption—that allow the avoidance of those rules to preserve heritage values. That is a fairly specific request around Lake Margaret Power Station, but we think it is one that should be looked at.

CHAIR—Corinna mentioned that she had put a submission in on some form of carbon pricing.

Mrs Woolford—Yes—the prime ministerial task force—

CHAIR—Was this MRET exception part of that?

Mrs Woolford—No, I do not think we raised that specifically, more because it was seeking opinion on what kinds of measures are needed as well as an emissions trading scheme. We have raised it with the Commonwealth previously. We have not yet had a response, I do not think, back to us saying yes or no. If it has, it would have been a no, otherwise we would have perhaps been able to progress things. We are keen for this issue to be known more widely. It is a big issue. We are trying to do the right thing by keeping the power station going, but we want to do the right thing by the community and the heritage values there as well.

CHAIR—I found out about it only yesterday. I did not even know it existed. This is the problem. I did not know that there was an issue until now. So it is good that we learned that.

Ms HOARE—Corinna, you I think mentioned that you have 60 per cent of renewables in Australia. Which countries have a higher proportion of their total energy as hydro? Also, Andrew, you were talking earlier about being involved in an international forum for the better building of sustainable freshwater dams. I was wondering what the progress of that is and which countries that are benefiting from that. Can you expand a little bit more on that?

Mr Scanlon—Yes, it is the International Hydropower Association, which is an industry body. It has most of the world's hydro power companies, the hydro equipment suppliers and observers from the World Bank as well as governments and other bodies. So it is quite a large organisation. It is an industry representative organisation.

Globally, hydro power provides about 20 per cent of the world's electricity. It may be a bit less than that but it is close on. Some countries are largely hydro—I am talking about three-quarters plus. Canada, Brazil, Norway and a few other countries in Europe have significant percentages of hydro. We are small. There is us and then there is the Snowy, which is about half of our size, and that is it. There are a few other small ones. New Zealand is significant. Over half of its energy is hydro.

In terms of the adoption of this sustainability protocol and good practice, we are an industry association that promotes that amongst our members. Our members sign up to it, but it is a voluntary process. This picks up on the core values and strategic priorities of the World Commission on Dams. It does not adopt all of the guidelines in the WCD because they were actually not practical or implementable. The World Bank has also not adopted the WCD guidelines. We are essentially trying to drive good practice through the industry through a voluntary process in an industry association. The industry groups meet regularly for conferences. There is a lot of research that goes on in terms of environmental issues.

Ms HOARE—Have there been countries that used to build bad dams which are now building good dams?

Mr Scanlon—We think the improvement is happening—for sure. I am working on a World Bank project at the moment. It is part of Tasmania Hydro's consulting business in India. As to progress, it depends on where you are. The Indian projects are certainly studied well, but there are clearly implementation issues. You can write a nice environmental impact assessment but not necessarily have it properly implemented. These are issues that countries are working on.

I believe that in China the resettlement issues—and these are major issues in some of these Chinese projects—are being done quite well today. Certainly, there has been significant improvement over the last 20 years or so in the way that the Chinese government is involved in resettlement. For instance, with the Three Gorges project, I think 50 per cent of its costs were in resettlement. In all of these circumstances there are always difficulties and problems. I would have to say that I believe there is good progress. In Africa, funding arrangements are often such that European standards are built into the projects—not all projects, though.

Ms HOARE—Yesterday, when we were at the Woolnorth wind farm, we heard that Tasmania Hydro has a 50 per cent share in Roaring 40s. You would know that the Roaring 40s company is using its expertise in partnering with the Chinese company to be able to export good technology

and good expertise. Has Tasmania Hydro considered that option? You are already part of that in relation to the wind farms. Have you considered that option in relation to dam building?

Mr Scanlon—With our consulting business, we are actually not involved in building dams overseas but we are involved in providing consulting services in the process of dam-building projects. I mentioned one project in the Satluj Basin in the Himalayas in India. We are working for the World Bank on a project looking at optimising the development of that basin for hydro power and other water reservoir uses. That is a good practice project. It is about how you do it well and how you optimise your economic, social and environmental outcomes. We are involved in a range of projects like that, as a consultant though, in terms of dam building and reservoirs.

Our history is that we were more involved in that in the past. In recent years we have focused more on the big Hydro Tasmania development program, which mostly involved wind power, Basslink and more local consultancies. But we are now engaging much more internationally as well. So we were significantly present in South-East Asia, but we had less of a profile. We now have an expanding profile and we definitely want to be involved in good projects internationally.

Mr TICEHURST—You say that 60 per cent of Australia's renewable energy is produced by Hydro Tasmania. What proportion of Australia's energy is that?

Mr Scanlon—It is about nine per cent. The mandated renewables measure was initially meant to bring it up to about 12 per cent. But, as the economy grows and energy schemes are put in place, there is no big hydro to be built in Australia anymore. Hydro dominates renewables; it is big. The wind farm thing, which MRET encouraged, has dropped away a bit, and that is the next obvious thing that you would build. The MRET system was designed to bring in the most cost-effective renewables, and I think it was working quite well. The price has gone up again, so hopefully it will continue to work.

Mr TICEHURST—What proportion of your renewables is wind power?

Mr Scanlon—We have about 150 megawatts in the Woolnorth-Studland Bay complex and we have a couple of small wind farms on the islands. That 150 megawatts is about five or six per cent of our installed capacity—we have about 2½ thousand megawatts.

Mr TICEHURST—Was Woolnorth built by Hydro Tasmania and then split later?

Mrs Woolford—Yes, the initial stage of it was.

Mr TICEHURST—They told us there was a fair capital investment in buying the land. But buying land does nothing for renewable energy.

Mr Scanlon—No. I am not sure of the exact reasons for buying the land, but I presume there must have been good reasons.

Mr TICEHURST—You would certainly have control over what happens on the land but, from a business investment point of view, as a renewable energy project it does not add any value.

Mr Scanlon—And it is not the way we went with subsequent renewable energy projects.

Mr TICEHURST—Hydro is the cleanest power of all. You said there is no opportunity to expand on hydro power in Tasmania.

Mr Scanlon—The opportunities are not big. The decision was made not to develop in the World Heritage area. There was a compromise between wild rivers and development. There is obviously the potential to build in the World Heritage area if you really want to, but I think that decision is fairly clear and we have no intention of questioning or challenging it. In and around Tasmania there are opportunities for mini hydros associated with water supply systems—we have put a few of these in our own system—and there are probably significant opportunities for more water reservoir developments for our agricultural industry. Mini hydro associated with that is certainly an option that would always be looked at, but it would not be big.

Mr TICEHURST—Big hydro is certainly a very efficient producer of CO₂-free energy.

Mr Scanlon—Yes. It is a cornerstone of our electricity system. It provides all these other electricity services such as peaking, black start, frequency control and those sorts of things. It is the premium electricity product.

Mr TICEHURST—Do you think we should revisit those decisions not to go ahead?

Mr Scanlon—Personally, I do not think so. You should have a compromise between dams and wilderness. I am glad the Franklin dam was not built. That is my view, though.

Mr TICEHURST—Have you also looked at the possibility of producing hydrogen as a fuel by electrolysis?

Mrs Woolford—I am not a technical expert, but we have in our business development group a team looking at producing hydrogen from renewable energy. For example, if we are importing power through Basslink we might not need to run wind turbines for energy in Tasmania, but we have been looking at whether we can still run wind turbines and store their energy as a hydrogen source and use it later on. I am not sure of the exact technology—whether it be a fuel cell or what. We can certainly provide you with that information if that is something that you are interested in. We have a partnership with the University of Tasmania to look at getting hydrogen incorporated into transport systems as an initial type of project.

Mr TICEHURST—That is a good application because generally wind farms are so far from the grid that the cost of linking them to the grid is huge. A 110 kilowatt line to Stanley has been put in, but then you need \$40 million to go from Stanley to Burnie to get a major part of that power into the grid. But if you are producing hydrogen in that area then you are shipping something that has stored value.

Mrs Woolford—That is right.

Mr Scanlon—Another big advantage for hydro is that, when you have a big hydro system, wind is much easier to develop. We have storage in hydro that allows us to turn the taps up when the wind is not blowing. When the wind is blowing, it is basically like a run-of-river hydro

system: use it or lose it. If the wind is blowing, it is on the grid; if the wind is not blowing, the big storage dams are turned on and you can manage your electricity supply.

Mr TICEHURST—But usually you cannot use the full capacity of your wind system because you cannot get the power into the grid.

Mr Scanlon—The transmission system is a big issue for wind farm development. It is a significant economic driver in terms of where you can build them. We built one in South Australia, but others have been too far away. The costs stop it.

Mr JENKINS—Your written submission is a good overview of what the inquiry is about, so we have been able to ask some questions that are outside the inquiry topic. Hydro Tasmania has run the state of Tasmania for some considerable time and I am happy that you now have an aspiration to rule the globe! What impediments are there for you to venture into international markets? The rationale for the joint venture with the Chinese has been well explained to us, but I am a little concerned that there are impediments, because of national policy, that do not give you an advantage in going into developing markets on your own. Would the CDM, the clean development mechanism under Kyoto, be something that would enable you to pursue those markets?

Mrs Woolford—Being able to access those markets would make it a far more attractive option for us. As you said, you have heard the Roaring 40s story. We were just not able to do things unless we started establishing offices in China or India or wherever to participate in those mechanisms. In terms of hydro development, not being involved in the dam building and not having signed off on Kyoto or similar policy positions does not really harm us. But if we wanted to expand ourselves and be active in other countries—for example, New Zealand—we cannot put a project there and get CDM credit for it or even do anything in Australia unless Australia has ratified the Kyoto protocol. There would be opportunities for us if the Australian government were more engaged in these areas.

We see that the AP6 process could provide some opportunities for Australian companies. To date that process is more to provide funding for specific projects, but if there was a way that that could create an engagement between countries in the Asia-Pacific region, then that could enable us to do projects in Australia and get a benefit from international companies interested in investing. The more engaged we are internationally and the more processes we can help our companies to be involved with is certainly going to be a better thing not only for Hydro Tasmania but also for all the other companies that are trying to invest in renewable energy and low emissions technology.

Mr JENKINS—What about things like Mr Ticehurst's question about electrolysis and the like—the ability to have that international cooperation that might give it a bit more momentum?

Mrs Woolford—There is a lot of international interest in these areas. I think the thing holding us back in Australia is the funding issue—having the money to go to these companies and approach them with a project that is of a big enough scale so that they say: 'Yes; that's a really attractive offer. We'd like to come and participate in that.' Until the costs come down, it is still going to be quite an expensive process. Again, I am not a technical expert—not a big expert in

this area—but certainly I can talk to the right people in the hydro who are, and get a response from them, if that is helpful to you.

Mr JENKINS—SMEC, because of its nature and its offshoots, has always been big in development projects sponsored by Australia overseas. It is selling its particular professional expertise. I was interested when we were at the wind farm or wind park to look at just one of those turbines. If you put it out on a Pacific island, it would run the whole island. It conjures up how we make that connect to offer that. It is something where your offshoot, Roaring 40s, is developing expertise and then making some contribution to developing nations, especially small island states. Do you have an arm that looks at that?

Mr Scanlon—We have a business development arm looking at business opportunities for our core business. We have a consulting business that looks at consulting opportunities. That involves working with things that are funded by other sources and where there is direct investment going in as well. As Corinna said, our consulting business has not been in the market of spending money on projects and owning projects; it has been providing consulting services largely.

It is a different market that Roaring 40s are looking at, though. They are looking at renewable energy markets in terms of investment and having a generation facility at the end of that that they have a share in. So we have different parts of our business that are certainly exploring and looking at different opportunities. Our business development would be looking at those sorts of things, but I cannot see anything on the horizon in that particular example.

Mr JENKINS—I thought that Lake Margaret was a wonderful, hidden gem, especially being so close to Queenstown. I wish you all the luck in making that obvious balance that you have to make between economic imperatives and the use of a valuable piece of infrastructure as against your acknowledging the need to preserve something that is pretty unique in the context of Australian history.

Mr Scanlon—It cannot be redeveloped quite economically on its own. It is marginal economics. The thing that makes it economic is the MRET. The MRET has a signal that stops us doing the right thing by the heritage value. There is very little difference between revamping the old station and building a new one. There is a little bit of energy efficiency gain, but there is not much. You can almost get the same renewable energy package for less cost, in a sense, in terms of having the work done but less reward in terms of the MRET and the market.

Ms HOARE—Have you asked the government the questions that you need to ask the minister?

Mr Scanlon—We have.

Mrs Woolford—I am sure we have. I have not been involved with that personally.

Mr Scanlon—We have made a submission.

Ms HOARE—Would we be able to have a copy of that submission to see whether there is any way our committee can support that?

Mr Scanlon—The West Coast Council have been active, as well, and they have lobbied members of federal parliament on this.

Mr TICEHURST—What was the MRET initiative? It is an existing power station but it has existed for many, many years. Isn't that essentially a maintenance issue? If you wanted to make a longer term thing, you might put in a steel pipe but, to preserve the heritage, you would redo it with the wooden pipe, which is commendable. We understood that the cost of doing it in the old way is probably not much more expensive than, say, replacing it with a steel pipe. So where does the MRET initiative come in?

CHAIR—I think it is more to do with the power station down the bottom.

Mr Scanlon—This station is at the end of its life and needs significant money spent on it. It needs a new pipeline and to be refurbished with machines at the bottom, or a new station needs to be built. When you look at the economics of that you find there is a certain cost in doing all that. The economics are very marginal. It is a very marginal thing. But we now live in an MRET world where there is a secondary market, and that market kicks a lot of refurbishment of hydro projects over the line. It allows refurbishment of hydro projects. You get extra energy out and, for that extra energy, you get an MRET certificate and you sell that. That can make a refurbishment project economic. That was the purpose of having a baseline in the MRET.

Also in the MRET is an antigaming provision that says that, to get full MRETs, it has to be a new station. We have a definition of 'new' for you, which is: 'Shut it for three years and fifty per cent of the cost of the original project is spent again.' So that is the thing that changes the proposal for Lake Margaret. The station is at the end of its life. It is very marginal, and we have to redevelop it. To redevelop it economically under the MRET rule and to make it a goer, we have to shut it for three years, which is crazy in itself, and then we have to spend extra money on it, which means we have to build a new station, and therefore we lose the heritage value. If we shut it for three years and lose the power for three years—or for 18 months or whatever the time would be that we have missed out on—we would lose the extra heritage value. We would still keep a lot of heritage value but we would not have the heritage value of an operating, old station.

Mr TICEHURST—Isn't the heritage value associated with those generators?

Mr Scanlon—That is right.

Mr TICEHURST—So if you take them out and put new generators in, what have you done to your heritage value?

Mr Scanlon—You have reduced your heritage value. We would not take them out; we would leave them there as a sort of static museum. We would probably have a smoke and mirror arrangement where we could spin one of the things and let tourists come in and out. But it is a static museum. It would have less heritage value in it, and we would build a new station right next door to it—one machine. We would get a little more efficiency out of it but not much at all. The efficiency is constrained by the system that feeds the water.

Ms HOARE—Why not keep the old machines running as a completely heritagéd—

Mr Scanlon—Because it is marginally economic; it is not really economic to do it. We need the MRET, and if we keep them running—

Ms HOARE—So if you get the MRET you could keep it going with the—

Mr Scanlon—If we get the MRET, it is a no brainer. It is economic, to my understanding; I am not the economic analyst.

Mr TICEHURST—It comes down to cost. What you are saying is that it is whether the Tasmanian government pays the cost or whether the federal government pays the cost.

Mr Scanlon—The federal government does not pay the cost. The MRETs are paid for by the electricity consumers around Australia. It is of no cost to the taxpayer. It is a cost to the electricity consumers, but it is spread right across the whole country. It is very small.

CHAIR—You mentioned that you put a submission in to the prime ministerial task force. Did you put a price on carbon in your submission—for example, so much a tonne of CO₂ or didn't you get so specific?

Mrs Woolford—No. I guess the closest we came to talking about that—I think we did in that submission; we may have in a different submission—would be to say that we see that, from a political and community point of view, there is likely to be a low cost to start with, just because that is the way a scheme has to be designed.

The point we are keen to make is that a lot of these alternative zero- and low-emission technologies are not going to get up and be part of the solution with an emissions trading scheme alone because the initial price is likely to be fairly low—maybe \$10 per tonne of carbon. To get other technologies to be viable under such a scheme you are going to need a pretty high carbon price. That leads into our views that it is going to be necessary to have an emissions trading scheme and other measures, whether it is an expanded MRET or another mandatory low emissions target or similar. While we have not quoted any actual carbon price, we can see that it is going to be pretty low to start with unless some pretty stringent caps are set on emissions or the penalty is sufficiently high.

CHAIR—You also mentioned R&D earlier. What do you mainly spend the R&D money on and how much would you spend—on what types of things?

Mrs Woolford—I could not tell you a figure, but the types of things that you want to be able to spend it on are perhaps doing small pilot projects to test a new concept. For example, on King Island we have a wind turbine with a vanadium redox battery set up as a new technology. To make that a project that we could invest in, I believe we received funding for that under one of the federal programs. We probably would not have done it otherwise, unless there was sufficient incentive to do it. For example, we looked at the LETDF program to see whether there might be opportunities for us to get funding under that. Programs like that are really great because there is the opportunity to get quite a large chunk of money, which can really help a test project or to get a concept tested to see if it is viable. But, as a company trying to raise the funds on your own to do that, it is very difficult with the high cost of technology at the moment.

CHAIR—As I come from Western Australia, I listen to Wilson Tuckey and Barry Haase, my two great friends. If I did not ask you about getting into tidal power, I could not go home and face them! I tell you: every time I go to a party room meeting, tidal power comes up with these guys. Have you been involved in any tidal type efforts in terms of construction or advice?

Mr Scanlon—Some of my staff in the consulting area were involved in reviewing the tidal project in the Kimberleys. We have also, as I understand it—I am not close to either of these projects—worked on a Korean tidal power project. That was at the consulting advice level, environmental engineering advice.

Mrs Woolford—In terms of us getting involved in tidal power, we have maintained a watching brief. We have not decided it is something we want to get into at this stage.

Mr TICEHURST—It is a case of providing hydrogen electrolysis on the site.

Mrs Woolford—That is exactly right.

CHAIR—You have listened well in that party room, Ken. I have heard that 20 times from either Tuckey or Haase.

Mr TICEHURST—Unless we have our own transmission lines, we can forget it. There are the same problems, but a lot of them are worse because it is further and further away. If you are going to create hydrogen using electrolysis, you have all the means there. That makes sense.

CHAIR—You say you go to national and international conferences. The Three Gorges construction project has been going for 10 years or something like that, hasn't it?

Mr Scanlon—It has been built over a long period of time. It is a huge project. It is not quite fully completed. I was there two years ago.

CHAIR—Have you seen it?

Mr Scanlon—Yes.

CHAIR—The Chinese government were not too keen on letting us go to see it at the time we wanted to have a look at it, but that was a few years ago. It must be one of the world's biggest hydro projects, is it?

Mr Scanlon—It is almost one of the world's biggest construction projects, if not the biggest. It is easily the biggest electricity project on the planet. It is 18,000 megawatts. In the whole of Tasmania we have 29 hydro stations of 2½ thousand megawatts. Hydro power is its second purpose; it was built for flood control. They simply built on the Yangtze to reduce the flood control problem: floods kill lots of people very regularly all the way down the Yangtze River. It is an amazing thing. I was there when the dam was half-completed. There was about a 40-metre lift across half of it still to be built. You went into the powerhouse; on one side it was complete. Obviously they are operating under a much reduced head, but they are still generating thousands of megawatts of power. It is just a great big river coming off the Himalayas. It is a huge catchment area.

Mr TICEHURST—A huge source of water.

Mr Scanlon—Had to move 1.2 million people, though.

Mr TICEHURST—In their system you can do it very easily.

Mr Scanlon—Yes. It is the only system where you could do that, I think.

CHAIR—Thank you very much.

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

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

Committee adjourned at 12.55 pm