Carbon Emissions: subsidies, incentives or taxes – what makes effective policy?

Chair:
Adam Morton

Speakers:
Prof John Daley
Mr Tristan Edis

Panel:
Prof Robin Batterham AO
Mr Roger Beale AO
Hon Greg Hunt MP
Senator Christine Milne
Mr Matthew Warren

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Transcript

Australian governments, both State and Federal, have tried hundreds of policies and programs over the past decade to reduce carbon emissions in the energy sector. A soon to be released study by Grattan Institute investigated their impact and identified the patterns. This seminar featured Grattan Institute authors, energy policy experts, and politicians discussing what lessons we can learn for Australian policy. What programs are worth keeping, and what programs should be set up, with or without the carbon price currently proposed by the Federal Government?

Speakers: **Prof John Daley, CEO, Grattan Institute**
Mr Tristan Edis, Research Fellow – Energy, Grattan Institute

Chair: **Mr Adam Morton, Environment Writer, The Age**

Panel: **Prof Robin Batterham AO, University of Melbourne**
Mr Roger Beale AO, former Secretary of Commonwealth Department of Environment (1996 – 2004)
Hon Greg Hunt MP, Liberal Party of Australia
Senator Christine Milne, Australian Greens
Mr Matthew Warren, CEO, Clean Energy Council

AUDIO: This is a podcast from Grattan Institute, www.grattan.edu.au.

SANDRA: My name is Sandra Kentish. I'm the Deputy Director of the Melbourne Energy Institute. I'd like to welcome you here tonight to the first of our Energy Future seminars for the year. This is a particularly special seminar because it's in fact a joint seminar, presented by the Grattan Institute in conjunction with the Melbourne Energy Institute. Before I start, or before we start, I'd just like to mention that the proceedings will be recorded and will be available on the Energy Institute website. Without further ado, I'll hand over to our master of ceremonies for the evening who many of you will know, Adam Morton, who's environmental writer … environmental reporter for The Age newspaper. Thank you, Adam.

ADAM: Welcome, everyone. Can you hear me okay? I'm still getting used to this headset. Hopefully tonight we're going to shed a bit of light on a subject that … on the policy response to the issue that has variously been described as the biggest political, economic environmental, security and, yes, moral challenge that's facing society. Climate change is, of course, shaping up as arguably the biggest issue in this federal parliamentary term and an extraordinary amount of energy is being spent discussing it, sometimes, some would say, with little enlightening effect. But we're hoping to address that tonight with a preview of a Grattan Institute report that's going to be released in the coming days, headed *Carbon Emissions: subsidies, incentives or taxes, what makes effective policy?* And we're going to hear about this from the Grattan Institute Chief Executive Officer, John Daley, and the Energy Research Fellow, Tristan Edis. Now that will be followed by a panel discussion. We have five panellists who are, in alphabetical order, Professor Robin Batterham AO, the University of Melbourne's Kernot Professor of Engineering and a former Australian Chief Scientist. Roger Beale AO, former Secretary of the Commonwealth Department of Environment and a member of the Federal Government's Climate Change Commission. Greg Hunt, who I understand is on his way, who is the Coalition's Spokesman on Climate Action, Environment and Heritage. Christine Milne, the Greens Deputy Leader and Climate Change Spokeswoman; and Matthew Warren, the Chief Executive Officer of the Clean Energy Council. Each will give an answer to a prepared question and then will take questions from the floor. It's going to go for about two hours tonight, so settle in and we'll start by asking John up to make his presentation.

JOHN: Thank you very much and thank you for the opportunity to be here, and thank you all very much for coming. We've entitled tonight and its presentation, Learning the Hard Way. For the hard core economists amongst you, I regret to tell you that you are going to be disappointed. You are not going to learn any extraordinary insights into economics tonight.

What we are going to talk about is in many ways extraordinarily orthodox. But what is perhaps a little different is that we are looking at the history of Australia's attempts to reduce emissions, and I'm afraid it is a very sorry history and in summary we have done it the hard way. We have learned a lot of lessons from experience which we probably could have guessed at, and I guess the so what for where Australia goes from here is to hope that in the future we don't continue to learn the hard way, but we start to get serious about reducing Australia's carbon emissions by doing the things that are sensible and relatively easy and relatively less expensive.

The research project that we have underway at Grattan Institute has reviewed some 300 different policies in federal and state governments over the last 15 years, all of which have been dedicated one way or another to reducing Australia's carbon emissions. And we've been looking for the patterns of what does, and all too often does not work. We've analysed this using a framework which accounts for something like 80% of the actual reductions, apart from land use change. And we'll be using this framework over the rest of this evening so it might be helpful just to kind of go through it very briefly.

We've talked about market based measures. So things that one way or another provide a carrot or a stick to reduce emissions. So they might be things like a carbon tax which says if you emit a tonne of carbon then you will pay say $25/tonne. They might be things like a cap and trade scheme which says if you emit a tonne of carbon, you have to buy a permit, there's a limited number of permits and therefore an auction process effectively determines how much that will cost you. It might be things like a renewable energy target where we say you have to, one way or another, go and purchase a certain number of tonnes of reduced carbon, find people who've done things that reduce emissions, we'll give them a certificate to prove that that's what they've done and you've got to go and buy those certificates. There's a number of different ways that you can have market mechanisms. What they all have in common is that they're relatively open about how you go about reducing emissions, but they all target the fact that you have indeed reduced emissions one way or another, and you get paid for delivery.

Then there's grant tendering. That's essentially where government says we hope that the following kinds of actions will reduce emissions. We invite people to propose various kinds of projects, they're going to do this. We will pick the best projects and we will then pay you to actually conduct that project so usually the payment is through the life of the project. Then there's rebates. These are things that we as consumers are perhaps a little bit more familiar with. Things where the government undertakes to make a payment to anyone who does a particular action. So anyone who puts a solar panel on their roof, anyone who puts in a certain kind of water heater, and so on. And you get paid for taking that action irrespective of whether or not it actually has an impact on emissions.

And then finally we have a series of energy efficiency standards. These are a little bit different from the others in the sense that they don't involve money passing over the table. And these are things where government essentially requires certain standards for devices. So for example, you are no longer allowed to sell in Australia a television with a standby on it that consumes more than a certain amount of power per hour whilst it's on standby. And as we'll see a bit later, there are in fact a huge number of regulations like that. And when we've looked at those measures, we've assessed them against four criteria. Firstly, are they scalable? Are they big enough that we care. As we will see, Australia's even very minimal reduction target that we've committed to publicly is quite substantial ask. So something that reduces a huge program that in total reduces our emissions by say only a million tonnes is nice, but it's not going to count in the overall scheme of the task.

Secondly we're looking for things that will deliver with speed. There are many things Australia could do that would have an impact over a hundred years and doubtless we should look at doing them. But we have a bunch of targets for 2020. Those are real targets. They matter. Starting the economy to move in this direction matters. And so we're looking for measures which will impact by 2020. Then we're looking at cost. One way or another, all of this is going to cost money. There is no easy road to carbon emissions. It is not possible to reduce a country's carbon emissions without it costing anything. It's not going to happen. So the question is, how can we do it so that it is as pain free as possible whilst accepting that it is going to cost us some pain. And so we've assessed these measures, these past measures, by asking what was the

price, what was the cost of delivering a reduction in CO_2. And just so I give you a sense of scale, the carbon trading scheme or emissions reduction scheme the government is talking about will deliver emissions reductions at around about $25-$35 a tonne. That's the general expectation from Treasury's modelling. In general, we've said anything which delivers reductions at under $20 a tonne is a really good idea. Anything which delivers it at under $50 a tonne is at least worth having a look at. Anything which delivers it at over $50/tonne is starting to get expensive. Anything over $100/tonne is really expensive and we will talk about a number of measures which have delivered at three or four hundred dollars a tonne which of course puts them into sort of NBN and BER territory.

So, and of course you have to look at both what is the cost to the government budget and then what is the impact on individual consumers because these measures will impact differently. Some things cost the government money, some things effectively cost us as individual consumers or industry.

And then finally, we're looking for things that are reasonably certain of delivering. Putting a lot of money into nuclear fusion might well seem a good idea, if it works it will be tremendous, it will solve all of our energy problems. But nuclear fusion has been about 20 years from delivery for the last 50 and it's still 20 years from delivery. So that's not the kind of thing we're looking for. We're looking for things where there's a pretty good chance they're going to deliver sometime soon.

In terms of the scale of the targets and the scale of where we are as a country, the orange line behind me is essentially the record of Australia's emissions over the last 20 years. As you can see, roughly speaking it went up. It dropped over the last two years with the global recession, that's actually a common pattern across the world and indeed it's been a much bigger drop in Europe. And then, assuming that economic growth continues, and taking into account all of the government measures that are in place already, but not those which are still the glimmer in Parliamentarians' eyes such as the CPRS that's been under discussion or its various evolutions, as you can see Australian emissions will continue to go up and go up quite substantially. The target that has been agreed already, unconditionally by the ALP, by the Liberal Party, by the Greens, the target that everyone agrees is an absolute bare minimum, it's a target which Australia has committed to publicly in various international fora, is to reduce our emissions 5% below the 2000 level and that's the dotted red line you can see there. Now many people suggest that that is a grossly inadequate target both given global warming and given the fact that Australia starts with a much worse position than many other places. We're not going to talk about that tonight. That may well be true. Let's just worry about whether we've got a fighting chance of getting to that 5% below 2000 level. To do that, we would need to reduce Australia's emissions by about 160 million tonnes per year in 2020. So just hang onto that, 160 million tonnes number, it's quite a big number, and that's the number that we want to assess all of these policies against.

In terms of Australia's task, it's worth remembering that our task at least should be substantially bigger than many other countries. This is the largest 19 economies in the OECD in terms of their GDP. And this is the emissions intensity of their electricity. So by that we mean how many tonnes of CO_2 are produced for each megawatt hour of electricity that is produced in that country. As you can see, Australia produces about 0.9 tonnes of CO_2 for every 900 kilograms, for every megawatt hour of electricity that we put onto the grid. As you can see, we are somewhat distantly followed by that well known successful economy, Greece, and then that recidivist climate change nation, the United States comes after that. And then it kind of tails off, and as you can see there are a number of countries that have electricity emissions intensity under half of Australia's. So, and many of these are OECD economies that aren't doing too badly. So it's certainly possible to have a very successful economy which produces far less CO_2 per tonne … sorry, far less CO_2 per megawatt hour of electricity. And to give you some idea of the scale of this, the average household consumes about seven megawatt hours of electricity per year. So the average Australian household is producing, just from its electricity, in the order of 6.5 tonnes of CO_2 per year. So that gives you an idea of the scale of the task and we have to reduce that by 160 million per year by 2020.

So what did we find? I've put up here the two fundamental criteria. Firstly, on the left the abatement per year. How much have all of these schemes that we've look at actually reduced emissions in 2010, and then what's the expectation for 2020? And then on the right hand side, what has been the cost per tonne of CO_2 reduced? Now these things are ranges and you'll see I've kind of divided it into conservatives and what it might be. The range doesn't actually matter that much, as you can see the pattern's pretty obvious. And in terms of abatement, as I said we've looked at 2010 and then we've looked at the projections for 2020. Some of the 2020 projections have a bit of if and maybe and perhaps in them, but nevertheless that's the official estimates that we could get our hands on. And we've divided it down the page with market measures, grants, rebates and efficiencies savings and we've … efficiency measures and we've put in the major schemes that have run over the last 15 years.

Now the overall pattern, as you can see, is as follows. The market measures have, by and large, delivered reasonably substantial and are expected to deliver even more abatement per year. So the renewable energy target is already delivering at around about eight megatons of … sorry, eight million tonnes of CO_2 per year, and it's expected to kind of move up to about 30 million tonnes over the next decade, and you can see the numbers for the other schemes there. And they've done so at not outrageous prices, so they've done so at somewhere between $30 and $60-$70/tonne depending on exactly what year it was and depending on who you believe and depending on exactly how these things flow through. So they've delivered substantial reductions. If you think about that renewable energy target, G-gas and gas electricity, if we believe those numbers for 2020, they will be delivering about 50-odd tonnes between them. That's about a third of what we need in 2020 although we of course need that whole 160, that third has already been counted in what is expected for Australia. Then we have a series of grants. As you can see, with the exception of G-Gap, it's very hard to see anything. There are in fact numbers on all of those. It's just most of them you can't see, because they're very small. By and large the grant schemes have not delivered substantial reductions in CO_2. Some of them have delivered at reasonable cost, but many of them have been quite expensive.

Then we come to the rebates. Things we're all actually quite familiar with, the insulation rebates, solar panels, water heaters. As you can see, the abatement per year is sufficiently small that those at the back are probably struggling to see anything. On the other hand you're probably not struggling to see these big things on the right hand side. They've cost us somewhere between $200 and $400/tonne which is quite expensive, and perhaps not the best use of our money. And we'll come back to seeing that in a bit more detail in a moment. And then the energy efficiency schemes, the various regulatory standards have delivered quite substantial reductions already in the region of about 15 million tonnes per year already, and expected to be substantially more than that over the next decade. And by and large at negative costs. They've actually saved householder's money. That's because most consumers tend to make quite short run decisions about what they buy. They tend to go for things that have cheap … that are cheap up front but which cost them more to run. And the advantage of these regulatory standards is that they essentially impose standards around cost to run, make it much … when you go out and just randomly buy a computer or a fridge or whatever these days, because of the regulatory standards, it's almost certain that that fridge or whatever it is will run at substantially lower cost than a fridge you bought 10 or 15 years ago.

So that's the overview of where we're going. And in a nutshell, the market measures have delivered substantial abatement at reasonable prices. The grants have delivered very little abatement at variable prices. Rebates have been the worst of all possible worlds. They've delivered almost no abatement at extremely expensive prices. And the efficiency standards have been a terrific thing. They've delivered good abatement at effectively negative cost. The catch, as we will see, is that there's just not enough of them and they're quite slow which means that we're not going to get all the way to 160 million tonnes just doing energy efficiency things. So that's the overview and I'd now like to hand over to Tristan Edis who's done most of the work on this project, to take us through a little bit more of the detail on each of those measures.

TRISTAN: Can you all hear me? Is it coming through the speaker? Yes? You can hear me or you can't? Okay. Put your hand up if you can hear me at the back. Good. Alright, great. Thanks very much for coming along. So, this … what we've looked at is three of what we've called market based measures. These measures have been in place, the renewable energy target

which is called MRET, was put in place in 2001 is when it began. The New South Wales Greenhouse Gas Abatement Scheme which is a … it is actually the world's first carbon trading scheme that was implemented by the New South Wales government in 2003. And then the Queensland Gas Electricity Target which was introduced in 2005.

Now, why are these relevant to our debate today? Because what they are is essentially parallels of a carbon trading scheme. The government has set a binding target on a number of companies and said to those companies, you must achieve this target. If you don't achieve the target you will pay a fine. So that gives them a good incentive to want to achieve the target. The second thing is that it allows people to trade amongst themselves in units of compliance towards that target. So megawatt hours of renewable electricity or tonnes of CO_2 abatement, or megawatt hours of electricity coming from a gas fired power station. So the critical feature there is one, there is a binding target. Someone is obligated to achieve it, and they are allowed to trade amongst themselves such that essentially if you're an obligated company, what are you going to do. You're going to find the lowest cost certificate you can get your hands on and try and comply with that target at lowest cost. That's the incentive for you. So that's the difference with market based measures versus some of the others is that it is a binding target, people are allowed to trade amongst themselves, they have a choice about what sort of projects they might want to undertake. In fact they don't have to undertake the targets, they don't even have to undertake the projects themselves, they can go let someone else do it and then they'll go and buy the certificates off them. So the key thing is that it provides certainty in that government must define the target up front, they define the rules and the regulations around what is a unit that complies towards it. Typically these schemes have very long timeframes so the renewable energy target is out 'til 2020, so we have some kind of clarity about what the rules are going to be on an ongoing basis. And we devolve the decisions to individual businesses about how they're going to achieve that target. The government doesn't get involved in exactly what projects are going to produce what certificates other than obviously the renewable energy target only supports renewable energy. The New South Wales Greenhouse Gas Abatement Scheme supports a broad range of options, however, some of those have to be in New South Wales, they can't be anywhere else. Nothing in Western Australia is allowed to qualify for the scheme, and the Queensland Gas Electricity Target, they're only allowed to do gas projects but they can get their gas from … in fact they could have got their gas from Papua New Guinea and that's what they thought they were going to do, but they ended up getting their gas from a whole heap of coal seam methane. They thought they were going to import gas, now they're going to export gas. So that's the difference is there's a high degree of flexibility. Now what we see here is a consistent pattern through all three of these schemes. The yellow is what the government set as the requirement. The orange is what actually got delivered. In every single case the market delivered faster and delivered a larger amount than what was actually even required by government. So the thing is while they might cost a bit more than some of the other measures we're looking at, they have a consistent confidence that they deliver on time, in fact ahead of time, and in fact they over deliver. And that's the key distinguishing feature when we're thinking about okay, we've got to scale this up to 160 million tonnes.

Now, by contrast, if we look at grant tendering schemes. Now the way that these work is the government says I'm interested in getting something, as John explained, but the key thing is it's a tender for a promise. So what you're going to do is you're not going to proceed with the project obviously until you're sure you're going to get some money from the government or otherwise you do the project anyway. But you haven't done it yet, you haven't delivered, but the government's got to make their decision in advance before you construct that project. So it is fundamentally based on a tender which is a promise to deliver. It's not actually delivering. And what happens is the government, the red, they announce a very large scheme, it's got to have a few hundred million dollars involved to get your attention. And so one of them is a low emission technology demonstration fund, the other's the Greenhouse Gas Abatement Program, not Scheme. And the other one's the Energy Savings Fund. Each of these schemes, the government announced 750 million, 400 million, 200 million dollars that they were going to put towards funding projects that were going to reduce our greenhouse emissions and progress wonderful gee-whiz technology.

What actually happened after five years? That's the orange. That's the … that's what translated from that budget into actual operational projects delivering electricity and delivering abatement.

You can barely see it. That's what's happened. Then what's the pale yellow, is what they delivered after 10 years. That was what they could convert from that budget into actual operational projects. They awarded money to a lot more projects than that, but they ended up falling over. They … the tenders actually turned out, oh you know what, I can't deliver on what I promised. I'm going to struggle to deliver that. Oh, I thought this was going to happen, I thought the dollar was going to be at 70 cents and it ended up being at 60 cents and then I couldn't buy that gas, that gas engine from the US, it cost me a lot more. And, so the thing is everyone thinks they're going to do really, really well. The problem is that when it comes to reality, it's really tough, and the other thing is for government, it's not just a matter of lowest cost, they've got to be sure that that person is capable of delivering what they say they're going to deliver and they're not going to spend a whole heap of money in advance, constructing that project and it's not going to deliver. And that's actually a really tough ask for government to be able to understand what are in essence really complicated technologies, really complicated industries. They've got to understand not just the technology, they've got to understand the economics of those things so that they don't give them too much money or they don't fund them to do a project that they were going to do anyway, and then we don't end up any better off. So, what we see there is consistent under-delivery. And if you can't spend $400 million, and that's $400 million over several years, how are you going to deliver a billion dollar program which is the sort of volume that you would need, and you need a billion dollars every year for the next few years in order to get yourself 160 million tonnes.

Okay, rebates. Why so bad? Pretty simple: they're expensive. They're expensive to the budget, that's the important thing is this is taxpayers' money paying someone. Now those people might save money on their electricity bill as a consequence of installing that, but that's money that's got to come from some other tax payer. And at $200 to $400, we estimate that if you're paying $200 a tonne of CO_2 out of the budget, in order to meet 160 million tonnes, we need a budgetary fund of $320 billion. Okay, so I don't particularly think that that's a realistic way to go about it.

Energy Efficiency Standards. It's clearly worth doing. You look at the numbers, you say it's delivered large amounts for abatement and it's done it at an effective net zero cost or … or a saving, because consumers have ended up saving more money than it's cost them extra to buy that more efficient fridge than the one that they would have bought otherwise, or that more efficient lighting product. The issue is not about whether it's worthwhile or not, it's about the speed with which we can implement it. Now the 2020 targets that both sides of politics are committed to, and I'll correct John, the Greens aren't committed to that one, the 5%, they're committed to a deeper target than that. But it's unconditional. It doesn't matter what China does, doesn't matter what the US do, so we've got to deliver 160 million tonnes within 10 years. It takes quite some time in order to implement a new standard. For all of these different products that's what it actually took to implement those standards, averaged across all of those different products that are now regulated. And then the other issue is it's then got to flow through to the existing stock. So the existing stock, well you bought your fridge 20 years ago, it didn't have a standard applying to it, an energy efficiency standard, so you've got to get rid of all of that old junk in order to see this thing flow through. And if, for example, residential buildings, we don't scrap our buildings very often. They last a long time. So we've got great energy efficient … well, some might say not that tough, but we've got energy efficiency standards that are going to dramatically improve the energy efficiency of new homes. The problem is it's going to take us well over 50 years before that flows through the stock. So in terms of getting us to our targets quickly, they will find that quite challenging for them to do all of the heavy lifting or even the predominant amount of the lifting. So, that's it, I'll pass it back to John.

JOHN: Thank you. Thank you, Tristan. I would like to point out that although we kind of put up graphs like that that are kind of, you know, nice summaries, there is actually a huge amount of work, burrowing through budget papers, obscure government publications, all sorts of things, to actually put all of those numbers together and Tristan has been a terrier finding all of that stuff so that we could add it all up.

Now in terms of just understanding how these things were classed I … I thought (mic fault). Hello? How all those things come together … it really doesn't love me … let me look at this across the page. We've compared market measures, grants and rebates. The basis for the

claim is different. The fundamentals of a market measure is the government pays you per tonne or relieves you of an obligation to pay per tonne of actual delivery. Grants the government pays during construction, rebates it pays per activity completed. For eligibility, everybody is liable under market measures, anyone can claim. So the government doesn't specify in advance who it is that can get the money. By definition in grants, only the person who wins the tender can wind up getting the government's money. And under rebates, usually it's consumers and small business that can claim that. In terms of the sources of abatement, and this is one of the real issues with market measures, it is very, very hard to predict where the abatement is going to come from. Markets are inherently quite unpredictable creatures. We as a species tend to be extremely innovative and the whole point about innovation is that you can't predict it. And if you look at the history of many of the market based measures we have seen, the emissions reductions have turned out to come from places all very unexpected. So for example if you look at the renewable energy target, when that scheme was set up, all of the original government forecasts were that something like half of the emissions reductions would come from essentially burning sugar cane waste. In the event, only about 5% of the reductions came from burning sugar cane waste and most of it came from solar hot water heaters and from wind farms, because they turned out to be cheaper than we had expected, people were clever at innovating on wind energy than we'd expected. And on the other hand it all turned out to be a little bit harder on sugar cane than everyone had hoped. That's a very consistent pattern with these market based schemes around the world. It's hard to predict. But the good news is people tend to innovate at costs lower than we hoped. So they tend to over-deliver. By definition grants deliver according to the thing that's been chosen by the government, that's why governments like them because there's a ribbon they can cut, look here is big solar power station, I can tell you what it is, it's very concrete. But the problem of course is that it may turn out to be a lot more expensive or a lot harder than we predicted. And then finally of course rebates have the enormous advantage that they are something that has been nominated by the government, everybody can understand a solar PV panel, for example. The catch is it's much more expensive than is immediately obvious.

In terms of innovation, market measure inherently promote them, grant schemes may innovate but actually there's a bias in those kind of schemes for governments to pick stuff where they've got at least a reasonable degree of comfort that it's going to work. So that's actually something that someone's already done somewhere else. So in a funny way they don't actually promote that much innovation in the long run, and rebates by definition pick stuff that we already know about. And in terms of government involvements, the whole point of market based measures is that governments basically set the rules and get out of the way and let private enterprise figure out what's going to be the cheapest way of complying. Grants, governments have to set the criteria for the scheme in the first place, pick the tender and then actually stay very closely involved in terms of monitoring the person you are handing over public money to is in fact building what you thought they were going to build.

And then finally in terms of rebates, the government do need to stay involved because one of the problems is that rebates often wind up succeeding excessively in the sense that the take up is much higher than governments thought. Ironically you set one of these things up, the price of the actual device comes down, whether that's a solar panel or whatever it might be, so lots more consumers do it because they realise they're getting something almost for free, if not for less than free. But of course, as we've seen, often these things are delivering very little abatement and consequently the government suddenly discovers it's paying out billions of dollars for something that doesn't have that much actual impact.

In order to make this concrete, we thought we'd just finish by talking about the issue of soil carbon. This is in the news at the moment. Essentially the idea is that plants absorb CO_2, carbon dioxide. If that plant matter somehow gets captured in the soil and it … that CO_2 is not then broken down and released back into the atmosphere, that effectively reduces the amount of CO_2 in the atmosphere, which is a good thing. Lots of people support this, the government has announced a carbon farming initiative and now has draft legislation out. Ross Garnaut talked in favourable terms about looking for farming carbon offsets. The Liberal Party's policy, at the risk of stealing Greg's thunder, talks a lot about an emissions reduction fund for soil carbons. Everybody thinks that this may well be a terrific idea. The core question of course is will it work? And CSIRO's official verdict on this at the moment is essentially that the quantity and cost of soil

carbon storage is unclear. Let me translate that out of scientific speak into art speak, that means maybe. And that is a very good answer. It may well turn out to be a lot more expensive than we thought. It may well turn out that when you do this on a large scale, it delivers far less in the way of CO_2 emissions than we realised. It may well be that when we do this in practice, it turns out that it makes the land completely unsuitable for doing anything useful on, and it's not such a great idea. It may well be that the only places that we've really tried to do this in fact were particular climates and there's not that much land in Australia that in fact has that particular climate. The point is we don't know. It may well be that this delivers enormous quantities of abatement at $15 a tonne, which would be terrific. But we don't know. And we could, we would suggest, go after this in a number of ways. We could make grants. We could say we're going to have a soil carbon scheme and essentially we're going to invite farmers to apply for it and any farmers that we think have got particularly good farming techniques, we're going to pay them as they do whatever it is that they do on their farm, and then hopefully over time that will result in emissions reductions. As we've seen, the history of that is it may well not do anything like what is predicted, at least in terms of volume, because we'll award grants to particular farmers and then some of them will discover it's a bit more expensive than they thought and some of them will discover that this means they've got to move from having wheat to having cows and actually that's a lot more expensive, it's a lot less profitable than they thought it was. It could be anything. The point is we don't know and the history of grant based schemes is we will find a whole bunch of stuff that like that, which means that if we announce $2 billion worth of scheme, chances are we'll only deliver at best 20% of that, quite possibly a lot less. And that's because we are paying, we're picking the winners in advance. We're trying to pick which farmers are going to do what in advance and that doesn't seem to work that well.

We could have a rebate. We could say any farmer who does the following activity will get the following payment. The catch, as we've seen, is that those things tend to be based on very optimistic projections of the actual delivery of CO_2 reductions as a result of particular activities, and by and large we as a community all wind up paying for that through our taxes. And the alternative is we could have a market based scheme which essentially pays farmers per tonne of CO_2 actually reduced and we would need obviously a system that verified that that had indeed happened, that the CO_2 wasn't later getting released out of the ground, and so on. But the core of it would be that we pay for delivery. And in an ideal world we would make that part of a much more general scheme. We would say anyone who reduces their emissions will essentially wind up paying less tax or get a rebate or whatever it might be. And whether that comes from soil carbon, whether it comes from planting trees, whether it comes from using less electricity, whether it comes from creating electricity through a wind farm rather than a coal fired power generator, we don't really care so long as it works and whoever can deliver emissions most cheaply, that's where we will buy our emissions reductions. And we would suggest the real measure, sorry, the real lesson of Australia's history over the last 15 years, the lessons that we could and can learn unfortunately the hard way from experience of 15 years, is that those kind of general market based mechanisms will deliver substantially more carbon emissions reductions at substantially lower costs than the other things that we could do. We all agree, or at least all of our major political parties agree, that we are in the territory of not what, not whether, but how. Not is there a climate change problem, not should we do anything about it, but assuming that we are trying to do something about it, what is the best way of going about this? We've spent 15 years doing things which economists could have told us 15 years ago were going to be expensive, slow or ineffective. And 15 years ago there were plenty of economists telling us if you are serious about this problem, then put a price on carbon, let private firms and private individuals get on, innovate, find smart ways to reduce carbon, and that will deliver what you need and it will do so at a reasonable price. There is no magic pudding in this. Any way you cut it, reducing carbon emissions is going to cost us money. But let's at least do it in a way where our money is spent efficiently and in a way that actually works. If you think about the $5 billion we have spent on rebates, as a community, over the last 15 years, that could have got us 20% of the way towards our target for 2020. In fact, it got us almost nowhere. That was an opportunity wasted and our suggestion to the community is let's get on with putting a price on carbon because it's going to get us where we need to be as cheaply as possible and that's what we are all trying to do as a community. Many thanks.

ADAM: Thanks John and Tristan. There's plenty to chew on there, and to help us digest it all we're going to turn to our panel. Now how this is going to work is our five panellists, there's a

prepared question for each panellist and we're going to work through those one by one and at the end of that we'll have a chance for questions from the floor. And I think some of our panellists are going to answer the question sitting down, and some are going to come up here and have a wander while they talk to you. The first question is for Robin Batterham. Robin, your question is, most low emissions energy technologies are currently more expensive than carbon intensive sources, however have potential to reduce their costs in the future through learning by doing and further research and development. To what extent do you think current government policy, which tends to rely heavily on grant tendering, could be improved to support technological development?

ROBIN: Well thanks for the question. And in a nutshell, it's really on the technology side, what's going to help us most is one way of putting it. We accept, and it's been splendidly put out, but getting emissions down is going to cost, it's as simple as that. And of all the technologies that we've got at our disposal, none of them will deliver lower emissions at significantly lower costs than where we are. So the real question is which ones do you back? There are no magic silver bullets here, spoken by the way as somebody very much in the technology business. The question to me is which ones can you accelerate and is that that dreadful game of picking winners, which we've just heard shot down in flames by the data. And I think the answer is to some extent you can, not so much pick winners, but move things in your favour. I'm going to mention three ways that you can move things in your favour from the technology side. So I'm not going to bet on a particular technology.

The first one is that you can look at learning curves. Learning curves are essentially how fast is the uptake, how are the costs coming down? So you can look at things like solar thermal, suck a bit of air between the teeth and say gee that's coming down at a fair old rate, and I'm not arguing the toss as to what the actual rate is. You can look at something else such as the cost of building ultra supercritical coal fired power stations and see the costs coming down a little bit. You can look at carbon capture and storage and you say wow, until it actually gets out and going, it is not even on a learning curve, as yet. That's a little bit unfair. No, no, no, that's a little bit unfair but you get my drift. Learning curves vary. So one of the questions we ought to be asking is if we invested a bit more in technology direction A, B or C, by whatever market measures, I hasten to add, would that in fact be worthwhile? So that's my first part. The other two come actually a lot quicker. Now this one's deadly. It applies across the board for innovation. It's about innovation. There is plenty of evidence that says if one of the levers you're pulling is a tad more R&D than what we're doing, put that money into high quality R&D as measured by peer review. And I'm sorry, that's a fact of life. People who are better at R&D actually come up with more results and it results in more innovation. So don't spread yourself too thinly. We're a 2% country, remember, 2% or less in the world's economy. Don't waste our money on also rans, that spray of words.

Finally, OECD. This is an analysis. It's pretty robust and it's pretty recent. And nobody's been able to shoot it down yet. It's a bit … almost against … just sit back and leave it to the market. They analysed innovation in low emission technologies, analysed all patents across the world as a measure of innovation. They analysed investment in countries in low emission technologies. That's not government investment, that's industry investing in wind farms or what … or manufacturing solar panels or whatever. What they found is this. If you increase the store of knowledge that's generally by R&D, but through innovation, in a mainline area, something that's been around a long while, like wind, if you increase the store of knowledge 10%, you will find that the investment that follows is 1% more compared with what was there. Good. If you increase the store of knowledge in emerging areas, like solar thermal, by the same 10%, costs you differently by the way, but that doesn't matter, it's 10% increase in the store of knowledge, the investment that follows is then 5%. Now that is a factor of five. Now I'm not into winning fortunes on the Melbourne Cup, but if somebody gave me 5:1 odds on which direction to head, I think I'd at least look seriously at it. Thanks.

ADAM: Our next question is for Roger Beale. Roger, as a former Head of the Commonwealth Department of Environment, you have been at the coal face of developing and implementing policy to reduce Australia's greenhouse gas emissions. What do you think is the single most important thing governments could do to make meaningful inroads into our greenhouse gas footprint?

ROGER: As a preliminary, let me say that this report rings very true to me. And when Andrew, my old colleagues in the front row, used to run the Greenhouse Office, and I think she'll recognise a lot of those lessons and stories too. And by the way, economists did tell them that 15 years ago, and I was one of them. It's got to be a portfolio, but the single most important piece that's missing is a clear medium term target backed by a bankable carbon price. What do I mean by bankable? A bankable price? One that investors can take to the equity market and to the debt market and say this will be at least sustained through the life of the project. Not one that's dependent on the annual budget cycle of governance.

A fixed price leading to an ETS with long term permits or undated permits and property rights would underpin a future price curve that would work well to actually begin to provide those bankable propositions we need to drive investment. And cost will be minimised if the coverage is broad, if it avoids carbon leakage in an elegant and efficient way, if the system is open to global trading as soon as that can be done in a way that is comprehensive and environmentally sustainable. Now, this is not a new position. As I was one of the leaders of our international negotiating effort for 10 years – by the way a role that was probably not uniformly appreciated on this panel – that was fundamental to what Australia was asking for. Differentiation, emissions trading prices on a global basis, flexibility mechanisms as they were called. So it's not new, but I also agree with Robin, it's not enough. We have plenty of evidence that a price will help get technologies off the shelf, not put them on the shelf. You do need the sorts of interventions that Robin has spoken about. It involves inevitably trying to make very wise decisions. We do need minimum energy performance standards, but all of those problems about changing the stock are absolutely real. And those are … and we do need investment in the development of the science around the huge opportunities that are potentially available but are yet unproven in both CCS and bio sequestration both through carbon soils and other mechanisms. Thank you very much.

AUDIENCE: Excuse me.

ADAM: Questions at the end. We're going to go through each person first please.

AUDIENCE: What's annoying is can't see who's speaking, it would help if they could stand.

ADAM: Well you're lucky because I …

ROGER: I use a wheelchair, I'm sorry, I … it's a bit hard.

ADAM: Regardless, you're in luck, because our next speaker …

ROGER: It'd be nice though.

ADAM: … is going to come up here in the centre. It's the Shadow Minister for Climate Action, Greg Hunt. And Greg and Christine Milne after him are each going to speak for 10 minutes. Greg's question is: what is your response to the Grattan Institute report and what does it imply for the Coalition's climate change policy?

GREG: Thank you. My time starts now. Thanks very much to Adam and also in particular to John and to Tristan. John and I have known each other since he was 18 years old. He's barely changed in his appearance. He is still youthful and he's as energetic as ever. So I want to make two simple points today. One is about markets, and the other one is about the notion of what governments can do efficiently. Let me start with welcoming the report. I think there are three very important things here. The first is the recognition that most people would have, that the home insulation program has probably been the least efficient program in the last 20 years in Australia. Had cash for clunkers actually commenced at $430 per tonne, it would have won the prize today. The second is the notion that you have set out very clearly the agreed challenge of achieving 160 million tonnes per annum of reduction by 2020. I respect Christine's position of seeking to go further straight up, but this is the starting point, and it provides a platform from which to go further. The third, and I think the most important element of this report is that it sets out a basis for common analysis of policies. And that is the simple single test which I have

argued for for some years of the cost per tonne of abatement of CO_2 or equivalent gases. That's the way to analyse our policies. Now having said that, to a certain extent I feel that you failed the task of doing that adequately. But I say it in a generous spirit. There's an enormous amount of research that's done. John and I go back a long way.

There are … and let me turn first to the notion of markets. I agree that markets are the most efficient way to achieve large scale abatement. But there are different types of markets, and the report fails to recognise that, because the report focuses on the notion, in economic terms, of the marginal cost of abatement. And it assumes that the marginal cost of abatement is the same as the average cost of abatement. This is completely false. And let me demonstrate with a couple of examples. If you look at the proposal, well the existing G-Gas system in New South Wales, let's call it the New South Wales Emissions Reduction or Abatement System. Its average cost and its abatement cost are entirely the same. And so it's been producing savings at the moment. I checked today, it's about $7.50 a tonne, and that's an extremely good thing. Under the alternative model that's proposed in Australia of the carbon tax, the difference is this: it doesn't seek to take your existing production and provide an incentive to go below or a penalty for going above. It wants to tax all of the emissions. Now you might say that's a good moral point, but what's the economic effect because this is an economic analysis. Under the CPRS modelling, which is the predecessor and is a good proxy to the carbon tax, in the first year they were going to tax about 430 million tonnes at $10 a tonne which would have been $4.3b to achieve 13 million tonnes of savings. And you might say well that sounds reasonable but then when you work out what is the cost per tonne of CO_2, the cost per tonne of abatement is about $330 per tonne, almost as bad as the home insulation program but not quite as bad as cash for clunkers. If you looked at the best case scenario under the CPRS, and I'm using Treasury modelling figures here, in 2020 they would have abated 140 million tonnes and they would have done so at a cost of about $16b and therefore at an amortised cost of abatement of north of $110 per tonne. And so you ask, well why is this so inefficient? And the reason it's so inefficient is because the mechanism relies upon driving up the price of electricity in order to achieve changes of demand. But the problem is that electricity is an inelastic good. In human terms, that means that it's an essential service. In economic terms, it means that for every nine units, 9% you drive up the price, there's about a 1% decrease in demand. That was the analysis of the New South Wales regulator looking at price changes in New South Wales during the course of the last decade. So it becomes an incredibly inefficient system. The weighted average cost over the entire period from what would have been the 1st July, 2011 to the 1st July, 2020, was a total cost to the system of $114b for about 500 million tonnes of abatement, or over $200 per tonne of abatement. And that's why we think that not every market is the same and there is a fundamental difference. Now we have a respectful difference on this because I think that there's a huge dead weight cost and what that means is there's money that you could use which is otherwise being wasted and then churned around. What would you do with that? What are they doing with that money? They're giving it back to people from whom they're taking it in the first place, and you say well what's the effect? Are people more likely to reduce their emissions if they get a pay back, or are they more likely to say well I'm getting the money back, therefore I'm not going to reduce my emissions. So that's the first of the disagreements, that not all the markets are the same. The second is a failure to assume that there are different types of ways in which governments can provide incentives for purchasing. And on the straight grant tendering, let me just say I accept … I accept what you say. But what is proposed by the Opposition and what has been in place in other markets in Australia is quite different. I'll give you three examples and then finish with what we're proposing.

The first and most important example is the water market and the role of government purchasing. The water market exists, it's a fully functioning market. I don't believe that anybody would challenge that. On top of that the government's added about $3b to purchase water. The way it does it is it uses the market to find the lowest cost water abatement. The reason I've got a piece of paper here is this is a summary from Water Find of the latest Commonwealth market tender and the fact is that the Commonwealth has put out $504 million, 100% of it was taken up by using the market, a 100%. Now Tristan had a mark up of 3,000% on the amount of money needed to achieve the outcome desired. I think that's false and I think that's a misuse of figures and I think that fails to deal with the reality of the Australian water market and Australian government purchasing. And this is purchasing which is being done by our political opponents using a system which both sides agree with, and that's achieving 100% take up today.

The second example is that Professor Garnaut has proposed a lowest cost purchasing of farm credit, again using the market. So government provides the money but purchases through an existing market. The third example is that former Premier Brumby, in the last couple of months and I think it was Adam who broke the story, proposed the idea of a purchasing fund to convert or close down Victoria's brown coal generators. That would have been done on an auction basis, a lowest cost basis, not on a qualitative basis. Exactly the same model. And then what we're proposing is precisely the same as the water market. You take the New South Wales market, you apply it across Australia and then you have a Commonwealth fund which would go in and purchase through an independent regulator on the lowest cost basis. And that's how you can apply government purchasing through a market with 100% take up. So I think it's a tough response but you guys were tough on Lateline the other night, so I felt in a smaller audience I might have a go back. And the fact that you leaked your report before today, well anyway. But the real point here is what John and Tristan have done is a great service in that it sets down the principle of lowest cost abatement per tonne of CO_2 reduced. And in order to do that, though, you need to assess the full cost of a market, not just the marginal cost because otherwise it's a failure to, you know … you are effectively ignoring $114b of money taken out of the economy. And also you need to understand that governments can purchase not just through a tender program, but through a direct application of the market as we see in the water market and the way in which governments of both persuasions have purchased water effectively to the point where 100% of their allocation was taken up and oversubscribed within a short period of time. Thank you.

ADAM: Okay, and for a different perspective we're going to hear now from Greens Deputy Leader, Senator Christine Milne. I've got quite a specific question here for Christine and I expect she might want to say some broader points as well. The question is: the Grattan Institute's analysis is quite critical of rebate programs to support solar photovoltaic panels, insulation and solar hot water. What do you think government should be doing to support greater energy efficiency which could potentially avoid the high budgetary costs associated with rebates?

CHRISTINE: Well thank you very much for the invitation to be here tonight. And I'd like to start by just making a general comment about the Grattan Institute analysis. And that is that it assumes that all of the programs that they've analysed were actually designed to reduce emissions. That was the stated object of those programs, but let me say many of them were designed for photo opportunities. Many of them were designed to buy votes. Many of them were also designed as education and public awareness raising, like solar panels on schools or on Parliament Houses or on public libraries, all that sort of thing. I don't think anyone ever seriously thought that that was going to achieve any sort of real level of abatement, but it was raising awareness in schools and communities and so on. But some of the programs were also legitimately designed as industry development policies that were dressed up as greenhouse gas abatement programs. They were industry development programs and we needed them, and I'll get to that in a minute. What I would agree is that they have been expensive and largely ineffectual in reducing emissions. That is true. And the Greens come from a perspective of saying well what is the destination and the timeframe and then that should determine how you actually get there. And that is the difference between the perspective we have and indeed the perspective of the government and the Coalition. If you have a policy position which just says we need 5% reduction on 2000 by 2020, and only 60% by 2050, then you'll have a different view about how comprehensive and how many levers you have to pull at the same time to get to a destination. Whereas if you come from a perspective as we do which is we need to get to net carbon zero as quickly as possible because that is the scientific imperative, and also that to do that we also need transformation in the Australian economy as quickly as possible, then you'll be looking at a range of mechanisms and that's where I totally agree with the Grattan Institute that you have to look at issues of scalability. How fast can you scale up these programs to the level that you need in terms of the scientific imperative of where you're trying to get, how systemic can you get, and you're not going to get scale without getting system wide change, and flexibility. So the Greens' perspective is that we want to see market based mechanisms across as many areas as we can possibly achieve them because we do think that that will deliver lowest cost abatement.

But having said that, we also, if you are going to get the transformation in the Australian economy you need as quickly as possible, you are going to need regulation as well as market based mechanisms. So just for example, the Greens are arguing for things like mandatory vehicle fuel efficiency standards, higher building codes, electricity market reform so that you don't just favour the supply side in electricity market, but you actually open the door to demand side in the national electricity market. That is a regulatory change which would have significant impacts. Things like minimum performance standards for white goods, even things like land clearing and saving forests and so on can be done through regulatory mechanisms which lead to enhanced and protection of carbon stores in the landscape. But also direct investment. Things like the grid. We need a massive investment in the grid and we need to add intelligence to the grid. Some of that can be direct government investment. That is one area where, I'm generally not in favour of public private partnerships, but I would argue that in terms of the grid with cashed up superannuation funds, you've got that opportunity to actually make the best of that and change the regulatory environment now to allow intelligence to be added to the grid so you maximise your capacity to bring on your renewables and bring on your efficiency at the same time. Things like R&D, I totally agree. We need to, and we're supporting what Professor Garnaut has said, we need to quadruple if not more the investment in R&D and get things up to a commercialised stage so that you can actually then attract joint venture capital. But that again is not going to be enough to bring on the renewables in the way that you would want, and that's why we support things like the renewable energy target, but also feed in tariffs, and we think of a range of feed in tariffs is absolutely what we would like to see to be able to bring on technologies like solar thermal, geothermal, for example, which won't be brought on unless you have a really high carbon price and the reality is we are not going to have a price that high in the short term. Now there are those pure economies or economists who would argue that you don't need the complementary measures. And that is the danger of interpreting a report like this saying, well you don't need the complementary measures, if you just have the market based mechanisms, that will do the job. Well it depends on your target, your level of ambition as to what you're going to get. And the … just this week you had the international energy agency bringing out a paper saying that current investments in renewable energy technologies are essential to quickly reducing their cost and to make a wide portfolio of renewable energy technologies affordable and competitive on a large scale beyond their current niche markets. Immediate CO_2 reductions driven by the early deployment of renewable energy may cost more than other options today but will reduce the costs of mitigating climate change into the future. As soon as technology improvements are factored in, even for a relatively limited period of time, the optimal portfolio minimising the long term cost of support policies broadens to at least three instruments, one addressing the CO_2 externality directly, one addressing the spill over effects from R&D efforts, and one addressing the spill over effects from learning by doing. So I would be arguing if you want transformation in your economy in a short time and you know your carbon price isn't going to be high enough, you have to bring on large scale renewables so that you can make the transition in the timeframe. So that is our argument for adding complementary measures to the straight up carbon price.

As to energy efficiency, I lament the fact that the response … the stimulus package, if you like, the response to the global financial crisis was to roll out energy efficiency in the least efficient way. And it was … you know, it's shocking to me that the government has devalued the currency of energy efficiency at the time when we need it most, and when we know it is the low hanging fruit in terms of getting out there and reducing emissions. So having said that, it was again … it was rolled out too fast as a response to the global financial crisis in the context of a stimulus package, rather than being a well thought through policy. But the idea was a good one. So I don't resile from the fact that it was a good idea that went horribly wrong in the execution. So what the Greens would do? Well, we would deal with hot water and insulation with an energy efficiency certificate scheme. We would establish an energy efficiency target to run in parallel with the renewable energy targets. So that is we would take out those energy efficiency measures and put them in a separate scheme so you'd have the renewables here, and the energy efficiency there. In terms of commercial buildings, we have legislation that I have introduced into the Parliament for commercial buildings, and that is essentially a stand alone energy efficiency cap and trade scheme. And that legislation was reviewed overseas and in fact has been put in place in other places, but here the Parliament didn't think it was worth pursuing because we have disclosure provisions. Disclosure provisions aren't nearly enough to get us where we need to be on commercial buildings. And we also would like to see acceleration in

transformation in the large scale sector, the energy efficiency opportunities legislation isn't achieving what we need to achieve in the timeframe, so we would be arguing and be prepared to look at things like accelerated depreciation in that sector, for example, to see what we could achieve with various policy there. And as I indicated, higher renewable energy target and the feed in tariffs. So we support the whole range of measures including the taxation measures, things like getting rid of the fringe benefits tax concession for motor vehicles, things like getting rid of the fossil fuel subsidies. And that is something that governments can do, save themselves money and actually achieve high levels of savings as well as drive transformation. It seems ridiculous to me that we have got some of our large industries out there complaining about a carbon price but the government's not out there saying yes, but we give them a fuel tax credit to the mining industry, a line in one year of $1.7b. If you want an effective carbon price in the market, then surely getting rid of your fossil fuel subsidies would be a good place to start. Thank you.

ADAM: Okay. Our last prepared question before we throw things open to the floor, is for Matthew Warren. Matthew, your members, the members of the Clean Energy Council are likely to be the businesses which will make large investments required to achieve Australia's 2020 emissions target. What are the characteristics of government policy that they need to be willing to make these large investments? Are you happy to come up here?

MATTHEW: Yeah, yeah.

ADAM: We've got a two-tiered system here, so as a non-politician you get five minutes.

MATTHEW: Okay.

ADAM: Sorry.

MATTHEW: Do you … and thanks to John and Tristan again, for the chance to present, and I'll try and find something original to say after the first four short presentations. I am an economist and just to go back to tors on this process, it is an economic problem we're trying to … the introduction of price on carbon is to internalise the environmental cost of greenhouse gas emissions. Last time I checked, sort of the … if the pure price, if you had a … a carbon price only apply globally, it would be around $100 a tonne to deliver to the targets needed to head off the problems. So, … so that's why we are debating furiously the market failures that exist because the application of that both is difficult in political terms as well as being trying to get the globe ... the world to do that. So, how do you apply policy in that imperfect market? And this debate, you know, the green paper and the white paper delivered to support the CPRS were 500 pages long plus each, and they skimmed the surface because we're arguing over all these market failures that exist in this process. So it's very frustrating from our perspective, and have my … some of my colleagues in economics argue for this purist approach, if a carbon price would deliver the result, well okay, then tell everyone you're going to go to $100 a tonne to start with and we'll live with that. Otherwise let's talk about the complementary measures that Christine mentioned earlier. And those market failures are everywhere that we … we're all familiar with the trade exposed sectors, we're familiar with the stranded assets of power stations, the need for new investment and how that's financed. Energy efficiency has enormous market failures through the split incentives, you know, that … particularly in low income households where they rent dwellings. The investment needs to be made by the owner of the building of course, has no incentive to invest that money. And energy efficiency is probably the most complex and the most widespread array of market failures. The energy … the electricity market in Australia is incredibly imperfect. It's a bizarre market when you think about it from economic terms. We basically have a market which says we will build and supply whatever the market wants to use in terms of electricity. And we won't charge you a cent extra for that privilege. So it's, you know, to start with, if we were to be really serious we should be starting to deregulate that market as quickly as possible, and that of course triggers one of the other ??? market failures in this which is political. Just the willingness of households to wear those increased costs and adapt to those changes needs to be borne carefully.

The clean energy sector is also a victim of a substantial and significant market failure. And that is asymmetric information. Fifty years ago when we were developing nuclear energy, when we

were developing a whole suite of other technologies, we weren't developing clean energy technologies because while we were creating the problem we're now trying to solve, we weren't aware of it. So we now have people saying well, you know, clean energy and it's one of the constant frustrations with trying to use the numbers and metrics around clean energy technologies as if they're static. They're not static, they're going to change over time. By what rate and by how much, we don't know, but you can't plug in a number for large scale solar, for solar PV and say it's too expensive, it's not working, we should stop using it because they're changing regularly. Solar PV is coming down the cost curve at a rate which is exponential. I was in the US last year and most of the sort of smart people in the emerging technology space think that solar PV may be the big surprise packet globally because … and they argue it's not because it's the best technology, but because it's hit that critical scale up… number. So there's such massive production going through China at the moment that the costs of the technology are falling, notwithstanding there are other technologies that may be more efficient over time.

So there's two sort of … two challenges within the clean energy space. The first is that R&D component. So how do we … how do we incentivise and bring forward that innovation that we need? And second, and this is often forgotten, is the real value of things like the renewable energy target and the feed in tariffs and other arrangements for small scale technologies, is that they force the market to start coping with this new type of electricity in real time. So you know, five years ago a network provider said it's not possible, we can't cope with all this variable supply energy and all this electricity, it's going to be too hard. Five years later they can cope with much larger numbers than they thought they could. California's gone through the same problem, they've now got 16% of their electricity coming from variable supply technologies. They said it couldn't be done five years ago and now they're going to 20. So it forced conservative and traditional players in the market to realise that they can change and they will change, and that's a substantial learning in R&D that's almost always forgotten in this debate.

So what do we need? First of all, like any other industry, we don't need certainty, we need stability. So, and stability means, for an HL or an Origin, the first thing they're going to have to do is go and find a bank who'll lend them the money, $3b, $4b to build a gas based low power station to replace their coal based low power stations. Now no bank will lend that unless they can see over 30 years that the pay back periods and the cost effectiveness of that investment will be guaranteed. So that's the kind of stability range that those investors need and the same applies for renewables. The renewable energy target delivers that for large scale projects like wind farms, but it does fall short for other technologies like bioenergy and anyone who's not down the bottom end of that curve, so more work needs to be done there.

The second is innovation, and we've … and it's been mentioned by a few people. Robin's had a go at it and a pretty good go at it. You know, I was reading a great edition of The New Yorker magazine a couple of years ago and they concluded that innovation's the product of two things. It's a combination of competition and abundance. And they pointed to the Apollo space program as being the best example. You know, the Cold War combined with unlimited funds for NASA got a man on the moon in nine years. They didn't think it was possible but they did it because the two things coincided. We're going to need that for emerging technologies. There's a view that venture capital funds and private sector investment's going to be able to deliver that. That's not the view of most of the venture capital funds. If they can't get their money in and out in five years, they're not interested. I was talking to some of the big VC players last year in the States about our ocean energy technologies and our geothermal technologies, and they just shook their head and said they look really interesting but we cannot get in and out of there in five years, we're not going to invest. The most aggressive investors aren't going to do it. So if governments are serious about those technologies, they need to invest in it themselves now and be prepared to back them for five or 10 years until they're through the cost curves. We have a solar flagships program for large scale solar, it's a good start. We need a geothermal flagships program, we need an ocean energies program, and we need to prepare to tell Australians we might do $2b and not get there, but we're going to try.

The third thing we're going to need is to remove renewable policy from politics, and I think that's a strong thing that Christine picked up on, is a lot of these programs weren't designed to abate at low cost. They had a political component, there have been some surprises from them so they're welcome, but we've got to depoliticise this process. Last year New South Wales, we had

a feeding … a gross feeding tariff introduced which was too high. It drove enormous deplete of solar PV and was cut off instantly. That's the worst thing for an emerging technology industry is to build it up and then cut it off. I'd also agree with insulation. The problem with the insulation scheme wasn't that the technology's not valid, but that it was deployed poorly. And again we got a huge boom in the installation of insulation, and there were technical problems and we've had a huge cut in deploy since then.

The fourth thing we're going to need is … oh, I've already covered that one. The fifth and last is that concept of industry policy. So just because a technology is expensive, it's going to surprise you if you have a strategic approach to developing those industries along the way. So what does that mean for what we've got now? The renewable energy target, I think we need to accept the fact as well that in policy terms, we're not going to get it right the first time. The design of the emissions trading scheme is going to be flawed. The European Union institutionalised failure into the design of its scheme and it got the design of the failure wrong. So accept the fact that you're not going to get it perfect the first time, but start. With a renewable energy target it was introduced by the Howard government in 2001, it was evolved and upgraded in 2009, and we had another go at it last year and got it repaired and we think we'll have to go back next year and do some further repairs to it. So that's … you know, that's the nature of developing effective policy in this space. We have small scale technologies, we need long term certainty, we need some of that stability that I mentioned earlier. If you're a PV installer, we don't know how you can be planning your business for the next six months, let alone the next sort of three or five years. It's just not possible because state governments were sort of introducing feed in tariffs, they're getting nervous about the politics of higher electricity prices, people are blaming PV, it's actually not, it's networks, but they get nervous and so those businesses are at real risk of being stranded by the same policies that were introduced two or three years ago. That's got to stop.

Solar flagships as I said, it's a good start, but we need to broaden the concept and accept the fact in the round of applications for the first solar flagships there were 42 that got short listed, four projects are going to proceed, so there are 38 other project developers out there who'd like to build large scale solar. We need a sort of a second round and a more diverse array of projects for them, and the same for wave and for geothermal. And energy efficiency will require a suite of measures, require standards, regulation as well as sort of removing impediments to investment. So that's the broad range. And I suppose finally as well, we need sort of mature government planning approval processes. It's a real frustration for our industry that as we start to scale up in areas like large scale wind farms, that we get some state governments who retreat to dangerous sort of populist politics in regional Australia. And we are fighting that issue on what seems a bizarre sort of non-scientific front at the moment, and we need sort of the conviction and courage of governments to stand by the genuine science and not get distracted by that sort of local issue. Thank you.

ADAM: Thank you to all our panellists. Now, it's time for questions. Inevitably we have less time left for questions than we hoped but that's the way these things work. As I understand it there's going to be … there are four microphones that are going to be around the room. And so if you stick your hand up we'll try and get a microphone under you, and if you could say who you are, make sure you speak clearly and loudly, and ask a question rather than give us a lecture, that would be great. And this gentleman here in the blue shirt and suit is first up. And if you also could direct your question to which of our seven speakers you'd like to answer.

AUDIENCE: Thanks. Yeah, sure. My name is Paul Reardon. My question is to Greg Hunt. I've got … there's actually three parts to my question. You made the statement that the cost of abatement would be under a carbon tax or under a cap and trade be … the price of each permit or tonne or tax per tonne multiplied by the amount of abatement. Is it not the case in fact that the cost of abatement under a carbon cap and trade scheme would be, at most, the penalty price? Because anyone who wanted to admit, would only admit if they could reduce their emissions for less than that. I think that the number you specified is actually just money that's taken out of the economy in one place and it's still available. It's not actually the cost of abatement.

GREG: That's right.

AUDIENCE: My second question …

GREG: That's right.

AUDIENCE: … is …

GREG: Sure I remember the first one.

AUDIENCE: … is you stated that a CPRX tax does not work because … you stated that it works by trying to drive the elasticity of demandable electricity supply. And in fact that's not the case. Whilst it might produce some abatement through that mechanism, it actually can drive as much abatement as you want without any elasticity whatsoever by driving down the carbon intensity of the electricity supply. So I think you misrepresented that point as well.

ADAM: Is that the … we're taking a long time for your question.

AUDIENCE: And the final question, the final part of my question is that you also stated that electricity demand is inelastic. Is it not the case, in fact, that in California during the California electricity price crisis, once price flexibility was introduced, the demand for electricity did in fact decline. So I think all three of your premises were false.

GREG: Alright, thank you.

AUDIENCE: Okay.

GREG: Well let me take you on, I'll try to do each in 30 seconds. The first in terms of the total cost of abatement. It's very simple. The problem with a system that taxes all of the emissions in the economy is that it has an enormous amount of dead weight. The example being there is no question, because it's a statistical fact, that under the CPRS year one $4.3b, 13 million tonnes of abatement. They're also taxing not just the 13 million tonnes but they're taxing another 417 million tonnes. And it's that focus on the non-abated part which creates the dead weight. In other words if you just focus on the … if you just focus on the abatement you can deal with it. That's my part.

ADAM: Please, just let him answer the question.

GREG: Part two. The issue about electricity. The Prime Minister herself has said that the goal was to decrease demand. It won't decrease demand in any significant way. Professor Garnaut effectively conceded that in the last two weeks. And that's because … and that's … and then on the supply side, in order to cause a switching from, at best, coal to gas, let alone to coal to renewables, there's a general agreement that the switching price is about $70 per tonne. So it's not an effective method to achieve the outcome desired on the electricity side. And then your last point about inelasticity, the latest paper that came out of the United States was an inelasticity quotient of about 0.2. What's that mean in human terms? For every 10% increase there's a 2% decrease in demand. For Australia, the New South Wales regulator did a full longitudinal study. They published the figures and the figures for New South Wales where they looked at a 50% increase over a five year period was a 6% decrease in demand per capita, or about 0.1.

ADAM: Okay. We might have to restrict the rest of the questions just to one barrel questions so we can get as many in as possible. The guy who put his hand up the back here.

AUDIENCE: Hi, I'm Megan Clementine, an environment editor at the Conversation website. My question is for John. Melbourne Energy Institute figures suggest that a moderate price on carbon between $25 and $70 would simply lead to a switch to natural gas. Now, a switch to well gas, the emissions are unknown but I've heard figures between … that it's between 60 and 90% as emissions intensive as coal. Is this the kind of outcome you would want? And if not, how can we discourage a simple switch to gas?

JOHN: I think it depends on whether you're thinking about this as a long term problem, or as a short term problem. If we're thinking about targets for 2020, then a switch to at least some of our electricity production to gas or at least ensuring that new electricity production is coming from gas, is probably a very good thing in terms of substantially reducing emissions at a reasonable price. If you're talking about much deeper cuts over the long run, chances are we won't be talking about gas, we'll be talking about other technologies. In terms of the impact of gas, it is quite substantial. Australian … as you saw, the average is about 0.9 tonnes of CO_2, coal fired generation is anywhere between 1 and 1.4 tonnes of CO_2 per megawatt hour of electricity, depending on what kind of coal you've got. Gas can be between 0.4 and 0.6, so it's a very substantial reduction from that sort of 1.1, 1.2 territory down to that kind of 0.5, 0.6 type territory. And one way of thinking about it is if Australia essentially could turn all of its coal fired generation to gas for about $43b, and that would have a … that would essentially halve the emissions intensity of our electricity. So it's certainly doable and it would have a big impact. I think there's a much more general issue here which is about how do we promote the renewable energies, renewable electricity sources over the slightly longer term? And this I think has been raised by a number of our panellists in terms of asking what do we do about promoting new technology? I'd suggest you need to break that up in a whole series of ways.

Firstly, there's hard core research and development, stuff which is clearly not economic. By definition that's not going to deliver us anything by 2020, so in terms of solving the 2020 problem, you know, all of the things we've talked about will apply. Nevertheless, there's a very strong case for that doing that R&D sell will have an impact in the much longer term. But because it's R&D you should support it like R&D, you pay clever people in universities to do good work and you make that stuff as public as possible. Then there's an issue over technologies because there's a market failure in terms of we're politically prepared to set a carbon price of $25 or $35, but we're pretty sure that in the long run it's going to wind up at a lot higher than that, but we'd like to be making some progress in the meantime. And so for example we might want to be accelerating the development of technologies such as solar thermal. A suggestion here which comes directly out of the report, is again you want to try and set up market mechanisms if you can. One way of promoting solar thermal is to say we'll run a big tender process and four out of 38 tenders will be successful. Another way of running it is to effectively set a large scale solar feed in tariff that says we will pay X dollars per megawatt hour for electricity from this kind of emerging technology, and first in, best dressed and if you want to be very, very sophisticated about it, you can set a declining price scheme so that the first people who get in, get a high price and then it's a lower price for the next people who build their station and so on. The advantage of that is that you essentially set up a market in renewable electricity technology with all of the virtues that we've talked about in terms of markets. But you avoid that whole process of a grant tendering scheme with all of the vices that we've seen about grant tendering. And I note on the large scale solar flagship scheme we are already seeing a significant number of the projects involved fall over. We shouldn't be surprised about that, that's what's happened every time we set up one of these schemes, and it's going to keep happening. So our suggestion is if you're serious about promoting those kind of technologies, shift the design of those schemes so that to the extent possible, you can make them look like markets. You might need in the short run two different markets: a general carbon market aimed at 2020; and then a separate market aimed at longer term electricity development for after that.

ADAM: Okay. Down in front.

AUDIENCE: Hi, my name's Shane Delphine. I've got just a question pretty much to the panel more generally. Just, why is … why does the government … why do schemes generally seem to exclude agriculture? So why aren't we putting a price on the emissions from our, you know, cattle and sheep and other … just other forms of agriculture more generally? Why … why is agriculture seemingly excluded?

ROGER: Perhaps I might answer that to ease the burden of my political colleagues. The reason that we haven't done that in the past is that the measurement issues and the transaction costs are very high, both on … in both directions. And that has been globally pretty much the case. We need to drive those down. The sooner that agriculture can be incorporated more comprehensively, the better. In the short to medium term, it's likely to be through offsets

programs where that can be identified. And I think that's pretty much … well pretty much a global approach.

ROBIN: I've got to say as a technologist on this one, he's absolutely right. The cost of measuring soil carbon, for example, to a level of a bankable document exceeds anyone's estimate of what the soil carbon bit might be. Which is a pity by the way 'cause you can model the Murray Darling Basin and say if you had … and CSIRO's done this recently, if you had $36/tonne you would stop all food production in the Murray Darling Basin and grow trees.

ADAM: Greg, the Coalition's direct action policy emphasises soil carbon to a fairly significant extent. I think 60% of emissions cuts by 2020 it estimates could be come from that. What's your …

GREG: Sure. You're false on your premise but I'll take it. No, no, it's very important if we've got a leading journalist, we get the facts right. The approach that we've set up is we don't mandate any source. We set up pure market and we will provide government incentives to purchase from the market the lowest cost abatement. Now we've identified the fact that the green carbon space is likely to provide a significant amount and we …

ADAM: Is it 85 million tonnes a year I think.

GREG: Correct. But is likely, but is in no way mandated to … and that's a misrepresentation or a misconception. The flipside of that is that, that is small compared with a lot of estimates. The Garnaut report, Chapter 22, estimates about 600 million tonnes of potential offset abatement through re-greening Australia, on a per annum basis. The WWF … sorry, the Wentworth Group of Scientists had a figure closer to a billion tonnes. Now, we have gone to about 8.5% of that as what is potential. But it could be landfill gas abatement, it could be waste coal mine gas abatement, it could be soil carbon, it could be trees, it could be mallee and mulga. Any of those things could prevail. But we were just saying that we think that the likely provision, and make no mistake, the international agreements, and I was with the … one of the key European players today, Jill Duggan from the European Commission, the international agreement that succeeds 2012, whether it's a pledge and review system which means it's not a formal system or whether it is a formal system, will incorporate soil carbon as part of it. That is a fact of history to come.

ADAM: You've partially answered … you've partially answered what I was going to ask. What … I was going to say John mentioned earlier about its potential being a maybe and I was going to ask, based on your policy, your confidence in it is stronger than that, and I'm wondering what that's based on.

GREG: It's simply based on the fact of working with the National Farmers Federation, working with the CSIRO, working with individual farm regions where they have in fact been doing significant measurement, longitudinal studies again over 20 years. The Dubbo region has done a 20 year study of farm carbon absorption, and it's not difficult. And that's the thing. That's only one of the systems. We don't mandate it. Our job as a government would be to ensure just as we do with the renewable energy target, that there's an independent regulator who measures and verifies a tonne of CO_2 abatement and if … and the assumption is that soil carbon will absolutely be a part of that. And it's … the assumption is that soil carbon will absolutely be part of the next round of the international system.

ADAM: Okay. Over here. The lady in white.

AUDIENCE: Thanks. My name is Gabrielle Kuyper and I wanted to pick up the earlier point about longer term investments, particularly in infrastructure. And I'm talking not just about large scale renewables, but also about public transport. So if we're serious about reducing emissions from the transport sector, we're going to need significant investment in public transport across Australian cities. I wondered if anyone from the Grattan Institute or on the panel wanted to talk about climate bonds and/or green investment banks and their potential role in financing that kind of infrastructure?

ADAM: John? Tristan?

TRISTAN: I'm happy to take it. I suppose … look, there's lots of different things that we can do in transport. Clearly one of the options is okay, well we can … we can reduce emissions through public transport, through more people taking trains and indeed in Japan the emissions intensity of a kilometre travelled by a passenger in Japan is significantly lower than what it is in Australia and that's predominantly because they use trains. The issue is that that is obviously an opportunity. But the question is, we've got to get to a 2020 target, how are we going to get there with scale and I think that is obviously an opportunity but it's not going to get us there, would be my answer. That doesn't mean it's not worth looking at and I would probably hand that over to them. But I just want to repeat that we need to keep our eye on the ball and that is that we've got to get very large scale reductions, we need to get them in a short time period. We're not going to restructure the design and orientation of our cities and roll out public transport at large scale and achieve our 2020 targets. But that doesn't mean that your point's not invalid, but I think I haven't fully answered your question, that's why I'll hand it over to someone else to thoroughly answer it.

ADAM: Anyone on the panel like to offer some thoughts on that?

CHRISTINE: Oh, I can. Just … when we were discussing the government's carbon pollution reduction scheme and subsequent policy, the government, as you will recall, put petrol into the scheme but took it out again by providing a cent for cent rebate according to whatever the carbon price would have meant. The Greens argued at the time that this was an appropriate opportunity to hypothecate some funds to invest massively in public transport, particularly in the cities. But the issue became somewhat obscured because of the petrol … the oil price rise at the time effectively took care of the difference. I would argue now that the underlying oil price is going to drive behavioural change in Australia. People will want to use public transport because it's going to become increasingly expensive. The problem to run a private motor vehicle, the problem we've got is that there has been no investment in the public transport system to cope with that transition. So this time around we have to have a serious discussion about how are we going to raise the kind of money we need in a systemic way that drives behavioural change. Ken Livingstone did it with the congestion tax in London by hypothecating it to public transport, and this is a discussion the community has to have.

MATTHEW: Just a … just to reinforce the difficulties of this, when I was working at The Aus, there was a report released that revealed that Melbourne's greenhouse emissions are double that of London, with a much smaller population. And I found out that the size of London is 1,600 square kilometres, and Melbourne is 9,000 square kilometres. And this is one of those institutionalised dysfunctions we have in Australian cities is that the other anecdote that goes on top of that is at a Al Gore lunch a few years ago someone raised a question which said that the people who vote Western democracies in and out of government are the people who live on the edge of cities. And I tested the thesis with Anthony Green from the ABC and he said that's exactly right. So, governments are reluctant to impose the planning regulations needed on new developments on the edge of cities because the people living on the edge of cities don't want to live in the houses they should be living in, where you can build public transport to support them. So we keep perpetuating the kind of housing we have because governments don't have the courage and the political will to take on the electorates they need to win to win government. So the capacity to deliver efficient and effective public transport to Australia cities is deteriorating every year and we're in this hideous catch-22 where it's going to be very difficult and increasingly difficult to repair that, even over time.

ADAM: Up the back here in the middle.

AUDIENCE: Hello, can you hear me?

ADAM: No. Perhaps if you could just try and project. Have you got a big voice?

AUDIENCE: I do. I thought you might be recording. Okay. I'll keep my question short. I think it's the elephant in the room. In terms of energy mix I'd like to hear a response from the Clean Energy Council and also the Liberal Party. Greg, you're under the pump, sorry. What's the role of nuclear in Australia's energy future?

MATTHEW: What's the role of what?

CHRISTINE: Nuclear.

PANEL: Nuclear?

AUDIENCE: Ah, you say.

GREG: He's already handballed it to me. Look, here's the answer. Nuclear is about a sixth of the globe's energy. I think that it remains a critical part and that if you take it away, I think what we'll see sadly in Japan in the coming years is that there'll be a replacement with coal or gas electricity for the interim. Global emissions will go up as a result of the Fukushima disaster. I think that nuclear remains a critical part of the global mix. Am I philosophically against it for Australia? No I'm not. Do I think that it requires bipartisan support in Australia? Yes I do, for two simple reasons. Firstly, because there would be the domestic reason … domestic risk of huge community division, and I think that's real and I think you do need to have bipartisanship before it would be domestically acceptable. And secondly, for anybody to invest, they would want to be certain that there was no sovereign risk that a policy implemented under one Party would not change. So I think that it would only ever happen with bipartisanship in Australia and, therefore, I see it as a considerable distance yet.

MATTHEW: I think would only add that our view is that the Australian public would be willing to accept nuclear energy only if you could demonstrate that you tried everything else first. So, and I think we're a long way from demonstrating that and I think the Australian public's appetite for accepting that the inherent risks of that technology has deteriorated in recent weeks. So, but I mean so it's not dissimilar to Greg's perspective, but I think realistically if you want to sell nuclear, you have to have shown you've exhausted all opportunities and we're clearly well short of that at this stage.

CHRISTINE: If I can just … I can just add to that. Too slow, too expensive and too dangerous, but if you can look at what's happened in Japan but look at the flow on effect in Germany. Germany's got a 40% reduction target by 2020. Angela Merkel was going to reverse the policy on nuclear and refurbish some of the older generators, nuclear generators there. And now she's not going to and they're not backing away from their target and they're not going to fossil fuels and so they are going to now vigorously get into energy efficiency and transformation of the grid. And I think we're going to see in Germany what can happen when you get a vigorous government determined to stick with a policy position in spite of what they would be now faced with what would seem in Australia an insurmountable task. But they don't think it is.

ADAM: Robin or Roger, want to add anything on that?

ROBIN: Oh yes. Okay, I point out I'm not quite sure where it is, but there's a public session on the fallout from the Japanese incidents at this university tomorrow night. It's Melbourne Energy Institute, so look it up on the web. I'm sorry, in my head I don't have the details but I'm sure someone at the end will comment on it. I'd just make the comment on nuclear … firstly a facetious one. The French of course are smiling from ear to ear because they're the biggest sellers of nuclear power into Germany and it's … they must be rather delighted at the moment that Aeon and RWE are not able to … are not on the path of … that they thought they were a couple of months ago. That's the first point, and not a helpful one of course. But the … the other thing on nuclear is, and I think it's been well covered, it is a low emission technology, so you have to look at it and say alright, am I prepared to wear the risks associated with it, and that's really … or the perceived risks, I might add, which are different. By the way, as everyone probably knows, in these dreadful sized houses, sorry, land lots that we insist on spreading Melbourne at, if you gathered the radioactive material out of normal soil in Melbourne, you only need about one house lot to make a bomb, if you could afford to do the separation. So you know, just get used to the fact that we actually do have a fair bit of this stuff around. But I come back to my main point which is this really is about risk and people's appetite for risk. And if you want to take the risks which a lot of people won't, then you would look seriously at nuclear as a low emission option.

ROGER: Can I just say that I agree with Greg, philosophically. I agree, as I often do with Robin, and I'd simply note that all energies have risks associated with them and coal has killed more people over the last century or the last 50 years than nuclear has or is likely to do.

ADAM: Okay, time for one more question. I think this hand, in the green jacket was up first.

AUDIENCE: Hi there. Look, my name's Lloyd Harrington, and I've just got a sort of an economic dilemma for everybody to consider. John was very interesting because he gave us an insight of this … John … Greg, sorry, Greg Hunt gave us insight that one of the problems with energy infrastructure is that it's very large and very long lived and we all live in homes, we have cars and we live in buildings and we have power stations and transport systems and stuff. And these live for a very long time. And of course if we change the price of energy in the short term, that has a very big penalty, economic penalty on all of us. So the question is, how do we get a price on carbon that's very low in the short term and doesn't penalise us economically, but it makes us invest like the price is $1,000 a tonne. But what we want to do, if we want to actually invest like the price of carbon's very high, whenever we make investment decisions, but we don't want to penalise the existing infrastructure with that cost. So it's a very interesting dilemma. Maybe somebody's got some ideas about how we might do that.

ROGER: Can I just start on this one? And that is that I have to disagree with my colleague, Greg, on this. He's been looking at tax as being the cost. Tax is a transfer payment. Depending on how you recycle the funds, if you recycle it to reduce more inefficient taxes, you can actually potentially, theoretically, get a double dividend. Tax by the way is also involved in purchasing emission reductions. You cannot purchase emission reductions from nothing. You can say, well we're getting them from wasteful expenditure, but the prior alternative is instead of doing this, hand it back to the tax payer. So it always comes back to the same effective price. The real cost is driven by the real changes in the economy at the margin, and the fractional differences between the recycling mechanisms you use and whether they have different efficiency signals. So we ought to get out of this tax transfer argument and focus on the real economic costs.

ADAM: Anyone want to add anything to that? No? Okay. That's it for questions tonight. And, so please thank all our panellists. I'm sure we'd all agree that it's nice to have these sorts of debates with no-one calling anybody names and we just have civil discussion where one person speaks at a time. Now I think, and Susanne's come up to sign things off, but I think John wanted just to wrap up before we finished. So, I'll let you guys fight over that. But thank you very much.

JOHN: Thank you. I'd just like to conclude by thanking everybody very much for coming. I hope it's been a useful and informative debate. I'd personally like to thank all of our panellists for your perspectives on our work, particularly the ones that disagree with us, they're always the most useful perspective 'cause they're the ones that make you think the hardest for next time. And very much appreciate your inputs. I guess the message we would like people to take home from this evening is that if we are serious about making changes for 2020, we will need to put in place a series of market mechanisms to get there. We may well need to do a series of other things as well, particularly if we're serious about reducing emissions after 2020, and we probably are. I hope we are. But if we're serious about 2020 we've got work to do. I would love there to be some magic pudding solution in which, you know, no-one was affected by this and there were no costs on the economy and all of the rest of it. But there is no magic pudding. We are arguing about how we do something which is going to be difficult and we're arguing about what's going to be the way that makes it as least difficult as possible. I guess our review of the last 15 years of experience tells us what the economic theory says, which is if you are serious about doing something, set up a market, put a price on something, and get on with it. You might want to do some other things as well, but the chances are that that business of putting a price on things, letting companies innovate, will in the long run probably deliver us more at lower cost than the alternatives. So thank you very much for your attention this evening.

AUDIO: This has been a podcast from Grattan Institute. Want to hear more? Check out our website, www.grattan.edu.au.

End of recording