

Europe wastes billions of euros by having overlapping climate-change policies. Is Australia about to make the same mistake?

A price on carbon is critical for effective climate change policy. But what happens when cap-and-trade is combined with other policy instruments?

Dr Cameron Hepburn explained why more than a carbon price is needed and the potential pitfalls from multiple overlapping instruments that can interact in undesirable ways, undermining rather than complementing a carbon price. He will be joined by an expert panel to discuss how we might learn from Europe's experience.

Chair: Mr Tony Wood, Energy Program Director, Grattan Institute

Speaker: Dr Cameron Hepburn, Economist, Fellowships at LSE & Oxford University

Panellists: Mr Andrew Stock, Director Executive Projects, Origin Energy
Dr Malte Meinshausen, Honorary Senior Fellow, University of Melbourne

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

TONY: This evening's speaker is Dr Cameron Hepburn. Cameron has been a long-time contributor to climate change policy and made a very strong contribution to the Stern Review. He now works at the LSE where he works with Nick Stern and the work being done at the cutting edge of climate change policy in the world.

For the past two months Cameron has been working in Melbourne. The work Cameron has been doing with Grattan Institute will be published later this year and will build upon the report, [*No easy choices: which way to Australia's energy future?*](#) we released early February which looks at the challenges if you seriously want to transform Australia's electricity supply industry from where we are today to effectively zero emissions in less than 40 years, and whether today's policy mix and the proposals from July this year are the most efficient way to get there.

CAMERON: I'm going to talk about multiple climate change policies and the structure of what I will say will follow five parts:

- Firstly, why is what I'm saying interesting and what's the policy context in which this matters?
- Secondly, when does it make sense to have lots of policies more or less doing similar things?
- Thirdly, what shouldn't we do? And this talk really builds on a paper that I published last year with a colleague at the LSE and a colleague at Harvard on how not to stuff up your environmental policy by having too many of them.
- Fourthly, what are the impacts of layering lots of policies on top of one another?
- And fifthly, how to avoid the mess that might result.

Climate policies have proliferated around the world and there are now literally thousands of them. Many rich countries have hundreds of different climate policies alone. Grattan Institute suggests that Australia now has around 300 climate related policies. And policy proliferation is exacerbated in federations such as the States or Australia because each individual state wants

to have their own set of policies as well. Ultimately what we're addressing is a global problem. My observation is that one of the reasons for the proliferation of policies is political. Observing UK Ministers, they're driven by the need for something to announce to their citizens. They need to be seen to be doing something. And I suspect it's the same here. And what happens when you need to be seen to be doing something is that you get an agenda of press releases and announceables and you need a new policy to go along with your press release. It's not just in climate change, there's more than one area of policy making where the headline, the slogan or the sound bite for the announcement has been developed and then poor old civil servants have had to work out what the actual policy should be to follow the sound bite. And I think a psychologist, and I'm not one, might say that this is one of many possible instances of action bias where when faced with uncertainty or risk, the do nothing option is left off the table. We need to feel like we're doing something. And clearly climate change involves great uncertainty, concern and worry for many of us. Being seen to be doing something is an important driver of all of these policies. As an example, a few years ago Deutsche Bank climate change advisors did a survey of policies they could specifically identify and analyse and even at that stage there were over 500 policies they could pin down. We've seen quite a lot of proliferation since then.

The other context here is that it's not just the specific climate policies that matter, they're layered on top of a whole bunch of other policies that relate to the areas of interest: energy, agriculture, transport, etc. We have about a trillion US dollars spent every year in subsidies for some kind of resource consumption, \$US400b on energy, two to three hundred billion on agriculture and two to three hundred billion on water. And I include water because water is the main mediating force for the impacts of climate change, whether it's sea level rise, droughts, floods, etc, water is always present and the water system interrelates reasonably closely with the energy system. Of course there are indirect subsidies in terms of not pricing environmental assets such as our biodiversity. And recently Dr Fatih Birol, the Chief Economist of the International Energy Agency, said that if we removed possible fuel subsidies that could be half the answer to climate change. That sounds like a pretty grand statement but, and it's certainly difficult to remove half the fossil fuel subsidies, but here is a rough and ready, I don't normally use data that has come from a newspaper, but this has come from the Guardian, so it's very convenient. I'm not vouching necessarily for its full quality or they're drawing on International Energy Agency data, but it makes my point that the scale of the fossil fuel subsidies really does exceed the scale of the renewable subsidies. So if you're thinking about your climate change policies and how to support clean energy, it may also be worth pausing for a moment and thinking maybe we could achieve some of similar objectives by reducing the scale of support for dirty technologies instead so that we're not doing one thing and pulling in different directions at the same time. And maybe we want to subsidise energy per se for various distributional reasons or concern about the poor, but we should probably then subsidise energy rather than clean and dirty stuff at the same time.

You would think my theory that announceables are driving policy proliferation problem, would be a problem particular to democracies. I don't think it is entirely a problem of democracies although I do think it's a problem that is worse in democracies. This is a map of China. China has seven pilot emission trading schemes on the go. They are due to be launched sometime next year although I don't think they'll all be launched next year. They're operating on an extremely rapid timetable, and there are plans to combine all of them up on a national level sometime from 2015. As an economist, I'm certainly a fan of putting a price on carbon; making polluters pay. It's all very economically rational. Well done to the Chinese. But they're also now talking about a carbon tax, so this is interesting. We have two layers of carbon pricing mechanisms, trading and taxation, potentially simultaneously deployed in China. Now surely this isn't driven by the need for announceables. Well, I think the Chinese are perhaps more aware than some of our Western politicians are about the challenges of combining policies together. They're perhaps less good at the PR side of things. The carbon tax was pseudo announced in early January. The announcement more or less said that it was around \$1.50, going up to \$6.00 in 2020. Then there was a clarification a week later that they're not really dead set on this carbon tax. It was somewhat retracted and then discussed and clarified and at the end it became clear that it was under consideration. But the Director General of Climate at the National Development Reform Commission (NDRC) said that there may be some overlap between the two systems, that's trading in taxes. Of course the two systems are not mutually exclusive, which is right. We need to consider carefully. And he's absolutely right. If you're going

to start applying multiple price instruments then you need to think about what you're doing. It's not the case that because trading is good and because taxes are good that if you do both of them that's even better. You want quality rather than quantity in your policies.

So let me spell out when it can make sense to use more than one policy at the same time. Well, firstly, if the way you think about the world is that the government should intervene when the market is failing, then one basis for having multiple policies is that there are multiple market failures. And indeed in the climate change context, there are several market failures. So what do I mean by a market failure? Well, the main market failure is that greenhouse gas emissions do damage to people now and in the future, but there's no price for them unless the government does something. So you can harm people without having to pay for that, and there's no market in which you can transact and buy and sell the harms that are relevant. So when there's no market for this, there's an absent market, and it's called a market failure. And so one thing that we can do is price the pollution or internalise the price with a trading scheme. You probably are all reasonably familiar with that logic by now.

But there are other market failures as well. When we do research and development and deployment of new technologies which are very relevant in the case of climate change and environmental damage, technologies are required to solve those problems. The research and development creates knowledge, knowledge is very easily sharable and it's hard to fully protect. So the benefits of that knowledge don't accumulate just to the company or the individual doing the research, they're shared by society at large. That's a good thing, but it means that the incentive for individuals and for individual companies to do that research is lesser than it would be given the social value of the fruits of that research. So there's therefore an economic case for supporting research and development in general, and a specific economic case for supporting research and development in an area such as climate change.

On the deployment side, if you move first with the new technology, whether it's wind or solar on your roof or concentrated solar thermal plants or geothermal plants, getting a new technology up and running and deployed is difficult. You have to engage with government, you have to work out what the regulations are, you have to find the right staff, you have to hire them and train them, etc. And then some other company comes along and steals your stuff and piggybacks off your efforts with the government and so on and so forth. So the first movers face additional costs that others take the benefits of and so you may end up with a scenario where there aren't people willing to go first. So there's a case for supporting the early stages of deployment of new technologies as well. So there are three main market failures. Each of those provides a reason for why the government might want to do something about them. It could be legitimate to have multiple policies to address those multiple market failures. And there are many other market failures related to the climate change problem, whether to do with the health safety noise differentials of clean versus dirty technologies. Technology lock-in: we all use qwerty keyboards. Have you ever asked yourself why? If not, maybe you could go and Google it and see what you find. The reasons are quite amusing but they're not very logical and they just slow you down when you type. So we can end up with these situations of technological lock-in that are clearly not optimal and there is potentially a role for intervention there too. So that's the main reason why you might have multiple policies.

The second reason why you might have multiple policies is because in fact they're really one policy masquerading as several. So there are several policies that are tailored together. For instance a trading scheme and a tax can work very well together if the tax is effectively serving as a floor price in your market in the trading schemes. These are called hybrid policies and they're very sensible. There's good 30 year old literature on how to design hybrid policies. So that was what to do.

What shouldn't we do? There are several ways you can do things that you shouldn't do. And I'll say a little bit more about one of them. You can stick taxes on trading schemes, you can stick subsidies with trading schemes. And these are not theoretical. We've got taxes in Ireland on carbon, and Ireland is also under a trading scheme; the European Emissions Trading Scheme. Subsidies and trading schemes, lots of clean energy, wind, renewable energy subsidies around the world coupled with carbon prices from trading schemes. In the UK we have two trading schemes on top of one another. We have a trading scheme called the Carbon Reduction

Commitment for downstream companies like supermarkets and so on that purchase electricity. And we have the European Emissions Trading Scheme applying to upstream companies that generate the power. And every time there's a standard put on cars or consumer goods, that is intended to reduce emissions, that is then being layered on top of a price. If you have a trading scheme in place there's a price incentive to reduce emissions.

Let me take you through a few charts here for how technology specific subsidies or support can have an impact on a particular market. What I've plotted here on the vertical axis is the cost of clean-up of different types of technologies, the marginal abatement cost. And on the horizontal axis is the quantity of abatement. Abatement means the amount of emissions that you reduce. And I have five technologies here, A, B, C, D and E. If you set a particular abatement goal, here Q^* (Q star), then in order to achieve that goal you'll need technologies A, B and C. You won't need technologies D and E. If this were a trading scheme, then this would yield P^* as a price from your market.

So let's focus on technology B and let's assume that this is a market where these five technologies aren't subsidised yet. Now let's suppose we subsidise technology B which can be solar. Maybe we give B a subsidy of S . Instead of costing \$10 per unit it now costs \$5 because the government's paying \$5. It might be that you've subsidised B enough that it becomes cheaper than A, after the subsidy. So you switch B and A around in the order. But this actually hasn't done anything to your market. It's left the price of P^* because A and B were being used beforehand. All it's really done is transferred cash from the tax payer to the people involved in the supply chain of producing solar cells. There's nothing especially wrong, or right, with that per se from an economic point of view. There are probably some costs of making those transfers, so there's some loss involved. But it's not doing very much.

What if we decide to subsidise technology E? E currently isn't being used. We can subsidise E if we subsidise it by amount S then actually it's still not being used to meet the target, so again it doesn't change the price.

Let me move to the more complicated bit. Here we have technologies A, B, C, D and E. Here's D. We're going to focus on D this time. Suppose we subsidise technology D as wind. We're going to subsidise D and I've combined the charts together for ease. Suppose we give it a big fat subsidy, and D becomes cheaper than B. What happens if you've got a carbon trading scheme in place with a fixed cap, what you do is you bump out technology C with its emission reductions, it's not being used any more, and instead you use technology D. So you've achieved your Q^* , instead of by using A, B and C, you've used A, D and B now. We've displaced something and we've replaced it with wind. But because wind was more expensive, we've just actually increased the overall cost of hitting that target, at least in the short run. And we've also transferred some taxpayers' money to people involved in the wind supply chain.

The point is in the short run this doesn't achieve any additional abatement if you've got a cap in place. It's pushed up the price of achieving that reduction, and you've just taken money from taxpayers and you've given it to people in the wind supply chain. And as I say that may or may not be a good thing. So that is an example of the impacts in the short run. I'll give you some more examples of impacts of actual cases here, so less theory, more real world. We'll get to the really real world a bit later.

In the UK there is something now called a Carbon Price Floor. It's quite high. In fact I think it's higher than the Australian price floor will be when the scheme comes into play in 2015. But in the UK the price floor is really a disguise for the word tax, and it's because George Osborne, the Chancellor, wanted some more money as there's a great big financial hole in the UK budget. So this UK carbon tax has been applied and it is layered on top of a European-wide emissions trading scheme which includes the UK.

So what does this carbon tax do? Well, it increases the cost of carbon in the UK, potentially. In fact it does right now. So that means that the UK is incentivised to reduce emissions more than it would otherwise do. But there's a Europe-wide cap, so if the UK is reducing emissions more and the cap hasn't changed, emissions go up in the rest of Europe. So there's no net impact on the atmosphere. The atmosphere doesn't care about George Osborne's tax. But George cares

because the UK Treasury gets the revenue from the tax and because the price of permits in the European scheme falls, all of the rest of the European governments get less money when they sell off their permits. Cunning plan. So we've managed to transfer revenue from Europe to the UK. But we've done it at overall loss to the world because we've shifted abatement from one area and moved it to a higher area. So overall it's become more expensive to achieve the same reduction. So there are three effects: more expensive to achieve the same reduction, no impact on emissions and more cash to the UK, less cash to the rest of Europe. And we've done some numbers on what different tax rates would mean in terms of increase in abatement cost and change in the European carbon price, but I won't go through them given that I'm sure I'm about to be gonged, aren't I?

Here's another example. There's a directive in Europe to increase energy efficiency. And the point of this directive is part economic, energy efficiency is a very sensible thing to do, provided the benefits are higher than the costs, which they often are. And the energy efficiency directive will also reduce emissions because the less energy you consume, the less you emit. But there's a cap, remember. We have a cap and there's a trading scheme underneath that cap. And you can see what the approval of the energy efficiency directive did to carbon market prices in Europe. We had a period of nice moderation where they just stayed more or less around 15 Euros a tonne. That was before the Greeks were revealed to have been up to mischief. And then the energy efficiency directive was approved and the carbon price plummeted. And the reason is because the government is effectively saying we are going to force a whole lot of people to reduce emissions in this way, so the residual costs of reducing emissions have gone down. The overall costs have gone up because you've got two types of ways of reducing emissions: we're going to force you to do more of one, and less of the other. That means the price in the trading scheme falls but the overall price or the overall cost to society rises. And here's a little chart. So if we have a fixed quantity of abatement, illustrated by this rectangle, we can do it partly with renewables, partly with energy efficiency and partly with other forms of abatement like switching from coal to gas or CCS or nuclear or something else. Then if you leave it up to the market it will deliver you the least cost solution in the short run. And that's what markets are good at. And it's why we should be using them.

If you force more renewables and more energy efficiency into the system where you've got a fixed cap, you're just reducing the amount of other abatement. And if the market was working in the first place then it more or less equalised the costs of these three different things. So you're pushing costs up. And of course if no other abatement is needed because your renewables target and your energy efficiency target are so stringent, then the price for your permits would crash to zero and your market, your carbon market is effectively destroyed. So you do need to take care.

Here's another impact. As I think was a bit of a talking point here at the time of the CPRS, once you have capped the emissions in your economy, voluntary action by mums and dads and everyone else doesn't necessarily change the overall cap unless the government comes to the party and tightens the cap to go along with the voluntary reductions. And there was a particular *Lateline* interview where Kerry O'Brien got stuck into Penny Wong for the fact that every bit of carbon emissions saved by individuals will mean less electricity produced by the energy companies which means more carbon permits to sell to big polluters and this was one of the political and PR challenges of the CPRS at the time.

I've hopefully explained to you that you can get into a bit of a mess by having two policies at a time. We have hundreds of policies at a time, so let's be clear that the mess is potentially substantial. I should also have said so there might be a reason for the many policies, and we'll be getting back to that again.

But solving this policy proliferation problem shouldn't be impossible. The first thing is that if the public are aware of the problem, then it might be that support for doing something and doing more of something falls away. And your electorate says look, we just want the right set of quality policies, not yet more stuff that isn't going to make a difference. And the right set of quality policies might be an emissions trading scheme with a tight cap that falls over time coupled with some set of very cunning incentives for a portfolio of renewable technologies which the Grattan

Institute is going to publish a report on in due course. So let's get some public awareness of the problem.

In federal systems some coordination is required to prevent proliferation. Understanding basic economics is helpful. It can be harmful too, I know that very well, but at least some basic economics can ensure that Ministers are advised against doing announceables on the fly because they want to say something to an audience. But the other thing is that realistically Ministers need to be announcing stuff and looking good. It's their job to look good, they're politicians and you shouldn't really criticise them for that, so the job of the rest of us is to think about how we can give them ways of looking good that don't lead to yet more policies. And here's one suggestion from a personal point of view, it's not a particularly good photo but there's Penny Wong opening a project, Chinese-Australian cooperation in which my company Climate Bridge was involved with. So there you go, she's announcing something, she's looking good, but there's no new policy.

The other thing is that when it does make sense to have multiple policies, which it sometimes does, then just ensuring that the various market failures you're addressing are being addressed in a joined up way. So for instance in Europe, with the energy efficiency directive that I mentioned, they're now thinking of pulling out 1.4 billion permits from the trading scheme partly to reflect the fact that if the energy efficiency directive works, then there'll be lower emissions and so actually that then does achieve something because you've tightened the cap commensurately with your policy of increasing energy efficiency. The other point is that policies to address critical market failures which we need, like research and development and deployment, need to be designed so that they don't undermine your carbon prices. And as I say, we will find out everything we need to know about how to do that in a forthcoming Grattan report. On that note I will pass to Tony to start the panel discussion. Thank you very much.

TONY: Let me introduce the other members of the panel who now are on stage. Firstly Andrew Stock. Andrew has been in the energy sector for quite a number of years. He's had senior executive roles for most of that period of time, originally working with a company called Sagasco in South Australia but subsequently with Boral Energy which became Origin Energy. In more recent years he has been responsible for a very large portfolio, approximately \$4b in investment in upstream petroleum, power generation and low emission energy technologies. Andrew has a particular perspective across all of the technologies, both the ones that have been increasing our emissions and those that are reducing our emissions, and therefore has quite an interesting perspective in the corporate world for how you think about the way investment takes place, the way investment decisions are made and how they're made in a policy environment.

And the other member of our panel is Malte Meinshausen. Malte is working in climate science at the University of Melbourne. He also has an extraordinarily strong background, particularly in climate science and the way in which the climate science has been positioned in a more specific, local political sense rather than a global sense. And he's been involved in some of the accounting rules that go behind the International Emissions Trading Scheme. The perspective he brings is how these policies work to address either singularly or together cost effectively the challenge of reducing greenhouse gas emissions.

ANDREW: I was reflecting as you were talking about the dimension of time because I think there was the hint of a question or a comment from the audience about time when you were working through the hypothetical. And I think time's an important dimension from a number of respects here in this whole debate because, as I think you'd acknowledge, technologies don't happen overnight. And particularly when we've got to fundamentally change the energy supply system around the world which has been in the last century and a bit, built around fossil fuels. So that will take time and, unfortunately, I think if we operated in a world where that hurdle to reduce the marginal tonne, which is a small hurdle in the short term, results in low prices for traded permits — and we're seeing that in the EU and we're seeing that debate happening in Australia as well — why do we have to have \$23 or a \$15 floor?

My observation from trying to get solar technology up over 10 years is that technologies need a big push and that push certainly needs to come from some research and development, but more often than not deployment and global scale deployment, because it's the global scale

deployment, as we know when we buy motor cars or any other manufactured appliances, it drives costs out and improves product delivery. And you won't, in my view, get that global scale deployment purely with an emissions trading scheme. So we do need to have a system that can have, and I'm talking globally and you can take that down to Australia, a system that can provide an incentive, whether it's a subsidy or whether it's a fee law or whether it's some other mechanism to drive technological change, because frankly I don't think that it will get driven on the basis of prices in the \$15 to \$25 a tonne range.

And the problem with the time dimension, as I think many of us might appreciate in this audience, and generally is that while we are working out how to bring forward the next technology, the clock's ticking and we're continuing to burn the fossil fuels at an ever increasing rate. So I guess my observation would be that time is a dimension but the way in which companies value time I think is an important consideration too.

TONY: Malte, would you like to make some general comments first?

MALTE: Thank you. When I first was invited to sit here on the panel I thought, well we have a forward looking economist, we have a forward looking policy research institute and we have a forward looking company, that's going to be quite boring. But then I actually saw the title of the event — *Killing no birds with two stones* — which is obviously meant as a provocation and I'm going to take the bait.

We are not talking only about achieving emission reductions in that very short term period, we want to be fit for the future where we have to have a zero carbon economy. We need to have, for example, extra push on the technologies that are going to be enabling us to meet our energy needs with zero carbon emissions in just 40 years from now. And, therefore having, for example in Germany, feed-in tariffs that sit underneath the EU trading scheme. Yes they are going to reduce the price incentive for some other sectors, but they're going to give micro incentives for some key technologies that we need for the longer term journey. So it is rather two stones for two birds. If we kill multiple birds with the two stones, because we have a lot of ancillary co-benefits: energy security, less air pollution, there are lots of benefits for doing climate policy and for making us less dependent on, for example, foreign energy resources. But it's not only two stones, as you mentioned, we have a large area of climate policies and pretty much all of them make sense in a very complex regulatory world. And we need to move even beyond multiple policies, we need to move to mainstream and climate policy into a lot of policy areas. We need to mainstream climate policies into transportation policies, we need to mainstream it into, for example, giving investment securities not only, or as you talked about abolishing subsidies, etc, so we need to move a couple of steps. So the most appropriate title that I can come up with, *Killing Multiple Birds With Mainstreaming Climate Policy*.

TONY: Cameron, would you like to respond to those comments?

CAMERON: I'd love to, thank you. They're a very fun set of comments actually. So on time, I think you're absolutely right. Time is a critical dimension here. It's one of the most important dimensions and I spent quite a lot of my academic career thinking about it and spent three very enjoyable years of my doctorate in Oxford basically working on the economics of time. And you're absolutely right that it's the dimension that was largely left off. And I left it off because it allowed me to make a point. When you put time back into the equation, you see that the R&D story and the deployment story and the avoiding technological lock-in story, all of these types of market failures come to the fore and make you think, we do need additional instruments and policies here. I would stick to the story line that we probably don't *need* many additional policies. We do need something but we don't need hundreds of them. We need a carbon price, we need solid research and development incentives, and we need a very small portfolio of policies to assist with deployment. And I guess if there's anything of Malte's comments that I disagreed with it was the idea that all of the climate policies we have currently make sense. I think that is a very ambitious statement. It's probably manifestly false. And that's pretty much what has motivated the talk that I've been giving. I think this is really an area where we need a bit more quality and a bit less quantity. But let me talk about birds and stones.

I'm delighted that you took the bait. I'm actually really wishing that I made the talk *Catching No Fish With Multiple Hooks, Lines and Sinkers*. For better or worse you're probably right that the four of us do broadly agree. I suspect all of us agree that carbon pricing is necessary but not sufficient. You need the base incentive to ensure that there is a cost to polluting, but given the time dimension and given all of the other ancillary benefits, you're absolutely right, there are several birds that can sometimes be killed with one stone. Given all of those things, it's clearly not sufficient and then the big question is what do we add on to carbon pricing? How do we add it in a way that it doesn't undermine carbon pricing, and how do we add it in a way that wastes as little as possible of taxpayers' money? And some of these numbers can turn out to be reasonably significant amounts per person of taxpayers' money that is being spent.

ANDREW: I wouldn't mind picking up that last point about taxpayers' money because I think most of us in this room are probably taxpayers in one form or another. One of the interesting observations about some of the renewable schemes is that they're relatively transparent, whereas some of the subsidies that exist are much less so. I suspect, and I'm certainly not working for the company, I am advocating it that if someone was to stand up and say well we should get rid of the immediate tax deductibility of exploration for oil and gas, there'd be an absolute uproar. But I don't know that there are too many other industries, for example, that get an immediate up front write off for spending money. These days you do on research and development, but if you're in the EMP business, one might argue that sustaining your resource base is a necessary thing to do to stay in business. But that's not very transparent to the general public. Another example I might offer is that there's a lot of hoo-hah, fostered initially by an IPART review in New South Wales, around a solar scheme for feed-in that I would say was poorly designed, and I do agree with Cameron that schemes that are poorly designed discredit what can be a good thesis but poorly applied. And I think you see that with solar PV and feed-in tariffs in Australia. If you looked at the IPART analysis, the actual reason that the prices were going up so much in New South Wales wasn't solar at all. Solar contributed a little bit, but it was actually the increase in network charges that were needed to supply the increase in peak demand for electricity which was caused by people buying more and more air conditioners. And many of those air conditioners were of poor quality because it took the states close to a decade to put in place an agreement about what was an appropriate standard of air conditioner to let into Australia from overseas. The point I'm trying to make is that many of the subsidies or support structures for the renewables sector are transparent. That means that journalists are easily able to write about them. Many of the other things that go on in our society are much less transparent. So perhaps if there's an argument, it's for a transparency principle where maybe there's a balance sheet that can be put forward to the general populous each year so they actually see how money that is coming out of the public purse is deployed (in the energy sector and those sectors that use energy and some of those are topical right now, aluminium smelting being one of them). And we might make the same decisions as a community but at least it would be a better informed debate. So I think transparency is a principle we need.

TONY: The other thing that came to my mind, Andrew, when you talk about that is with these various subsidies and other arrangements, whether they're transparent or not, is how do you work out which are the good ones, which are the bad ones, which are the stones we should stop throwing, which are the ones we should throw more accurately? We'll run this analogy to death eventually, I'm sure.

Malte, you've made the comment that there are clearly policies that have produced outcomes which arguably have been very positive, and particularly with respect to driving down cost of technology. But is that the test one should use, or how does one think about this issue of which are the policies we should be keeping and which ones are maybe questionable? One of the things we've seen in Australia, and we've seen it in the last 24 hours with the government removing the solar rebate, is that for those companies who've been getting the benefit, they will obviously argue very loudly for that particular support mechanism, and those who might see it from the other side — they don't like the cost or they think that a subsidy to you, is a penalty to me, — don't like it. So how do you think we should be thinking about this, the 300 policies we have in Australia and how do we unpick this to bring something which does have a smaller number of effective policies?

MALTE: I think the first thing you should be really clear about is what are your policy objectives. And this academic study was taking policy objective equals emission reductions at lowest cost. And I would say this is not the only policy objective because we want to achieve the emission reductions over the whole century at the lowest possible cost. And this doesn't have to be the same. If we have the next five years with the lowest cost, we are having all the low hanging fruits there, we take them and then we didn't prepare for the future. So be clear about the policy objectives and then be really clear about the complex policy environment that you are in. If you, for example, have an emission trading system which filters down in prices to consumers, but then the consumers are paying their electricity bill, but maybe they are in rental arrangements and wouldn't be able to willing to put up with the investment costs of solar PV or solar thermal for example, then you need to have other incentives that target these investment costs. So you need to have a very fine and detailed view about what is the policy environment or the regulatory environment that you are actually in to target your policies near to the institutional barriers in the way of achieving the lowest cost reductions; lowest cost in the terms of lowest costs over the century to prepare us for zero carbon economy.

TONY: One of the other things that I take from that point Cameron made about the multiple policies is that if you ask a politician, they might also say well we're also after more jobs, we're after rural activity, we're after this, and you say which one do you want? And they say yes. So this is one of the challenges of policy, what people will say, this policy, well it didn't produce what we thought we were going to get but we got a lot of jobs, or we got export opportunities, we got something else. I think your point about being clear on this is absolutely right, but it's quite hard for policies often to actually do that because they're pulled in different ways. And from an investor perspective, you say well how do I think about these policies when I'm trying to make investment decisions. And I guess Andrew that's one thing I'm interested in from your perspective, when you're looking at these, not just the fact we have policies, but we've also got prospective policies being put in place and possibly the ones that are in place are being changed in various ways, deliberately or inadvertently, what does that mean, what does that do to investors when they're thinking about trying to make a decision about a long-term asset.

ANDREW: It creates uncertainty. And there is a lot of uncertainty out there when you make any investment decision, certainly over long timeframes. But if the rules keep changing, then that's a big uncertainty. Most industries will live with a set of rules and deal with the uncertainty in price that comes out of that because that's what they think they know, if you like, or can understand, but I guess the uncertainty that comes with changing the rules is something that is a lot harder to predict. I was thinking about this as I was pondering tonight. On the one hand I've just said that, but on the other hand, one will see any company out there continuing to advocate in the public domain and in Canberra and other state jurisdictions for a set of rules that better suit them. So on the one hand industry will argue we want consistency and stability because that reduces investment risk, and on the other hand, we're out there actually trying to change the rules all the time as well. So it's an interesting paradox of behaviour, mainly because they think they probably can change the rules that benefit themselves versus their competitors perhaps, or another industry, but nevertheless it does create uncertainty and then you overlay that on the political dynamic and it makes for an interesting mix.

CAMERON: I think Andrew's point about transparency is a good one. And may I just underline that and add something to it. I put up this chart of the scale of fossil fuel subsidies versus renewable subsidies. That's, in a sense, taxpayers' money too. I say in a sense because it's often in other countries around the world, they were global numbers and fossil fuel subsidies are particularly large in places like Iran and Russia. But still, there is taxpayers' money going to substantial fossil fuel subsidies and they get a disproportionately low level of scrutiny. In fact they should get more scrutiny than the scale of the renewable subsidies, both because they're larger but also because they're probably pulling in the opposite direction to the direction that we should be travelling in.

TONY: The one that always strikes me is the one in New South Wales recently where the government decided to subsidise a particular coal mine. In this case it was equal to \$300m a year of New South Wales taxpayers money. But there's an extraordinary distortion in the pricing of coal versus gas versus renewables and yet it hardly gets any publicity whatsoever. And that was almost transparent. I mean it was actually reported in the media.

AUDIENCE: My name is Mike. Question to Dr Hepburn. You make the point quite clearly of multitude of policies being counterproductive. But you quite adamantly state over and over again pricing carbon is fundamental. You don't question that. And Dr Meinshausen said we need to be sure about what we're trying to achieve. Now to take your analogy into play, should the birds which we're trying to kill actually be energy use reduction rather than carbon reduction? And if so, maybe we don't have to use a tax on carbon as the stones, maybe we need to have a tax on energy.

CAMERON: Yes, I did say those two things and I'm happy to have said them both and I'll say them again. I think that there are too many policies and I think that pricing carbon is fundamental. And the reason putting a price on carbon, or at least carbon dioxide and other equivalent greenhouse gases, is fundamental is because, in terms of the objectives, that is one of your core objectives. The problem and the science that we've known for over 150 years is that we're adding to the layer of greenhouse gases, it warms up the planet, the planet wouldn't be at benign, happy temperatures that it is now if those greenhouse gases weren't there. So they're helpful but too many duvets on you in the middle of the night you get quite hot and sweaty. And so that's the problem that we're addressing. Problem is too much CO₂ and other forms of greenhouse gas pollution. Placing a price on the pollution to ensure that polluters face the costs of doing what they're doing is a fundamental part of climate change policy. You'd be hard pressed to make me change my mind on that one. And if there was some inconsistency there, I guess I'm missing it.

TONY: Do you have any comment about the question of whether pricing energy consumption is a better way than ...

CAMERON: I do. I think this is also about being clear about your objectives. Using energy is a good thing, it's a great thing. I mean energy has been correlated with GDP and welfare. You look surprised by my comment but I may just point out there are some lights on here and if we didn't have energy, we'd be in a bit of strife. So energy and in particular exergy, which is highly ordered forms of energy, is highly correlated with human improvements, and material improvements in the standard of living. The problem is that the energy that we use is dangerous, it's polluting; it's polluting at the local level, it's polluting at the global level. And so the challenge is to make the energy that we use safe and clean and healthy. If you just tax energy, you're taxing the wrong thing. Energy is not the problem, it's the way we produce and consume energy that's the problem.

AUDIENCE: My name is James Brown. I'd like to support Dr Meinshausen. I think Germany has developed a number of really excellent policies, particularly the lock-in feed-in tariff which means that if I want to put in a particular technology, and there are different levels of support for different technologies, if I want to put in a plant using some new energy source, then they will ask me how much I need to make a profit on that plant and they will give me a feed-in tariff which enables me to make a profit. And they'll say once you get that plant online we will pay you for the energy that you deliver over 20 years, and you just go to a bank with a spreadsheet. And you don't have to tap subsidies or anything else like that. Fundamentally you've got a conventionally financed thing, and basically no money flows until you start generating electricity. And the impact of that, even if you're paying, let's say, one Euro per kilowatt hour, only impacts on end prices to the extent of that energy produced. So if you produce one small plant and it proves to be not really successful, it doesn't matter. And it seems to be that is a very, very strong set of policies and it has delivered in a number of areas in Germany. It was initially supported by solar, but in fact the amount of solar going in is fairly modest. And most of it is in fact wind that's going in. But it does provide you with this ability to support different technologies and invest in new technologies which may be promising in the future.

TONY: Think that was a comment rather than a question ...

MALTE: I would largely agree, the feed-in tariffs, tremendous programs like the 100,000 roof program, etc, and that really kick-started both the wind industry and solar PV. Of course as with any other newly introduced policy, there are some issues where you have to have a second look, and part of the feed-in tariff problems were that they were really successful in bringing the

costs down. And so the measure of how you bring the feed-in tariff subsidy down at the same time, there was some criticism because you were still paying a high feed-in tariff when actually the cost of the system went down. But on the positive side, it was bringing the system of solar PV tremendously down like nobody anticipated. So this was both a problem and the great thing about it. I'll make one other comment about the previous one about energy. I think we are not interested in consuming energy, what we're interested in is, and you pointed out the lights, we are interested in consuming energy services. And so if we can provide the same energy services to the six billion people on this planet with less energy, then that is a good thing. And no doubt about it, we can't meet something like a two degree objective or 350 or something in the long term, ambitious climate targets without bringing down our energy needs. So energy services and are a really good thing, but whether to tax energy or to tax carbon, I think energy efficiency has to be a major focus on policy interventions and putting a price on some energies can be a good thing to achieve that. There are others like labour linked schemes, efficiency standards, etc, so there's a whole range which don't directly target carbon. So you need to have again a mix of multiple policies to achieve your goal.

AUDIENCE: Mark Vess from the Department of Business Innovation in Victoria. Building on the point about energy efficiency, I think it's a critical issue and I suppose one point about the presentation, I'd interpret very differently the graph of EU carbon prices, etc, and I understand how when you've got global financial crisis and Greek crisis, etc, those things depressing the carbon price are one thing, but energy efficiency programs that actually depress the carbon price I would have thought could be portrayed as a very positive thing. And in the Australian context, with our carbon pricing scheme, if we were able to significantly improve energy efficiency and that led to a reduction in carbon price — leaving aside issues in the open carbon trading scheme and global carbon price taking, etc, as a separate issue — but if we were actually able to, or the Australian government was actually able to communicate that they could have complementary measures in energy efficiency which were going to lower the carbon price, I think that might be a very positive thing for the government to be selling rather than being portrayed as a negative.

CAMERON: Potentially ... just let me give you an equivalent story. Suppose we have to hit a five per cent emissions reduction target and suppose we have a carbon cap and a trading scheme and a price, and suppose that the government says right, we're going to build and roll out, with the help of EDF, a massive fleet of nuclear power stations. And that's going to get our emission reductions down to seven per cent below target. What happens to your carbon market? Well, the price crashes to zero and away you go. You've basically removed that carbon market because you forced nuclear onto the system. Now it's probably more expensive than doing it through the carbon markets, at least in the short run, because the market in the short run is designed to pick out the cheapest costs. So now you might be right with energy efficiency, all I'm saying is that ... and I should qualify what I said before, Malte's of course entirely right, I mean what we want is energy services. And if that's what the gentleman up the back was referring to, then I do agree with you. So on the topic of energy efficiency, if you force energy efficiency into the system, you just need to have a good reason for it. So you need to be able to say, and maybe you can say this, there is a market failure. That means energy efficiency is cheaper, maybe unlike nuclear, than the other tools that we have at our disposal, renewables, etc. And because of this market failure it's not going to be taken up without the government really hammering energy efficiency over the heads of everyone in industry and at home. And maybe that market failure is the principle agent problem in tenant rental landlord type situations, maybe it's other irrationalities that we can discover looking at behavioural economics and the way firms behave and so on. But if you've got a reasonable justification for saying there are further market failures and the market will not deliver the appropriate means of reducing emissions and we wish to force one, then by all means, I'm absolutely in favour of that. But I just need to see the analytical basis for it before you press ahead with forcing one particular technology onto the economy over another. And the reason I have for that attitude is that we're in a world where I think if we're honest, we don't know which is the winner here, certainly in the energy generation side, is it solar PV, is it concentrating solar thermal, is it nuclear, is it CCS, is it wind, is it geothermal? They all can place a kind of reasonable potential claim to having some role to play. And in that context where there is wide uncertainty, as my colleagues at the Grattan Institute have been saying in our discussions, you really want to ensure that you don't get lock-in to one technology and you also want to show some humility about what the winning

technology might be. You might be certain that it's technology A. I might be certain that it's technology C. If I get into power and I force C onto the system, well let's just hope I'm right. But I might not be. And I think the kind of humble approach is to say well let's make sure that we've got an overarching incentive for all of these technologies to play and to compete and let's make sure that we're supporting those that are early in their stages of their development because that's where those spillovers are greatest, where we can have cost reductions, and we do need an additional policy mechanism to do that. But by and large, let's try and be as humble as possible about what the ultimate winners might be.

ANDREW: I just want to make a couple of comments about energy efficiency. I did comment earlier about the fact that as we live in a federation, it generally takes 10 years for this country to agree on standards for appliances, and I'm not exaggerating. I mean, in respect of the air conditioners I think it was something like that. Similarly with housing. And it's perhaps a problem of federations, but there's a very powerful that one can get off the internet about the improvement that California drove in refrigerator efficiencies over a 30 year period. And effectively the regulations that California set, it wasn't a free market for refrigerators, well there probably was in terms of buying them, but the only ones you could buy in California were a certain standard. And the standards that California set for refrigerators over a period of about 15 years drove the efficiency of refrigeration, the useful product that you get by putting things in the fridge, the efficiency of that process trebled I think it was in terms of refrigeration per unit of area, or volume for the dollar. I mean costs went down, efficiencies went through the roof and it came as a result of the regulator setting targets. I guess as working for a company that operates across Australian states, all we would like is that there was one set of targets for the country around efficiencies rather than different schemes in every state. And if we're going to have to work to them, let's not take 10 years to work it out because the down side of that is that by the time we do work it out and implement them, we may well have a bigger problem to deal with in terms of more consumption in the intervening period. And then the adjustment costs to reduce that consumption by employing more efficient appliances subsequently are higher. So one system would be great in terms of energy efficiency for appliances, but let's get there quicker.

MALTE: I just wanted to pick up briefly on one issue that came up now twice, the problem of picking the winners and putting your eggs into the wrong basket. And like you mentioned before, feed-in tariffs are one option to deal with that problem partly because you only reward after you actually produce the electricity, but it gets more complicated with the classical R&D policies where you have to invest up front. And so since I think the announcement of this event suggests that Europe waste billions, I wanted to mention one type of R&D policy in the area of CCS and innovative renewables where you have that problem of which winner do you pick. And this is going to be the winner. And it's rather organised as kind of a reward scheme at the end, so there's a set of objective criteria that, after you establish your demonstrating plant for CCS, so innovative renewables, there is a pot of money of three billion Euros potentially and that is going to be rewarded after the successful demonstration of that pilot program. So you don't invest up front, you ask big industries to put their risk assessment in themselves and that's how you can partly circumvent that problem of picking the winners.

AUDIENCE: One thing I'm interested in talking about is not just climate policies but how they integrate with other policies. So you have the regulation of wholesale electricity markets, the regulations of networks, and these kind of policies operate in the context of those and often they're not working together as well. So I'd just like to hear your thoughts on that.

ANDREW: If one looks at broad scale renewables, generally wind is fairly well distributed, but some states have more dense populations than others. Solar is more often than not distant from population centres, at least if you want to have solar thermal plants and so forth, or fuel based PV. So the question of transmission is a key question and something that I think is being looked at now is how do we have a set of rules for transmission that allow new lines to be built in advance potentially of enough projects. So it's a nut that hasn't been cracked yet but it's a critical one.

TONY: It's also one that we're going to do at the Grattan Institute later.

AUDIENCE: Mike Sandiford. I'm the Director of the Melbourne Energy Institute. I'd like to thank the panel members for a very stimulating discussion. I want to pose the question, *perhaps we don't have enough policies?* And why do I say that? Well I come from a point of view of being more interested in the technology side. We're interested in developing new technologies, we're constantly banged over the head by economics saying you can't pick winners, you've got to try and allow it to emerge in the free market. Well I look at the policies and say have you guys got any clues about which one is going to be the winner? Why? In fact we need a diversity of changing policy over a period of time to meet a whole spectrum of things. How do we apply the market rules to the policy so that the best policies emerge? One is by injecting new policies in.

CAMERON: I'm not saying that we don't need some new policies, I am saying that we need less of what's there and more of what's good. The point about picking winners and performance pays, I mean I think the use of incentive tools, policies that pay on delivery, as it were, is great. That does, to a certain extent, solve your picking winners problems. There's a little remark in brackets that's quite complicated that I won't expand on much, but just to say that there's a trade-off between paying out over 20 years, given that corporate discount rates are quite high and public sector discount rates are quite low, and paying once you've had some measure of performance post commissioning but not for the whole 20 year period. So there's that little tweak there too, but that's in brackets. So paying for performance, fine. Mike, you're absolutely right. I mean the further you go back towards fundamental research, the further you are picking, whether you pretend you're picking or not. I mean if you subsidise one lab and not another it's not as if they're doing market neutral, technology neutral research. They're looking at a specific idea. And so I think humility is the operative word throughout. When you're at the end of the kind of development chain, humility says let's pay for performance 'cause that means we don't have to pretend that we know that Cylindra's going to win. Oops. And that this other firm's going to fail. When you're further back up the R&D chain you do need to pick and so what that means is that you should pick according to portfolio, if you delegate to research councils what you can because they're probably better than Ministers at knowing what's likely to fly and what isn't. So I think it's different instruments along different bits of the chain. But more quality and less quantity throughout, I would say.

AUDIENCE: Do we need a renewable energy target in the context of a carbon price?

ANDREW: We might find that out this year. There's a review of the renewable energy target to take place this year, so I'm sure that question will be actively debated. And you can already see that's starting to be the case in the media. If I express a personal view, I think we need both, because my concern would be that we've got a lot of heavy lifting to do in this country to even hit five per cent below 2000 emissions by 2020, frankly. And if one looks at the past decade and what's delivered, it's been what was the Emirates scheme, deliver the bulk of the abatement. Demand for electricity was seen to be inelastic, you just stick the price up and people would continue to use it. I think that's currently being questioned because demand has been flat for the last two years. So I think increased prices have an effect as well. But ultimately, picking up Malte's point, we're going to need to have ways of producing electricity with close to zero emissions. And it's not that far out: only 40 years away. And I don't think we're going to get there purely with an ETS by any stretch of the imagination.

CAMERON: That was a very simple question. The simple answer is yes we do need something on top of the carbon price, it's necessary, it's not sufficient and that something may or may not be a specific renewable energy target. I can think of other instruments that might be better designed and might work better, but I certainly agree with Andrew that the carbon price is not enough. And it's because you can be a completely right wing economist about this and note that well we've got more than one market failure, so we're going to need more than one policy instrument to support it.

AUDIENCE: Thank you. Stuart Allinson. My observation from a distance is that the European scheme has met its targets through the Clean Development mechanism. Whether it's an intended consequence or not, what that has had the effect of has Europe has effectively paid for the retooling of its industrial competitors in China, Brazil, Russia and India, and yet taken short term decisions about its own direct emissions, as it were. I work with a number of organisations in Australia for whom a carbon price is actually not very helpful because if they're larger need

energy users, their direct response to that price would be either to make an investment of 10 to 15 years payback, or to continue to pay for offsets through the Clean Development Mechanism, or to move their production to an environment where there is no carbon tax. So my question is, can you cite specific examples under the European scheme where the carbon price has had the direct consequence of causing organisations to make long term investment in retooling? And if not, what is the policy intervention that's necessary to get organisations to look beyond the next three to five years and towards the next 10 to 20? Thank you.

CAMERON: There are bits of your question I think are absolutely right. One of the problems, and I've been saying this for many years, about the design of the European emissions trading scheme is the time horizons are too short. The first phase was three years. We're talking about multi-decade assets here. The next phase is five. It's a bit better. The one after that is eight. And then we get 10. But ultimately they're still not long enough. I can't point to specific examples of major investments being made purely on the basis of the carbon price. I've heard of instances where investments haven't been made in fossil kit because of the carbon price. And that's also important. But where I guess I'd qualify some of the things that you said, Europe has taken the view that the carbon price is necessary but not sufficient. It has a 20% renewable energy target by 2020. And that is clearly not business as usual. So that policy instrument is delivering change domestically, it's not simply all about offsets. On the topic of offsets though, I don't think they're a bad thing. I mean declaration of interest, I'm director of a company that works in China doing clean energy in China. I'm proud of what that company does because the problem has to be solved in China. If we don't reduce emissions in China we're toast. We're certainly fried. And it's also cheaper to do a lot of the emission reductions in China. And the atmosphere doesn't care. The hip pocket does, and the more cheaply you can do it, the more you can do, because you run out of money if you do the expensive things first. The other thing I'd say about offsets is that — and I should say that my views on international carbon trading and offsetting came before the company, not the other way around. You may not believe that, but it's true. And in fact you can verify it because I published on it. The other thing about offsets is that they have triggered a change in mindset in countries like China and India which I don't think would be as comfortably at the table of negotiations internationally if there hadn't been thriving carbon markets which from their point of view were wonderful. This was magical stuff from the Europeans that allowed clean energy projects that otherwise wouldn't happen, that were on the brink of failing, to get up and over the hurdle and to start to happen. And so there's now 4,000 offset projects around the world. A couple of thousand in China. Not all of them have succeeded, but many of them have. And they're cheaper, they deliver emission reductions in critical countries that are required to get into the global deal of reducing emissions. And it hasn't stopped Europe doing things at home because it's got its own 20% renewables and energy efficiency targets.

MALTE: I would say in Europe, a large proportion of the 18% emission reductions below 1990 levels are reflections of investments into energy efficiency, etc. Of course there are other things, reunification, debt crisis, etc, that play large roles, but these are the aggregate number for all the individual investments that have been taken on the basis of European climate policies and some other factors. Let me link it to the offsets. Offsets are principally great, but of course we have to again have a second look at it and that is what the European Union did. In the second trading phase you had a huge proportion of these green, clean development mechanism offsets coming from HFC 23 projects where you have one industrial gas, you stick a burner that costs a couple of millions maybe on top of a chimney and you get billions worth of credits. That can't be what we are looking for. So in the next phase after 2012 in the EU, there won't be any CDM credits any more entering the system unless they are from LDC countries.

CAMERON: Or unless they're from projects that were already registered.

MALTE: Yes. But not the HSC 23.

I would like to slightly qualify the comment you made about the length of the commitment periods in the EU emission trading system being too short, because A, you have the banking of credits, which has its own problems, but it creates the market perspective of longer than the individual accounting periods. And B, if you do decide nothing else within the EU, then you have an emission trading system which uses the cap by 1.74 per cent per year up to 2050. So you have that long term default perspective and that is a great thing for any climate policy to have,

that you create a default path where you have to have an active decision in order to change that. Part of the uncertainty that you mentioned earlier is, for example, in Australia the Opposition leader can create a lot of uncertainty if he says well I'm going to scrap all these policies again. This is partly why the policies by this government are not as effective as they could be. So it's not only the government, it's the whole political system which can create the certainties for the industry to make actually the change that we need in order to have the little changes possible on ecosystems and human food production, etc.

TONY: And with that I think we need to bring it to a close. I'd like to firstly thank Cameron Hepburn who certainly stimulated a lot of interesting discussion and debate, and secondly Andrew and Malte who have provided some interesting reflections on how these sorts of things might work. And also thank you to the audience for your excellent contributions. We hope to see you all here at our next seminar in June, looking at the future of coal and gas in Australia.

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