

The Future of Carbon Pricing and the Australian Electricity Market

Since the carbon price has been in effect over the last few months, there has been wide-ranging debate over many of the elements of the pricing regime. This seminar reviewed the carbon price in the context of its impact on the Australian electricity market.

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AUDIO: This is a podcast from [Grattan Institute](http://GrattanInstitute.org).

ROSS GARNAUT: We agreed that I'd throw out some general thoughts to open up discussion. The general thoughts will be around four headings: what has been happening in the Australian electricity market and what effect is carbon pricing having; where is the Australian electricity market going in the immediate future under current and prospective policies; three, where is the Australian electricity market likely to go in the long term future through a process of global decarbonisation, if we have policies in place that allow economically efficient outcomes; and four, how will the future be different if carbon pricing is repealed?

First, what's been happening recently, and what's the early effect of carbon pricing. The biggest story in Australian electricity pricing in recent years has been the ending of a long period of quite rapid growth in demand and actual decline in wholesale demand in electricity since 2008. A change in trend that's surprising to some people, not all that surprising for those who read my two climate change reports, but gradually the impact of that big change of trend is being absorbed. The decline in wholesale demand for electricity is generating strong downward pressure on wholesale prices to the extent that even when you add in carbon pricing to wholesale prices, the total wholesale price at present is a bit lower in real terms than it was in 2006/2007. The carbon price has raised wholesale prices but it less than compensates for those large pressures for decline. When the carbon price was introduced on July the 1st for the immediate impact, and we at the University of Melbourne are all grateful for charts that Mike sends us fairly regularly, the immediate impact was a jump in wholesale prices rather more than one would expect from the simple pass through of pricing. There seemed to be two factors at work. One was the water problems down at La Trobe Valley at the time. The other was there seems to have been some game playing attempts to take advantage of the transition, but competitive pressures to squash that out, so that was a short term effect.

So by September that initial distortion had worked its way through and we were getting a pass through for Victoria of roughly the average cost of the carbon price. In other states with lower emissions intensity of electricity production, we had a pass through of a bit more than the average carbon price. Overall the pass through effect was similar to that that had been anticipated in the early economic modelling, most recently by the Treasury. So while there's been strong downward pressure on wholesale prices for the last four years, electricity prices have nevertheless, to users, to retailers and especially to smaller businesses, increased at a faster rate over the past half dozen years than ever before over a comparable period in our

history. In real terms, more than in any other developed country. If you look at the comparative charts, Australia and other developed countries over the past half dozen years, Australia's just off the map. So how do we reconcile these two contrasting statements? Downward pressure on wholesale prices, but historically extraordinary increases in prices that users are actually paying. The explanation is the way we've created a regulatory system, since 2006, that has first guaranteed rates of return on investment in distribution and transmission in particular that is higher than the supply price of investment. Standard economics tells you that if you do that, then you'll provide incentives for ways for overinvestment. Those who've done second year economics will recognise Aversion Johnson, American economic review 1961. We made the classic mistakes and the consequences are exactly as the theory anticipates. There's also been a blowout in costs at the retail end, of the retail services separately from the transmission distribution. That's a smaller part of the whole story.

Why has wholesale demand fallen over recent years? The first element of the cause is price. Demands are behaving in response to price exactly as you expect, it should be no surprise. We know that the price elasticity of demand, the amount by which demand falls as price rises, is greater in the long term than short term because it takes a while for consumers to adjust their behaviour, to adjust their consumer durables, their insulation to make investments to save energy. So that the incentive to reduce energy use increases over time, even if there's only a once for all increase in price. At the same time the wholesale market has been put under pressure by the rapid growth, from a small base of decentralised electricity production, especially photovoltaic systems. Partly under the influence of a range of subsidies but more recently strongly driven by declining relative prices in combination with the increasing prices of distributed power. So we seem to have, for many parts of the market, entered a situation where the pure economics of decentralised power is starting to look attractive for many people. And once we've reached that point then there can be quite rapid shift towards decentralised power, which takes pressure off the wholesale market. The much condemned program of insulation seems to have some effect on demand, and there's no doubt that the discussion of climate change, of energy efficiency has reinforced the effects of higher pricing in making many consumers, both business and household more aware of the advantages of more efficient energy use. So there does seem to have been some change of behaviour related to greater awareness of opportunities.

There's been some reduction in demand associated with change in industrial structure. The big energy using industries like aluminium and steel are a smaller proportion of the economy now than they were half a dozen years ago, not because of the carbon price. In fact these heavily energy intensive industries are more than fully compensated, getting back 94.5% of the permits free. But in a form that retains incentives for reducing energy use because if they reduce their energy use, the amount of permits that they get doesn't decline. So the, in effect, over-compensation is not having an environmentally damaging effect, it's just unnecessary expenditure. And there'll be a further increase in the support for trade exposed industries after 2015, under the arrangements announced for linking to Europe because the CDM mechanism will be available for each user to meet 12.5% of the permit requirements. But, and they will be available at very low prices because of the oversupply in the CDM market internationally, but the free permits will still be made available on the old basis. So that will be another element of compensation for the most energy intensive industries. So, and the Australian aluminium, steel, and other energy intense industries have had relatively high emissions intensity per unit of

output by global standards. So there's quite a lot of opportunity for reducing emissions and some enterprises are actually making use of those advantages, for example, the shift from use of hematite, Fe_2O_3 to magnetite, Fe_3O_4 in the Whyalla steel mills. That alone, if you do your high school chemistry arithmetic, that gives you a reduction in emissions per unit of output of almost one-eighth. And there are many opportunities like that for reducing emissions. But the compensation quite sensibly does not fall when companies take advantage of opportunities for reducing emissions. It remains as an incentive to reduce emissions.

So why has the role of the energy intensive industries expanded in the economy? Well mainly it's the structural change forced by the resources boom, the increase in the real exchange rate which has put downward pressure on the competitiveness of all tradeable goods industries outside the resources sector. And that's had some effect on demand growth.

The early signs in the last quarter have been that the downward pressure on demand for wholesale electricity has probably accelerated with the introduction of the carbon price. But we'll have to wait a little while before we can confidently form judgements about that. Well the second issue I want to say something about, whereas the Australian electricity market going in the immediate future around current and prospective policies. For the reasons I've already mentioned, we can expect the role of decentralised electricity supply, the photovoltaic, to accelerate. We've legislated a renewable energy target that will bring into the market, if the law remains unchanged, a fixed amount of renewable energy arising from large scale sources, large scale units, to 41 terawatt hours by 2020. So a steady increase. And that fixed sum is a rising proportion of electricity demand rising at a higher rate than would have been the case if electricity demand had continued to grow. The combination of these two effects means that we're very likely to have, over the next seven or eight years, a faster rate of reduction in emissions from the electricity sector than the modelling of the government's policies had suggested. We're on a path through a combination of economy and energy use declining demand for wholesale electricity and more rapid, well similarly rapid injection of renewable energy to reduce emissions at a fairly strong rate.

What role will the carbon price have in these developments? The carbon price is not particularly important to either the two factors I've mentioned. The carbon price's main role, while it's at the modest rates that it's at and is likely to be at up until 2020, will be to influence which of the fossil fuel supplies are placed under the greatest pressure. With modestly growing or for a while declining total electricity demand, increasing quanta of both small scale and large scale renewable energy, there'll be very strong pressures for withdrawal of substantial amounts of fossil fuel production. With a carbon price, the greatest pressure will be on the most emissions intensive parts of the generation industry. In the absence of a carbon price there would be simply a comparative cost in the absence of carbon costs would determine which units were going to withdraw. How's the adjustment going so far? Well the most important adjustment so far has been first gas is not being brought in at as rapid a rate as had been anticipated. Now that's likely driven by another factor. Anticipation of strongly rising gas prices, now that we are developing a gas export industry. So gas is really being priced out of the generation market except in certain peaking roles because of the development of an export industry. The price will rise to export parity prices as we develop the capacity to export our gas. Situation here is very different to the United States. In the United States they had a proportionately a similar increase in gas reserves over recent years. In the United States that led to a big decline in relative price of gas, or absolute price of gas, and that's forced out a lot of coal based generation. In Australia

the big expansion of supplies in Eastern Australia was associated with the development of an export industry. So here we've had exactly the opposite effect, gas being priced out of the generation market. The difference is largely driven by different attitudes to the export of gas with the US policy not being favourable to gas exports up to this point. That might change in the future but the biggest adjustments in Australia have been a bit of a pull back on gas, and the withdrawal into intermittent production of some of our coal based power generation. One of the very emissions intensive South Australian plants has stopped producing power during the winter half of the year. It's just going to come in to meet demand in the stronger parts of the year and one of the Queensland plants is having part of its capacity retired. That adjustment will have to go a lot further under the influences I've been talking about, and it will happen naturally in the market. It will be forced by low wholesale electricity prices. And if there's no government intervention then we can enjoy very low wholesale prices for a while until the market sorts itself out – the electricity market version of a supermarket price war.

So one other likely development is going to be, and it will sit naturally alongside greater concern for economic efficiency is development of more efficient storage capacity for electricity which will take some of the peakiness out of Australian demand. That will be hugely encouraged if policy is adjusted to actively discourage power demand at the peak. But even in the absence of that there are signs of greater use of storage that will be reinforced and accelerated with policy changes to discourage use of peak power.

How will the Australian electricity market look if economically efficient policies are supporting decarbonisation into the longer term future? And here we're taking up a crystal ball, so the critical words are economically efficient. How would it look if it all goes well in Australia and abroad? And if the world's to achieve its mitigation objectives, the agreed UN objective of holding temperature increase or having a reasonable chance of holding temperature increases to about two degrees Celsius, and total global emissions have to fall by something more than half, that has to happen at the same time as you've got quite rapid growth in incomes right through this period to the middle of the century, from developing countries. And so it won't work unless, on average, developed countries accept falls in emissions of around 90%. Only 38 years to go so that's a pretty rapid rate of emissions reduction. Australia starts with a highest per capita emissions in the developed world, so one might think that if we're heading towards a world in which it's accepted that entitlements should be at some lower level than at present, than average global use at present, and then are distributed more or less equally on a per capita basis, one might think that Australia's high per capita emissions will require a larger proportion of fall than other developed countries. On the other hand we are the developed country with the highest population growth. So the arithmetic suggests that a fall of about 90% will be roughly what's necessary in Australia and in the rest of the world. It's quite likely that the costs of emissions reduction will be lower in electricity generation than in some other sectors. So efficient decarbonisation is probably going to require going further than in electricity and not quite as far as in some other things. And note that I'm talking about emissions entitlements, not domestic emissions in an efficient world system that's meeting its global mitigation objectives. There would be opportunities for trade in emissions entitlements so that countries would find it relatively easy and cheap to reduce emissions, can sell entitlements to countries which find it expensive and difficult.

In this world of achievement of global mitigation objectives, almost no fossil fuels will be used for electricity generation unless it's accompanied by effective sequestration, either biological or geological. Biological sequestration has much promise and outcomes will depend on research development and commercialisation of new technologies. Geological sequestration, much the subject of unfavourable comment in Australia at present, nevertheless is likely to be economically successful in some locations. And those locations are going to be where opportunities for low cost production of electricity from fossil fuels are located close to favourable geological sites. So maybe the La Trobe Valley is one of these locations. It's more likely that combustion of gas will be associated with successful geosequestration than combustion of coal, both because the volume of emissions per unit of energy are smaller, and also because the physical process of separating out the carbon dioxide waste is easier and cheaper for gas combustion than coal combustion.

In this world of successful mitigation undertaken in an economically efficient way, it's likely that we'll see large quantities of all the low emission sources of electricity generated around the world, of solar, of wind, of nuclear, of biomass, but not biomass from good agricultural land because this is also going to be a period of rising food prices in a competition between energy and food for good agricultural land, it's likely that food will be the winner. So the use of biomass will be focused on use of land that's not of high agricultural value. We're quite likely to see quite a big use of marine sources of energy, wave and tidal. We're likely to see I think substantial amounts of gas with sequestration, substantial amounts of coal with sequestration, both biological and geological, and substantial amounts of hydroelectric. Substantial amounts of nuclear power, and certainly the very large part of the growth in demand will have to be met from nuclear if we're going to achieve these very low emissions outcomes.

Well what sources of these fuels, so which of these fuels will be especially important in Australia? We've got absolute advantages over most other countries, and overwhelming absolute advantages over other developed countries in pretty well all of these generation technologies, even in hydroelectric where we don't have much domestic capacity. But our location is very close to just about the world's richest hydroelectric potential, and the rivers of the southern side of the island of New Guinea. Not so far by modern transmission standards from the northern extremities of the Australian national electricity market are going to make that a relatively low cost source of energy. So Australia's in a very unusual position of having an abundance of all of these sources of power. No other developed country has comparable resources per capita as we have of solar, of uranium oxide, high grade uranium oxide, we're the world superpower there, of wind resources, of wave resources on the south coast. Even opportunity for biomass when you take account of the fact there's going to be low quality land, often saline land in areas of high insolation that are going to be efficient locations for generation of biomass. Algae is my favourite for winning in that particular race.

This absolute advantage in low cost, low emissions energy is likely to mean that, if the economics is allowed to win out, we're going to go through an electrification of transport at a relatively early stage, which in itself will add substantially to demand for electricity, reversing some of the recent pressures for increase. It's likely also that our comparative advantage in low emissions energy production is likely to bring back to Australia a comparative advantage in energy intensive minerals processing that we had when the world could rely on fossil fuels. Temporarily we've lost it, but that's likely to come back with new forms of energy.

So with us having this absolute advantage across a very wide range of low emissions energy sources, what's going to determine which of these we use a lot of within Australia? And if economics is allowed to govern the outcome, if we're to achieve our mitigation objectives at the lowest possible cost to our standard of living, we'll find that the rough hierarchy from those sources of energy most likely to be used intensively in Australia, will look roughly as follows. It will be determined first of all by the cost of international movement of the different forms of energy, and if the whole world is using a lot of nuclear, a lot of gas, a lot of coal, gas and coal with sequestration, a lot of solar, a lot of wave, a lot of wind, a lot of biomass, a lot of hydroelectricity, a lot of nuclear, if the whole world is using a lot of these, Australia has an absolute advantage in producing most of these. We will tend to export those sources of energy where international transport costs are relatively low, and we will use at home those sources of energy where international transport costs are relatively high. And so the hierarchy of use at home will run from most intensive use I think of renewable energy resources because the international transport costs where you require long distance underwater transmission are relatively high. Second in the hierarchy for use at home would be coal with sequestration. The third would be gas with sequestration. Gas having higher international transport costs than coal because of the energy you lose in the liquefaction process and in keeping it liquid through international transport. Biomass because of the low energy content per unit of mass is likely to be lower in the hierarchy of domestic use. And I think uranium and nuclear will be lowest in domestic use because the cheapest form of energy of all to transport internationally is uranium oxide. The value of uranium oxide in comparison to energy content is tiny, so economics will push us to export that and for us to use at home more intensively other sources of energy.

So to conclude and briefly, how's our energy system, our electricity system likely to evolve under various possible policy futures. Certainly at present, the presence of the carbon price has a limited effect or a diminished effect on investment behaviour because of uncertainty about whether it will be retained. And the investor has to take into account a significant probability that it won't survive in this present form, and that diminishes its influence. For that reason, just at the moment, the renewable energy target is probably more powerful in driving behaviour. Well it is more powerful in driving behaviour than the carbon price. The carbon price now will be linked to the European price. I think that is a good development. It does mean all countries are in practice adopting some combination of carbon pricing and direct intervention, direct regulation in their mitigation policies. The general rule economically is the higher proportion of carbon pricing, the lower the cost for a given amount of mitigation. But even in the European Union with the long standing emissions trading scheme, the carbon price is accompanied by a lot of direct intervention, regulatory intervention. In fact, there is much more intervention of that kind than we see in Australia. And you can see that in the Productivity Commission report for the multiparty committee in the middle of 2011. So if we link our carbon price to Europe, as very sensibly we've done, the carbon price is linked to just part of the European mitigation effort. Some other countries, China, the United States are doing a lot in the way of mitigation, but almost all through very expensive forms of regulatory intervention. In both cases carbon pricing is respected to some regional schemes. It may be that over time it probably will be, those regional schemes will grow, but the main weight is being carried by regulatory intervention. Our linking of our carbon price to the European price will mean that if we relied only on the carbon price then we would not be doing as much as the Europeans because they're doing a lot in other ways,

mostly distorting, very expensive ways. Some of them are not contributing very much at all to the mitigation effort at very high cost, but some of them are contributing more. We need to have that basic idea very clearly in our minds that if we're expected to make an effort that's comparable to the rest of the world and the rest of the world is only getting part of its emissions reduction through carbon pricing then, and we've got the same carbon price as those other countries, then we're going to have to do some additional things as well.

It's in our interests that Europe, especially Europe, the rest of the world as whole but especially Europe, now that we're linked to it, over time moves more and more to rely on some carbon pricing, less on more expensive forms of mitigation. They may do that. I think that the big fall in carbon prices in Europe over the last couple of years is likely to be a temporary effect. Lots of policy makers in Europe are very much aware that the implicit heavy reliance on direct intervention associated with the fall in the carbon price is not economically desirable. We're likely to see some adjustments in European policy over the next few years, certainly in the period before we linked to Europe in 2015. But we'll have to wait and see exactly what those effects are.

We can do a little bit better than the rest of the world in relying more on relatively cheap carbon pricing by having a more broadly based carbon pricing arrangements than other countries, and we've got that, we've got a relatively broadly based scheme. And we can also reduce the cost of mitigation to ourselves by making sure that the direct intervention that we do is in a more rather than a less efficient way. The renewable energy target, while it's much less efficient than carbon pricing, is better than some of the other forms of direct intervention.

Well in this world in which carbon pricing is only part of the mitigation policy story, and in which there's uncertainty about its continuation, would it actually matter if the carbon price was withdrawn? There are some very clear consequences of having no carbon price at all. One is that we would remove any systematic tendency for the big adjustment that has to take place in the Australian fossil fuel generation sector to be focused mainly, or disproportionately on highly emissions intensive forms of energy. It's much more likely that the withdrawal of capacity of fossil fuel generation would contain high proportions of low emissions forms of energy if we don't have any carbon price at all. Without a carbon price it's unlikely that we'll get much action on geosequestration, no matter how brilliant the technological innovation, it's never going to be cheaper to sequester the carbon waste of a coal or gas fired generation plant than to vent it into the atmosphere. At least expectation of carbon pricing is a necessary condition for success of geosequestration, and it's likely to be a necessary condition for coal production in Australia or in the rest of the world having any future at all. As the mitigation challenge becomes steeper and steeper, as it will have to do, and I think despite all the noise, all the pressure, all the political nonsense we've got, especially in Australia and the United States at present, it's unlikely that the scientific realities will be ignored indefinitely. The later we leave big efforts in reducing emissions, the more expensive it's going to be. When the time comes, when Australia is ready for a less qualified effort to reduce emissions, the reduction of emissions is going to be much cheaper if it's done through carbon pricing. That will also be true in the rest of the world and for the same reason, we're likely to see the gradual spread of carbon pricing elsewhere. And for these reasons, if we got rid of the carbon price in the next few years, the main part of the Australian economic reform agenda from that time would be to restore it. Thank you.

MIKE: Thanks very much, Ross, and I'm going to invite Tony to come up with myself and we'll talk for a short while with Ross. I'm hoping that Tony is more literate in economics than I am. I certainly didn't do second year economics, so this is a bit like David and Goliath here on my side. First I might hand it over to you, Tony, to ask some questions or take up some points.

TONY: I guess probably start with a couple of those, the more economic issues, Ross, because you were probably quite realistic in several times during your presentation talking about if efficient carbon prices or efficient markets, efficient signals, if economic efficiency was to prevail, and then towards the end you raised some circumstances at least which in the short term it might not, even the renewable energy target arguably certainly for the little while it's been in place for most of its life has actually produced reasonably significant mitigation. Probably not at \$23 a tonne but certainly not the sort of numbers that some people have spoken about either. But of course at the moment it's due to effectively stop generating new investment by 2020 which isn't all that far out. So I guess the question I was interested in as well, for those of us who do believe that markets are the most efficient way to deliver the sort of outcome we want, and given I still remember a previous Prime Minister of this country, Bob Hawke, saying that one of your characteristics was to give advice to governments that could actually be implemented as opposed to those that might be theoretically perfect. Given that the political reality is that if there was a change of government, the Opposition has committed to repeal the current structure, we'll call it the carbon tax for the sake of that argument, then if you were the advisor to this incoming government in that political reality, apart from ultimately saying we need to move some more efficient mechanisms, how would you give advice to an incoming Coalition government about the way in which they might use markets, given they are politically caught up in this conundrum of having to repeal the current system. They are also apparently, and according to their manifesto and consistently said they're committed to the same target as Australia, so how do you think you could begin to frame something that might actually be politically workable but moving towards a more environmentally efficient outcome?

ROSS: Well this is the advice the Treasury will have to put on the table of a new Prime Minister if there is one after the next election. So it's a highly practical matter. I think we should keep in mind one political reality. We have got legislated, through both Houses of the Australian Parliament, a very good carbon pricing arrangement with substantial part of the scarcity rents generated by carbon pricing captured for the public revenues and passed back to the community 100% or more back to the community and tax cuts, family payments and support for renewable energies. You're aware, Tony, from my work that I think the support for renewable energy should be focused on innovation, not just be given willy-nilly to renewable energy. But the charters of the two new bodies, the Clean Energy Finance Corporation, I mean really allow those boards to do that if they wish to do so. There are some good people being associated with that work, so there's a reasonable chance that that part of the use of the revenue will be well used to support innovation. So that's a political reality. We have, in Australia, despite all of the noise, a functioning set of policies that most people in the rest of the world think are pretty good. In fact a lot of people in the rest of the world think they are better than any other country's got. That was tough work, politically, and we got through that. What happens if there's a change of government? Well first, I would hope that the Leader of the Opposition has around him some good advisors who are thinking ahead to the time when he might be Prime Minister and will be responsible for implementing the policies that are being talked about now. And if that's the case, they'll be giving cautious advice about the costs of ditching a system of carbon pricing and

relying on a more exclusively interventionist approach, because that will have lots of problems for an incoming government. It's certain to be associated with larger costs, if they meet the mitigation objectives that they've articulated. And some of those costs will be fiscal costs. The carbon pricing generates quite a lot of revenue which is being given back as tax cuts, household payments as well as support for renewable energy. Those tax cuts are not going to be very easy to repeal. If you ask in an opinion poll people if they like the carbon price, a majority says no. If you ask them if they like the carbon price and the tax cuts, if all the money's given back in tax cuts, the majority says yes. They are going to be asked sooner or later whether they like the withdrawal of the tax cuts. And the answer to that is going to be no. So the complications for a new government that's gone into Office with a rigid policy of commitment to withdrawal of carbon pricing are going to be very severe. And an advisor to such a government, with the interests of the future Prime Minister at heart, and we've all got an interest in an Australian Prime Minister being successful, advisors who want that Prime Minister to be successful will be cautioning about the costs and the difficulties simply of ditching what's been put in place.

TONY: I'm sure Tony Abbot's got your mobile numbers though. So just thrown into that mix, Ross, is the impact of falling demand which probably wasn't there in people's thinking as recently as two or three years ago, although it had started. And I guess that throws into the mix the interests of the incumbent industry in a different way than when much of the policy was being framed, at least initially. Just to give you some numbers, demand is now down some 13% on forward expectations of 2008. And presumably the industry then was thinking well we can get away with a renewable energy target without losing gross market electricity supply. We might not grow like we had been used to, two to two and a half per cent, but we wouldn't be shrinking. Now of course we've got a heavily oversupplied market and it is shrinking, and the renewable energy target on top of that. How is that going to play out in the politics in the next couple of years do you see, and what are the efficient market mechanisms that will circumvent the natural power plays from the incumbent industry.

ROSS: Oh, there's no doubt there's going to be pressure for changing the Australian law on renewable energy target. And my view is that we should be careful about changing law, changing the goal posts on which people have been making investments without good reason because changing the rules always increases uncertainty about future investments, raises subjective perceptions of instability of arrangements in future that increases supply price of investment and raises the cost of power. It's not true that at the time the current renewable energy target, the 41,000 gigawatt hours, was legislated that no-one was aware of the market situation. Read update paper number eight in the *Garnaut Climate Change Review* where I set out the international figures on price, long term price elasticity of demand. And what we're getting is the sort of demand response to increases in prices that other countries have got. So it wasn't a surprise to people who did their sums properly at the time the renewable energy target was legislated. It may have been a surprise to some people who didn't do their sums properly, but I don't think that is a very good argument for changing the rules of the game, the fact that some players in the market did not anticipate what should have been broadly, if not in detail, foreseeable changes in the market situation. And then alongside that, just on the public policy matter, especially if the carbon price is at risk and therefore is not driving investment decisions as strongly as it otherwise would be, the renewable energy target becomes, of all the other instruments, as Tony mentioned, a relatively low cost form of decarbonisation, not as low cost as appropriate carbon pricing would be, appropriate levels of carbon pricing would be, but much

cheaper than a lot of the alternatives. So I think whether you think that carbon pricing is here to stay or not, I think you'd be very wary about giving way to pressures from interests who, for the time being, are being damaged by the fall in wholesale prices.

TONY: I guess you get governments and politicians particularly who do respond to these sort of pressures that are, right now, they'll be interested in the outcome of the review on the basis of well, I've got the certainty for investment that you're talking about, which makes enormous amount of sense on one side. For the other they've got concerns about rising prices and people who are at least positioning the rising prices as being partly caused by not only the renewable energy target but also, as you mentioned yourself, by some of the costs in the network arguably, because of inefficiency. One of the main questions, Ross, was to what extent? Now we're sitting here in Victoria, in a state which sold the businesses, deregulated quite some time ago. And many people may not even be aware that in the other parts of Australia retail prices are controlled. And you can get some interesting outcomes as a result of that. So what do you think governments will be able to keep out of the efficiency operation of these markets, not just on carbon pricing but also on some of the other price controls which may actually impede the sort of efficiency that you've talked about and therefore lead to exactly the outcome they're trying to avoid which is more upward pressure on prices.

ROSS: These are always hard issues and how well governments manage these hard issues determines how well we do as a country. And if governments are giving in to these sorts of pressures all the time, then that will be reflected in low productivity growth, sacrifice of living standards, and sometimes governments make bad decisions and respond to vested interest pressures and we all pay for it. It's in all of our interest to do what we can to get some rationality into decision making. But just on the point about the effect of the renewable energy target on prices. The renewable energy target and the decline in wholesale demand together are putting huge downward pressure on wholesale prices. And that is affecting the whole of the electricity market. Now, the renewable energy target requires the surrender of renewable energy certificate, but that's on a minority of the electricity market. One has to include in the arithmetic of the effect for the immediate future of the RET on wholesale prices, not only the effect of the renewable energy certificate price, but the downward pressure on wholesale prices. You're not looking at the whole story if you only look at the things driving up prices, not the things driving down prices. And the whole context of prices could be change, quite a lot by changes in our regulatory arrangements. I think the current price regulation for transmission and distribution in Australia is unsustainable. We've guaranteed certain rates of return, companies have had an incentive to over-invest, that is leading to a reduction in demand. Now with the guaranteed rate of return, that becomes the reason for another increase in prices. Companies are given an increase in price to compensate for the fact that demand will fall. When my paper, update paper number one on the electricity market drew attention to some of these figures, I had a chat soon after that with the Treasurer of Victoria. And she said to me, I really enjoyed that paper, at last I can understand it. In my first few years as Treasurer every now and again the industry would come and say well you've got to put up electricity prices because demand's growing, we've had to make all this new investment. Then last year they came and said you've got to put up electricity prices even more because demand's fallen. And we've got ourselves into a vicious cycle. We're going to have to reform this. It's reached a stage of *reductio absurdum* that is damaging all interests, not only consumers' interests. Cleaning up the regulatory system could lead to modest falls in electricity prices over the next few years. Combination of that and what's

happening in the wholesale market could transform the price environment and lead to a rather different environment for the continuation of the mitigation adjustments.

MIKE: So what's the role of the regulator? How about the market operator? There's a lot of confusion about how the market operates, even to people involved in trying to understand the energy system. Just recently I was having a conversation with Ross and Tony and they used some words which will be indescribable when we were trying to work out what Escosa has just done in South Australia. Escosa is Central Service Commission and they've recommended a reduction in the regulated component of wholesale price to the regulated tariff. And that's a remarkable thing in this day and age, by 8% is the recommendation. But of course the regulated component, the wholesale tariff was based previously on what the industry said their long run marginal cost would be to generate electricity. Nothing to do with what the spot market was saying. So this doesn't seem to be an entirely efficient market operation. Perhaps in politer terms than you said the other day.

ROSS: Well there are four elements of our electricity market and the price you pay at the other end depends on all four. There's generation. I think we've got a reasonably efficient generation sector. It makes adjustments in response to economic changes. At the moment it's delivering relatively low wholesale prices. It would deliver lower wholesale prices until some of the coal based capacity withdraws from the market. That's how markets work. That's what happens in the copper market or the steel market. If you've got oversupply, prices fall and that causes some operators to ... some companies to withdraw from the market. I think generation is broadly competitive working reasonably well. It would work better if we had a deeper and national transmission market which would allow more effective competition across states. I think that's affecting competitiveness in generation. So we can improve it but it's not too bad. Then you've got transmission and distribution which are natural monopolies. In the nature of things you can't get real competition, it just doesn't make sense to have two companies each putting their wires down the street, although we seem to almost have that for a while with telecommunications. We have to have an efficient regulatory arrangement for those two and so the solution there has to be more rational regulation.

For the retail end, and that's what you're talking about with Escosa's setting of prices in retail price in South Australia. I think if you've got the other elements of the system right, then normal competition policy disciplines can police prices best at the retail stage. In any industry it's necessary for the competition authorities, in most industries the ACCC, to take an interest in the competitive environment to make sure there are no artificial barriers to new entrants into the industry. If you've got a new generator of power and it finds itself locked out by control of the market by a few producers, it's important that that new supplier is able to enter the market. But the best way of achieving good outcomes at the retail end is just the normal competition policy mechanisms. If they're all working okay, then I think we can let the market sort out whether the price is the spot price or the contract price. Victoria's closest to having that right. There's actually no retail price regulation in the electricity market in Victoria and prices haven't increased proportionately quite as much as other states. Not perfect, there are competition issues here, but it's been a bit better without a regulation of retail prices than it's been elsewhere with such regulation.

MIKE: Perhaps, Tony, you give us a bit of an insight in there's a spot market, but there's an even more important contract market isn't there, so bit of a decoupling there. As an example, in Victoria in the last 12 months there has only been one or two events when electricity prices on the spot market have gone above \$100 a megawatt hour. If you go back four years, they were spending whole days up around \$10,000 a megawatt hour. So there are a lot of changes in the fine structure of the markets produced by this overcapacity. But how long does it take for that to flow through?

TONY: Think about the way the various participants work in any of these markets. What you're trying to do in the way anybody who in the room here is, you know, owns shares for example, what you always love to do is be on the right side of the trades every time. So you like to be able to make money in one direction but make sure you don't lose money in the other. So what you're constantly doing and what the big companies are doing is managing their exposure to these high priced events, remembering that someone always makes money on high price events. The issue is not to be on the wrong side of that equation. And so what you find is that whilst you've got limited people, for a wholesale price level is several thousands of dollars a megawatt hour, the average price is well below 50, they'll protect themselves against those events through some form of insurance or condrax or hedge arrangements. And Ross mentioned before the hydro in Australia, to a large extent what we do with the hydro, we use it as an insurance because it can be quickly brought on stream and gives people the insurance protection. It's more of a seller of insurance than it is a seller of electricity. So, what happens when you have the sort of situation you've got now? Well what's happening is you are, as you said Mike, seeing a lot fewer of these high priced events. And so to some extent people are going to be saying well, I didn't die last year, maybe I don't need my insurance from now on. And the answer is most of us would conclude, well that may not be such a clever thing, maybe I should need to keep insurance. So what you find therefore is people will continue to enter into these side contracts. They will continue to hedge the arrangements and they'll continue to watch the volatility. Because I think inevitably, as Ross said, as you see withdrawal of capacity, then the market will adjust, you'll see withdrawal capacity and prices will return to something that equates too something like the long marginal cost. But as Ross said, I mean the idea that a regulator, however good they might be, can sit in an office in Adelaide or any other capital city of this country and say well, this is how much I reckon the market's currently charging for debt or equity or for electricity in the wholesale market, is in fact exactly the opposite of what we set out to achieve in Australia. And what we have, as Ross said, achieved in Victoria. In our view, the sooner that we move towards the markets we're all anticipating, the sooner we'll get more efficient pricing. By the way, I should say by the way there has been an interesting example in the past in the energy sector where we saw what happened in energy. I remember when I first joined the energy market in Brisbane and people did tell me that in the 1850s on the south side of Brisbane there were two companies laying gas pipes in the streets, trying to hook up customers and they were. The only problem is they didn't have particularly efficient communication systems. So every now and again, because they didn't know which customers were connected to which pipes, one of them would turn off the gas and find out who complained.

MIKE: There we go. Ross, you briefly mentioned the business of new entrants in these types of market might be challenging. What are the mechanisms that we need to make sure as we bring on renewables, that new entrants have a fair passage.

ROSS: Well the standard rules for avoiding anticompetitive behaviour that the ACCC applies, and they've been worked out in a lot of situations, you need to be sure that there's no collusion on price, that you don't get pushed into contract clauses that limit the right to search for better alternatives that in their nature restrict competition. There are lots of these rules that have been developed for different types of markets, so by the ACCC, and I think application of the standard rules will do the job there.

MIKE: Tony, do you have anything more before we open it up to the audience?

TONY: One last question I'd have and that would be related to the international scene, Ross, and you mentioned that on balance, linkage to the EU scheme seemed like a good idea. I mean, people may be aware that the EU scheme itself has had some real challenges in terms of the way it's operated. To some extent we may be event exposed to European politics in which different individual governments could almost veto changes in the scheme. From where you were, say in 2008 when you did your original review of climate change, how do you see now the global situation in terms of this, and how will Australia participate to get a good outcome.

ROSS: Well I must say in 2008 I was more positive about the possibility of moving towards greater international linking. Then, we found there was very strong Australian business opposition to linking with Europe because the European price was high. And whenever I floated that idea, I get a big raspberry from emission intensive industry saying oh the Europeans are ridiculous with those high carbon price. So for better or worse, I decided that it wasn't a goer to link to Europe at that time. Also the Europeans were very reluctant to link with us at that time. We couldn't have then if we'd chosen to. And it took a long discussion over about a year to pave the way for linking between Europe and Australia, so it's possible now, it just wasn't possible until recently. But it's often a fault of economists, certainly often a fault of mine to overestimate the rationality of other members of our species. And I had hoped that ... had expected that more countries sooner would head for carbon pricing. I think we'll still head there, but it's going to be a bumpier road. But what's happened in Europe, the fall in the carbon price is not a very surprising thing. The four years of stagnation after the financial crisis, the market's actually behaved as you expect it to behave. Not much growth in demand for emissions intensive goods and good services and that obviously has an effect on the price. The market's working as it should. We've had some surprises on the other side. In my reports I didn't anticipate China moving in the foreseeable future to an emissions trading scheme or a carbon price. I was positive about the efforts they were making and were likely to make in future on mitigation, but I thought that was going to come mainly through relatively expensive direct intervention. But we've now got in China major pilot schemes in five cities, five big cities, some with nearly the population of Australia and two provinces with populations several times as Australia. And the way Chinese reform works, they'll see how that goes and spread it to the country as a whole if it seems to be having the effects that were anticipated. So the benefits in lower costs of mitigation from carbon pricing are so large that I think we will see movement in that direction over time. We're not getting there as fast as I at least hoped in 2008.

MIKE: Great. Well I think it's time to open it up to questions, and I emphasise the word questions, so try and keep the questions short and concise and we've got about 20 minutes.

AUDIENCE: Hello. Yes, I'm interested in your discussion of nuclear power, Mr Garnaut. I'm just curious, I don't believe nuclear power has been introduced into any country without major government intervention. And since Fukushima it is inconceivable that governments cannot intervene in the introduction of nuclear power. How can this possibly be a part of your market strategy?

ROSS: Well, there's a sense then which it doesn't matter terribly much what my market strategy is. The Chinese and Indian governments, two large economies that are growing very rapidly, have taken the view that if they're going to meet a rising energy demand with relatively low emissions, then a major component of that will be nuclear. Both of them, but especially the Chinese, did take note of the Fukushima disaster. One of the problems for Fukushima of course is Japan's location in an unstable tectonic area. There are large parts of China and of India that don't have similar instability. The Fukushima experience does reveal very large problems of corporate organisation, corporate relationship with government. And you're quite right that unless problems of that kind are sorted out, the risks are considerable. But I met with the Vice Chairman of the National Development Reform Commission with responsibility for climate change policy just a week before Fukushima and then again three months after. And a week before he was explaining to me the role that nuclear would take in Chinese energy expansion. Just part of a mixed strategy, China also had by far the world's largest wind program, solar program, biomass program, but the world's biggest nuclear program was part of what they were doing. And he was then very upbeat about the role that nuclear would play. And the Chinese have been impressed by how costs were coming down effectively through mass production of components of nuclear plants just the way costs are coming down with large scale production of solar and wind components. And he expected that within five years nuclear power costs would be competitive with coal in coastal China. Well, the implications of that for mitigation are very large. As a result of Fukushima, China initiated a major review of the safety of nuclear. They decided to continue to go ahead with plants that were already being built, but put a moratorium on new plants, new approvals pending review. What the review showed is that, to them, to the people responsible for it, that China needed to tighten safety requirements in the light of Fukushima but once that had been done, that they could continue with a large nuclear program and that continuation has gone on now. So I'm talking about an empirical reality of what's happening in China. I suppose you could frame the question, do I think it's wise that they do that? I'm not the world's biggest expert in nuclear safety, but obviously there are two types of risk. There's the weapons proliferation risk and there's the local safety risk. We've got global mechanisms for handling nuclear proliferation that are quite elaborate. Obviously one would have a lot of worries about a lot of countries having access to nuclear waste, but I don't think China's one of them. On the local safety issues, the Chinese engineers and scientists have satisfied themselves that the risks are manageable. In the long term these decisions in China, as they are in Japan and Germany, will be strongly influenced by community attitudes. There's not in my backyard phenomenon in the rich coastal cities of China as there is in Japan and Germany. So decisions of the high authorities won't necessarily determine the outcome, but for the time being they're satisfied that they can meet high safety standards.

AUDIENCE: Thanks. Alan Pears from RMIT. The speakers tonight have talked about the decline in electricity demand in Australia, and when we look at AEMO's forecasts out to 2020,

we've seen rapid changes and they've been downwards. So the thing that puzzles me which I'm interested in the panel's opinion on, is it a situation where someone who wants to invest in any large scale project for electricity supply in Australia will struggle to get finance on the grounds of profound uncertainty about whether or not the project, if it takes five years or 10 years to build, will actually have a market?

ROSS: Well one has to say that we don't need a lot of new capacity for generation in Australia in general. We do need new low emissions capacity in Australia. That's the mitigation task. So we need incentives for investment in low emissions generation. So the real question is not whether there's an incentive for investment in general, we don't want an incentive for investment of more high emissions capacity. We've got plenty of that. Competitive processes will push a lot of that out of the way, and should push a lot of that out of the way. Do we have adequate incentives for low emissions investment? Well there's no doubt that the uncertainty about the future of the carbon price greatly diminishes its power in influencing investment decisions. There's also not much doubt that the debate about the future of the renewable energy target is having an effect on the incentive to invest. And calculations have been done within the industry about the effect of that on the supply price of investment and therefore on the cost of making investments. There's not as much uncertainty about the renewable energy target. There's bipartisan support for the target. There's currently a review of some parameters of the project. If that's settled, especially if it confirms the current Australian law, then that will greatly diminish uncertainty. In the nature of things that will give greater surety for investment in renewable energy that qualifies under the target than it gives for substituting low emissions fossil fuel for high emissions fossil fuel. Only a carbon price will do that.

TONY: There wasn't much there really before some of this was seen, there was already quite hiatus on new capacity, particularly of the larger scale. People who were building large scale gas plant move from building combined cycle gas plant which does use a reasonable amount of gas. And as Ross said, the implications for potential increases in gas prices have meant they've moved towards open cycle gas turbines, which is sensible from a flexibility perspective, questionable in terms of both cost and environmental outcomes because it's higher in emissions than combined cycle and also higher in cost. But again that's the market operating to those sorts of signals. It's much more interesting when you said the long timeframe for these investments is to how people look beyond 2020, because even if there was you see a small amount of adjustment around the RET, I think the idea of maintaining certainty of investment makes a lot of sense, as Ross said. The interesting question as to how people are going to think about that investment and what sort of real price signal, what long term price signals are going to be and to what extent does that raise some interesting challenges around the way the fundamental market works.

MIKE: I guess the big unknown, probably no-one better to comment on this beside yourself, Alan, is how much slack is in the energy efficiency equation. There could well be 15% or thereabouts. Reduction of our, Allan would say more, which would take any great scenario out to 2020, even coming back to the levels that we have today. So that's a challenge. Of course new technologies might come on board would shift the energy mix between electricity and other fuels, electrification of transport, for example, could boost the demand for electricity, reduce the overall energy consumption by society. So challenging things there on the decadal scale as I guess you would acknowledge. But it is quite surprising just how much we've reduced the electricity demand over the last few years. It seems to me that there is a significant community

response going on, bit like in Victoria we changed our water demand more or less overnight back in the early stages of the 2000s, with successive droughts, becoming aware of that, you know. This was an important commodity to use wisely, water: electricity the same.

AUDIENCE: Thank you for the awareness and actual advisory. Thank you for your interest in the electricity market. Do you see the prospect of future possibility of the uranium enrichment industry within Australia, given you're an exporter as a top of your industry export spectrum?

ROSS: I don't know that'll be resolved by a combination of cost factors and given where we're at at the moment in the discussion of nuclear policy in Australia. There's a lot of energy goes into uranium enrichment which can be energy from other sources. And if Australia is a low cost energy producer in a low emissions world, just as it used to be in a high emissions world, then Australia will be economically a competitive place for uranium enrichment, especially since the uranium oxide mining takes place in Australia. So I guess the outcome in the long term is going to depend on political attitudes to the nuclear industry.

AUDIENCE: Thanks very much. Professor Garnaut, can you speculate on what you think the energy mix is likely to be 2020 and beyond, between particular technologies whether that be PVs, solar, thermal, and then the sort of conventional renewable, or sorry, conventional non-renewable plants?

ROSS: Well, 2020 is not very far away, so the more interesting question is 2050. But 2020, if the current law remains unaltered on the renewable energy target, then we know there'll be a large expansion of renewable energy which will, for a number of years, be dominated by wind. But the relative cost of a number of the other renewable energy sources is coming down quite quickly. Now a lot of those require innovation, both what one might describe as global innovation, breakthroughs that will be breakthroughs for the whole world as well as local innovation. Always a lot of cost carried by the pioneer introducing a new technique into a new market in Australia. And I would see support for innovation of both kinds, a legitimate use of the funding from the two new clean energy funding agencies, arena for the early stage research and development clean energy financing for the commercialisation, large scale commercialisation of technologies. So if those bodies develop with a strong focus on support for innovation, then we will get more diversity. We won't only get wind. And one of the possibilities is that solar costs will come down so much that we'll see quite a lot of market driven intrusion of solar into the energy mix. As I mentioned in my presentation, the combination of the artificially high prices for electricity through the way we regulate the system and the big reductions in PV costs are making it economic, for many households in many locations, to switch to decentralised power. That could go a long way between now and 2020, so we might be surprised by the proportion of energy coming from decentralised solar. I would anticipate that if we have the law on renewable energy target confirmed, then we would get development of some new large renewable energy provinces which, if they had that sort of security, could justify the cost of transmission from regions where renewable energy is much cheaper. I would expect that we won't see a big increase in the role of gas despite our abundance of gas. And despite the fact that on pure economics you would expect us to be a domestic user of gas because there's so much cost and so much energy use in liquefaction and export of gas, and that will be driven, the small expansion of gas by the big increases in prices as a result of the development of the gas export industry. Here the American policy will have some significance for us. In the US there are very strong interests in favour of restricting the export of gas, both environmental interests wanting

replacement of coal by gas, industrial interests that want low cost raw materials for petrochemicals and other industries. Now, the gas producing industry would like America to have the favourable policies for export of gas that Australia has. And so there'll be arguments, political contests over that in the United States. If the exporters win, then that will have the effect of raising US prices, and reducing East Asian prices. And the reduction in East Asian prices will reduce our gas prices. So gas might come back into the equation. But I think the most likely thing is that we won't see a big expansion of gas up to 2020. I mentioned in my presentation the opportunity in Papua New Guinea. That's potentially very large zero emissions power on a very large scale and it will get cheaper the larger the scale. So not by 2020 but looking further ahead that could be quite important. Looking much further, 2050, no doubt where the economics leads us to expect in a country like Australia with an abundance of very wide range of energy sources for us to be an exporter of those sources of energy that are very cheap to transport and uranium oxide is the first of those. I suppose enriched uranium oxide even more so. So if the economics are driving it, we would be an exporter of enriched uranium oxide but not a producer of nuclear power ourselves. We'd have a very large role for renewable energy by 2050 and probably a highly diverse portfolio, given our resource base. How much of each of the components of that diverse portfolio would come from each technology will depend on technological developments that we can't predict with certainty. I would expect that in that world, geosequestration would be quite important, possibly especially for the La Trobe Valley where basic energy costs are very low and sequestration costs nearby very low. And I would expect that capture of carbon dioxide waste to intensify biological processes for sequestration, through biological processes will become quite large in Australia.

MIKE: Well there we have it, the crystal ball, and I think that's used up our time. I'm sure there are plenty more questions but that should entice you to come back next year. Before we finish, I would just like to give my personal thanks. Tony and I get to sit up here and take the credit for this but it's done with a lot of hard work and I'd particularly like to thank Susannah Powell here.

And thank you to the audience. I think both Tony and I have been delighted and amazed at how much interest there's been in this series of seminars that we've put on. It's well above our usual engagement from the university point of view. I think it testifies, as I said earlier on, to the interest in these topics and the challenges they present. And we're keen to continue and enhance it for the next year. So come back for more. And finally, thanks very much, Ross, for wonderful insights.

End of recording

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