Renewables 2012 – Positioning Australia in a global context

Clean Energy Council, Melbourne Energy Institute and Grattan Institute hosted a public seminar featuring Christine Lins, Executive Secretary of REN21. The seminar provided insight into advances being made in renewable energy business and policy in both developed and developing economies and will position the Australian industry within this global context. Following Ms Lins' presentation, a panel discussion, featuring Kane Thornton, Deputy Chief Executive, Clean Energy Council; Malte Meinshausen, Senior Fellow, School of Earth Sciences, University of Melbourne; Tony Wood, Energy Program Director, Grattan Institute; and chaired by Tristan Edis, Editor, Climate Spectator discussed issues around the adoption on renewables.

REN21's Renewables Global Status Report (GSR) is the world's most frequently referenced report on renewable energy business and policy. The most recent report, released in June this year, found that in 2011:

- renewable energy sources supplied 16.7% of global final energy consumption
- 118 countries were implementing renewable energy targets • investment in renewables increased to a record $257 billion, and
- photovoltaic module prices dropped by 50%.

The 2012 GSR highlights the steady growth of renewables in all end-use sectors – power, heating and cooling and transport – and across energy markets, support policies, investment and technology.

Concurrent with these global developments have been significant changes in Australia's clean energy industry with the introduction of the carbon price, the commencement of the Clean Energy Finance Corporation and the review of the Renewable Energy Target.

Host: David Green, Chief Executive, Clean Energy Council

Speaker: Christine Lins, Executive Secretary, REN21

Chair: Tristan Edis, Editor Climate Spectator

Panellists: Kane Thornton, Deputy Chief Executive, Clean Energy Council

Malte Meinshausen, School of Earth Sciences, University of Melbourne

Tony Wood, Energy Program Director, Grattan Institute

AUDIO: This is a podcast from Grattan Institute.

DAVID: One of the reasons why my colleagues were very keen across all the institutes to have this event tonight is because we believe there's a really strong and positive future globally for a cleaner, sustainable renewable future. For us a sustainable future is about the use of renewables, but it's also about energy efficiency. Many of us attended a fascinating talk about three weeks ago that Grattan Institute and Melbourne Energy Institute organised here in Melbourne about the demand side of that equation. Tonight we're looking at the supply side, the green supply side of that equation. It's also going to be an opportunity to hear from a very wide range of discussants after Christine has spoken about how an international renewables policy pans out, on how it will apply here in Australia.

There are a wide range of people interested in this subject, not only the audience here in Melbourne tonight, but also the event is being streamed live through the internet people. So can I take this opportunity to thank all those people who are sitting by their computer screens to listen to this talk tonight. We're delighted to have such a wide audience.

I'm sure many of you here don't need to be told that at the moment renewable energy is centre stage to a very live debate about the future of the renewable energy target here in Australia. It's a central tenet of the Clean Energy Council that is vital that we sustain support for clean energy in Australia, vital that we sustain support for the renewable energy target, vital that we don't have change to it so we get investment flowing, we get stability, we get the delivery out there for consumers. Many consumers across the world, are feeling the pinch when it comes to energy bills at the moment. The ability to generate and use your own green power in a well-insulated and well-controlled property is vital to enabling people to get off the dependency of volatile fossil fuel prices globally. So this debate is absolutely central not only to the Clean Energy Council but the policy community globally.

I'm therefore particularly delighted that we've been able to bring to Australia Christine Lins. Christine has an unrivalled experience in this field, not only internationally but also in her home country. All of us from Grattan Institute, the Melbourne Energy Institute and indeed, as I say, the Clean Energy Council, were particularly pleased that Christine was able to come here. Christine, for those of you who haven't had the opportunity to meet her in the many briefings she's been doing in Australia the past few days, is the Executive Secretary of REN 21 which is a renewable energy policy network of the 21st Century. REN is a global public private network focused directly on renewables. It's based at UNEP, United Nations Environment Program in Paris, has a long and established track record in bringing together industry associations, science and academia, and global NGOs working in the field of renewable energy. The annual publication which Christine will be talking about, the *Global Status Report* is one of the most frequently referenced reports on renewable energy business and policy globally. You will often see it quoted in UN speeches, and many policy maker speeches across the last few years. During the last 10 years Christine has also served as the Secretary General of the European Renewable Energy Council based in Brussels. The fact we've got such strong targets in Europe are a testament to the work that many in the NGO community have done and particularly the work that Christine has done as Secretary General of a key renewable association. She is continuing that work in her new role at REN 21. She worked in renewable energy agency in Austria before she moved to Brussels. I know from having looked at that work from the agency in Austria over the years, they always had a very strong emphasis not only on renewables but also renewable heat, renewable electricity and the demand side as well. I'm sure that will all be reflected in what Christine talks about tonight.

Christine holds a Masters degree in International Economics and Applied Languages, and that gives a very thorough academic background to the talk she'll be giving tonight. She came over to Australia on Monday and I think it's fair to say that apart from the occasional snatches of sleep, we've actually worked Christine pretty hard. I first met her yesterday in Canberra where she'd already done a series of meetings and she spent both yesterday and today not only in meetings in Canberra but also in discussions over dinner with both senior people from the Opposition and senior people from Government. I'm sure that we will be able to build on this discussion in all of our work both in the academic world and the business world. We've also got an extremely good panel to follow which my good friend and colleague, Tristan Edis, will be introducing to you after Christine's talk.

CHRISTINE: Good evening ladies and gentlemen. Thank you. And a big welcome also from my side and a big thank you to the Clean Energy Council, Grattan Institute and the Melbourne Energy Institute who are hosting this event tonight. It's a pleasure to be here with you. We have had a lot of really interesting meetings over the course of the last couple of days that on the one hand provided me with a quite interesting insight into the state of play as far as energy policy is concerned here in Australia. I'm happy to be here to give you an overview on global renewables development.

David already introduced REN 21 as a major stakeholder network. We are really a coalition of the wielding of all those in the public and the private sector that want to work towards a transition to renewable energy sources. We have governments, we have international organisations, industry and NGOs, and we clearly see that only through a strong public private partnership, will such a renewable energy future effectively be possible. We are issuing a publication, the *Global Status Report* that is available free of charge from our website. It really is a compendium about the development of renewables from all around the world. This is work that is based on contribution from more than 400 contributors and reviewers globally. So we really give tribute also to the decentralised nature of renewable energy sources. We have a lead author based in the US and then a team of both regional and technology contributors that give an overview on an annual basis about the global trends in the fields of industry, investment, policy and markets. We look into all renewable energy technologies and also all sectors from electricity. We also look into heating and cooling and into the transport sector. For 2012 we have introduced a couple of new elements in this publication, namely we did a closer look on rural renewable energies. Basically the situation as far as renewables is concerned in the developing countries, in Africa, South-East Asia and Latin America. For the first time we have introduced a focus on portraying the complementarity of energy efficiency and renewable energy policies because we clearly see that both demand and supply have to work together.

I'm going to take you in a nutshell through the findings of the report. We have currently about 17% of final energy consumption generated from renewable energy sources globally. You might have heard that 2012 is the International Year of Sustainable Energy for All. That is an initiative coming from the United Nations which aims at doubling the share of renewables by 2030, increasing energy efficiency, and guaranteeing energy excess for all by 2030. When we talk about doubling the share, we refer to those 17%.

When talking about the 17% you see that they are half composed of traditional biomass. They are, for the other half, roughly composed of modern renewables such as wind, PV, hydro and other sources. We see worldwide that the usage of traditional biomass is declining, and we see in general that renewables have been growing quite rapidly in all different sectors. We see that the geography of renewables is expanding, so we see more and more countries in the world putting in place renewable energy targets and policies.

The global status report provides a listing of the top countries in the field, in different technology fields and those in the different fields of investment. We base ourselves on official data on the one hand, and we also base ourselves on data from the industry and from NGOs. We really do a compilation of all those and are trying to portray the market and the development in the most accurate way so all the data that you find in the report is up to the beginning of 2012. The report was published on the 11th of June so it's all fairly new information, which is quite difficult to put together in such a short time framework as some of you who work on such reports might realise.

There on the slide these little circles in red, mark the Asian countries. I think this is quite interesting to see that in many technological areas and in many fields, we have Asia taking up an important role. China, India, but we also see Vietnam with Indonesia in this list and I think this trend, which we have seen in the last couple of years, will continue We still see that Germany continues to lead in Europe and is one of the frontrunners globally. We also see that China ended 2011 with more renewable power capacity installed than any other country. I think this is particularly remarkable because we must not forget that less than a decade ago China had no policy and not a lot of renewables development in place. The Chinese government put in place a renewable energy law in 2004 and since then the market and also the industry has really significantly taken off. When we look at the data from previous years, those Asian circles would have been much less. I think that just confirms what many organisations, such as the Asian Development Bank, suggest and that is that this century is going to be the Asian century, and we clearly see that there is a lot of development happening here in the Asia region.

I want to now quickly take you through what this 17% means. So 17% were final energy consumption. That translates to roughly 20% of global electricity that was produced from renewables. That means that about 25% of our global power generating capacity is renewable

space, and we saw that on all the additional power capacity that was added to the system back in 2011. Roughly half of the new capacity was coming from renewables. So globally around half of the new power plants were renewables based. In some parts of the world this figure was even higher. What you have here is the new annual power capacity added in the European Union in 2011, and there we see that the European Union has really reached a record with 71.3% of all new power plants coming from renewables. Clearly this is a strong upwards trend. So we had about half of the power plants renewables based in 2010. Then this proportion is really going significantly up, and 47% of all new electricity generating capacity came from photovoltaics in the European Union in 2011.

Whenever I present to an audience who is not so familiar with renewables development this is often a figure where there is some frowning and people are wondering if this is true because these are really quite remarkable figures. One of the bases for this development is clearly the fact that a couple of renewable energy technologies in certain contexts are becoming competitive. We have seen quite significant cost reduction in many of those. Some areas are definitely going to continue to fall. 2011 was really a very special year. We saw prices for PV modules, for example, decrease by 42%. In one year the price fall for a PV module was reduced by 42%. Price reduction of about 10% for onshore wind turbines, and clearly with these developments, we see that renewables in some cases actually reach great parity, meaning that the generating price from, for example, a PV system is on par with household retail prices. This depends heavily on the current price of electricity in place. We see that we are in many countries very close to achieving real competitiveness of renewables with conventional sources.

I've spent a lot of time focusing on electricity. This is also something that I really noticed in the discussions in the last couple of days. In Australia I would say the debate is basically entirely focused on the electricity sector. Whereas, for example, in the European Union there is a much stronger focus also on the promotion of renewables heating and cooling because in the European Union about half of our final energy consumption is spent on the production of heat. So we see that renewables in the form of biomass, solar thermal and geothermal provide a series of technological opportunities, and we see all around the world that there is a growing trend to use solar resources to generate process heat for industry. More than 200 million households using solar hot water collectors all around the world is quite a remarkable figure. You see on the slide that again China is really very active in this area and is leading the way.

When it comes to transport, renewable energy sources are used in the form of electricity, hydrogen for the production of hydrogen, biogas liquid biofuels. Liquid biofuel production grew about 17% for ethanol and about 27% for biodiesel. We see that countries start to put in place promotion measures for electric mobility. Very often these programs are coupled with policies to promote electricity from renewable energy sources.

The *Global Status Report*, then gives a whole overview on the market development and the trends in the different technology sectors. I'm not going to go into this otherwise we're going to spend the whole evening on it. I'm just going to pick out one which is solar PV, because if we would have to characterise 2011, it would clearly be the solar year. We have seen worldwide an increase of installed capacity from 40 to 70 gigabytes, so there were 30 gigabytes of new solar power PV capacity installed in 2011. When you look at the graph you clearly see how long it took us to get to the 40 and how quickly we effectively went up to the 70s. That brought the PV industry in the range of a 100 billion US dollar industry. We see that Australia also placed in the top branch there with about 800 megabytes of PV installed in the course of last year. However, when you compare this to a country like Germany which installed 7,500 megabytes last year, 7.5 gigabytes in one year, and when you know that you get much more sunshine here than we do in Europe, then I think that puts things into perspective. It probably also shows the potential that Australia might have.

Wind continued to be a very steady increase, with another 40 gigabytes added. Very steady success story, so to say. I think it is quite significant that South Australia generated about 20% of its electricity demand in 2011 from wind. Biomass is a big and important part of renewables. The present global demand for biomass is in the order of 53 exajoule, that are mainly used for

heating, cooking and industrial applications. We have also tried in this edition of the *Global Status Report* to portray the trade flaws of biomass, pellets and other commodities.

When it comes to industry trends, we see growth in the industry. We saw these cost reductions, I referred to earlier, and we see that worldwide there are about five million people nowadays employed in the renewables industry, which are classed as primarily in the sectors of solar and of bioenergy. We estimate that this job creation trend in this sector is going to continue, despite some policy uncertainties and some challenging times for some industries, and despite some industrial consolidation.

The Report provides a very detailed overview on how many jobs in each country in which sector, and is based on a study that was done by the International Renewable Energy Agency (IRENA) and the ILO, the International Labour Organisation.

When it comes to investment then we see that the total global investment in renewable energy jumped in 2011 to a record of 257 billion US dollars. That is an increase of 17% compared to the previous year. We see that the increase was a bit slower than in previous years. We had an increase of 37% from 2009 to 2010. Nevertheless, when we look at these figures we see that this amount is 94% more than the total investment in renewable energy in 2007, the start of the financial crisis. Clearly there is a strong upwards trend. This investment is not evenly spread all around the world. The top five countries for renewables investment in 2011 were China, the US, Germany, Italy and India. The US is here in this position because there were a lot of recovery funds that had to be spent until the end of 2011, and we are not sure whether in the US the development will actually continue that way. I think the big question mark is also what the outcomes of November 6 are going to be because you see that renewable support in the US is very strongly politicised. What is also quite interesting here in this chart is the position of India, because it's the first time that India is in the top five range. I think it's quite remarkable that investment in renewables in India went up 62% in one year, so to $12b, which is mainly due to the fact that the Indian Government has recently announced the solar mission: a policy target with the aim of installing 20 gigabytes from solar by 2022. That is another example where we clearly see that a target and a stable framework brings about investment and opportunities.

The *Global Status Report* gives an overview on different policies and different measures in place in countries around the world. Nowadays nearly 120 countries all over the globe have renewables targets in place. More than half of those are developing countries, which I think is quite encouraging. I have also seen that in many parts of the world, mainly in Europe and also in the US, there were some setbacks resulting from a lack of stability and some retroactive policy measures and some stop and go policies that then have negative effects on the sector and on development. I'm not going to comment here on the Australian situation because I think we'll have lots of opportunity to do so in the course of the panel discussion. Just let me share with you a series of existing shares of renewable electricity production targets. We have many different targets all around the world, some on final energy consumption such as the European Union, some on electricity and so forth. With the Australian target, the rate is basically a renewables electricity target. I think it is important to actually compare apples with apples and to see what that actually means. So Australia has a 20% by 2020 target for renewables electricity. Often the European Union is referred to having a 20% by 2020 target as well. I think for this, we have to bear in mind that the 20% in Europe are meant as 20% of final energy consumption coming from renewables, which ultimately will translate to roughly 33 to 35% of renewables electricity. That's basically the European target. It is not officially broken down and that's why the EU position there on the graph is empty. You also see that you have countries with different ranges of targets in place. For example, Germany 35% electricity by 2020, Denmark 50%, and the UK 80%. This is another example of a clear commitment of the government of developing offshore wind and this again has a clear industrial component in the policy framework.

We portray the whole series of policy instruments that are out there from fiscal measures, from feed-in tariffs, from renewable portfolios then from reverse auctioning, and we just give an overview there. We see that more and more countries put in place targets promoting renewables heating and cooling, and we also see, and I think this is quite interesting, that there

are lots of cities all around the world that have come up with climate change action plans and often these contain a renewables component. We see that the city and also the state and the regional level is gaining in importance there.

We'll come to the conclusion of my presentation, because you many of you might have a question on what the future of renewable energy is, what it will be, what is in the cards. Unfortunately I left my crystal ball at home, so I can't really tell you how the future will actually look. I think it is very interesting that several scientific reports and publications foresee that the future of renewables can look very bright. We have here a quote from the special report on renewable energy sources from the IPCC, the Intergovernmental Panel on Climate Change, which in their recent report came to the conclusion that close to 80% of the world's energy supply could be met by renewables by 2050. This report also tells that the range of renewables can be in the order of 23 or 80%, which is a very big range. Where we are going to end up will very strongly depend on enabling public policies and enabling a framework with predictable and stable conditions. How this can translate to an Australian context is something we are going to debate in the panel discussion. I thank you very much, and I look forward to your questions.

TRISTAN: Welcome all. My name's Tristan Edis, I'm the editor of a climate change and energy publication called *Climate Spectator*. I'll be your chair for this evening. You've already met Christine, and I'll introduce the rest of the members of the panel. To my right we have Kane Thornton. Kane is the Deputy Chief Executive of the Clean Energy Council which is the industry association for the Australian renewable energy industry, amongst other things. He's also the president of the Alternative Technology Association. They are a long standing group of people who have been driving energy efficiency and renewable energy in this country. He's also worked at Hydro Tasmania, AusTrade and IBN.

Then we have Tony Wood, who is the Program Director of Grattan Institute's Energy Program and also the Program Director of the Clean Energy Program with former President Bill Clinton's Foundation. Prior to that worked for 11 years at Origin Energy. He has a deep level of experience in the Australian energy sector.

And lastly we have Malte Meinshausen. He's a climate scientist at the Potsdam Institute for Climate Impact Research which is a very famous and well-credentialed research group into climate change issues globally. He is also a researcher with the University of Melbourne and has been a contributing author to the IPCC's Fourth Assessment Report and has been involved in numerous other areas such as advising the German government and also advising on accounting rules for international emissions trading.

First of all I thought it'd be worthwhile going to climate scientist, after all, that's ultimately what it's all about. Malte, to contain temperature rise of global warming to two degrees, how rapidly do we need to phase out fossil fuels and replace them with renewable energy and other forms of very low emission energy?

MALTE: First of all thank you for your talk and working in climate science means if you get such a report, you put that in the same drawer where all your antidepressant pills are because in climate science we don't have so much good news. So seeing these numbers, how renewable has really taken off is great news and it keeps us alive. The two degree target, this is what the international community signed up to. Two degrees is by no means, as you know, a safe target. Just this week our studies were showing again the coral reefs are facing long term degradation even at levels of 1.5 degrees global warming, unless miracles occur. So two degrees is not a safe target but it's what the international community signed up to and it will prevent much larger climate disasters coming our way. For two degrees there are a couple of milestones necessary in terms of global emissions. We have to peak before 2020. And not just the next year, but for 10 years we have to peak global emissions. Do we do that at the moment? Are we on track? Absolutely not. Can two degrees be still achieved? Absolutely. We have the scientific studies that show it's economically doable; we have the technologies for it. The big thing that science can't predict is, is there the political will? As scientists we shouldn't make any judgements about whether the political will is there, but again, such positive news from renewable energies might

in the end spur the political will that it is doable. It is producing lots of good co-benefits so we can actually go down that path. Two degrees is doable, in the longer term, and that is where renewable energies are really important. By 2050 globally we have to halve emissions below 1990 levels. By 2070 we have to aim for a zero carbon economy worldwide. In the global average we shouldn't emit anymore carbon into the atmosphere. Effectively after 2070 we should try to get back as much as possible out of the atmosphere again. So the timeframe is in the long term but there are near term steps before 2020, bending the global emission curve and there I think renewable is absolutely essential. China is a great success story. On the other hand we live in a schizophrenics' world. China had the biggest add on of co-consumption just in the last year. China's per capita emissions are the same as the EU ones with fossil and industrial CO_2 emissions; it's still a bit below the Australian per capita emissions. On the one side we have these huge increases in emission because of huge increases in fossil fuel use, and on the other side we have these very positive stories about renewable energy actually taking off. So in terms of the timeframe, it is very tight. Without renewables we wouldn't make it. It's absolutely essential. Probably by only focusing on renewables and not focusing on the other guys actually decreasing the incentives, we wouldn't achieve the two degree targets.

TRISTAN: At the moment, in a developed country like Australia, we emit one tonne of CO_2 for every megawatt hour of electricity we receive. What sort of timetable would we be thinking about if we had to replicate that? How fast do we need to get it down to 0.2, or if we were thinking about the globe, how fast do we have to essentially have 100% renewables in electricity supply, for example? Obviously there are other areas that we need to decarbonise as well, but do you have a feel for that?

MALTE: When you break down global emissions it depends a bit on the assumption about what each country should do, what the country's capacity is, what the historical contribution is to climate change, how much is the ethical responsibility for a country to do? They can obviously come to different value judgements. In the international climate negotiations there are kind of two large camps out there. Per capita emissions should converge around 2050, and then we are talking about the electricity as well in Australia. It should be carbon neutral by 2050, 2060, 2070. The other camp says well, the industrialised nations already used up so much emissions in the past, so they have to act first and foremost and really invest heavily. If that is not done by investing in renewable energies in other developing countries like China and India but is done domestically, then we are looking at a decarbonisation theoretically within 10 years.

TRISTAN: That's a pretty big challenge. We've heard about rapid growth in renewables but in absolute numbers we've still got a huge challenge ahead of us. You talked about an enabling policy framework. What do you see as the key characteristics? Looking around the world, what are the right sort of things that we should be doing if we're going to be able to scale up renewable energy, drive its costs down, improve its performance?

CHRISTINE: As I mentioned we have roughly 17% of renewables in final energy consumption. That means that 83% are non-renewable and there is still a big way to go. At least in Europe we have spent a lot of time debating what is good policy and what is the right policy. There was a lot of discussion on whether it is all about harmonising different policy instruments and just using one for the whole European Union. Ultimately we came to the conclusion that whatever framework you have in place does not matter so much. I mean we've seen the report, that feed-in tariffs seem to be very successful. There are now 65 countries all around the world and 27 states with feed-in tariffs in place. However, we also see that other countries are making good progress with renewable portfolio standards, with reverse auctioning, such as Brazil recently. I think it's not so much about the choice of the policy instrument; this depends very much on the overall energy policy framework that is in place in the country. What we do see is that long term predictability and stability are absolutely key. They are key for the industry to orient their growth plans and they're also key for driving investment in a way that it comes into a market. It's very encouraging to see that there are now 120 countries around the world having policy targets. It is absolutely key that these targets are not revised on a continuous basis, but they are really stable and explain the ambition of where a country, or a region really wants to go.

TRISTAN: So if we wanted to axe the tax that we just set up, that probably wouldn't be such a good idea? Would that constitute stability? Predictability?

CHRISTINE: I think Australia is in the process of putting in place with the rate and with the carbon price a framework that orients the country in the right direction. It is absolutely key that these measures are kept at the stable level as much as possible.

TRISTAN: What's the timeframe that we're talking about here, because some people will say, but renewable energy, we're giving it a hand out today, when's it going to end? What's the sort of timeframes we're talking about with trying to essentially grow the muscles on these immature technologies? What sort of timeframes should we be putting in place to see some kind of stability? What do they need in order to get themselves to a point where we should reasonably expect them to be able to compete against the older guys in the playground?

CHRISTINE: I think we have to bear in mind that our energy system is set up based on fossil fuels and that there are the new players into the game, that coming here to compete on a ground that is not absolutely fair. If I could just cite some numbers of the International Energy Agency: in 2010 there were 409 billion US dollars spent on fossil fuels subsidies globally. There were 66 billion spent on renewable support. I think that puts things already in proportion. So we are not talking about the level playing field that today is really ready to show real prices and to have renewables compete to the fair level. We, however, also see that there is a lot of talk that when you really upscale renewables, that clearly the need for support is going down and we have seen several policy frameworks such as the German one which is often the model that is referred to where they have opted for feed-in tariffs. But where the design of the policy framework is evolving in a way that there is a certain integration introduced into the tariffs and there is a perspective given that on a long term, in consultation and in coordination with the industry, this framework will effectively adapt and it will reduce because on the one hand to incorporate the cost reductions of the quality, and then on the other hand to make the whole support system financially sound and viable.

TRISTAN: Is it about a government saying, I'm going to give you support, I'll give it to you over say 10, 15 years, but that support will decline steadily over time so if you don't improve, and you don't get better and you don't get cheaper, then essentially you'll be weaned off?

CHRISTINE: I think they won't be weaned off because the statistics already show that they're getting cheaper over time and I don't know that there are many sectors that can effectively showcase such a steep price decline as we've seen, for example, for PV modules. By the way this is something that hardly anybody has ever predicted. On all the scenarios and all the forecasts from the IEA and from other organisations, you would never see such high shares of PV as in 2011. You also don't see such a rapid declining cost and so the two go really together. I think it's an accepted effect that a policy framework has to evolve over time. What is important is that there is consultation and there is discussion between the public and the private sector because again, it has to happen in consultation.

TRISTAN: Kane, to what extent has Australia got what might be considered a stable framework, a framework that enables companies to invest, to essentially improve their capability, improve the technology? Are we there yet? Could we improve? Have we been horrible in the past?

KANE: From our perspective there's no doubt Australia's got essentially the policy platform and it goes back to the renewable energy target that was introduced in 2001. It's been highly effective and it is essentially what we talk about as being investment grade policy and that is it's a policy mechanism that's in place and it allows large scale investors make investments into energy generation plant that operates for 15, 20, 30 years, and it gives them the confidence to be able to make those investments and essentially recover those investments over the life. In our view there's absolutely no doubt, and I think Christine spoke about many other countries around the world, that have followed Australia's lead with a very similar type scheme. There's no doubt in our view that the platform's there. It has been highly effective over the last decade.

But we have more recently seen a period of policy instability and some of that has been about the extension and the changes to the renewable energy target. I think it's fair to say they're now behind us. We've now seen a period of fairly toxic debate about a carbon price and to a certain degree, that's behind us. What we're starting to see in the renewable sector is all of this pent up investment over the last three to five years start to be unlocked and investors starting to get the confidence that the policy settings are right now. We've got the target to get to 20% renewables out to 2020. We've got some work to do, but all of, if you like, the building blocks are now there for us to get on and start making real progress. As a result you're seeing large scale wind projects start to be built around the country. We've seen commercial and large scale solar projects start to actually make progress. I should add as well, a bit more recently with the introduction of the carbon price, with the establishment of the Australian Renewable Energy Agency and also the Clean Energy Finance Corporation, these are really important institutions with pretty significant capital to also be able to support essentially the next wave of technologies. These are things like large scale solar, like geothermal, like ocean energy, and these technologies are still coming out of the laboratory. They're starting to scale up. They're starting to be demonstrated and tested in the Australian particular circumstances. Over time, we're optimistic that those institutions will help really drive them forward so we can achieve the 20% target, but we can really push well beyond that with a lot of different technology options and ultimately as low a cost as possible.

TRISTAN: I want to set up some renewable energy plants and I go off to the bank. What's the bank want to see in terms of a time scale for them to feel some degree of comfort that they can lend you some money? Is it three years? Is that the sort of thing that we're talking about for banks to feel happy to lend money to renewable energy project developers and companies?

KANE: These are big investments, and as I said earlier, it's generally around about the 15 year period. That's the period in which essentially the investment is paid off. Now a lot of these projects will operate for longer than that. Ultimately, therefore, both the developers and essentially the financiers and the banks need to take a 15-year view around the policy settings; what will be the value of the electricity that's produced from the wind farm or the development, what will be the value of the renewable energy certificates under the renewable energy target scheme, and essentially want to see that all of that adds up sufficiently to pay off the investment over 15 years. We've seen this short-term policy debate, carbon price, on off, carbon price tweaked, we've seen the renewable energy target, expanded in 2009. We saw it enhanced and split out in 2010. In fact now we're in the midst of a review of the scheme. All of that over a say three or four year period of time when again these investors are looking over a 15 year period and trying to make sense of the policy settings and essentially have enough confidence to put large amounts of capital in place to make those investments happen.

TRISTAN: Tony, renewable energy isn't the only way that Australia, or indeed the world, can reduce their emissions. It's probably not the cheapest one certainly to reach the government's 2020 emissions reduction target. How on earth are we going to prioritise between all the wealth of options that we've got and some which are more expensive but might be really important in the long term versus others that are cheap today but maybe aren't going to get us all the way that we need to go?

TONY: One of the questions that emerges is about the structure of the policies we've had to date, because they don't tend to do the things you've been talking about. From the 1st of July this year Australia made a significant step in that we've now put a price on emissions that we produce from the electricity we consume. That, by itself, will do certain things and it's starting to do certain things and the sky hasn't fallen and so we'll start to see that gradually make more of a difference over the short term. To add a little bit to what Malte was saying before – and I would recommend to you to have a look at the world energy outlook under the IEA's current report which is going to be updated towards the end of this year – one number that really struck me quite coldly was that do you want to stay within the two degrees that Malte was talking about. To meet that, if from now on we build no new power stations that produce greenhouse gas emissions, no more cars, no more industrial processes, we're already 80% of the way there. If we don't stop by 2017 we're 100% of the way there. So in the words of the IEA the door is

closing and that means that we've got to start moving things quite rapidly in the way that Tristan may be implying. It seems to me that one of the things that's changes with the emissions trading scheme introduction is the final nature of where the complementary policies should be. For example, before that, the renewable energy target did deliver and has delivered quite significant greenhouse gas abatement at moderate cost. You could debate how much abatement and how much cost and lots of people are today debating that point. But what we're now seeing is a situation in which the real energy target effectively has become industry policy. And industry's policy always brings out winners and losers. As a consequence what you're seeing right now in the media, all this week, all last week and will probably see for another few weeks yet, because of the review that was talked about, what you're seeing is this big debate. People are saying wait a second, this renewable energy target isn't delivering low cost abatement anymore. The ETS will do that. What this is doing is producing very expensive renewable energy, why should we be doing that? So you only have to look at the people who are saying that and what their commercial interests are to understand why they would say that, because exactly what's happening and in particular in Australia where energy demand is actually going down, what that means is the pie isn't getting bigger for the energy industry. Now the renewable energy is eating somebody else's pie. Those people don't like it, and they're screaming very loudly. You only have to see what was reported and the way people describe their response to the renewable energy target review, and what they're calling for, either the abolition or the scaling back, whatever you might want to say. So that's the context in which this whole debate's taking place. One of the challenges we have I think, Tristan, coming back to the core point of your question, I think is that in some ways we did this arse about in Australia. If we had put in place our core climate change policy, and you could debate whether it's strong enough, because I don't think it is, but if you put that in place first, then you should truly have complementary policies that address the market failures and look to bring forward the technologies that are going to ultimately be lowest cost in the long term. The one criticism that I have of the RET, the renewable energy target, is it doesn't do that. What it does, as does the ETS, it delivers what's cheapest today. It's been very effective, as I said before, in delivering quite a bit of wind and some solar, as Kane mentioned. What it hasn't done, and ETS doesn't do either, by the way, is bring forward technologies that could ultimately be lower cost in the future. I think that's where the policies should be focusing, because in the short term in Australia and elsewhere, as people become more concerned about energy prices in some parts of the world, thankfully not here, more concerned about energy security, those two will dominate the debate. Renewable energy is heading into some pretty severe stormy weather. That's going to bring some big challenges globally for renewable energy. As the IEA said, at the moment the future of the renewable energy industry is in the hands of government policy. I think the winds are going the other way, personally.

TRISTAN: On that negative note, let's go to questions, from the floor.

AUDIENCE: Andrew Lang, board member of the World Bioenergy Association. Tristan, I notice that you and Tony, were co-authors of this Grattan Institute *No Easy Choices: Which Way to Australia's Energy Future*. I'm always looking for emissions of the information about bioenergy when we're talking about Australia's energy policy, particularly renewable energies, it's the cheapest, it offers the most jobs, it's the most carbon sequestration, it's generally emitted. I'm always curious why. Christine knows that in Murek in South Austria, 100% renewable, all from biomass, and Goosing in Austria and Copenhagen, largely from biomass, heading towards zero emissions. Stockholm the same. Why is this? Why are we emitting this when Martin Fergusson is saying, because renewables just aren't reducing, we are looking at a nuclear rollout by 2020, 2025, is there something that we need to be doing to promote this emitted renewable?

TRISTAN: So about bioenergy.

AUDIENCE: About bioenergy which is also heat, fuels, bioplastics, the whole thing that is coming from biomass.

TRISTAN: Kane, you've got a few bioenergy members. They qualify under the renewable energy target for support. What's going wrong?

KANE: Despite what Tony said, I think part of the elegance of the renewable energy target is ultimately it's there to drive the deployment of the lowest cost renewable technologies, and that was originally, I think it's fair to say, bioenergy, wind certainly came down in cost pretty quickly, and at the moment wind is the lowest cost form of the proven renewables. To a certain degree bioenergy's suffering from that. I think there are other challenges. In part they're about grid connection and that's an issue that's common to many other renewable forms, but certainly bioenergy faces challenges in getting connections to the grid at competitive prices, at getting access to the grid. I think it's fair to say in some of the work that we've been doing bioenergy has a bit of an image problem, and part of the work we've been doing is trying to address that, raise awareness about bioenergy, what it is, what it is not, and giving both policy makers and the community a bit more of an understanding about bioenergy. To a certain degree I think it does come back to the original point which is it's currently not the lowest cost of the technologies, and there's a decision essentially there for policy makers to say what is the target that Australia wants to achieve, how hard do we want to pull the lever and at what cost are we prepared to bring in different forms of renewable energy.

TRISTAN: Christine, as an example Germany particularly has taken a different approach in some respects to Australia and said we need multiple options, and we need to progress them all in parallel. Do you think maybe there's something where we should be looking at? Clearly wind's got a head of steam, I suppose, solar PV has started to get running, but bioenergy's sort of left in the starting blocks. Any hints or clues?

CHRISTINE: I think something that we have effectively omitted in all our statements, is that there is a need for R&D, for further investigations in renewable technologies because I think that all these different scenarios that we are discussing, BDIA, BDEPCC, they base themselves on existing technologies and they show that even with what we have today we can make it. It is clear that improvement in technologies in certain areas is absolutely key and R&D is definitely necessary and important. Let me just comment on the issue of biomass and of bioenergy because effectively it's a very complex one. We do not talk about just one conversion road, but we talk about electricity generation, about heating and cooling and about biofuels for transport. The solution clearly is not the same. We see that, at least in Europe, bioenergy is often used as a co-firing in coal plants. I'm not fully aware about how much as a practice that is really used in Australia but is definitely something there. One of the successes that you, Andrew, pointed to about the fact of Austria and Scandinavian countries mainly, largely deploying and investing in biomass and especially in biomass heat, is that farmers have understood that the sustainable exploitation of forests and very often what we use there to produce heat are the by-products. It's not about cutting down trees but it's about really by-products that come out from forests, that these can be additional sources of revenue for them. It is quite interesting that the whole farmers conservative constituency is actively supporting the use of biomass and has really helped to spread these technologies and spread these developments. The Scandinavian countries, Germany, and Austria, they have lots of SMEs, and they have lots of companies that are specialised in there. There is also a whole market pool that was established there. On the other hand, there is always the discussion about biomass and this relation to sustainability. Then we see also that many parts of the world are struggling with defining sustainability criteria for the use of biomass. There is still a lot of work that needs to be done, and where definitely some criteria need to be fixed because clearly when talking about renewables, the usage of biomass should be done in a simpler way.

TRISTAN: Fundamentally in Europe there are dedicated policy mechanisms to just drive biomass for, for example, whether it be biofuels or power generation or heat.

CHRISTINE: Absolutely. So the way it works in the European Union is that we have this mandatory target, the binding target of at least 20% renewable energy from final energy consumption by 2020. This target is then broken down into national targets. So each of the 27 European countries have agreed to a certain share of renewables by 2020, that ranges from 10% in Malta to 50% in Sweden. Then each country came up with a national renewable energy action plan that outlines measures in the field of electricity, in the field of heating and cooling,

and in the field of transport, that indicate with which measures the different members think to reach the target and there clearly there is a big, big focus on biomass.

AUDIENCE: Thank you. My question is related to wind power, wind energy. It seems that a lot of countries are installing more and more wind energy sources. Australia has enough wind to establish that source here as well. What is the situation in Europe compared to Australia? Are the people in Europe complaining that they are getting sick? Or is it something peculiar to Victorians or Australians which will limit our capacity to install wind power?

TRISTAN: Christine.

CHRISTINE: I have heard that apparently wind turbines are particularly hostile here in Australia. I've heard these arguments several times. In our part of the world it's not so much the health concern, there in some countries effectively discussions going on, on noise, and there were some of the consumer groups forming against wind in some countries so there was some resistance. I don't think up to the same level of what you seem to get here. But clearly we also see that many countries have overcome this by developing community wind farm projects because it's very interesting that from the moment when a community or when consumer groups are involved in the development of wind parks, suddenly they are not interested in health anymore and they don't produce so much noise because they actually bring in revenue for the community and then suddenly they become quite interesting. There are a series of models out there that show how that apparent or not obvious risk can effectively easily be overcome.

AUDIENCE: Hi guys. My name's Gregoria. I've actually worked in both the public and the private sector with respect to renewables. I think it's probably fair to say that the approvals process, particularly in Victoria, can be quite cumbersome. It's probably because it's been mostly focused on wind. I've got two questions. The first one is do you think that the current controls in the development approval process can be changed to streamline these projects given that they do cost a lot of money and banks aren't willing to wait that long? Secondly, do you have any ideas as to what, in your views, you think that might be?

KANE: I think the short of it is, in this case, as we develop more wind farms, we get a better understanding about their impacts, about the concerns of local communities, about the planning regime in each jurisdiction around Australia and the extent to which it facilitates the pretty quick deployment of these projects. We've been on a bit of a learning curve right around the country and I think there's examples of where states have refined their planning regimes. I think South Australia's probably an example where its planning regime is pretty supportive for wind technology. There's no coincidence that South Australia currently sees about 50% of the country's wind farms. They've got more experience, they've developed their planning regime to essentially, recognise that the challenges and the real issues that need to be dealt with but equally to move through those as quickly and practically as possible. That's a good example.

AUDIENCE: This is a question mainly for Christine. I'm assuming you may have picked up here while you've been in Australia that it's not as strong an environment for renewables as other countries, that we're going through some arguments around renewable policy and climate policy that Europe probably would have gone through a number of years ago. Can you comment on why it's different in Europe, in particular from where the strength or level of interaction from governments, a level of bipartisan support, the amount of industry support, or industry opposition from the old industries, and also the wider community and not-for-profit organisations?

CHRISTINE: We have to look into the driving factors for renewables policy and those are very different from one place to the other. It is referred to as the triangle of renewables policy. What are the drivers? It can be energy security, it can be environmental concerns, and it is industrial policy. There is an inherent difference on when it comes to energy security between Australia and the European Union. Clearly we are not blessed with so many resources as you are here, and the start of renewables promotion was clearly environmental concerns, it was energy security concerns, and we see that more and more countries, they really go towards the

promotion of renewables out of industrial concerns because politicians are, and I guess that's the same in all parts of the world, very sensitive to being re-elected. If they manage to create jobs, then that gives them quite a good core among voters. But what do we see? We see an increasing trend for people wanting to have a sustainable energy supply. They often refer to in these debates the statement and the announcement of Germany to phase out nuclear after the Fukushima accident last year. This is not something that was borne in the head of Mrs Merckel. Let's be very clear. She's a nuclear physicist. So I don't think that she was really keen on getting rid of nuclear but it was clearly the population who said stop, we don't want any more nuclear in this country. That was at the basis basically for getting the energy transition going. This is also something that is very interesting for me, that you have hardly heard in Australian news, maybe you have not even heard it, but last weekend the Japanese government agreed to phase out nuclear. This is definitely something where the population is starting to play a role. We have many countries around the world where energy policy was not always democratically debated. For example, in France energy policy was always fixed by the elite of the country. So there was never any debate about the role of nuclear chairs and whatsoever, all very centralised. All of a sudden in the last presidential election campaign, the whole debate about energy choices was starting to be an issue, and the newly elected president of France, Francois Hollande, announced in the election campaign that he will reduce the share from electricity from nuclear from 75 to 50% by 2025. I think that shows that the population and the impact of the population on choices of the future should not be underestimated, especially in democracies such as ours.

TONY: I need to do something I don't normally do, and that is defend the Australian policy framework. We actually now have bipartisan support to reduce our greenhouse gas emissions by 2020, by 5% below the 2000 level, unconditionally. If the rest of the world continues to make any sort of progress, conditionally by 15%. We've got our emissions trading scheme in place which is probably one of the most extensive in the world, even though it might be somewhat modest, and we have a 20% renewable target, which by the way, looks like it's going to be more like a 25-something per cent, who knows what the forecast is, of renewable energy by 2020. I wouldn't agree by the way that we haven't got a pretty good robust policy outcome. Some of these things are much more recent, particularly around the emissions trading scheme, and we certainly don't have the same degree of bipartisan support for some of these policy elements that you see in parts of Europe. The other thing that's very important to this, now the megatrend that was brought up before in Christine's presentation, is gas. And gas, around the world, is a big deal in terms of the energy mix. For example in the US last year, even though there was significant growth in renewables, there was much more growth in gas. That's going to have a big impact not only on emissions but also on renewables I think.

AUDIENCE: Roger Dargaville from the University of Melbourne. Question for Christine. When you get to very high penetrations of renewables, you run into a problem that you can't control the dispatch of especially wind and solar. What steps are being taken in Europe, what mechanisms have been planned to be able to deal with the variability in renewables, especially wind and solar?

CHRISTINE: Effectively that's absolutely correct. There are certain renewables that are variable. There are others that are providing power whenever it is needed. That's why I think it is really important to always talk about the mix of renewables. You have hydropower, you have biomass, that could really provide stability there. We do have lots of examples in Germany, in Spain, in Denmark, in Portugal, where track records were shares of 50% of electricity from wind and solar at certain moments could easily be integrated into the system. You need to factor in load management, and you need to adapt your grid and your system to high shares of variable renewables. The whole high renewable scenarios will not be able to be implemented by just continuing the design of our grids as they are at the moment. So there is the importance to effectively look into grid sign and also look into interconnection. There is a big debate going on about the European grid which needs to be far more interconnected, and where also a debate lies again with the public because people often oppose new grid lines and there is also really a need for dialogue with people because without extension of infrastructure, we are going to effectively run into problems with integrating these high shares of variable renewables.

TRISTAN: On that, Kane, the wind industry in this country has a very high concentration of renewables in one location, and that's wind in South Australia. At the same time there are some economic constraints there in that when the wind blows and blows very hard, electricity prices tend to become very low. How is the industry looking at that particular issue, what are the sort of stresses that that's putting on them and how they're reacting to the fact that essentially the electricity market itself is pushing them out?

KANE: This is a pretty hot debate right at the moment, as Tony said earlier, and has consequences for the whole energy sector. Obviously included in that is renewables plant operating at the moment and into the future. Just to clarify that, we've seen periods, particularly recently, with very strong winds, renewables are dispatched into the grid and essentially drive down wholesale prices. To a certain degree in the broader public policy debate, driving down wholesale prices from a consumer perspective is a good thing, given all of the other trends on retail electricity prices that are pushing up prices quite quickly. But you're right, it obviously does have an impact on the returns of other renewable investments and obviously the feasibility into the future. As we've discussed, the energy sector really is in a state of transition at the moment with future demand changing, with more renewables being driven in and only now are we starting to come to terms with what impact that has both on consumer demand for renewables at a domestic level, but also ultimately the grid and also the wholesale energy prices. The short answer to your question is it does have an impact, there's no question about that, but as this transition continues to occur, I think ultimately what we'll see is the renewable energy target continuing to drive renewables into the market and continuing to drive it towards a point of at least 20% by 2020. In effect that is what will make wind farms and other forms of renewables commercially viable between now and 2020.

TRISTAN: Is there an issue with the need for us to perhaps put wind farms in other places. The wind might be great in South Australia. Maybe the grid can cope with more but in the end, the prices won't be very good for wanting to develop new projects anyway. We need to either expand the grid, improve interconnections, or start developing projects in other locations.

KANE: At the end of the day it's a balancing act. If you're looking to develop a wind project, you're looking for where the resource is the strongest, where the grid is essentially the strongest so you can get your energy to market. Essentially where is the greatest amount of demand? Where's the greatest amount of strength within the energy market in that region? It's a complicated matrix of those three factors. As wholesale prices move in one region, as a network and interconnectors are augmented and strengthened, as we chase the best resource around the country, the location of the best wind farms, and this will be the same. In fact we're already seeing this occur with solar as its deployment increases. Ultimately all of those factors come together to drive decisions about where those projects are going to be built, with which technologies right around the country. We see a future where there is an assortment of different renewable technologies put into different parts of the electricity grid, representing strengths and weaknesses, representing different forms of intermittency, helping to balance the grid, and we see that already globally in different parts of Australia, and that way we can actually sustain much higher penetrations of renewable energy broadly, and start to pretty quickly phase out some of our most carbon intensive forms of generation.

AUDIENCE: Ken Guthrie. This is a question probably for Tony or Kane. Christine's mentioned a couple of times today about Europe having a renewable heating and cooling target. Our situation in Australia tends to be that if we put green electrons into the grid, then the problem's solved. However, there's a lot of greenhouse that comes from other parts of the energy system. I just wonder what we can do about getting a more balanced approach?

TRISTAN: Tony?

TONY: Why don't I take one part of it? In terms of the grid, there are some serious challenges in relation to as we move away from what we've been used to in the past. Every industry around the world, energy is one of them, but not just energy, the system basically has evolved to suit the incumbents. That's not necessarily a bad thing, but you get an enormous amount of inertia

in the system. As a consequence of that our system actually does pretty well if you're a big coal fired power station or gas fired power station. It isn't so good if you're a modest generator of the sort of scale that we might be concerned about here this evening. What that means is we've got to address those issues. Finding ways to overcome the barriers, the series you do exist to the connection of medium scale wind, solar, solar thermal and so forth is a critical part of the regulatory process. That doesn't come through the renewable energy target or the ETS, it comes through addressing fundamentally those barriers in the regulatory process. And that's one of the things I think we need to do somewhat urgently.

TRISTAN: On Ken's question about the need to be doing something about heat: we're burning a lot of gas in Victoria to produce heat and steam, not to produce electricity. There doesn't seem to be much being done about that?

KANE: If you look at it, at least at a domestic level, I think Tony covered some of the commercial scale stuff, but at a domestic level, I think the reality is that people are now starting to come to terms and starting to be exposed to the full costs of supplying energy from traditional sources to their home. We've seen this over the recent period, certainly in the uptake of solar PV. Increasingly in the future things like solar hot water where people are starting to seriously look at those full costs and consider the alternatives, consider how they can generate their own electricity, how they can more efficiently heat water, and avoid the higher retail electricity price in the future. But I think Tony's right, there's a lot of structural regulatory reform that needs to go with that.

AUDIENCE: There's been a lot of focus on reducing emissions from the electricity sector. I was just wondering what focus has been given to reducing emissions from the transport sector, particularly petrol powered cars because you can use biodiesel for trucks and diesel engines but not for petrol engines. So where are we in terms of reducing emissions in the transport sector?

TONY: Belching cars. I think the answer partly is you go to the lowest hanging fruit first. In Australia, compared with many parts of the world where transport is a much higher proportion of their greenhouse gas emissions, is not so high, and so the biggest challenge for us is the fossil fuel fired plants, and what we've got to do is really start to address that. Transport and agriculture have to be addressed, but I think it's a matter of priorities.

KANE: The other thing to note, we've seen massive leaps forward in battery technology recently. I think it's a really exciting area and we're starting to see pilot scale battery technology rolled out around the transport sector around the world and starting to be piloted here domestically. It became really interesting when you consider that in the context of balancing the grid, using some of the intermittent source of renewables, renewable energy powered transport sector I think is a pretty exciting future. That's becoming much closer than some people realise.

TRISTAN: Yes, Malte.

MALTE: You are touching an absolutely critical point. For example in Germany, we have a target of one million electric vehicles on the road by 2020. In terms of all the other targets, probably Germany is doing the least well on this one. There's a lot of discussion about how you bring that electric mobility on the roads. From the science perspective it's interesting, we had some models that were projecting really high cost to achieve two degrees. We had them five years ago, we had them coming through the report and IBCC as well. Now over the last five years we dug a bit down to see where these high costs come from? Two of the most costly models come from VS. They were so high cost because they did not include the option of electric mobility in their models. That's why modellers now do more to come up with mitigation options in the transport sector. There electric mobility is the key that really drives down the cost of our projections of how costly this to achieve the two degree target. Just one final point on the 2017 date that you mentioned before, the IEA made that very important statement that by 2017 we really have to stop investing in new coal power and new fossil fuel resources. It is not that we have to stop emissions from transport and coal fired power plants by 2017, but the calculation is that by that time we have so much installed power from fossil fuel resources that if

we use them up to the end of their lifetimes, we will have enough emissions to hit the two degree line. That doesn't mean necessarily that if we go up to 2025 we couldn't make the two degree line. But what it means then is that we have a lot of stranded investments of the new coal fire power plants that are coming up right now. So by 2017 peaking global emissions, that's the cost optimal path. If we do it later, it becomes all the more costly and we have all the more stranded investments. It doesn't mean that it's impossible, it just a lot harder.

TRISTAN: I'll hand it over to David.

DAVID: Can I ask everyone to thank the panel. Could I just say by way of a conclusion, we've clearly had a fascinating, debate with a wide range of points discussed this evening. This all hinged around Christine's presentation. So I did want to take this opportunity to thank Christine not only for her efforts this week and there's still a day to go before you get on the plane home, but also to thank all of you for being here tonight. It's been a privilege not only to have all of you here but also have the opportunity to listen to Christine and to bring to this debate her international knowledge. I particularly wanted to thank Tristan for chairing tonight. Obviously from the work he does as a journalist in the field, he was able to bring that extra degree of decisiveness to his questions, which is always very useful in a discussion like this. Also I would like to thank Tony, Malte and Kane for their time and their contribution. A wide range of perspectives is always very useful. Now in thanking them, and I'll ask you to join with me and thank everyone in a moment, none of this would actually be possible without our co-hosts tonight. So if I could particularly thank Jemma and Susannah of the Melbourne Energy Institute and Angela of Grattan Institute, and ask you to join with me in thanking them particularly for enabling us to be here this evening.

For those of you who don't know, you can get a recorded version of tonight's session on not only the CEC's website, but also the MEI and the Grattan websites. Now, all of us will want to play a major role in this debate, the CEC, Grattan and the MEI all have a role to play in the debate. All of you have a role to play, not only today but in the future in this debate. It's great to see so many people here tonight. I did particularly want to take this opportunity particularly to thank my colleague, Kate Greer, who's organised Christine's visit here, and to thank in particular Marcus Awl for bringing together this visit over this week. And finally to thank my colleagues Kristen, Tess, Alicia, Laura and Beth for their work tonight. Very often it's the people in the background who make it all happen. There's now a fantastic opportunity for a bit of informal networking, but just bear in mind it's been a long day for some of the speakers, we don't want to delay people unduly, but do exchange your business cards at the end. Thank you all very much indeed for taking the time to come here this evening.

End of recording

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