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SENATE

SELECT COMMITTEE ON FUEL AND ENERGY

Reference: Issues relating to the Fuel and Energy Industry

WEDNESDAY, 7 APRIL 2010

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SENATE SELECT COMMITTEE ON

FUEL AND ENERGY

Wednesday, 7 April 2010

Members: Senator Cormann *(Chair)*, Senator Hutchins *(Deputy Chair)*, Senators Bushby, Fifield, Joyce and McEwen

Senators in attendance: Senators Cormann and McEwen

Participating members: Senators Abetz, Adams, Back, Barnett, Bernardi, Bilyk, Birmingham, Bishop, Boswell, Boyce, Brandis, Carol Brown, Cameron, Cash, Colbeck, Collins, Coonan, Crossin, Eggleston, Farrell, Feeney, Ferguson, Fielding, Fisher, Forshaw, Furner, Heffernan, Humphries, Hurley, Johnston, Kroger, Lundy, Macdonald, Marshall, Mason, McGauran, McLucas, Milne, Minchin, Moore, Nash, O'Brien, Parry, Payne, Polley, Pratt, Ronaldson, Ryan, Scullion, Stephens, Sterle, Troeth, Trood, Williams, Wortley and Xenophon

Terms of reference for the inquiry:

To inquire into and report on:

a. the impact of higher petroleum, diesel and gas prices on:
   - i. families,
   - ii. small business,
   - iii. rural and regional Australia,
   - iv. grocery prices, and
   - v. key industries, including but not limited to tourism and transport;

b. the role and activities of the Petrol Commissioner, including whether the Petrol Commissioner reduces the price of petroleum;

c. the operation of the domestic petroleum, diesel and gas markets, including the fostering of maximum competition and provision of consumer information;

d. the impact of an emissions trading scheme on the fuel and energy industry, including but not limited to:
   - i. prices,
   - ii. employment in the fuel and energy industries, and any related adverse impacts on regional centres reliant on these industries,
   - iii. domestic energy supply, and
   - iv. future investment in fuel and energy infrastructure;

e. the existing set of state government regulatory powers as they relate to petroleum, diesel and gas products;

f. taxation arrangements on petroleum, diesel and gas products including:
   - i. Commonwealth excise,
   - ii. the goods and services tax, and
   - iii. new state and federal taxes;

g. the role of alternative fuels to petroleum and diesel, including but not limited to: LPG, LNG, CNG, gas to liquids, coal to liquids, electricity and bio-fuels such as, but not limited to, ethanol;

h. the domestic oil/gas exploration and refinement industry, with particular reference to:
   - i. the impact of Commonwealth, state and local government regulations on this industry,
   - ii. increasing domestic oil/gas exploration and refinement activities, with a view to reducing Australia's reliance on imported oil, and
   - iii. other tax incentives; and

i. the impact of higher petroleum, diesel and gas prices on public transport systems, including the adequacy of public transport infrastructure and record of public transport investment by state governments.

WITNESSES

BARRETT, Mr Andrew Gerald, Group Leader, Petroleum and Greenhouse Gas Advice, Geoscience Australia 1

BARRON, Ms Christine, General Manager, Indirect Tax Division, Revenue Group, Department of the Treasury 21

CARSON, Ms Leesa, Principal Advisor, Energy Minerals, Geoscience Australia 1

CONSTABLE, Ms Tania, Acting Head, Resources Division, Department of Resources, Energy and Tourism 21

COPELAND, Mr Alan, Manager, Resources Section, Australian Bureau of Agricultural and Resource Economics 1

FOSTER, Dr Clinton Bruce, Chief of Division, Petroleum and Marine Division, Geoscience Australia 1

JAQUES, Dr Alan Lynton, Chief Scientist, Geoscience Australia 1

JOHNSON, Mr Paul, General Manager, Industrial Energy Efficiency Branch, Department of Resources, Energy and Tourism 21

KESBY, Mr Paul, Acting Assistant Secretary, Environment Standards Branch, Department of the Environment, Water, Heritage and the Arts 21

McDONALD, Mr Jason, Principal Advisor, Tax System Division, Department of the Treasury 21

MELANIE, Ms Jane, General Manager, Resources, Energy and Trade, Australian Bureau of Agricultural and Resource Economics 1

MORLING, Mr Brendan John, Head, Energy and Environment Division, Department of Resources, Energy and Tourism 21

NIVEN, Mr Richard Hugh, Manager, Transport Fuels, Department of Resources, Energy and Tourism 21

RAETHER, Mr Robert, Assistant Secretary, Renewables and Reporting Branch, Strategies and Coordination Division, Department of Climate Change and Energy Efficiency 21

SHEALES, Dr Terence Charles, Chief Economist, Australian Bureau of Agricultural and Resource Economics 1

STORY, Mr Oliver, Manager, Demand Side Management Policy, Department of Resources, Energy and Tourism 21

WILEY-SMITH, Ms Mary, Assistant Secretary, Community and Industry Partnership Branch, Renewables Energy Efficiency Division, Department of Climate Change and Energy Efficiency 21

Committee met at 2.32 pm

BARRETT, Mr Andrew Gerald, Group Leader, Petroleum and Greenhouse Gas Advice, Geoscience Australia

CARSON, Ms Leesa, Principal Advisor, Energy Minerals, Geoscience Australia

COPELAND, Mr Alan, Manager, Resources Section, Australian Bureau of Agricultural and Resource Economics

FOSTER, Dr Clinton Bruce, Chief of Division, Petroleum and Marine Division, Geoscience Australia

JAQUES, Dr Alan Lynton, Chief Scientist, Geoscience Australia

MELANIE, Ms Jane, General Manager, Resources, Energy and Trade, Australian Bureau of Agricultural and Resource Economics

SHEALES, Dr Terence Charles, Chief Economist, Australian Bureau of Agricultural and Resource Economics

CHAIR (Senator Cormann)—Welcome. I declare open this public hearing of the Senate Select Committee on Fuel and Energy. The Senate has referred to the committee matters associated with fuel and energy, including the price of fuel, regulation and taxation arrangements and alternative fuels. The committee is due to provide its final report to the Senate on 30 June 2010. Today, the committee is focusing on energy and fuel security, in particular to the terms of reference relating to the existing set of federal and state government regulatory powers as they relate to fuel and energy products, taxation arrangements on fuel and energy products, the role of alternative sources of energy to coal and alternative fuels to petroleum and diesel, the domestic energy supply and the domestic oil and gas exploration and refinement industry.

This is a public hearing and there will be a *Hansard* transcript of the proceedings. Before the committee starts taking evidence, I remind all witnesses that, in giving evidence to the committee, they are protected by parliamentary privilege. It is unlawful for anyone to threaten or disadvantage a witness on account of evidence given to a committee and such action may be treated by the Senate as a contempt. It is also a contempt to give false or misleading evidence to a committee. The committee prefers all evidence to be given in public, but under the Senate's resolution witnesses have the right to request to be heard in private session. It is important that witnesses give the committee notice if they intend to ask to give evidence in camera. If a witness objects to answering a question, the witness should state the ground upon which the objection is taken and the committee will determine whether it will insist on an answer, having regard to the ground which is claimed. If the committee determines to insist on an answer, a witness may request that the answer be given in camera. Such a request may of course also be made at any other time.

I remind senators that the Senate has resolved that an officer of the department of the Commonwealth or of a state shall not be asked to give opinions on matters of policy and shall be given reasonable opportunity to refer questions asked of the officer to superior officers or to a

minister. This resolution prohibits only questions asking for opinions on matters of policy and does not preclude questions asking for explanations of policies or factual questions about when and how policies were adopted. Officers of the department are also reminded that any claim that would be contrary to the public interest to answer a question must be made by a minister and should be accompanied by a statement setting out the basis for the claim.

I particularly draw the attention of officers to an order of the Senate of 13 May 2009 specifying the process by which a claim of public interest immunity should be raised. I would also ask witnesses to remain behind for a few minutes at the conclusion of their evidence in case the Hansard staff need to clarify any terms or references. I remind people in the hearing room to ensure that their mobile phones are either turned or switched to silent. Finally, on behalf of the committee, I would like to thank all those who have made submissions and who have sent representatives here today for their cooperation in this inquiry. I invite you to make brief opening statement and then the committee will ask you some questions.

Dr Sheales—Before I make an opening statement I would like to apologise for two of my colleagues who have been temporarily held up at security. Hopefully, we will have them here before long. That was our mistake and one of our party's mistakes.

Since ABARE last appeared before the committee in June 2009, we have undertaken some further work that is relevant, we believe, to the terms of reference of this committee. In particular, ABARE was commissioned by the Department of Resources, Energy and Tourism to compile an *Australian energy resource assessment* in collaboration with Geoscience Australia—our colleagues here at the table. This resource assessment brings together for the first time the complete picture of Australia's energy resource endowment, covering both fossil fuels and renewable energy sources. It comments on where we are now in relation to those resources and where we will be in the future, and it does that by integrating geoscience and long-term economic outlooks for the different energy sources.

The project was led by Geoscience Australia, with Geoscience providing information and analysis on the current and potential resource size, distribution and characteristics. ABARE's input to the process was to provide the economic analysis and modelling underpinning the longer term outlook. In assessing the long-term outlook to 2030, the key factors that we believe are likely to affect the development and utilisation of energy resources were considered. These include economic growth both domestically and globally, population growth, energy prices, cost of technologies and technological developments and policy drivers. Our Geoscience Australia colleague Dr Jaques, who is next to me, will provide a brief overview of the main features of the *Energy resource assessment*, and following that we would be happy to take any questions that the committee may have.

CHAIR—Thank you very much. This is a very valuable piece of work. It has been a very interesting read. I would not admit to being across all of it, but I think it is a very important work for Australia. Well done.

Dr Sheales—Thank you.

Dr Jaques—Thank you. Geoscience Australia appeared before this committee on 26 June 2009 and provided information in relation to Geoscience's role and especially to Geoscience

programs and activities to encourage exploration and discovery of new energy resources in Australia. This included a presentation on its activities under the Energy Security Initiative, which is providing new information to encourage the discovery of new hydrocarbon resources in Australia's large offshore jurisdiction and hydrocarbon, geothermal and uranium resources onshore. As my colleague from ABARE said, Geoscience Australia and ABARE were commissioned by the Department of Resources, Energy and Tourism to undertake this comprehensive and integrated scientific and economic analysis of Australia's energy resources. The purpose of this assessment is to inform future industry investment analysis, decision making and government policy development. It is the first time that such an assessment of this nature has been undertaken.

The assessment itself was released on 1 March 2010 by the Minister for Resources, Energy and Tourism, the Hon. Martin Ferguson AM, MP. The assessment covers Australia's non-renewable and renewable energy resources. The non-renewable resources are dominated by the fossil fuels: crude oil, condensate and LPG, we also considered shale oil, conventional gas, coal seam gas, tight gas, shale gas, as well as black and brown coal. The assessment also included the nuclear energy fuels uranium and thorium—a potential future fuel.

The renewable energy resources are a diverse group of energy sources that are expected to play an increasingly important role in Australia's energy mix in the future. They included geothermal, hydro, wind, solar, ocean—that includes wave, tidal and ocean thermal—and bioenergy resources.

I see you already have a copy but I have made copies of the executive summary, which I am happy to table.

CHAIR—Thank you.

Dr Jaques—I will touch on the key messages on the front page. The assessment assesses, as we have said, not only the resources but the factors likely to influence the use of Australia's energy resources to 2030, including the technologies being developed to extract energy more efficiently and cleanly from existing energy and new energy sources. We concluded that Australia has abundance and a diversity of energy resources. Australia has more than one-third of the world's known economic uranium resources, very large black and brown coal resources that underpin both exports and our low-cost domestic electricity production, and substantial gas and increasing coal seam gas resources. This globally significant resource base is capable of meeting both domestic and increased export demand for coal and gas and uranium exports over the next 20 years and beyond. Not only that, there is good potential for further growth of the resource base through new discoveries. Identified resources of crude oil condensate and LPG are more limited and Australia is increasingly reliant on imports for transport fuels.

Australia has a rich diversity of renewable energy resources: wind, solar, geothermal, hydro, tidal, wave and bioenergy. Except for hydro energy, where the available resources are already mostly developed, and wind energy, where use is growing strongly, these resources are largely undeveloped but could contribute significantly more to Australia's future energy supplies. Greater use of many energy sources with lower greenhouse gas emissions, particularly the renewable energy sources, is currently limited by the immaturity of the technologies and the cost of electricity production. Advances in technology supported by industry and government actions

are expected to result in commercial electricity production by 2030 from sources that are currently only at the demonstration stage.

Australia's energy usage in 2030 is expected to differ significantly from that today under the influence of the 20 per cent energy renewable target and other government policies such as the proposed emissions reduction target. In addition, the government has established a clean energy initiative which includes the Carbon Capture and Storage and Solar Flagships programs and the Australian Centre for Renewable Energy.

Australia's long-term energy projections, which are the subject of a separate report by ABARE but included in our energy assessment, show total energy production nearly doubling due to strong export demand, primary energy consumption rising by about 35 per cent and electricity demand increasing by nearly 50 per cent by 2030. Whilst coal is expected to continue to dominate Australia's electricity generation, a shift to lower emission fuels is expected to result in a significant reduction in coal's share and increases in gas and renewable energy, especially wind.

We also found that Australia's energy infrastructure is concentrated in areas where energy consumption is highest and the major fossil fuel energy sources are located. Greater use of new energy resources, particularly renewable energy resources, will require expansion of Australia's energy infrastructure, including augmentation of the electricity transmission grid.

The energy assessment is structured as follows. Chapter 1 presents a summary of the assessment and identifies key findings. Chapter 2 is an overview of Australia's energy resource base and market and provides a realistic assessment of our combined energy resources, energy-related infrastructure and Australia's energy consumption production and trade, as well as our place in the world energy market. It also assesses the key factors likely to affect the development and utilisation of Australia's energy resources in the next two decades, including economic and population growth, energy prices, cost competitiveness of energy sources, government policies, technological developments, and environmental considerations.

Chapters 3 to 12 contain detailed individual assessments of each of Australia's key energy sources. Each resource assessment follows a similar structure. The first part is a summary of the key information in the chapter. The second includes background with definitions, the structure of the industry and the world market. The third covers detailed information on the resources, such as economic and total demonstrated resources, location and characteristics. It also provides information on the Australian market for that resource, including production, consumption, recent growth and any trade that occurs. The fourth part contains the outlook to 2030, which is a critical part of the assessment, and includes an assessment of key factors which will affect the resource over that 20-year time frame, including prices, cost of development, government policies, technological developments, infrastructure and environmental considerations. It includes an analysis of potential resources not yet identified as well as projections of production and consumption and trade to 2029. These projections incorporate the renewable energy target of 20 per cent of electricity supply by 2020 and a five per cent carbon emissions reduction below 2000 levels by 2020.

In summary, the *Australian energy resource assessment* is the first national assessment that brings together information on all Australia's energy resources, both renewable and non-

renewable. As such it provides a better framework for consideration of Australia's energy resources and their future development and use.

With your permission, chair, I have prepared a set of summary slides which I could table or I am happy to talk to it if you so desire.

CHAIR—Perhaps you can table them. If you want to take us through them quickly, that would help. Given that there is only Senator McEwen and me, we might be able to squeeze in enough questions.

Dr Jaques—Thank you, chair. I will not pause on the first three slides, which simply provide the framework I have already outlined to you, including the structure and content on slide 3. Slides 4 and 5 come from the executive summary and you see there the map that attempts to bring all the different energy resources onto the one page, both the demonstrated non-renewable resources by petajoule but also where the resource base is for the emerging renewable energy resources. We are unfortunately were not able to show hydro and bio on that same map.

The key findings, as I have said, are Australia's abundant and diverse energy resources, major uranium, coal and large conventional gas and coal seam gas resources. This globally significant resource base can underpin both domestic and export demand to 2030 and beyond and there is potential for future growth. The exception is our resources of oil, which, as I have said, are more limited and Australia is increasingly reliant on imports for transport fuels. There is a diversity of renewable energy resources, as we show on page 4, largely undeveloped apart from hydro and wind.

Slide 5 shows the same map but essentially summarises the points that I have previously made in summary about the fact that many of the emerging energy resources with lower greenhouse gas emissions are currently limited by the immaturity of technologies and cost of production. We expect that to change over the outlook period and there will be commercial electricity production from many of these sources that are presently under development.

In slide 6 we show in chapter 2 the non-renewable resources, again demonstrated resources by petajoule and type showing the distribution of our major energy sources by size, to give you a feel for the relative size. On the right-hand side at the top right we see the economic demonstrated resources in petajoules, which show the importance of our coal and uranium resources and our important gas resources. On the lower right we see the renewable electricity capacity by installed capacity by megawatts. We see the dominance of hydro and the growing importance of wind, followed by biomass and other energy sources.

Slide 7 is based on the ABARE energy projections. It shows Australian energy projections out to 2029-30, with energy projected to grow at 3.2 per cent per annum and the different growth profiles for each of the individual commodities there. The two right-hand slide graphs show, firstly, primary energy consumption, where consumption is projected to rise by 1.4 per cent. It shows you there the relative percentage of those energy types in 2007-08 and in 2029-30. You see there the strong growth in gas particularly and the decline in the relative consumption of coal, which is reflected in the fuel mix in electricity generation in the graph on the lower right. That shows you projections that by 2029-30 coal will be contributing less to the electricity generation mix and it will be displaced by increased contribution from gas and wind.

Turning now to the individual commodities, we will start with oil on slide 8. That shows you the distribution of Australia's crude oil, condensate and LPG resources, including—in the pale colour—the past production of oil. That shows you the size of the original resource and the remaining resource in petajoules. We see that Australia has a declining crude oil resource base, but we have additional condensate and LPG resources associated with the offshore gas fields off the north-west coast of Western Australia. There is exploration potential to add to those resources, and exploration of course is continuing. Much of that exploration potential is in frontier areas in deeper water.

In slide 9 we look at the projections that oil production is to decline by two per cent per annum and consumption to rise by about 1.3 per cent per annum. Net fuel imports are projected to rise 3.3 per cent per annum and by about 2029-30 are projected to constitute about 75 per cent of net liquid fuels. Australia is increasingly reliant on fuel imports. Yes, new discoveries are made—as I said, they are in both proven and frontier basins and there is potential for both—and we also have other sources of oil, particularly shale oil, which is not presently used. There are other possibilities in terms of gas to liquids, coal to liquids and biofuels. The graph on the left in green shows you the estimated potential size of some of these, including undiscovered crude oil, which might help to fill the declining production in the future. On the right the graph shows you the projected production and net imports without further discoveries.

Slide 10 outlines Australia's very large gas resource base, about 1.6 per cent of world gas reserves, a big conventional demonstrated gas resource lying mostly off the north-west coast of Western Australia. There is a record of exploration success and more finds are likely. These major gas resources, some of which were found years ago, are now being increasingly developed for LNG exports. In eastern Australia we have coal seam gas resources associated with our large coal basins, and the coal seam gas resources are growing rapidly and increasingly playing a part in eastern gas markets. Coal seam gas LNG exports are now proposed.

Slide 11 summarises why some of that growth in gas is taking place. It is a flexible, clean energy source and it is the fastest growing fossil fuel to 2030. Australian gas production is projected in the ABARE projections to grow by 6.7 per cent per annum to 2030, doubling its share in the energy mix. LNG exports are projected to grow by 9.5 per cent per annum to 2030. You can see below there on the left-hand side a graph of existing, under construction and proposed new LNG facilities for both conventional and coal seam gas. Gas consumption is projected to rise by 3.4 per cent per annum to 2030, when it will constitute about 33 per cent of consumption and its share of Australian electricity generation is projected to be around 37 per cent. You can see the projected growth in exports and consumption on the top right-hand graph out to 2029-30 and both the projected increase in the electricity generation in terawatt hours and gas's share of electricity generation rising to 2029-30 very strongly in the graph on the lower right-hand side.

Turning to slide 12, coal is Australia's largest energy resource, with substantial black and brown coal resources. This large low-cost resource base has underpinned our cheap electricity and of course our major coal exports, both metallurgical and thermal. We have very large high-quality resources that are adequate for many years of production for both black and brown coal. Globally, coal is the fastest growing fossil fuel, driven by strong global demand, particularly from China and India.

Slide 13 shows you the distribution in little more detail of our operating coalmines, known coal mineral deposits and the black and brown coal basins, which are widely distributed across Australia. We have seen high levels of exploration in recent years, and these have added new resources, particularly in the Gunnedah and Galilee basins. There are major expansions planned, both mine expansions at existing mines and new mines and coal-loading facilities. This investment in mine and production facilities needs to be matched with the appropriate infrastructure to meet this growing export demand. At the same time, we are starting to see competing land-use and groundwater resource management issues arising in areas where the land is already used for agriculture and other purposes.

Slide 14 summarises the results of the forward projections, which show that Australian coal production is projected to increase at about 1.8 per cent per annum out to 2029-30 and exports to nearly double by 2030—a 2.4 per cent growth, with exports to potentially reach 450 million tonnes in 2030. At the same time, domestic consumption is projected to fall over that period by a little less than one per cent per annum, and coal's share of electricity generation is projected to be replaced by growth in gas and wind. You see there the graph on the lower left-hand side showing the growth in coal production and exports, with strong growth in exports projected to 2029-30 and, on the right-hand side, the decline in coal's percentage of electricity generation. Carbon captured and storage is expected to play an important role in reducing coal emissions for coal in the future, and the government has made significant investments to support and accelerate the development of carbon capture and storage in Australia and particularly the Carbon Capture and Storage Flagships Program.

Slide 15 summarises uranium and thorium. Australia has around 38 per cent of the world's uranium resources, the largest in the world, and large thorium resources, mostly tied up in monazite in mineral sands. There presently is no market for thorium. We have seen high levels of exploration for uranium in recent years which have made new discoveries, and there is potential for further discoveries of resources. A number of new mines have been proposed to meet growing world demand. You see there on the lower left the proposed range of new mine production going into the out years. Whether or not these come to pass is yet to be seen, but certainly there are a lot of projects that are planning to produce in the future.

Looking forward, on slide 16 you see that Australia's uranium resources are adequate for about 140 years of current production and can therefore meet growing export demand, even more with the new mines planned. Global demand, growing at about 3.7 per cent for uranium, is built on the back of renewed interest in nuclear power. There are 53 new nuclear power plants in progress and 135 others planned. This was at the end of last year. Australian uranium exports are projected to increase and could reach 21 kilotonnes in 2030, up from 8.5 now. You see that strong growth projected in the graph below. However, we face increased global competition in world markets for uranium exports from countries such as Kazakhstan, Canada and Namibia.

By 2030, new generation IV reactors and fuel cell technologies are likely to be available. These are likely to result in safer reactors using less fuel and particularly emitting less high-level radioactive waste. Whether or not thorium will be used in that time frame is uncertain, but we do not expect to see significant commercial-scale use of thorium reactors in that time frame.

I now turn to slide 17 and geothermal energy. Australia has significant but not yet well defined geothermal energy resources. These have only recently been recognised because they are not the

conventional hydrothermal resources typically found in countries that have young volcanic chains. We have two types of geothermal resources, known as hot rock geothermal resources, which are the result of radioactive decay of old rocks—as you can see on the right-hand side—and water circulating within them is heated to temperatures that are potentially suitable for baseload power generation. We also have geothermal resources in hot sedimentary aquifers. These are commonly lower temperature resources but potentially still suitable for electricity generation and certainly suitable for a wide range of direct use applications. The technology involved in geothermal energy production is feasible but not yet commercially demonstrated in Australia. The government has provided strong support for commercial demonstration plants—a drilling program—and there are several projects at proof of concept or early stage of commercial demonstration. The forward projections envisage commercial production by 2030, perhaps producing around 12 terawatt hours, or a little under two per cent of electricity generation.

Slide 18 shows estimated temperatures at five kilometres depth, the hottest being the red and the coldest being the blue. The inset map that looks like flyspecks is a reminder that our resource base is not well defined because the data are inadequate to objectively show that. We have also shown a screen over the map which shows you areas of thick sedimentary cover—more than three kilometres—which potentially might host hot sedimentary aquifer resources, and areas that are greater than 200 degrees Celsius at a depth of five kilometres.

Slide 19 is a summary of our hydro energy resources. Hydro energy is a mature, low-cost energy and is currently our largest source of renewable electricity. The resource potential was realised early and the resource largely developed. There are opportunities for refurbishment of existing plants—there are a number of plants already engaged in that—and the development of mini-hydro schemes. However, growth is likely to be constrained by a lack of water resources. Australia is a very dry continent with low run-off and high evaporation, and the lack of water resources has been exacerbated by drought, particularly in eastern Australia in recent years. On that basis, hydro energy is projected to grow only slightly—by about two per cent—but its share of electricity generation is projected to fall from a little under five per cent currently to around 3.5 per cent by 2030.

Slide 20 summarises the wind energy resources. The map shows the average wind speed in meters per second. The strongest wind speeds are shown in the richer, redder tones, and you can see there that Australia has a world-class wind resource which extends around the coast and inland for much of southern Australia, and anything above seven metres per second would be considered a potentially suitable wind resource. The important point is that this wind resource extends well inland in many areas, and this is increasingly being developed. Shown there are the operating wind farms of greater than 10 megawatts, and the proposed and under-construction wind farms are shown in pink. We have seen a major growth in the number and size of wind farms, with 200 megawatt-plus wind farms now common. The technology is now mature. Wind turbines have evolved over the last 20 years to a mature state. Wind is a fast-growing energy technology worldwide and in Australia will overtake hydro as our No. 1 renewable source of electricity. There are more than 11.3 gigawatts of proposed additions to capacity. Those projections suggest that wind energy production will increase by around 11 per cent per annum to about 40 terawatt hours by 2030. The wind share of electricity generation will increase from currently less than two per cent to about 12 per cent by 2030. Associated with this major increase in use of wind resources are the grid integration and management issues and upgrades and extensions to the transmission network required to match the resource, which is often in remote

areas, and decentralise away from the current focus on non-renewable fossil fuel based electricity generation.

Slide 21 summarises the solar energy resources. This map from the Bureau of Meteorology shows the annual average solar radiation. It is not the best indicator of resource. What we need is direct normal irradiance data. Work is in train to improve the data set that is available for that. Australia has a world-class major solar resource. Its use is relatively modest, largely as solar thermal heating and PV, particularly in off-grid remote areas, where it has been employed as an alternative to diesel. Solar PV production costs are coming down and we are seeing greater deployment of solar PV in urban areas.

The government has invested strongly to support the acceleration in R&D of all types of solar energy generation, particularly with the Solar Flagships program, which aims to accelerate solar thermal, with commercial production by 2030. Projections suggest that solar energy generation will grow very strongly, at around 17 per cent, and reach around four terawatt hours by 2030.

Turning now to the ocean energy slides, we have tidal energy on slide 22. Australia has a significant tidal resource, mostly in Northern Australia. The brighter colours indicate where the greater resource is. It is also localised by geography in other areas, including parts of Bass Strait and Queensland. The technologies for extraction of tidal energy are largely immature at this point, apart from tidal barrages, which are generally not favoured on environmental grounds.

Most technologies these days are now focused on the use of kinetic energy in tidal energy, using some of the learnings from wind turbine technology in tidal turbines, as shown in the picture below. That is a particular type of tidal turbine. A number of these different types of technologies are under development in trials around Australia and there are some small-scale demonstration plants. Tidal energy has off-grid applications, particularly in remote areas. In fact there are proposals to use tidal energy at Koolan Island. We expect commercial production by 2030. At this stage it is difficult to quantify what that would be.

CHAIR—It is going to be a big year, 2030!

Dr Jaques—Indeed. On slide 23, we have wave energy. Australia has a world-class wave energy resource along its southern margin. The stronger colours there indicate the wave energy in terajoules per metre. Again, many of the wave converter technologies are still immature. There are different technologies being trialled in Australia and around the world. You see an example of the CETO technology, a pump-type action being developed by the Carnegie group. There are a number of small-scale demonstration plants and there is the potential for both on-grid and off-grid applications and other applications, perhaps including desalination plants. We see some commercial production likely by 2030.

Finally, the last chapter deals with bioenergy. Australia has a diversity of biomass resources as fuels. The forest, agricultural and other organic waste is largely underutilised. We also have biogas resources and other urban residue waste which could be used. This map shows you simply where the current electricity generation facilities from biomass are. Mostly that is bagasse associated with cane production in Queensland.

We have some biogas production there in the southern states—which you can see in the yellow—and some biofuel production. To date, generation of first-generation biofuels has been limited by available feedstock. Current R&D is focusing on emerging non-food stocks and conversion technologies, particularly to use tree crops and other materials and in future perhaps algae to produce a wide range of biofuels. Some of these new generation biofuels have the capacity to produce aviation fuel, which is not available at present from much of the first-generation fuels.

The issue worldwide for use of bioenergy, particularly in biofuels, has been competition for arable land—competing with food production and the use of water and land. The new generation technologies are intended to use less water and to use more marginal lands and therefore not be in competition with food sources. The graph on the lower left there shows the projected growth in the use of bioenergy and particularly its share of total energy, shown there as a percentage on the right.

With that overview we have drawn together a range of energy sources. Some of those energy sources are already well developed and being readily deployed. Others are more dependent on the development of technologies and the energy projections are based on what might happen in terms of the rate of development of some of those energy technologies. They may in fact accelerate more rapidly due to technological advance, but these are the energy projections and our assessment as we are able to do it today. We hope that this energy assessment will provide a better framework for consideration of Australia's energy resources and their future development and use. Thank you.

CHAIR—Thank you very much, Dr Jaques, for that very detailed opening statement. I note how you make the observation that Australia's energy usage in 2030 is expected to differ significantly from that of today under the influence of the 20 per cent renewable energy target. Then you mention other government policies such as the proposed emissions reduction target and in your statement you mention the five per cent emissions reduction target. You have not mentioned other government policies such as the Carbon Pollution Reduction Scheme; rather you have mentioned policies such as the proposed emissions reduction target, which of course has got bipartisan support. Was that a deliberate decision? Can you just talk us through that?

Dr Jaques—I will pass that on to my colleagues who did the modelling. I think they are in a better place to answer that.

Ms Melanie—In terms of the policy settings for the energy projections we have taken into account existing government policies and the policies that can reasonably be expected to be implemented over the outlook period to 2030. As part of that we have included the renewable energy target, which has already been legislated. We have incorporated a five per cent carbon emission reduction target below 2000 levels by 2020. We have done that by being consistent with what was proposed in the white paper on the CPRS, so it is the essentially the same design. Some of the assumptions are drawn from that report. The carbon prices, for instance, that we have used are consistent with the modelling that was undertaken for the white paper adjusted for the midyear economic and fiscal outlook that came out in November of last year.

We have also included other government policies such as the Clean Energy Initiative, which includes the Solar Flagship Program and the CCS Flagship Program, as well as trying to capture

a range of energy efficiency measures that are in place. We have also got in there some state-level policies, a lot of which will be phased out when the CPRS or a carbon emission reduction target is implemented.

CHAIR—Do you have a list of the energy efficiency measures that are in place, or forecast to be in place, in the period to 2030? I see you nod—yes?

Ms Melanie—Not in the energy projections report, but we have done some work on energy intensity in Australia, focusing on trends in energy efficiency across different sectors and, in that report, there are some policies that are described and we would be happy to provide some further information if that would be of interest. We have not made any assumptions about what policies would be in place. We have just looked at the trends in energy efficiency across sectors and extrapolated that over the next 20 years or so.

CHAIR—You have looked at past trends and extrapolated from them. So you have not taken into account any possible policy decisions around that?

Ms Melanie—To the extent that they have not been implemented, no.

CHAIR—The reason for that question is that we have, so far, struggled to get a clear answer from any department around energy efficiency targets around government. But, just going back to my original question: as I take it, you have not included an assumption that the CPRS is in place over the next 20 years in considering this; you have only assumed that a five per cent emissions reduction target will be in place, given that that has bipartisan support—is that right?

Ms Melanie—That is right.

CHAIR—You might not be able to answer this but, if you can, I would be interested in your answer: to what extent would your findings be different if the Carbon Pollution Reduction Scheme were legislated?

Ms Melanie—The way that we have implemented the Carbon Pollution Reduction Scheme is very consistent with the way that the CPRS is being proposed. So I would not envisage that there would be a lot of differences in terms of the final outcomes.

CHAIR—Okay. I will give that some thought. I might get back to you on that. In terms of the energy mix that you envisage for Australia in 2030, nuclear is not part of that mix. I can guess the answer as to why, but can you just talk us through that?

Dr Jaques—Yes. That was not considered because there is no plan to produce nuclear energy. That would require policy change and so we have not considered that.

CHAIR—So, in terms of the brief that you were given by the government, that was one of the no-go areas? As to the way the government told you to look at our energy mix by 2030, nuclear was going to be out—is that right?

Dr Jaques—It would require a policy change for us to adopt nuclear power. There has been a report on not only what would be required in terms of the policy change but also the regime that

would need to be established and the supporting infrastructure that would be needed. And I think we refer to that in our chapter on uranium. I think, from memory, that was estimated to be in the order of 10 to 15 years.

CHAIR—Sure, and the only reason I am asking is because you clearly did a lot of work around quantifying uranium and thorium as energy resources available to us, and there is a lot of work around how much our exports are going to develop. I just wanted to be very clear that you have not assessed how the energy mix would look if nuclear were to be part of the mix?

Dr Jaques—No, we have not included nuclear power as part of Australia's energy mix. We consider it as an important energy export, and the resources have been assessed in that context—as the basis for exports.

CHAIR—You looked at how the energy mix would be expected to develop by 2030, and you say it is expected to differ significantly from that of today. In that context, given that you have also looked at it from an economic point of view and integrated the science with economic analysis, did you look at the cost implications of that in terms of the energy mix by 2030 compared to the energy mix today?

Ms Melanie—Basically, the aim of the report of the long-term energy projections which then fed into the *Australian energy resource assessment* was to provide the long-term view of Australia's energy production, consumption and trade. So we have not, as part of that, looked at the cost implications. But we have taken into account some of the costs of the technologies.

CHAIR—But—just before we go into the costs of the technologies—if you talk about looking at trends in production, consumption and trade, cost would be a significant factor in that, wouldn't it?

Ms Melanie—Yes. In terms of the assumptions relating to the modelling exercise, we have looked at the cost of technologies. We have looked at energy prices, economic growth assumptions, government policies, technological developments—these are some of the key factors, the key drivers of energy production, consumption and trade over the 20 years. So, to that extent, from that perspective, we would look at the cost.

CHAIR—Have you included an assumption around costs over the next 20 years?

Ms Melanie—Costs of?

CHAIR—Of energy.

Ms Melanie—Yes.

CHAIR—So what is your assumption as to what the trend in the cost of energy is going to be over the next 20 years, given the change in energy mix which you are predicting?

Ms Melanie—We have looked at energy prices, what prices might do over the next 20 years or so.

CHAIR—And what is your conclusion?

Ms Melanie—It is an assumption. So by assumption we have assumed that energy prices generally are likely to increase over the next 20 years or so and depending on which type of energy you are talking about the trend is slightly different, but because there is a fair bit of substitution between energy sources, they tend to move pretty much in the same direction.

CHAIR—Clearly the challenge is that we are looking at energy security for Australia moving forward. We are expecting a growing economy, we are expecting a growing population, so energy demands and energy use is going to continue to increase but we want to reduce emissions at the same time. That is what we are talking about, is it not? Does that summarise the challenge, the reason we are doing all of this work? I see a couple of nods.

Dr Jaques—Correct. Our assessment is of the energy resources and their potential use. We did not particularly address the emissions from that.

CHAIR—You are making the observation on how the energy mix is going to develop over the next 20 years and I think that is in the context of these are all of the resources we have, these are the resources we are most likely to use, given that at the same time as increasing use we also want to reduce emissions. Is that what is driving your—I see again a couple of people nodding. Is that correct?

Dr Jaques—Certainly the renewable energy target is driving a lot of the modelling because it is already legislated, so yes, there will be—

CHAIR—Sorry—not meaning to interrupt but the context for my question is that I think I have read somewhere we have 500 years of brown coal reserves left and we have about 90 years of black coal reserves left. We expect to reduce consumption domestically but we expect to double exports. So are we not either expecting to shift emissions into other parts of the world or deferring it over a longer period but expecting the same Australian coal—brown coal, black coal—to be used and ultimately result in global emissions? They way I am reading your assessment, looking at domestic trends, there is a doubling of exports of coal over the same period. Really we are looking at reducing emissions in Australia, irrespective of what happens with our coal in other parts of the world. Is that a fair observation?

Ms Melanie—I guess the purpose of this exercise was not really to look at energy resources from a climate change perspective. It was more to provide information that could be used by government and industry in investment decisions. So it was about putting together as much information as possible on a range of energy resources, bringing together the scientific perspective and the economic perspective to help make that decision. That was the objective of the *Energy resource assessment*. So it is one input in a broader question.

CHAIR—Sure, but if it was not for our assumptions around wanting to reduce emissions in Australia, then our energy mix moving forward presumably would look very different. In fact, it would be much more similar to what it is now. We would probably continue to rely on cheap coal. You have made the observation that historically we have relied on cheap coal. What is shifting us away from cheap coal is that drive towards wanting to reduce emissions. Yet

everything I am looking at, and your report as well, talks about doubling our exports of coal over the same period.

Dr Jaques—Perhaps I could add a comment and that is the reference to where we sit globally. The International Energy Outlook has produced two scenarios, one of which is the 450 scenario, which assumes that countries globally take efforts to reduce their carbon emissions and they end up with a different set of energy projections from the reference scenario, which is based on current energy use and projections. So I think globally there is a framework in which Australia sits and that drives the export markets.

CHAIR—Sure. You can take this further but I am just interested, looking through these graphs, that you put in with wind energy an expected share of electricity generation by 2030 of 12 per cent. It might well be in the report but for solar energy you put in your growth expectations of 70 per cent per annum. Do you have an expected share of electricity generation from solar or is it—

Dr Jaques—Yes, we do.

Ms Melanie—It is still below one per cent by 2030.

CHAIR—So by 2030, our expectation is that the share of electricity from solar will still be below one per cent?

Ms Melanie—Yes.

CHAIR—With tidal energy, there is an expectation that there will be commercial production by 2030. In looking at the resource, do you have a list of most likely to least likely projects which might come on stream by 2030? In making that observation of commercial production by 2030 of tidal energy—it will have to be in the north, presumably, because that is where the resource is, according to your graph.

Dr Jaques—In each of the chapters, we have reviewed in the outlook a range of projects which are currently under way. Some of them are at a relatively advanced stage and most of them—in the case of tidal energy, are listed in our energy report in table 11.11—are at a less advanced stage. Some of those have proposed start-up dates associated with them and capacity. So our comment there about expecting production is based on the summary of what companies have reported in terms of their own plans and a view of what is likely to happen in developments in the outlook period.

Dr Sheales—Each year, ABARE puts out twice a year publications on both new energy generating projects and new minerals projects. That is a bit nearer to them but, of course, these projects would have lives of 20 years or whatever.

CHAIR—Sure, but essentially at this stage it is best guess and you have done an audit of what people are saying out there but it is not a line in the sand with a specific target where you are saying very confidently that by 2030 these are the projects which are likely to be up and running. Is that a fair characterisation?

Dr Jaques—I think that is a fair comment, but I do not think we would be wanting to say that, given that many of these projects are still at early stages of demonstration and many things can happen along the chain to commercial development. We have seen this pattern both globally and in Australia—often technology moves slowly and suddenly there is an advance and things can change quite rapidly.

CHAIR—This leads me then to a question and you have touched on it before. Clearly, the dominant source for electricity generation in Australia today is coal. For a whole range of reasons, principally to reduce emissions, we want to shift away from coal. Our projection is that solar is going to be less than one per cent moving forward, we think that wind is going to be about 12 per cent and then there is a range of technologies which have a lot of promise although they may or may not come to fruition—there is still a lot of uncertainty. Then we have nuclear out there as a proven, reliable technology. We have a third of the world's know resources in uranium; I do not know how much in terms of thorium. It seems to me we are leaving ourselves a bit exposed there, are we not?

Dr Jaques—That is a policy issue, Senator.

CHAIR—Fair point. Can I ask—and again tell me if you cannot answer this—you mentioned we have 140 years of production of uranium, given current—

Dr Jaques—Current production.

CHAIR—And current export trends?

Dr Jaques—Current resources against current production. Both are growing and that number is expected to change in the future. Clearly it is adequate for exports for years to come.

CHAIR—This is a hypothetical question, but in the context of energy security moving forward I think it is an important question and you might be able to answer it. If Australia did have nuclear as part of its domestic energy mix, how many years of resource would we have available to us?

Dr Jaques—I could not comment, Senator.

CHAIR—And nobody has done any of that work in the context of—

Dr Jaques—I would have to take that on notice. I cannot recall whether the uranium energy report included that.

CHAIR—It seems like an obvious question, I would have thought.

Dr Jaques—Well the fact that Australia is able to supply several countries which use nuclear energy as a significant component of their electricity supply would suggest that Australia has plenty of uranium resources adequate to support both exports and any potential possible future use. Australia's uranium resources are expected to grow with the current high levels of exploration. That follows a quiet period of exploration until, say, five years ago when uranium prices were fairly depressed and there was little demand, but the growth in demand for world

uranium resources has lifted exploration for uranium globally and certainly in Australia. We would expect to see further discoveries of uranium.

CHAIR—I am not meaning to ask inappropriate questions but I am trying to understand how a government can make an informed decision on our energy security moving forward in the context of wanting to reduce emissions at the same time as energy use is going to go up if they do not have that piece of information in front of them. Is there somebody else in government you can point me to who would be doing this sort of work or would your organisations be the most obvious organisations to do that work if a government was inclined to ask the question?

Dr Jaques—I think that is a policy question.

CHAIR—No, I am not asking you a policy question; I am asking you a question of capability.

Dr Jaques—The resource issue—are there enough resources?—I think I have answered. Certainly that is a geoscience issue. The development of a nuclear industry or otherwise is firstly a policy issue and then a technology issue. I do not think my organisation would be well placed to provide any advice on the technology requirements.

CHAIR—I am honestly and truly not meaning to ask you a policy question. Let me rephrase it. It is really not my intention to ask you a policy question. If a government wanted to know from expert organisations across the Public Service how much uranium and thorium resource there is out there to supply domestic or industrial nuclear energy, where would that government go in the federal Public Service?

Dr Sheales—Senator, maybe a little simplistically, but I think we have the answer in front of us with the slide here. You can see there is a huge production, which is for export under current policy. It would merely be a matter of diverting some of what is projected to be exported to domestic use, but it is a hypothetical question, as we all acknowledge at this point.

CHAIR—Yes, sure.

Senator McEWEN—You will just have to wait until you are in government, Senator Cormann, and you can be the minister for nuclear energy.

CHAIR—Hopefully sooner rather than later.

Senator McEWEN—Hopefully not. Thank you for your excellent reports. In your assessments of what portion of the energy mix for Australia each of the renewable and non-renewable energy sources will take leading up to 2030, do you take into account the extent of government support for exploration and development of renewable technologies? You were talking about assumptions about costs et cetera. Do your projections take into account the level of government support?

Ms Melanie—One of the main drivers of what happens to renewable energy is the Renewable Energy Target Scheme. That is a new major policy that has major implications for renewable energy so, yes, we have taken that into account.

Senator McEWEN—You mentioned other government programs such as the Solar Flagships Program and the CCS Flagships Program.

Ms Melanie—That is right.

Senator McEWEN—If those programs did not have government support, presumably they would not exist; is that correct?

Dr Jaques—Certainly the government programs are hoping to accelerate the development of these technologies. Some of these technologies have been under research for several years; some of them are quite new. But certainly geothermal is a new industry in Australia and that has come along very quickly, and certainly the support the government has provided there has obviously been important. Similarly, carbon capture and storage is an emerging technology globally. It is a difficult problem, and the government support there I am sure is going to be very important. Similarly with the Solar Flagships Program, solar thermal power is an important challenge, and I think the government programs there will again be important in moving towards enhancing our capacity to use those energy sources in the future.

Senator McEWEN—So presumably if there were a government in the future that did not support those technologies by providing funding, in particular, for research then those technologies might not continue to fly or might not come to maturity?

Dr Jaques—I think that is difficult to say. It is important that industry and government fund the R&D. Indeed, at this point the development of much of the geothermal industry will require investment capital to be established. I think that is a point that each industry gets to, where it moves from the RD&D stage to the commercialisation stage. That is when private capital becomes important. It is difficult to say what impact—other than the fact that obviously both industry and government support for RD&D is important.

Senator McEWEN—Did your projections in your report about the development of the different types of energy resources take account of current government regulatory, taxation and legislative regimes as well?

Ms Melanie—What we have taken into account are the major government policies that are already out there and some of the state level policies that have direct implications for energy markets. That will cover the bulk of what we have looked at.

Senator McEWEN—But you have not made any recommendations that the committee could look at for future incentives, legislative changes or regulatory changes—

Ms Melanie—No.

Senator McEWEN—that could encourage different kinds of developments? Okay. I just want to ask a question about wind. During this inquiry, energy from wind has got a bad rap from some people, who are saying that it is no good as baseload and that it has other issues, including being visually polluting or noisy or whatever, but I notice from your report that you anticipate that energy from wind will increase over time. Does that therefore suggest that perhaps some of those

issues that we have heard earlier in this inquiry about wind are not as significant as people claim?

Dr Jaques—I think locally the placement of wind farms may be an issue in certain locations. That is a local issue. The issue of managing an intermittent wind energy source within a transmission framework is a challenge as the level of wind penetration increases but, at the levels we are talking about here, studies indicate that it can be managed. There is important research going into wind forecasting so that the programming of wind use in dispatch can be better done. There is also important research going into storage.

Increasingly what we are seeing, though, is that wind generation is being backed by expansion of gas, which is a fast peaking source of power, and we are seeing matching growth of gas and wind. So I suspect that gas is being used increasingly to back the wind at times when it is not available. Of course, a greater dispersion geographically of wind farms creates more stability because you have greater averaging of wind availability. So I think, overall, we can say that wind is projected to increase in Australia significantly, as it has globally. It is a mature technology. The development of the wind turbines continues to improve their performance and power output, but much of that has already taken place so it is a relatively mature technology which is able to fulfil the need in the immediate outlook.

Senator McEWEN—You mentioned there an issue of storage, and that is something that this committee has dealt with in terms of security of supply, whatever form of energy it is—storage and where it is located and backup supplies in case of emergencies and stuff like that. What are the major issues that we are facing in Australia in regard to that? We know, for example, we are very reliant on oil for transport and fuel, and there are issues now around location of oil as to whether it is accessible et cetera. But is that issue of storage and security of storage an issue for the other forms of energy that we are talking about as well, and what do we need to do?

Dr Sheales—Are you talking about solar or that sort of thing?

Senator McEWEN—We mentioned wind; can you actually store the energy from wind power? Is that something we need to deal with?

Dr Jaques—There is research going on to support storage systems—superbatteries and things. The CSIRO, in fact, has programs in that. I am not fully across the details of what is being done in terms of storage development, but I know it is an important research priority for them—and of course there are others researching that as well—which would also apply to solar and to wind and, potentially, to other intermittent electricity-generating technologies. There is also tandem use—for example, pumped hydro is being proposed as a backup to wind where water is pumped locally up to a holding pond and then released when the wind energy or solar is not available. That is being developed and trialled locally, and in places overseas. In terms of other storage, storage of the non-renewables has not been seen to be a problem in that the transport systems are in place to distribute gas particularly. I am not sure that I can comment any further on that.

Senator McEWEN—What about in terms of, for example, gas extraction in Central Australia that has to be either converted to liquid for transport or transported by pipeline to centres of

population? There is always a complaint that we are not investing enough in infrastructure to deliver the fuel or the power from the source to the centres of population where it needs to go.

Dr Sheales—That is certainly one of the challenges with some of the renewables such as thermal. If you recall the graphic that you saw on thermal resources, some of them were located in very isolated areas. The issue there is that you could generate electricity on site but then you have got to have a grid to get it to places. That is certainly an issue. I would have thought that gas, though, which you mentioned, is fairly well covered. Of course there is continuing investment in the distribution of major pipelines. The importance of gas, as I think Dr Jaques referred to earlier, is that it can provide the baseload backup to solar, wind and some of the other renewables that are not there 24 hours a day. You do need some baseload backup, and gas is one of the lower emitting sources of energy that can be used in that context. My colleagues might correct me here, but I think that, given that we are just working with current policies on renewables and also on the five per cent emissions reduction, one of the reasons that we see the big increase in the percentage of electricity coming from gas is that it is lower emitting than the current sources of fuel.

Dr Jaques—Infrastructure will be a problem in some areas for remote resources—remote solar, remote tidal, remote wind, remote geothermal. But there is no doubt that it has been recognised that the already long transmission grid will need to be further augmented, and there are considerations of more nodes, and distributing generating centres around these nodes, in the future. In the early stages of commercialisation of remote energy projects, proximity to grid is an important consideration, so I think that is going to be a factor. But one would expect that the existing transmission infrastructure will be expanded in time and there will be nodes and hubs developed which integrate better some of the renewable energy resources than is presently possible.

Senator McEWEN—Finally, in terms of the inputs into your report I think you said that the cost of all energy would go up over time. My memory is that Dr Jaques said that there might be a differential in the cost increase for the different types of energy but that over time the cost will go up. Is that right?

Dr Jaques—I think that comment was made by ABARE in the context of the inputs to the projections. Perhaps they could clarify that.

Ms Melanie—Yes, these are assumptions in our modelling.

Dr Sheales—That is one of the things that will also help drive efficiency gains, because clearly there is an added financial incentive for people to think about efficiencies in terms of their consumption and use of energy.

Senator McEWEN—That is right. But energy, like every other cost input in life, will go up in cost over time, I suppose.

Dr Sheales—You would have to expect that, but also we make the point in the report that the energy intensity of much of manufacturing, for example, and other industries is declining through time in Australia. Again, that is for a range of reasons, many of which we have discussed already today.

Senator McEWEN—Yes, but the way to save money on energy is to not use as much.

Dr Sheales—I suppose that is right.

CHAIR—Thank you very much for your contribution today.

Proceedings suspended from 3.49 pm to 4.07 pm

BARRON, Ms Christine, General Manager, Indirect Tax Division, Revenue Group, Department of the Treasury

CONSTABLE, Ms Tania, Acting Head, Resources Division, Department of Resources, Energy and Tourism

JOHNSON, Mr Paul, General Manager, Industrial Energy Efficiency Branch, Department of Resources, Energy and Tourism

KESBY, Mr Paul, Acting Assistant Secretary, Environment Standards Branch, Department of the Environment, Water, Heritage and the Arts

McDONALD, Mr Jason, Principal Advisor, Tax System Division, Department of the Treasury

MORLING, Mr Brendan John, Head, Energy and Environment Division, Department of Resources, Energy and Tourism

NIVEN, Mr Richard Hugh, Manager, Transport Fuels, Department of Resources, Energy and Tourism

RAETHER, Mr Robert, Assistant Secretary, Renewables and Reporting Branch, Strategies and Coordination Division, Department of Climate Change and Energy Efficiency

STORY, Mr Oliver, Manager, Demand Side Management Policy, Department of Resources, Energy and Tourism

WILEY-SMITH, Ms Mary, Assistant Secretary, Community and Industry Partnership Branch, Renewables Energy Efficiency Division, Department of Climate Change and Energy Efficiency

CHAIR—I welcome officials from the Department of Climate Change and Energy Efficiency, the Department of the Environment, Water, Heritage and the Arts, the Department of Resources, Energy and Tourism, and the Department of the Treasury. I remind senators that the Senate has resolved that an officer of a department of the Commonwealth or of a state shall not be asked to give opinions on matters of policy and shall be given reasonable opportunity to refer questions asked of them to superior officers or to a minister. This resolution prohibits only the asking of questions for opinions on matters of policy and does not preclude questions asking for explanations of policies or factual questions about when and how policies were adopted.

Officers of the department are also reminded that any claim that it would be contrary to the public interest to answer a question must be made by a minister and should be accompanied by a statement setting out the basis for the claim. I particularly draw the attention of officers to an order of the Senate of 13 May 2009 specifying the process by which a claim of public interest immunity should be raised.

Thank you all for attending. The committee is very grateful that you have made yourselves available together. We have had occasions in the past where questions have needed to be directed to one or other department. It is going to be useful for us to have you all here at the same time. We are conscious that over the last two years this is the third time many of you have appeared. We do appreciate that. There are only two senators here today, so I doubt we will be using the whole time allocated, till 6.30 pm.

I understand that there might still be some issues around bedding down some of the machinery of government changes in terms of responsibilities for what and who is going to be best equipped to answer certain questions. It might well be that, before we finalise our report by the end of June this year, we ask some of you to appear one more time. We would be very grateful for your cooperation in that regard.

I invite each department to make a brief opening statement if you so wish. There being no brief opening statements, I will kick off. You would recall that on previous occasions we have had discussion around the energy white paper process. I am sure you, Ms Constable, are expecting me to ask where the energy white paper process is at.

Ms Constable—As the minister has stated recently, the energy white paper has been delayed until at least the second half of 2010. That delay is a result of not having the climate change policies finalised and the taxation review not being put forward at this stage.

CHAIR—When the timetable for the energy white paper was first set out I do not recall that there was any reference to either the final passage of the CPRS legislation or the Henry review of taxation. At what time did the government come to the view that they would not be able to process the energy white paper until such time as either the Henry review had reported or the CPRS legislation was finally dealt with?

Ms Constable—We looked at these considerations the whole way along. In the consultations that we had on the energy white paper, along the way we made it very clear that there were caveats on the resolution of various policies, including both the taxation review and the climate change policies.

CHAIR—I am just trying to understand what the sequence here is. Does that mean tax policy is going to be driving energy policy rather than our focus on energy security driving and influencing the wider taxation framework moving forward? It is really a question as to what should be coming first, isn't it?

Ms Constable—There are a whole range of issues that need to be taken into account with any of these policies. Energy security impacts on climate change; climate change taxation impacts certainly on energy policy. To complete the long-term energy policy without including those strategic policies would not be in the interests of the Australian community because they are so important to our long-term considerations.

CHAIR—Sure, but the parliament has rejected the CPRS legislation twice now. The government administers legislation which is passed by parliament. Have you as a department been given any indication as to when you are going to focus on the strategic energy security considerations moving forward in the absence of the Carbon Pollution Reduction Scheme?

Ms Constable—The CPRS is a matter for government to consider. The strategic position on energy policy within the department is always under consideration. There are a whole range of issues that the department is undertaking at the moment that relate to short-, medium- and long-term policies. To bring those together in an integrated way was the task of the energy white paper, and that has been delayed. There is no indication at this stage that there will not be a long-term energy policy. As I said, it has been delayed until we see the resolution of climate change and taxation review issues at this stage. Then we will consider the long-term energy policy position.

CHAIR—I am not meaning to dwell on this inappropriately, however, from the committee's point of view, clearly, when we set out on this process we were led to believe that there would be a green paper in August 2009—that is nearly a year ago now. That is now not happening and this obviously has an impact on our considerations. I would still question whether the needs from an energy policy point of view should be influencing relevant aspects of taxation considerations rather than the other way around, but I understand that is a policy issue and it is not an issue that you might want to comment on. Is any work being done now on the basis of no CPRS on our long-term forward look in terms of energy security, energy policy moving forward?

Ms Constable—We have considered a whole range of issues, Senator, and where we might go with low-emissions technologies down the track—and my colleague Brendan Morling might want to comment on that. There is work that has been undertaken, that you have already considered in the last hour, and that is the Australian *Energy resource assessment*. That has been conducted under the auspices of the energy white paper and by the department and is a very successful document, stage 1 of understanding what our resources are in the long term.

We have other studies underway that the department has commissioned in relation to low-emissions technologies, which is the responsibility of the department. That work is near completion. We also have some work in relation to long-term investments relating to our energy needs, and that work will be finalised by the end of 2010.

CHAIR—I do agree with you that the assessment we discussed over the last hour is a very important piece of work. But going back to the reasons why it the energy white paper is delayed and the linkage to the taxation review: which parts of the taxation review are relevant to the release, and the timing of the release, of the energy green paper and energy white paper? Is somebody going to be able to answer that for me?

Mr McDonald—I cannot really comment on what is relevant for the energy white paper because it is not within their remit. But the consultation paper which was released talks about the kinds of things that the Henry review would be interested in, and it is particularly roads and transport fuels and the taxation of those and how they can be made potentially more efficient. That would be one area which potentially the white paper might be interested in with respect to the Henry review and the government's potential response.

CHAIR—So the reason we are delaying the energy white paper is because the Henry review might deal with the treatment of road and transport fuels, is it?

Ms Constable—There is a whole range of issues that affect resources and energy—

CHAIR—I am trying to understand which ones they are.

Ms Constable—that are being considered. My colleague has just mentioned road and transport. There is a range of issues on resources that may be subject to taxation measures, and there are other energy areas relating to alternative fuels and excise arrangements. I am not familiar with what is in the taxation review at this stage. The department has certainly had input into the taxation review process. There was extensive consultation by the taxation review secretariat and I certainly had a number of discussions between the energy white paper secretariat and the taxation review secretariat. It was very clear that we needed to understand exactly what was going to be in the taxation review before we finalised our own process. But we have had input through the department, through our own taxation area, into the taxation review.

CHAIR—So, Ms Constable, if you are driving the energy white paper process within government, wouldn't you want the taxation review process to be very conscious of what your policy needs are from a taxation regulatory framework point of view rather than the other way around? Isn't the tail wagging the dog here?

Ms Constable—I think you misunderstood me, Senator.

CHAIR—Perhaps.

Ms Constable—I thought I just made it clear that there was extensive consultation between the two departments.

CHAIR—I am thinking about sequence here.

Ms Constable—The department did provide input into the taxation review at various times.

CHAIR—They just did not do that on the basis of a considered green paper or white paper concluded process. Wouldn't it have been preferable to have had the white paper finalised before the Henry review of taxation is finalised, so that they can have the full benefit of all of the pearls of wisdom that come out of the energy white paper process, to ensure that they get it absolutely right from an energy security policy point of view moving forward?

Ms Constable—I think these arguments are circular because all of these policies impact on one another.

CHAIR—Sure. One of the other things that we discussed last time, which I thought we are not able to get to the bottom of, was the whole issue of energy efficiency and energy efficiency targets. As I understood it then, there were different departments that were responsible for different aspects. Some were responsible for energy efficiency across industrial and business, others were responsible for energy initiatives around residential. There did not seem to be a clearly identifiable energy efficiency target across government that was driving policy development, because the view was that things would be driven by the CPRS once the CPRS was in place as the main policy vehicle. Can each department in turn, to the extent that you are responsible, give us an update as to where things are at energy efficiency-wise in terms of targets, initiatives and things that are likely to happen over the next little while?

Ms Wiley-Smith—The Department of Climate Change and Energy Efficiency, as you are aware, has recently gone through a MOG change. We have gained the programs to do with energy efficiency and also the renewable energy programs that were previously run by the Department of Environment, Water, Heritage and the Arts. That means that for this portfolio we have carriage of energy efficiency policy and energy efficiency programs that relate to households and also commercial energy efficiency. But my colleagues in the Department of Resources, Energy and Tourism also retain responsibility for industrial energy efficiency.

CHAIR—I want to make sure I have got it clear. Have you got responsibility for policy across the board and programs for household and commercial, and the Department of Resources, Energy and Tourism has responsibility for industrial? Have I got that right in terms of programs? You are responsible for policy across the board, is that right?

Ms Wiley-Smith—Yes, we are, but in consultation with our colleagues in a whole-of-government approach. So we would work very closely with our colleagues in the Department of Resources, Energy and Tourism.

CHAIR—But you do that in consultation with your colleagues who have got program implementation responsibility rather than policy responsibility, is that right? Who is ultimately responsible? If I wanted to go to a one-stop shop of policy responsibility for energy efficiency, where would I go? Would I go to you or would I have to go to different people?

Ms Wiley-Smith—You would go to the Department of Climate Change and Energy Efficiency.

CHAIR—Thank you. That is what I thought.

Mr Johnson—Under the administrative arrangements orders, our minister has responsibility for industrial energy efficiency.

CHAIR—Does he have responsibility for policy, for programs or for both?

Mr Johnson—He has responsibility for policy only in so far as it relates to industrial energy efficiency.

CHAIR—So there is not one single minister who is responsible for energy efficiency overall? I am not meaning to be difficult; I am just trying to be really clear.

Ms Wiley-Smith—As we have just described, we would work together. If a coordination exercise were to occur, then we would certainly take the lead because we have quite significant responsibility in the commercial as well as the household and the government's response to energy efficiency. But in terms of the industrial part, as my colleague has just described, there is a relationship there and there are two ministers involved.

CHAIR—Yes. But, looking as a whole at the potential of energy efficiency to reduce the growth in energy use and emissions moving forward and understanding there are household, commercial and industrial aspects to it, is there an overall energy efficiency target?

Ms Wiley-Smith—There is not an overall energy efficiency target. However, I would like to draw your attention to the Prime Minister's energy efficiency task force and the press release that was released last week, on 30 March, which talks about how we can work together and drive change to deliver major improvements in Australia's energy efficiency. That work is currently being undertaken and we have members from various departments involved, including the Department of Resources, Energy and Tourism and of course our department.

CHAIR—So there is a process underway. I think that is great. And there are two ministers who have got responsibility for different bits. That is great. But there is no overall target at this stage. Have we quantified how much can be saved overall through energy efficiency measures in terms of reducing the growth of energy use moving forward? Have we quantified by how much we can reduce emissions as a result of energy efficiencies across the board moving forward? Is that a piece of work that has been done?

Ms Wiley-Smith—I would have to take that on notice because that would need to be referred to an area that actually deals with abatement and emissions within our portfolio, and they are not here at the moment.

CHAIR—I am not meaning to be difficult, but it is a question that we have been asking for some time. I would be very grateful if we could get some information in relation to that.

Mr Morling—Just to follow up on that, we did provide some information about our industrial energy efficiency program in response to your questions last time.

CHAIR—You did, yes.

Mr Morling—That covers the 200 largest energy users, so that does give you some quantification of the types of savings that are possible.

CHAIR—Yes. Do you have any questions on energy efficiency, Senator McEwen?

Senator McEWEN—No. I am fine.

CHAIR—I look forward to some of that information moving forward once all of the different responsibilities settle down. I am moving through a whole series of issues in no particular order. Next is smart grids and smart meters. There is an argument that there is a lot of opportunity through smart grids and smart meters to enhance energy efficiency. There was a smart grid conference here in recent days. The feedback that I have been getting out of it suggests that Australia is not doing very well compared to the US and Europe. I am interested to get a bit of a perspective from you, as experts, but also to get a bit of an understanding as to where things are at in terms of the work that we are doing in Australia on smart grids and smart meters. Who is the best person to tell me about that?

Ms Wiley-Smith—I might start. We have responsibility for the Smart Grid, Smart City program, but I would refer the issues around smart meters to my colleagues from renewables, energy and tourism at the end of the table. In terms of our program, which was the National Energy Efficiency Initiative, through the last budget the last government announced that $100 million would be provided subject to a pre-deployment study. The pre-deployment study has

been undertaken. Through that process, we had extensive consultation and we had some assistance from McKinsey and Company. We also had CSIRO assisting us through the process of developing the smart grid grant guidelines. Again, we went through another series of consultations in the development of the guidelines. Going back to the pre-deployment study, the pre-deployment study found that there was a business case for the government to invest in a smart grid deployment. We have moved forward from that process to go through a grant guideline and open process. At the moment we are just finalising our assessment process of bids to run a smart grid project in Australia. At this stage, the government has announced its intention to announce the successful bidder at the end of this month, so in April.

CHAIR—Do you agree with the statements that have been made in recent days by overseas experts that Australia is 20 to 30 years behind, or is that an exaggeration? Where do we sit compared to the US and Europe in the stage of development?

Ms Wiley-Smith—Certainly, through the stakeholder engagement that we had in the development process for the pre-deployment study, it was said that basically through this project and through the deployment we would be leading the way, because it would be the first time that we are actually developing in Australia a commercial-scale smart grid to inform a wider business case.

CHAIR—We would be leading the way internationally?

Ms Wiley-Smith—Certainly, some of our international colleagues said that this would be of interest to the world, and they would be looking to see how we actually deploy this particular trial in Australia, what type of success we have and also what challenges we deal with.

CHAIR—We visited the Country Energy facility out at Queanbeyan which has been talked about in recent times. It appeared to us that there seemed to be different bits happening in different states; there seemed to be different levels of engagement at different state levels. How does your $100 million initiative and your process overlap with what might be happening in different state and territory jurisdictions, given that of course there are a whole range of different players and stakeholders involved? Is there some coordination somewhere along the way—how will all of that work out?

Ms Wiley-Smith—Yes, there is coordination and stakeholder engagement throughout the process. We have certainly liaised and been involved with our stakeholders that are engaged in some of the other trials that are happening in Australia. The intention here is actually to demonstrate a fully commercial scale smart grid. To make sure that the lessons learnt from this particular trial are picked up by companies right across Australia, we have a regulatory working group which is planned and also a standard working group. There is also significant stakeholder engagement in terms of community engagement as well as with other distributors. So a distributor that wins the bid for Smart Grid, Smart City and is actually deploying it will also be working with their colleagues to ensure that they are sharing the lessons that they have learnt and will also be feeding into existing processes that are already underway through COAG processes, such as those happening through the Ministerial Council on Energy.

CHAIR—You talked about a regulatory working group; what are some of the regulatory and policy issues that you envisage will have to be resolved to make sure that smart grids can be a success moving forward?

Ms Wiley-Smith—In the discussions we had, through the pre-deployment study in particular, we went through a number of barriers that were real or perceived, and the stakeholders were actually identifying those. So, within the energy sector itself, companies were actually identifying what they perceived the barriers to be. But what we are doing through this trial is testing that and watching to see whether there really are any regulatory barriers and then work through how we deal with that and provide advice into the right processes, such as the MCE.

CHAIR—I am a senator representing the great state of Western Australia, and Western Australia is not part of the national electricity market. Can you just talk us through how, at a national level, you will be able to ensure that there is a truly national perspective on all of this?

Ms Wiley-Smith—Yes, Senator. Western Australian companies—say, Western Power—have certainly been involved right through the consultations, and they will continue to be involved because at the moment they are actually rolling out our Solar Cities program in Perth, and there is a small element to that which will actually include a smart grid. So they will be feeding their learnings back to us and also engaging with the winning bidder.

CHAIR—When you say there will be a smart grid in WA, where is that? How is that going to work? Is it a small trial exercise somewhere or is it a particular suburb?

Ms Wiley-Smith—I would have to take the detail on that on notice, but it is certainly part of the Solar Cities project that we have there.

CHAIR—Okay. Now, smart meters—somebody else was responsible for that? Is that right?

Mr Morling—Yes.

CHAIR—So where are we at with all of that?

Mr Morling—Just as a bit of a background, the Ministerial Council on Energy considered the cost-benefit analysis in 2008 and agreed to pilots and trials in most jurisdictions and to consider the results of those pilots and trials in mid-2012. To assist with the development of the program, the MCE established the National Stakeholder Steering Committee for Smart Meters, which comprised representatives of both electricity distributors and retailers plus one consumer representative, to develop the operational aspects of the SmartMeter program. MCE itself has also agreed that distributors would have the mandate to roll out the smart meters, and at this stage the work of the National Stakeholder Steering Committee continues in developing those technical and operational aspects.

CHAIR—So there is a proposition that in a particular time frame smart meters will be mandated in each state. Is that the way it is supposed to work?

Mr Morling—The commitment is to roll out smart meters where the benefits exceed the costs. We have had the initial cost-benefit analysis that showed that was pretty much the case in

most jurisdictions, but the idea of having pilots and trials is to firm up the estimates behind the cost-benefit analysis and where it is proven that the benefits exceed the costs, as we would expect, then those jurisdictions have agreed to roll out smart meters.

CHAIR—So it is going to be up to the states and territories to roll it out. What is the involvement of the Commonwealth in all this?

Mr Morling—It is an agreement under the Council of Australia Governments to roll out smart meters where the benefits exceed the costs.

CHAIR—So you are saying that we have got this ministerial council—and the Commonwealth is one of eight—and they have all collectively agreed, but it is going to be up to the states to drive it. Is that a fair representation?

Mr Morling—I think that, broadly, it will be up to the states to run the pilots and trials and to report back the information to the Ministerial Council on Energy, and where the benefits exceed the costs they are obligated to roll out the smart meters.

CHAIR—I got that point. But when the benefits exceed the costs will the Commonwealth have an involvement in rolling out smart meters or is it going to be up to—

Mr Morling—No, it will be up to the electricity distribution companies to roll out the smart meters and the jurisdictional minister will have the power to mandate a rollout in each jurisdiction.

CHAIR—So there will be an expectation, but, presumably, there will be a cost involved in all of this.

Mr Morling—Sure, there are costs involved, but there are also significant benefits involved, and the cost-benefit analysis did show that those benefits were significant and on a nationwide basis did significantly exceed the costs.

CHAIR—So when you say that the cost-benefit analysis shows that the benefits exceed the costs, and we think that pretty well is the case in every jurisdiction—and I think that is what you said. More work still being done though—is that work to prioritise who is going to go first?

Mr Morling—No, at the point in time when the cost-benefit analysis was done, a lot of it was based on estimation because there were not a lot of trials underway. Since that time a number of distribution companies have either commenced, or plan to commence, those trials on a larger scale and, as they do those trials, then we will get more information in that will allow us to provide more firm estimates as to exactly the benefits and costs.

CHAIR—Is there a single document, a national overview, of where every state is in the stage of assessments of cost benefits and implementing smart meters? Is there one national document that captures all of that information?

Mr Morling—I will ask Mr Story to answer that.

Mr Story—The cost-benefit analysis for ministers was the theoretical review of the evidence available at the time effectively based on trials up to around 2006. We have set in place a process to monitor and assess what pilots are required and to report back on progress in those pilots, and that is through the National Stakeholder Steering Committee for Smart Meters that Brendan mentioned earlier. They produced their first report on the status of pilots and trials at the end of last year and they are planning their further one on what future trials will be required to deliver evidence before MCE's decision date in 2012. The MCE's June 2008 decision was that they wanted to come back in 2012 to review the evidence on cost benefits based on their pilots and trials—

CHAIR—So at this stage, from what you are saying, there is actually not a single jurisdiction that has pressed the button and said, 'We're definitely going to go down that way.' Everybody is still at the stage of saying: 'Yes, we think the benefits outweigh the costs, but let's assess that some more.' Essentially, everybody is still in an assessment process until at least 2012. Is that a fair way of putting it?

Mr Story—No, I do not think that is right. Victoria has made its own commitment to proceed with the rollout. The assessment that was done for the MCE illustrated a net benefit across the country, but it also illustrated differences in net benefits in different places.

CHAIR—Where are the net benefits greatest and can you tell us why?

Mr Story—There are quite a range of reasons in terms of that analysis, starting from things like what the existing practices are in meter reading. For example, in the ACT we have a multi-utility company that is responsible for electricity, gas and water. It has gained some cost synergies by managing its meter reading jointly across those different utilities, therefore just reducing meter-reading costs in electricity might not provide the same operational benefit as it might in another place. That is one example.

The estimated net benefits of the rollout come from quite a large range of different services across routine meter reading, special meter reading and connect/disconnect when people move in and out of a house, managing outages, identifying where outages are and improving some of the reliability benefits and, of course, providing information to householders on their energy use to help them manage it. That is just a selection of some of the benefits.

CHAIR—Okay, but these would all be things that would be pretty similar across all jurisdictions. You have given us a very specific ACT issue around the structure of the services supplier. Beyond that, are there any particular differences between different states and, if so, which ones are they and why?

Mr Story—I am sorry for my lengthy answer. The point I was trying to get to is that, given that there is such a large range of things you are using it for, the variation in benefits really depends on the particular practice in a particular state or by a particular distribution business for each of those practices. So there are other examples on other types of services. For example, in South Australia they do not actually turn off the power when you move out of a house, they leave the power running, so the net benefits of automating the connection and disconnection of houses are different in South Australia than they are in other places. There are different net

benefits in different places for each of these different services. I could not point to a single thing that drives the differences in benefits across different places.

The other thing that it is important to come back to is that one of the purposes of the pilots and trials is to try and understand how to get the most out of that type of investment, given that it is quite a complex investment. In order to understand how to get the most out of it, some evidence from pilots and trials would be useful.

CHAIR—Okay.

Senator McEWEN—Does whether or not a state has a feed-in tariff scheme of some sort have an impact on how a smart meter is used or the benefits that it can deliver?

Mr Story—It has a very marginal effect. We did look at what support the smart meter rollout could provide to the connection of embedded generators—generators within the distribution grid—which includes solar panels. One of the costs that someone connecting a solar panel has is that they have to get metering installed to support their generation, to measure the flow back into the grid. We looked at: if you were replacing all of the meters, can you put in meters that would support that without needing to get the new meter put in at the time? The answer was: it would be worth doing that from a cost-benefit perspective for a net metering scenario, which is where you are just measuring the flow across the grid rather than the total generation. It would not be worth installing metering in every single house across the whole state that supported gross generation, which is what some of the feed-in tariff designs are.

That does not mean that you would not have smart meters available for people to install when required if it was required to support that arrangement. The metering will support whatever type of tariff is required. In terms of the benefit of the smart meter rollout for the connection of generators, it was a fairly small proportion of the overall total, just because there is a relatively small number of connected generators. So, while we are still down around a few per cent, it does not really affect the overall business case.

Senator McEWEN—No, but if the technology is there, the potential is there for it to enable the domestic consumer to see whatever tariff rebate or reduction they are getting.

Mr Story—Yes, the technology can support it. The technology should follow the service that you want really.

Senator McEWEN—Thank you. Throughout this inquiry we have heard a number of people say that implementation of the Smart Grid will be assisted by the rollout of the National Broadband Network. Has there been any work done on the correlation between the Smart Grid and the NBN?

Ms Wiley-Smith—One of the objectives of this trial is to investigate the synergies between a Smart Grid and the rollout of the NBN. All of the bids were asked to look at that. It is certainly our intention that through this trial we will be investigating those synergies.

Senator McEWEN—Good. Thank you.

CHAIR—So you have not got a view yet? You are waiting?

Ms Wiley-Smith—We are waiting for the information and the rollout.

CHAIR—Just going back to the smart meters, is it possible for you to, perhaps on notice, give us a snapshot as to where every state is at or do we have to go to every state and ask for that information ourselves? Is it something that you collate and could provide us with without much difficulty?

Mr Morling—We are happy to provide any of the documents from the national stakeholder steering committee that are publicly available. The one mentioned by Mr Story on the summary of pilots and trials is available, so we will provide that to the secretariat.

CHAIR—Thank you. I am not asking you to release any state secrets, so that is all good. When we were out in Queanbeyan there was an electric vehicle as well. Is the department doing any work in this area? A witness presented the vision of having electric cars everywhere and being able to plug in your car at night. Are you doing any work in this area at all?

Ms Wiley-Smith—Yes, we are in terms of the Smart Grid Smart City trial. We are looking at the impact on the grid and how electric vehicles could actually be used in a Smart Grid, including storage. That is part of it.

CHAIR—So at this stage it is exploratory in terms of looking at the potential?

Ms Wiley-Smith—Correct.

CHAIR—Just sharing it around to make sure that our friends from Treasury are not getting bored, I will go from cars to transport fuels, which I think is a good link. Is there anything you can share with the committee around the current approach to fuel and energy taxation and how it impacts Australia's fuel and energy security? Given that we are waiting to finalise the energy white paper until the tax review is finalised, I wonder if there is anything you can share with us in terms of the synergies and the impacts from one to the other.

Ms Barron—I do not think there is anything we can share prior to the tax review being released.

CHAIR—We are playing that game again, are we?

Ms Barron—I am sorry, but—

CHAIR—I am not meaning to be difficult, but last time it was either, 'I'm not responsible,' or, 'It's in the Henry review.' We have been hearing it for a long time now.

Ms Barron—I understand that. Hopefully, you can understand that, having undertaken the review, the government would not be making any decisions about something that was covered by the review, absent its full consideration.

CHAIR—Will you be able to share with us when the Henry review is going to be released?

Ms Barron—No, I would not be able to share that with you.

CHAIR—That was a rhetorical question. I thought I would give it a try. I am not asking you to get yourself in trouble by revealing state secrets, but I would have thought it was reasonable for me to ask what sorts of assessments Treasury has done of the impact that taxation has on our fuel and energy security moving forward. I am sure you can do better than say we have to wait until the Henry review has come out.

Ms Barron—I am not sure that I can say better than that. What I can say is that the fuel tax regime that we have in place now was based on the outcomes of the 2004 energy white paper. It certainly had energy security as one of the factors that drove its consideration.

CHAIR—I am very interested to hear you say that. So in 2004 the energy white paper drove tax changes whereas what we are saying now is that tax changes are going to drive energy policy.

Ms Barron—I do not want to put words in my colleague's mouth, but I think what she was saying was that the two things needed to be considered together ultimately.

CHAIR—Ms Constable and I have been having this conversation for a long period of time. I think the point is well made.

I want to go through some specific issues. The committee has received evidence that the commencement of net taxes on biofuels in 2011 would slow the development of biofuels, particularly second generation biofuels, and that the commencement of the tax should be delayed. I understand that this is a policy question and you will say it is something you cannot comment on. I am not asking you to make a policy choice or to say how you think it should be approached; I am asking you to explain your perspective on that evidence that we have received.

Ms Barron—On the evidence that the change that is due to take effect on 1 July 2011 should be postponed?

CHAIR—Not so much that it should be postponed, but that it will slow the development of biofuels, particularly second generation biofuels. Do you agree with that proposition or do you believe that people who are making that point have got it wrong and, if so, for what reasons?

Ms Barron—The policy towards fuel has been known since 2004, so the industry has had before it for a number of years now what its future tax environment might look like.

CHAIR—Except that for the last 2½ years they have sort of been in limbo a bit because there may or may not be some changes as a result of the Henry review, which we may or may not see in the near future.

Ms Constable—Can I add something there on what the government has done on second generation biofuels?

CHAIR—Please.

Ms Constable—You will recall an announcement was made by the government in 2009 which identified seven successful projects in relation to second generation biofuels. Those projects were the University of Melbourne to examine algae to biofuels, the Algal Fuels Consortium to develop a pilot-scale biorefinery for sustainable algal biofuels, the Curtin University of Technology to examine the production of biofuels from Mallee biomass, BSES Ltd to examine biofuels from sugarcane biomass, Monash University to develop a pyrolysis biorefinery, Microbiogen Pty Ltd to examine the production of ethanol from bagasse using patented yeast strains and Licella Pty Ltd to examine the commercial demonstration of lignocellulosics to biocrude. So in total we have a program of up to $15 million for second generation biofuels.

CHAIR—So you are saying that the government is spending money on encouraging people to do certain things in relation to second-generation biofuels rather than having the beneficial tax treatment or the tax incentive arrangements? Is that what you are saying?

Ms Constable—No. What I am saying is that it is a complementary program to anything that might be considered within the taxation review and that the government is considering a whole range of measures. This one is certainly an area that will make a difference to research and development on making second-generation biofuels successful in the future.

CHAIR—Still with Treasury, can you talk us through the tax policy options that are available to government to enhance Australia's fuel energy security? I am not asking for your recommendations to government; I am asking you for an outline of options that are available to government.

Ms Barron—I think I might need a little more information about the question.

CHAIR—We have discussed in some detail the linkages between the taxation review and the energy white paper and how one impacts on the other and which one should come first. What I am trying to get a sense of is what are some of the tax policy options that could have an impact on fuel and energy security one way or another that may be before government. I am not looking for your recommendations; I am looking at some of the options available to government.

Ms Barron—Do you mean in a theoretical sense?

CHAIR—In a very practical sense.

Mr McDonald—In one sense, that is asking what could be in the Henry review because, obviously, what is in the Henry review is some of the options available to government.

CHAIR—As I am saying, we are going around in circles. You may have to come back after the Henry review has reported. I understand that will be at the time of the budget; it is a matter of public record. I see you nod. If you do not mind, before we finalise our report we may have another conversation about these things.

Ms Barron—I think that would be more fruitful.

Mr Niven—I am from Transport Fuels, the Department of Resources, Energy and Tourism—

CHAIR—Tell Treasury what you want!

Mr Niven—What I can say is that it is not just about excise policy. There are issues of the availability of the fuels and also issues of consumer choice. As an example, LPG is currently cheaper. It is excise free but, as a result of that and the general cost structure, it is a cheaper fuel. However, the uptake by the general community does not match the cheaper nature of that fuel because of a range of issues associated with the infrastructure availability, consumer choice and consumer impressions which, in turn, feed into the availability of vehicles. So if people were making a decision on choice alone there would be a far greater uptake of liquefied petroleum gas cars, but there isn't. So there are factors beyond the tax system that influence choice in these matters.

CHAIR—Sure. Thank you. That is very useful, but I am not giving up on Treasury just yet. Presumably, in the work you do you would receive feedback from stakeholders and people involved in the energy sector about how the current taxation legislation could be improved? Are you able to share some of the main themes of that feedback you have received from stakeholders in the energy sector on how the taxation framework could be improved?

Ms Barron—Maybe my colleague could share some of the views that came out through consultation in public submissions.

Mr McDonald—I can. If you wish, I could read to you slabs of this report.

CHAIR—I would rather you did not read slabs of the report; maybe you could just table it, then the secretariat can have a close look at it on our behalf.

Ms Barron—This is Australia's future tax system consultation paper, so it goes through some of the issues that were raised with the panel in public submissions.

Mr McDonald—There are large boxes in many places which try to summarise the views of stakeholders and submissions, such as:

> Many submissions note that motor vehicle taxes, particularly fuel tax, are a significant part of household consumption expenditure, and the purchase and use of motor vehicles is taxed disproportionately to other forms of consumption.

There are summaries in here of the broad views of nearly every submission that we received.

CHAIR—Given that this is such a useful publicly available document I am intrigued as to why you would not be able to list the various options. I guess the government can always come up with other options as well. I am sure there would be much in there. Concerns have been raised with the committee by the petroleum industry about the possibility of the introduction of a new resource rent tax and how such a tax would impact on the industry. Can you talk us through the benefits and downsides of such a tax?

Mr McDonald—What kind of tax are you talking about?

CHAIR—A possible resource rent tax, which has been widely talked about. It has been raised with this committee by representatives of the petroleum industry, who have expressed concern

about the impacts a possible resource rent tax would have on that industry. Have you made any assessments on the impact of a possible resource rent tax?

Mr McDonald—There are lots of different types of taxes that you can apply on resources and lots of different taxes that do already apply on resources, such as royalty regimes. The Northern Territory has already got a profits tax. There are excise arrangements, there are cash flow taxes. There are capital allowance taxes so, before I would be able to offer you any advice on the potential, theoretical or hypothetical impacts of these taxes on any particular sector, I would probably need to know exactly what kind of tax you are talking about.

CHAIR—I cannot obviously tell you what kind of tax I am talking about because I do not know exactly what kind of tax you are considering. Has a decision been made whereby any tax that might be applied at a federal level will not go on top of a similar or equivalent tax that is being applied at a state level? If, as you say, states have royalties, with cash flow taxes and various other taxes, including their own resource rent type taxes, is the Commonwealth committed to not imposing a tax on top of what might already be happening at a state or territory level or are we going beyond that?

Mr McDonald—I would not like to comment on any options that may or may not be in front of government as a result of the Henry review, if that is what these reports are actually responding to.

CHAIR—I thought you would say that. Regulations: is there a department which has overall responsibility for coordinating the focus on energy security in Australia?

Mr Morling—Energy security is the responsibility of our minister, the Minister for Resources and Energy.

CHAIR—So he would be driving that across the federal government and across the state and territory jurisdictions?

Mr Morling—He has responsibility where the Commonwealth government has responsibility. In a number of cases, such as the Ministerial Council on Energy, he does not have direct responsibility for such things as the security of the power system within a particular jurisdiction. But the Ministerial Council on Energy has a number of bodies, including an energy security working group that is a forum for dialogue to ensure that jurisdictions coordinate actions and provide information amongst themselves, given the interconnected nature of the system.

CHAIR—Is there a summary somewhere of all of the existing federal and state government regulatory powers which relate to fuel and energy products or would we have to hunt them—

Mr Morling—That would be an enormous task and you would have to approach each jurisdiction individually. The one area where our minister does have responsibility is for liquid fuels, under the Liquid Fuel Emergency Act. So we are happy to provide you with information on that aspect.

CHAIR—But there is no clear understanding across the energy security spectrum of all of the regulatory powers and relevant legislation? That is an enormous task so, presumably, that is because there is an enormous amount of regulation across the different levels of government?

Mr Morling—I am not exactly sure what the question is, but you can understand that—to take the electricity system, for example—each jurisdiction has to have its own arrangements for how it might deal with such things as a short-term supply shortfall. Each of those jurisdictions also need to be aware of the potential impacts on other jurisdictions. It is not something where the system itself is incredibly complex. These arrangements have built up over time, which is historically the way the system built up itself, so you would not expect to see a single document or a single piece of work that would get down into the level of detail that each jurisdiction might work at. I am happy to provide you with any summary material that might be publicly available from the Ministerial Council on Energy.

CHAIR—'Incredibly complex' is exactly what worries me. The context of the question is that one of our terms of reference looks at the existing set of federal and state government regulatory powers as they relate to fuel and energy products and fuel and energy security. To look at setting forward a policy framework you do not start from scratch—there is historical stuff there—but if you want to determine where you are and where you want to go you have to be very clear about where you are, including the terms of your current regulatory framework. We have approached all of the states and territories. You guys might be able to make it easier for us by telling us, to the extent you can, what is there.

Mr Morling—One point of clarification: the complexity of the system is not just about regulatory complexity. The laws of physics are such that operating an electricity system is naturally complex. We are happy to search for and provide you with any documents that provide a summary of the energy security arrangements that have been dealt with through the Ministerial Council on Energy or any of its subgroups.

CHAIR—Are there any processes at present, through the ministerial council or otherwise, aimed at streamlining and simplifying the regulatory framework?

Mr Morling—I might have to take the particulars of that on notice, but the broad theme of the work is more about working with the particular governance structures that are in place. We have the Ministerial Council on Energy but we also have the Australian Energy Market Operator, which is central to any security arrangements, and at the broader, framework level we have the Australian Energy Market Commission and the Australian Energy Regulator. A lot of the work is based around making sure the roles and responsibilities of each of those organisations are clear.

CHAIR—Is there a process underway where the government is seeking to streamline regulation of project approvals?

Mr Morling—I do not understand what you mean by 'project approvals'.

CHAIR—You are not involved in a process of streamlining project approvals in the energy sector at a national level?

Mr Morling—If you are talking about the electricity and gas infrastructure, that is a jurisdictional issue that is regulated under the legislative framework of the national electricity law and the national gas law. Both of those have just recently been through significant reform to convert them into a national framework with one national regulator, the Australian Energy Regulator. That is applied in each jurisdiction.

CHAIR—All of the states happily went along with that, did they?

Mr Morling—They passed their application acts. For electricity, these are the National Electricity Market states, which exclude Western Australia and the Northern Territory.

CHAIR—So all states except Western Australia are on board.

Mr Morling—Yes, but Western Australia did also apply the gas access regime—or a significant part of it—under the national gas law. It obviously does not apply the national electricity law.

Ms Constable—I will add to that. As you are aware, energy security involves the whole energy supply chain. For a long period of time we have looked at streamlining regulation and administration of our regulations within the context of the Ministerial Council on Energy—Brendan Morling has just talked about that—and also under the Ministerial Council on Mineral and Petroleum Resources. You may be aware of the Productivity Commission review of the regulation of the upstream petroleum industry, for which a number of recommendations were made at that stage. The department has had that under consideration for some time. Streamlining regulation and administration is certainly at the heart of what the various ministerial councils have undertaken over a period of time.

CHAIR—Thank you for that. What sort of work, if any, have you been doing about keeping electricity affordable moving forward while ensuring cost reflectivity—or is that something that is entirely driven at a state and territory level? Is there any work being done at a Commonwealth level by any one of your departments in relation to that?

Mr Morling—In a sense, electricity prices are made up of a number of components, of which the wholesale cost of energy is just one. That is a spot market, which generators sell into and retailers purchase out of. Then there are the network costs, and a small component for retail margins on top of that. Prices are regulated in all states except Victoria. That remains a jurisdictional responsibility. Prices are only regulated for those customers who choose to start a standing offer. It is open to any customer to take up a market offer, if their circumstances so warrant or suit that. We have done some work in terms of expected price rises and what might be driving those price rises. That is more about a transparency issue. The broader answer to your question is that the responsibility under the Ministerial Council on Energy is to provide the framework for ensuring that electricity is supplied in a competitive and efficient manner.

CHAIR—When you say ‘efficient manner’, the committee has received evidence from a number of witnesses concerned about energy poverty and the impact of increasing electricity prices on those most vulnerable in our community. There has been a concern expressed that the percentage of renewable energy in Australia’s energy mix will significantly increase the price of

electricity. I am sure the Commonwealth would be conscious of this. Is there anything being done to address that reality?

Mr Morling—In a sense that, once again, pricing is a jurisdictional responsibility—

CHAIR—The Commonwealth parliament has put the renewable energy target in place, so there will be an increasing mix of renewable energy. For a whole range of reasons, that has been broadly supported, but there will be a price impact as a result of that, as I am sure you would agree. Are you leaving it entirely to the states and territories to play that through the system?

Mr Morling—As I said, the states and territories have responsibility for pricing, but the states and territories also provide supportive mechanisms in terms of looking after low-income customers. Each of the states also provides hardship policies for those customers who are having—

CHAIR—Sure, but it is a Commonwealth policy that is driving that additional increase in costs and it is the states that are the jurisdictions that are expected to pick up any flow-on consequences for lower income Australians. Is that what you are saying?

Mr Morling—I will leave questions about the price impacts of the renewable energy target to the Department of Climate Change and Energy Efficiency. But, where that does lead to price increases, under the Australian Energy Market Agreement, those price increases should be passed on. The way that is dealt with is through the various regimes for dealing with any income support and, like I said, dealing with hardship cases.

CHAIR—Have you done any assessment of what the price impact of the 20 per cent renewable energy target by 2020 is going to be?

Mr Raether—The government released some modelling in January last year regarding the price impact of the renewable energy target. You will be aware that the parliament in August last year passed the legislation to put in place the target. What that modelling showed is that the price impact is fairly modest from the renewable energy target, which hits 20 per cent by 2020. The order of magnitude was around four per cent above the impact of the CPRS over that period.

So, as I said, in terms of the overall cost structure of electricity that Mr Morling has outlined regarding the wholesale costs, the network costs and other things that impact on electricity price movements, the impact of the renewable energy target is fairly modest.

CHAIR—So that is four per cent but on top of the CPRS?

Mr Raether—That is correct. That was on top of the CPRS with a minus five scenario.

CHAIR—Which department is now responsible for hydrogen and the potential of that? Who is looking after that?

Mr Morling—That would be our department, Senator.

CHAIR—It was the Department of the Environment, Water, Heritage and the Arts which stated in its submission that hydrogen had the potential to produce zero carbon based emissions. They said there would be some technical challenges before it would be commercially feasible. Can you provide us with a bit of an update on where we are at with the *Australian hydrogen activity report*?

Mr Morling—I am sorry, Senator, I will have to take that one on notice. I do not have the information at hand. I can provide that fairly quickly.

CHAIR—Will I assume that we are still actively progressing—

Mr Morling—We are still undertaking some activities. For example, we still participate in the International Partnership for the Hydrogen Economy. I can update you on recent meetings we have attended there and, to the extent I can, on what the outcomes were of those meetings.

CHAIR—Just to make it clear, we are talking here about hydrogen and the potential of hydrogen as an alternative transport fuel. Have you got any indication as to when it is likely to be commercially available?

Mr Morling—I do not have any information at hand.

CHAIR—You might take that on notice and provide us with information if you have got it.

Senator McEWEN—I have one question. Throughout the inquiry a number of submitters have made the point that Australia has declining crude oil resources and production and is increasingly reliant on import of that particular fuel. What is the government doing to alleviate our increasing dependence on imported oil?

Ms Constable—Firstly, we have had to understand what the impacts might be in the longer term. As I have indicated previously, that is work that has been undertaken in the energy white paper. Certainly the *Energy resource assessment* has looked at this. I know that Geoscience Australia and ABARE have just provided you evidence. The work that has been undertaken so far to understand that has been considerable. We have also looked at our growing import expectations and we have undertaken various studies. We have engaged consultants to have a look at this issue and also consulted with industry over this matter. We have made sure that, in the event of increased imports in the future, we have looked at what sort of infrastructure we might need to have in place in order for those increases in imports to occur. We have conducted an audit of our import terminals. We are confident that we understand what the issues are and what we would need to do in the future. We also have a range of things in place. Geoscience Australia have an extensive energy security program, as we have talked about before, to understand what our prospectivity may be. We also have ensured that our administration and regulation in relation to these issues is being considered carefully to ensure that we are able to meet our future needs.

Senator McEWEN—Is that the subject of discussion at the Ministerial Council on Energy, the MCE?

Mr Morling—Liquid fuels is not part of the MCE discussion. It might be part of the petroleum ministerial council.

Ms Constable—It is always under consideration in the Ministerial Council on Mineral and Petroleum Resources.

Senator McEWEN—Thank you. Ms Wiley-Smith, I have a question about the Solar Cities program, which you mentioned. Can you give us an update? What have we learnt so far from the Solar Cities program?

Ms Wiley-Smith—At this point, we actually have all seven solar cities operating and offering services to the community. A few of the cities have been operating for a couple of years now and they include Townsville, Blacktown, Adelaide and Alice Springs. We have initial information coming through on qualitative learnings, how to approach householders, community engagement and different types of models that are working within those particular communities. We are working with the cities now and across other agencies to bring some of those learnings together and provide them to the public. We have information already on newsletters that are distributed through our website that talk about some of the projects that are going on and that are performing quite well, some of the deployments that are going on and also some energy reductions that have happened. We have already got some very pleasing results from the Magnetic Island project, which is part of Townsville solar city. We are also having regular catch-ups—they are annual at the moment—with the solar cities, where information is provided to the public in public forums, where they talk about some of their lessons to date. We are also collecting information on the data that has been collected through the smart meters on the different trials. That is coming together at the moment. It is being transferred from the cities through into a central database which is located within our department. We do not have enough information in that database yet to be able to make any assumptions or to look at some of the lessons learnt, but our intention is that once we do have robust data we would make that available to the public—but of course taking into consideration the privacy issues of the householders that have been providing the information.

Senator McEWEN—Thank you very much.

Ms Wiley-Smith—I am happy to provide the committee with copies of the newsletter and information that we have got to date from some of the cities, like Townsville.

Senator McEWEN—That would be useful. Thank you.

CHAIR—We will leave it there for today. Officers from the Treasury can expect to be asked to come back after the release of the Henry review. I am sure that we will ask you some more questions about what that means for the energy white paper. Thank you all very much for your contribution to the committee today.

Committee adjourned at 5.22 pm