THE SENATE

SENATE FOREIGN AFFAIRS, DEFENCE AND TRADE REFERENCES COMMITTEE

Inquiry into the implications of climate change for Australia's national security
Public Hearing –Tuesday, 20 March 2018
Questions Taken on Notice
Department of the Environment and Energy and Department of Defence

1 PROOF HANSARD, pp. 8–9, 11

Senator FAWCETT: …Can I come to the Department of the Environment and Energy. I want to go to the issue of fuels and alternative fuels and how we manage fuels and fuel shortages. I notice that AEMO, around electricity and gas in terms of their energy sources, has a process whereby they have exercises to test the system, to test the response to shortages and how they are going to respond. There are national responses to energy in an advisory committee that looks at determining how it will respond. When I go to liquid fuels, though, there doesn't appear to be the same degree of resilience. There's a discussion there about the act—I think it is the 1984 act—and what the federal government can do in consultation with the states. But I see no evidence of active planning around things like fuel shortages. Can you talk to the committee about what the department would do, from a whole-of-government planning perspective, around alternative fuels if our normal supply of liquid fuels were interrupted—what I'm sure someone like Senator Whish-Wilson would say are the effects of climate change down the road—or even what the IEA says about our lack of storage and disruptions to the supply chain? How do we test that? How do we demonstrate that we have resilience in that space?

Ms Wilson: Senator, I apologise; you're going to be disappointed by my answer as well. My energy division and energy security division colleagues are not here today. I will also take that on notice.

Senator FAWCETT: Strike three!

Ms Wilson: We didn't realise we'd go into fuel security and those sorts of energy questions. We're certainly very aware of AEMO's work. We're aware of IEA's recommendations and things they have also said. Let me assure you that in the department we are considering these issues, but I will take that on notice.

Mr Archer: If I may, I'll go back to your question about hydrogen. Certainly the department has a keen interest in the prospects around hydrogen as an alternative fuel source, both its potential domestically and also as a potential future major export industry. So we are actually working with the CSIRO, the Chief Scientist and the Australian Renewable Energy Agency to look at pieces of work that go to scoping what the issues might be around the future of hydrogen in those respects, in terms of both the opportunities and barriers. In fact, it was something that was identified in a preliminary way in the report that CSIRO has previously prepared, the *Low emissions technology roadmap*, in terms of opportunities for domestic industry and for exports.

Australia is also part of an international initiative called Mission Innovation, which was established at the same time as the Paris agreement was concluded in 2015. Under that initiative, there are a range of so-called innovation challenges. Hydrogen is not currently one of those challenges, but we're certainly working actively with our international colleagues to see what effort can be put within the Mission Innovation framework on exploring the opportunities for hydrogen globally.

Senator FAWCETT: I understand some of the work the CSIRO has been doing is in terms of what form it can take—I think they're working with ammonia as the way of being able to then package it up and send it off. I'm more interested to understand, as we do that work—you say you're looking to try to bring together some of the streams of research—what we are doing around the ability of our existing or future platforms, whether they be land, sea or air, to utilise an energy source like that as an alternative for climate impacts. My concern is more around disruptions to our existing liquid fuel supply.

Mr Archer: That's a fairly detailed question—

Senator FAWCETT: That's why I asked it.

Mr Archer: I'm probably not in a position to point exactly to a piece of work that goes to those questions.

Senator FAWCETT: You started so strongly, Mr Archer!

Mr Archer: Certainly there is a range of aspects that are being considered in terms of how you produce the hydrogen in the first place, the input sources to that and the energy that's required to manufacture hydrogen. You've alluded to the transport questions, because hydrogen per se is not a particularly stable product to be transporting. There is a range of applications that hydrogen potentially could be utilised in, whether it's as a replacement for more traditional forms of gas within our own energy uses or whether it's in advanced technologies such as hydrogen fuel cells in transport. So there are a lot of issues that the potential for hydrogen raises, and we're really only just starting to unpack those and identify the sorts of issues you are raising around potential disruption as well as the economic opportunities that go with them.

Senator FAWCETT: Sure. Rather than to have three or four different answers on notice, perhaps the various departments could actually talk together in terms of providing a supplementary submission talking about what work you're doing in the space of alternative fuel sources, their suitability for rapid development and deployment in the event of disruptions to our liquid fuel supplies, including, from Defence's perspective, as the owner of the platforms, their suitability for use in current or near-generation platforms.

…

Senator FAWCETT: [Inaudible] asked the question about whether we should give some more guidance for their answer on notice. I want to make a very quick comment on the scope of what I would love to see from the combined agencies. Rather than a generic 'big hands, little map' answer about generalities, I'd love to see an answer that is fairly specific. For example, at the moment we know that you can take a modern gas turbine powered aircraft and put diesel in it. It decreases engine life and the performance suffers a bit, but we know we can do it in an emergency. In World War II, with very simple engines, we could very quickly adapt charcoal and gas producers to put on the front of cars and trucks. Can we do that for our modern Bushmaster type vehicles and other things? With any of the fuels and alternates, whether it be hydrogen or other things, how quickly can we adapt it, if it indeed is at all possible? That's the kind of response I'm looking for, so I understand what priority we need to place upon either investment in adaptation technologies or investment in liquid fuel security to make sure our current platforms remain useable in the foreseeable future.

ANSWER

At the request of the Committee, this response has been developed jointly by the responsible portfolios—the Departments of the Environment and Energy and Defence. The Departments of Home Affairs and Foreign Affairs and Trade have been consulted.

Australia's liquid fuel supply chain

Liquid fuel, such as petrol and diesel, accounts for over a third of Australia's energy use, including nearly all of our transport needs. For this reason, the Department of the Environment and Energy actively monitors how fuel is being supplied to Australia, and whether there are risks to our supply.

The Department has commissioned numerous studies and publicly available assessments are accessible online at:

https://www.energy.gov.au/government-priorities/energy-security/energy-security-assessments

Australia's fuel supply has proven to be highly reliable, even during significant global and local disruptions. This is because Australia sources fuel from over 20 countries and no single country provides more than 20 per cent of our total fuel imports. If there is a problem in a specific region, Australia can rely more heavily on supplies from other places. At any one time, there are 45 oil tankers heading for Australia. These tankers collectively carry around two weeks of additional supply.

The 2016 Defence Industry Policy Statement identifies that Defence will continue to need access to a secure and resilient fuel supply chain that provides the right fuels to a flexible number of locations in scalable volumes to meet capability needs, in a safe, efficient and cost effective manner. Defence is committed to implementing programs aimed at building energy resilience, improving energy efficiency, reducing energy costs, and reducing greenhouse gas emissions.

Management of liquid fuel supply disruptions

The primary principle underlying all Australian energy supply emergency responses (gas, electricity and liquid fuels) is to intervene in market operation as a last resort, once all attempts to manage a supply disruption through normal market operations are exhausted.

In the event of an emergency, regulatory responses will vary depending on the type and scale of the energy supply disruption. Australia's state and territory governments have constitutional responsibility for planning and co-ordinating the response to fuel shortages within their territorial boundaries. They have legislation and response plans in place to manage such emergencies.

The Australian Government has primary responsibility in the event of an actual or likely liquid fuel shortage with national implications. After consulting with states and territories, the Governor-General may declare a national liquid fuel emergency under the *Liquid Fuel Emergency Act 1984* (LFE Act). It is worth noting the LFE Act has not been invoked since its inception in 1984.

The LFE Act gives the Minister for Energy wide-ranging powers to control the refining, distribution and use of liquid fuels in a declared national liquid fuel emergency. It also allows the Minister to delegate authority or particular powers to state and territory Ministers.

The framework for managing a co-operative national response is set out in the *Inter-Governmental Agreement in Relation to a National Liquid Fuel Emergency (2006)*. The national response is managed and tested through the National Oil Supplies Emergency Committee (NOSEC), which includes representatives from the Australian, state and territory governments and the fuel supply industry.

NOSEC administers the National Liquid Fuel Emergency Response Plan (NLFERP). This plan, agreed by federal, state and territory energy ministers, is designed to ensure that available fuel supply is managed and allocated in the most efficient and fair way, to minimise the impacts of the shortage on fuel users. The NLFERP includes the National Oil Emergency Demand Restraint Strategy, a list of demand restraint measures that can be applied during a liquid fuel supply disruption.

NOSEC also provides advice to the Minister in the lead up to, and after, the declaration of a national liquid fuel emergency. NOSEC meets at least twice per year, and undertakes a scenario exercise every second year, which considers how a liquid fuel emergency would be managed. Should a national emergency appear likely, NOSEC will convene as often as required to assist implementation of the NLFERP.

International Energy Agency obligations and stockholdings

As an International Energy Agency (IEA) member country and signatory to the International Energy Program Treaty (the Treaty), Australia is required to hold oil stocks equivalent to at least 90 days of the previous year's average daily net oil imports. The Department of the Environment and Energy is working to implement Australia's compliance plan to address the current shortfall in oil stockholdings and will soon commence an initial pilot tender process to purchase up to 400 kilo tonnes of oil tickets which may be exercised in the event of a supply disruption.

Australia currently holds stocks equivalent to 46.6 days of net imports, including refined products and crude oil stocks. Non-compliance has been driven by falling domestic crude oil production, and rising product demand and imports.

Non-compliance with IEA obligations does not mean that Australia has a domestic fuel security problem. Although Australia's stockholdings using the IEA methodology have fallen (reflecting increased dependence on imports), the amount of fuel available for consumption in Australia has remained largely unchanged in the last decade.

Alternative fuels

Alternative fuel production in Australia

Alternative transport fuels contribute a small share of the Australian transport fuel market. Biofuels—biodiesel and ethanol—are 0.5 per cent of the total fuel mix. Gaseous fuels—compressed natural gas (CNG), liquefied natural gas (LNG), and liquefied petroleum gas (LPG) —are five per cent of the total fuel mix, mainly LPG. Synthetic fuels—coal-to-liquids (CTL) and gas-to-liquids (GTL) —make a negligible contribution to the transport fuel mix at this time.

In 2016 there were three producers of fuel-grade ethanol in Australia, producing 220 mega litre (ML) per year from a total production capacity of 450 ML, with Manildra Group accounting for 300ML of total capacity.

Support for alternative fuels

The Australian Government supports the biofuels industry through grants, emissions reductions policies and excise relief.

Domestic production of ethanol and biodiesel continue to be subject to excise relief. The excise on ethanol is now 5.3 cents per litre or 13 per cent that of petrol (which is 40.3 cents per litre). The excise on biodiesel is now 2.7 cents per litre or about 7 per cent that of diesel (which is 40.3 cents per litre). Excise concessions for biofuels are set to decline over the next decade, recognising the increasing maturing of the alternative fuels. Excise on biofuels will continue to be less than half that of petrol and diesel.

Through the Emissions Reduction Fund, business and others can earn carbon credits for projects that switch to lower-emission alternate transport fuels, including biofuels. For example, airlines can generate credits by changing the energy source or the mix of energy sources used by aircraft, including increasing the use of bio-derived jet fuel.

Hydrogen

Hydrogen has the highest energy content of any known fuel by weight, but has a very low energy content per unit of volume: one kilogram of hydrogen gas is equal to around 3.2 litres of petrol; and one tonne of hydrogen is enough to power 14 cars to travel 300 km. Pure hydrogen is made from splitting hydrogen-rich substances such as water (including seawater), natural gas and coal. Australia has these feedstocks in abundance. Hydrogen is a clean, zero-emissions fuel if produced from

renewable sources. Production from natural gas or coal gasification can be coupled with carbon capture and storage for low-emissions production.

Hydrogen is not a direct substitute for traditional fuels such as petrol, diesel and gas. Instead, it is converted into electricity via fuel cells, and it is this electricity that is used. Hydrogen has the potential for economy-wide applications, including for use in fuel cell electric vehicles (FCEVs) for passenger cars, trucks, buses, boats and construction and industrial vehicles, or to provide auxiliary power to traditional transport technologies. FCEVs complement battery electric vehicles in applications where the speed of refuelling is important (such as fleets) or where the electricity grid is not available.

Beyond transport, hydrogen can also be used to store energy, as an industrial feedstock, and for stationary fuel cells to provide electricity. This diversity of uses is reflected in the range of global companies that are working to develop hydrogen technology.

Capability of existing Defence platforms

Defence has sufficient fuel to meet its requirements in current strategic circumstances. It holds significant operational and strategic fuel holdings compared to most commercial organisations, which will only hold fuel for several days of operations. To assist with any disruption to Australia's commercial liquid fuel supplies, Defence fuel holdings generally range from several weeks (aviation and vehicular fuels) to a number of months (naval fuels) at normal rates of consumption. Defence's consumption of fuel constitutes around one per cent of Australia's total annual consumption. Additional fuel can be acquired to meet surge requirements should our circumstances change. Defence also has 40 international arrangements with partner countries to acquire fuel, reducing the potential impact of market forces in a time of crisis. As a last resort to guarantee fuel supply, the Commonwealth may enact the *Liquid Fuels Emergency Act 1984*. Under this Act, Defence has access to fuel as an `essential user' for activities in the `Defence of Australia'.

Developments in alternative fuels and their certification for sea, land and air platforms have the potential to improve future interoperability, cost effectiveness and resilience. For example, in May 2017 the Australian Defence Standard (DEF(AUST)5213C AM1) for Navy Fuels was amended to include provision for alternative fuels obtained from blending conventional fuels with synthetic fuels manufactured by approved methods. The standard was endorsed by the Royal Australian Navy (RAN) and is available to suppliers, noting that current approved processes require blending of conventional fuel with up to 50 per cent synthetic fuels to meet the required physical and chemical properties for naval distillate. The United States Department of Defense has also conducted testing and certification of fuels and platforms to prepare for bulk purchases of alternative fuels for operational use. In 2016, the Great Green Fleet sailed to Australia to participate in Exercise Pacific Rim on a 90 per cent regular ship diesel and 10 per cent biofuel blend. Cost and availability through commercial suppliers is still considered a barrier and wholesale commercialisation of alternative fuel products is not expected in Australia for several years.

There is no standard requirement for tenderers for Defence projects to provide information about the use of alternative fuels in their products. However, specific projects may request such information, depending on the Capability Manager's requirements.

Future opportunities

Biofuels

The Government is supporting biofuel ventures through the Australian Renewable Energy Agency and Clean Energy Finance Corporation. Projects include:

- $3 million funding for Renewable Developments Australia Pty Ltd to complete trials on new crops and methods for making advanced ethanol in Pentland, Qld.

- $2.4 million funding for Southern Oil Refining to construct a state of the art biofuel laboratory near Gladstone, QLD.

Hydrogen

Hydrogen has the potential to become an internationally traded commodity like LNG, but realising this potential will take continued research and development, demonstration experience to unlock greater efficiencies and cost reductions. One important area is the development of hydrogen "carriers"—chemical substances that include hydrogen but are more dense and easier to handle than pure hydrogen in large volumes. Ammonia (comprised of nitrogen and hydrogen) is one promising carrier, and in 2017, the CSIRO announced it had developed an innovative membrane that allows much greater volumes of hydrogen to be separated from ammonia faster and more cheaply. CSIRO is now working with BOC, Hyundai and Toyota to develop a pilot plant showcasing this technology, which will be able to produce around 10kg of hydrogen a day (enough to drive more than 1000km).

CSIRO's Hydrogen Future Science Platform is a $13.5 million multi-disciplinary investment in development of technologies that allow Australia to convert solar energy to hydrogen for export, as well as providing low emissions energy solutions for Australians. ARENA has made available up to $20 million in grants for hydrogen R&D, expected to be awarded in the latter half of 2018.

Defence's Capability Technology Demonstrator program has funded R&D for portable light-weight fuel cells that can be recharged through solar energy, for use in forward operating bases and mobile units, peace-keeping and emergency relief.