23 August 2019

Dr Wendy Craik AM
Chair
Climate Change Authority
GPO Box 787, Canberra ACT 2600
Via email: submissions@climatechangeauthority.gov.au

Energy Networks Australia's submission on developments in climate change technology

Dear Dr Craik

Energy Networks Australia welcomes the opportunity to provide this submission outlining recent developments in Australia since the 2016 Climate Change Authority report providing advice on a climate policy toolkit.

Energy Networks Australia is the national industry body representing businesses operating Australia's electricity transmission and distribution and gas distribution networks, with 21 member companies providing more than 16 million electricity and gas connections to almost every home and business across Australia.

Our gas distribution businesses manage over five million connections to Australian households and businesses. The gas supplied through these networks provides 44 per cent of the annual energy consumption in Australia's homes. The consumption of gas is not uniform throughout the year with a seasonal peak in winter where gas consumption is approximately triple that of summer's.

To date, the focus of decarbonisation has been on the electricity sector. Over the long-term, gas networks will have their own decarbonisation journey. New fuels, such as biogas and hydrogen, have the potential to become mainstream and complementary energy solutions that will use existing energy infrastructure.

Evaluating climate change policies

Energy Networks Australia supports the proposed principles for assessing climate change mitigation policies (Box 2 of the consultation paper).

We recommend that energy reliability and security is a principle that needs to be considered in assessing the interaction between energy and climate change mitigation policy options. Significant work has happened through the Energy Security Board since the 2016 CCA report that aims to improve energy reliability and security. It would be appropriate for the CCA to consider the comparative outcomes for energy system operational impacts, including reliability and security, from alternative carbon abatement measures.

The world leading level of renewable generation integration in the wholesale electricity market of South Australia is highlighting potential implications in balancing intermittent generation and the loss of inertia caused by reduced synchronous generation. Similarly, high levels of distributed generation provide operational challenges, as well as some opportunities, in low voltage networks. Responsive gas-fired generation can play an important role in addressing these challenges in the future. It is important to consider the integration issues across the different energy systems and to develop a stable domestic gas policy to ensure that gas can fill this pivotal role in reaching the 2030 abatement targets.

Energy Networks Australia also supports the characteristics for use in evaluating policies. We recommend that an economy wide impact of any policy options is included as an additional characteristic. The purpose of this characteristic is to provide guidance to better understand cross sectoral impacts of climate policies.

Australia's focus to date has been on decarbonising the electricity sector through measures such as the Commonwealth's and state based renewable energy targets and feed-in tariffs. In many ways, these policies have also incentivised electrification while not addressing emissions from other sectors. More work is required to reduce emissions from the other sectors and to consider cross-sectoral impacts. For example, Figure 1 illustrates Victoria's energy consumption. The main features are:

- Daily electricity consumption is around 500 TJ, peaking in winter. Renewable electricity generation is a subset of this, reported at 20.6 per cent for 2018.
- Daily gas consumption is seasonal, ranging from around 300 TJ per day in summer up to 1,200 TJ per day in winter. This seasonal load is largely a reflection of the utility of gas to provide space heating and hot water to homes and businesses during colder winter months.
- Daily consumption for transport is between 800 and 1,000 TJ. This is fairly uniform throughout the year.

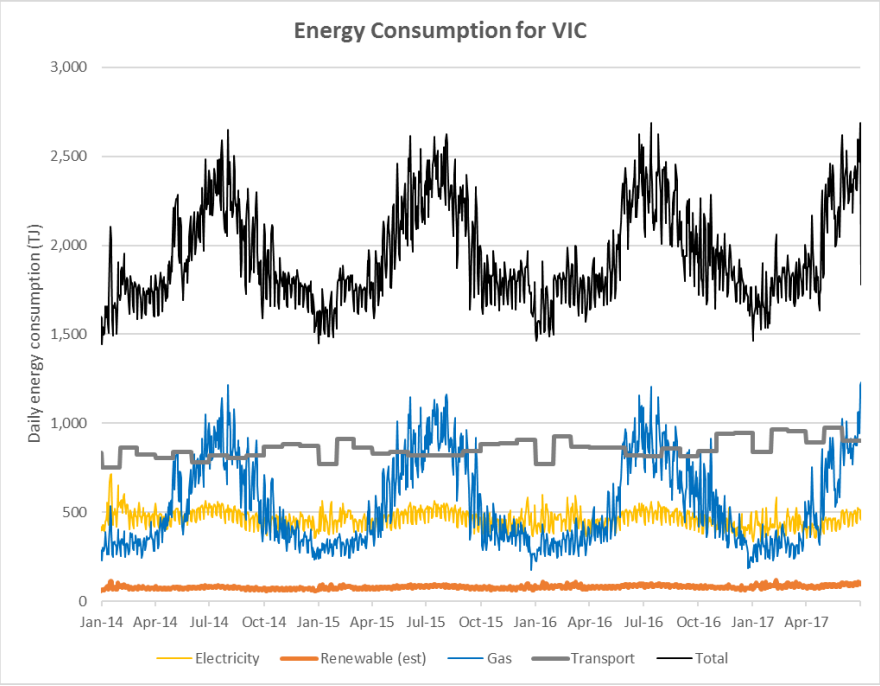

Figure 1: Victorian Energy Consumption (source: Energy Networks Australia analysis)

The overall energy consumption – and the decarbonisation challenge - for Victoria is shown by the thick black line. Decarbonising transport will highly likely involve a large-scale conversion to battery or fuel cell electric vehicles supported by biofuels in certain instances (e.g. aviation). This will place major upward demand on the electricity networks requiring investment in new electricity generation, transmission and distribution infrastructure.

Promoting the electrification of gas appliances in homes will place even higher upward demand on the electricity networks. Due to its seasonal demand this will require major upward pressure on peak demand

of the electricity network during winter periods. Similar challenges exist for each Australian State or Territory.

Energy Networks Australia recommends that evaluating climate change policies should consider the overall energy consumption challenge and address infrastructure issues of sector specific policies.

What aspects of the Authority's previous recommendations remain valid and why?

Energy Networks Australia supports a coordinated national approach to emission reduction targets. We are supportive of the Commonwealth Government's approach to the *Paris Agreement on Climate Change* including a 2030 target and a longer-term target to achieve net-zero emissions. Since 2016, Australian state governments have adopted alternate emission reduction targets compared to those supported by the Commonwealth Government.

Emission targets

In its 2014 report, the CCA proposed a range of trajectories reflecting different emissions reductions in 2020. The science underlying this figure was based on a total carbon budget in line with a global target of limiting global warming to 2.0°C and showed that more action and faster emission reductions would be required beyond 2020 if the 2020 target is not met. The Authority recommended a target range of between 40 to 60 per cent below 2000 levels by 2030.

FIGURE 9.1: RELATIONSHIPS BETWEEN 2020 TARGETS, 2030 TRAJECTORIES AND NATIONAL EMISSIONS BUDGETS

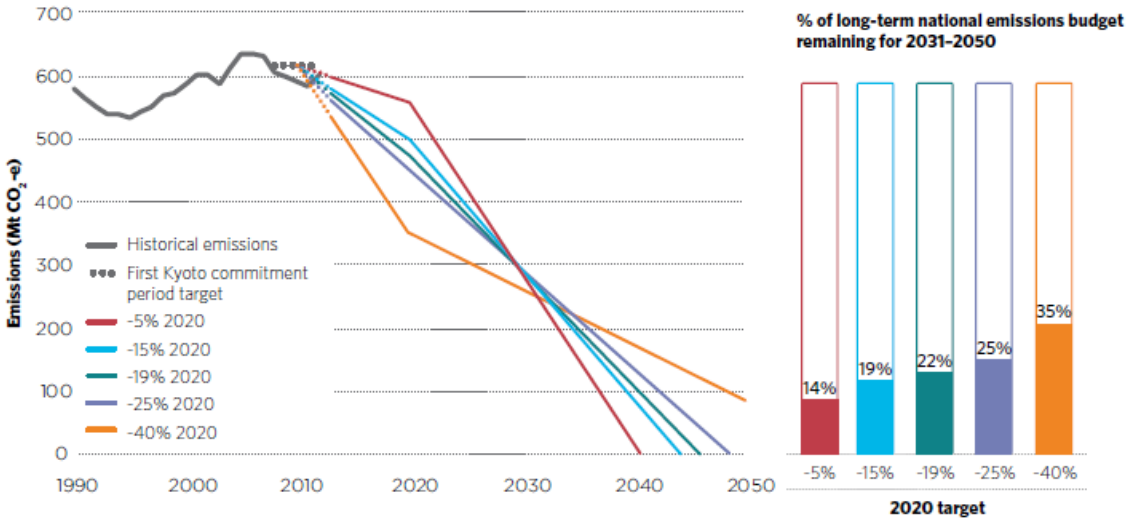

Figure 2: Range of trajectories (Source: Climate Change Authority, 2014).

In reviewing its trajectory options, the CCA should consider:

- The shift in global discussion about limiting global warming to 1.5°C.
- Whether the Commonwealth Government is using its Kyoto period carry-over to meet the 2020 target and what impact that will have on the potential trajectories.

- The individual targets being established by State and Territory governments. For example the interim report[1] on Victoria's climate targets recommends reductions of 45 to 60 per cent reduction by 2030 compared to 2005 figures. Figure 6.1 of the Interim Report illustrates Victoria's historic emissions and notes an increase in emission to 2005 and then a slight decrease mainly as a result of land use change and the closure of Hazelwood power station. Decreasing emissions by 45 to 60 per cent in a decade for Victoria will either mean replacing all its power generation with renewable generation or addressing emissions from other sectors as well.
- Historical evidence for the time taken for energy supply and energy end use technologies to reach widespread deployment range from 20 to 70 years. Major conversions of the energy system require planning for generation, transmission and distribution, as well as amendments to legislative and regulatory processes which take time.
- Energy Networks Australia accepts the science of climate change. Nevertheless, given the above arguments, a target of 45 to 60 per cent reduction by 2030 appears challenging. Moreover, adopting ambitious targets like this may lead to myopic policy decisions to reach those targets, without considering long term, economy wide implications.

In order to decarbonise the energy system, the CCA should consider all potential technologies and not hinder the development of new technologies that can reduce greenhouse gas emissions across the economy.

Achieving a net zero emissions economy in the long-term

The gas industry has commenced major projects since 2016 to decarbonise the use of gas domestically, and as an export opportunity.

Hydrogen's role in heating

Gas is used by industry as a feedstock and also as a means to provide heat. In homes and businesses, the role of gas is mainly to provide space heating, hot water and cooking services.

Decarbonising the gas consumption could be achieved through electrification. However, this would further increase the demand on the electricity networks and require even more investment to meet this demand (over and above the increased demand for transport). The seasonal consumption of gas, peaking in winter, would result in a major investment of electricity infrastructure to meet this peak demand. This extra infrastructure to meet the heating peak would only be used for a small part of the year leading to inefficient investment in infrastructure.

A more practical and cheaper alternative is to decarbonise the gas and to continue using existing gas distribution infrastructure. Many reports have indicated this is a lower cost option, with analysis by the Australian Gas Infrastructure Group and Deloitte Access Economics showing that the decarbonisation of the gas networks in Victoria could be achieved at 40 per cent less cost than the electrification of the gas load.

[1] Independent Expert Panel in Interim Emissions Reductions Targets for Victoria (2019). Available from: https://engage.vic.gov.au/climate-change-reducing-victorias-greenhouse-gas-emissions

Other international studies[2] have also shown that the cost of electrification is higher than the cost of decarbonising gas networks. For example:

- A 2016 study by KPMG[3] for the UK found that converting gas networks to hydrogen would have an incremental cost of between £4,500 to £5,000 per household up to 2050 while electrification would cost between £12,000 and £14,000.
- In a 2018 report for the American Gas Association, the average cost of US greenhouse gas emissions reductions through policy-driven residential electrification would range between US$572 and US$802 per metric ton of CO_2 reduced, which is significantly higher than renewable gas which was less than US$100 per metric ton.

The outcomes from these studies are different from those by pro-electrification lobbyists, such as Renew or ASBEC[4], as they account for overall systems costs resulting from the extra investment required for electrification, which simpler analyses tend to ignore.

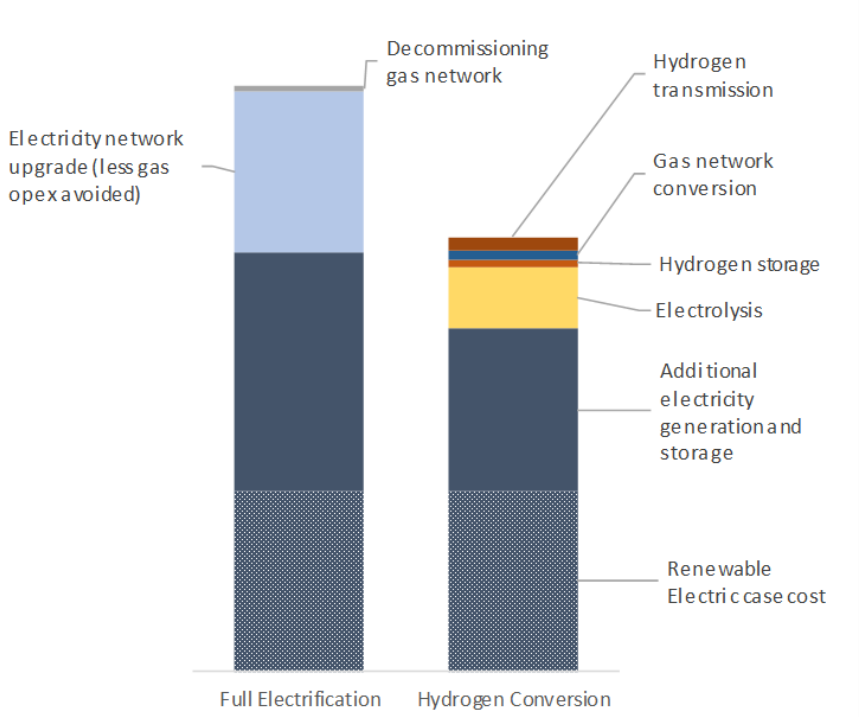

Figure 3: Relative cost comparison of decarbonisation pathways for Victoria (source: AGIG and Deloitte Access Economics Analysis[5])

Energy Networks Australia recommends that the CCA consider the potential opportunities presented by hydrogen in the built environment when developing its emissions targets and associated policies.

[2] https://www.energynetworks.com.au/news/energy-insider/electrify-gas-should-we-or-shouldnt-we
[3] KPMG (2016), *2050 Energy Scenarios – the UK gas networks role in a 2050 whole energy system*
[4] The Australian Sustainable Built Environment Council
[5] https://www.energynetworks.com.au/news/energy-insider/hydrogen-powered-future-tops-full-electrification

Hydrogen's role in electricity

Hydrogen creates significant opportunities in the electricity sector that appear not to have been included in the Interim Report. As the production of hydrogen from electrolysis increases, individual electrolysers can be considered as a Distributed Energy Load that could be switched on and off to manage demand and provide stability to the electricity grid, very much like batteries. This is because electrolysers have the ability to quickly ramp up and down also allowing them to absorb excess renewable generation at times. This creates additional revenue opportunities for renewable generators.

While hydrogen can be stored to provide inter-seasonal heating load, some of this hydrogen could also be used to generate electricity (either through turbines or fuel cells) at times when generation levels are low, for example through prolonged periods of cloud cover and/or low wind activity. In this role, hydrogen can support the electricity grid similar to the role natural gas plays today.

Development of Australia's hydrogen industry

The gas industry has developed a strategic plan – Gas Vision 2050 – with the aim to decarbonise gas in line with Australia's long-term decarbonisation targets. The decarbonisation pathway involves the use of hydrogen, biogas and carbon capture and storage.

The pathway, illustrated below, involves testing and developing renewable gas technology through applied research and pilot projects out to 2022. Our network businesses are currently progressing four trials around the country with two already operational, and the other two expected to be operational by mid-2020's.

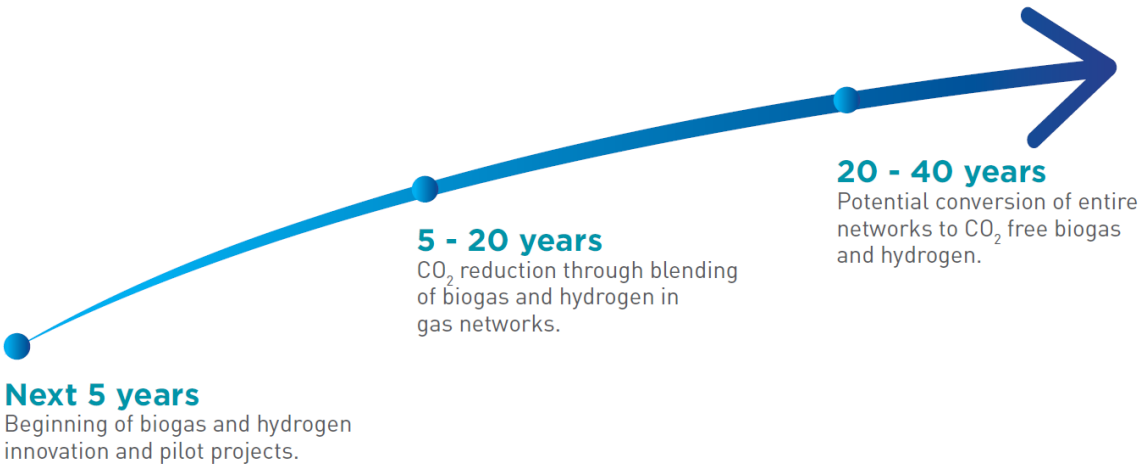

Figure 4: Pathway to decarbonise gas networks (Source: Energy Networks Australia, 2017).

This will be followed by blending renewable gas into networks at larger scale. The National Hydrogen Strategy is considering an injection target of 10 per cent by 2030. Beyond the mid-2030's, large scale conversion of gas networks can be carried out to achieve 100 per cent renewable gas by mid-century.

Some key activities since the 2016 CCA Report are:

» COAG EC agreeing to develop a National Hydrogen Strategy. The strategy is planned to be finalised by the end of 2019.

- The development of a National Hydrogen Roadmap, led by CSIRO in August 2018.
- The Hydrogen Energy Supply Chain project in the Latrobe Valley. This pilot project will gasify brown coal to produce hydrogen which will be liquefied for export to Japan.
- Future Fuels CRC is a $92 million cooperative research centre to develop new hydrogen technologies and to decarbonise gas networks.
- Toyota Australia will build a hydrogen centre, including a refuelling centre at the company's former site of car manufacturing at Altona in Melbourne's west.
- Energy Networks Australia members are leading pilot projects to produce hydrogen and perform trial injections into parts of the gas network which are expected to begin blending hydrogen in portions of the gas network in 2020.

The CCA should consider the progress being made by industry in updating its advice. Energy Networks Australia recommends that the CCA considers to potential opportunities presented by hydrogen when updating its advice to Government.

Sectoral and economy-wide policies

Gas networks

Australia's focus on decarbonisation has been on the electricity sector through the role of renewable electricity generation and the government policies to set targets for renewable energy (electricity) and associated feed-in tariffs. Combined with specific grant funding programs, this has led to a growth of renewable generation in Australia to roughly 20 per cent of the total electricity produced.

However, electricity only provides 20 per cent of the energy to the economy, with gas and transport fuels providing the other 80 per cent.

Setting sectoral targets for gas networks should encourage the near-term innovation and should align with other government policy such as the National Hydrogen Strategy that are currently under development.

Connecting utility scale renewables

Electricity represented an opportunity for early decarbonisation through renewable electricity generation. For example, increased levels of utility scale renewable including solar and wind in Western Victoria can assist to meet Victoria's electricity demand as the current aged generation fleet retires. Connecting that generation to the main demand centres will require new transmission infrastructure to be designed, approved and constructed.

The Integrated System Plan (ISP) is the integrated plan for strategic transmission infrastructure across the National Electricity Market (NEM). Emissions policies and renewable energy subsidies, renewable energy hubs and demand centres play an important role and have a critical impact on modelling and the results of a co-optimised plan. All state and federal government policies that impact the NEM such as various trajectories of renewables should be documented by COAG and formally provided to AEMO for use in the ISP assumptions and modelling.

The ISP should cover a range of trajectories and identify the cost to consumers for high levels of renewable energy deployment that require energy storage and transmission assets to ensure reliability.

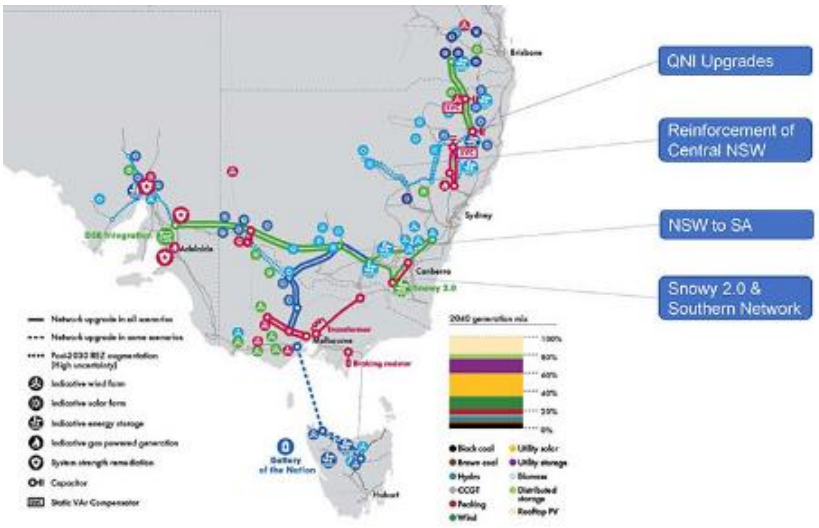

*Figure 5: Major Transmission Projects (*Source*: TransGrid website[6])*

The CCA should be cognisant of the national planning approach when updating its advice for electricity. Meeting renewable targets cannot be considered in isolation to the ability to maintain a power stable system. Long term, stable national policy is required to ensure that there is both efficient generation and transmission investment for the benefit of consumers. Transmission is a key enabler for moving to a lower emissions economy, long term stable policy is needed to ensure that investment signals and financeability can be maintained.

Balancing household PV

Australia now has more rooftop solar installed per capita than anywhere else in the world. The electricity grid faces growing challenges as more of these systems are installed on homes and businesses. However, this also creates opportunities, but the following capabilities will be required:

- Enabling networks to have better visibility of where these resources are installed and how they can behave;
- Defining networks constraints so customers can be advised on how they can export and/or import to the grid;
- Establishing standards to community these constraints.

Higher levels of rooftop solar will change the dynamics of the demand on the grid with lower demand in the middle of the day, and potential energy imports into the grid from these distributed resources.

[6] https://www.transgrid.com.au/what-we-do/projects/current-projects/Snowy%202.0/Pages/default.aspx

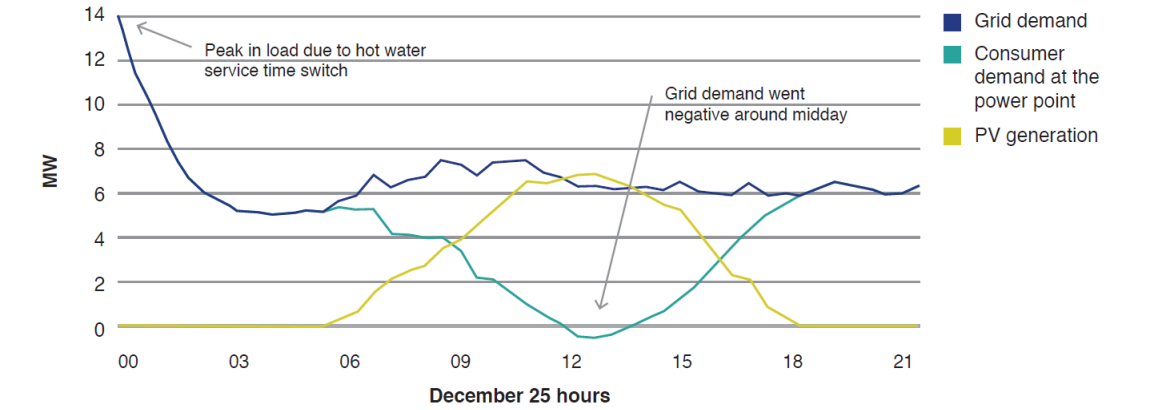

Figure 6: Illustration of grid demand due to PV generation (Source: Open Energy Networks – Interim Report: Required Capabilities and recommended Action, July 2019)

In updating advice for emission targets from households, the CCA should consider the network management issues and constraints identified in the AEMO & Energy Networks Australia Open Energy Networks project.

Recommendations

Energy Networks Australia recommends that the CCA:

1. Broaden its evaluation principles and characteristics to include reliability and security of the energy system as well as recognise economy wide impacts of proposed policy options.
2. Consider the practicality of 2030 emission targets noting progress by states and the effect of Kyoto carry-over credits to meet our 2020 emission target.
3. Consider the potential roles of hydrogen to decarbonise gas, electricity and transport.
4. Consider infrastructure issues of decarbonising gas, connecting large scale renewables and rooftop solar.

We welcome the ongoing opportunity to be involved in the development of Australia's climate change advise and associated policy proposals. If you have any other queries, please contact Dr Dennis R Van Puyvelde, Head of Gas on dvanpuyvelde@energynetworks.com.au or 02 6272 1548.

Yours sincerely,

Andrew Dillon

CEO