Submission No 39

COGENERATION AND TRIGENERATION IN NEW SOUTH WALES

Organisation: Energy Efficiency Council

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4 September 2013

Re: Inquiry into cogeneration and trigeneration in New South Wales

Dear Mr Miller

The NSW Public Accounts Committee wrote to the Energy Efficiency Council inviting the Council to make a submission into its inquiry into cogeneration and trigeneration in New South Wales ('the Inquiry'). This submission sets out the Energy Efficiency Council's key positions to the inquiry.

The Energy Efficiency Council is the peak body for energy efficiency, demand response and cogeneration, and brings together Australia's top expertise in demand-side to support the development of policy and programs.

The Council starts from the position that NSW's energy markets should act in the long-term interest of consumers, by creating an investment environment that encourages an economically efficient mix of energy-supply and energy-use technologies.

Cogeneration and trigeneration can play an important role in this mix, by supplying affordable and low-emissions electricity, heating and cooling. Cogeneration and trigeneration:

- Convert a much higher proportion of the energy in fuel into a useful service than conventional generators. While many conventional generators in NSW convert less than 35 per cent of the energy in their fuel into useful energy, cogeneration and trigeneration can convert over 80 per cent of the energy in fuel into a useful service. As a result, cogeneration and trigeneration can improve energy affordability and boost productivity. Recent research suggests that boosting the overall energy efficiency of Australia's economy by one per cent a year would increase GDP by $26 billion in 2030.
- Can reduce the need for network augmentation, helping to keep energy affordable for homes and businesses. Over the last 5 years, expenditure on network augmentation has been the main factor driving up electricity bills in NSW. AusGrid already makes use of distributed generation to reduce augmentation costs. Expanding the use of distributed generation to avoid augmentation would deliver benefits to consumers.
- Improve the security of energy supply, by reducing dependence on a small number of large generators and parts of the network. After recent major storms in the US, facilities with district energy systems were among the few facilities with power.
- Are highly responsive, in contrast to both coal generators and intermittent forms of renewable energy, helping the energy market to match supply and demand.
- Are relatively mature technologies in a range of applications.

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However, there are a number of factors that distort the investment environment and disadvantage cogeneration and trigeneration, including aspects of the regulated parts of the National Electricity Market (NEM) and the behaviour of the Network Service Providers (NSPs). If these barriers are addressed, market dynamics will result in cogeneration and trigeneration being installed where it benefits consumers. These barriers include:

- Barriers that affect any type of distributed electricity generation, including challenges in connecting to, and using, the grid;
- Barriers that affect any type of thermal energy service precinct; and
- Barriers specific to cogeneration and trigeneration, such as NOx controls.

The Council has developed a number of recommendations to address these barriers that would maintain investor confidence across the energy market and can be introduced without significant cost or disruption.

Our view is that, once these barriers are addressed, the market will consider issues such as the price of gas and other fuels in determining whether cogeneration will be installed at a particular location or not. If gas prices rise significantly it could have negative impacts that are far beyond the scope of this inquiry, including impacts on households and sectors such as plastics and food manufacturing.

Therefore, the Energy Efficiency Council recommends that the Public Accounts Committee focus on the following issues:

1) Setting up a 'NSW Distributed Generation ombudsman' to oversee the operations of state-owned NSPs, including AusGrid, Endeavour Energy and Essential Energy, to ensure that they operate in the interests of energy consumers by adhering with, and going beyond, the minimum requirements of the NEM, by:
    - Facilitating timely grid-connection of cogeneration and trigeneration systems;
    - Determining appropriate and fair charges for network connection and use, including any us of public networks as virtual private-wire systems;
    - Providing fair and transparent payments for network support services, such as the deferral of network augmentation;
    - Providing accurate and up-to-date maps that indicate the value of load reduction in specific locations in the grid, to facilitate the grid-connection process and enable 'competition' in network services; and
    - Augmenting the grid to facilitate the connection of distributed generation where it is cost-effective to do so, from a consumer perspective.
2) Endorse a number of changes to the NEM rules and regulations that would ensure that NSPs have the appropriate incentives to support demand-side activities, which would be pursued through the Standing Council on Energy and Resources (SCER) and/or the Council of Australian Governments (COAG)
3) Endorse an opt-in regulatory system for district distributed-electricity systems that is similar to the UK's, which allows distributed generators to offer exclusive services subject to their prices being similar to nearby competitive prices.
4) Endorse a national support mechanism for the first 3,000 MW of cogeneration and trigeneration build in Australia to address early-mover disadvantage. This could be introduced on an interim basis in NSW through the NSW Energy Saver Scheme, until a national scheme is in place.
5) Review the requirements on generators for nitrogen oxide emissions

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Australians deserve energy markets that serve their interests. The Energy Efficiency Council looks forward to presenting to the Public Accounts Committee, and working with that committee to ensure that the energy market in NSW meets the needs of the community.

Please contact me on [redacted] should you require further information on any of the issues raised in this submission.

Yours sincerely

[redacted]

Rob Murray-Leach

Chief Executive Officer

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Energy Efficiency Council

Submission to the

Public Accounts Committee Inquiry into Cogeneration and Trigeneration in New South Wales

Suite 2, 490 Spencer Street, West Melbourne VIC 3205 ABRN 136 469 291 ABN 63 136 469 291

Contents

NB - the expression ‘TOR’ stands for ‘Terms of Reference’

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1. Cogeneration, Trigeneration and District Energy

Cogeneration and trigeneration systems create both electricity and thermal energy. These systems use fuel much more efficiently than conventional generators, so they can deliver energy services more affordably and with lower greenhouse gas emissions.

In conventional coal- and gas-fired generators, when the fuel is combusted much of the energy in the fuel is converted into heat that is lost to the atmosphere. As a result, coal generators typically convert less than 35 per cent of the energy in the coal into electricity.

In contrast, cogeneration systems use most the heat that is normally wasted. The thermal energy is used to warm buildings, provide hot water or deliver services in manufacturing. In trigeneration systems some of thermal energy is also used to generate chilled water, which can be used to cool buildings or deliver services. As a result, cogeneration and trigeneration systems can convert over 80 per cent of the energy in fuel into a useful service.

Cogeneration and trigeneration systems need to be located relatively close to the point where the thermal energy is used, or be connected to thermal-energy distribution systems. As a result, these systems do not require extensive electricity transmission and distribution networks to deliver electricity to end users; this reduces both electrical losses and the cost of network augmentation.

District Energy Schemes

District energy schemes involve a central plant (or plants) providing heating and/or cooling to multiple buildings and/or energy users. Serving multiple energy users from a centralised system can significantly lower costs for energy users, by:

- Reducing capital costs compared to each user installing their own equipment.
- Reducing space requirements for equipment, because space is only required for central plant rather than multiple heating / cooling systems.
- Using more energy efficient equipment, due to economies of scale. This reduces running costs and emissions per user.
- Improving system productivity, further reducing capital and running costs, where systems serve diverse loads (e.g. residential buildings require more cooling during the evening, and commercial buildings more during the daytime).

District energy systems do not necessarily involve cogeneration and trigeneration, and can simply involve large centralised heating and/or cooling systems. Likewise, cogeneration and trigeneration systems can be installed in single buildings, and do not have to be used in district energy schemes.

However, cogeneration and trigeneration systems are well-suited to district energy schemes, because the large number of energy users delivers economies of scale and diversities of load that maximise the benefits of co/trigeneration systems.

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2. Benefits of Cogeneration, Trigeneration and District Energy

The benefits of a particular cogeneration, trigeneration or district energy system will vary with their design and their context, including the proportion of thermal energy that is used. These benefits can include:

Increased energy efficiency

Cogeneration, trigeneration and district energy can halve the amount of fuel required to deliver a service. This has multiple benefits, as set out below.

Reduced need for network augmentation

In the right locations cogeneration, trigeneration and district energy can reduce the need for expensive augmentations of electricity networks (poles and wires). AusGrid already makes limited use of distributed generation systems to reduce augmentation costs. With over $40 billion spent on augmenting the grid in a five year period, network augmentation has been the main factor driving up national electricity prices in recent years. Reducing network augmentation could reduce further rises in electricity bills.

More affordable energy

Cogeneration, trigeneration and district energy can improve energy affordability in multiple ways. First, these systems improve the efficiency of fuel use. Second, where they defer network investment, they will reduce electricity prices for all users. Third, by reducing demand, particularly during peak times, they can reduce wholesale electricity prices.

Boosting competitiveness

When a company improves its energy efficiency it becomes more productive. Australia is currently one of the least efficient developed economies, which puts our businesses at a competitive disadvantage. Recent research suggested that if Australia were to raise its rate of energy efficiency improvement by just one per cent per annum it would boost GDP by $8 billion by 2020 and $26 billion by 2030[1].

Creating jobs

By boosting competitiveness, energy efficiency enables businesses to retain and expand their workforce. In addition, it also creates jobs in energy services. Studies in the US found that each dollar invested in energy efficiency generated US$2.32 in local economic activity, US$0.84 more than an equivalent expenditure in petroleum and gas bills[2]. A recent study suggested that boosting energy efficiency would create an estimated 75,000 jobs in Australia by 2030, including builders, engineers and manufacturers.

A more secure and responsive energy system

After recent major storms in the East Coast of the US, damage to networks meant that facilities with district energy systems were among the few facilities with power. In addition, cogeneration and trigeneration are much more responsive to changes in demand than both coal generators and intermittent forms of renewable energy.

Meeting Australia's emission targets

Energy efficiency and a shift from coal-fired generation to highly-efficient gas-fired cogeneration and trigeneration reduce greenhouse gas emissions, but are also things that we should do anyway because it makes good economic sense.

[1] The Climate Institute 2013, Boosting Australia's Energy Productivity Report,
[2] National Renewable Energy Laboratory 1995, DOE/GO-10095-196, Energy Efficiency Strengthens Local Economies, U.S. Department of Energy, Washington

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3. TOR i - Does the current regulatory framework can adequately support the utilisation of cogeneration / trigeneration precinct developments?

There are a number of major barriers to the deployment of cogeneration, trigeneration and district energy. The most significant barriers in NSW are due to the way that NSPs operate. This submission breaks these issues into:

- Network costs and benefits (Section 3.1).
- Grid connection (3.2).
- Recommendations on network costs and benefits and grid connection (3.3).
- Issues with retailing energy and using private wires (3.4).
- Early mover disadvantage (3.5).
- Nitrogen Oxide Emission Requirements (3.6).

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3.1 Network costs and benefits

Co/trigeneration systems deliver a series of benefits to multiple parties in the electricity market, including:

- Heating and cooling services;
- Electricity supply at specific times and locations; and
- Network services, including frequency modulation and reducing or deferring the need for NSP expenditure to augment the grid.

Where distributed generators sell electrical and thermal energy services to an off-grid user (either themselves or another client) they can capture most of these benefits in a long-term contract. This is partly because the end-user captures the full benefits of avoiding having to pay for connection to the grid.

However, in grid-connected situations co/trigeneration owners are rarely able to capture the full benefit of their systems, and face unfair competition from smeared network costs. The cost of grid-supplied electricity consists of a wholesale price (electricity) and a network cost. The cost of supply can vary dramatically between locations, because the cost of providing network infrastructure varies between locations, and network losses vary between locations.

However, the NEM rules require 'postage-stamp' pricing, so that energy prices are heavily smeared between regions. Without significant technological and corresponding regulatory intervention, it would unreasonable to expect that widespread site-specific pricing will be implemented within the next two decades. Therefore, grid-supplied energy prices will continue to fail to reflect the cost of use at specific locations.

As a result, co/trigeneration supplied electricity can face unfair competition from cross-subsidised grid-supplied electricity, unless it can secure payments from NSPs for avoiding use of most of the network and/or deferring the need to build network services to meet peak demand.

NSPs are regional monopolies, and generators face significant power asymmetries in securing a fair value for reducing the need for network augmentation. The AEMC's Power of Choice report confirms that in many situations, while reducing network augmentation may be in the interest of consumers, it may not be in the interests of NSPs. Numerous sources have confirmed that network businesses face substantial incentives to over-invest in network augmentation, and therefore a negative incentive to support distributed generation that reduces the need to augment the network.

Furthermore, the historical focus of NSPs on network augmentation has left them critically under-skilled in understanding both the potential of energy efficiency and co/trigeneration to reliably reduce peak demand, and how to use these options effectively. Like any business, if NSPs are presented with two options that have similar returns on investment (i.e. network augmentation and non-network solutions), and they have a poor understanding of demand-side options, they will inevitably favour network augmentation.

While some NSPs have made some effort to improve their skills in this area, such as Ergon and Energex, the culture and skill sets of every network business in Australia still substantially favours network augmentation. This means that network businesses are likely to both under-invest in distributed generation and impede its installation by other parties.

Therefore, governments need to regulate or direct NSPs to ensure that they pay distributed generators a transparent, location-specific network support payment where

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they reduce or defer expenditure on the grid. The NSW Government owns the NSW-based NSPs, and so could become a national leader in this space.

3.2 Grid connection

In addition the issues of securing payments for network benefits, where co/trigeneration projects need to connect to the grid they need to negotiate with a single NSP that is given monopoly power in relation to grid connection.

Co/trigeneration systems in urban settings are normally directly or indirectly connected to the network, even if electricity is not being exported using the grid and the grid is not being used as a back-up for the system. However, it is widely accepted that co/trigeneration system owners face significant barriers in connecting to the grid in a timely manner and paying a fair price for connection.

The Council agrees that there are genuine technical issues and costs for connecting cogeneration units to the grid, particularly where fault levels need to be addressed. As a result, the NSP and co/trigeneration proponent need to work together to determine the issues, costs and benefits of grid-connection. However, as discussed above, the incentive structure, skill-set and culture of many NSPs discourages them from actively supporting grid connection.

The monopoly power of NSPs is a *prima facie* case for regulating the cogeneration connection process. While some NSPs have been reasonable in negotiating connection to the grid, the unjustifiable behaviour of other distribution businesses makes it clear that oversight is essential. The current process for connecting a cogeneration unit to the grid is extremely arbitrary, and can include:

- Uncertain and often completely unjustifiable timeframes for negotiating a connection agreement.
- Uncertain and often unjustifiable costs for studies to determine the costs of connecting to the grid.
- Uncertain and often unjustifiable costs for connecting to the grid.
- Inequitable rules about who pays for network upgrades if they are required. Currently, the last cogeneration unit that wants to connect to the grid before an upgrade is required to pay the full cost of the upgrade, despite the fact that other units may connect before or after the upgrade. In contrast, the costs of upgrades to the grid to address rising energy demand are generally smeared across all energy users.

The Australian Energy Market Commission is currently completing a Rule Change to provide clearer timelines around the connection process. However, there will still be opportunities for NSPs to introduce inappropriate delays, and the Rule Change will not provide guidance on the cost of connection studies, connection costs or augmentation costs.

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3.3 Recommendations for network issues

The Energy Efficiency Council recommends that the NSW Government:

- Endorse a number of changes to the NEM rules and regulations align NSP incentives with consumers' interests and ensure that NSPs have the appropriate incentives to support demand-side activities, including decoupling NSP profits from electricity throughput (kWh) and reforming electricity charges. This would provide NSP-owners (the NSW Government) with more security of income and deliver in the long-term interests of consumers.

  These changes would need to be pursued through the Standing Council on Energy and Resources (SCER) and/or the Council of Australian Governments (COAG).

- Establish a NSW distributed generation ombudsman to oversee the operations of state-owned NSP, including:
    - Facilitating timely grid-connection of co/trigeneration systems;
    - Determining appropriate and fair charges for network connection and use, including any us of public networks as virtual private-wire systems;
    - Providing accurate and up-to-date maps that indicate the value of load reduction in specific locations in the grid (as required by the AER), to facilitate grid-connection and enable 'competition' in network services;
    - Ensuring that NSPs providing fair and transparent payments for network support services, such as the deferral of network augmentation;
    - Improving the transparency and sufficiency of the regulatory and planning process to ensure that NSPs investment decisions are efficient.
    - Addressing critical skill and culture issues in networks; and
    - Augmenting the grid to facilitate the connection of distributed generation where it is cost-effective to do so, from a consumer perspective.
- Opening up the market for demand-side activities that offset network investment to competition. At a minimum, this means that:
    - NSPs should be required to provide robust data on upcoming network constraints; and
    - Contracts to address constraints as contestable service should be put out to tender, with NSPs' ring-fenced businesses allowed to bid for that work on a level playing field.

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3.4 Multiple retailers and private wire rules

The economics of district energy systems require coordination with multiple parties. Heating and/or cooling services need to be sold to a geographically specific set of customers using purpose-built distribution infrastructure. This means that system owners need to be confident that a certain number of energy users will have long-term demand for heating and cooling services in order to justify investment in both the central plant and the distribution infrastructure. For district cogeneration and trigeneration systems, generators need to have confidence about demand for both electricity and heating/cooling use.

As a result, in a number of overseas co/trigeneration schemes, governments have introduced requirements for local energy users to connect into the schemes, to provide the security of load to justify the development of the schemes.

The Energy Efficiency Council is not seeking the establishment of such a mandate in Australia. However, the current regulatory system in Australia significantly reduces the confidence around demand for heating, cooling and electricity demand.

In particular, the requirement for competition between electricity retailers in certain types of development actually diminishes options for energy consumers. While the Council approves of the intent of these regulations to provide consumer protection, in practice these regulations mandate a role for a monopoly NSPs. Given that over 50 per cent of electricity bills are currently network costs, a much higher proportion than the proportion of the bill that is driven by retailers, this requirement actually increases the proportion of consumers' bills that is directed by a monopoly.

Furthermore, as noted above, in some respects co/trigeneration compete with network investment, so mandating the involvement of an NSP both reduces competition in electricity supply and significantly undermines the benefits of co/trigeneration systems.

The Council recommends that the overarching goal of consumer protection could be better met using the approach recently adopted in the UK, which allows co/trigeneration systems to retail directly to consumers, without the need for multiple retailers, as long as the prices that are charged are within the bounds of the prices charged by nearby energy companies.

Where co/trigenerators can sell directly to consumers using the public network, they should also be allowed to use the public network as virtual private-wire systems with appropriate charges. The network costs of supplying distributed generation to consumers are substantially lower than the costs for centralised generation, and private wire rules would allow distributed generators to pass on these lower costs to consumers. Furthermore, this would allow distributed generators to retail directly to consumers, allowing them to capture some additional benefits. This would not allow distributed generators to capture the full benefits of the distributed generation system, but it would allow them to capture more than they currently can.

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3.5 Early mover disadvantage

Co/trigeneration systems and district energy schemes face multiple barriers in Australia. While sections 3.1 to 3.4 highlight a number of solutions to these issues, it will take several years to address these many issues.

Therefore, the Council recommends a transitional scheme that provides financial support for the first 3,000 MW of cogeneration in Australia. While this would be less reflective of benefits than a location-specific network support payment, it would be significantly more cost-reflective than no payment at all. As a result, this type of system would increase the overall economic efficiency of the NEM. In advance of a national system, NSW could rapidly introduce interim financial support for cogeneration through the Energy Savings Scheme. The incentive should only be provided to cogeneration that:

- Exceeds a minimum threshold of efficiency (e.g. 50 per cent), with additional incentives for cogeneration units as their efficiency increases beyond this threshold.
- Is below 30 MW and runs for more than 2,000 hours per year.

3.6 Nitrogen oxide emission standards

The vast majority of nitrogen oxide (NOx) emissions in Sydney come from motor vehicles and industry. However, the NSW Environment Protection Agency has focussed its efforts on cogeneration and trigeneration, which is currently a negligible source of NOx pollution. The Environment Protection Agency introduced requirements for projects in Sydney and the Illawarra to be either NOx neutral or required to achieve Best Available Technique (BAT) emission performance, which effectively mandates the use of very expensive equipment that affects the economics of cogeneration and trigeneration[3].

The Council supports the general principle of emission standards for NOx where they are proportionate and reasonable. However, the Environment Protection Agency's current approach is far more stringent than requirements in many European cities and other developed countries. Therefore, we recommend that the NSW Government review the current NOx requirements to determine if they are both proportionate and the most effective way to address NOx emissions, or whether approaches that focus on the largest sources of NOx emissions would be more appropriate.

[3] http://www.epa.nsw.gov.au/air/cogentrigen.htm

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4. TOR ii - The operation of cogeneration / trigeneration technology in other jurisdictions and the applicability of the technology to New South Wales

Cogeneration technology is already used in NSW, interstate and overseas in a variety of contexts, including commercial buildings, industrial sites, manufacturing and food processing. Examples in Australia include the cogeneration plant at the Qenos Olefins plant in Altona, Victoria and the recently-commissioned trigeneration plant at the Qantas jetbase and catering site in Sydney.

However, the use of cogeneration and trigeneration technology in Australia and NSW is significantly lower than other jurisdictions. While NSW's temperate climate does affect the costs and benefits of cogeneration and trigeneration technologies in certain applications, in many applications this has little or no impact, and the main barrier to cogeneration and trigeneration is regulatory.

In particular, there are very few commercial or multi-user district energy schemes in Australia, including systems without co/trigeneration. While there are a number of non-cogeneration district energy schemes in institutional settings, such as James Cook University, there are very few multi-user schemes, despite their extensive use overseas in both temperate and tropical climates.

Given that almost all commercial buildings in Australia have on-site heating and cooling systems, the absence of any multi-user district energy schemes is remarkable. This suggests that the regulatory environment is the major barrier to district energy schemes, irrespective of whether they involve cogeneration technologies.

5. TOR iii - The economic viability of cogeneration / trigeneration technology in New South Wales including the impact of future gas prices on the running costs of cogeneration / trigeneration systems

The Energy Efficiency Council starts from the position that NSW's energy markets should create an investment environment that encourages an economically efficient mix of energy-supply and energy-use technologies. There are currently a number of issues that distort this investment environment, reducing the uptake of cogeneration and trigeneration.

Our view is that, once these barriers are addressed, the market will consider issues such as the price of gas and other fuels in determining whether cogeneration will be installed at a particular location or not. If gas prices rise significantly it could have negative impacts that are far beyond the scope of this inquiry, including impacts on households that use gas for heating and cooking, and sectors such as plastics and food manufacturing.

6. TOR iv - Any financial, public safety and/or other risks to prospective cogeneration / trigeneration customers

The financial, public safety and other risks of cogeneration and trigeneration systems are minimal if appropriate risk management steps are taken. Cogeneration and trigeneration systems have been used extensively in developed and developing countries for many decades without serious incident. It is notable that, after recent storms in the US, facilities with district energy schemes were amongst the few buildings with power.

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7. TOR v - Any supply security and reliability issues associated with cogeneration / trigeneration, especially for residential customers of these systems

See Section 6.

8. TOR vi - The ability of existing regulatory arrangements at the New South Wales and national level to address issues which may be identified

The Energy Efficiency Council believes that the existing regulatory arrangements are ineffective, and recommend a number of changes on page 2 of this submission. In particular, the Council recommends the formation of a NSW Distributed Generation ombudsman.

Suite 2, 490 Spencer Street, West Melbourne VIC 3205 ABRN 136 469 291 ABN 63 136 469 291

Appendix A Terms of Reference

Inquiry into cogeneration and trigeneration in NSW Terms of Reference

That the Committee inquire into and report on the installation and use of cogeneration/trigeneration technology in New South Wales and in particular:

i. whether the current regulatory framework can adequately support the utilisation of cogeneration / trigeneration precinct developments;

ii. the operation of cogeneration / trigeneration technology in other jurisdictions and the applicability of the technology to New South Wales;

iii. the economic viability of cogeneration / trigeneration technology in New South Wales including the impact of future gas prices on the running costs of cogeneration / trigeneration systems;

iv. any financial, public safety and/or other risks to prospective cogeneration / trigeneration customers;

v. any supply security and reliability issues associated with cogeneration / trigeneration, especially for residential customers of these systems;

vi. the ability of existing regulatory arrangements at the New South Wales and national level to address issues which may be identified;

vii. any other relevant matters.

Suite 2, 490 Spencer Street, West Melbourne VIC 3205 ABRN 136 469 291 ABN 63 136 469 291