CITY OF SYDNEY

APPROACH TO RETAIL EXEMPTIONS ISSUES PAPER SUBMISSION TO THE AUSTRALIAN ENERGY REGULATOR

1 Introduction

Background

In developing its vision for the future, Sustainable Sydney 2030, the City spent more than a year consulting its community and a consensus emerged on the way to make Sydney a greener, more global and connected city.

Some 97 per cent of people wanted the City to take urgent action to tackle climate change, so the City made sustainability the overarching theme. A major objective of Sustainable Sydney 2030 is to position Sydney as one of the world's leading green cities in the race to counter climate change. To achieve this, the City has committed to reducing greenhouse gas emissions by 70 per cent by 2030 from 2006 levels.

Eighty per cent of the city's greenhouse gas emissions come from centralised power generation, primarily burning coal, which is inefficient, unnecessarily polluting, a waste of non-renewable resources and the primary cause of climate change. Key in the City's objective to tackle climate change is to supply 100 per cent of the city's electricity from local generating plants through a combination of energy efficiency and low- or zero-carbon decentralised energy. These local generating plants are known as trigeneration because they provide combined cooling, heat and power and can use natural gas or renewable gases for fuel.

The emission reduction targets will be delivered through what Sustainable Sydney 2030 calls "Green Transformers". These are a combination of green infrastructure, primarily trigeneration, but also waste and recycled water infrastructure. When combined with demand reduction, trigeneration will provide 70 per cent of the electricity needs of the city in 2030 and reduce greenhouse intensity by about 35 per cent. This will need at least 330 megawatts of trigeneration to be delivered by 2030. The balance of energy needs will come from zero carbon waste heat from local electricity generation and renewable energy from within and outside the City area.

Green Infrastructure Plan

Developing the Green Infrastructure Plan and putting it into action is happening on two levels – for the city as a whole and by the City of Sydney leading the way and installing local generation projects in its own operations. This “show by doing” principle has been previously adopted in Woking and London and demonstrates that if the public sector leads, others will follow.

At the first level, contracts are already under way for the Decentralised Energy Trigeneration, Renewable Energy and Alternative Waste Treatment Master Plans. The Decentralised Water Master Plan is currently out to tender and the Automated Waste Collection Master Plan will follow later this year. These will complete the city-wide Green Infrastructure Plan which will be embedded into the City’s master plan and operations.

Ways of delivering the Green Infrastructure Plan will follow, with particular focus on how to introduce trigeneration. An integrated approach has been taken for the city-wide green infrastructure. This enables, for example, city-wide trigeneration, non-potable recycled water and automated waste collection to use the same networks and stations - renewable gases and non-potable water can be recovered from the waste and used on the city’s green infrastructure.

At the second level, the City has already made available an $18 million budget to reduce its CO_2 emissions by 48 per cent by 2012. This is the first step towards the City’s own 70 per cent reduction in CO_2 emissions target for its buildings and operations. This has led to a series of building energy-efficiency retrofit and renewable energy projects. However, measures such as output performance specifications will be employed to maximise the competition and economics of the projects as well as ensuring the challenging targets are achieved. For example:

- All the City’s properties have been included in the City’s trigeneration tender which also provides options for finance and city-wide public/private joint venture Energy Services Companies (ESCOs). Specifications for the trigeneration systems allow them to be extended beyond individual buildings into precinct-based systems supplying nearby buildings not in City ownership. This would establish the City’s first Low Carbon Zones. A good response was received to requests for expressions of interest, particularly from the major energy players in Australia, and the project will go out to tender shortly.
- All the City’s properties have been included in the City’s building energy and water efficiency retrofit project, which will go out to tender this year.
- Energy-efficient LED lighting will be installed in all 8,500 of the City’s street and public domain lights over the next three years following the trial of 250 LED light columns.

In other measures, a Sydney Better Buildings Partnership is proposed to be set up to reduce the carbon footprint of big commercial and public buildings in the city, and high- level advocacy is under way to find ways of removing the regulatory and institutional barriers to decentralised energy (trigeneration, renewable energy, etc).

Trigeneration

Trigeneration helps both delay and reduce the need for new investment in electricity infrastructure. It achieves this because the waste heat from local electricity generating plants can be used (via heat-fired absorption cooling) for air conditioning and refrigeration. This replaces electric-powered air conditioning and refrigeration which are a primary cause of electricity demand growth, particularly during the summer peak energy load periods.

For example, the Sustainable Sydney 2030 trigeneration target of 330 megawatts would reduce electricity peak demand by up to a third if all trigeneration waste heat were converted to heat-fired absorption cooling – as well as supplying 70 per cent of the City's electricity needs from local generation. Similarly, there would be a reduction in the winter electricity peak demand when trigeneration waste heat replaces electric heating and electric reheating in air conditioning units.

Removing the regulatory barriers to decentralised energy (cogeneration, trigeneration, fuel cells and renewable energy) will stimulate the decentralised energy market and make a significant contribution to energy production efficiency and reductions in CO_2 emissions.

Removal of the Regulatory Barriers to Decentralised Energy

There are significant regulatory and institutional barriers to the deployment of distributed generation or decentralised energy. The electricity market was designed for a centralised energy system, not a decentralised one. The consequence of this is to penalise decentralised energy by imposing centralised energy market and administration costs for something that makes little or no use of the big transmission networks. These costs and regulation are out of all proportion to the scale of the generation, distribution and supply and expose decentralised energy developers to the vagaries of vested-interest energy players. The laws of physics dictate that electricity will flow to the nearest load, so wherever decentralised energy is located the generation, distribution and supply will be integrated and will always be very local. It should not be treated as if it were centralised energy.

In the UK, decentralised energy was stimulated by the Electricity (Exemption from the Requirements for a Licence) Order 2001[1] which led to the Woking private wire and other decentralised energy systems. These were class

[1] The Electricity (Class Exemptions from the Requirement for Licence) Order 2001 http://www.hmso.gov.uk/si/si2001/20013270.htm

exemptions, so permission was not required from any of the vested interest energy players, including the distribution network operator, or the regulator – the Office of Gas and Electricity Markets (Ofgem). Compliance with the order was sufficient to implement decentralised energy projects.

The exemption supply limits were 50 megawatts (without Secretary of State approval) or 100 megawatts (with Secretary of State approval) for each generation site over private wires. This enabled significant growth in non-residential supply. However, the exempt limit for home use was only one megawatt (about 1,000 homes) for each generation site with limited exempt aggregated supply over public wires. This enabled the growth of decentralised energy in towns and cities such as Woking and London and led to the enactment of the Electricity Supply Licence Modification 2009[2] or local electricity supplier licensed to retail electricity over the local public wires distribution network based on the 'virtual private wire' over public wires principle.

Because decentralised energy was the key carbon reducer for London (as well as cutting energy costs and helping tackle fuel poverty), the Mayor of London and the London Climate Change Agency (of which the Mayor was chair and Allan Jones CEO) decided to do something about this through negotiation with government.

This resulted in the setting up of the Ofgem/DTI/BERR Distributed Generation Working Group (on which Allan Jones sat) to investigate and remove the regulatory barriers to distributed generation or decentralised energy. Although the barriers were easily identified, the conundrum for the UK regulator Ofgem (Office of the Gas and Electricity Markets) was how to tackle the problem without upsetting the market approach to supplying electricity to domestic consumers and the protection given to domestic consumers. A compromise was reached leading to the creation of "virtual private wires" over public wires.

If decentralised energy is restricted to using the public wires distribution network and the maximum supply limits removed it can be licensed according to its size and treated as a second competitive (decentralised) energy market. Arrangements can be made for any imports into or exports from transmission networks (which would be minor) via the back-up agreement with grid electricity suppliers similar to the UK. This would allow the decentralised energy developer or ESCO (since more than just electricity would be supplied) to charge its customers competitive retail electricity prices (less the distribution system charges) rather than the much lower wholesale price it would get by selling electricity into the grid. Ofgem enacted the Electricity Supply Licence Modification Order on 19 March 2009 to bring about this second competitive (decentralised) energy market.

[2] Ofgem Distributed Energy – Electricity Supply Licence Modification - 19 March 2009
http://www.ofgem.gov.uk/Sustainability/Environment/Policy/SmallrGens/DistEng

The City's proposal to introduce a new local electricity supplier licence based on the UK's Electricity Supply Licence Modification 2009 formed part of the City's submission to the Prime Minister's Task Group on Energy Efficiency on 30 April 2010 which also forms part of this submission.

An attachment to this submission entitled *Removal of Barriers to Trigeneration* forms part of the City's submission for consideration by the Task Group. It contains details of the Woking and London models and the proposed Sydney model, together with the details of the regulatory change to remove the barriers to decentralised energy. It also includes the Institute for Sustainable Futures on the Issues and Barriers in Developing Trigeneration in Sydney – Working Group Discussion Paper and Action Plan.

This submission to the Australian Energy Regulator is based on the City's experience of the practical measures it is taking to deliver deep cuts in CO_2 emissions that go well beyond Australia's present commitment to reduce carbon pollution. This experience can be applied to any community in Australia or indeed the world.

3 Overview of exemptions

The main focus for jurisdictional exemptions regimes should not just be for energy 'reselling' or 'onselling' and the opportunity for class exemptions should be taken to remove the regulatory barriers to decentralised energy.

3.1 The AER's role under the proposed Retail Law and Retail Rules

3.1.3 Exempt seller and customer related factors

Both the exempt seller and customer related factors should also include:

- Whether the purpose of the energy supply is to reduce greenhouse gas emissions.

3.1.4 AER exempt selling functions

Issuing retail exemptions

Deemed exemptions should apply to all forms of low or zero carbon decentralised energy electricity supply.

Developing Exempt Selling Guidelines

The Exempt Selling Guidelines should also provide for energy supply whose purpose is to reduce greenhouse gas emissions.

Maintaining and publishing a Public Register

The public register should also include details of greenhouse gas emission savings from local decentralised energy networks against the National Greenhouse Accounts (NGA) Factors.

3.2 Distinction between retail exemptions and network exemptions

Separating the physical act of distributing electricity or gas from retail activities is too onerous on exempt generators, distributors and suppliers and should only be required where 3rd party suppliers make use of the private wire or gas networks to supply customers connected to the private wire or gas networks.

Developing Exempt Selling Guidelines

Exempt Selling Guidelines should include guidance on the calculation of greenhouse gas emissions savings for local decentralised energy networks.

Maintaining and publishing a Public Register

It would be helpful and more technically correct to differentiate between the national grid transmission network and the local distribution network, particularly for decentralised energy.

The public register should also include details of greenhouse gas emission savings from local decentralised energy networks against the National Greenhouse Accounts (NGA) Factors.

For local decentralised energy generators there should not be a requirement for separate exemptions for electricity distribution and retailing activities as one is a function of the other and adds unnecessary regulatory burdens to decentralised energy.

4 Issues for discussion

4.1 Apparent growth in onselling

The apparent growth in onselling is not problematic. With electricity network charges now forming 50% of retail electricity prices which are due to rise to 60% by 2013 the current electricity market is no longer competitive with the majority of retail prices just for transporting and distributing electrons from inefficient and polluting remote coal fired power stations and the AER should not interfere in local energy arrangements where the customer benefits from these avoided charges.

Inefficient and polluting centralised energy should not be perversely propped up by government regulation to the detriment of more competitive and cleaner decentralised energy whose carbon reducing benefits are wanted by customers from an ethical point of view as well as future proofing against a future carbon price or emissions trading scheme.

The energy markets have changed and it is time for the AER to recognise this and take a light handed approach to comparatively small scale decentralised energy systems.

As regards a decentralised energy provider or Energy Services Company (ESCO) becoming insolvent the AER could require that connection and supply agreements include a clause on customer 'step-in rights' in addition to Retailer of Last Resort providing customers with the opportunity to procure another decentralised energy provider or ESCO before making use of Retailer of Last Resort.

4.2 Policy principles

4.2.1 Regulatory arrangements for exempt sellers

It is appropriate for the AER to impose no conditions on large customers of exempt sellers, particularly for decentralised energy systems, since imposing conditions would defeat the point of exemptions by imposing unnecessary regulatory burdens on comparatively small scale systems.

Enabling large customers to choose their own retailer could be afforded by 3rd party access over private wire or gas networks.

4.2.2 Access to retailer of choice

The issue of off grid networks can be overcome by removing the onerous regulatory burdens on small scale decentralised energy systems and incentivising connection to the local public wires distribution network without having to be a participant in the National Electricity Market which forces decentralised energy to go 'off grid' in the first place.

With the regulatory barriers to decentralised energy removed similar to the UK and private wire networks connected to the local public wires distribution network customer choice can be afforded through 3rd party access over private wires. With the regulatory barriers to decentralised energy removed the decentralised energy provider or ESCO should be able to out compete any centralised energy retailer.

4.2.3 Customer protections

RoLR protections

As regards a decentralised energy provider or Energy Services Company (ESCO) becoming insolvent the AER could require that connection and supply agreements include a clause on customer 'step-in rights' in addition to Retailer of Last Resort providing customers with the opportunity to procure another decentralised energy provider or ESCO before making use of Retailer of Last Resort.

Internal complaints handling by exempt sellers

Exempt sellers should not be required to base their dispute resolution processes on Australian Standard AS ISO 10002-2006. Common sense should prevail by not adding unnecessary regulatory burdens to small scale decentralised energy providers or ESCOs.

4.3 Exempt seller related factors

The City does not agree with the AER that exemptions should only to those selling energy 'incidental' to that business. Modern electricity regulation should provide for class exemptions for small scale decentralised energy electricity providers or ESCOs similar to the UK. There is no justifiable reason why small scale decentralised energy providers or ESCOs should be forced into the National Electricity Market and associated costs for a market that does not recognise decentralised energy. The laws of physics dictates that electricity will always flow to the nearest load so decentralised electricity will make little or no use of distribution networks and no use at all of transmission networks.

Decentralised energy is as different to centralised energy as mobile telephones or the internet is as different to landline telephones and the AER should recognise that this by allowing the two markets to coexist with each other by appropriate 'light handed' regulation and exemptions similar to the UK.

4.3.2 Exempt seller's circumstances

Section 501 of the proposed Retail Law is wrong to assume that a person who holds a retailer authorisation will purchase electricity from the wholesale market. This is a classic regulatory barrier to low and zero carbon decentralised energy which is not big enough to benefit from the National Electricity Market to offset the associated costs of participation and regulation and the AER should recognise this and provide for both class exemptions over private wire networks connected the public wires distribution network and for local electricity generators licensed to retail electricity over the local public wires distribution network similar to the UK.

4.3.3 Profit intention of the exempt seller

See response to 4.3.2 Exempt seller's circumstances.

4.3.4 The 'significance' of the exempt seller's activities

See response to 4.3.2 Exempt seller's circumstances.

4.3.5 Whether an exemption would provide appropriate governance of the exempt seller

See response to 4.3.2 Exempt seller's circumstances.

4.3.6 The cost of obtaining a retailer's authorisation compared to the benefits to the exempt seller's customers

See response to 4.3.2 Exempt seller's circumstances.

4.3.7 Any other relevant exempt seller related matter

See response to 4.3.2 Exempt seller's circumstances.

Treatment of off-grid supply arrangements

See response to 4.2.2 Access to retailer of choice. It is not appropriate for the AER to require energy suppliers in off grid networks to seek individual exemptions or impose conditions on them. They should concentrate on removing the regulatory barriers that forces decentralised energy to go 'off grid' in the first place.

4.4 Customer related factors

See responses from 1 to 4.3, inclusive. The AER should not add any other customer related factors to those outlined in the Law and those discussed in section 4.2.3 to avoid adding any more onerous regulatory burdens to an already over regulated area.

5 Proposed Exemptions

5.1 Deemed class exemptions and Registrable class exemptions

See responses from 1 to 4.4, inclusive. The City does not agree with the AER's registration threshold of 25 premises with a single site as this would be adding more onerous regulatory burdens to an already over regulated area.

5.2 Class exemption categories

In addition to the class and other exemptions set out additional classes of exemption should be included similar to the class exemptions as set in the Electricity (Exemption from the Requirements for a Licence) Order 2001.

Attachment 1 – Draft determination

See responses from 1 to 5.2, inclusive. Additional classes of exemption should be included similar to the class exemptions as set in the Electricity (Exemption from the Requirements for a Licence) Order 2001.

Allan Jones MBE
Chief Development Officer, Energy and Climate Change
27 July 2010

REMOVAL OF THE BARRIERS TO TRIGENERATION

1.0 Introduction

1.1 This briefing provides an update on the City's actions to progress the implementation of large scale trigeneration in the City of Sydney and to provide guidance on the implementation of trigeneration projects in the City in the meantime.

2.0 Concepts and Principles of the City's Decentralised Energy Master Plan

2.1 Sustainable Sydney 2030 sets challenging targets, not least the 70% reduction in CO_2 emissions and $330MW_e$ of trigeneration delivering 70% of the City's electricity requirement by 2030. Sustainable Sydney 2030 established the 'what' phase and the suite of decentralised energy master plans, of which the Decentralised Energy Master Plan Part A - CCHP is the primary part, will establish the 'how' phase to deliver the Sustainable Sydney 2030 targets. The next step will be the practical 'delivery' or implementation phase which will need to fit within the decentralised energy master plans.

2.2 The Decentralised Energy Master Plan Part A seeks to maximize the reduction of CO_2 emissions and generate at least 70% of its annual electricity requirement from CCHP or trigeneration. The City's own CCHP or trigeneration project will seek to generate more electricity than this, ie, as much electricity as possible from trigeneration, cogeneration, quadgeneration (fuel cells) and renewable energy to or above 100% of the City's property portfolio electricity requirement to maximize the delivery of the Sustainable Sydney 2030 targets and provide local security of supply.

2.3 This means that decentralised energy CCHP or trigeneration should use modular large scale high electrical efficiency CHP plant such as reciprocating engine CHP with heat fired absorption cooling and not use electric air conditioning, heat pumps or any other similar plant that consumes electricity or competes with the decentralised energy plant. This is different to the experience in New South Wales to date which is based on small scale CCHP for stand-alone buildings rather than large scale CCHP for a group of buildings or Low Carbon Zones within the framework of a city-wide CCHP or trigeneration scheme.

2.4 High electrical efficiency plant such as reciprocating engine CHP will require the least number of decentralised energy stations to deliver the City's CCHP or trigeneration targets. Low electrical efficiency CHP plant should not be used. Large scale mixed community decentralised energy systems or Low Carbon Zones should also seek to deliver up to or more than 100% of the Low Carbon Zone's energy requirements, enabling island generation or local security of supply to be afforded.

2.5 It is important that these concepts and principles are understood and applied as a myriad of small scale decentralised energy systems will never deliver the City's CCHP targets. Small scale CCHP may form part of early demonstration or 'show by doing' or phased projects (as in the case of the City's CCHP project) but these must also be designed to operate within a modularised large scale decentralised energy system.

3.0 The City's Trigeneration Project

3.1 The general principles for the City's CCHP or trigeneration project are the same as for the City's Decentralised Energy Master Plan – CCHP and can be summarised, as follows:-

CCHP Design – The CCHP or CHP system should be designed using an approved CHP software tool city-wide district energy such as energyPRO[1].

Good Quality CHP – The CCHP or CHP system should be designed and operated to achieve the 'Good Quality CHP' standard as set out in the UK CHPQA programme[2].

CCHP Alternative Fuels – The CCHP or CHP gas engine system should be able to be fuelled by natural gas now and by renewable gases to take advantage of renewable gases derived from waste and biomass in the future.

Thermal Storage – Large scale thermal storage should be incorporated into the design to optimise the CCHP or CHP system.

Back Up Boilers – Gas fired back up boilers should be sized to peak thermal energy (heating and cooling) capacity.

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[1] EMD energyPro www.emd.dk/energyPRO/Frontpage
[2] UK Department of Energy & Climate Change 'Quality Assurance for Combined Heat and Power' www.chpqa.com

Heat Fired Absorption Cooling – Heat fired absorption cooling should be used in place of electric cooling to maximise the efficient capacity of the CCHP or trigeneration system.

Low NOx CHP Plant – Low NOx CHP plant should be used to comply with the Department of Energy & Climate Change NOx Policy for Cogeneration.

Export Electricity – Advantage should be taken of exporting surplus electricity into the local distribution network, not for sale to a licensed supplier, but to other City buildings or consumers, including other CCHP sites, under an enabling agreement for exempt supplier operation or 'virtual private wire' principle over the local public wires distribution network.

Low Carbon Zones – Every opportunity should be taken to utilise the City's cogeneration/trigeneration projects to connect nearby buildings to and to act as a catalyst for the development of Low Carbon Zones. This will require a modular approach to projects, wherever practicable.

Decentralised Energy Master Plan – CCHP – All City cogeneration/ trigeneration projects should coordinate with and take account of the City's Decentralised Energy Master Plan – CCHP.

Design, Build and Operate or ESCO Business Model – The City's trigeneration project is to be procured by the design, build, operate and maintain or Energy Services Company (ESCO) business model. The procurement also provides for the financing and the establishment of a city-wide ESCO options. The City's multi-site CCHP or trigeneration project seeks to reduce the design, build, operation and maintenance costs as well as enabling the trading of surplus electricity between sites across the local public wires distribution network (not the national grid) and to provide the opportunity to establish a city-wide ESCO to deliver the precinct based trigeneration systems or Low Carbon Zones.

4.0 Operational and Electricity Trading

4.1 Due to the nature and profiles of the heating and heat fired absorption cooling demands at the City's main property portfolio the CCHP system should be able to generate surplus power which will be utilised to supply export electricity to the City's CCHP (standby and top up electricity) and remaining non CCHP sites (supply electricity) or surplus export power from other CHP/renewable energy systems, under a proposed enabling agreement for with Energy Australia.

4.2 The surplus export power from the City's CCHP systems shall be facilitated by half hourly import/export metering.

5.0 Barriers to Trigeneration

5.1 Barriers do exist to the large scale implementation of trigeneration and other forms of decentralised energy in New South Wales, particularly with regard to electricity regulation which was designed for centralised energy not decentralised energy. However, the electricity regulatory regime in New South Wales is not dissimilar to the electricity regulatory regime in the UK. The regulatory barriers to decentralised energy in the UK were overcome initially by class exemptions and private wire networks (the Woking model) and later by the 'virtual private wire' over public wires concept through the application of a simple supply license modification (the London model).

5.2 The application of the Woking and London decentralised energy models and the proposed implementation of the Sydney decentralised energy model are as detailed in Appendix No.1.

5.3 In order to progress the Sydney decentralised energy model the City commissioned the Institute for Sustainable Futures to identify the issues and barriers in developing trigeneration in Sydney and established the Trigeneration Working Group to contribute towards the draft discussion paper and draft action plan. The final version of the Trigeneration Working Group discussion paper and action plan is attached as Appendix 2.

Allan Jones MBE
Chief Development Officer, Energy and Climate Change
2 March 2010

Appendix No.1

CITY OF SYDNEY PROPERTY PORTFOLIO – DECENTRALISED ENERGY STRATEGIC DIRECTION

1.0 Background

1.1 The City's Aquatic Centres, Town Hall Precinct – Phase 1, Customs House and potentially other trigeneration projects are to be procured as part of a single contract since the technical solution will be similar and will enable import/export electricity trading across the public wires distribution network. The City's Chief Development Officer, Energy and Climate Change had implemented a similar project across 81 sites in Woking under an enabling agreement for exempt supplier operation.

1.2 The City is working with Energy Australia in developing the Town Hall Precinct and other City trigeneration projects to gain exemptions to enable the City to supply itself via the 'virtual private wire' over public wires distribution network concept. This approach will also tease out any regulatory barriers that will need to be overcome or removed to facilitate decentralised electricity trading over the local public wires distribution network.

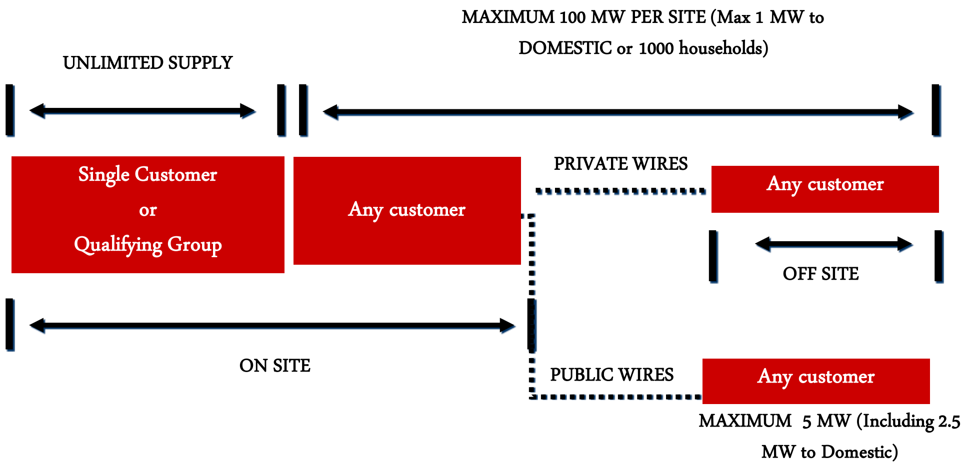
2.0 The Woking Model

2.1 The Woking model took advantage of the UK Electricity (Class Exemptions from the Requirement for a Licence) Order 2001[3] which enabled Woking Borough Council to generate, distribute and supply electricity directly to itself and to other consumers over private wire networks. The 2001 Order removed the regulatory barriers to generating and supplying electricity to non domestic customers but limited the generation and supply of electricity to domestic customers to $1MW_e$ (about 1,000 households) per generation site, even though the retail cost of decentralised energy was lower than centralised energy. This barrier was overcome in Woking by ensuring no more than 1,000 households were connected to cogeneration, trigeneration or renewable energy sites. See Figure 1.

[3] The Electricity (Class Exemptions from the Requirement for Licence) Order 2001 http://www.hmso.gov.uk/si/si2001/20013270.htm

Figure 1: Supply Exemptions Order 2001

Generation: per site max 50 MW, or 100 MW with secretary of State Approval



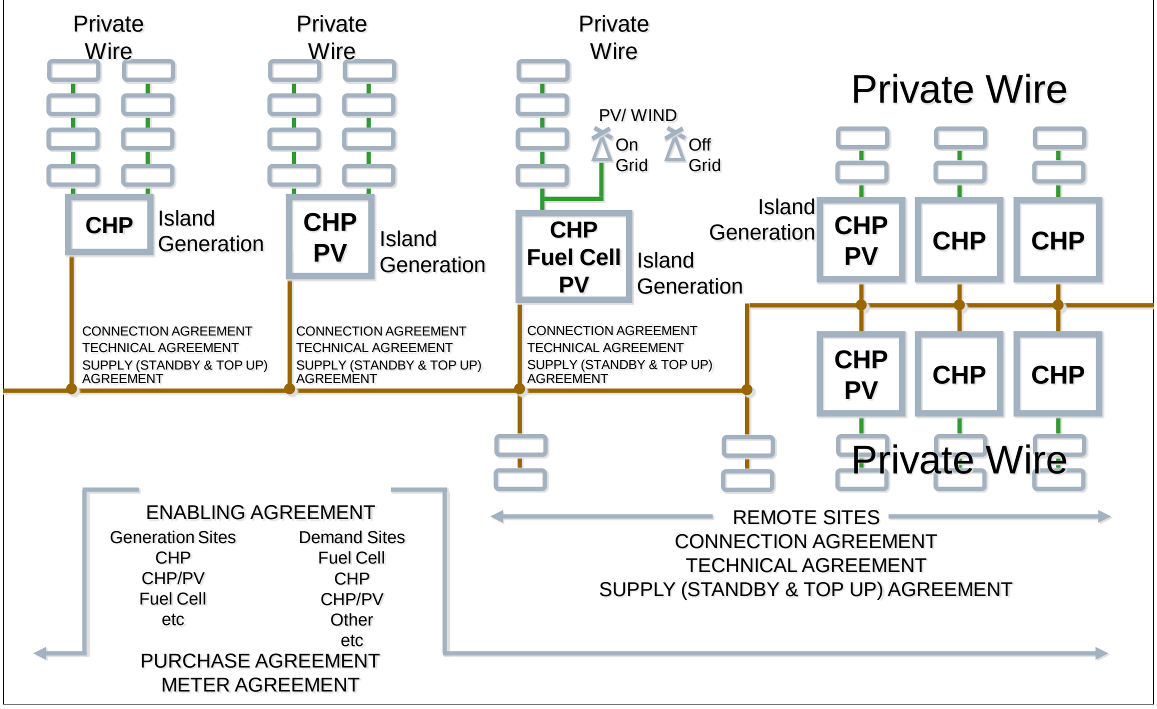
Source: Based on Department of Trade and Industry, Electricity Directorate

2.2 All cogeneration and trigeneration systems were connected to the local public wires distribution network and incorporated thermal storage and back-up gas fired boilers to provide continuous electricity, heating and cooling services with three levels of energy resilience.

2.3 With the establishment of Thameswey Ltd and Thameswey Energy Ltd (the Council's public/private joint venture Energy Services Company or ESCO) the Council sought to significantly increase decentralised energy (including cogeneration, trigeneration and renewable energy) in the Borough and further reduce CO_{2e} emissions beyond what it could deliver on its own using mainly public sector finance to delivering its decentralised energy and climate change targets at a far greater capacity and accelerated rate using public/private sector resources and mainly private sector finance.

2.4 The mechanism that was employed to implement this was an enabling agreement for exempt supplier operation developed jointly with Seeboard (subsequently taken over by EDF Energy), the region's public wires distribution network operator or DNO. The agreement brought together all 81 decentralised energy sites into a common local electricity trading system balancing imports and exports between the sites across the public wires distribution network. In other words, any standby and top up electricity required by one generating site or group of generating sites was supplied by surplus electricity exports from another generating site or group of generating sites instead of each generating site operating in isolation to other generation sites with their own individual standby and top up and export agreements. Any imports from or exports to the national grid was grandfathered by Seeboard/EDF Energy as part of the agreement. See Figure 2.

Figure 2: Woking Energy Internet



2.5 The local electricity trading was managed in practice by using the same UKDCS system that provides the UK's electricity half-hourly data collection and aggregation service for centralised energy but assigning both generation and supply to the same meter location (import and export), thereby providing its own standby and top up/export arrangements as a group of decentralised energy systems.

2.6 The House of Lords Science and Technology Committee Inquiry into the Practicalities of Renewable Energy identified the principle of the Energy Internet[4] after its visit to view the Woking decentralised energy (distributed energy) system.

2.7 The buildings supplied by the decentralised energy system were controlled by an advanced building energy management system (BEMS) with outstations for each decentralised energy site which not only monitored and controlled the building energy services (heating, cooling and electricity) but also read the generating stations electricity and gas meters and the consumers heating, cooling and electricity meters. The BEMS had a weather station located at the Civic Offices

[4] House of Lords Science and Technology Committee Inquiry into Renewable Energy: Practicalities Volume 1 Report Appendix 11
http://www.publications.parliament.uk/pa/ld200304/ldselect/ldsctech/126/12623.htm

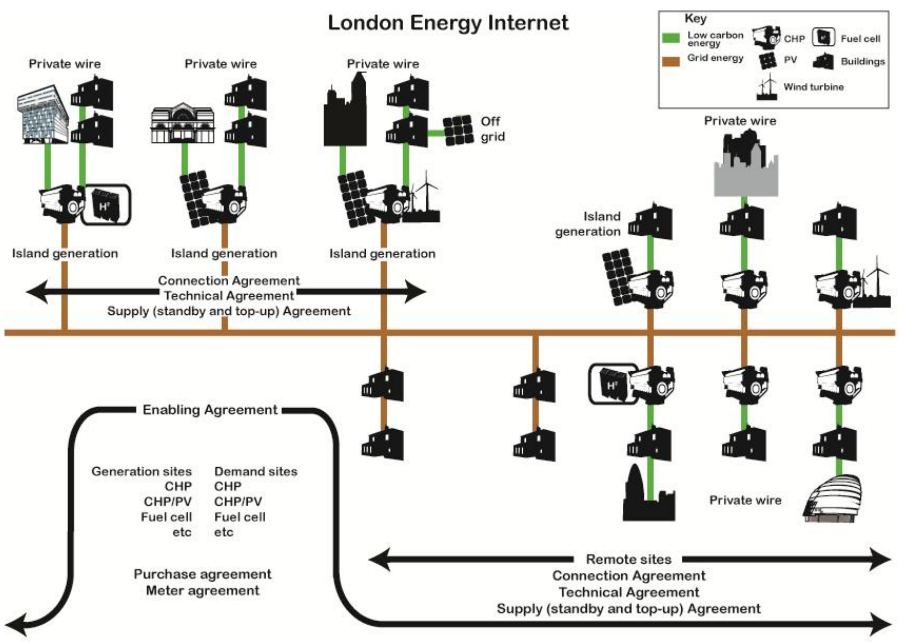
measuring not only temperature but also wind speed and outside lighting levels enabling advanced algorithms to be developed for the smart control not only of electrical energy but also thermal energy (heating and cooling).

2.8 For example, this enabled the Woking Town Centre trigeneration stations to be switched off at midnight but still able to supply heat fired absorption cooling to nightclubs operating until the early hours of the morning from thermal storage whose heat was generated and stored from electricity generation earlier in the day. Electricity supplied to Woking Town Centre overnight came from surplus electricity generated in the Council's leisure and swimming pool complexes where thermal energy was required to maintain the thermal energy and humidity balance of the buildings but much less electricity was required during closing hours. Similar reverse energy profiles were matched across the Borough through the selection of different energy generating plant and energy demand profiles to minimise or eliminate the import of electricity from or export to the national grid.

3.0 The London Model

3.1 The London model also took advantage of the UK Electricity (Class Exemptions from the Requirement for a Licence) Order 2001 which enabled the London Climate Change Agency (LCCA) to generate, distribute and supply electricity directly to itself and to other consumers over private wire networks. See Figure 3.

Figure 3: London Energy Internet



3.2 With the establishment of the London ESCO Ltd (the LCCA's public/private joint venture Energy Services Company or ESCO) the LCCA sought to significantly increase decentralised energy (including cogeneration, trigeneration and renewable energy) in London (including projects outside London, but for London, eg, Thames Gateway, Thames Barrage, renewable energy, etc) and further reduce CO_{2e} emissions beyond what it could deliver on its own using mainly public sector finance to delivering its decentralised energy and climate change targets at a far greater capacity and accelerated rate using public/private sector resources and mainly private sector finance.

3.3 However, unlike Woking (who had a Danish joint venture private sector partner) the London ESCO private sector joint venture partner was EDF Energy, one of the largest vertically integrated generation, distribution and supply companies in the UK who also owned the London, Eastern and South Eastern distribution networks. This enabled a review and reassessment of the financial models for both private wire and public wire networks and even a hybrid of the two, particularly where island generation was required.

3.4 Although the exempt licensing supply regime worked well for non residential buildings and for Woking with a population of 100,000 by ensuring that no more than 1,000 households were connected to each decentralised energy system this was not really practical for a city like London with a population of 7.4 million. For example, the Thamesmead housing estate contains 25,000 households plus commercial and industrial sites which would require at least 25 x $1MW_e$ small scale decentralised energy stations for housing alone when 3 or 4 large scale decentralised energy stations would be the sensible technical and economic solution.

3.5 Following lobbying by the LCCA and political lobbying by the Mayor of London the UK Government, through the Department of Trade and Industry (DTI), published a call for evidence for the review of barriers and incentives to distributed electricity generation, including combined heat and power in November 2006[5]. This resulted in the establishment of the Office of Electricity and Gas Markets (Ofgem)/DTI Distributed Energy Working Group[6] in May 2007 to remove the barriers to distributed energy that may exist within the electricity market and the electricity licensing arrangements. The LCCA was a member of the Working Group.

3.6 The Working Group's work culminated in the concept of 'virtual private wire' over public wire networks and the recognition that what was needed to remove the regulatory barrier was a new supply licence to operate over the public wires distribution network rather than the

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[5] DTI Distributed Energy Review Call for Evidence November 2006 http://www.berr.gov.uk/energy/whitepaper/review/implementation/distributed-energy/page35076.html

[6] Ofgem/DTI Distributed Energy Working Group http://www.ofgem.gov.uk/Networks/ElecDist/Policy/DistGen/disenwg

transmission network where most of the costs and barriers to distributed energy existed as the national electricity market was never designed to take into account distributed or decentralised energy only centralised energy. This approach would also maintain residential customers access to the competitive electricity market. Note: This also now applies to private wire networks.

3.7 It was agreed that the best way to deliver a new supply licence to operate over the public wires distribution networks was a simple modification to the existing supply licences to enable local distributed or decentralised energy generators to generate, distribute and supply electricity directly to consumers over public wires distribution networks only without the need to participate in the national centralised electricity market. Any imports or exports traded with the national grid would be grandfathered, ie, managed by parties to the grid balancing and settlement agreement, etc. In other words, the existing licensed utilities would contract with the distributed or decentralised energy generators similar to the enabling agreement for exempt supplier operation developed between Woking Borough Council and Seeboard (now EDF Energy).

3.8 Ofgem enacted the Electricity Supply Licence Modification[7] on 19 March 2009. A secondary and related issue was cost reflective charging for the actual distance travelled by the locally generated electricity over the distribution networks. Under the laws of physics electricity will always flow to the nearest electricity load so the distance travelled was relatively minor when compared with grid electricity. A common cost reflective charging system[8] has been enacted by Ofgem and will come into effect on 1 April 2010.

4.0 The City of Sydney Model

4.1 The City of Sydney model will utilise and take advantage of the knowledge and features of both the Woking and London models but adapted for the City of Sydney environment. The barriers to decentralised energy and the solutions to those barriers are very similar to those encountered in the Woking and London models.

4.2 Therefore, the strategic direction for the City's own trigeneration and renewable energy projects for its own property portfolio will need to follow the foregoing principles by establishing decentralised energy projects specifically designed to trade electricity with each other across the local distribution networks using the 'virtual private wire' concept and to utilise and incorporate other related monitoring and

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[7] Ofgem Distributed Energy – Electricity Supply Licence Modification - 19 March 2009 http://www.ofgem.gov.uk/Sustainability/Environment/Policy/SmallrGens/DistEng

[8] Ofgem Next Steps in Delivering the Electricity Distribution Structure of Charges Project – 20 March 2009 http://www.ofgem.gov.uk/Networks/ElecDist/Policy/DistChrgs/Documents1/Next%20steps%20SoC%20decision%20doc.pdf

control systems, such as Building Energy Management Systems, monitoring and targeting software and metering, to provide a 'smart grid' approach to delivering the Sustainable Sydney 2030 targets.

4.3 For practical reasons, the outcome of the Decentralised Energy Master Plan – CCHP is likely to provide a modular approach (at least for some) to the development of large scale CCHP or Low Carbon Zones. Therefore, it is important that the City's own trigeneration projects for its own property portfolio are designed with the capacity and interconnectivity that would support and catalyse the modular approach to large scale CCHP or Low Carbon Zones.

4.4 The City will also need to continue to work with Energy Australia, regulators and others to identify and resolve the regulatory and other barriers to 'smart grid' decentralised energy in the City of Sydney. The electricity regulatory regime in New South Wales is not dissimilar to the electricity regulatory regime in the UK, at least where the UK was some years ago, and advantage can be taken of the regulatory changes made in the UK without 'reinventing the wheel'.

5.0 The City of Sydney 'Smart Grid'

5.1 The principles of the City's 'smart grid' would be to integrate the advanced electricity metering (import/export) with the decentralised energy systems monitoring and control systems which are further integrated with the Building Energy Management Systems (including weather station - outside temperature, wind speed, etc) monitoring and controlling the building engineering services in buildings (such as the heating, cooling and electricity plant and equipment) connected to the decentralised energy systems.

5.2 This would enable real time monitoring and control of not just the electricity generating/supply systems and demand management but also of the related heating/cooling systems and thermal energy demand management which in themselves would be derived from the waste heat of electricity generation. This would provide a more robust and resilient energy system, particularly at times of extreme climate conditions.

5.3 For example, not only would absolute and peak electrical loads be significantly reduced through the displacement of electric air conditioning and refrigeration with thermal cooling derived from the waste heat of local electricity generation but at times of high ambient temperatures more cooling would be needed which would require more waste heat from local electricity generation which would lead to more local electricity generation. Unlike existing electricity systems that degrade to the point of power cuts at times of high ambient temperatures, a 'smart grid' trigeneration system will become even more resilient to extreme temperature events by making smart use of the waste heat from local electricity generation. The local electricity generation can even be cooled by some of its own waste heat (via heat fired absorption cooling) to keep the electricity generation within its optimum performance levels at times of high ambient temperatures.

5.4 The ‘smart grid’ trigeneration system can also incorporate both local renewable energy and remote renewable energy systems. The latter is particularly important where the City develops renewable energy outside its LGA providing a genuine catalyzation and supply of green power to the City’s buildings.

5.5 For stand-alone residential and non residential local energy systems not connected to the city-wide decentralised energy system (including small scale renewable energy) smart meters can also be integrated into the ‘smart grid’ system enabling cross trading between local large and small scale energy systems as well as facilitating smart meters for conventional grid energy supply systems.

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Appendix No.2

Issues and Barriers in Developing Trigeneration in Sydney

Trigeneration Working Group
Discussion paper and Action Plan

Institute for Sustainable Futures

UNIVERSITY OF TECHNOLOGY SYDNEY

Issues and Barriers in Developing Trigeneration in Sydney

WORKING GROUP DISCUSSION PAPER AND ACTION PLAN

Prepared by

Institute for Sustainable Futures

For

The Council of the City of Sydney

FINAL VERSION

NOVEMBER 2009

Institute for Sustainable Futures

University of Technology, Sydney

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Broadway, NSW, 2007

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Disclaimer

While all due care and attention has been taken to establish the accuracy of the material published, UTS/ISF and the authors disclaim liability for any loss that may arise from any person acting in reliance upon the contents of this document.

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Abbreviations

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
DE	Distributed Energy
DECCW	NSW Department of Environment, Climate Change and Water
DG	Distributed Generation
DM	Demand Management
DNSP	Distribution Network Service Provider
DUOS	Distribution use of system
ISF	Institute for Sustainable Futures
LGA	Local Government Area
NEL	National Electricity Law
NEM	National Electricity Market
NEMMCO	National Electricity Market Management Company (now AEMO)
NOx	Nitrogen oxides
NSP	Network Service Provider
SCR	Selective catalytic reduction
TNSP	Transmission Network Service Provider
TUOS	Transmission use of system

Table of Contents

List of Proposed Actions

Action 1: Streamline Connection

Work with Energy Australia (see also Action 22) and Industry and Investment NSW (IIN) to engage with finalisation of the NPWG draft legislation to ensure it establishes:

i. equitable and efficient network connection cost allocation guidelines so as to provide greater certainty around network connection costs and processes for embedded generators; and

ii. a negotiation framework including setting timelines for the negotiation processes.

Action 2: Case Studies

Industry parties (e.g. cogeneration developers) to compile experiences relating to gas network connection costs and conditions from existing projects (likely to involve contact with Gas Network Service Providers as appropriate) to go into a Trigeneration Handbook [see Action 19]

Action 3: Ombudsman

Advocate to the NSW Minister for Energy for a “Distributed Generation Ombudsman” with the knowledge, technical engineering skills and authority to review negotiations with DNSPs and to assist in dispute resolution. This role could in-principle be fulfilled by the Electricity and Water Ombudsman of NSW.

Action 4: Standardise Connection Costs

Advocate to the AER for the standardization of the calculation methodology for benefit cost analyses on network and non-network options to avoid skewed calculations/selective use of assumptions.

Action 5: Assess Avoided Costs

Outline the business case for trigeneration under the existing regulatory arrangements in order to demonstrate the case for the importance of capturing avoided network costs. This would carry greatest weight if it relates to a planned trigeneration project. [Note: The business case should include costs for generator registration fees (see Action 8) and emissions scrubbing costs (see Barrier G)]

Action 6: Network Support Payments

Through the Working Group, Energy Australia and AER should be engaged on the issues of:

i. utilizing the D-Factor (and potentially the DMIA) to channel funding for network support payments for the export of power from distributed generators;

ii. the application of a fair and equitable procedure for calculating a default network support payment; and

iii. the capping of network connection charges at the cost of installing a private wire network (a virtual private wire approach).

Action 6A: 'Virtual Private Wire' Framework for Electricity Supply Licensing

Advocate for the introduction of changes to the regulatory framework to enable the introduction of the 'virtual private wires' (VPW) over public wires concept for trigeneration and other decentralised or distributed energy generation and supply similar to the UK.

(The VPW concept could provide a useful framework within which to lobby for a broad set of necessary reforms that cover similar territory to Actions 6, 7, 9, 10 and 14.)

Action 7: Relax Generator Rules

Submit a Rule change proposal to the AEMC for:

i. the creation of a category for small non-market generators exporting less than 30MW, which can sell to any retailer, large customer or group of customers at the connection point, or raising the threshold for exemption to 30MW. (Note: Further increasing the 30MW value as appropriate to Trigeneration Master Plan may need to be considered). Lowering the registration fee burden should also be discussed with AEMC/AEMO.

ii. Distributed generators that gain exemptions or operate through an intermediary to be treated as if they are market generators in relation to dispute resolution and other provisions within the NEM Rules.

Action 8: Consider Registration Fees

When outlining the business case for trigeneration as part of the argument to capture avoided network costs (see Action 5), registration fees should be included in those calculations

Comprehensive documentation of the applicable processes, legal requirements and standards regarding generation licensing for trigeneration facilities should also be included within the Trigeneration Handbook (see Action 19)

Action 9: Engage with retail regulatory reform process

Within the framework of the Working Group provide feedback to AER and NSW Government regulatory/policy reform processes as comments are invited [Note: this option should only be considered pending developments in network connection issues]

Action 10: Clarify/Relax Islanding Rules

Prepare an application to the AER requesting clarification on regulatory requirements regarding network licensing and exemptions within the specific situations (or options) likely to be confronted through the implementation of the City of Sydney's Trigeneration Master Plan (such as private wire networks not connected to the grid; connected to the grid for import/export, etc.). When regulatory requirements are considered onerous, advocate to AER for relaxation of rules for embedded generators. [However note that if the regulatory changes set out under Barriers B and C are implemented there would be no incentive to implement islanded networks.]

Comprehensive but simple documentation of the applicable processes, legal requirements and standards regarding network service provision for trigeneration facilities should be included within the Trigeneration Handbook (see Action 19)

Action 11: Advocate for Amendment of Economic Regulation

The Working Group should submit a Rule Change Proposal to the AEMC change the National Electricity Rules to remove regulatory biases against DE options such as trigeneration. This includes:

a. Allowing network businesses to invest in Distributed Energy and Demand Management options up to five years prior to the corresponding trigger point for network augmentation.

b. Requiring network businesses to implement all available and cost effective Distributed Energy options with lower greenhouse gas emissions prior to augmenting the network.

Action 12: Consider Air Quality

The City of Sydney should continue its collaboration with DECCW to determine the requirement for additional air quality modeling specifically related to the Trigeneration Master Plan Blueprint.

Note: When outlining the business case for trigeneration as part of the argument to capture avoided network costs (see Action 5), SCR costs (about $6/MWh) should be included in those calculations.

Action 13: Guide to incentives

Advocate for an effective and adequate national price on carbon in the context of the CPRS. Until this achieved the NSW Government should allow for credit for cogeneration and trigeneration energy savings through the NSW Energy Savings Scheme.

Action 14: Time of Use Pricing and Smart Meter Benefits

Through the Better Buildings Program (BBP), the City of Sydney should monitor and report on the benefits delivered by the smart meters particularly in relation to reduction in energy consumption, peak demand and the use of trigeneration.

Action 15: Financing

As part of the Climate Change Fund, the NSW Government should establish financial incentives to specifically support trigeneration and other distributed energy options, and should be directly marketed as such. This may take the form of low interest loans through a revolving fund.

- Access to the finance should be open to all parties seeking to develop trigeneration and other distributed energy options including Electricity Distributor network businesses.
- Initial access to finance should be available for a minimum period of five years.

Action 16: Reform Network Loss Factors

Lobby the AEMC to allow distribution loss factors for embedded generators based on average actual distribution losses rather than highly averaged or distorted marginal loss factors. Ideally this should be integrated with recognition of other network benefits of distributed generators relating to peak load management.

Action 17: Training

Through the Working Group, establish the content of an industry training program covering issues relevant to the Trigeneration Master Plan, which could be hosted and coordinated by the City of Sydney using a basic cost-recovery model. The program is likely to cover different targeted streams for different types of participants. Options for building on existing “Green jobs” training efforts should be explored.

Action 18: Facilitate Distributed Generation

The NSW Government should establish and fund programs, possibly through DECCW or Industry & Investment NSW, to facilitate the DG connection process:

a. Where appropriate, undertake certification and testing of small scale DG equipment for connection purposes certified power system analysis work to avoid cost duplications across DG proponents and DNSPs

b. Developing a more efficient process for testing and providing reliability and safety performance of equipment not covered by Australian standards

c. Provide a “Distributed Generation Advisory Service” to accumulate expertise and provide advice to small-scale generators on the above issues and those referred in Action 1.

Action 19: Trigeneration Handbook

Develop/commission a Trigeneration Handbook to provide information and guidance on:

i. the network connection process and the rights and obligations of generators, payments for network benefits, optimal sizing, negotiation and approvals processes, responsibilities in the case of loss of supply, gas connection issues, planning requirements, etc.

ii. Gas network connection costs and conditions from existing projects (likely to involve contact with Gas Network Service Providers as appropriate) to go into the trigeneration guidebook (see Action 2)

iii. Applicable processes, legal requirements and standards regarding licensing for generation and Network Service Provision

Action 20: Network Planning

The Working Group should engage with the AEMC Review of National Framework for Electricity Distribution Network Planning and Expansion to ensure that appropriate information is disclosed.

Action 21: Statement of Opportunities

The NSW Government should publish an annual consolidated Statement of Opportunities which draws on the ESDRs to present a concise, consistent and accessible description of opportunities for developing Distributed Energy options to address network constraints. This would include location, timing, load reduction required and the value of such load reduction.

•The Statement of Opportunities should be complemented by an effective communication strategy to raise awareness of opportunities and how potential DE project developers can take advantage of them.

Action 22: Partnership

The City of Sydney should engage Energy Australia in discussions around a high-level (Lord Mayor/CEO) Partnership on Distributed Generation and Demand Management. This would involve publicly announced targets for DG and DM in 2009 for each year from 2010 to 2020. Tracking progress may require the establishment of a register of trigeneration facilities within the City of Sydney LGA in collaboration with Energy Australia.

Action 23: Distributed Energy Review, Targets and Agency

a) The NSW Government should undertake and publish a comprehensive annual NSW Distributed Energy Review. This Review should include (in relation to Energy Efficiency, Distributed Generation and Peak Load Management):

- A detailed and robust resource assessment of distributed energy potential in NSW.
- An accurate assessment of current distributed energy practice in NSW.

- An overview of international best practice in distributed energy programs and policy.
- An evaluation of available facilitation measures.

b) The NSW Government should also establish annual targets for Distributed Energy in NSW. While these targets need not be mandated, annual reporting against progress is essential.

c) A NSW Government Agency with appropriate resources and authority should be commissioned to co-ordinate a “Distributed Energy Strategy” to reach these targets.

1 INTRODUCTION

1.1 Background

The City's "Sustainable Sydney 2030 Vision" includes a target to achieve a 70% reduction in greenhouse gas (GHG) emissions from 2006 levels by 2030. Such a target is vital to demonstrate leadership in climate change abatement, and when implemented strategically, can not only reduce costs through improving efficiency, but also jointly achieve the goal of 'climate-proofing' the city's vital infrastructure for the benefit of its residents and businesses.

The key to achieving this ambitious target is a major coordinated effort to promote energy efficiency, renewable energy and a network of small- and large-scale cogeneration and trigeneration across the City. Cogeneration and trigeneration (referred to solely as "trigeneration" hereafter for simplicity) form a large part of the proposal for "Green Transformers" as described in the 2030 Vision.

A target is set for a network of Green Transformers to supply 330MWe of power by 2030 and it is projected that this would supply 70% of the City's electricity requirement, deliver a 20% reduction from business as usual greenhouse gas emissions, and when combined with renewable energy supplies, eliminate dependence on coal fired electricity generation, while deferring investment in new power stations and network augmentation. It should be noted that 330MWe target was established against a projected demand of 470MWe in 2030. As the City's demand is currently 600MWe (and under a 'business as usual' scenario could increase to 1000MWe according to Energy Australia), a strong and successful approach to energy efficiency is assumed. Therefore it has been suggested that the 2030 installed trigeneration capacity may need to be even greater than 330MWe to achieve the City's emission reduction goals.[9]

However, numerous institutional barriers currently prevent the large-scale development of trigeneration networks in Sydney. These include network connection and grid import/export issues, licensing and standards, complex approval procedures, pricing barriers, amongst others. The Institute for Sustainable Futures (ISF) at the University of Technology was engaged to prepare this discussion paper outlining these institutional barriers as well as an Action Plan to overcome these barriers. The paper was used to guide the City of Sydney's Trigeneration Working Group workshop on 15th September 2009, at which time the Action Plan was created based on prioritised actions. This process aims to lay the foundation for future trigeneration development in league with developments in the Town Hall House trigeneration pilot project and the upcoming production of the City's Trigeneration Master Plan.

1.2 Scope

The aims of the discussion paper are as follows:

[9] A. Jones 2009, written comments to the draft version of this Discussion Paper

- Identify and describe the key issues and barriers that have a negative impact on the feasibility and practicability of developing co- and trigeneration networks in Sydney.

- Produce an Action Plan which recommends prioritised actions that the City of Sydney and other participating government and industry parties should take to contribute to overcoming these institutional barriers, including suggested key contact persons and clear responsibilities for each action. The Action Plan will be of specific relevance to the Broadway and Town Hall Precinct projects.

This discussion paper aims to cover all of the higher-level institutional barriers, but may not be comprehensive in addressing barriers relevant to a specific site or project. Rather it is intended to offer a summary of key issues and practical recommendations as to how they might be addressed. As a discussion paper, this document is intended to inform and encourage debate within the Working Group and beyond, rather than to provide a final definitive statement on these issues. The Action Plan covers issues that the participating parties may legitimately and constructively influence.

2 ISSUES AND BARRIERS

Trigeneration and cogeneration have been identified by the City of Sydney as capable of delivering significant net economic and environmental benefits. The slow pace of adoption of these technologies suggests that there are issues in or barriers to their development. Of course, any development must overcome issues and barriers in order to proceed. Some of these issues reflect normal and desirable requirements to ensure the development complies with community expectations. Other issues may represent unproductive barriers slow the development at the expense of benefit to the community. It is often difficult to draw a clear line where a legitimate issue ends and an unproductive barrier begins. However, for the sake of simplicity, this discussion paper generally refers to “barriers” rather than “issues” as it is primarily concerned with identifying and removing the unproductive obstacles that slow the positive development of trigeneration in Sydney.

As illustrated in Figure 2.1, barriers can be broadly divided into two groups: ‘technical barriers’ that relate to the nature of the technology and its cost; and ‘institutional barriers’ that relate to how consumers, organizations and government deal with the technology.

Figure 2.1 – Categorisation of Barriers and Corresponding Responses

Barriers							
Technical		**Institutional**					
Current Technology	Current Costs	Regulatory Barriers	Inefficient Pricing	Payback Gap	Split Incentives	Lack of Information	Cultural Barriers
Measures to Address Barriers							
Technical		**Institutional**					
Research and Development Support		Regulatory Reform	Price Reform	Incentives	Facilitation	Information Provision	Targets

Technical Barriers

There are generally no insurmountable technical barriers to trigeneration, in that the technology is technically feasible and in many cases, apparently economically viable. Although despite the financial case for trigeneration being attractive in many cases when the full environmental and efficiency benefits are captured, it should be noted that the business case can still be critically dependent on the gas price. At domestic purchase prices of $15 per GJ few installations stack up, while at $7 per GJ the business case might be quite strong. When environmental and efficiency benefits are captured to present the true business case, trigeneration’s point of commercial viability may extend close to the high end of the gas price spectrum, while if they are not (or are only partially captured) then the case may become unviable at the lowest end of the gas price spectrum. The reasons why the full benefits may not be captured lie in these critically important institutional barriers (see below).

The Wood Mackenzie study for the 2007 Owen Inquiry (Wood Mackenzie 2007, p.28-30) considered a range of gas prices from $4.50/GJ (delivered gas price in 2007) to $6.50/GJ (delivered gas price if NSW's gas generating capacity was to increase to 2500MW) demand. Otherwise, the predicted price trend is stable, unlike gas markets in other countries. While prices this low are only likely to be achieved at economies of scale larger than even the biggest trigeneration Master Plan will provide, they can provide a relative indication of the impact of increasing demand on supply price. The business-as-usual case used was $5/GJ, and thus the range of price rise based on increasing demand was in the order of 30%.
However, gas prices are not the only market issue to take into account. What represents a viable or unviable gas price will be different today (or even in 2007) to what it will be tomorrow, particularly looking forward towards with the Sustainable Sydney 2030 timescale for action, when the cost of electricity, carbon and other factors are taken into account.

Institutional Barriers

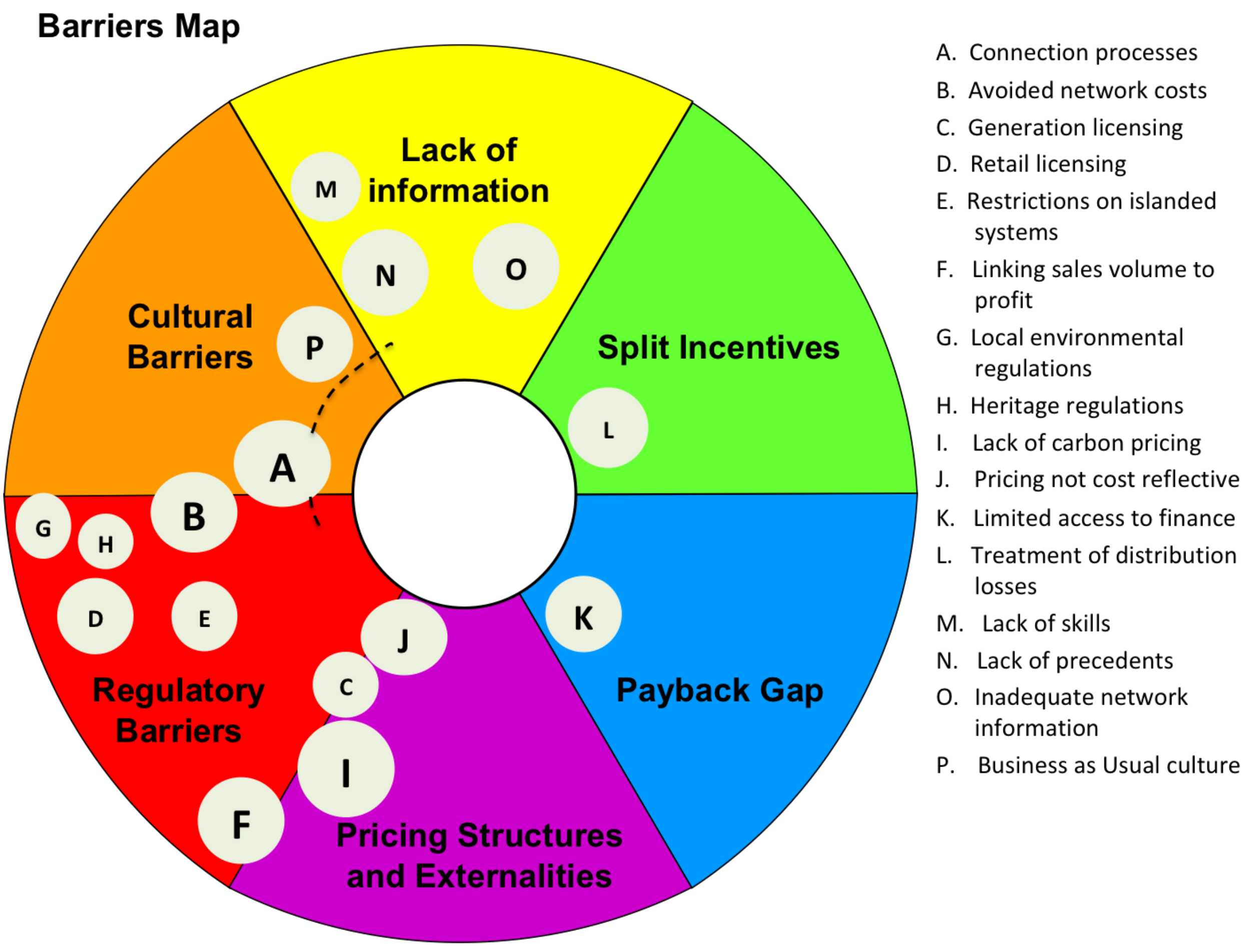
As mentioned above, the reasons that trigeneration is not being implemented in Australia on a broad scale generally lie in the existence of these institutional barriers. As illustrated Figure 2.1, institutional barriers to trigeneration can be classified into six broad areas, which are used as the basis for classification in this report:

1. Regulatory barriers - the biasing of regulation against trigeneration and other DG options relative to traditional modes of centralised generation, transmission and distribution;
2. Inefficient pricing - failure to reflect costs (including environmental costs) properly in energy prices;
3. Payback gap - the difference in the acceptable periods for recovering investment between energy consumers (and trigeneration proponents) and centralised energy suppliers;
4. Split incentives - the challenge of capturing benefits spread across numerous stakeholders;
5. Lack of information – lack of or difficulty of access to relevant information; and
6. Cultural barriers - resistance and scepticism to the use of distributed energy options on the part of individuals and organisations (including utilities, regulators and policy makers).

Throughout this section each barrier raised is specifically addressed. This is considered an easily accessible format for the Trigeneration Working Group (TWG), where specific immediate actions are described in relation to specific barriers, and can be assigned to relevant parties. While the actions presented here are directly "symmetric", that is, the proposed action seeks to directly address the barrier, such as addressing inefficient prices by reforming prices, it should be noted that other indirect responses could be more effective. In some cases it may be better to adopt an "asymmetric" response, by for example, addressing lack of information through regulatory measures provision, or overcoming cultural resistance through providing incentives, and so on.

The barriers to be discussed in this section are visually categorised according to the six broad areas mentioned above, as seen in Figure 2.2. The size of the circle surrounding the barrier letter gives an indication of its relative importance. Figure 2.2 represents the fact that barriers often fall into more than one category. For example, connection processes contain elements of regulatory, cultural and information barriers. Nonetheless, for convenience, each barrier has been categorised into a single class for the purposes of this report.

Figure 2.2 – Classifying Barriers to Trigeneration



Regulatory Barriers

Regulatory barriers are considered by many to be the most significant barriers to trigeneration development. While the TWG may have less ability to directly influence these barriers, actions that both include and go beyond advocating for regulatory change are included in this section.

To aid Interpretation of this section of the paper it is useful to first provide a brief overview of the governance arrangements for the national electricity industry. Roles and responsibilities are as follows:

- The Ministerial Council on Energy (MCE), through dedicated working groups, sets policy and drafts legislation and initial rules;
- The Australian Energy Market Commission (AEMC) and its associated working groups and panels oversee the National Electricity Rules (NER) and manages the ongoing "rule change" process. Chapter 5 of the NER covers connection of registered generation to transmission and distribution systems. Any person or body can propose a rule change;
- The Australian Energy Market Operator (AEMO) manages the operation of the National Electricity Market (NEM) including development and amendment of procedures governing market participants such as registration of generators. AEMO also has responsibility for the reliability and security of the national electricity system. Any person or body can propose a procedure change; and
- The Australian Energy Regulator (AER) is the economic and market/rules compliance regulator. It defines what monopoly providers (transmission and network operators) can charge for their services and oversees market participant compliance with the Rules. [10]

Barrier A. Complex, uncertain and expensive network connection processes

To connect generation equipment to the electricity network, an embedded generator must negotiate a connection agreement with the relevant Distribution Network Service Provider (DNSP). In the case of the City of Sydney Council's Local Government Area (LGA), the DNSP is Energy Australia. The connection agreement sets out the connection costs and the standards of service that the connecting party will receive.

Energy Australia's connection process is guided by a standardised connection agreement available on its website.[11] Even so, as each network connection is unique, network connections are managed on a case-by-case

[10] Provided by Adrian Amey (Industry & Investment NSW - 'IIN' and member of the TWG) as written comments to the draft version of this Discussion Paper

[11] See: <http://www.energyaustralia.com.au/energy/ea.nsf/Content/Network+Standard+Generator+Connection+Agreement>

basis; the equipment type and generation capacity generally determine the process. Trigeneration proponents and Energy Australia need to reach agreement on the technical terms of connection, contractual matters, the allocation of costs for feasibility studies and any grid reinforcements or line extensions that may be required. The process can be complex, time-consuming and expensive. While most DNSPs are skilled at modelling loads many have less experience in modelling the effect of embedded generation on the system.

Another aspect of the complexity of the connection process is in managing the risks associated with the potential power quality at different network supply nodes. A key issue here is the existing vulnerability of the network to “fault current” caused by supply disturbances within the electricity supply system and how this may be affected when distributed generators are connected. Distributed generators have the potential to contribute additional fault current due to malfunctions in the generator or the network and this may lead to the existing network’s prescribed “fault levels” being exceeded. Deciding who should bear the responsibility for managing this additional fault current needs to be clarified, particularly in circumstances where the existing network fault levels are exceeded *before* the distributed generator connects.

The complex processes that exist at present add substantially to the transaction costs for organisations considering distributed generation. More streamlined connection processes for distributed generators could improve the viability of projects. However, note that this issue is of greater concern for smaller-scale trigeneration facilities.

In addition, the lack of an effective negotiation framework can lead to delays and frustration for parties negotiating a connection agreement. Project developers can become a source of frustration for DNSPs as a lot of work is required to analyse the impact of the connection but many of the connections do not end up being implemented. DNSPs can see this as a waste of time. Further, many developers do not understand the impact of distributed generators on the network and what this means for connection costs.

The need to pass on avoided Transmission Use Of Service (TUOS) payments can distort DNSP incentives for the connection of distributed generators to the network (NERA 2007), particularly where DNSPs are not able to pass these payments through to other users. As a result, DNSPs may not see it as being in their best interest to facilitate connection of distributed generators. A streamlined process for connection to the grid could be formulated and followed by DNSPs, however this will not reduce the complexity involved in assessing each connection. The connection process would remain a case-by-case arrangement based on the equipment type and generation capacity.

Cost allocation rules could be developed to determine which party would bear the costs related to the connection. For example, fault issues may require transformer or substation upgrades. At the moment the cost is generally borne by the distributed generator. However, other models of cost allocation may be more appropriate. For example, in Denmark any grid extensions for connection of offshore wind generators are considered a public good and therefore the cost is borne by the grid operator (and ultimately by customers). Alternative types of cost allocation models such as this need to be further explored.

At the end of November 2009, the Ministerial Council on Energy's Network Policy Working Group (NPWG) is expected to release draft legislation establishing a national connections framework for electricity distribution, which aims to streamline the connections process for non-registered embedded generation.[12] This provides an important opportunity to ensure connection barriers are reduced.

Finally, trigeneration proponents also argue that gas connection can be prohibitively expensive. Some gas suppliers may require the cost of new gas pipelines to be borne by the gas customer. Negotiations with gas suppliers for required pressure and volume of gas can prove complex and time consuming which acts as a barrier for cogeneration proponents. Note that in relation to gas network planning, there is no equivalent publicly open process of justification of expenditure on network expansion operated by the regulator, but these decisions are made on a commercial basis as new connection requests are received. Therefore it is important that the gas networks are made aware of new (especially large) proposals for trigeneration as early as possible to best plan efficient network expansion, and allow for effective cost sharing of new infrastructure investment. This underscores the importance of Jemena's participation in the TWG.

However, it is understood that currently Jemena do not intend to make any provision for increased gas network capacity sin the forthcoming AER Gas Price Determination for or reference to the City's trigeneration plans.

The Trigeneration Working Group can contribute to the streamlining of connection processes for trigeneration projects through the following Actions.

Action 1: Streamline Connection

Work with Energy Australia (see also Action 22) and Industry and Investment NSW (IIN) to engage with finalisation of the NPWG draft legislation to ensure it establishes:

- **i) equitable and efficient network connection cost allocation guidelines so as to provide greater certainty around network connection costs and procedures for embedded generators; and**
- **ii) a negotiation framework including setting timelines for the negotiation processes.**

Action 2: Case Studies

[12] A. Amey 2009, written comments provided on the draft version of this Discussion Paper.

Industry parties (e.g. cogeneration developers) to compile experiences relating to gas network connection costs and conditions from existing projects (likely to involve contact with Gas Network Service Providers as appropriate) to go into a Trigeneration Handbook [see Action 19]

Action 3: Ombudsman

Advocate to the NSW Minister for Energy for a "Distributed Generation Ombudsman" with the knowledge, technical engineering skills and authority to review negotiations with DNSPs and to assist in dispute resolution. This role could in-principle be fulfilled by the Electricity and Water Ombudsman of SW.

Action 4: Standardise Connection Costs

Advocate to the AER for the standardization of the calculation methodology for benefit cost analyses on network and non-network options to avoid skewed calculations/selective use of assumptions

Barrier B. Inability to capture value of avoided network costs for energy exports

Most trigeneration units are currently designed and sized to offset electricity purchases of the owner or host, thus avoiding the full retail cost of electricity supply, including network charges. However the export of power from such facilities to the grid – an important component of trigeneration networks at the large scale planned for the City of Sydney – typically only attracts the wholesale price, which is 40% to 60% lower. The wholesale price is much lower than the retail price, primarily because it excludes the network charge. Securing long-term retail supply contracts with tenants or local consumers through exemptions to retail and network regulation is often proposed as a solution to this barrier. However this becomes more difficult with increasing scale of generation, and may not be attractive to building owners for whom selling electricity is not a core function (see Barriers C, D and E).

An alternative solution may be to pay trigeneration facilities "network support payments" or a "local energy network credit" for exported energy. This recognises that whenever a distributed generator exports energy to the grid and thereby reduces peak demand on the network, it is reducing the need for network infrastructure to deliver power from distant centralised power stations.

Currently distributed generators are seldom rewarded for this (often very significant) value of avoided network infrastructure. Under Clauses 5.5 (h) and (i) of the National Electricity Rules (ver. 30) the pass-through of avoided TUOS costs from DNSPs to embedded generators is mandatory. This is reflected in Energy Australia's standard generator connection contract (ver. 2, April 2009). Avoided Distribution Use of Service (DUOS) costs do not fall within the National Electricity Rules and there is no explicit wording around this issue contained in the AER's Final Distribution Determination for the 2009–10 to 2013–14 regulatory period (28 April 2009)[13]. Consequently, DNSPs seldom pass through to embedded generators significant avoided network costs.

It is often suggested that the value of distribution generation to the network is negligible because there is a significant risk that due to planned maintenance or unplanned faults, the distributed generator will not be generating at the time of peak demand. However, the unexpected unavailability of energy export from a distributed generator is comparable to an unexpected increase in customer demand of the same amount. Responding to unpredictable spikes in customer load is commonplace for network businesses, so dealing with comparable dips in export of a power from distributed generators should also be manageable. DNSP concerns of distributed generator risks can, as with the management of customer demand, also be managed through pricing incentives. Structuring the level of network support payments to reflect the different value of network support at different times can be an effective means of sharing risk between the DNSP and the distributed generator.

Energy Australia should be engaged in this negotiation process as part of the Working Group, and through a high-level partnership with the City of Sydney (see Action 22). The focus of this negotiation process could be the agreement of a "default network support payment". While the DNSP and distributed generator should still be free to negotiate alternative arrangements by mutual consent, a default network support payment would serve to both strengthen the negotiating position of distributed generators and streamline the negotiation process. The default network support payment could be based on the principle that energy exports receive a network support payment equal to the actual distribution and transmission network charges prevailing at the time, place and voltage level minus the off-peak network charges for that same place and voltage level. Provided the prevailing network charges were set at efficient levels, this approach would recognise the capacity value of the energy export, without including the value of base network connection costs. It is also essential that default network support payments be set for a reasonable minimum period of time, such as ten years. Network support payments should not only apply to exported power, but also for electricity "exported" from the facility to other users on the same site.

Network support payments should be paid by the local DNSP, reflecting the avoided cost of providing network infrastructure. It should be recognised that DNSPs often hold the position that network support payments represent a real cost to their business, but that the avoided network costs do not represent real savings as existing capacity has already been built and must be paid for, and proposed capacity has not yet been built and the revenue to cover such investment has not yet been recovered. While commentators differ on this viewpoint, in any case it is likely to be easier to encourage

[13] Note that the AER Determination does refer to the (indirectly) related D-Factor mechanism, which will be discussed later.

DNSPs to offer network support payments if there is a specific mechanism for recovery of these costs by the DNSP.

In NSW the "D-Factor"[14] scheme provides a suitable cost recovery mechanism for network support payments. It allows the DNSP to recover the electricity sales revenue foregone from Demand Management (DM) activities it has implemented as well as the direct cost of DM measures themselves up to the value of the avoided network investment. Therefore DM investments under the D-Factor result in reduced capital expenditure on new infrastructure, but no corresponding reduction in revenue for the DNSP. In the context of trigeneration, the reduced sales revenue for the DNSP should be recoverable through the D-Factor, while the remainder of the avoided network costs can be recovered by the DNSP and 'passed through' to the project operator in the form of network support payments. The D-Factor is therefore an important mechanism through which the City of Sydney and the Working Group can engage Energy Australia in broader participation in trigeneration.

It is also worth noting that Energy Australia has been allocated by the AER a $5 million Demand Management Innovation Allowance (DMIA), which is not dependent on ex-post regulatory endorsement. In principle, this funding is risk free for Energy Australia and could be used to support trigeneration projects. Funding through the DMIA should be considered by the Working Group.

Another alternative that is often suggested is to pursue the installation and operation of a ***private wire network*** – that is, a separate duplicated electrical distribution system connecting generators with customers. Note that while the greenhouse and technical efficiency benefits of trigeneration are retained in a private wire scenario, this option is generally not favoured because of the economic inefficiency of duplication. In the case of a private wire network, significant additional new investment in the distribution network may be required and the benefits of avoided network costs on the main grid – both societal and for the project – are unable to be captured.

An hybrid of the two above approaches is to establish a "virtual private wire" system as described below.

Action 5: Assess Avoided Costs

Outline the business case for trigeneration under the existing regulatory arrangements in order to demonstrate the case for the importance of capturing avoided network costs. This would carry greatest weight if it relates to a planned trigeneration project. [Note: The business case should include costs for generator registration fees (see Action 8) and emissions scrubbing costs (see Barrier G)]

Action 6: Network Support Payments

[14] Australian Energy Regulator's (AER) Final Determination, Appendix K, p.470

Through the Working Group, Energy Australia and AER should be engaged on the issues of:

i. **utilizing the D-Factor (and potentially the DMIA) to channel funding for network support payments for the export of power from distributed generators;**
ii. **the application of a fair and equitable procedure for calculating a *default* network support payment; and**
iii. **the capping of network connection charges at the cost of installing a private wire network (a virtual private wire approach).**

UK Example: Virtual Private Wire:

As in the UK, a **'virtual private wire'** concept could be utilised as a solution to the private wire issues discussed above, whereby the existing 'public wire' distribution network infrastructure is used for connection and distribution of distributed energy (trigeneration, cogeneration, renewable energy and fuel cells) and the low or zero carbon electricity is supplied directly to consumers by the distributed energy generator as if the public wires were private wires. This has the advantage of capturing most of the economic benefits of trigeneration operating over private wires without constructing separate networks. It involves local consumers only paying the Distribution Use of System (DUoS) charge, whilst at the same time providing local consumers with genuine low or zero carbon energy. If structured correctly, this approach can also providing incentives to the Distribution Network Service Provider to support trigeneration and distributed generation. The UK's Office of Gas and Electricity Markets (Ofgem) implemented this concept under the Electricity Supply Licence Modification Statutory Notice[15] on 19 March 2009.

The UK has also implemented shallow connection charges (where the majority of the connection is defrayed as a unit charge over a long period of time) as opposed to deep connection charges (where the full capital cost of reinforcing the network "upstream" of the connection point has to be paid up front).

The principal avoided costs available to distributed generators in the UK include:

- Transmission Network Use of System (TUoS) charges
- Ancillary Service charges relating to frequency and voltage control spinning reserve and market management
- Distribution losses
- Distribution Network Use of System (DUoS) charges (if actual rather than virtual private wire)

[15] Ofgem Distributed Energy – Electricity Supply Licence Modification - 19 March 2009 http://www.ofgem.gov.uk/Sustainability/Environment/Policy/SmallrGens/DistEng

In addition, trigeneration and cogeneration operators also benefit from the following:

- Exemption from the Climate Change Levy (CCL) for self supply or supply over private wire networks
- CCL benefit (equivalent to the financial value of CCL Exemption) over public wires
- 100% Enhanced Capital Allowances
- 100% Exemption from Business Rates

Good quality trigeneration and cogeneration is also rewarded for carbon saving under Phase II of the EU Emissions Trading Scheme and will benefit from the UK Carbon Reduction Commitment (CRC Energy Efficiency Scheme) which is the UK's mandatory carbon trading scheme for organisations that consume over 6,000MWh of electricity a year and becoming a mandatory planning consent requirement for new developments, particularly in London.

Cost reflective charging for distribution networks[16] will also be implemented on 1 April 2010 to help make sure that the 9000 MW of distributed generation forecast by the UK Government to be connected to the distribution networks between 2010 and 2015 is rewarded where network benefits are provided by such generation.

Action 6A: 'Virtual Private Wire' Framework for Electricity Supply Licensing

Advocate for the introduction of changes to the regulatory framework to enable the introduction of the 'virtual private wires' (VPW) over public wires concept for trigeneration and other decentralised or distributed energy generation and supply similar to the UK.

(The VPW concept could provide a useful framework within which to lobby for a broad set of necessary reforms that cover similar territory to Actions 6, 7, 9, 10 and 14.)

Barrier C. Generation licensing requirements and standards

Under the National Electricity Rules ('the Rules'), any party who owns, controls or operates a generating system connected to a transmission or distribution network must register as a generator. The generator must classify their unit as: market scheduled, market non-scheduled, non-market scheduled or non-market non-scheduled. A generating unit with an aggregate nameplate rating of 30MW or greater will be classified as scheduled.

[16] Ofgem Next Steps in Delivering the Electricity Distribution Structure of Charges Project – 20 March 2009 http://www.ofgem.gov.uk/Networks/ElecDist/Policy/DistChrgs/Documents1/Next%20steps%20SoC%20decision%20doc.pdf

Generating systems less than 30MW are classified as non-scheduled. Under Clause 2.2.3(b) of the Rules, large generating systems may be classified as non-scheduled with National Electricity Market Management Company's (NEMMCO, now the Australian Energy Market Operator, or AEMO) approval only where the primary purpose of the generating unit is local use and sent out generation rarely exceeds 30MW, the physical and technical characteristics of the unit are such that it is not practicable for it to participate in central dispatch, or the output of the unit is intermittent (NEMMCO 2007).

Under Clause 2.2.1(c) of the Rules, certain generators may be considered exempt and are not required to register with the NEMMCO. Currently, generators below 5MW are exempted from registration. In addition, generating systems with an aggregate nameplate rating less than 30MW may also be exempted by NEMMCO if it exports less than 20GWh into the grid in a year (this corresponds roughly to the unit running at full capacity for a total of approximately 1 month of the year). Even if an exemption may apply, an application for exemption must be made to NEMMCO in order for it to be granted. It is likely that at least in the next few years, a reasonable proportion of new trigeneration projects would be exempt from the need to register due to being less than 5MW in size. The remainder – and likely an increasingly large proportion over time, particularly if the City's Master Plan targets large-scale networks – would be required to apply for either registration or a licence exemption.

As per Energy Australia's Network Standard 94 (NS 194: Connection of Embedded Generators, p.8), the Transmission Network Service Provider (TNSP) TransGrid must also be advised of any proposed connection of embedded generation above 10MW, or embedded generators of any size if the locations of installation deems the level of generation to be "significant compared to the TNSP connection point capacity." Embedded generation facilities of 10MW or more will be subject to the requirements of TransGrid, creating an additional level of procedural complexity.

Participant fees to register with NEMMCO include a registration fee as well as participant fees per MW per annum. Annual fees can be a significant cost burden and act as a barrier to registration as a market generator. Note that this only represents a 'Regulatory' barrier to the extent that these charges are disproportionate to the size of the generator, as there is no actual prohibition on any willing participant registering as a generator.

The alternatives to complex registration processes and the associated participant fees include the following:

- Sell the power directly to the local retailer
- Register through an intermediary that is already a registered market participant (Origin Energy may fit this profile given their recent acquisition of Cogent)
- Seek an exemption
- Sell the power directly to a large customer or group of

customers through a retail power purchase agreement

It is worth noting that as trigeneration networks approach neighbourhood-scale and are being sized beyond the needs of one or two facilities, the options of exemption and arranging power purchasing agreements directly may become less feasible.

None of the alternative approaches are ideal. By selling power directly to a local retailer, the generator is constrained to only sell to that customer, and even with an exemption the generator is still constrained to only sell to the local retailer. When registering through an intermediary or if granted an exemption, the party has no standing under the NEM rules and so does not have access to dispute resolution mechanisms and other provisions.

In the UK, the solution to this problem introduced in 2001 was an exempt licensing regime that covers class exemptions without Secretary of State approval up to 50MWe, and up to 100MWe with Secretary of State approval.[17] Class exemptions means that providing the trigeneration/decentralised energy proponents comply with the rules set out in the Statutory Order there is no requirement for them to seek approval from anyone or anybody to implement their trigeneration or decentralised energy scheme. The Distribution Network Operator effectively polices compliance when proponents seek connection their networks, streamlining the whole process.

More recently the UK introduced an Electricity Supply Licence Modification in March 2009 that enables the introduction of the 'virtual private wire' over public wires concept which would be particularly suitable for large scale multi-customer or city-wide trigeneration schemes. This would also be a viable option for the City to pursue. See Alternative Action 6 under Barrier B.

For the City of Sydney's trigeneration proposals where there are mixed, complimentary and a variety of loads, it is important that exempt generators should be able to supply electricity to all consumers not just a large customer, This is particularly relevant and key to.

Action 7: Relax Generator Rules

Submit a Rule Change Proposal to the AEMC for:

i. **the creation of a category for small non-market generators exporting less than 30MW, which can sell to *any* retailer or large customer or group of customers at the connection point, or raising the threshold for exemption to 30MW.** (Note: Further increasing the 30MW value as appropriate to Trigeneration Master Plan may need

[17] The Electricity (Class Exemptions from the Requirement for Licence) Order 2001 http://www.hmso.gov.uk/si/si2001/20013270.htm

to be considered). Lowering the registration fee burden should also be discussed with AEMC/AEMO.

ii. Distributed generators that gain exemptions or operate through an intermediary to be treated as if they are market generators in relation to dispute resolution and other provisions within the NEM Rules.

Action 8: Consider Registration Fees

When outlining the business case for trigeneration as part of the argument to capture avoided network costs (see Action 5), registration fees should be included in those calculations

Comprehensive documentation of the applicable processes, legal requirements and standards regarding generation licensing for trigeneration facilities should also be included within the Trigeneration Handbook (see Action 19)

Barrier D. Retail licensing and contestability

In NSW, under Section 33 of the Electricity Supply Act 1995, a license is required for the retail supply of electricity. IPART, on behalf of the Energy Minister, carries responsibility for issuing such retail licences and while licence conditions can be varied, exemptions cannot be obtained by small retailers such as in the case of network-connected trigeneration.

However, retailing falls under the Ministerial Council on Energy's National Reform Agenda, with retail licensing conditions due to be standardised across the NEM. This is an ongoing and complex process under the auspices of the AER, involving the drafting of new National Electricity Law and Rules governing retailing. The new regulations will cover the relationships between customers, retailers and distributors for both gas and electricity in a single package. Comments have closed on the first draft of the legislation, and the second draft legislation is due to be released at the end of November 2009 (Amy 2009 pers. comm.).

Retail contestability

The term 'retail contestability' refers to electricity customers being allowed to select the electricity retailer of their choice. Retail contestability has been available to NSW electricity customers for several years. This has implications for trigeneration projects that do not have sufficient 'in-house' electrical load to utilise the full production of the installed plant – a category that is likely to include most projects in the City of Sydney's future trigeneration plans. Full retail contestability means that the purchase of electricity by potential consumers – including tenants in a building within which a trigeneration facility is located – cannot be mandated by the project developer/building owner. In other words, there is a no guaranteed local market for direct electricity sale. Further, for a project operator to sell to tenants or third parties they are required to hold a retail licence, which poses a barrier to small generators in terms of administration and licensing cost.

The NSW Government is also in the process of producing a policy/discussion paper (currently no scheduled release date) on renewable energy precincts that will cover, amongst other things, the policy implications presented by embedded generators in relation to both retail licensing and contestability (Amy 2009 pers. comm.). Both the Industry and Investment NSW paper and AER legislative draft present opportunities to influence the retail regulatory process in favour of trigeneration networks.

In principle, exempting co/trigeneration from retail contestability is a "second best" solution where other barriers, and in particular capturing avoided network costs, is not possible. It is recommended that this solution only be pursued where it has been found impractical to resolve network connection barriers (primarily Barriers A, B and C).

A Virtual Private Wire approach could also provide a potential solution to this problem as discussed under Barriers B and C above.

Action 9: Engage with retail regulatory reform process

Within the framework of the Working Group provide feedback to AER and NSW Government regulatory/policy reform processes as comments are invited [Note: this option should only be considered pending developments in network connection issues]

Barrier E. Restrictions on islanded systems

Under section 11(2) of the National Electricity Law (NEL) and Clause 2.5.1 of the National Electricity Rules, a person must not own, control or operate a distribution system that forms part of the interconnected transmission and distribution system, unless that person is registered or has gained an exemption from the AER from the requirement to register (AER 2007). In the situation where a trigeneration proponent wishes to develop its own grid that is connected to the rest of the electricity network, the proponent would need to register as a Network Service Provider (NSP) or gain an exemption from the AER. (Note the distinction between this issue of registration as a *NSP* as opposed to registration as a *generator*.)

The AER can grant an exemption from the obligation to register as a NSP, which by definition would also exempt a person from compliance with the obligations in chapter 5 of the NER. Alternatively, the AER may grant a more limited exemption from the operation of chapter 5 of the NER, so that the person must still register, but need not comply with the obligations in chapter 5 that would otherwise apply (AER 2007).

The NSP registration requirements for different operational arrangements of trigeneration facilities are not clear and require specific clarification. In relation to the development of 'private wire networks' connected to the main electricity grid, the precedent suggests that general or class exemptions are unlikely to be granted, but that specific exemptions may be granted (AER 2007).

In the case of a private wire network serving multiple customers within an islanded system not connected to the grid, it should be noted that its customers do not have the option to choose another supplier and new regulation is likely to be required to prevent monopoly exploitation of this situation. However, if the regulatory changes set out under Barriers B and C are implemented there would be no incentive to implement islanded networks.

Island generation connected to the public wires distribution network is the ability to continue to supply energy in the event of a failure of the main grid to afford local security of supply to customers connected to the island network. This is normally delivered by private wire networks but there is no technical reason why island generation could not be provided over public wires provided the public wire network was designed for island generation, typically in the form of ring main circuits.

Action 10: Clarify/Relax Islanding Rules

Prepare an application to the AER requesting clarification on regulatory requirements regarding network licensing and exemptions within the specific situations (or options) likely to be confronted through the implementation of the City of Sydney's Trigeneration Master Plan (such as private wire networks not connected to the grid; connected to the grid for import/export, etc.). When regulatory requirements are considered onerous, advocate to AER for relaxation of rules for embedded generators.

Comprehensive but simple documentation of the applicable processes, legal requirements and standards regarding network service provision for trigeneration facilities should be included within the Trigeneration Handbook (see Action 19)

Barrier F. Network economic regulation linking electricity sales volume to profit

One of the most prominent regulatory barriers occurs as an unintended result of regulatory efforts to limit the abuse of market power by monopoly electricity suppliers. In NSW, electricity Distribution Network Service Providers (DNSPs) are subject to economic regulation in the form of a maximum average price they can charge. As network costs are mainly driven by capital costs, which in turn are linked to peak demand, a DNSP's cost structure is not strongly influenced by the volume of electricity flowing though their wires.

As a consequence, since revenue equals price multiplied by sales volume, a maximum price cap means that total revenue is directly related to the volume of electricity delivered. On the other hand, total cost is generally not related to sales volume except for sales at the time of peak demand. Since profit equals total revenue minus total cost, this means that the profitability of the network business is closely tied to the total sales volume. This puts the financial interests of the network business in direct conflict with any measures that would reduce the volume of electricity sales passing through the network. This means that trigeneration facilities, which reduce network sales volume, are a threat to the profitability of the network business.

In NSW, the D-Factor mechanism has been introduced to address this issue and thus NSW is more fortunate than many other Australian states. Yet while in principle the D-Factor effectively addresses this regulatory dilemma, in practice its application has been fairly limited. The answer to this problem lies in the need for a suite of complementary measures to go alongside the D-Factor to protect both consumers and network business profitability, while simultaneously removing barriers to greenhouse gas emission abatement. Dunstan et al. (2008) describes the initiatives in detail, which are reproduced here:

- "Short-term incentives relating to the annual price control formula within regulatory periods. These incentives created by the "form of regulation" should be neutral between DM and network investment options, and should decouple Distributor profit and revenue from electricity sales.
- Long-term incentives between regulatory periods created by the processes of assessing the "prudence" of investment and incorporating new assets into the Distributor's asset base. These should be neutral between DM and network investment options in terms of recovery of costs and sharing of efficiency benefits between shareholders and customers.
- Planning and development regulations. These should ensure that there is equal opportunity for DM and network investment options to be both considered and adopted.
- Regulation should also ensure that Distributors' planning and operational decisions take account of external environmental costs and in particular, the costs associated with greenhouse gas emissions." (p.6)

<u>Action 11: Advocate for Amendment of Economic Regulation</u>

The Working Group should submit a Rule Change Proposal to the AEMC change the National Electricity Rules to remove regulatory biases against DE options such as trigeneration. This includes:

a) Allowing network businesses to invest in Distributed Energy and Demand Management options up to five years prior to the corresponding trigger point for network

augmentation.

b) **Requiring network businesses to implement all available and cost effective Distributed Energy options with lower greenhouse gas emissions prior to augmenting the network.**

Barrier G. Local environmental regulations

Air Quality Standards

Trigeneration results in local air emissions, which can be subject to regulatory requirements. The pollutants of most concern for trigeneration are oxides of nitrogen, carbon monoxide and unburnt hydrocarbons.

Schedule 4 of the Protection of the Environment Operations (Clean Air) Regulation 2002 (NSW)[18] contains air quality standards of concentration for key pollutants from mechanical plant such as trigeneration. This Regulation contains the relevant standards and testing procedures for all key pollutants excluding oxides of nitrogen, which are dealt with by the "Interim DECC Nitrogen Oxide Policy for Cogeneration in Sydney and the Illawarra".[19] The Interim Policy also suggests that:

> "The Sydney CBD only has the capacity to accommodate uncontrolled emissions from around 10 MW of cogeneration before it is possible that health based nitrogen dioxide goals could be exceeded…It is likely that uncontrolled emissions from around 200 MW of cogeneration would result in the health based nitrogen dioxide goal being exceeded across the CBD." (p.3)

At the large scale proposed for the City of Sydney's Trigeneration Master Plan, it is therefore inevitable that air quality regulations will constrain the design, location and/or operating characteristics of trigeneration plants in Sydney in the long-term. The current implication of this regulation is the Interim Policy's requirement that all new cogeneration facilities achieve "Best Available Technique (BAT) emission performance". While BAT is not defined in the interim policy, the NSW Department of Environment, Climate Change and Water (DECCW) is currently finalising the policy, which will include a definition of BAT. In the interim, DECCW are advising that NOx emissions of 250 mg/m^3 is appropriate, which is more stringent than the standard contained in the Regulations.[20]

Given the BAT policy and scale of the City's plans for trigeneration, it appears that the default situation is likely to require specific efforts to control emissions, which will impose additional costs on trigeneration projects. Costs may take the form of increased stack height to improve dispersion of NOx

[18] See: <http://www.legislation.nsw.gov.au/viewtop/inforce/subordleg+642+2002+first+0+N>
[19] Available from: <http://www.environment.nsw.gov.au/resources/air/inp09124.pdf>
[20] Pickup, J. 2009, pers. comm. 2 September

emissions, or the requirement of additional air emission control technologies to reduce the concentration of emissions from the stack such as Selective Catalytic Reduction (SCR) (see SKM 2004 for further discussion).

While cheaper NOx control technologies may add only $1/MWh to the cost of the turbine (SKM 2004), SCR is likely to add a cost of around $6/MWh to generation costs due to higher capital and operating costs. In approximate terms, about half of the additional cost is capital cost ($3/MWh) and half is operating cost ($3/MWh) (SKM 2004).

It is worth noting that the Interim Policy highlights the option of NOx offsetting by assisting industrial emitters to reduce their emissions elsewhere, however given the localised nature of air pollution it seems likely that this option will have relatively limited application in the CBD.

Noise Restrictions

DECCW maintain a range of policies and regulations on noise emissions,[21] however given the contained nature of trigeneration plant, these regulations are not considered to be a significant constraint to the development of trigeneration.

Action 12: Consider Air Quality

The City of Sydney should continue its collaboration with DECCW to determine the requirement for additional air quality modeling specifically related to the Trigeneration Master Plan Blueprint.

Note: When outlining the business case for trigeneration as part of the argument to capture avoided network costs (see Action 5), Selective Catalytic Reduction costs (about $6/MWh) should be considered in those calculations.

Barrier H: Heritage Regulations

Within NSW, Heritage management is laid down within the *Heritage Act 1977* and the *Environmental Planning and Assessment Act 1979*. It is possible that heritage provisions in the legislation and subordinate regulations or guidelines could affect the design and placement of specific components of trigeneration plant, heat rejection or exhaust streams. This may be specifically relevant to the Broadway and Town Hall Precinct projects, however it is suggested that in any case heritage regulations are unlikely to present a significant barrier as any restrictions can be overcome through planning and design procedures at each site.

[21] Refer to: <http://www.environment.nsw.gov.au/noise/> for an overview.

Barrier I. Lack of carbon pricing

External costs are costs that are caused by the supply of a good but are not included in the price of that good. The most obvious external cost of electricity supply is the costs of climate change caused by burning of fossil fuels to generate electricity. This means that the average price of electricity is set below its true cost of supply, thus leading to excessive consumption of centralised coal-fired electricity supply and reducing the uptake of lower carbon intensity options such as high efficiency gas-fired trigeneration.

The simplest mechanism to redress this barrier is to put a price on carbon through either a carbon tax or a carbon emissions trading scheme as in the NSW Greenhouse Gas Abatement Scheme (GGAS) or the proposed Federal Government Carbon Pollution Reduction Scheme (CPRS). Even though in principle the GGAS should perform this function adequately for NSW, due to a range of factors the GGAS credit price has been highly volatile and has generally been in the order of $3 to $7 per tonne of CO_2-equivalent displaced, which is far too low to have a significant financial impact on trigeneration projects. (Note: GGAS is scheduled to finish if or when the CPRS begins.)

In the UK, carbon pricing is effectively applied through the Climate Change Levy, EU Emissions Trading Scheme (ETS) and the Carbon Reduction Commitment (for large energy consumers outside the EU ETS).

Action 13: Guide to incentives

Advocate for an effective and adequate national price on carbon in the context of the CPRS. Until this achieved the NSW Government should allow for credit for cogeneration and trigeneration energy savings through the NSW Energy Savings Scheme.

Barrier J. Network pricing not cost reflective

While less obvious than excluded external costs, pricing structures can be an even greater barrier to trigeneration than the exclusion of external costs. Although interval meters and time of use tariffs are becoming more common, most electricity consumers in Australia, particularly smaller consumers, still pay a flat electricity tariff. That is, the same electricity price all day, everyday throughout the year.[22] This flat tariff is in contrast to the wide variations in the cost of providing electricity both in the wholesale (generation) price and reflecting the cost of providing peak capacity in networks. This flat price structure creates a bias against greenhouse gas emission abatement options that are well suited to respond to these cost fluctuations including trigeneration when operated as a peak load management resource. While flat tariffs are sometimes defended as protecting vulnerable consumers, the

[22] The main exception to this rule is off peak electric water heating.

effect is often to impose avoidable costs on all consumers to pay for large investment in centralised generation and networks to meet occasional peak demand.

Given the preeminence of peak demand growth in driving proposed network and generation investment decisions, in the long term it is crucial that electricity prices are fundamentally reformed. This relates to both retail and network prices.

In past there have been time-of-use pricing trials by Energy Australia and Integral Energy and City of Sydney's planned Home Energy Trial of real-time metering is a valuable addition to these trials. Nonetheless, the deployment of both "smart meters" and time of use pricing has been generally slow. The City's Better Buildings Program also presents a valuable opportunity to introduce new metering technology and capabilities into the commercial office building sector. As commercial operators become more aware of their electrical load profile and associated costs, it is possible that the peak load management benefits available from trigeneration may increasingly be valued appropriately.

Funding through the $100m federal Smart Grid, Smart City initiative[23] should be considered for the BBP particularly in relation to metering efforts; while strong linkages should be maintained with the CSIRO Intelligent Grid research project.

See also Barriers B and C, in particular virtual private wire example (Action 6A).

Action 14: Time of Use Pricing and Smart Meter Benefits

Through the Better Buildings Program (BBP), the City of Sydney should monitor and report on the benefits delivered by the smart meters particularly in relation to reduction in energy consumption, peak demand and the use of trigeneration.

[23] See: < http://www.environment.gov.au/smartgrid/>

Payback Gap

Barrier K. Differences in access to finance

As trigeneration has generally high initial or capital costs, limited access to finance to manage the high initial costs is often cited as a barrier. However, some care needs to be taken in relation to this issue. It is not clear that limited access to finance has been a major barrier in retarding the development of trigeneration. The massive growth both in the finance industry and in the provision of personal and corporate debt suggests that access to finance has in general not been major feature of the past two decades. On the other hand, there appears to be ample evidence that trigeneration, along with other less expensive demand management options such as energy efficiency, represent a large neglected reservoir of cost-effective investment opportunities with relatively short payback periods of a few years or less. As the Stern Report observed,

> "Individuals and firms should invest until the expected savings are equal to the opportunity cost of borrowing or saving (assuming risk neutrality). Studies suggest that individuals and firms appear to place a low value on future energy savings. Their decisions expressed in terms of standard methods of appraisal would imply average discount rates of the order of 30% or more. (Stern 2006)

This 30% discount rate implies that consumers and businesses require distributed energy investments to pay back their initial investment within about three years. The so-called "payback gap" refers to this discrepancy between the payback period that consumers and business demand to be met by many distributed energy investments and the payback period that is required of many other investments (including those made by utility companies in energy supply infrastructure).

The answer is likely to lie, in part, with the other barriers described in this paper and in part in the long payback periods that apply to centralised energy resources. Given the strategic importance of the secure electricity supply, governments have for many decades provided preferential support for electricity utilities and in particular networks, both in the form of government ownership and investment and via regulated returns on investment and support for monopoly provision of services. This has given regulated monopolies access to finance with long payback periods (of perhaps 40 years) relative to providers of distributed energy options like trigeneration.

Recognising these barriers the 2002 Demand Management Inquiry undertaken by the NSW Independent Pricing and Regulatory Tribunal (IPART) made as its primary recommendation:

> *That the Government:*
> *Establish a Demand Management Fund or Funds with the objectives of:*

- *Facilitating sustainable generation projects*
- *Implementing energy efficiency and end-user fuel switching*

programs to supplement the retailer licence conditions

- o *Assisting smaller scale, more diffuse energy efficiency programs*
- o *Encouraging energy efficiency initiatives with a wider range of partners, including equipment suppliers, the building industry and local government*
- o *Facilitating programs that tap the synergies between water and energy demand management.* (IPART, 2002)

This recommendation was adopted by the NSW Government in the form of the Energy Savings Fund, which has subsequently become the NSW Climate Change Fund (CCF). Currently the CCF provides one off project support to trigeneration projects in the form of grants, although the publicised form of grant support is not entirely clear.[24]

In the UK, large projects – particularly city-wide projects similar to the City of Sydney's vision – are financed by Energy Services Companies typically written down over a period of 25-30 years.

Action 15: Financing

As part of the Climate Change Fund, the NSW Government should establish financial incentives to specifically support trigeneration and other distributed energy options, and should be directly marketed as such. This may take the form of low interest loans through a revolving fund.

- **Access to the finance should be open to all parties seeking to develop trigeneration and other distributed energy options including Electricity Distributor network businesses.**
- **Initial access to finance should be available for a minimum period of five years.**

[24] See: <http://www.environment.nsw.gov.au/grants/altpowgenprojects.htm>

Barrier L. Distorted treatment of distribution losses

Distribution losses are electrical energy losses incurred in the conveyance of electricity over a distribution network. Every generator in the NEM is assigned a loss factor that reflects the energy losses that occur between its connection point and a nominated network reference node. NEMMCO settlement payments to generators are adjusted to take into account distribution losses. Clause 3.6.3 of the National Electricity Rules sets out the basis for determining distribution loss factors.

NEM rules state that if the capacity of a generator is greater than 10MW then a site-specific distribution loss factor is assigned and used for that generator. However, generators with a capacity of less than 10MW are assigned an average distribution loss factor based on the voltage level the generator is connected at.

The calculation and use of loss factors for embedded generators can have distortive impacts which may disadvantage embedded generation. The use of average marginal loss factors does not reward the embedded generator for the distribution losses it avoids, but rather acts as a penalty.

In the UK, the solution to this issue was the introduction of a generator licence modification requiring DNSPs to implement a common cost-reflective distribution network use of system charging methodology, incorporating specific line loss factors for distributed generators. This demonstrates that distribution losses may be addressed concurrently with recognition of other network benefits (Barriers B and C).

Action 16: Reform Network Loss Factors

Lobby the AEMC to allow distribution loss factors for embedded generators based on average actual distribution losses rather than highly averaged or distorted marginal loss factors. Ideally this should be integrated with recognition of other network benefits of distributed generators relating to peak load management.

Lack of Information

Barrier M. Lack of skills

Due to the relatively small number of trigeneration projects actually undertaken to date in Sydney and Australia more broadly, there is very limited experience across the range of sectors required to successfully design, install and operate trigeneration systems. This includes:

- Utilities – capacity to model and understand the implications of connecting embedded generators to the system, including realistic assessment of fault levels. This issue is related to perceived risks and network usage charges.
- Project proponents – many proponents are commissioning the design and installation of systems for the first time, and are not adequately informed of their needs, legal obligations or design requirements. A well-informed project proponent is critical to the success of future trigeneration expansion.
- Engineering consultants – recent trigeneration projects have reported issues with dramatic oversizing of plant for islanded systems due to design engineers not adequately understanding the year-round operation of trigeneration systems, and the interaction of the system with building particularly in highly efficient buildings. Note that these issues are of less significance if excess power can be exported to the grid and the plant can be operated at consistently higher load.

This issue of skills/experience shortage is particularly acute as it pertains to the operation of precinct scale trigeneration, which has seldom been applied in Australia.

Action 17: Training

Through the Working Group, establish the content of an industry training program covering issues relevant to the Trigeneration Master Plan, which could be hosted and coordinated by the City of Sydney using a basic cost-recovery model. The program is likely to cover different targeted streams for different types of participants. Options for building on existing "Green jobs" training efforts should be explored.

Barrier N. Lack of local precedents

As mentioned above, closely related to the lack of skills is a lack of precedents within Australia – that is, good examples of trigeneration in operation across a range of operational building scenarios at a range of scales. The lack of precedents is related to the element of risk associated with new and innovative approaches, as perceived by potential proponents and financiers. The lack of precedents results in a range of outcomes, including:

- Unnecessary duplication of costs for connection, power system analysis and testing, reliability.

Financial incentive for trials and risk sharing may be made available.

The City should capitalise on lessons learned from international experience to the greatest extent possible, to assist the industry in approaching issues that are new to the local market environment.

Action 18: Facilitate Distributed Generation

The NSW Government should establish and fund programs, possibly through DECCW or Industry & Investment NSW, to facilitate the DG connection process:

a) Where appropriate, undertake certification and testing of small scale DG equipment for connection purposes certified power system analysis work to avoid cost duplications across DG proponents and DNSPs

b) Developing a more efficient process for testing and providing reliability and safety performance of equipment not covered by Australian standards

c) Provide a "Distributed Generation Advisory Service" to accumulate expertise and provide advice to small-scale generators on the above issues and those referred in Action 1.

It is clear from the discussion hitherto that there is a significant lack of clear, accessible and relevant information available to trigeneration developers to assist in streamlining the development process.

Action 19: Trigeneration Handbook

Develop/commission a Trigeneration Handbook to provide information and guidance on:

i. the network connection process and the rights and obligations of generators, payments for network benefits, optimal sizing, negotiation and approvals processes, responsibilities in the case of loss of supply, gas connection issues, planning requirements, etc.

ii. Gas network connection costs and conditions from existing projects (likely to involve contact with Gas Network Service Providers as appropriate) to go into the trigeneration guidebook (see Action 2)

iii. Applicable processes, legal requirements and standards

regarding licensing for generation and Network Service Provision

Barrier O. Inadequate network planning information regarding constraints and avoided costs

Where multiple DG proponents seek access to spare capacity in the network, a more clear and transparent process is required to facilitate prioritisation of those projects. DG proponents pay for network studies with no guarantee results will be accepted by the DNSP, so all of the risk is with the proponent.

Planning information can provide forecasts of network constraints and therefore opportunities for investment for proponents of trigeneration. However, there is no guarantee that up-to-date demand and planning information provided by DNSPs will be timely or accurate and no recourse if information is wrong or so delayed as to be of no value to a trigeneration proponent. Nevertheless, under the Disclosure Protocol of the NSW Code of Practice on Demand Management for Electricity Distributors, DNSPs are required to publish an annual Electricity System Development Review (ESDR) with some elements of key information of relevance to a DG proponent. This includes the historical (5-10yr) and forecast (5-yr) demand from, and capacity of, each zone substation and approximate cost of upgrading the network to meet forecast demand through traditional means, amongst other information. However, the information is not provided in such a format that is easily accessible and useful to project proponents and does not cover other important elements such as the cost of connection, the additional works required to facilitate DG (e.g. switch/line/transformer upgrades), etc.

The Australian Energy Markets Commission (AEMC) is currently formulating information reporting requirements as part of its Review of National Framework for Electricity Distribution Network Planning and Expansion, which presents an opportunity for action.

Action 20: Network Planning

The Working Group should engage with the AEMC Review of National Framework for Electricity Distribution Network Planning and Expansion to ensure that appropriate information is disclosed.

Action 21: Statement of Opportunities

The NSW Government should publish an annual consolidated Statement of Opportunities which draws on the ESDRs to present a concise, consistent and accessible description of opportunities for developing Distributed Energy options to address network constraints. This would include location, timing, load reduction required and the value of such load reduction.

The Statement of Opportunities should be complemented by an effective communication strategy to raise awareness of

opportunities and how potential DE project developers can take advantage of them.

Cultural Barriers

Barrier P. Industry momentum favouring business-as-usual network solutions

As with all sectors, there is significant momentum driving the implementation of business-as-usual solutions, and organisational goals and processes are set up around functioning most efficiently and effectively with the existing model. This can be described as a “cultural” barrier to using DM solutions to address load growth issues. In relation to network planning, these cultural barriers make it very difficult for DE providers to displace business-as-usual solutions. The most effective means of addressing cultural barriers are target setting and facilitation. The provision of information and financial incentives also has an important role to play – these are covered above under Barriers P and K respectively.

Target setting

Where the prevailing culture, habits or tradition are not delivering appropriate outcomes, targets can be an effective means of changing behaviour. For example, DNSPs in NSW are subject to regulated targets for reliability and price profitability, which is a mechanism for the regulator to drive the organisations to focus effort on these priority areas.

Targets also imply both measuring and reporting performance at regular intervals Targets can be “hard” such as the NSW Energy Efficiency Scheme, “soft” such as the Federal Government’s aspirational greenhouse target of reducing greenhouse gas emissions to 60% by 2050, or something in between.

In order to stimulate DE and DM implementation, targets could be set for both in terms of energy (GWh per annum) and peak demand (MW). These could be set by:

- the NSW Government as a complement to the Energy Efficiency Scheme targets. While ideally these targets would be legislated, this need not necessarily be the case; or
- the City of Sydney in a publicly announced high-level (Lord Mayor/CEO) partnership with Energy Australia.

In any case, it is essential that annual targets are set, performance towards these targets is publicly reported at least annually, and a strategy for implementation is adopted including clear accountabilities for performance. An appropriate target may be to meet all growth in projected energy consumption and projected peak demand for the next decade through a combination of DG, DE and centralised renewable energy as mandated through the Federal Government’s Renewable Energy Target.

Action 22: Partnership

The City of Sydney should engage Energy Australia in discussions around a high-level (Lord Mayor/CEO) Partnership on Distributed Generation and Demand Management. This would involve publicly announced targets for DG and DM in 2009 for each year from 2010 to 2020. Tracking progress may require the establishment of a register of trigeneration facilities within the City of Sydney LGA in collaboration with Energy Australia.

Facilitation

Facilitation goes beyond information provision, but stops short of offering specific incentives, and is generally intended to support parties already seeking to develop trigeneration or other distributed energy options. Facilitation is often aimed at reducing transaction costs, managing risk and building confidence and can include:

- High level management commitment, to reduce administrative and cultural barriers
- Advice and technical assistance
- Training and skills development (refer to Action 15)
- Networking of customers and product and service providers (e.g. through seminars, conferences, websites)
- Community engagement (e.g. though City of Sydney or NGO run programs).
- Standardised agreements for provision of distributed energy services, in order to reduce legal and negotiation costs.

While there are numerous facilitation initiatives provided by government and other organisations, there is no overall coordination or evaluation of their effectiveness. This leads to confusion, overlap, gaps and inefficiency.

In the UK, the EU Cogeneration Directive[25] has been implemented as a series of legislation actions on the promotion of cogeneration and Trigeneration in the internal energy market[26].

Action 23: Distributed Energy Review, Targets and Agency

a) The NSW Government should undertake and publish a comprehensive annual NSW Distributed Energy Review. This Review should include (in relation to Energy Efficiency, Distributed Generation and Peak Load Management):

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[25] EU Cogeneration Directive 2004/8/EC http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:052:0050:0050:EN:PDF

[26] DECC EC Directive on Promotion of CHP in the Internal Energy Market http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/emerging_tech/chp/chp.aspx

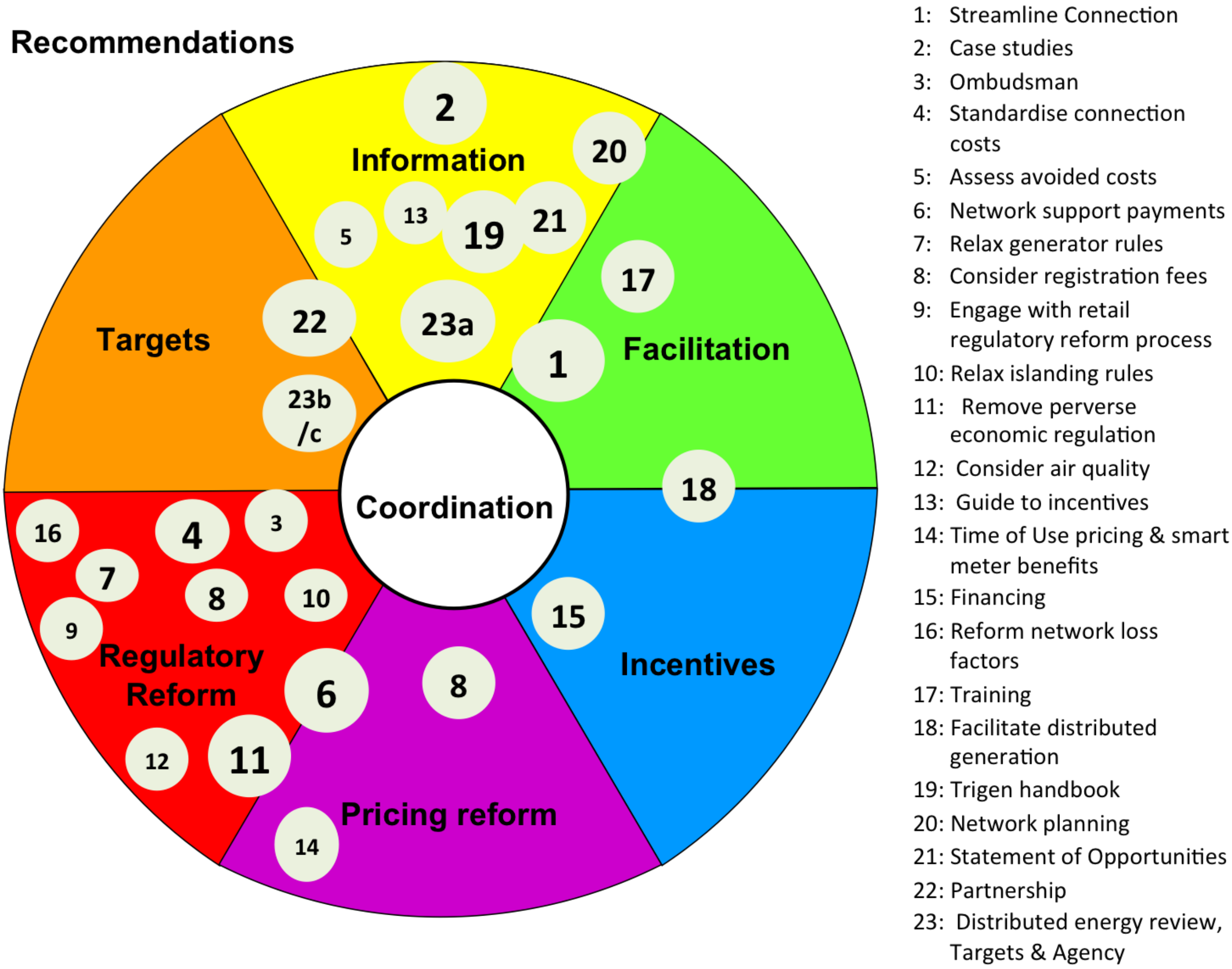
- **A detailed and robust resource assessment of distributed energy potential in NSW.**
- **An accurate assessment of current distributed energy practice in NSW.**
- **An overview of international best practice in distributed energy programs and policy.**
- **An evaluation of available facilitation measures.**

b) The NSW Government should also establish annual targets for Distributed Energy in NSW. While these targets need not be mandated, annual reporting against progress is essential.
c) A NSW Government Agency with appropriate resources and authority should be commissioned to co-ordinate a "Distributed Energy Strategy" to reach these targets.

3 ACTION PLAN TO OVERCOME BARRIERS

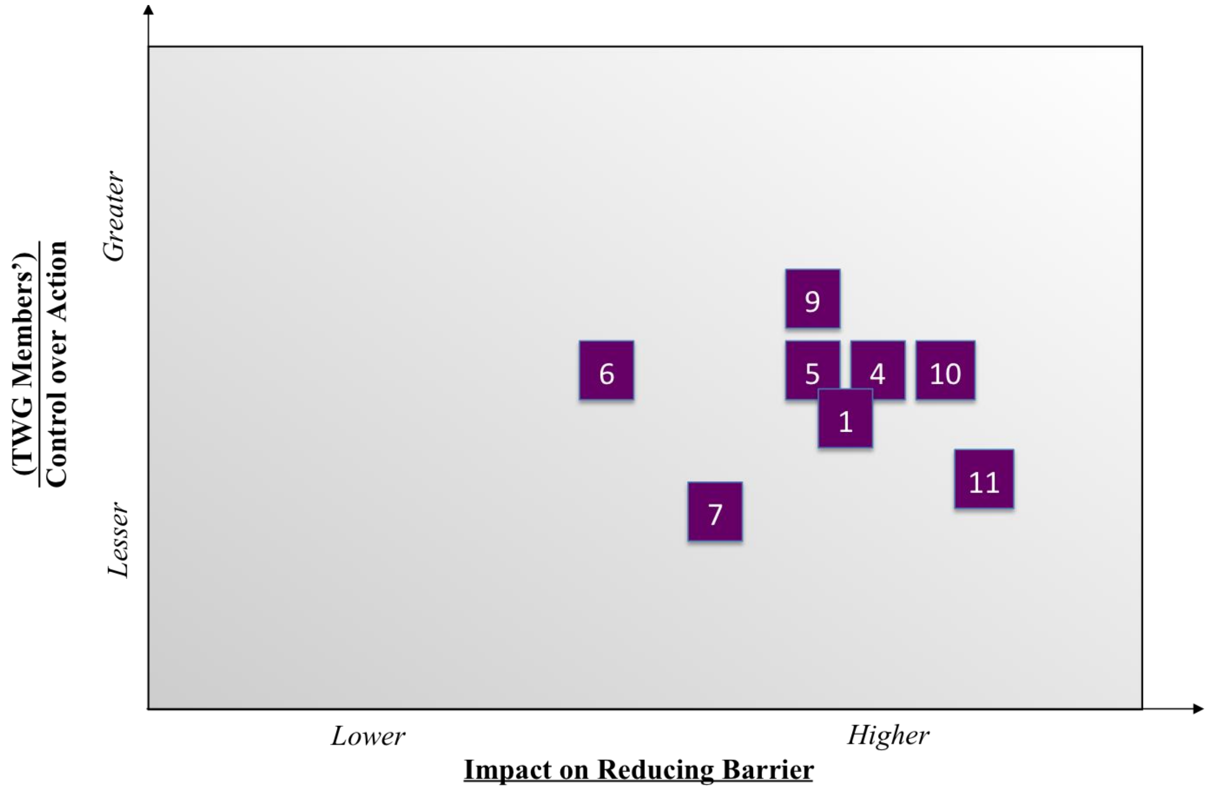
The previous section discussed specific barriers to the development of trigeneration in Sydney and suggested specific actions that the City of Sydney and other participating government and industry parties can carry out to assist in overcoming these barriers. The Figure 3.1 maps these proposed actions against the framework of the 'policy palette'.

Figure 3.1 - Actions to Address Barriers



Following consideration of these proposed actions at the forthcoming workshop, the Working Group formulated an Action Plan with suggested responsibilities and timeframes for action. Each participant was asked to vote for the four (of the 23 suggested) actions that they considered to be most important, and map them based on the importance of the impact that the action would have if successfully executed and the level of control that the TWG is likely to have over the successful implementation of that action. The prioritisation process resulted in the Impact/Control Diagram presented in the Figure 3.2. The purple squares represent the action numbers that received the most votes, and their consensus position on each axis.

Figure 3.2 – Impact/control diagram representing prioritisation of actions to address barriers



The Action Plan created as a result of the assignment of responsibilities to the most highly prioritised actions is presented in Table 1.

Error! Reference source not found. - **Action plan for favoured options**

Action	**Title**	**Responsibility/ Lead**	**Timing**	**Notes/ Resources**
10	Relax islanding rules (licensing)	IIN (Discussion paper pending)	Pending	
9	Retail Reform (licensing)	IIN (Discussion paper pending)	Pending	
5 (+6+11)	Assess Avoided Costs	**CoS**, EA, Jemena, proponents	Pending	Rule change via AEMC, NB: Now case and timing specific
11	Reform network economic regulation	-	Pending	
1	Streamline Connection	IIN	Pending	
7	Generation Rules (licensing)	IIN	Pending	
6 (+5+11)	Network Support Payments	-	Pending	
4	Standardise Connection Costs	Not discussed	Not discussed	Not discussed

Other actions that were prioritised highly by just one or two participants and may be addressed at a later stage (but were not included in this Action Plan) were:

- 15: Financing
- 8: Consider registration fees
- 18: Facilitate distributed generation
- 22: Partnership with Energy Australia
- 23: Distributed energy review, Targets & Agency
- 13: Guide to incentives (carbon price)
- 12: Consider air quality
- 16: Reform network loss factors

Progression of this action plan now rests with the City of Sydney in light of amendment to the original vision for the TWG. To a large degree the appropriate follow up will be informed by the Trigeneration Master Planning process.

4 NOTE ON THE ISSUE OF IMPLEMENTATION SCALE

Throughout the workshop there was a recurring theme of discussion around the appropriate scale of trigeneration implementation required to meet the City of Sydney's emissions reduction goals, and on which the TWG should be focussing its energies. At the smallest end of the spectrum there are trigeneration units sized to meet the electricity, heating or cooling load demands of a single facility, increasing in scale to multiple facilities, and up to neighbourhood or district systems in the order of 30-50MWe. To a large extent the appropriate scale will be determined by the findings of the upcoming Trigeneration Master Planning process. However, there was disagreement from participants as to whether developing smaller-scale trigeneration is in fact a useful stepping stone to precinct-scale development, or whether the barriers encountered are fundamentally different. The property sector representatives, for example, were generally of the opinion that the TWG should be focussing on the largest scale possible, and that somewhat limited value would be gained from using small systems as a stepping stone. Energy Australia and ISF, on the other hand, expressed the opinion that the jump in scale was unlikely to be able to occur without a significant transition phase and 'learning by doing', progressively addressing the array of institutional barriers.

However, the City of Sydney targets will never be met with a multiplicity of small scale trigeneration schemes, as the market is currently delivering. Energy Australia's stated view is that a fewer number of large scale trigeneration schemes would be more beneficial to them and their network, quite apart from the greater reductions in energy demand and CO_2 emissions. Therefore a pragmatic stance is perhaps that where possible, smaller scale trigeneration schemes should be implemented only as part of a modular approach to large scale trigeneration schemes. This enables trigeneration schemes to be implemented now whilst at the same time preserving the ability to catalyse and form part of the large scale trigeneration or 'low carbon zones'. This is what the City is implementing with its own trigeneration schemes.

The barriers discussed in this report – and the actions constructed to address them – are of differing levels of importance depending on the scale of implementation.

Table 1 has therefore been provided to illustrate the relative importance of the barriers and issues discussed relative to implementation scale. What is clear is that when addressing the barriers to the above, the City must be mindful of the range of different scales likely to be encountered throughout the initiation and development of its vision.

Table 1 - Importance of barriers relative to implementation scale

Barrier/Action	Importance at scale		Comments
	Small-Scale	Large-Scale	
A: Electricity Connection	High	Medium	Done at scale the effort of connection is smaller relative to the project size
B: Avoided network costs	High	High	Vital at all scales
C: Generation Licensing	Medium	High	While this presents a problem at all scales, exemption is currently available under 5MW scale
D: Retail licensing	Nil-High	High	This is a potentially significant problem for any facility with greater electrical production than local building needs (where it is not a concern)
E: Islanded system restrictions	Low-Medium	Medium	
F: Network economic regulation	High	High	
G: Local environmental regulations	Low	High	Unless Best-Available-Technology is required of small generators, air quality regulations are unlikely to impose a significant requirements in the short-term, however at large scale air quality will be of great importance to approach strategically
H: Heritage regulations	Low	Low	
I: Carbon pricing	High	High	
J: Network pricing	Medium	Medium	
K: Access to finance	High	Medium	While this issue generally affects smaller scale installations more significantly, new financing models may need to be developed for larger scale rollout
L: Distribution losses	Medium	Medium	

Barrier/Action	Importance at scale		Comments
	Small-Scale	Large-Scale	
M: Lack of skills	Med-High	Med-High	
N: Lack of precedents	Medium	Medium	
O: Network planning information	Medium	Low	At scale the assessment of strategic installation locations can proceed more cost-effectively
P: Industry momentum	High	Medium	Larger scale implementation will require active, concentrated engagement from DNSPs and thus will contribute to some extent in overcoming industry momentum for BAU network solutions

4.1 New Issues Encountered at Precinct Scale

It should also be noted that due to the absence of any precinct-scale developments to date, there may be other barriers that have not yet been encountered, but that are predicted to be have some influence. One such example, as raised in the TWG workshop, is the issues associated with installing precinct scale hot- and (possibly) cold-water piping networks. This may involve approvals for construction and laying of pipework under public or private land, with the coordination of associated approvals from a broad range of governing agencies, to ensuring the regulatory environment for connection and licensing is not incompatible with efforts to provide customers with alternatives to electrical heating and cooling. It is considered that the City would be able to address these issues in a holistic fashion through the development of its Master Plan, and largely smooth the procedural hurdles at the beginning of the implementation process, given that it would be part of a strategically planned and coordinated approach. Nonetheless, issues associated with arranging connection may prove challenging, and learning from experience in other countries is recommended.

The UK's approach to these issues is set out under Barriers B, C, I and P demonstrates the importance of decentralised or distributed energy to the UK Government's energy and climate change targets as well as the precinct size projects implemented in the UK, including the City of London, Southampton and elsewhere in Europe, in particular, Denmark and the Netherlands. The experience gained in the UK can benefit the City since the issues involved are very similar and the resolution of the issues have already been worked through and implemented.

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