Submission in Response to:

'Power from the People –

Inquiry into distributed generation'

By Victorian Competition & Efficiency Commission

Prepared by:

PRENDERGAST PROJECTS

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Revision A

Key Recommendations

1. 'Medium Scale Generators' should be divided into 2 further categories relating to in-building generators that look to connect to the grid via existing infrastructure, and Precinct generators that look to connect to the grid via the HV Network.
2. The most crucial rule and policy change for the further growth of embedded generation, for the purposes of demand management, energy efficiency and GHG emission reduction would be for the VCEC to:
    a) Propose a new rule or process that rewards embedded generation and trigeneration projects for its value to the grid through reduced and cost reflective TUOS and DUOS charges
    b) Propose a process by which project applicants can get feedback on the potential TUOS and DUOS savings within a suitable timeframe, ideally within 3 months, on the basis of concept design information.

Introduction

3. Prendergast Projects provides advice to clients on Precinct Trigeneration and District Energy projects. These projects see low emission generation and distribution of electricity, heating and cooling, on a multi-building basis, rather than each building considering it's heating and cooling (and sometimes embedded low emission generation) requirements.
4. This response to the Inquiry into distributed generation is with respect such projects, and normally include:
    - Medium Scale embedded generation, between 1 and 5 megawatts as defined by the Inquiry report (May 2012)
    - Heating recovery, gas boilers, absorption chillers and electric chillers
    - Reticulation of electricity via the existing distribution grid
    - Reticulation of heating and/or cooling services by insulated buried pipe work under public streets and roads.
    - Building connection points, including heat exchangers and meters, and sometimes absorption chillers
5. This submission does not consider household or small-scale generation and Feed-In-Tariffs.

Background

6. Buildings use 40% of the nation's energy and produce 23% of the nations Greenhouse Gas (GHG) emissions.
7. Over the last decade, many organisations involved in new building developments have sought to maximise energy efficiency in an effort to address climate change. During this work, concentration also naturally moved to the GHG emissions of supply of electricity, due to the high carbon intensity of grid delivered electricity in Australia. This has often included embedded trigeneration in buildings seeking high energy efficiency ratings, including Green Star (by GBCA) and NABERS ratings.

8. Generally, in-building trigeneration units are limited in capacity, as they can only be sized to meet base electric and thermal loads. Gas fired reciprocating engines are unable to run efficiently at loads under approximately 70%. If in-building trigeneration units are over-sized, they are unable to run except at higher times of demand. Standard business hours are only 2,340 hours per year (~24%), which is often less than the hours of trigeneration unit operation hours required for an attractive return investment. Despite this, some buildings have achieved up to 59% GHG emission reduction in part by using in building trigeneration.
9. Developers of precincts, such as Frasers Central Park, Docklands, Revitalising Central Dandenong and Green Square, are now investigating methods of energy efficiency and maximization GHG emission reduction at a precinct scale. The development of low emission centralised heating, cooling and/or trigeneration systems is often more efficient at a precinct level due to economies of scale and non-simultaneous demands of a variety of different buildings types (known as Diversity factor).
10. Additionally, many local governments are investigating ways of reducing the Greenhouse Gas (GHG) emissions of their LGA, which includes existing buildings stock. Again, while some councils are considering energy efficiency of buildings only, other councils are investigating precinct scale low emission supply of electricity, heating and cooling. Such projects include the City of Sydney trigeneration project, and Townsville District Cooling project.
11. The benefits of these projects include:
    a) Reduced GHG emissions through the use of trigeneration and high efficiency electric chillers (compared to older buildings low efficiency electric chillers)
    b) Reduced peak demand, due to production of heating and cooling using waste heat rather than electricity
    c) Reduced peak demand due to embedded generation
    d) Avoidance of inefficient building by building approach to trigeneration
    e) Avoidance of inefficient building by building approach to heating and chilling
    f) Reduced peak demand through potential future thermal storage, that see chilling and heating storage charged at off-peak, or when renewable energy is available, and dispatched when buildings demand energy
12. In all precinct scale projects, they:
    a) Would not occur without a central coordinating organisation, and the willing participation of local developers, building owners and tenants.
    b) See the engagement of an energy services provider to, at a minimum, retail the electricity, and also commonly fund, install, own and operated generation plant

Medium Scale Embedded Generation

13. Important technical and commercial issues regarding the operation of Distribution Network Services Providers organisation need be made clear, including:
    a. Capital works can either be paid by:
        i. Future ongoing DUOS payments
        ii. Developer contributions

b. Electricity grids are primarily designed 1 directionally for the supply of electricity from remote generation to various users. While it is possible to feed electricity from users back up the grid, this is not how the grid is designed.

14. We believe important distinctions need to be made by the inquiry regarding medium scale generation. The importance of these distinctions for grid connection discussions is made clear over subsequent items. The 3 categories of medium scale generation seeking grid connection are:

    a) **In-building embedded generation** units whose primary purpose is to generate electricity, heating and cooling for on-site consumption. A grid connection is only proposed for the export of surplus electricity

    b) **Precinct scale embedded generation** units whose primary purpose is to sell electricity (and heating and/or cooling) to surrounding buildings using the local grid.

    c) **Other** – including island precinct systems

15. Typically, precinct scale embedded generation connects via a High Voltage line to the local substation, from which electricity is distributed to local buildings. Electricity is not directed back up the grid, requiring fault level protection and other grid redesign works. Such connections depend on the distance from generation to the local High Voltage line, but are generally more than $100k but less than $500k.

16. In-building embedded generation seeks to direct electricity back up the building's existing grid connection. While this may seems a simple solution, the resulting redesign works of fault protection, transformers, wiring and other equipment often sees costs blow out to over $1 million, making such a connection unfeasible.

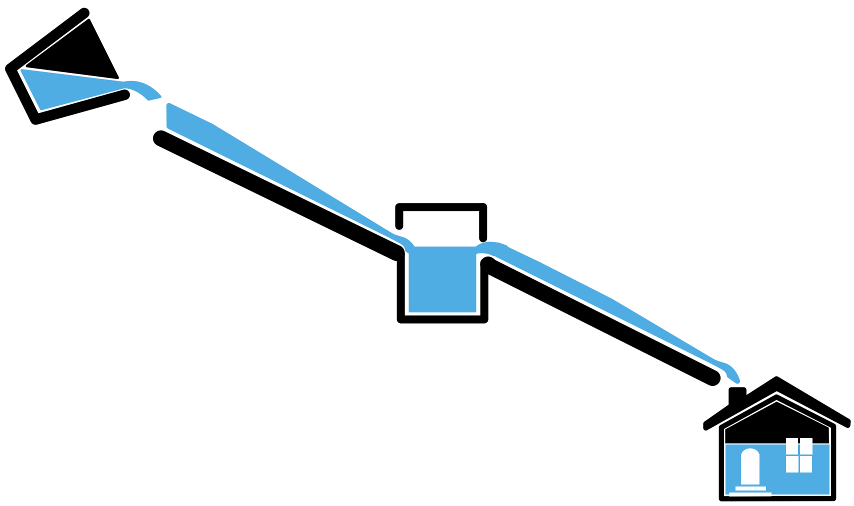

Figure 1 *– Analogy on how the electricity grid is designed*

17. The grid is primarily designed to take electricity from remote generation, and deliver it to houses. It is designed in 1 direction, and contains wires, transformers and sub-stations to provide appropriate services to customers. Figure 1 shows how this works with water as an analogy. To simply generate at the customer end, and expect to use the same infrastructure

to feed back into the grid is not possible without large re-engineering, and this is widely not understood by those who do not work for distribution companies.

***Figure 2** – Large-scale water tank.*

18. Another analogy, using water again, is to compare a house having a small backyard water tank to supplement grid supply compared to a house having a large scale tank on stilts (Figure 2) designed to provide pressure to the water supply for the local community. It is obvious that a house cannot have such a tank, and expect to feed excess back into the water grid using the garden hose. This is obviously not possible.
19. In addition to this, DNSP's commonly request that any augmentation to the grid to allow in-building trigeneration to feed back into the grid is paid for by the applicant. This is understandable, as the DNSP will not see large electricity flow using the new infrastructure, as the intention is for the applicant to only export excess electricity during low building electricity demand times. It is also debatable that the embedded generation provides any benefit to the grid due to the feed in to the grid on an irregular basis.
20. The above unfeasibility of grid connection by in-building has lead to frustration by building owners and the community, and subsequent enquiries by Climate Works and inclusion in this inquiry. However, to truly address this issue, it is important that it is fully understood in the first place.
21. We recommend that the inquiry proceeds with it's proposal to support Climate Works proposed streamlined and regulated connection process, but also considers that greater awareness and communication is required by in-building trigeneration applicants and DNSP's.

Timing - Business Investment Decision

22. In terms of general industry discussion, and concentration by the VCEC inquiry and Climateworks report, there is a large concentration on grid connection process and costs.

Grid connection costs for Precinct Scale generation can be from $100k to $1 million, depending on length to local HV network and augmentation costs.

23. However, for a 4-megawatt (electric) embedded generator distributing electricity via the grid to local buildings, network (TUOS and DUOS) charges could be in excess of $1 million per year. This is a much more important issue for precinct scale trigeneration projects, compare to grid connection cost.

24. Typically, the coordinating organisation will have to coordinate various building owners, developers, and other organisations and will follow the following process over 12-18 months (not including design and installation) from initiation to delivery commencement:

    a) Feasibility

    b) Decision to proceed or otherwise

    c) Tender/Bid Process

    d) Negotiation

    e) Decision to proceed or otherwise

    f) Engagement of Contractor/Supplier

    g) Project Delivery Commencement

25. An understanding on potential discount or exemption on TUOS and DUOS charges is key to the feasibility of the project

26. In the current commercial, technical and regulatory environment, some monetary contribution or enabling infrastructure (e.g. Free land) is required from the coordinating organisation or elsewhere (e.g. Grant funding). The exact scale of such funding is agreed at time of engagement (Step f), and is based on known costs and revenues up front.

27. Knowledge of applicable TUOS and DUOS costs or exemptions/discounts 'make or break' such projects. Certainty on such costs could lead to large scale development of embedded generation and trigeneration projects using the grid, and provide the benefits identified in Item 9.

28. To enable such projects to happen, the issue is not so much as the scale of the exemptions/discounts, but the time by which they can be known and made certain. There are examples of Network Support Agreements that can be agreed by embedded generators and the local DNSP, where the embedded generator is paid due to the benefit to the network of such generation being available at peak times.

29. Network Support Agreements take a long time to negotiate and agree (i.e. Greater than a year), and rely on information that is only available at detailed design stage. By this time, either the project has been decided to be unfeasible, or an Energy Services Provider has been engaged, and any payments under such an agreement become unexpected profits.

30. The value created by embedded generation projects need to be defined early in the project development process, through feedback and agreement with the local DNSP, to enable growth of the embedded generation industry in precinct energy projects.

Conclusions

31. Precinct scale trigeneration and district energy projects have significant benefits for the community and economy.
32. 'Medium Scale Generators' come in different categories that are very distinct when it comes to grid connection, and need to be defined and understood.
33. Great industry understanding and communication is required to the applicability of in-building trigeneration to connect to the grid to export excess electricity generated by customers. There is a current understanding and communication gap.
34. Grid connection costs for precinct scale embedded generation projects are insignificant when compared to network charges over the life of the project.
35. The most crucial rule and policy change for the further growth of embedded generation, for the purposes of demand management, energy efficiency and GHG emission reduction would be for the VCEC to:
    c) Propose a new rule or process that rewards embedded generation and trigeneration projects for its value to the grid through reduced and cost reflective TUOS and DUOS charges
    d) Propose a process by which project applicants can get feedback on the potential TUOS and DUOS savings within a suitable timeframe, ideally within 3 months, on the basis of concept design information.
36. Please contact Jonathan Prendergast on the contact details below if any further information is required

Jonathan Prendergast

Director

M: 0403 602 426 T: (02) 8971 3980

jonathan@prendergastprojects.com.au

Prendergast Projects Pty Ltd

2/142 Regent St

Redfern NSW 2016

www.prendergastprojects.com.au