CLEANaS

CLEAN ENERGY ASSOCIATION OF NEWCASTLE AND SURROUNDS

Lighthouse Community Energy Project
Potential Value Adding Measures Feasibility Study
Virtual Net Metering

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CLEANaS is a not-for-profit association dedicated to driving the uptake of clean energy in Newcastle and surrounds through community owned projects and activities. http://cleanas.org.au/

INTRODUCTION

The Clean Energy Association of Newcastle and Surrounds (CLEANaS) aims to increase the uptake of renewable energy and energy efficiency installations in the Newcastle and surrounding region. We seek to do this by supporting current energy users to reduce their energy consumption as well as transitioning to renewable energy sources.

This report details the Feasibility study on the potential value adding measure of Virtual Net Metering as part of Output Three of the Lighthouse Community Energy: A critical mass of viable and appropriate project sites identified and prepared for implementation.

CLEANaS is considering possible mechanisms which could add value to the portfolio of prospective projects by improving financial viability. This includes Virtual Net Metering, which enables aggregation and peer to peer trading of electricity; and Environmental Upgrade Agreements, which remove barriers for financing mechanisms for commercial buildings.

VIRTUAL NET Metering (a.k.a LOCAL ELECTRICITY TRADING)

Virtual Net Metering and local network charges in Australia: an update

As part of the Smart Future Cities Conference 2015 held on 1-3 October in Newcastle NSW, a panel session on "Virtual Net Metering and local network charges in Australia: an update" was conducted.[i]

This took the form of a 60-minute panel session with presentations followed by a structured discussion and Q&A session. The session included an introduction of a research initiative by the Institute of Sustainable Futures, details of rule changes to energy trading by the Total Environment Centre, and with representation from Byron Shire council. The panel was moderated by Dr Andrew Mears from SwitchDin (and CLEANaS committee member), and included panellists:

- Jay Rutovitz, Institute for Sustainable Futures;
- Mark Byrne, Total Environment Centre; and
- Sandi Middleton, Byron Shire Council.

The abstract for the panel session is included below:

The rapid penetration of small-scale distributed electricity generators in distribution networks has been driven by a number of factors, including community interest in low-carbon and renewable energy and the decreasing cost of alternative generation technologies, especially solar PV. Under the prevailing electricity market structure these projects are generally only cost effective if most of the output is consumed on-site. If it was possible to transport excess energy to other sites in the vicinity then it could improve project performance, and would certainly allow project proponents to consider larger systems. However, distribution businesses do not currently offer tariffs to reflect partial use of the electricity network, and retailers do not offer a standard "netting off" service where energy is shared between multiple sites (referred to as "virtual net metering"). Local councils in Australia have emerged as key proponents of network tariff reform and virtual net metering due to their interest in reducing their greenhouse footprint and encouraging the growth of distributed generation reducing energy costs across their facilities.[ii]

To provide a more complete review of Virtual Net Metering and to ensure continued relevance, the synopsis of the panel session included below has been amended to include further details from the Institute of Sustainable Futures project web site together and to include recent developments in that project since the panel session was conducted.

Context

The NEM is at a historic point of transformation. In 2008-2009, the Annual Energy forecasts for the NEM were that electricity demand would continue to its past performance and rise. However, demand dropped and continued to drop, in part due to the rollout of Rooftop solar PV, energy efficiency and from behavioural changes in residential and commercial electricity use in response to increased electricity prices. Energy Efficiency and Rooftop Solar PV installations are forecast to continue and grow, decreasing the demand for centralised electricity supply. It could be inferred that Centralised electricity supply has already peaked.

Today the electricity network is a Highly Centralised Network. In the future, it will be a Decentralised Network with far more local energy, with increases in wind and solar farms, bioenergy, and local energy production such as solar PV in residential, commercial and industrial electricity users, together with a move away from coal fired power.

The Death Spiral

A possible outcome of the current situation is referred to as "The Death Spiral". Approximately 35% of retail electricity costs are from network costs, with big investments in distribution networks having spurred increases in retail electricity prices. This is contrasted by decreases in grid electricity consumption. The key drivers for consumption falling are: higher electricity prices, Energy Efficiency programs, Renewable Energy policies supporting solar and cheaper Solar PV and storage.

With decreased consumption, energy sales are down, however capital repayments stay the same and the cost of the network remain relatively unchanged. To recover these costs, energy distributors are likely to increase their prices which results in increased retail costs. These increased prices would trigger decreased grid electricity consumption through behavioural changes, Solar PV, and Energy Efficiency. With relatively fixed costs, decreased consumption would trigger further increases in electricity prices. The increased prices would make batteries and solar PV relatively cheaper, decreasing grid electricity consumption. With increased prices, the prospect of going off the grid would also become more appealing, further decreasing grid electricity consumption and putting further pressure on increasing electricity prices to recover costs with a decreasing customer base.

Local Energy Benefits

Another possible outcome is from the mutual benefits of local energy generation and the electricity network.

Local energy benefits for Networks:

- Reduced transmission and distribution losses
- Potential to save money on network investment
- Emissions reduction
- Increased resilience of system
- Technical network services

Network benefits for Local Energy:

- Provides local generators access to bigger markets
- Keeps high level of reliability
- Allows local generator to run system for maximum efficiency
- Supports technical requirements of consumers

Current problems with Local Energy Production and Use

- Current network charges for local energy production include: Transmission, Sub-transmission, HV Distribution and LV Distribution. However, local energy production only utilises the HV & LV Distribution networks.
- Distributed Generators (Local Energy Producers) sell at wholesale and buy back at retail prices.
- There exists a strong incentive for customers (and product developers) to focus "behind the meter" implementations and to reduce grid consumption.
- There is a perverse incentive to duplicate infrastructure (such as private wires). Willoughby Council is one such example.[iii]
- Implementations involve sub-optimal sizing of generators and little incentive to supply grid services, which constrains potential cost effective distributed generators.
- Increased costs for consumers left using only grid electricity, as infrastructure costs are recouped from smaller sales volume, with reduced network revenue leading to defensive pricing strategies (see the death spiral above).

CONCEPTS

Local network charges (LNC)

Local network charges are reduced tariffs for electricity generation used within a defined local network area. In most circumstances, the tariff will reduce the network charge portion of electricity bills for local generators to the extent that the generation reduces long term network costs. This recognises that the generator is using only part of the electricity network, and reduces the network charge accordingly. To date reduced network tariffs have been applied most systematically in the UK. A core principle of the LNC is 'cost and value reflectivity', and as such any LNC payment should reflect reduced system costs in the long term.

Local electricity trading (LET aka VNM)

It is confusing but we are now using the term 'local electricity trading' to describe this concept which can also be referred to as virtual net metering (VNM).

With Local electricity trading (LET), location matters. With LET:

- An electricity customer with on-site generation is allowed to assign their 'exported' electricity to other site(s);
- It is 'virtual' because there is no direct physical interconnection ... it's a matter of accounting of these transactions; and
- LET and local network charges both have a big impact on the economics of local generation
- Local electricity trading is an arrangement whereby generation at one site is "netted off" at another site on a time-of-use basis, so that Site 1 can 'sell' or assign generation to nearby Site 2. This will reduce the combined energy and retail portion of electricity bills for local generation.

Barriers

- In theory there is no regulatory reason to stop Network Service Providers offering local network charges and retailers offering LET, however there is currently no requirement or established methodology to follow. Retailers may offer LET on case by case basis, but this would be costly.
- A rule change is required to introduce Local Network Charges, and may be required for LET

Why does it matter?

The combination of local network charges and LET aims to offer desirable alternatives to customers who might otherwise choose to disconnect from the grid altogether or keep all their generation “behind the meter”, drastically reducing the amount of electricity they take from the grid. This could reduce the overall network costs in a more distributed energy future.

Improving opportunities for small-scale distributed electricity generators to distribute and sell electricity locally using cost-reflective pricing arrangements could unlock substantial new clean energy potential. For example, small to medium businesses (such as local councils or universities) may want to generate electricity at one site and use it at another site nearby. Network businesses are currently unable to offer a tariff to reflect such partial use of the network, and retailers do not currently offer the ‘netting off’ service for multiple sites as standard. This has stopped numerous projects going ahead. Current arrangements mean that local generation is sized to match the lowest onsite electrical load in order to minimize grid exports, as there is little financial benefit from doing so. This affects economies of scale and operating efficiency.[iv]

THE PROJECT: FACILITATING LOCAL NETWORK CHARGES AND LOCAL ELECTRICITY TRADING

The objective of the project[v] was to facilitate the introduction of reduced local network charges for partial use of the electricity network, and the introduction of Local Electricity Trading between associated customers and generators in the same local distribution area.

To achieve the project objective, the following activities were undertaken:

- Conducted five case studies, or “virtual trials”;
- Developed a recommended methodology for calculating local network charges;
- Undertook an assessment of technical requirements (e.g. metering) and indicative costs for Local Electricity Trading;
- Performed Economic modelling of benefits & impacts; and
- Increased stakeholder understanding and support for rule change(s).

Partners: A Broad Coalition ...

The project lead was University of Technology Sydney - Institute for Sustainable Futures (UTS: ISF) and the project sponsor was ARENA. This project brought together a partnership of consumers, researchers, electricity providers and government, including a number of local councils, power companies, and renewable energy advocacy groups.

The virtual trials:

The UTS: ISF project undertook five ‘virtual trials’ of local network charges and virtual net metering, in NSW, VIC, and QLD. The trials described were “virtual”, so all outputs and netting off transactions were modelled, and proponents’ energy bills did not change. However, all of the projects are under serious consideration and data inputs are real where possible, including actual consumption profiles, current energy tariffs, and network tariffs from the project proponents. Results of four out of the five trials are now in. The remaining trial is by Moira/Swan Hill Council in Victoria, working with Network provider Powercor and Retailer AGL to model LET one to many or many to one using Solar PV.

Trial key facts

Proponent	Winton Shire Council	Byron Shire Council	Willoughby Council	Wannon Water
State	QLD	NSW	NSW	VIC
Network provider	Ergon Energy	Essential Energy	Ausgrid	Powercor
Retailer	Ergon Energy	Origin Energy	Energy Australia	AGL
Technology	Geothermal	Solar PV	Cogen	Wind
Size	310 kW	150kW	173 kW	800 kW
Generation site	New plant	Sports Centre	Leisure Centre	Waste Water Treatment Plant
Netting off sites	29 Winton Council sites	Waste Water Treatment Plant	Concourse	17 Wannon Water & 4 Glenelg Shire Council
LET model	1-to-1 transfer	1-to-1 transfer	1-to-1 transfer	1-to-2 transfer

A model was constructed to compare the business case for local generation projects under current market conditions, and with combinations of LNC & LET. The trials examined the business case for the new generation for a number of scenarios.

Key results

Three of the four projects were found not be financially viable under current market conditions without LNC or LET. All scenarios utilising LET and/or LNC led to reduced costs compared to BAU. Employing a private wire (similar to behind the meter implementations) had a positive effect in all cases where it was an option, but for most scenarios a private wire was not as beneficial as utilising both LET and LNC. This indicates that the combination of LNC and LET could remove some of the current perverse incentive to duplicate infrastructure via private wires.

As expected, the current market scenario results in the lowest reduction in network charges, as the only change in charges is the effect of the behind the meter consumption at the local generation site. The private wire case results in by far the greatest loss of immediate income for the network business. The implication is that if customers opt to build private wires, network businesses will receive less immediate revenue than if those customers were incentivised to export to the grid through the use of a LNC.

Note that if the removal of a customer/load from the network does not decrease the network's costs to the same degree as the associated revenue reduction from that customer, those residual costs will be recouped as increased charges from all customers as networks operate under revenue cap regulation, revenue shortfalls in one year are recovered via customer tariffs over the following years.

The case for export from cogeneration, as modelled in the Willoughby trial, has a marginal cost of operation of just over 7 c/kWh, provided the cogen is also supplying useful heat. Export was not found to be economic under current market conditions, even at peak demand times, when such export would presumably be useful to the network business. The payment of an LNC alone would make peak exports worthwhile, and the combination with LET would make exports worthwhile at shoulder periods. Thus indications are that current market conditions result in suboptimal operation of cogeneration, as plants may be undersized in order to avoid export, or simply not operated when operation would result in export. This situation could be remedied through the combination of the LET and LNC for Cogen operators. The marginal cost of cogeneration case demonstrated in the project that even a relatively low LNC can send a meaningful signal to operate dispatchable generation when the network is most likely to need support.

Project Summary

The trials indicate that in most circumstances, the combination of LNC and LET address the following issues to some degree:

- Inefficient sizing and operation of distributed generators;
- Lack of incentive for dispatchable generators (such a Cogen) to operate at required (peak) times;
- Potential under-utilisation of the grid, with consequent rise in consumer network charges; and
- Perverse incentives to duplicate infrastructure.

The UTS: ISF project results indicate that the offering of an LNC would help keep kWh on the grid, maintain network usage and thus help limit increases in network charges.

BUSINESS CASE

The business case for LET/LNC is to some extent site and installation dependent, reliant on the generator capital and maintenance costs and on electricity usage patterns of the “Netted off” sites.

All virtual trials (and the majority of scenarios) showed a positive cost benefit compared with business as usual (BAU). Without employing the measures of LET & LNC or implementation of a private wire (where possible), only one trial site (Wannon Water) was deemed financially viable (savings compared to BAU).

All scenarios (with the exception of BAU) modelled for Winton Shire Council (310kW Geothermal) had a positive cost benefit with the greatest benefit from employing both LET & LNC with payback period of seven years. This was followed by employing a private wire which had a nine year payback period. It should be noted that network charges were the most significantly affected in the private wire case, with a 3.6 times the reduction in network charges, compared to where LET

& LNC are used. The reduced network charges did not result in equivalent savings for Winton Council, as the cost of the private wire absorbed much of those savings.[vi]

The details from the Byron Shire Council (150kW Solar PV) business case modelling indicated that all scenarios resulted in a saving compared to business as usual, and that a private wire gave the greatest benefit to the Shire Council followed by employing both LET & LNC with both scenarios having a return on investment (IRR) of 13% and a simple payback period of eight years.[vii] Similarly to Winton Shire Council, for a private wire the network charges were significantly affected with a reduction 2.6 times that of LET & LNC with no additional savings to the Council, with the private wire cost absorbing the reduction in network charges.[viii]

All scenarios result in a saving compared to business as usual for Wannon Water, with employing both LET & LNC having the greatest benefit with a return on investment (IRR) of 11% followed by employing a private wire. Similar to the other trial sites, a reduction of 4.5 times that of LET & LNC network charges for a private wire were noted with savings swallowed up by the private wire cost.[ix]

The installation of cogeneration was found to be marginal for Willoughby Council, with modelling indicating a small benefit resulting from employing both LET & LNC. It should be noted that those results were highly dependent on the price of natural gas.[x]

The positive business cases presented for the use of LET & LNC from the virtual trials show promise. Once LET and LNC measures are implemented within the NEM, it may be possible for CLEANaS to pilot their use with a local renewable energy generation project. However it should be noted that due to the somewhat site specific nature of these implementations a detailed business case should be developed as part of the planning phase of the pilot project.

[i] Rutovitz, Jay, Virtual net metering and local network charges in Australia: an update
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[iv] LNC VNM Project Summary
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[vi] Local Network Charges and Local Electricity Trading: Winton trial fact sheet
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[vii] Facilitating Local Network Charges and Local Electricity Trading – business case spreadsheet for the Byron virtual trial
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