INSTITUTE FOR SUSTAINABLE FUTURES

VIRTUAL NET METERING IN AUSTRALIA: OPPORTUNITIES & BARRIERS

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ABOUT THE AUTHORS

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1 BACKGROUND

The Australian electricity market is currently witnessing an unprecedented proliferation of small electricity generators being connected *within* the distribution network. This trend is driven by substantial increases in the costs of electricity and, in the case of solar photovoltaic (PV) power systems, government incentives coinciding with reductions in the installed cost of these systems. Such generators are commonly referred to as 'embedded', distributed' or 'decentralised' generators, but for the purposes of this report the term 'distributed generation' (DG) is used.

In the current regulatory environment, most of the energy generated by newly installed distributed generation systems must offset host building demand to be a viable investment in the majority of cases[1]. Any generation exported back to the grid may be eligible for regulated or market driven feed-in-tariffs (FiT) or in the case of larger systems, sold on the wholesale spot market, or less commonly, sold to a retailer via a Power Purchase Agreement (PPA). Incentive based FiT programs for small-scale renewable generators have been rolled back in most states, or are expected to be rolled back over coming years, as they will have fulfilled their service of stimulating uptake. The resultant FiT arrangements are likely to be regulated or market-based FiTs, meaning that the agreed value is only credited to the generator for power physically exported to the network from the customer meter.[2] This may resemble the current FiT for solar PV connections in NSW recommended by the regulator, IPART, which provides retailers with an advisory FiT range of between 7.7 and 12 cents/kWh[3] (IPART 2012). Given the relatively low received value for such electricity relative to the current costs of most DG technologies, such market based FiTs are expected to largely restrict the uptake of DG to sites with sufficiently large demand to offset.

2 WHAT IS VIRTUAL NET METERING?

2.1 DEFINITION

Virtual net metering (VNM) is a metering arrangement that aims to overcome the aforementioned barriers that stand to limit the uptake of distributed generation. VNM refers to when an electricity customer with on-site generation is allowed to assign their 'exported' electricity generation to other site/s. The other site/s may be owned by the generator or other electricity customers.[4] The term 'virtual' is used to describe this sort of

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[1] Except in jurisdictions where a gross feed-in-tariff arrangement is permitted, where the electricity is sold independent of electricity demand.

[2] In a 'net' FiT arrangement, generation is netted off with demand instantaneously ('import-export metering'); under a 'gross' FiT arrangement, all generation is exported.

[3] According to information contained on IPART's MyEnergyOffer website, the highest available feed-in-tariff available to a Sydney customer in May 2013 was 8c/kWh. Approximately half of the retailers did not offer a FiT (IPART 2013)

[4] Virtual net metering has also been referred to as 'remote net metering', 'neighbourhood or group net metering'.

metering arrangement as the exported electricity generation is not physically transferred to the consumer, but rather transferred for billing reconciliation purposes.[5]

VNM could take a number of different forms, for example, by allowing:

- generation to be transferred to another meter(s) owned by the same entity (i.e. a council has space for solar PV at one site, but demand at a nearby facility);
- generator-customers to transfer or sell their exported generation to another customer(s);
- community-owned renewable energy generators to transfer their generation to local shareholders; and
- community retailers to aggregate exported electricity generation from generator-customers within a local area and resell it to local customers

The different types of VNM, as categorise by the researchers, are discussed in Section 3.

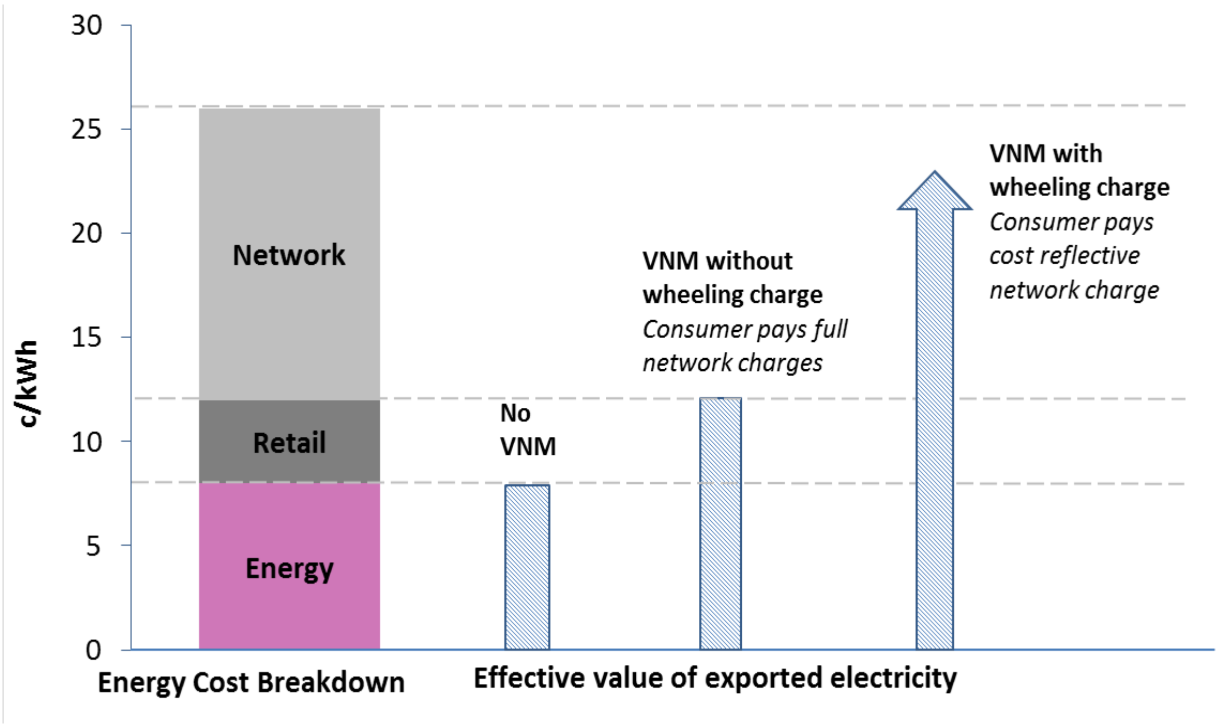
2.2 WHY LOCATION MATTERS

The generator and consumer in a VNM arrangement may theoretically be located anywhere; however, if they are both located within the same network area (e.g. distribution zone or distribution feeder line) or geographic area,[6] it is arguable that the final consumer of the electricity should be exempt from a proportion of the transmission use of system (TUoS) and distribution use-of-system (DUoS) charges. This reduced payment for network services, proportionate with the degree of utilisation of the 'local' segment of the network is sometimes referred to as a 'wheeling charge' and is paid to the distribution network service provider (DNSP). (In this paper, the term wheeling charge will hereafter be used to describe proportional cost-reflective network charging.) As shown in Figure 1 below, a VNM arrangement becomes more attractive when wheeling charges are available as it can substantially improve the business proposition for the generator by crediting a greater value to the locally generated electricity (furthest right column). If wheeling charges are not available because the consumer is located too great a distance from the generator to qualify, or for any other reason, then the maximum benefit a generator can receive from VNM is limited, as DUoS and TUoS must still be paid by the consumer (second column from right). In a market based FiT arrangement, retailer FiT offers are limited by a natural price ceiling as the retailer must on sell that same electricity at retail rates (second column from the left) including full network charges.

[5] The physical electricity that is generated itself is unlikely to be transported specifically from site A to site B – it is impossible to track the flow of electricity through the network. However, assuming the demand at the zone-substation or feeder level is still flowing 'downstream' towards the customers, the physical unit of electricity coming from Site A will be used at nearby sites.
[6] The exact nature of the locational specificity will vary according to policy or network priorities and would need to be arrived at through the policy dialogue.

Figure 1: Potential value received for the export of electricity to the grid

Note: breakdown of costs are for demonstration purposes only and will depend on the customer and tariff type.



If wheeling charges were to be applied, the DNSP, the regulatory body, or the legislation governing VNM would need to define what qualifies as 'local' or whether there are varying degrees of 'local'. A network-based definition would be most appropriate for calculating accurate wheeling charges; for example, the consumer(s) of electricity would need to be located on the same feeder line or within the same zone substation region as the generator to be eligible to pay the lowest wheeling charge. A geographic-based definition may be easiest for participants to engage with; for example, to be eligible to pay the lowest wheeling charge, the consumer would need to be located in the same postcode or local government area as the generator, or separated by a maximum radial distance.

2.3 THE ROLE OF DISTRIBUTION NETWORK SERVICE PROVIDERS

To enable VNM, the billing or meter data of both generator and consumer must be reconciled by the DNSP, ideally instantaneously or on an interval basis (i.e. quarter- or half-hourly). Doing so requires both generator and consumer to have interval meters.[7]

As part of a VNM arrangement, DNSPs (or retailers) may take on the role of (a) ensuring that billing systems in place to reconcile the meters of the consumer(s), and (b) calculating then applying an appropriate wheeling charge (if wheeling charges are part of the VNM

[7] It is common in US applications of VNM that the exported generation from the generator is typically credited to the consumer on their next bill (see Section 4.2 for examples). This form of billing reconciliation does not require interval meters and therefore cannot lead to true cost-reflective pricing as the time of consumption is independent from the time of generation.

arrangement). The DNSP may also be required to inform retailers of network boundaries which align with the VNM administrator's definition of 'local' to enable retailers to determine the locational eligibility of participants.

2.4 THE ROLE OF RETAILERS

The role of the retailer with respect to VNM would be:

a) to test participant eligibility based on location and customer type,
b) to broker the agreement between the generator(s) and the consumer(s) if required, and
c) to ensure billing systems in place to reconcile the meters of the consumer(s) (this may alternatively be undertaken by the DNSP).

Existing retailers may have a private incentive to broker a VNM agreement, particularly if it allows them to acquire and keep customers (both generators and consumers) for longer term contracts, ensuring both the security of returns to the retailer and the generator's return on investment. This may be most attractive for the retailer when customers are large enough to warrant the incurred transaction costs to broker the VNM agreement (see example in Section 4.1.2).

In some cases, particularly with smaller participants, existing retailers may not have sufficient incentive under current market rules to broker VNM agreements. This barrier to VNM is discussed in more detail in Section 5.2.

3 TYPES OF VIRTUAL NET METERING

3.1 A TYPOLOGY OF VNM

VNM can be applied in a number of ways with a number of different participants. Table 1 below outlines ISF's four identified types of VNM, differentiated by the relationship between generator and consumers. It is important to note these VNM arrangements have no geographic limits on the location of electricity consumer relative to generator. However, as discussed in Section 2.2, if the consumer is located within a predefined network or geographical proximity, any available wheeling charges may make VNM a much more viable proposition by attracting a higher price for the sale of electricity (refer back to Figure 1).

Also discussed in Table 1 below is whether the electricity is 'sold' or 'transferred' from the generator to the consumer. The electricity will be 'transferred' to the consumer(s) billing account when the consuming entity has a stake in the generator (ownership, financial or otherwise). The electricity will be 'sold' to the consumer(s) when the consumer is a third party with no stake in the generator.

Table 1- ISF's typology of Virtual Net Metering

Type of VNM	Description	Generator	Consumer	Electricity sale or transfer?	Potential generators and consumers
1. Single entity VNM[8]	An entity transfers exported generation from one site to offset electricity demand at its other site(s)	Entity A *Meter A*	Entity A *Meter B, C etc*	Transfer	Organisations with multiple meters such as: • Councils, • Universities • Multi-site companies, • Large landholders with multiple supply points
2. Third Party VNM	An entity sells exported generation to separate entity(s)	Entity A *Meter A*	Entity B, C, D etc. *Meter B, C, D etc.*	Sale	Could be open to any generator and consumer: • solar farm/small wind farm • Landlord of multi-tenant sites sells to tenants (shopping mall, multi-unit dwelling)
3. Community Group VNM	A collectively owned generator transfers exported generation to shareholders	Entity A *Meter A* (i.e. generator owned by core group of investors)	Entity B, C ,D etc *Meter B, C, D etc* (shareholders in core group)	Transfer	Generators whose equity is split and electricity output is transferred to the meters/accounts of shareholders require this type of VNM: • Community funded generators • Occupant funded generators on multi-unit dwellings
4. Retail Aggregation VNM	Multiple entities sell exported generation to retailer for resale to multiple consumers.	Entity A,B,C etc *Meter A,B,C etc*	Entity X,Y,Z via Retailer *Meter X, Y, Z etc*	Sale	• Local generators with exportable electricity • Retailers including community retailers • NB: If no geographical link between generator & consumer, this is similar to Small Generation Aggregator Framework.

3.2 BENEFITS OF DIFFERENT TYPES OF VNM

Table 2 outlines how the increased flexibility offered by different types of VNM could benefit the generator and the consumer.

[8] Sometimes referred to as 'meter aggregation'

Table 2 - Potential benefits of VNM to generator and consumer

Type of VNM	Generator	Consumer
1. Single entity VNM	**Generator and consumer are same entity** - DG can be installed where optimal resource exists. - Installation size not limited by demand load (economies of scale) - Renewable energy can be supplied to building where limited renewable resources exist. - Avoids need to run physical cabling to a suitable connection point, duplicating network infrastructure	
2. Third Party VNM	- DG can be installed where optimal resource exists. - Installation size not limited by demand load - Avoids need to run physical cabling to a suitable connection point	- Renewable energy can be supplied to building where limited renewable resources exist. - Tenants have easier access to purchasing local DG including renewable energy - Capital constrained customer can buy renewable energy without capital outlay
3. Community Group VNM	**Generator is collectively the consumers** - Shareholders receive higher return on investment as they can offset their own load instead of selling power on wholesale market or to building. - Renters or households without an appropriate site can access renewable energy generation - Renewable energy generation assets are easily transferable - Allows residential customers to benefit from economies of scale investing in a large scale generation. - Easier to find site for community energy project as no need to find building to offset demand and no need for long term PPA with building owner.	
4. Retail Aggregation VNM	- DG can be installed where optimal resource exists. - Installation size not limited by demand load (economies of scale) - Receive fair returns on exported generation	- can purchase local DG including renewable energy at a reasonable rate

4 VIRTUAL NET METERING PRECEDENTS

4.1 VNM IN AUSTRALIA

There are very limited applications of virtual net metering in Australia to date. The best examples are of:

- Single Entity VNM (Type 1), without a wheeling charge (network charge reduction) in place, set up by Origin/Cogent with Investa Property Group at Coca-Cola Place in North Sydney; and
- Third Party VNM (Type 2), without a wheeling charge in place, set up by Origin/Cogent with Places Victoria in Dandenong, Victoria.

4.1.1 Single Entity VNM

Investa's Coca Cola Place Building in North Sydney has a 744kWe trigeneration plant where there is demand for heating and cooling in the building, as well as electricity demand for commercial base building loads. More electricity is produced by the trigeneration than can be used within the common building loads, and as such electricity is exported to the grid.

Any electricity generation up to the level of site demand effectively offsets the full retail electricity price at that metering point. Any exported electricity generation would ordinarily be fed back into the electricity grid, obtaining roughly the wholesale energy price. However, through the "Virtual Net Metering" arrangement with Origin/Cogent, the exported generation is able to offset its electricity consumption Investa's Deutsche Bank Place Building at 126 Philip Street in the Sydney CBD (Investa, 2011). The value of obtained for this arrangement is the full retail rate less the network (transmission and distribution) charges. As network charges makes up roughly 50% of the bill, it increases the value obtained for exported power but only by a relatively small amount (Refer to Figure 1).

As this arrangement is in place in the market (albeit without a wheeling charge in place), it is clear that there is no regulatory barrier to its operation.

4.1.2 Third Party VNM

The Dandenong Precinct Energy Project is a very similar arrangement, which plans a central 2+4MWe central trigeneration plant, connected to a district hot water reticulation network and Energy Transfer Stations within each precinct building to supply heating, or cooling using absorption chillers (Origin/Cogent, 2011). Heating, cooling and locally generated electricity are sold to precinct customers. As per the Coca Cola Building example, this arrangement uses the public grid to transfer electricity, and incurs full pass through of network charges to purchasing customers. The major difference is that in this VNM example, the generator is able to offset electrical demand of *multiple customers* within the precinct.

Again, as this arrangement is in place in the market, it is clear that there is no regulatory barrier to its operation. However, there are several conditions of this arrangement that restrict its broader application, as described in Table 3 (informed by Wickramasinghe, 2013)

Table 3: Conditions of arrangement and limitations on applicability

Condition	Detail	Limitation on applicability
Customer Status	Customers must become a retail customer of Origin/Cogent for all of their electricity bills.	Would require interested party to switch retail contracts, which in many cases may not be up for renewal for several years.
Generator ownership	The generators are owned by Cogent, which may make the arrangement more attractive to the retailer, prompting greater interest in providing the service.	While there is no reason that this arrangement is not possible for a *customer-owned* generator (e.g. trigeneration or PV), it may be less attractive to the retailer, or may need a long-term supply contract.

Condition	Detail	Limitation on applicability
Full Network Charges paid	The customer is charged a pass through for full network charges on any exported power, even if the site demand being offset is next door.	This dramatically limits the value of the VNM approach, as 50% of the retail value is still lost.
Large Scale	The total energy use – and the generation from the systems under the arrangement – is relatively large. Thus the contract deals in large volumes, making it more attractive from the retailer's perspective.	Smaller councils or other parties may not have sufficient demand to command interest from a retailer with this arrangement. Scale may also limit the application to biomass, trigeneration or other large sized DG, as energy flows and installed capacity are sufficient to warrant additional contract overheads for the retailer.
Systems & Processes Required	Specific billing data reconciliation hardware/metering, software and processes are required by the retailer to enable a VNM billing approach.	Currently Origin/Cogent is the only retailer we are aware of with this capability. New players could enter the market, provided they are able to create viable business models around this feature. However, in the absence of wheeling charges, it is anticipated that the margin may be insufficient to drive interest from new entrants.

4.2 VNM INTERNATIONALLY

The USA currently has approximately ten states with some form of VNM permitted.[9]

[9] The scope of this research does not permit a full literature review of VNM globally. There may be VNM in other US states or other countries not mentioned here.

4.2.1 Single Entity VNM

California introduced Same Entity VNM (Type 1) for local governments in 2008 which permits 'meter aggregation' provided that both meters are on time-of-use tariffs and that the combined capacity of all DG technology participating within a utility's service territory doesn't exceed 5% of the aggregate peak demand (US Department of Energy, 2013). The electricity is credited to the customer's next electricity bill at retail rates for eligible renewable energy technologies.[10] The Californian Public Utilities Commission assesses each application for meter aggregation to ensure that the individual arrangement will not increase the network cost burden of non-participants. In 2012, New York introduced Single Entity VNM for agricultural and non-residential customers, provided that both sites of generation and consumption are located within the same 'load zone' and utility territory (US Department of Energy, 2013). Pennsylvania's aggregate metering policy is limited to individual customers who own multiple meters within a 3km radius of one another (Renewable Energy World, 2012). Maryland, Rhode Island, Colorado, Connecticut, Maine, Vermont, New Jersey and Massachusetts also have 'Single Entity' VNM in place for either all customers or for all subset such as local government (US Department of Energy, 2013).

4.2.2 Third Party VNM

In 2011, California extended its VNM arrangement to multi-tenant properties whereby a multi-unit building owner(s) installs DG and connects it to the common area load (US Department of Energy, 2013). The exported generation is transferred via bill credits to the building owner(s) and/or tenants based on a pre-arranged allocation agreement. This arrangement allows for both Third Party VNM – for example, if the building owner owns the generation and transfers electricity to tenants in exchange for rental payments – and Community VNM arrangements – for example, if the building owner and tenants collectively own the generator and share in electricity generation.

4.2.3 Community VNM

In 2010 Colorado introduced what is known as 'Community Solar Gardens' legislation, which allows any entity with at least 10 'subscribers' or shareholder to invest in community solar projects up to a maximum size of 2MW (US Department of Energy, 2013). The shareholders must be located in the same municipality or county in which the community solar garden is located, unless the local population is below a certain threshold, which allows a shareholder to invest in a neighbouring solar garden. The aims of the legislation are to:

I. *"Provide Colorado residents and commercial entities with the opportunity to participate in solar generation in addition to the opportunities available for rooftop solar generation on homes and businesses;*
II. *Allow renters, low-income utility customers, and agricultural producers to own interests in solar generation facilities;*
III. *allow interests in solar generation facilities to be portable and transferable; and*

[10] Credited at 'retail rates' indicates all network charges (DUoS and TUoS) are avoided by the generator-customer and no wheeling charge is applied.

leverage Colorado's solar generating capacity through economies of scale."

(Colorado Community Solar Gardens Bill, 10-1342, Colorado Government 2010)

Oregon, Delaware and Maine all offer some form of community shareholder VNM (Delaware Government 2011; Renewable Energy World 2012). In 2012, California attempted to introduce similar legislation to Colorado's Community Solar Gardens. The bill, SB 1014, was initially defeated in the Senate but passed in May 2013 with amendments ensuring that non-participants were not burdened with additional network costs (Clean Technica 2012; PV Tech 2013).[11]

5 BARRIERS TO VNM IN AUSTRALIA

Due to the limited scope of this paper, the description of barriers is based on discussions with industry parties and observations of project precedents. This was supplemented by a very limited review of the National Electricity Rules (AEMC, 2013), however a more detailed review of the rules and other barriers is recommended as part of the Next Steps.

There are no regulatory barriers to the Type 1 "Single Entity VNM", without a wheeling charge in place, as evidenced through the Origin/Cogent approach (Section 4.1.2). However, Origin/Cogent is the only retailer the authors are aware of that offer a VNM service to its customers (see Table 3 for conditions on this arrangement). This section outlines several key barriers to realising Types 2, 3 and 4, and determining wheeling charge arrangements.

5.1 WHEELING CHARGES

While specific details on the charging for network services in the US precedents (Section 4.2) are scarce, it appears that full retail prices are attracted under some VNM arrangements. This is effectively 'free' use of the network, which may be acceptable for policy purposes, but is not cost-reflective as the network is still required by the distributed generator.

While there is little doubt that locally generated and consumed electricity uses less of the network infrastructure that is in place to deliver electricity, the degree of reduced cost burden (and associated cost-reflective charging) needs to be discussed and debated by industry and community parties. It is anticipated that a well-structured wheeling charge debate should be able to address any equity issues.

It is the authors' understanding that there are no explicit barriers within the National Electricity Rules to network businesses charging locationally-specific rates for a VNM arrangement (wheeling charges). Distribution (DUoS) and Transmission (TUoS) charges are payable by the *consumer* of electricity, which are attributed to the customer bill as a direct pass through. So while the distributed generator does not directly pay the network service provider for the export of power to the grid, unless the purchasing customer is granted a reduced network charge, then essentially the distributed generator still incurs the full cost

[11] The full details of this VNM arrangement were not yet publicly available at the time of writing.

of services on its exported energy. The exception to this is the "locational component" of the transmission charge (TUoS), which under Section 5.5(h) of the Rules:

> *A Distribution Network Service Provider must pass through to a Connection Applicant…the locational component of prescribed TUOS services that would have been payable by the Distribution Network Service Provider to a Transmission Network Service Provider had the Connection Applicant not been connected to its distribution network (AER, 2013, p.407)*

This means that the "locational component" of TUoS may be credited to the generator; however, in practice this is a very small proportion of total network charges.

There is no mention of a "locational component" of distribution charges (DUoS), as either being allowed or precluded. Thus while no specific regulatory preclusion appears to exist, it is considered unlikely that network businesses would entertain the approach there was an explicit Rule compelling them to do so. This understanding aligns with the Cogent's experience (Wickramasinghe, 2013).

5.1.1 Calculation Methodology

For cost-reflective wheeling charges to be applied, a clear and transparent methodology would be needed determined and agreed by industry and community parties.

Cost reflective, site-specific network pricing already occurs for large customers, and as such there is a methodology in place for calculating these values. The network provider proposes a pricing regime, the customer can object and regulator makes a ruling. Similar methodologies are used to calculate transmission and distribution losses for large customers.

However, none of these methodologies deal with transferring power short distances *within* the network, and thus a methodology would need to be agreed. It is highly unlikely that a site-specific calculation would be viable or advisable as the scale is too small, but it is suggested that a methodology for calculating a set of standard, distance-based network prices for distributed generation wheeling charges would be possible.

It would also be possible for these wheeling charges to be standard minimum values, and allow network businesses to pay DG more in certain critical network investment locations, should that generation be sufficiently firm to assist in meeting their reliability criteria. Linking wheeling charges to the network business efforts to target key locations of augmentation investment is likely to be important in garnering support for the arrangement, to best enable short-term as well as long-term reduction on electricity prices from VNM.

The principle of 'virtual private wire', advocated by the City of Sydney (2010) is one method used to calculate wheeling charges. This uses the principle that the customer looking to connect two sites should not pay more to use the existing network than it would cost them to build their own new private wire between the sites. This approach has clear underpinning logic, although cannot be extended to all types of VNM shown in ISF's typology (Table 1).

It should be noted VNM would need to engage with overlapping industry debates surrounding the push for cost-reflectively of network pricing, in terms of the balance between volumetric and capacity based network charges.[12]

5.2 RETAIL BARRIERS

The preliminary research undertaken for this paper indicates that there are currently no regulatory impediments to stop an existing retailer from brokering a deal between a specific generator and a specific consumer or consumers (allowing Type 2, 3 and potentially Type 4 VNM options shown in Table 1). This is demonstrated by Sydney's Kurnell Desalination Plant, which buys power directly from the Capital Wind Farm at Bungendore, NSW, which is owned and operated by the 'gentailer' Infigen Energy.[13] The transaction costs of brokering such a deal currently limit such deals to large market participants. For existing retailers to have incentive to offer VNM to smaller participants would require a large reduction in transaction costs, which would only come through economies of scale which may or may not be attainable in a competitive retail environment.

The Dandenong Energy Precinct Case demonstrates the current viability of Type 2 projects, connecting a single generator with multiple customers of the same retailer. It is possible that customers could be with different retailers, however participating retailers would need to come to an agreement (Wickramasinghe, pers. comm, 2013). The biggest challenge from the retailer perspective is the thin margins in the market making the associated overheads uneconomic. Even for Single Entity VNM, retailers face additional software, hardware/metering and transactional costs associated with reconciling virtually linked meters on a quarter- or half-hourly interval basis. While it is expected that such costs would diminish with scale, there is both an initial set up and ongoing reconciliation cost burden (Wickramasinghe, pers. comm, 2013). While not insurmountable, this poses challenges to developing commercial activity in an area where margins are thin, requiring larger energy loads to ensure a return.

As such, there is a clear barrier to retailer participation in brokering VNM agreements particularly between smaller generators and consumers. Options to overcome this could include:

a) Mandating or incentivising VNM participation by some regulatory mechanism (further discussion is beyond the scope of this report), or
b) Creating a 'second-tier' type of retailer which would have aim to facilitate the transfer or sale of electricity within a certain local proximity (Chris Dalitz, personal communication, 2013)

This 'second tier' type of retailer would likely step in to facilitate VNM agreements which existing retailers do not see as profitable (due to transaction costs) and therefore, such retailers may or may not be a for-profit entity. Such entities would likely need to be governed by a less-stringent set of market rules with lower barriers to entry. For example, a

[12] Note that even the basic premise of net metering (solar PV offsetting demand on its own site) has been challenged by the Queensland Competition Authority (QCA, 2013, p.v)

[13] A 'gentailer' is an industry term for a company that is both a generator and registered retailer, whereby they sell their own generation directly to customers in order to maximise returns.

‘community retailer’ may set up to aggregate local distributed generation and sell it locally, or to broker individual VNM arrangement between local generators and consumers which are too small to interest existing retailers.[14]

5.3 PROCESS & OTHER BARRIERS

As there so few Australian precedents for VNM, and none that the authors are aware of that employ wheeling charges, the lack of a clear process as to how a DG proponent would go about establishing a VNM arrangement presents a barrier. This could be addressed through regulatory reform, or the establishment of a demonstration precedent, as mentioned in Section 6.

Given that VNM is expected to drive uptake of DG within certain eligible sectors, barriers to the uptake of DG are also relevant to consider when assessing barriers to VNM. These barriers include:

- Foregone network revenue from the replacement of centralised generation with distributed generation which offsets end-user electricity consumption
- Increasing ‘upstream’ or ‘deep’ network augmentation costs to accommodate increasing penetration of generation capacity within the distribution network[15]

As these barriers are specific to the broader topic DG, they are not discussed further here; for detailed discussion of these barriers refer to the Australian Decentralised Energy Roadmap Working Papers (Dunstan et al, 2011).

6 PROGRESSING VNM IN AUSTRALIA

Despite the apparent lack of a regulatory impediment to VNM – with or without wheeling charges – ISF believe that VNM is unlikely to occur without either a Rule change to expressly allow VNM and associated wheeling charges, and potentially create dedicated 2nd tier retailers to facilitate this model; or the establishment of a strong project precedent through a group of willing parties (proponent, network, retailer).

It is suggested that in order to progress VNM as a viable concept in Australia, the first stage would be to initiate industry dialogue, initially through:

- Inviting key stakeholders to provide feedback on this discussion paper
- Holding a VNM workshop for invited stakeholders to determine what benefits the stakeholders are most interested in, and develop a work program to further progress the VNM concept.

[14] In another example, a regional organisation of councils (who often broker bulk electricity supply agreements with retailers for constituent councils) may wish to apply for a second tier retail license to facilitate such VNM transactions for its constituent councils – see Single Entity VNM in Table 1.

[15] VNM programs in the US often attempt to alleviate this issue by limiting the collective installed generator capacity to a proportion of the feeder capacity or voltage related statutory limit, with generator participation based on a ‘first come’ basis (DSIRE, 2013).

- Such a work program may include the following actions:
  - A detailed comparative examination of the functioning VNM models applied elsewhere and what program features would be suitable for inclusion in the Australia's context;
  - A detailed examination of the role for 2^{nd} tier retailers, and the process required to underpin their establishment;
  - Work with the AEMC to develop a methodology for calculating bands of standardised "wheeling charges" applicable to VNM, drawing on existing methodologies and international precedents;
  - The subsequent collaborative development of a rule change proposal that reflects industry and community preferences for an appropriate VNM and retailing arrangement; and/or
  - An *alternative or complementary* option is to establish a partnership between an interested and progressive coalition of a DG proponent, a distribution network and a retailer that can see value from VNM, to progress a trial/demonstration project. This could obtain grant funding to support the learning process and required background work.

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