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National Electricity Market Campaign

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Background Paper

Virtual Net Metering

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Total Environment Centre's National Electricity Market advocacy

Established in 1972 by pioneers of the Australian environmental movement, Total Environment Centre (TEC) is a veteran of more than 100 successful campaigns. For nearly 40 years, we have been working to protect this country's natural and urban environment: flagging the issues; driving debate; supporting community activism; and pushing for better environmental policy and practice.

TEC has been involved in National Electricity Market (NEM) advocacy for eight years, arguing above all for greater utilisation of demand side participation (DSP) — energy conservation and efficiency, demand management (DM) and decentralised generation — to meet Australia's electricity needs. By reforming the NEM we are working to contribute to climate change mitigation and improve other environmental outcomes of Australia's energy sector, while also constraining retail prices and improving the economic efficiency of the NEM — all in the long term interest of consumers, pursuant to the National Electricity Objective (NEO).

Community renewable energy

With the real and present threats posed by climate change, communities, individuals, companies and governments are seeking to take practical action to mitigate the problem, as well as adapt to its consequences. Transitioning to renewable energy through CRE projects is one of the many such actions that can be taken, and we believe that regulatory frameworks should facilitate the deployment of CRE. There are thousands of CRE cooperative organisations and projects around the world, and around 70 in the early stages of development in Australia. Despite this, there is only 1 project currently in operation in Australia; Hepburn wind in Victoria, which recently generated its 10 millionth kilowatt hour of electricity. There is a further CRE project under construction in Denmark, Western Australia.

In other jurisdictions, CRE projects have received much stronger support. For example, the Scottish Government's Community and Renewable Energy Scheme, designed to support CRE projects with funding and project management assistance, has assisted in the commissioning of over 300 CRE projects.

Australia is fortunate to be endowed with some of the world's best renewable energy resources. Australia is exposed to high solar radiation and has extensive areas of high wind which enable the utilisation of the two most developed renewable energy technologies. Australia also has the resources to benefit from emerging renewable energy technologies, such as geothermal and wave and tidal energy.

CRE can provide a range of benefits, including:

- Projects can provide jobs, both in commissioning the project and in long-term operation and maintenance.
- Enables communities to take responsibility for their own electricity generation. CRE projects can help local communities build resilience against high electricity prices and other electricity supply issues, such as transmission failures, and can be a way for low income households and tenants to have a stake in their electricity supply.
- Brings communities together, i.e. enhances social capital.

- Renewable energy resources are often located far from existing electricity networks, requiring costly investment in augmenting the networks; CRE projects can bring electricity supply to a local level, eliminating the need for such investment.

However, as with many 'novel' methods of electricity generation, CRE faces numerous technical, regulatory, cultural and legal barriers in Australia, as regulatory frameworks were designed to meet the needs of the out-dated centralised model of electricity supply.

Options for retailing electricity from CRE projects

One of the barriers to CRE in Australia is a lack of clarity of the options for communities to retail the energy they generate, and what option is best. There are a range of possible options, including:

- establishing a new tier of small retailers with less onerous fiduciary and compliance requirements
- subcontracting logistics (billing etc.) to a big retailer
- setting up a virtual net metering (VNM) network - which can be done now if you're a gentailer with generator and retail licences
- a discounted rate from networks for local generation supplied to local areas (don't think they can currently do postcode style pricing for generation).

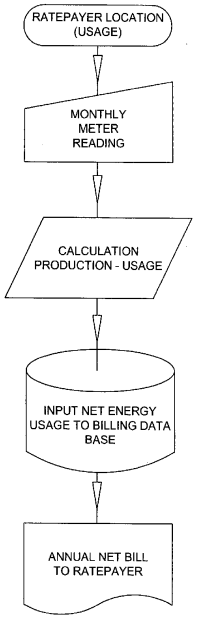


Figure 1: the net metering process

Net metering

Net metering is a common tool used to pay consumers for energy they generate using renewable energy installations (or vehicle-to-grid electric vehicles). In this context, the term 'net' is used to mean energy remaining after the consumers usage has been deducted: the owner receives retail credit for the electricity they generate, or at least a portion thereof.

Most standard electricity meters can accurately record both consumption and export to the great, thus net metering is a no- or low-cost method of measuring export to the grid and allowing the owner-consumer to effectively bank excess production for future credit against their electricity bills.

The precise rules on net metering vary considerably by jurisdiction, with variances in whether and for how long banking can be used and how much the credits are worth (i.e. whether the consumer receives the retail or wholesale price for the energy generated, or some other measure).

Common to most net metering systems are:

- monthly roll over of credits
- a small monthly connection fee[1]
- monthly payment of deficits (i.e. the normal electric bill)
- annual settlement of any residual credit.

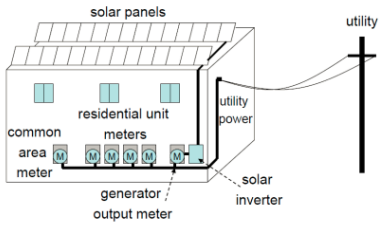
[1] Electric bills contain a connection fee and an energy fee based on the number of kilowatt hours used that month. When no kilowatt hours are used the monthly connection fee is still paid. When the meter turns backwards for the month, the negative kilowatt reading is rolled over to the next month.

While similar to feed-in tariffs (FITs) or time of use metering/pricing (TOU), net metering can be implemented solely as an accounting procedure, not requiring additional or specialised metering infrastructure, and not necessarily even necessitating any prior arrangement or notification.

Net metering is now widespread. In the US all public electric utilities are required to make net metering available to consumers upon request. In Canada, some provinces have implemented net metering programs. A number of European countries have implemented net metering, including Denmark, Italy, Spain and France. In Australia a number of the state-based FiTs would more correctly be termed net metering.

Sharing the generation of CRE: the problem under traditional rules

VNM has been largely developed in the context of multi-tenant dwellings, such as apartment blocks. Under traditional electricity frameworks, each tenant has an individual electric meter to measure their consumption. However, where tenants have joined together to undertake a CRE installation, such as a large rooftop solar system, the multiple individual meters presented a problem for assigning the benefits of the generation to each tenant.



Source: California Public Utility Commission

Figure 2: example of a CRE setup
rooftop solar PV in a multi-occupancy building

The first option in such a situation is that a CRE installation can easily be connected to a common area load or to an individual tenant. A simple strategy for distributing the energy generated would be for the site host to net meter the power generated, with investors effectively donating their share of the energy generated. This could be appropriate for a CRE project at a site with high shared loads or where the CRE project is not intended to provide individual benefits, for example a project at a school or community centre. In such a case the energy may also be sold through some other financial arrangement. For example, the CRE investors may not receive any direct credit for the electricity generated, but instead could receive other benefits such as incentive payments or tax-deductions.

However, in many cases participants in a CRE project are likely to want to directly receive their share of the generated energy, or the financial reward for that generation. That is, they wish to be individually net metered, even though there is only on CRE generating unit. If the generating unit were to be connected directly to multiple loads, i.e. multiple tenants, there would be no way of ensuring equitable distribution of the electricity generated - some tenants would ultimately benefit more than others.

While theoretically possible, the installation of multiple metering systems, one for each tenant or load, would be cost prohibitive, take up considerable space, and would preclude other benefits, such as the sharing of generation with other areas of a community that are unable to directly generate energy.[2]

Virtual Net Metering

VNM deals with this issue by allowing participants in a CRE project to install a single generation system to cover both common and tenant loads connected at the same service delivery point. With VNM, the electricity does not flow directly to any of the tenants' meters, but instead is fed directly back into the grid.

There are two ways to then credit the individual participants for their share in the system. Either the owner/manager of the CRE project could track the electricity production per individual share, or the network company could allocate the electricity produced by CRE system to both the building owner's and tenants' individual accounts, offsetting their electricity bills. The distribution of this credit will be based on a pre-arranged allocation agreement.

In short, VNM allows a customer to assign the net production from a generator to other metered accounts that are not physically connected to that generator.

The benefits of VNM

The benefits of VNM include:

- **Improving CRE siting**: VNM allows CRE proponents to choose the best site for a project, rather than being limited to a sub-optimal location. This has the additional benefit of allowing for greater flexibility in relation to local planning or zoning requirements.
- **Economies of scale**: VNM allows for CRE projects that can take advantage of economies of scale by developing larger projects than traditional single-owner renewable generation.
- **Creative renewable energy deployment and financing options**: as well as facilitating CRE projects, VNM may also allow for the emergence of other innovative third-party ownership models.
- **Greater deployment for a greater range of consumers**: VNM allows non-homeowners to invest in renewable generation and can be targeted at low-income consumers, as in California's Multifamily Affordable Solar Housing Program, which was designed specifically for low income affordable housing to allow low income tenants to receive the direct benefits of CRE through reductions in their electricity bills.

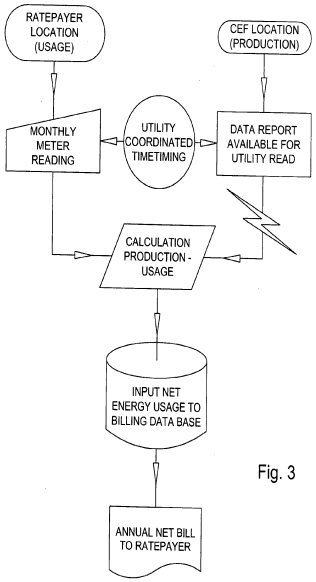


Fig. 3

Figure 3: the VNM process

Overall, VNM allows for the expansion of efficient and economical CRE projects to provide renewable energy to an increasingly diverse customer base.

[2] For example, one apartment block may install a CRE solar PV project. Tenants from a second block may be unable to install such a project due to the block being shadowed by a neighbouring property or trees. VNM allows tenants from the second block to purchase shares in the first blocks CRE project and to utilise the energy accorded to them by that share.

Types of VNM

VNM can be grouped into 2 broad types:[3]

1. **Behind the Meter Aggregation/Aggregated Net Metering (ANM)**: the practice of combining meter readings from multiple service points *on the same property or within a set location*[4] without each being individually connected to that system.[5] This allows a customer who owns a generating asset and receives service on multiple meters on to offset the aggregate load from those meters with generation. This may be used to aggregate different loads across large properties, such as farms, or across a defined area such as a suburb.[6]

2. **Grid-Tied 'Virtual' Aggregation (VNM)**: a number of customers, each with individual meters, share the net metered credits from a single system, without every customer being physically connected to that system. Instead, they are connected through the distribution network.

The use of the distribution network is the key distinguishing feature of the two models. Some distribution network operators overseas have opposed the ANM model, arguing that it allows CRE projects to use distribution network infrastructure without paying the usual fees for this usage. However, while ANM may utilise a portion of the local network, the usage does not incorporate all components of usual delivery charges, such as charges for transmission. VNM will utilise more of the distribution network, but it will also not utilise transmission infrastructure.

In general the CRE project pays a local transport charge to the distribution network owner which reflects the lower usage, but compensates the owner for the use of their infrastructure. For the same reason, the CRE project should not be so large as to require upstream augmentation of the network as this may be inequitable if the CRE project is paying a discounted grid access charge.

VNM overseas

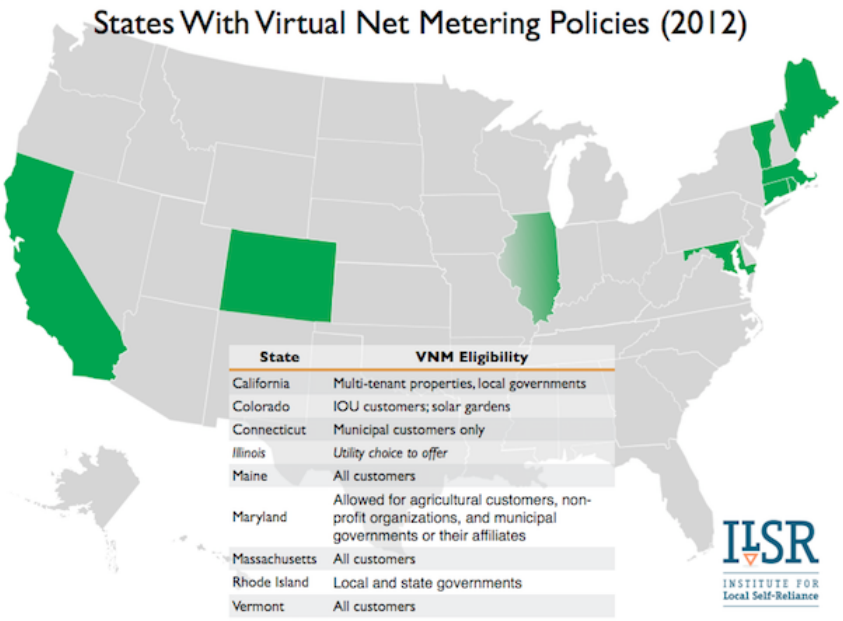
The US in particular has advanced VNM policy. After California introduced the country's first VNM program in 2008, the policy is now being considered by states across the country as a way to improve the flexibility of net metering policies and increase investment in renewable generation.

[3] http://www.karbone.com/wp-content/uploads/2012/02/Karbone-VNM-Research.pdf

[4] E.g. Pennsylvania's ANM policy is limited to individual customers who own multiple meters within a two mile radius.

[5] Network companies can provide this service using physical interconnection, or virtually by combining the total usage from two or more meters.

[6] E.g. an agricultural application of ANM would be to combine the load on a farm's barn, outbuildings, and residence. A solar PV array may be installed on a barn which has excellent sun exposure but uses little electric power. Aggregating the load of the residence (which may, for example, have less roof area or be in a shady location) and outbuildings to the load of the barn would make the installation practical and cost-effective for the customer.



State	VNM Eligibility
California	Multi-tenant properties, local governments
Colorado	IOU customers; solar gardens
Connecticut	Municipal customers only
Illinois	*Utility choice to offer*
Maine	All customers
Maryland	Allowed for agricultural customers, non-profit organizations, and municipal governments or their affiliates
Massachusetts	All customers
Rhode Island	Local and state governments
Vermont	All customers