Peer To Peer Energy Trading

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Australia has more than 2 million solar PV installations, making us number one in the world in terms of the highest proportion of prosumers. While previously, the grid was designed to be one way only, it is now changing to two-way energy flows; facilitating exports of electricity as much as imports. One option to enable a two-way energy flow is local energy sharing or peer-to-peer trading.

What is energy sharing, or peer-to-peer energy trading?

Simply put, energy sharing is where one party produces excess electricity and then shares this with another party. Energy sharing is also known as Virtual Net Metering (VNM) or peer-to-peer energy trading.

Peer-to-peer (P2P) energy trading can be compared to file sharing programs on the Internet, like BitTorrent; to eBay in terms of shopping and to Airbnb in terms of accommodation. Fully enabled P2P trading would cut out the ‘middleman’ and allow transparent dealings between equals, as opposed to being treated as a ‘consumer’ by a corporation.

Peer-to-peer energy trading explained

The party that sells electricity is called ‘prosumer’ because they not only consume energy, they also produce it.

Energy sharing could happen between tenants in a multi-rise, between adjacent buildings, or between anyone on the same network.

For example, if my solar panels at home produce excess electricity while I am at work, I could sell the surplus energy to my neighbour who can’t have solar panels. Similarly, your organisation could have multiple assets and wish to sell electricity to yourself or to donate electricity to neighbouring households or businesses as part of your social commitment.

Advantages of peer-to-peer-trading

The biggest advantages of local energy sharing are that:

- Energy does not have to be transported from centrally located power plants, reducing electricity transportation costs
- Energy generation can be based on renewables
- Energy can be bought from a known source (which allows you to claim energy from a specific project)
- Energy costs can be lower for the buyer
- The financial benefit for the generator can be better than a feed-in rate

- There is choice and transparency in dealing with other consumers

Barriers to peer-to-peer trading

Several barriers exist to P2P trading at present, and it is not known at what time these will be overcome so that consumers can begin to participate and benefit from renewable energy. Some of the main barriers include:

- Not yet commercialised
- Immature market for solutions
- Multiple stakeholders that need to be convinced of the business case (e.g. retailers)
- Regulatory barriers

Supporting technology – Blockchain

P2P energy trading involves a large number of transactions between prosumers and consumers and needs technology that allows for low-cost authentication, validation and settlement while protecting privacy. One of the most promising technologies to enable this is 'blockchain', a distributed ledger technology. Blockchain is mostly known as the technology supporting distributed trading, such as Bitcoin.

With blockchain, transactions are stored in virtual blocks, which are connected together in a chain. A complete history of all transactions that have ever occurred within a particular network is retained. Blockchain technology can offer a cryptographically secure, distributed ledger that can track where electricity was generated, where it can travel to and who used it.

There is no question about where a kWh came from and how it was produced. The technology is transparent and secure and does not require a central entity to store and manage shared data and business process. It will also make it easier for new and smaller players to be involved, right down to the individual solar household.

Current status of P2P energy trading

Progress with peer-to-peer trading is slow. A couple of trials in the residential market have been unsuccessful, partially because there was no funding, but mostly due to the current market situation.

On the one hand, regulated network tariffs mean there are little benefits to local energy trading. On the other hand, there are low levels of installed controllable distributed energy resources, which makes it hard for solution providers to provide value to their customers.

There are a number of trials using blockchain technology that have been or are currently being conducted, examples of which you can see below.

Most other forms of energy trading are heading down the Virtual Power Plant (VPP) pathway like AGL's VPP in South Australia or Origin's VPP in Victoria. However, like the blockchain trials, these solutions are not widespread and involve mostly the residential sector.

Blockchain-based peer-to-peer trials

AGL Solar Exchange trial in Victoria

AGL previously used blockchain technology in a desktop/virtual trial using solar panels, batteries and smart air conditioning in Melbourne homes. The aim was to understand the value in P2P energy markets.

Now AGL has launched Solar Exchange, which is an online marketplace enabling solar households to trade their excess solar power in the form of solar tokens. These tokens can be sold to other AGL customers residing in Victoria.

Under the right conditions, a buyer could buy tokens at a lower price than buying energy from the grid, while a household with solar could sell excess solar tokens at a higher price than the solar feed-in tariff. A successful trade of Solar Tokens can only be made if the buyer and seller have chosen compatible trade settings and have compatible solar export and grid usage profiles for the same trading interval.

The Solar Exchange is the largest consumer energy trading trial in Australia, with more than 250 Victorian customers participating since the pilot launched in August 2018.

Power Ledger trials in Western Australia

The Power Ledger Platform enables interoperability between diverse market management/pricing mechanisms and units of electricity (kWh) by way of pre-purchased tokens, called 'Sparkz', which are backed by blockchain bond called 'Power Tokens'.

Sparkz are settlement tokens that are pegged to the local fiat currency (e.g. AUD in Australia, USD in the USA). Sparkz can be traded on the Power Ledger platform within defined trading groups through a suite of APIs that interface with smart meters.

The Power Ledger system tracks the generation and consumption of all trading participants and settles energy trades on pre-determined terms and conditions in near real time.

One promising use case for platforms such as Power Ledger's is an embedded network, such as apartment blocks or housing developments, where residents can trade their solar energy with one another in a semi-regulated environment.

Power Ledger have implemented several successful trials of their technology under this embedded network scenario in Busselton and Fremantle. In the case of fully regulated markets, where a retail license is required to buy and sell energy on the national grid (such is

the case in most of Australia), the ability for blockchain to facilitate true peer-to-peer energy trading on a wider scale than just embedded networks is somewhat constrained.

LO3/TransActive Grid in South Australia

LO3 is a US-based firm known for setting up a microgrid in Brooklyn and Germany, and for the fact that their solution is built on blockchain technology.

The company is focused on the physical transaction of energy, not the financial transactions. They see their strength in the need for fast-acting load responses, storage, controllable generation and reaction time. Their first rollout in Australia is the New TransActive Grid in South Australia.

Up to 6MW of distributed solar generation will be made available on a local energy marketplace, using LO3's peer-to-peer trading platform. The microgrid will begin with a 'discrete' market using Yates Electrical Services' Small Generation Aggregators License and their associated commercial or industrial customers, who will bid on solar electricity supplied by the firm.

A meter will be added onto a household or business which manages all energy inputs and outputs, giving participants access to cheaper electricity generated by local solar farms. The solar power will come from six locally built PV plants ranging from 200 kW to 1 MW in size (two have already been constructed) that are being sited on 'redundant' farmland in South Australia's Riverland region.

deX

In December 2017, Greensync launched the 'Decentralised Energy Exchange' (deX). Normally, behind-the-meter generation capacity is invisible to the energy market operator. However, deX is a digital technology platform that allows utilities to see exactly what distributed energy resources are available at any time on customers' premises and how they are performing.

deX can remotely control those resources, with the customers' consent, at times of high demand or volatility to avoid shortages. The platform lists buyers and sellers, records agreements between them, manages event handling and verifies both parties met their obligations.

The deX program started with commercial and industrial system-owners and will expand to include about 1,200 battery-owning households, which will make up about 5MW of a total 11MW of network support. deX partners include retailers Powershop and Mojo, storage and power engineering firms Siemens, Tesla and ABB, and consumer technology suppliers like Geli, Jetcharge, Wattwatchers and Power Ledger. AEMO, ARENA, Energy Networks Australia and the Clean Energy Council are also partners.

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