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P2P Energy Trade: a New Vision of Energy Management

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What is P2P Energy Trading in General? Peer-to-peer energy (P2P) trading is the system of purchase and sale of electricity between two or more grid-connected parties. In this structure, any excess energy (for example, solar or wind power) can be transmitted and sold to other consumers using a special trading platform. This technology opens new opportunities for all grid participants, such as choosing whom they sell electricity and from whom they will buy it.

Currently, excess solar energy is exported back to the grid for a small feed-in tariff rate. However, this method is becoming obsolete as more people are looking for flexibility and control in managing how their resources are distributed. As mentioned before, the purchase of electricity is made through a special secure platform that is based on blockchain. Due to this blockchain technology, all purchases will be secure and resistible to cyberattacks.

How It is on the Sketch and in Real Life. Two main reasons why the P2P model was invented are the construction growth of distributed energy resources, like solar panels and wind power plants, connected to electric grids, and the further promotion of this process. Thanks to this technology, prosumers can change their roles in a trade process. On the one hand, they can sell electric energy to other consumers directly and can have a profit during relatively high tariffs and the relatively low buy-back ones. On the other hand, buyers can

save costs while sellers can make a profit [1]. The schematic structure is shown in Figure 1.

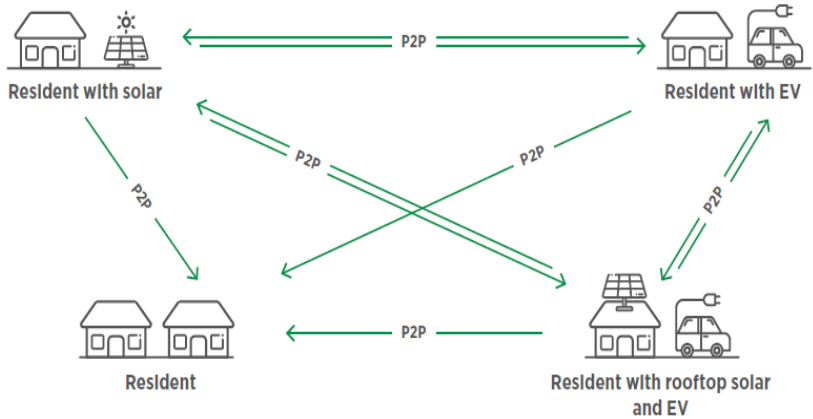


Figure 1. P2P Energy Trade Structure

In order to compare how it is realised in the real life, we will take the Brooklyn microgrid in Figure 2 as an example. On the one side of President Street smart meters count the whole amount of energy, produced by solar panels, and this information is stored on a decentralized blockchain [2]. On the other side of President Street there are homeowners, who play the role of consumers, have an interest in buying electricity from neighbours. The whole trading process is based on the cryptographically secure decentralized application platform Ethereum. As the result, citizens who live on the consumer side can be supported by energy supply from prosumers.

The LO3 company is now developing an application that will give the opportunity to monitor and transact their excess production based on personal preferences. At the same time prosumers will be able to control solar panels, batteries and building loads with the help of this app.

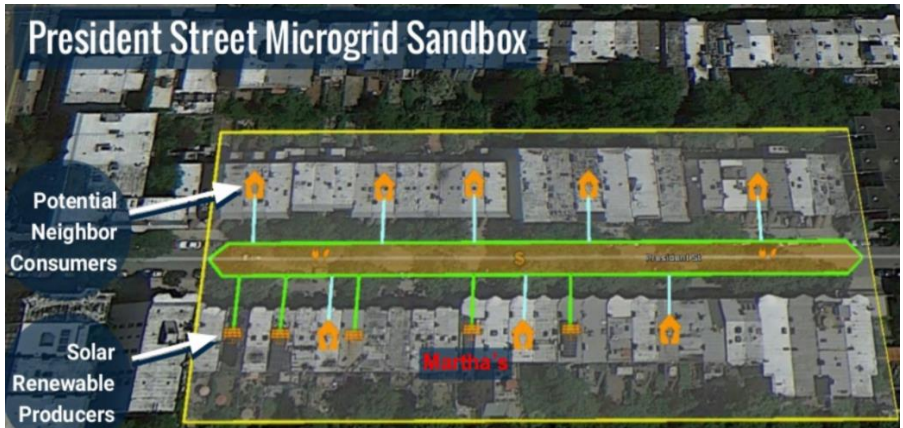


Figure 2. Brooklyn Microgrid

This project is a vivid example of how rapidly green energy and digital technologies are changing the traditional way of relations between electric producers and consumers. Moreover, there are projects in Australia where blockchain was implemented into electricity trading between residents. It's worth mentioning that in Germany there is a huge network of about 8,000 customers, who can trade stored energy with each other.

Technology's Advantages and Challenges. Potential contribution to the electric grids' development can't be overestimated. There is a list of them:

1. Provision of a choice for dealing with different consumers and cutting out electricity retailers;
2. Reduction of electricity transportation costs;
3. All transactions are public and can't be altered that makes the whole process secure;
4. Widening possibilities for renewable energy deployment;
5. Provision of ancillary services to the main power grid;

6. Improved energy access for consumers in mini-grid set-ups.

At this time, there are still potential challenges that slow down the process of integration P2P trade in the energy sector:

1. Probable governments' loss of control over energy systems can be an obstacle for them to keep authority to implement better policies and regularization;
2. It requires costly appliances such as smart meters, which can also increase costs;
3. Transactions become a part of the blockchain after initial computation, and this can be a long process [3].

On the whole, P2P trade can change the whole vision of energy trade. It can significantly reduce overall operation costs of the power system and reduce consumers' electricity bills. At the same time, a big work must be done in order to achieve all these goals in the future.

References:

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