Cover Letter for Energy Journal

Energy, The International Journal

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**Title of Manuscript:**

Peer-to-Peer Energy Trading for Photo-Voltaic Prosumers

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**Reason for Journal:**

This paper references the surge in renewable energy adoption by the residential sector. It’s topics cover the implementation of a different form of energy market that could be deployed by a regulated utility. Readers may be interested to know that complex micro-grid solutions may not be the only way to create such a market service. The future of energy will incorporate varying forms of micro-transactions for energy usage, we attempt to design and analyze one for the readers of the journal to reference.

**Statement and Description:**

Net-metering has been lobbied against by utilities because it forces them to pay back prosumers at retail prices. Solutions to the problem try to remove the utility and provide isolated micro-grids with self-governing market transactions using unfederated blockchain technology. These solutions are often complex and not practical because prosumers cannot modify the utilities distribution infrastructure. The objective of this paper is to design and simulate a practical peer-to-peer market implementation. The regulated utility acts as a participant and an integrator. The prosumers could use a community managed, unregulated service to manage pricing for energy sourced into the grid. The service would allow for the utility to implement a transaction fee to deliver energy to consumers. Creating a more equitable compensation for prosumer generation that is automatically balanced with consumer needs.

**Approach:**

The approach taken by this paper is to leverage a real-time pricing strategy (NRG-X-Change) instead of traditional market transactions with trading and settlement cycles. By doing so it allows for real time pricing based on consumer demand on a network. The other approach is to do away with complex blockchain technology because the distribution service operator is handling the security of the metering by using a device that could be placed behind the regulated smart meter with similar form factor for easy installation. Since the device is locked behind the smart meter it is protected from tampering and fraud. Another benefit from the custom device is that it can read the homes usage as an unregulated device since its part of an unregulated market and is an addition to the revenue grade meter installed at the home. The final approach is to use an open-source application to receive messages from these metering devices over the internet. The open-source application is a python-based implementation of the NRG-X-Change mechanism with monitoring dashboard. The community manager would oversee maintaining the application and distribute funds based on the logged and auditable transactions.

**Novel Contributions**

* Design of a device that can fit into current smart meter infrastructure to lower costs of implementing peer-to-peer metering networks
* Software for implementation of NRG-X-Change algorithms
* Simulation of multiple prosumers using

**Other Journal Submissions:**

* None

**Closest Reference Article:**

* Mihaylov, Mihail & Jurado, Sergio & Van Moffaert, Kristof & Avellana, Narcís & Nowe, Ann. (2014). NRG-X-change a novel mechanism for trading of renewable energy in smart grids. SMARTGREENS 2014 - Proceedings of the 3rd International Conference on Smart Grids and Green IT Systems. 101-106.