

Factsheet

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Overview of blockchain applications in the renewable energy sector

The potential of the blockchain technology or more generally its underlying distributed ledger technology (DLT) is widely recognized, resulting in many opportunities for innovation. As a simplification, however, we are using the very common term «blockchain» in this text as a placeholder for the much broader concept that includes all distributed ledger technologies, even though blockchain is only one implementation of DLT.

This factsheet highlights potential applications within the field of energy. However, due to the complexity of the respective area this factsheet can only provide a high-level overview of potential applications and some real world uses cases - and is by no means meant to be exhaustive.



Image source: www.unsplash.com

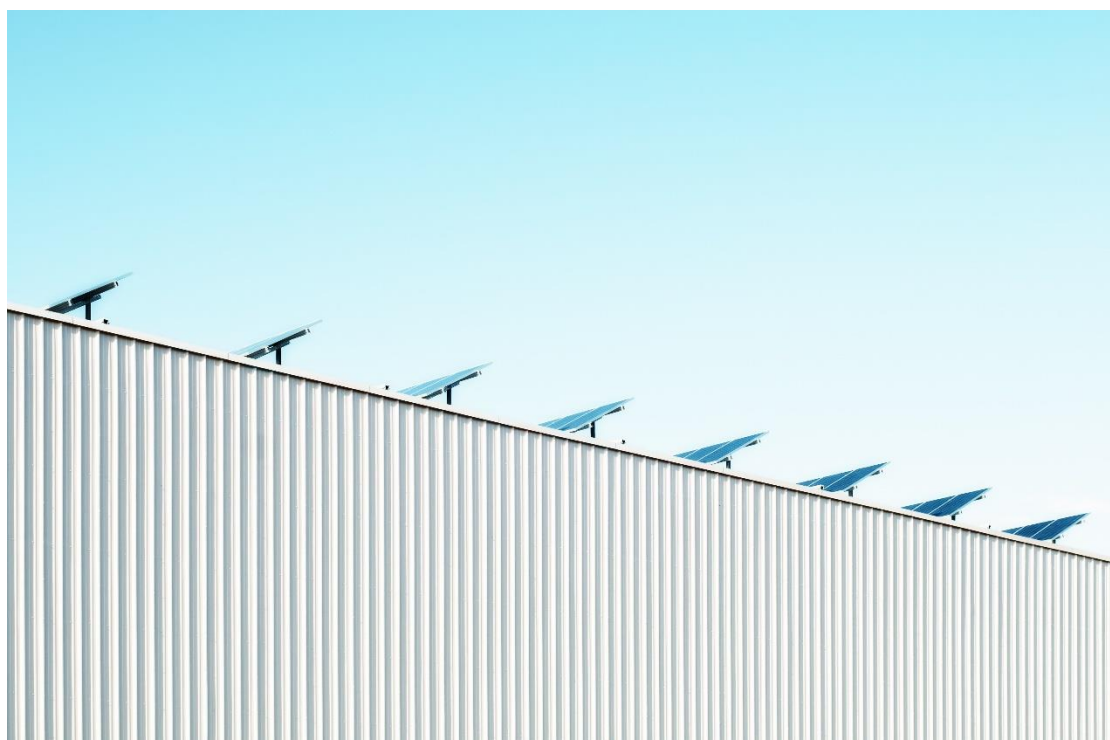
Although the potential of blockchain technology is highly recognized in the energy sector, the majority of such applications are still at the development stage. Moreover, since the energy sector consists of a broad range of stakeholders (e.g. retailers, suppliers, manufacturers, traders, utilities and many more) this overview only touches the surface of actual blockchain based activities within the overall energy sector.

Potential Applications: The potential of blockchain technology in the energy sector is associated with cost reduction, process acceleration and overall flexibility, as the transaction model is decentralized, which is particularly attractive for energy consumers.

Examples for potential applications include:

- Energy transfer, as a basis for read-out and settlement processes and clearing;
- Documentation of ownership, asset management, proofs of origin, CO₂ and green electricity certificates;
- Electromobility (possibility of innovative billing models);
- Integration of DLT in the field of smart devices.

The potentials of blockchain technology will affect the business models of many stakeholders that operate along traditional energy grids such as for example producers, suppliers, consumers, traders, investment agencies as well as regulators. Due to the complexity of blockchain implementation regarding its associated infrastructure as well as the experienced resistance from 'traditional actors', its full integration into the energy sector will not come over night.



Greatest potential is seen in for the so called “prosumers”: Consumers may use their “home-made” energy while at the same time producing excess energy (e.g. through solar plants, small wind turbines or combined heat and power plants). Surplus energy can then be directly sold or traded to neighbours. Future business models could focus on providing digital services to enable, for example, 'individual and independent' prosuming. Traders can track market events along distributed ledgers on their trading screen, where orders are transmitted almost real-time and displayed, and the opposite side can close a trading transaction by clicking on an order displayed on the screen.

The further development of blockchain based energy prosumer models may be successful if the costs of such energy transactions are significantly lower than the internal coordination costs of current actors. Furthermore, the blockchain space needs to provide coherent and market based allocation tools which can send proper “behavioural signals” to a swarm of small energy producers.

Concrete Use Cases: An early use of DLT in the energy sector was **Solarcoin** (<https://solarcoin.org/>). The project aims to motivate solar prosumers by rewarding them with Solarcoins. Solar power producers receive a digital token for each unit tradable MWh of solar energy. Other use cases focus on the transactional layer of renewable energy trading.

Another project in that field is **elblox** (www.elblox.org) which established a peer-to-peer market place in order to enable the personalized allocation of electricity to consumers by including regional electricity traders in to their platform. The project is run by Axpo from Switzerland and Wuppertaler Stadtwerke from Germany.

Projects like **SELBER** (see Distributed Energy under <https://climateledger.org/en/Innovation/Use-Cases.33.html>), **Power Ledger** (<https://powerledger.io/>) or **LO3 energy** (<https://lo3energy.com/>) provide solutions to consumers, and, utilities by offering them means to generate digital renewable energy assets as well as ownership models for deployed technologies (e.g. pv panels or community owned energy storage capacities).

Besides incentivizing decentralized renewable energy production, DLT may also become a driver for the electrification and reduction of individual transportation systems. Charging and sharing of electric vehicles may become one of the major playing fields of DLT. In 2016 German power company innogy (RWE) and automotive technology company ZF joint forces to create DLT-based **eWallets** for charging and sharing electric cars (<https://innovationhub.innogy.com/>).

The increase of efficiency gains in the transport sector is also envisaged by the project **LETchain**. The project aims to integrate corporate mobility management systems by incentivizing carpooling and the use of public transportation via an open token system (see Sustainable Transport under <https://climateledger.org/en/Innovation/Use-Cases.33.html>).

In 2017, the Dutch energy centre **ElaadNL** presented its proof of concept for a DLT based charging station. Workflow packages covering payments, consumer communication and value storing were integrated in to one single network of distributed ledgers. This DLT uses a tangle, which assembles a directed acyclic graph for storing transactions (instead of blocks) and can therefore operate without transaction fees.

The Climate Ledger Initiative (CLI, www.climateledger.org) aims at providing objective and technology neutral information with regard to current and future climate-relevant applications which are based on distributed ledger technology. The work of the CLI is financially supported by the Governments of Liechtenstein and Switzerland as well as by the EU's Innovation Program Climate-KIC.

