

November 2023

# Overview for ACBC



# Powerledger

# Powerledger



**We make software for tracing energy and trading environmental commodities, like carbon credits.**

**We have a public blockchain, the Powerledger chain, which can also be used by 3rd party software providers.**

**Our SaaS model is being used by energy utilities, renewable energy developers, energy retailers and corporations.**

# TraceX

Carbon Credit and REC Marketplace



# TraceX digital marketplace software enables ease of trading and settlement.



TraceX is a digital marketplace that can efficiently handle the trading of renewable energy certificates, carbon credits and other environmental instruments.

## Seamless trades

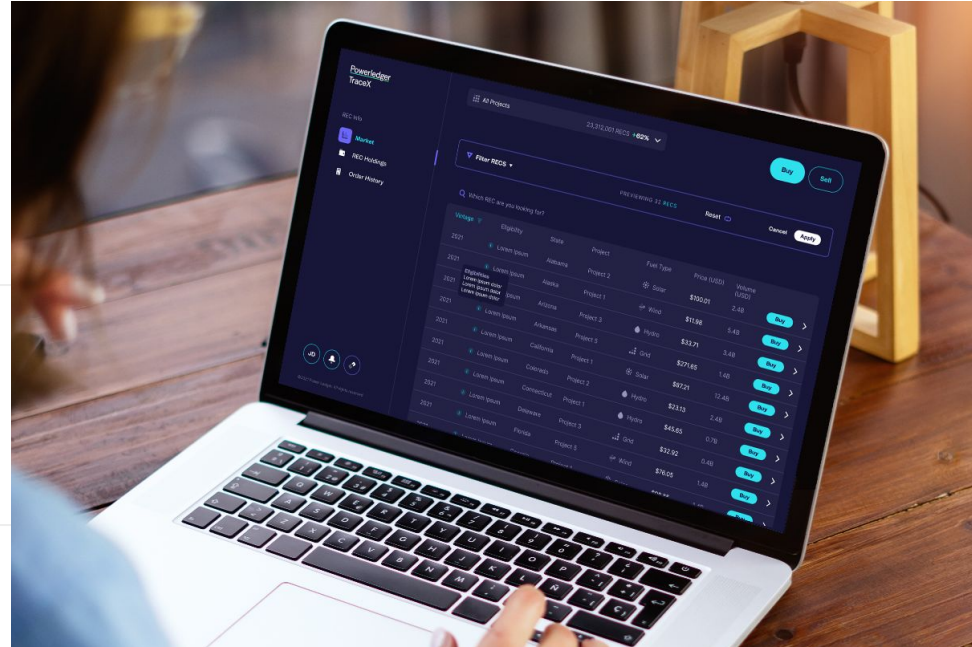
Users are able to place orders for Energy Attribute Certificates, such as Renewable Energy Certificates (RECs), against those already available in the market dashboard. Users can also raise their own buy order using the purpose built user interface. Anonymised orders become visible for all market participants as soon as they are placed, and when matched are executed with on-platform payments.

## Registry integration

TraceX is fully integrated with the largest voluntary REC registry in North America – the Midwest Renewable Energy Tracking System (M-RETS). Users are able to link their M-RETS account and import RECs to the marketplace once the link is established. Successful purchases in the marketplace are updated directly through to their M-RETS account.

## Solid audit trail

Being blockchain-enabled TraceX captures data pertaining to import and export trades, along with retirement events of environmental attributes on a proprietary distributed ledger – providing an immutable and verifiable audit trail.



# Benefits of the TraceX exchange for REC Buyers and Sellers



## Faster and more cost efficient

- TraceX offers standardized set of terms for the purchase and sale of RECs that all participants accept as part of Terms of Access.
- Avoid the prolonged negotiation of the legal terms and associated legal fees.
- Avoid the delays and credit costs associated with manual settlement using business resources.

## Better price control

- Use the limit order on TraceX to set the sale price for your RECs.
- Use the market price to sell or buy your RECs at the prevailing price.
- Trust the market for the most up to date price, not your broker who is benefiting from the spread.
- Transact with more entities with built-in credit checks.

## Future proof

- The REC market is evolving. With TraceX, participants can buy and sell RECs on a blockchain enabled platform that is scalable to meet growing volumes, digital currency ready, and built for future Environmental opportunities.

## Mitigates credit risk

- All Participant's complete KYC and Payment account linkage (verified Business Account) prior to being able to trade. Once order is matched, a pre-settlement balance check is initiated to Buyer's bank account to ensure sufficient funds. Success locks trade and payment gateway initiates transfer of funds. Confirmation of successful funds transfer triggers smart contract creation (transfer of ownership) removing credit risk

## Mitigates settlement risk

- RECs are encumbered on the originating registry once imported onto TraceX to prevent double-use. Once orders are locked, these encumbered RECs back every matched order and ensure seamless delivery of product
- Payment confirmation in seller's bank account from Payment gateway triggers the Smart contract-change in ownership recorded on the blockchain, providing for a solid audit trail and change of ownership direct to the Registry



# Midwest Renewable Energy Tracking System (M-RETS) - TraceX

Registry Integration to create an automated marketplace

**Type:** Commercial project

**Partners:** Midwest Renewable Energy Tracking System

**Location:** United States

**Objectives:** Powerledger has partnered with the Midwest Renewable Energy Tracking System (M-RETS) to launch a Renewable Energy Certificate (REC) marketplace in the United States. M-RETS tracks generation from renewable resources across all of North America, serving as a trusted centralized gateway to compliance and voluntary environmental markets to make it easier to track RECs through one system.

**Duration:** 2021 onwards

## Project Stats:

- Trading pilot period underway
- 10,000 RECs listed as bids currently
- 157,000 RECs listed as asks currently

## Outcomes:

- M-RETS participants can link their registry account with TraceX using their unique ID
- Participants can import RECs and list them for sale and receive RECs into their registry account from purchases

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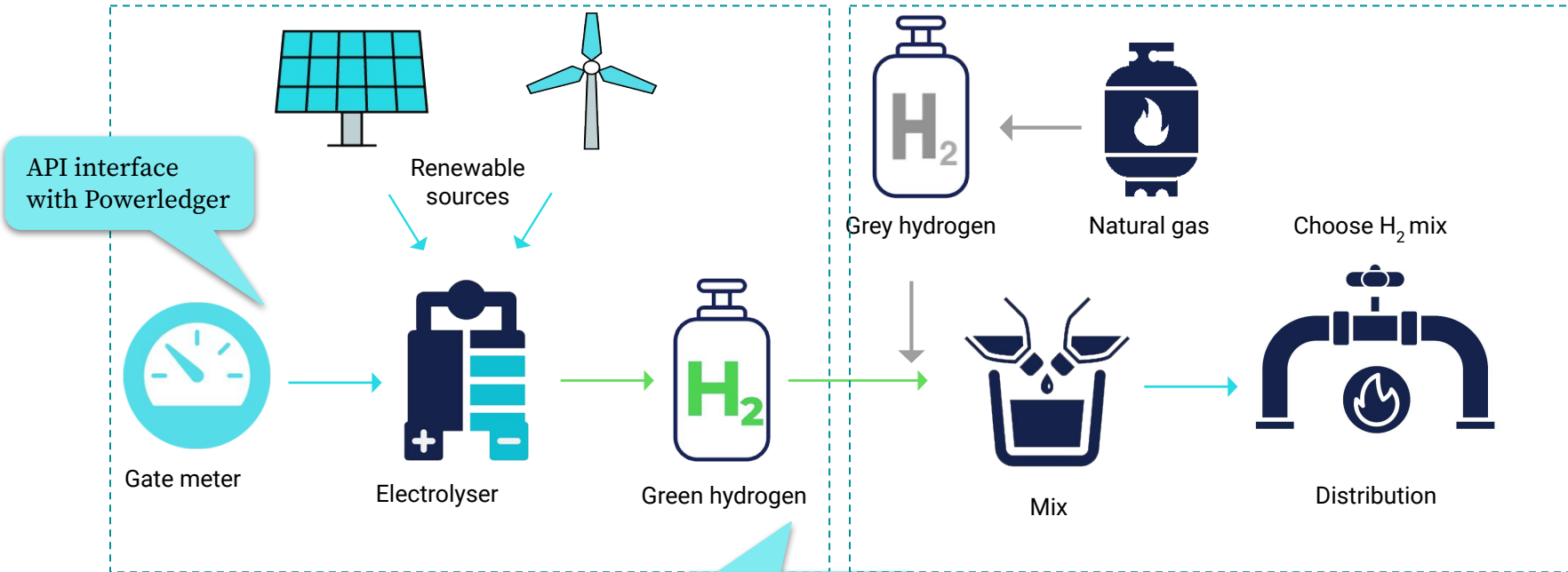
# Tracking Energy



# Green Hydrogen Tracking: Cradle to Gate



Powerledger Vision



Powerledger



# Vision™: Track and Visualize energy provenance for H<sub>2</sub> production

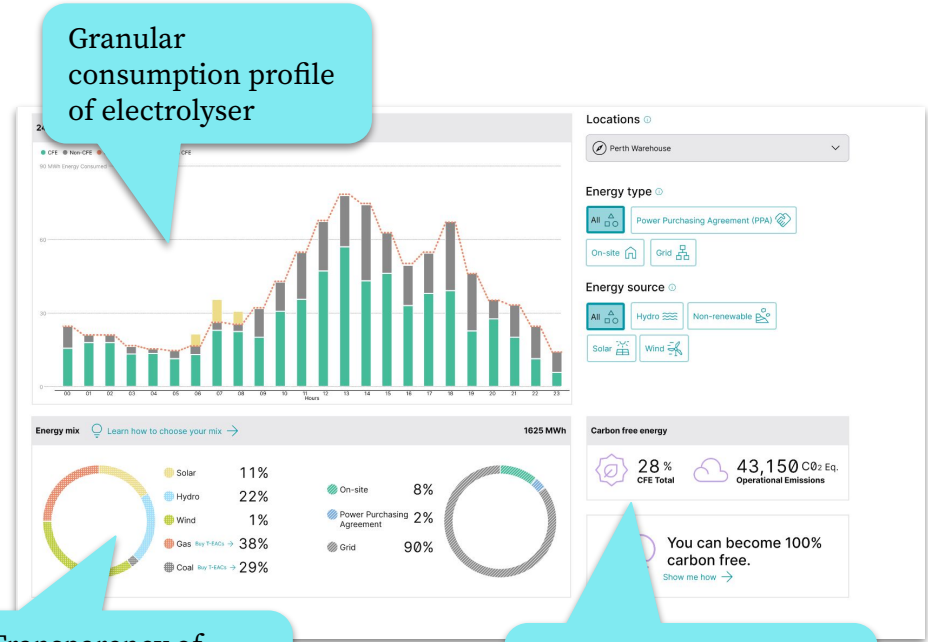


Powerledger's Vision provides **visibility of the provenance for energy used in hydrogen production**, whether it is from the retailer's generation assets or bought via PPAs. It can also track renewable energy certificates / GOs purchased for the process.

In this example, energy consumption is visualized for 24 hours. Energy consumption is broken down by **energy type**, and **carbon emissions** for non-renewable energy are accounted for each consumption site.

Sustainability reports can be automatically created and all blockchain tracked information is available when needed, improving transparency for auditing.

Energy consumption can be displayed at a more granular level such as hourly, 15 min or even 5 min intervals.



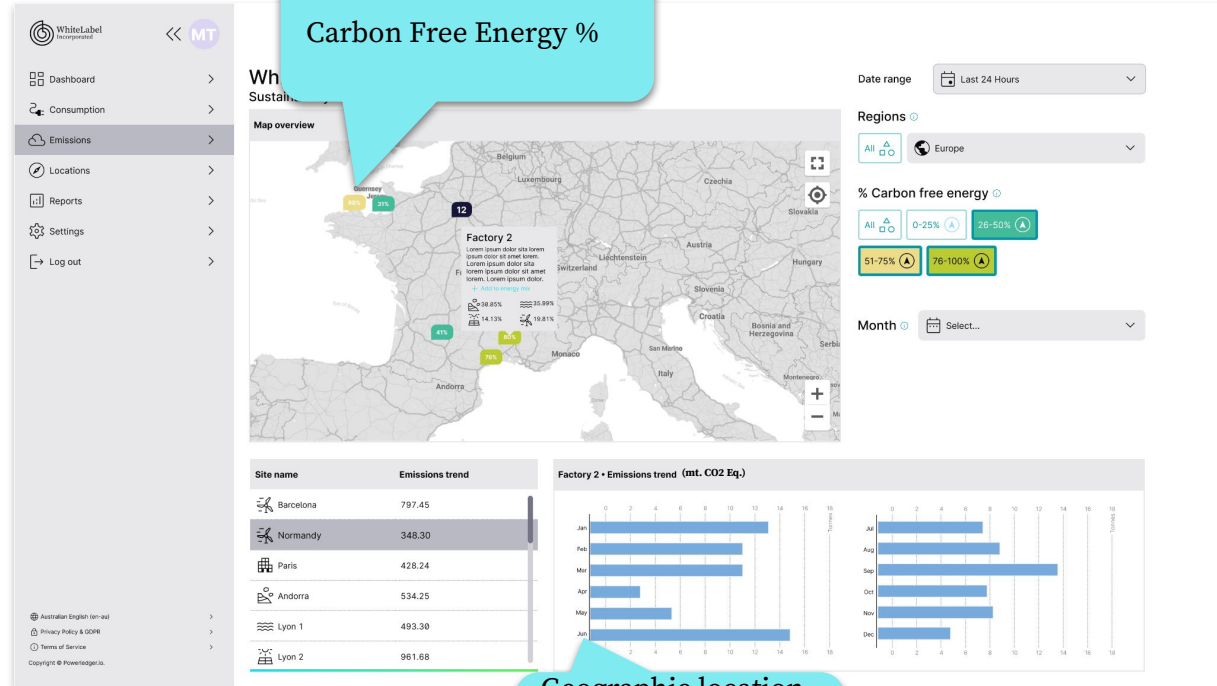
# Vision™: Portfolio Management Tool



Keep track of the carbon intensity of all your production facilities with Powerledger's Vision Emissions site.

Carbon emissions are accounted for each consumption site globally and displayed in a world map that can be zoomed into per country and region. Detailed metrics of carbon emissions per site and **carbon free energy percentage** are displayed.

Granular grid metrics, such as that from Electricity Maps, can be included in the solution to allow **full emissionality accountability**, including energy sourcing from the grid.



Carbon Free Energy %

Geographic location and emission trends of each individual site

Grid energy mix based on best available information

™ pending



Hydrogen provides a missing link between creation and storage of power.

But it needs tracking with blockchain



Hydrogen has made quite a name for itself in recent months and years. And not surprising considering its impeccable chemical credentials in its most famous reaction.  $H_2 + O_2$  reacts to form pure water and zero carbon dioxide in a highly exothermic reaction.

For applications that require high energy density, hydrogen is a very good candidate. The issue comes when you consider how many different ways there are to produce hydrogen. Some of them are 'clean' and some of them are 'dirty'. Some of them are in between clean and dirty and a matter of philosophical discussion about carbon footprint. Each and every one has a colour associated with it, from green and pink, blue brown red purple and grey. There are nine in total, and keeping track of all that is Powerledgers very own energy tracing blockchain technology.



*Hydrogen coded colour scheme denotes provenance*

We have developed a system for keeping track of every kilogram of hydrogen, ammonia and tonne of steel. The 'sunk' carbon footprint is assessed by partner accountancy firms like EY and Bureau Veritas and the marginal carbon footprint is assessed and tracked by us at Powerledger.

The result is that new technology becomes a known quantity from a carbon perspective and any new venture is protected from the accusations of outlandish or over optimistic claims.

In a new generation of chemistry process, carbon dioxide can be reacted with hydrogen to create renewable methane with all the energy density and low emission you might expect.

Powerledger is also a founding member of the hydrogen certification scheme.

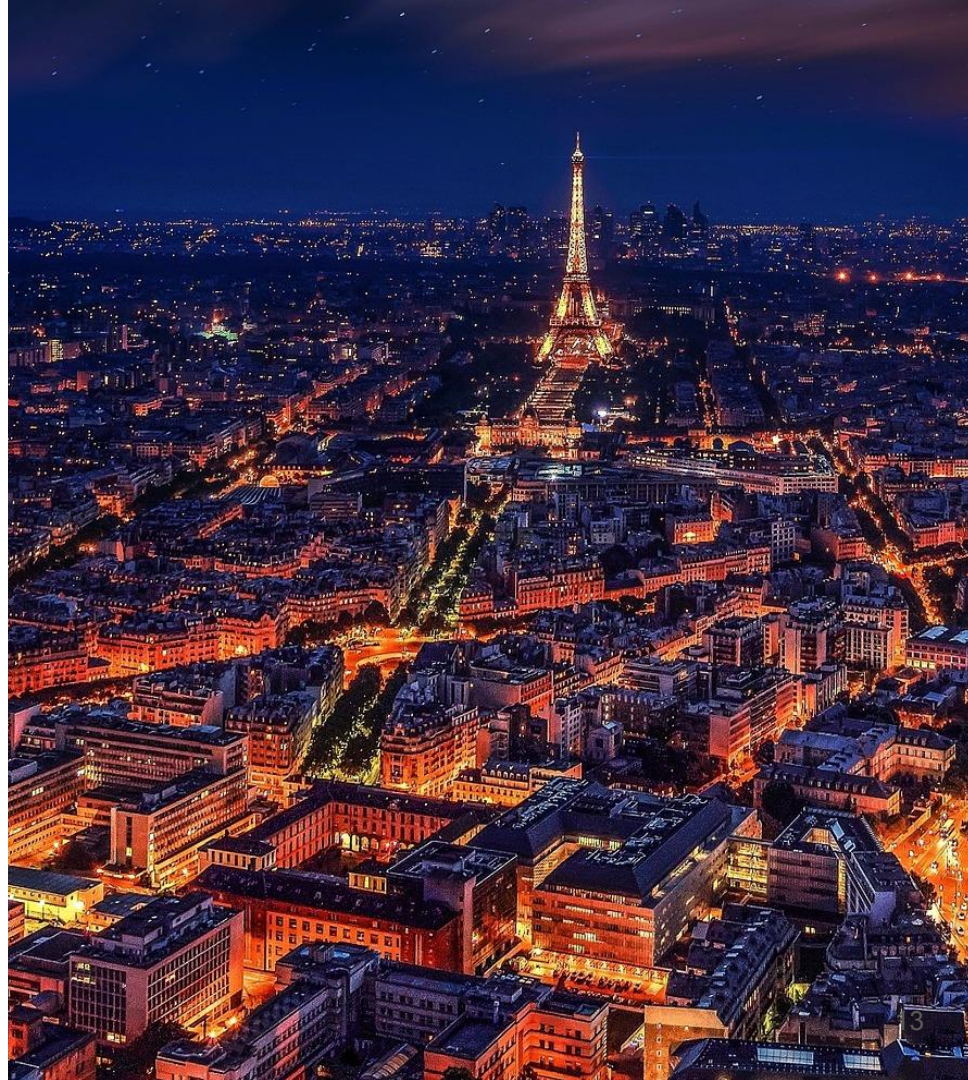
Read more here: [Update on Australia's Hydrogen Certification Scheme](#)





## Choose Your Energy Mix, France

- A world first application of blockchain to do energy tracking and matching for 24/7 renewable energy.
- Customers can choose their energy mix, based on the type of renewable energy, location, time and type of the generation — from rooftop PV to large generation.
- The Platform tracks, traces and provide irrefutable transparency giving the customers control over the energy mix they buy.
- Customers joining this innovative retailer because of transparency and choice.
- To date there are 6,000 customers using the platform, with further scale up under discussion.





**TATAPOWER-DDL**

## P2P Trading & Provenance, India

- This project demonstrated the benefits of P2P energy trading for Tata Power and their customers across Delhi, as an alternative to net metering.
- The project included a combination of Tata Power owned sites and customer sites — both Prosumers and Consumers — in total >140 sites took part in P2P trading of excess solar energy.
- The project also included a 1MW solar PV plant owned by Tata Power.
- The project also demonstrated provenance tracking and the usage of green energy for EV charging in the Tata Power EV fleet and simulated benefits of Local Energy Market for reducing grid congestion utilising a large community battery with P2P trading.
- A detailed Project Report was submitted to the regulator DERC at the successful completion of the project. DERC is currently considering regulatory changes to enable P2P throughout the state.





## T77 & O77 P2P Precinct Bangkok, Thailand

- The project began in 2018 as the largest commercial P2P energy trading project in the world. Initially, 700kW solar was being traded across six commercial, educational and residential sites.
- In 2021, O77 precinct, Hasu and Mori buildings were added: bringing project to 1.2MW in size in the marketplace.
- The success of this project led to the partnership between Powerledger & BCPG, which was just extended in Q1 2023 to end of 2025.







## Smart City at Chiang Mai University, Thailand

- A smart city demonstration project involving three campuses and 142 buildings, leading to 30% renewable energy autonomy.
- 12MW of solar, and 1.2 MWh of battery capacity across the campus, 8MW of solar live.
- Demonstration of energy tracking, P2P trading & granular carbon intensity tracking.
- Up to 49% of daily energy usage is from solar.
- Carbon footprint reduction from solar energy consumption: Avg 42% (55 tonnes CO<sub>2</sub>-eq per month).
- Additional carbon footprint reduction by P2P trading: additional 7% (9 tonnes CO<sub>2</sub>-eq per month).

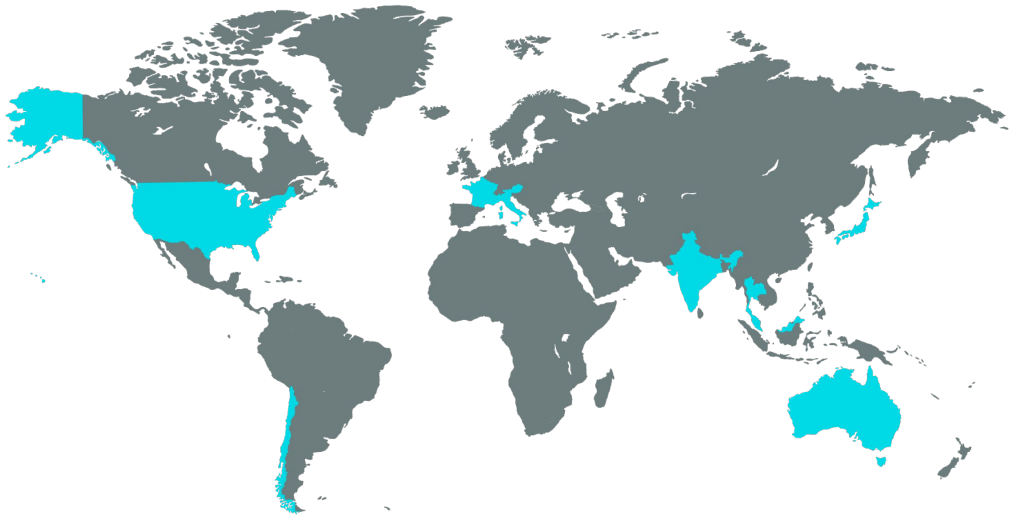




# Increasing demand for Powerledger's Products



Powerledger's technology is available in **fourteen countries**, across **five continents** – enabling the trading of cheaper, cleaner electricity, and the emergence of a greater level of grid stability.



The software we call our Platform features' works alongside the existing infrastructure of energy systems, enabling greater control and ownership for energy consumers and producers alike.

Our clients and partners are getting ready for the new electrical world. Their customers need stable grids and scalable renewable energy.

Customers want genuine renewable energy; they also want their Renewable Energy Certificates (RECs) to be matched against their load profile and demand - they want to know the provenance of every one of their kilowatt hours. And they expect to choose, track, trade and trace what's going on on a 24/7 basis.

## Why blockchain?



Blockchain is a new technology that allows data and even digital assets to be stored in a highly secure way. You could think of it as a ledger like Google sheets only with the ability to have everyone agree on every entry and not allowing 'bad actors' to change things nefariously when no one is looking. This technology opens up all sorts of possibilities; in particular business models where individuals and companies can transact with each other without intermediaries.

This in turn means that the accountability for electrical distribution can be made cheaper and more democratic, and crucially avoids the need for processes and a central entity in the control of the data. Third parties always add cost, time and liability. A full explanation of how blockchain can be used in the energy sector is available [here](#).



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# The benefits of blockchain



1. No centralised payment system for electrical communities sharing and trading electricity.
2. Automated auditing as a result of the above.
3. Scalable systems that work at any level of operation
4. Like barcodes transformed supermarkets in the 70s, by making things faster and simpler blockchain will do the same.
5. No counterparty risk, assuming use of digital currency.
6. Sophisticated and possibly sensitive personal data about electricity usage can be handled in a secure way that prevents abuse.



*Blockchain will help transform electrical bills like barcodes transformed supermarket shopping.*

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### Transactions

29 Mar 11:31am ICT

Overview **Records** All meters ▾ 28 Mar 2021 -

#### Transaction records

Showing all transactions, sorted by time in descending order [Change](#) [Export](#)

| DATE              | BUYER | SELLER | TRADE TYPE           | AMOUNT KWH                     | TOTAL       |
|-------------------|-------|--------|----------------------|--------------------------------|-------------|
| 28 Mar 2021 14:00 | 7_F   | 7_B    | Renewable allocation | 0.2463 @ 3.2809/kWh            | 20.49348567 |
| 28 Mar 2021 14:00 | 7_B   | 7_B    | Renewable allocation | 15.18956 @ 3.2809/kWh          | -49.8354274 |
| 28 Mar 2021 14:00 | 7_C   | 7_B    | Peer to peer         | 13.26666666666667 @ 3.5821/kWh | 47.28719333 |
| 28 Mar 2021 14:00 | 7_F   | 7_B    | Renewable allocation | @ 3.1                          |             |
| 28 Mar 2021 14:00 | 7_B   | 7_B    | Renewable allocation | @ 3.1                          |             |
| 28 Mar 2021 14:00 | 7_H   | 7_B    | Renewable allocation | @ 3.1                          |             |
| 28 Mar 2021 14:00 | 7_F   | 7_B    | Renewable allocation | @ 3.1                          |             |
| 28 Mar 2021 13:45 | 7_D   | 7_M    | Bought from grid     | @ 3.1                          |             |
| 28 Mar 2021 13:45 | 7_F   | 7_M    | Bought from grid     | @ 3.1                          |             |
| 28 Mar 2021 13:45 | 7_H   | 7_M    | Bought from grid     | @ 3.1                          |             |

511 - 520 of 1205 < 1 ... 50 51 52 53 54 ... 127 > 10 / page ▾ Go to

#### Blockchain details

**Blockchain transaction ID**  
Oxaaf17ccbc0fc48fd5559397847266081bedcbabdb8edad213312606dd99a5d7

**From**  
Oxaaf938917caa2ce5d0d54b8125e2ed5f6bcbc527

**To**  
Ox66874ab30832d5b8115515a82628043453460d16

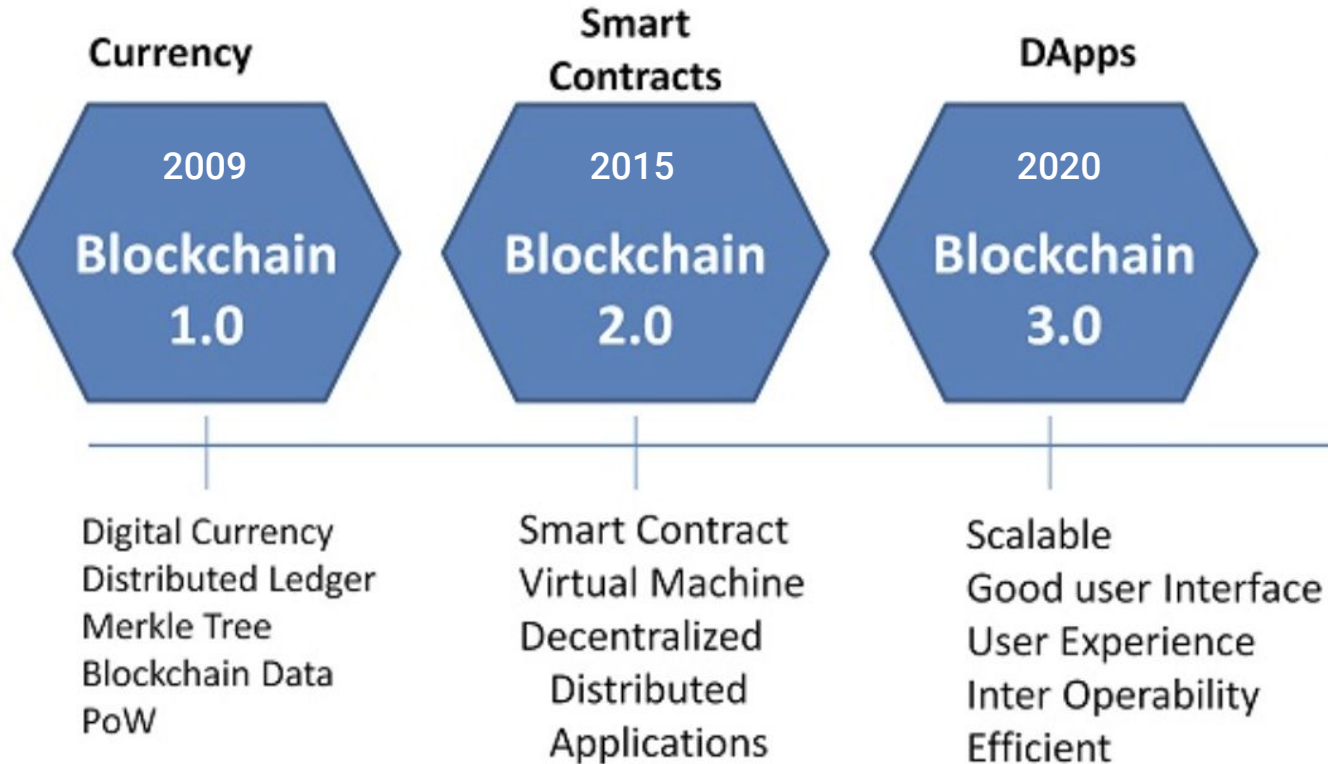
**Sparkz amount** ⓘ  
6.179.340800

[Close](#)

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Every transaction is tokenized and written on our blockchain, ready to enable instantaneous reconciliation and settlement.

# Blockchain evolution from Gen 1.0 to Gen 3.0



# Optimizing 2nd Gen, Ethereum, w/ "3rd Gen" blockchains

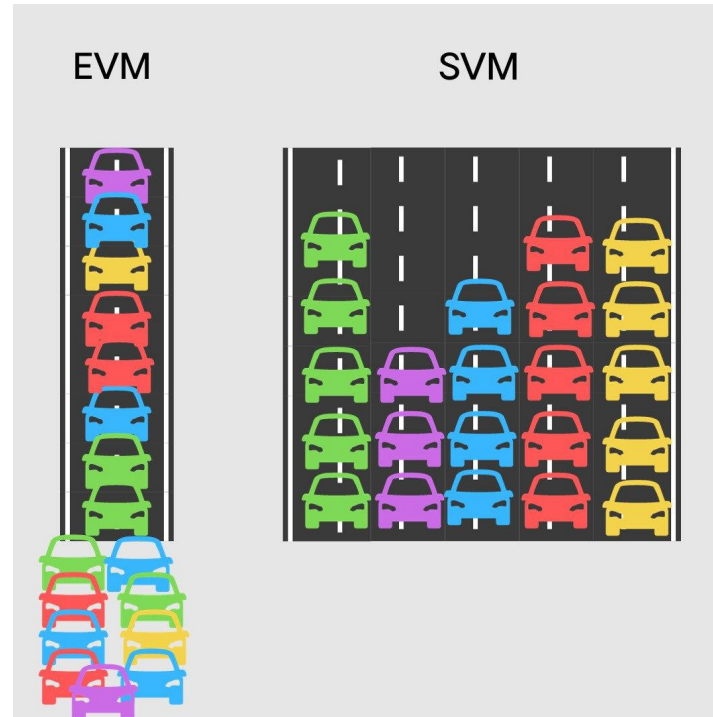


| Benchmark/<br>Coins    | Ethereum<br> | Cardano<br><br>CARDANO | Avalanche<br> | Polkadot<br> | Algorand<br> | Solana<br><br>SOLANA |
|------------------------|---|---|--|---|---|---|
| Transaction Throughput | 15-30 tps   | 250 tps   | 4,500 tps  | 1,000 tps   | 1,100 tps   | 50,000 - 65,000 tps   |
| Transaction Fee        | ~\$4 - \$21   | 0.4 ADA ~ \$0.77  | 0.001 AVAX ~ \$0.63  | 0.0157 DOT ~ \$0.64   | \$0.002   | \$0.00025   |
| Consensus Mechanism    | Proof of Stake  | Ouroboros Proof of Stake  | Proof of Stake   | Nominated Proof of Stake  | Pure Proof of Stake   | Proof of Stake  |

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# How is Solana so fast?

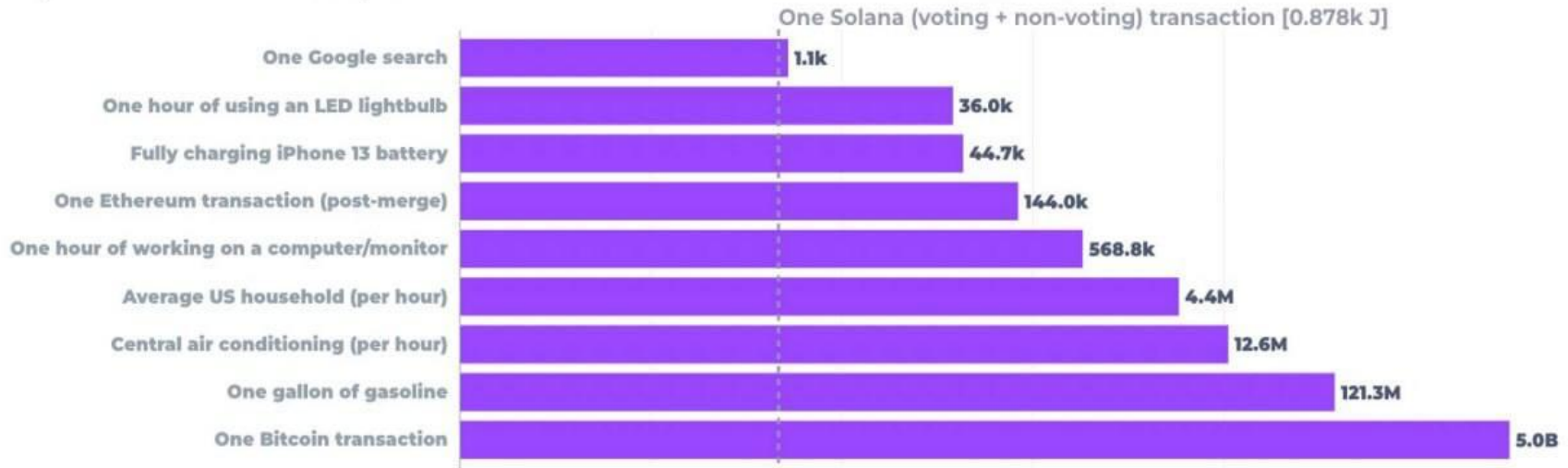
## Parallel transaction processing



# Blockchain energy use, Solana, Bitcoin and other comparisons



## Comparative Scale of Solana Footprint



For reference: 1kWh = 3.6 million Joules



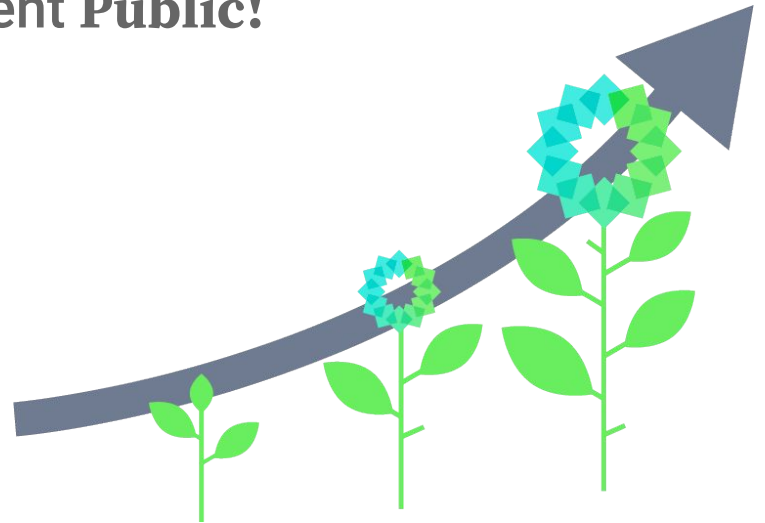
# Powerledger chain, based on Solana



**In March 2022** - Powerledger launched its Proof of Stake Blockchain

**In August 2023** - Powerledger chain went **Public!**

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