

Unlocking grid flexibility:



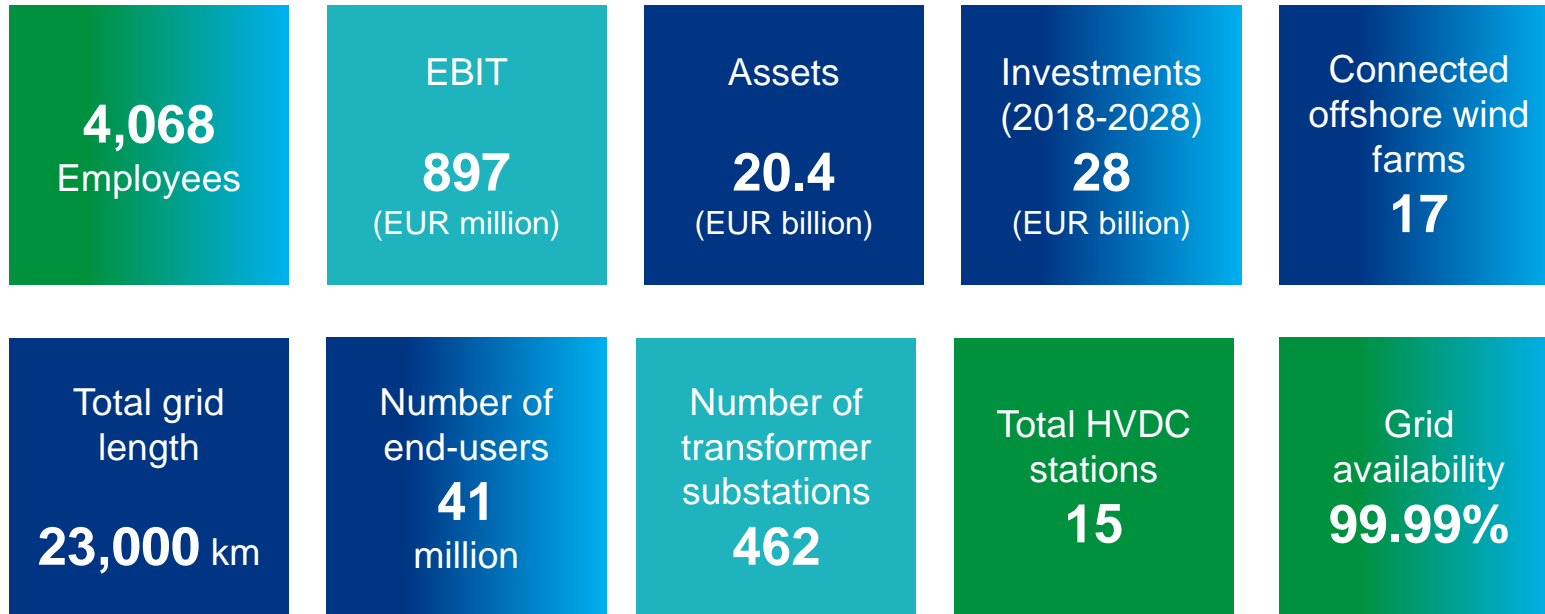
September-5-2018

Jan Vorrink

TenneT at a glance 2017



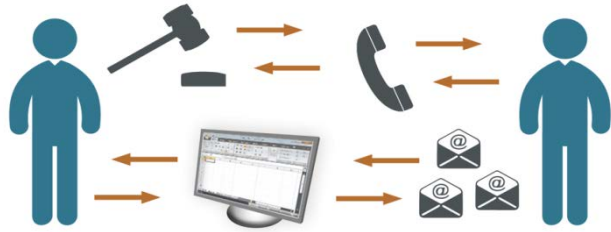
Europe's first cross-border grid operator



An economic layer the web never had



Transactions without blockchain



Distributed system of records shared across a public or business network

Shared Ledger

All parties agree to verified transaction on the same network

Consensus

Transactions with blockchain



Crypto-graphy

Secure, authenticated & verifiable transactions

Smart Contract

Business terms embedded in ledger & automatically executed with transactions

Note: **Bitcoin** operates on the basis of Blockchain technology, but a **Blockchain** can be used for many more applications than just Bitcoin.



There is a lot of potential

Blockchain is here to stay: foundational technology

Learn fast, fail often (business use cases)

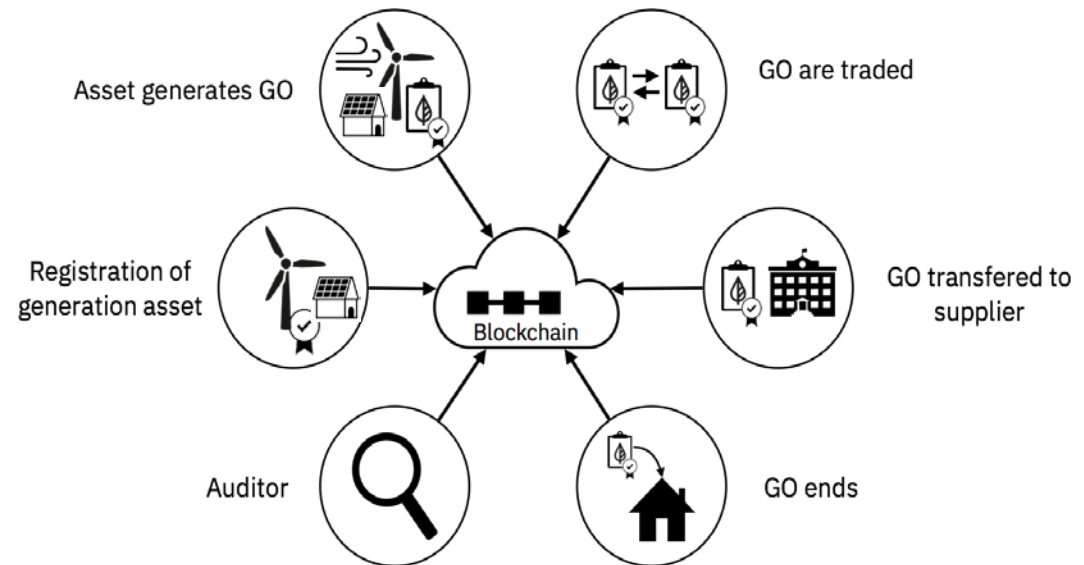
Why blockchain?

The leading blockchain platform is not invented yet

Only store relevant data on-chain

Certify decentral sustainable energy production

→ Blockchain captures the end-to-end process in one ledger.
All parties work on the same data.



certiq



There is a lot of potential

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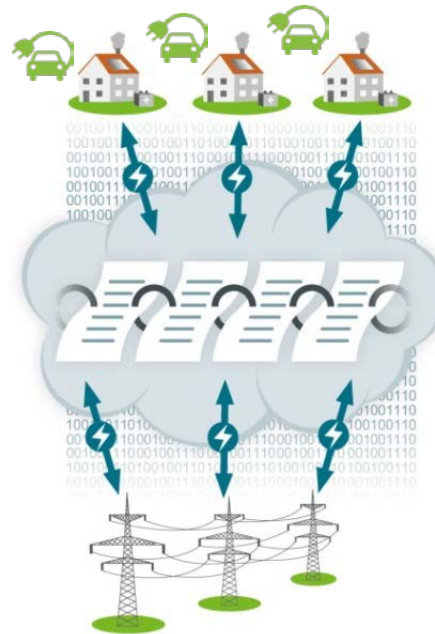
Why blockchain?

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Unlocking decentral flexibility

→ Gaining practical experience with blockchain technology and interfacing with existing TenneT systems and processes.



 **Aquarii**

redispatch with home batteries

 **RepubliQ**

aFRR with electric vehicles

Aggregator Vandebbron

Stop and postpone charging process: regulating up

Pilot description

- Voluntary aFRR bids (1 MW)
- Realtime data communication:
 - TenneT setpoint & verification
 - Aggregated power signals
 - *Data on asset level*

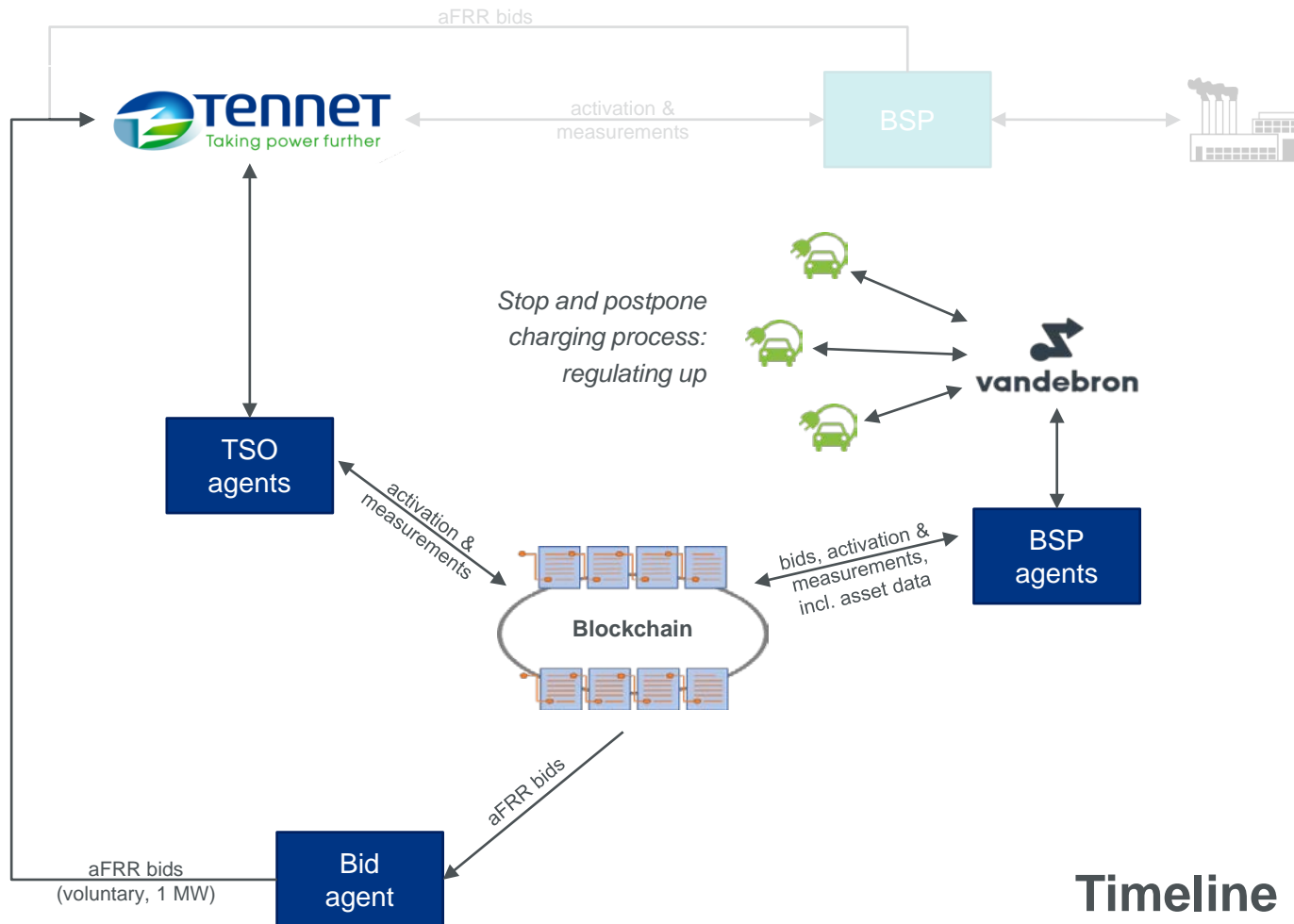


automatic Frequency Restoration





RepubliQ implementation

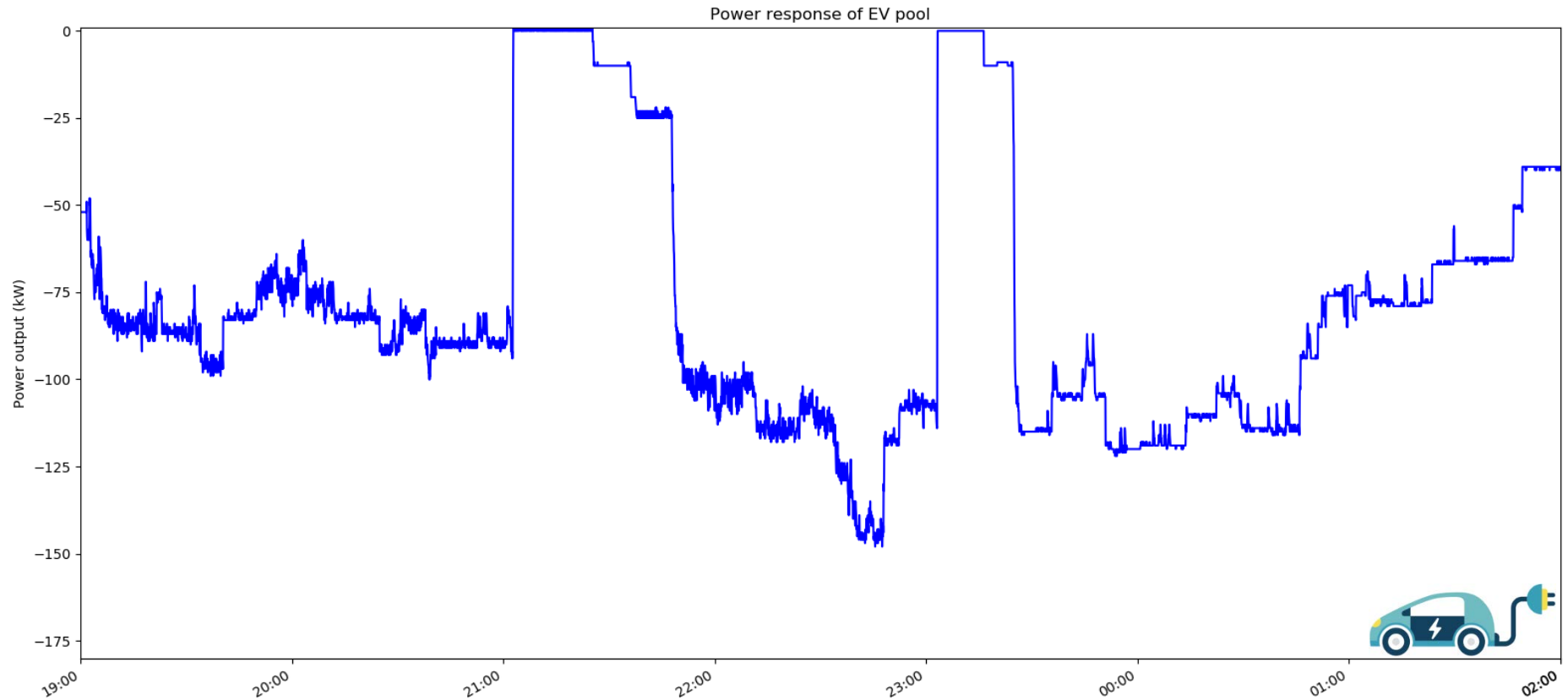


Timeline

- ✓ 2017: first BC implementation
- 2018: evaluation phase
- 2019: to be determined

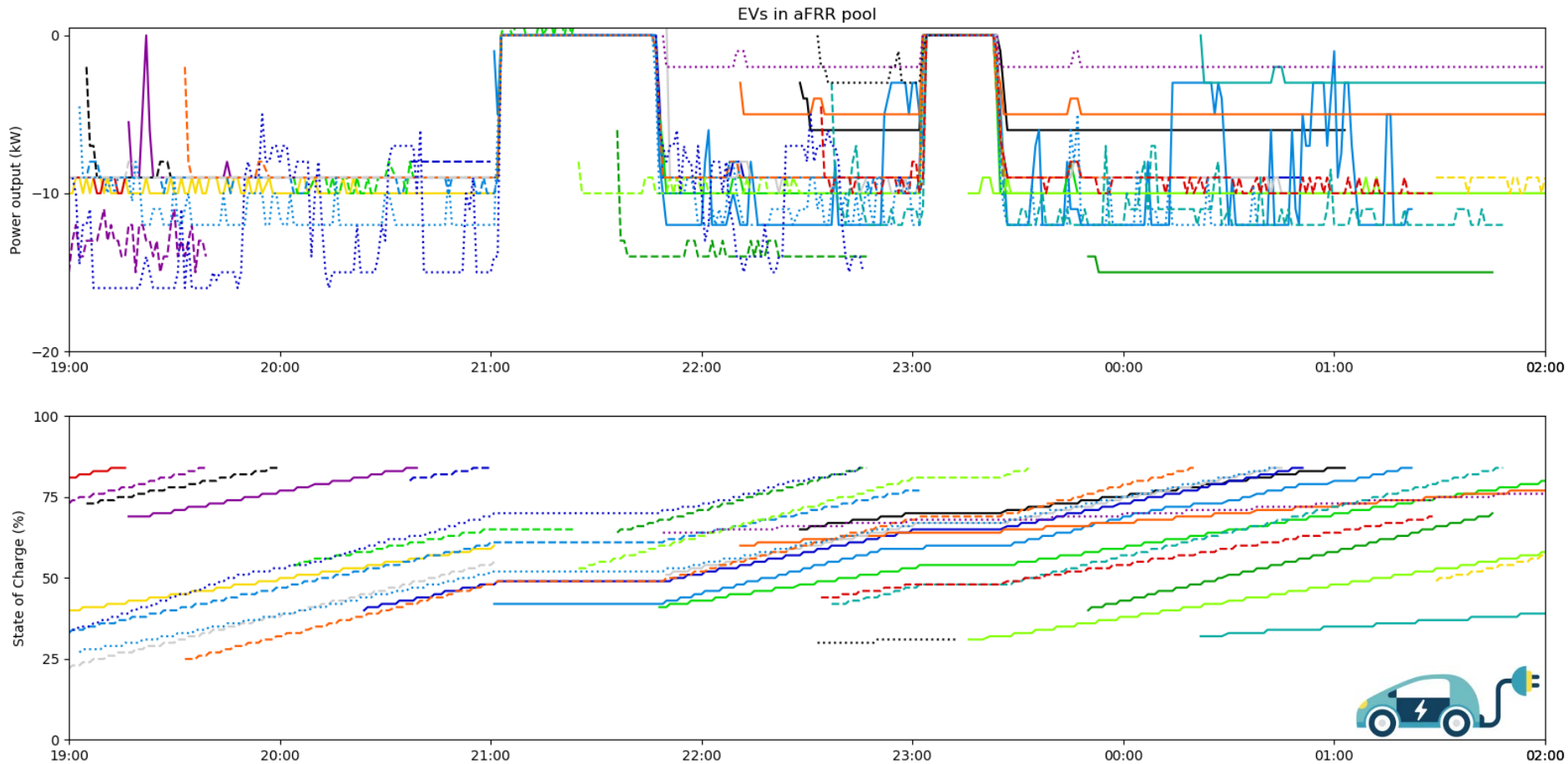


Evaluating activated bids





Evaluating activated bids

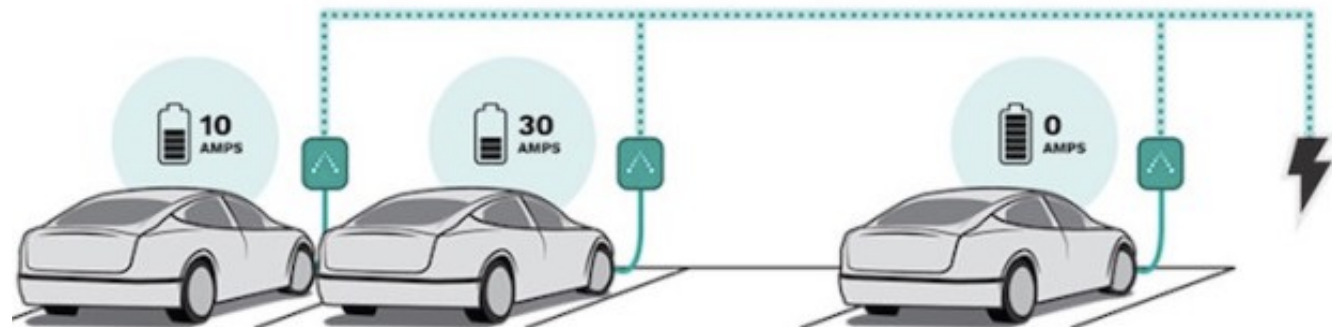




Outlook

Continuation of pilots!

- Evaluation / operation with Vandebbron: more cars, more bids
- Startup of aFRR pilots in Q3 2018
- Further development of blockchain pilot following European tender procedure



Thank you for your attention!

Questions?

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Taking power further

