

E-Mobility, Blockchain & The Grid

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Vision meets reality.

Electromobility Tomorrow

EV drivers like minimal interaction with the charging process:

- No searching for charging stations
- No logins, no mobile apps, no passwords
- Payment happens without drawing a card

But a driver also wouldn't like his movements to be tracked by a roaming service or a payment system provider

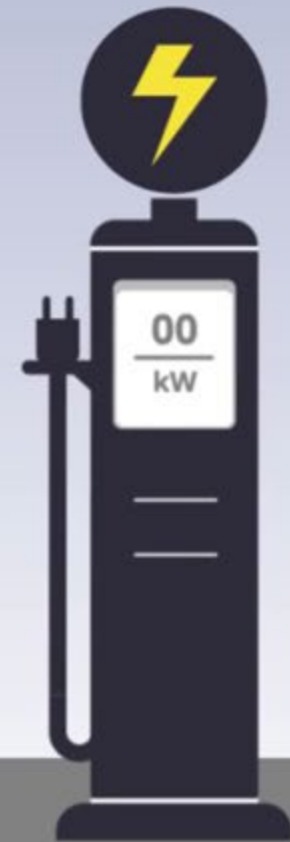
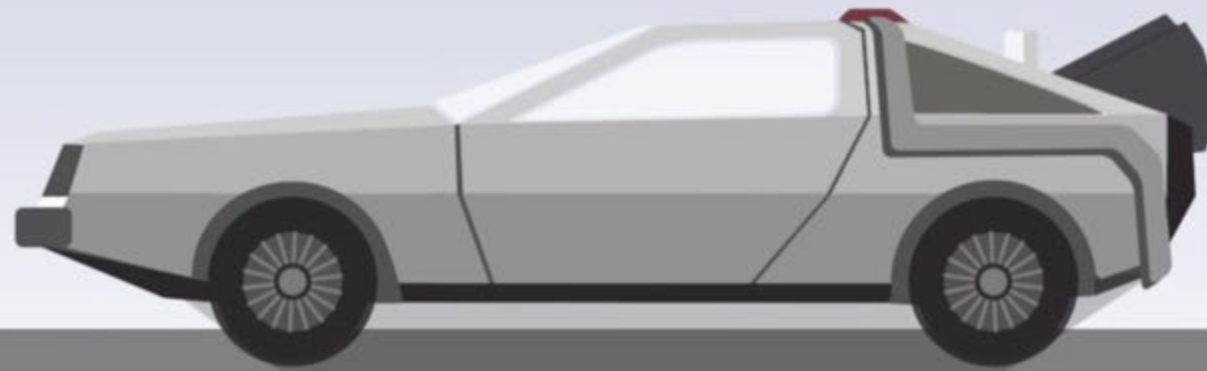
Grid Operators shouldn't put more copper into the ground just to mitigate congestion if it can be avoided

The following proposal has been developed as a proof-of-concept at SCS

eCharge



an innovative reservation
and payment process

by **S C S**





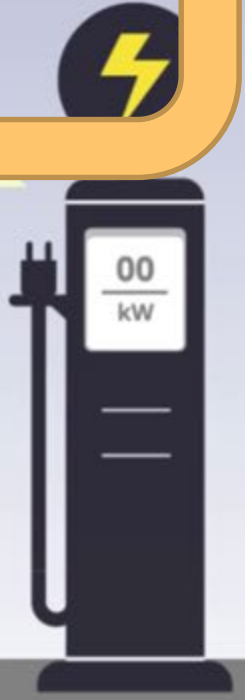
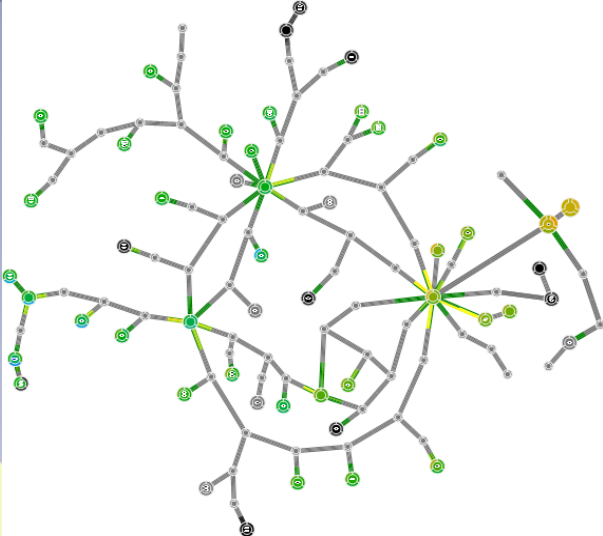
I'd like to charge today at 16:37
and I need 15kWh ...

  -Car 14:54

One-time key

OK, you can charge with
10kW during 1.5h. Please pay
reservation fee of 1CHF to ...

Charging price: 30Rp/kWh



Electric Car

Charging Station

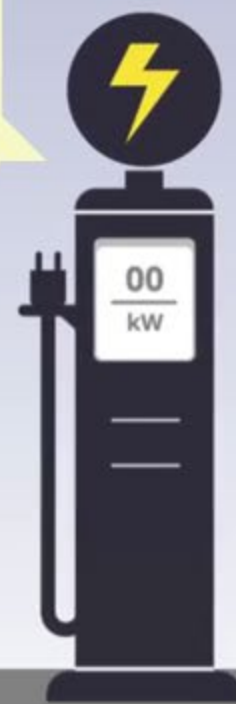
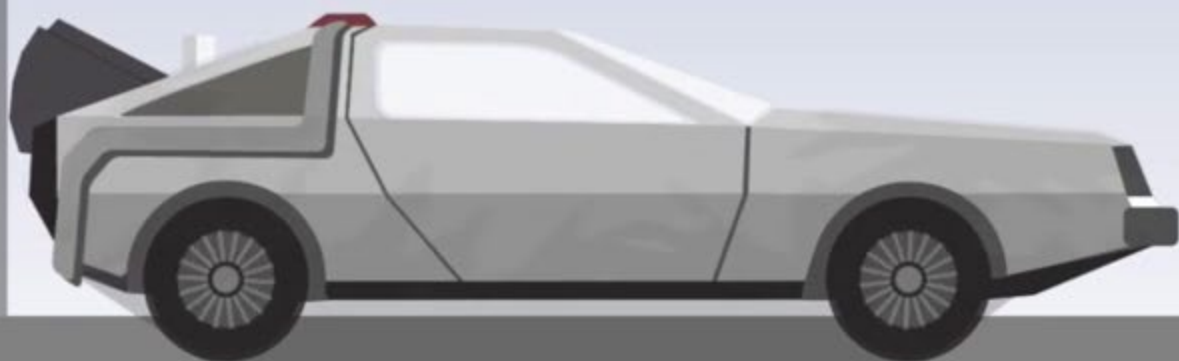


OK, you can charge with 10kW during 1.5h. Please pay reservation fee of 1CHF to ...

~Station 14:54

Confirming reservation from 16:37 to 18:07 with 10kW

~Station 14:55



Electric Car



Charging Station

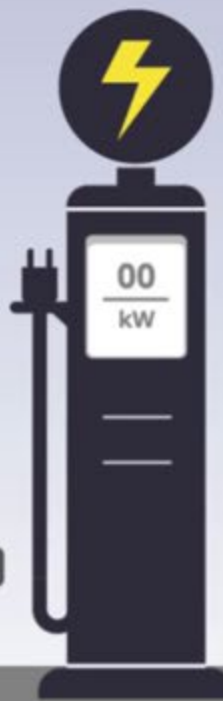
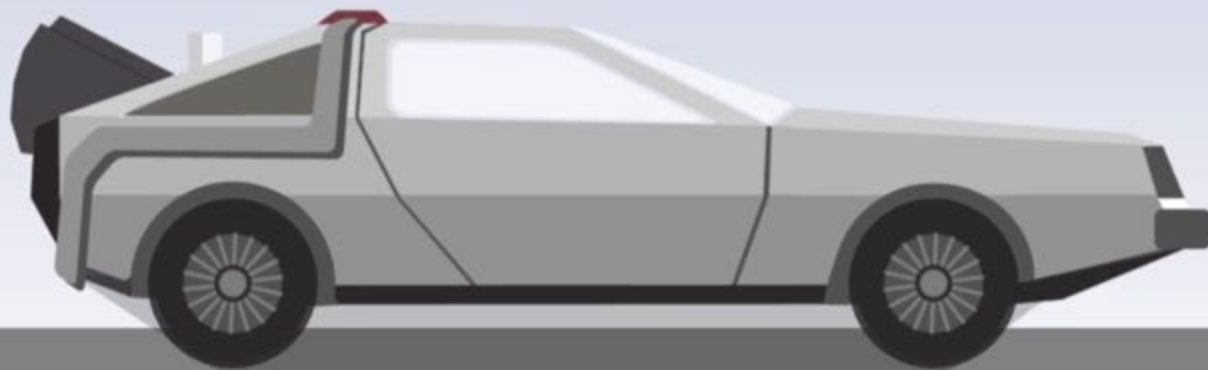
~Station 14:54

Confirming reservation from
16:37 to 18:07 with 10kW

~Station 14:55

Authentication: I'm here and
I'm the owner of ...

~Car 15:11



Electric Car



Charging Station

~Station 14:55 🔒

Authentication: I'm here and I'm the owner of ...

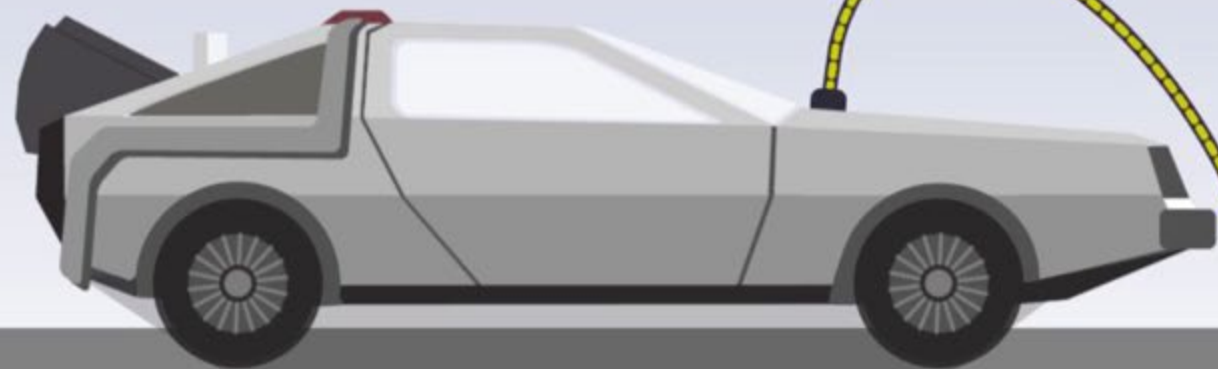
🛡️ 🔒 ~Car 15:11

Recharging started:
10kW during 1.5h

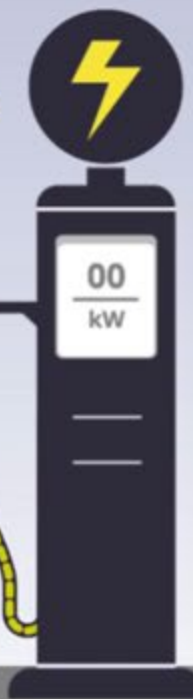
~Station 15:12 🔒



Car's wallet



Electric Car

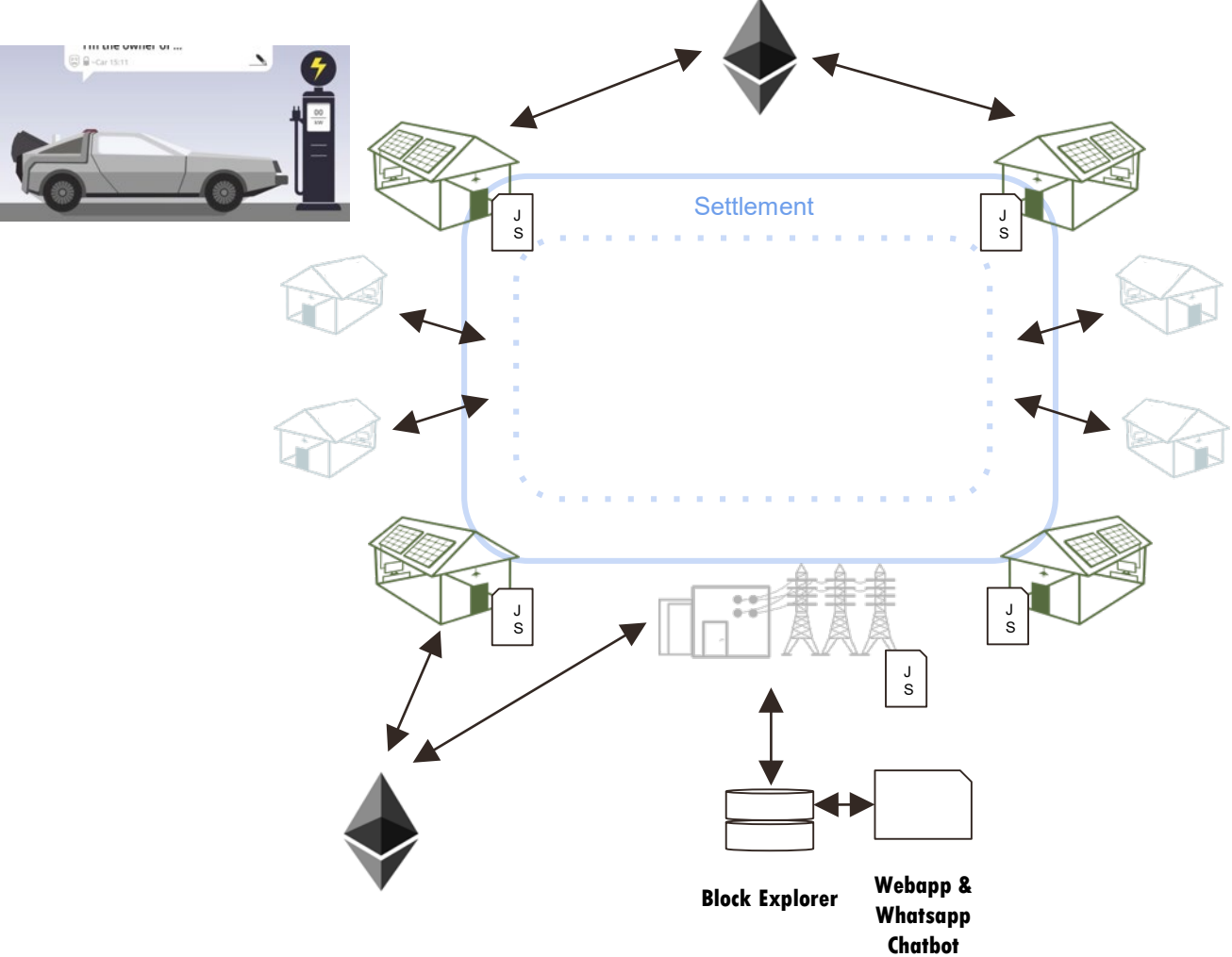


Charger's wallet

Charging Station



Quartierstrom Project Walenstadt



	Prosumer / Validator
	Consumer / Client
	Utility / Validator
<hr/>	
	Smart Meter
<hr/>	
	Node / Client Agent

Contributions SCS

- Dynamic Grid Usage Tariff
- Blockchain Platform Evaluation
- Privacy



Why Blockchain: Trust

- **Integrity:** The counterparty plays fair.
- **Competence:** Ability to protect information
- **Confidentiality:** The counterparty isn't curious and doesn't use my data for non-declared purposes

Utility companies and car industry enjoy their customers' trust

Regarding their integrity.

Not so much regarding their competence or curiosity

Challenges

- **Decentralization doesn't come for free** (*and hasn't really been achieved so far*)

PoW Mining for Bitcoin consumes the equivalent of Switzerland in electrical energy

There are «green» alternatives, but they don't come for free neither

- **Scalability is limited**

Public Blockchains can only process few tx/s

Solutions:

do as much as possible «off-chain»

2nd layer protocols ([Lightning](#)), side-chains ([Cosmos](#), [Polkadot](#)) and others.

- **Confidentiality** (GDPR: Right for deletion, protection of personal data)

Cryptography: Zero-Knowledge-Proofs, Ring Signatures, Homomorphic Commitments

Trusted Execution Environments (TEE) (Intel SGX, ARM TrustZone, Keystone (*announced*))



super computing systems

Conclusion

- Applying Blockchain can make sense IF it's a matter of **trust and commitment**.
- Confidentiality is no natural feature of blockchain. Quite to the contrary.
- Decentralization has limits.
- Still: Scalable, ecological and confidential solutions are possible on a blockchain.

SCS is working on it: substraTEE: <https://github.com/scs/substraTEE>



Vielen Dank für Ihre Aufmerksamkeit

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Vision meets reality.