Panel Discussion

Sustainable Energy Solutions

Moderator

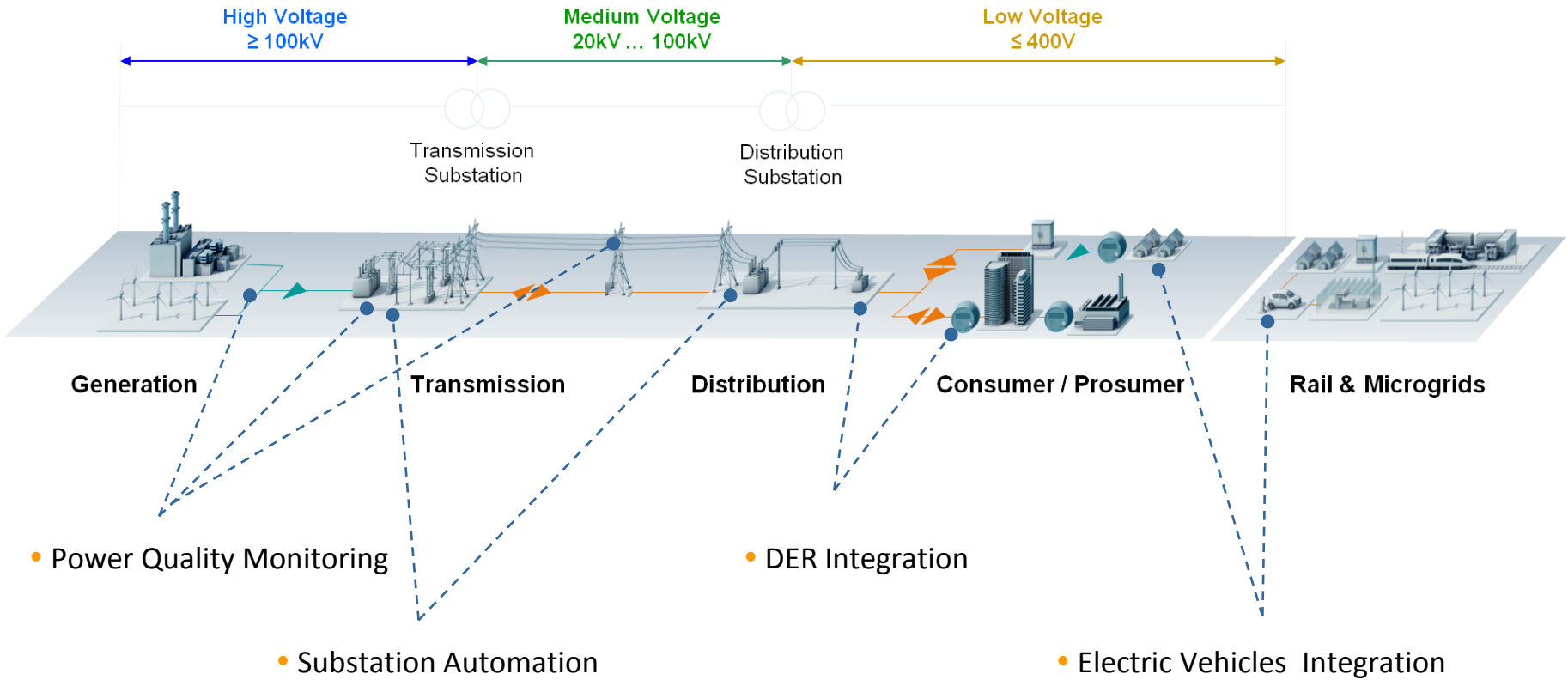
Steffen Fries, Siemens AG, Germany

Panelists

Gyorgy Kalman, Norwegian University of Science and Technology, Norway
Mark Apperley, University of Waikato, New Zealand
Steffen Fries, Siemens AG, Germany

May 23rd, 2017

the energy system value chain



challenges & questions for discussion

Starting point for the panelists

- DER - Technology eliminates most emissions from fossil fuels
- How to enable better use of intermittent renewable sources
- Payment options for energy exchange
- What challenges do we face in grid-scale energy storage
- Which further challenges exist?

topics from the panelists

Gyorgy Kalman, Norwegian University of Science and Technology, Norway

- **security challenges in control systems**
- **security and privacy of payments in smart grids**
- **transmission capacity estimation and management in highly distributed grids**

Mark Apperley, University of Waikato, New Zealand

- **distributed solar/storage solutions and light-weight grid dependency;**
- **grid-edge trading/sharing;**
- **improving utilization of renewable sources**

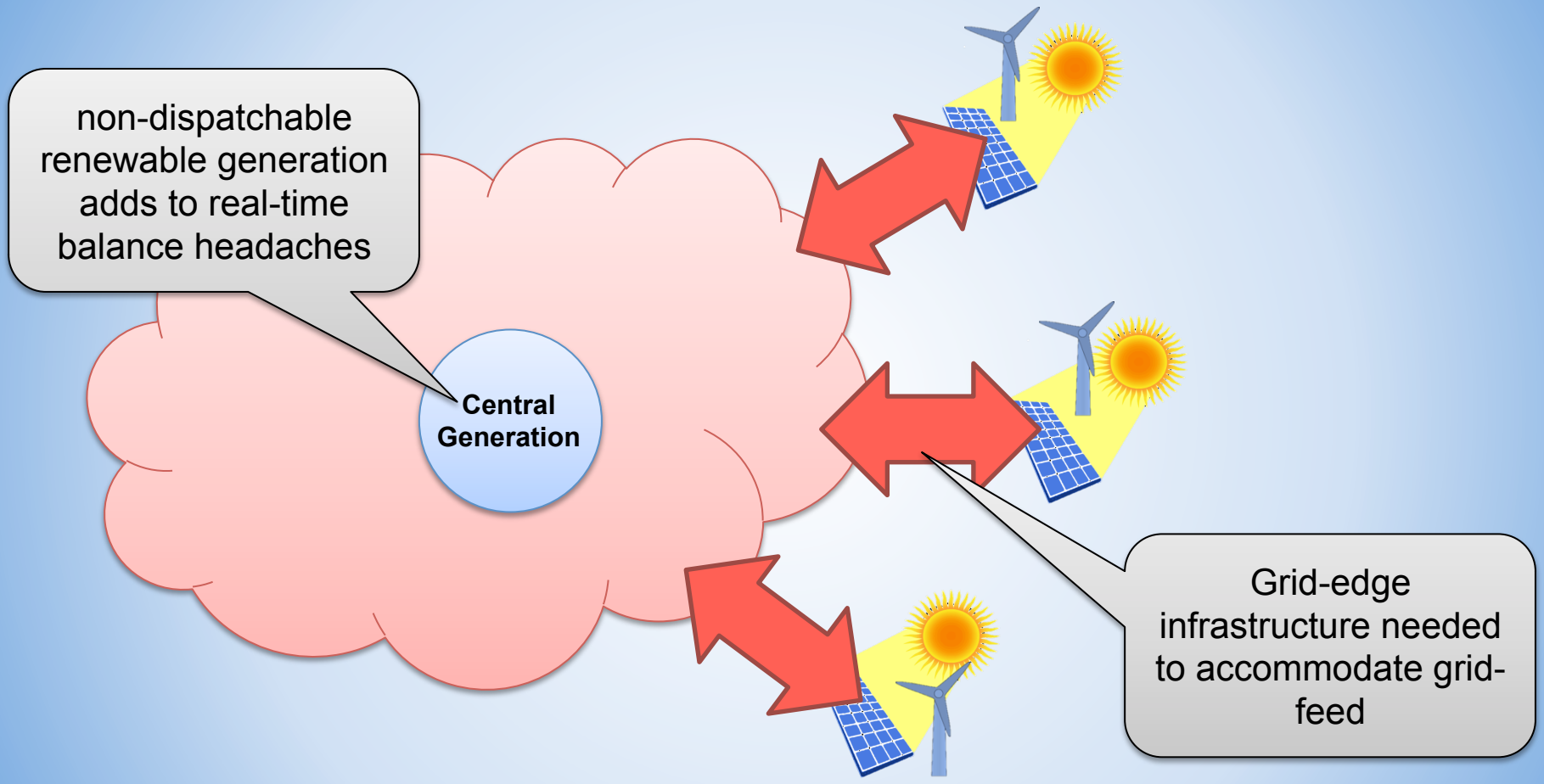
Steffen Fries, Siemens AG , Germany

- **securely connecting electric vehicles to the grid**
- **payment options for electric vehicle charging – approaches and challenges**

summary of discussion

- **distributed energy resources like solar and distributed energy storage like batteries are one important driver for the realization of microgrids**
- **energy load management needs to provide the efficiency to have microgrids ideally autarkic**
- **microgrids are a good opportunity to investigate and learn efficient load management and boundary condition, to be also applied in connected microgrids and the digital grid as such**
- **storage technology is still challenging; transformation of energy to hydrogen seems to be a promising approach providing flexibility and efficiency**
- **in some countries like Norway, energy for electric vehicles is tax free, helping to adopt this technology much faster**
- **countries like New Zealand and also Germany have periods with around 80% renewable energy, from solar or hydro electric power plants**
- **payment for energy may differ and may range from classical payment methods like credit cards or cash, using contract based digital certificates and corresponding private key up to the option to use energy as payment in microgrids. When using certificates, a public key infrastructure is a precondition for trust establishment.**

Distributed Generation



Distributed Storage

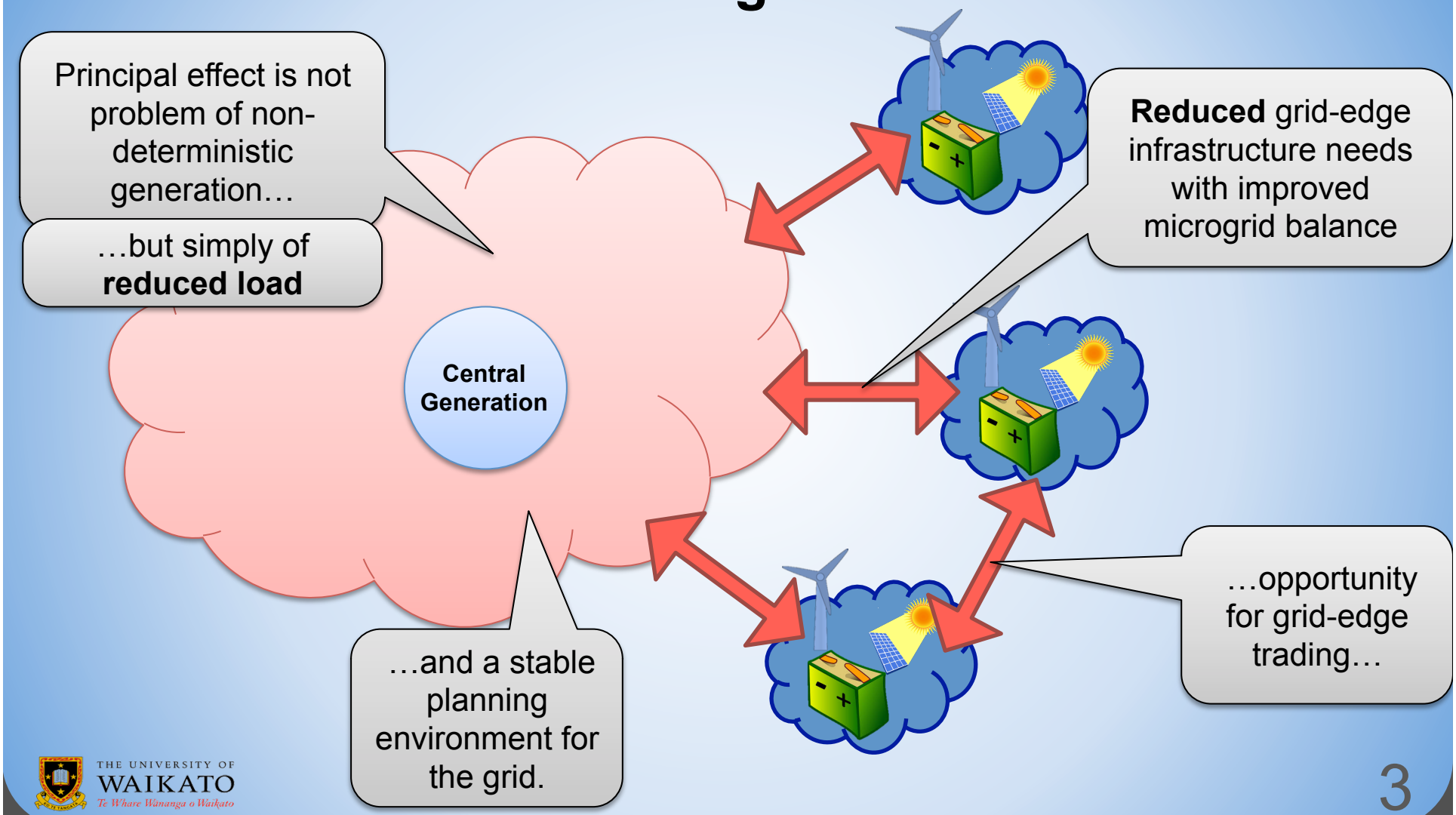
potentially storage can be used to assist real-time balance…

Central Generation

…and vastly improved utilisation of renewable sources of energy.

Grid-edge infrastructure needed for charging and discharging

Microgrids


Principal effect is not problem of non-deterministic generation…
…but simply of **reduced load**
Central Generation
…and a stable planning environment for the grid.
Reduced grid-edge infrastructure needs with improved microgrid balance
…opportunity for grid-edge trading…

SUSTAINABLE ENERGY SOLUTIONS PANEL

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Selected topics

- Control system security – with the life-expectancy mismatch
- Questions on smart electricity metering
- Grid storage
- Smart grid control with large number of generating entities

What we talked about

- Electric cars: usage, charging, maintenance costs, my e-Golf was presented as areal-life example
- Remote control and management of subsea installations through examples from the Norwegian self
- We touched the problem of energy storage from microgrid to main grid operations. Amongst others, we talked about generating hydrogen and pushing it into the natural gas network.
- The challenges around managing microgeneration from the grid perspective were presented


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- securing your business
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Panel Contribution

Securely connecting Vehicles to the Digital Grid

Panelists

Steffen Fries, Siemens AG, Germany

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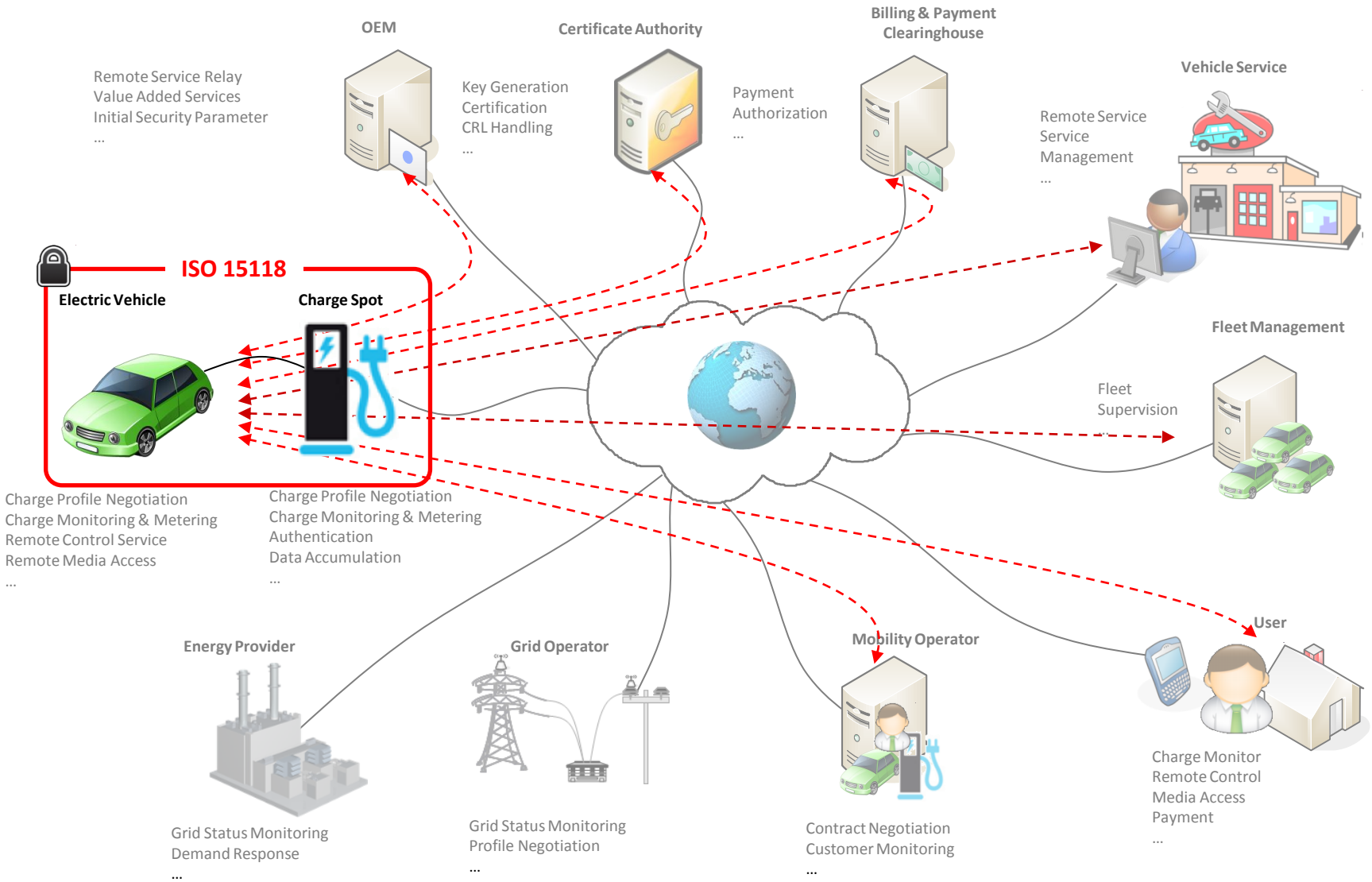
interactions for the charging of electric vehicles



securely connecting electric vehicles to the grid

Approach

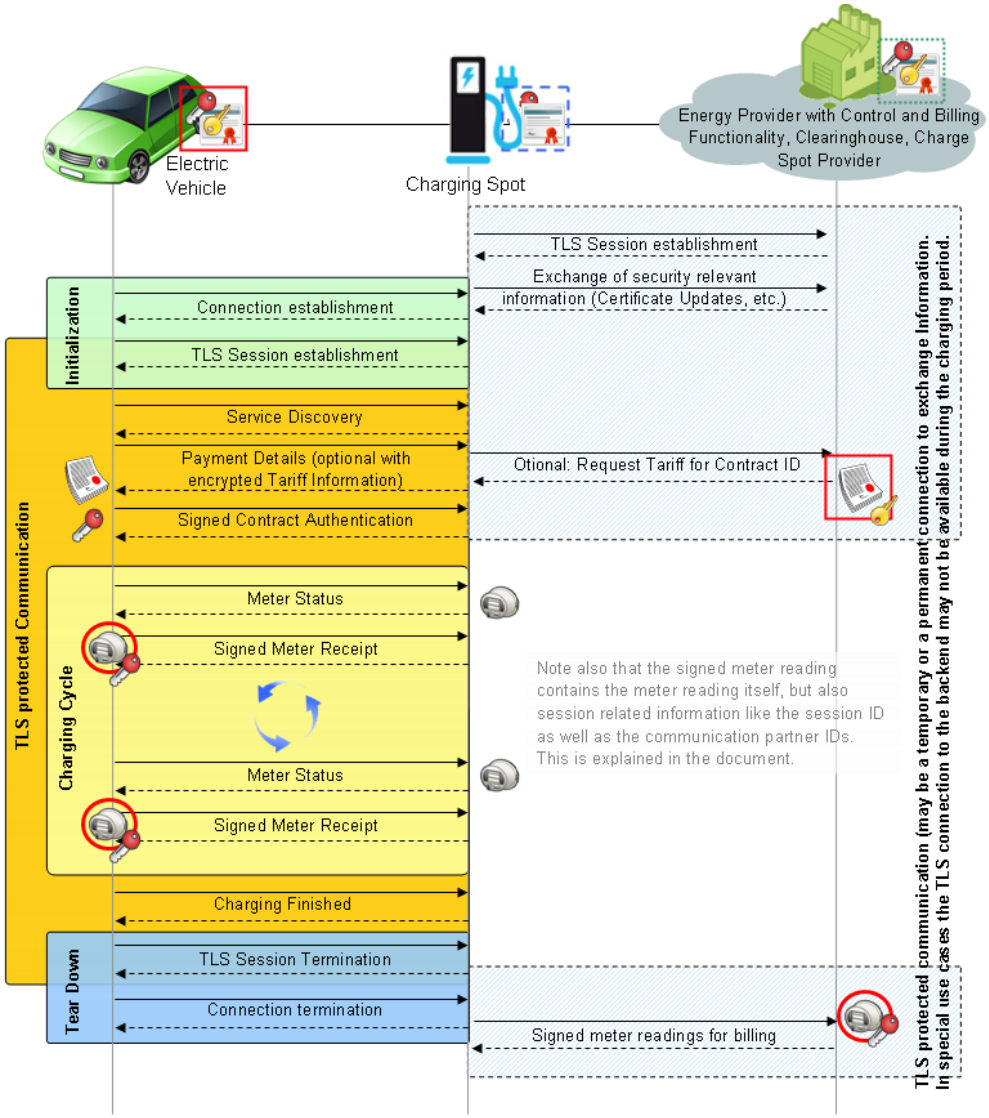
- Standard: ISO/IEC 15118
- Unilateral authenticated TLS to protect communication between EV and EVSE
- XML security for EV authentication and data exchange with the backend

Credentials

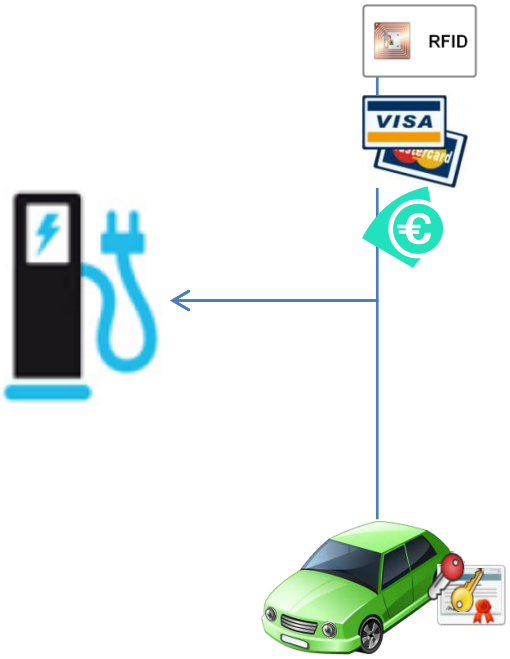
- Public/private key pair incl. certificate

Connectivity

- EVSE has (Semi-)Online connection to the backend
- Persistent connection between EV and EVSE during charging



payment options for electric vehicle charging



Target standard: ISO/IEC 15118

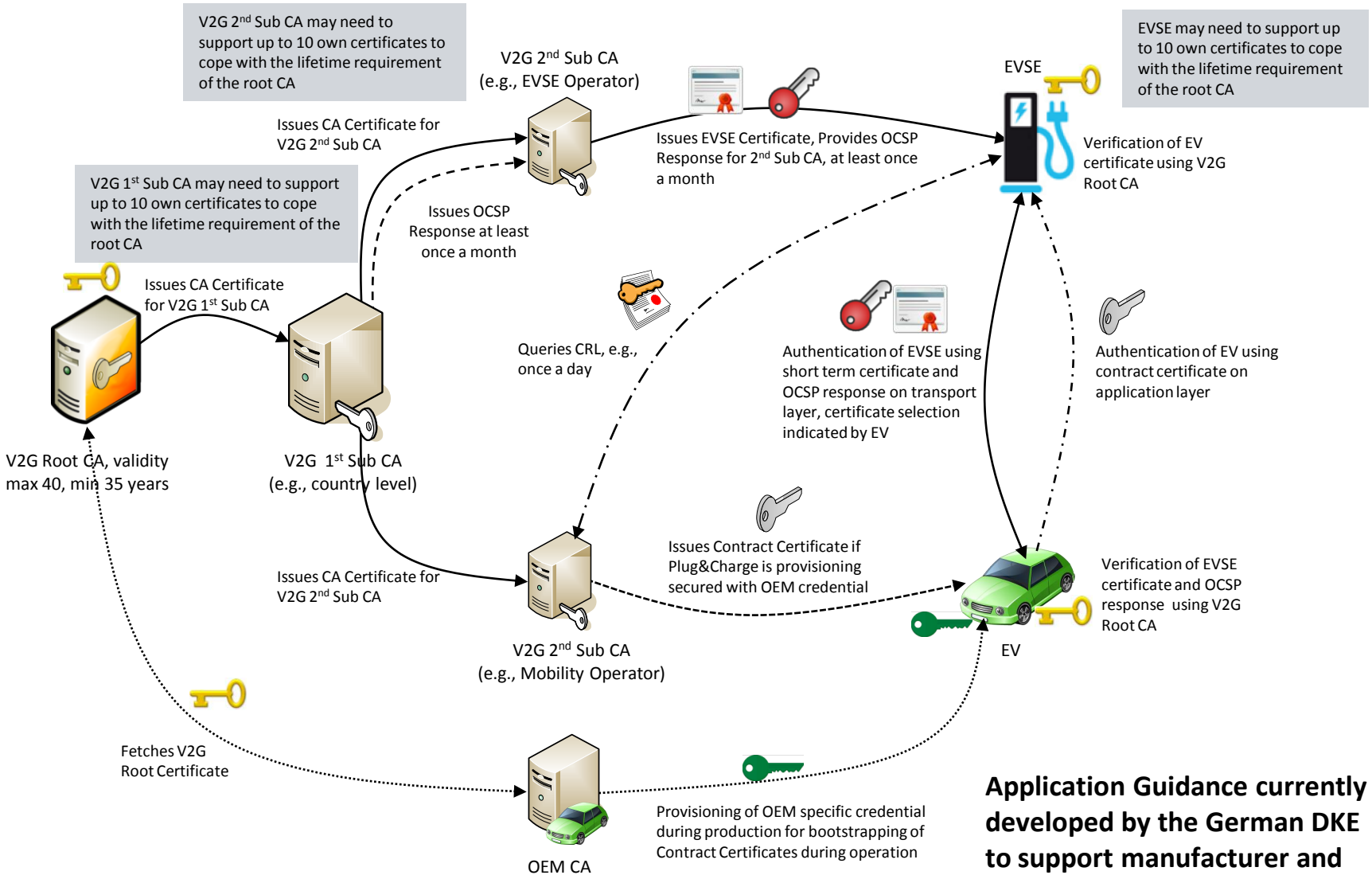
External Identification Means (EIM)

- Identification of user at the charging spot
- Direct payment at the charging spot
  (typically using a credit card or a customer card)
- RFID to open housing for charging cable access
  (e.g., for rental cars, fleet management, etc.)

Plug & Charge (PnC)

- Public/private key pair associated with electric vehicle
  → allows for charging and payment without additional interaction at the charging spot
- Requires a contract with a mobility operator
- Allows “roaming”
- Requires PKI

challenges: operating the PKI for plug&charge



Application Guidance currently developed by the German DKE to support manufacturer and infrastructure operators.