

Implementing a scalable IoT/Cloud-Enabled Electric Load Management System for Efficient and Reliable EV Charging Infrastructure that adheres to DNO power restraints

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* Electrical Vehicle

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Introduction

Overview:

The rapid growth of EV charging networks across multiple cities and countries presents significant challenges.

- Efficient and reliable charging services are crucial for the widespread adoption of electric vehicles.
- Adhering to power restraints and “prosumer” requirements from DNOs is essential to avoid grid strain.

Objective:

- To demonstrate how a cybersecure IoT/Cloud-enabled electric load management system can address these challenges.
- To showcase the system’s ability to dynamically manage electric loads, adhere to DNO power restraints, and provide real-time insights for operators.

Mobility is responsible for ...

~ 33%



of all energy
consumed



~ 20%



of global
CO₂ emissions



Increasing electrification of mobility drives the growth of the charging infrastructure market with 24% CAGR from 2021 to 2026

>50%

of new passenger car sales will be electric by 2035



>30%

adoption of electric LCV, MDT & HDT by 2030



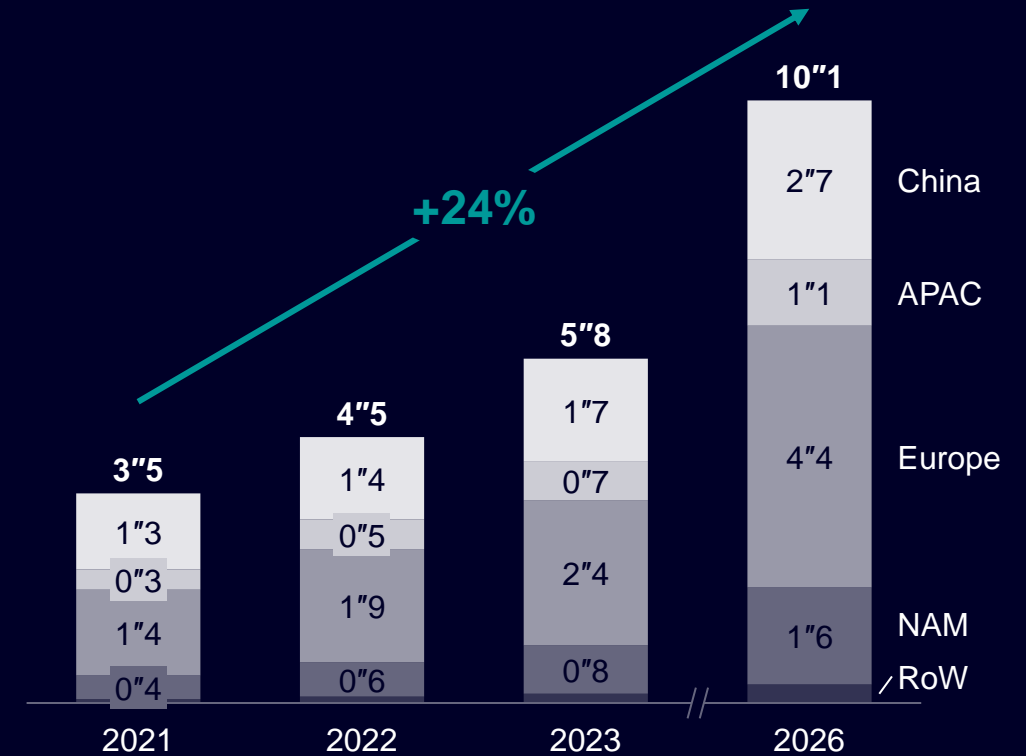
>30%

CAGR in charging demand from passenger cars until 2030



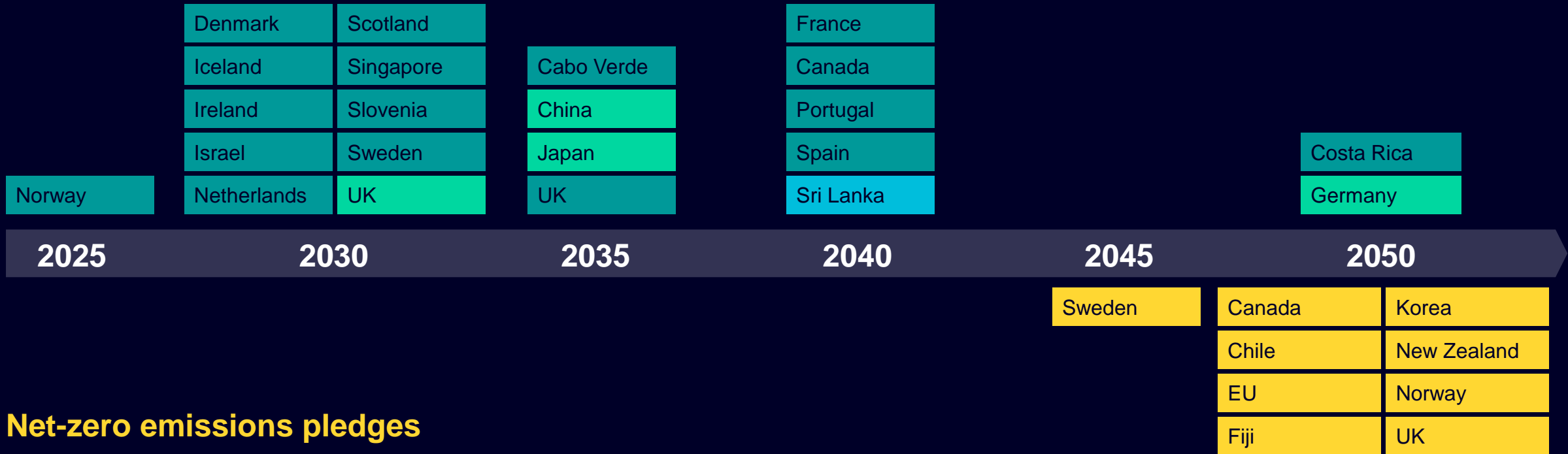
eMobility

addressable market in €



Source: BCG, McKinsey, MI@SI 2022

Internal combustion engine bans or electrification targets



Net-zero emissions pledges

■ 100% electrified sales ■ 100% ZEV sales ■ 100% ZEV stock ■ Net-zero pledge

Source: <https://www.iea.org/reports/global-ev-outlook-2021/policies-to-promote-electric-vehicle-deployment>

Challenges Charging Electro Vehicles



Today's Challenges

- Monitoring of fast-growing station network
- New technology for gas station attendants
- No or weak power grids from DNO



Upcoming Challenges

- Load restrains by DNO's
- Need for monitoring and operation
- Truck charging (45 minutes VS overnight)

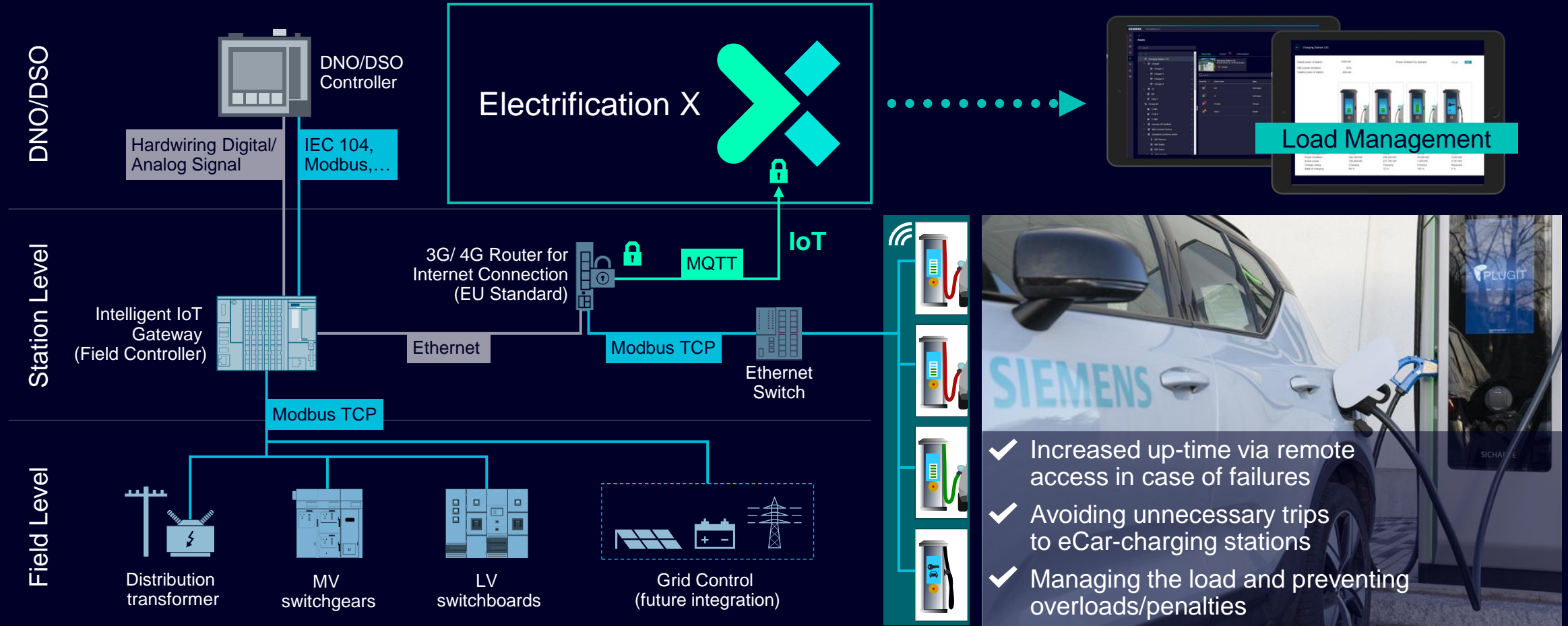


Future Challenges

- Green charging – renewable integration
- Tarif peak shaving
- Energy cost optimization

Proposed solution

End-to-end cyber security



Core Components



Dynamic Load Management



Remote Control



In the past: Manual Control

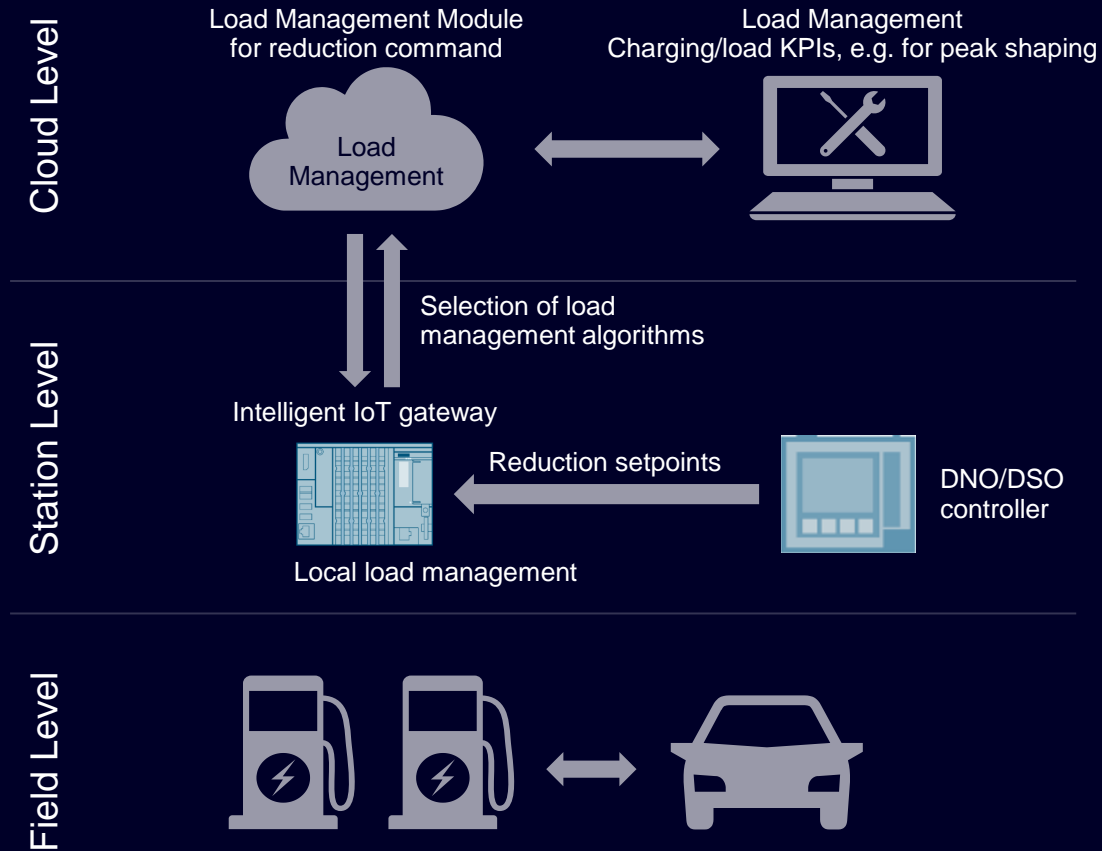
- In case of EV-charging system freezing, the technician must manually restart the EV-charging station
- High service costs due to deployment of personnel
- Time-consuming



Now: Remote Command Control

- An EV-charging station is controlled from a software app and can be restarted remotely
- Efficient operation with minimum downtime
- Optimized OPEX

Dynamic Load Management



Save time and money by optimizing operations:

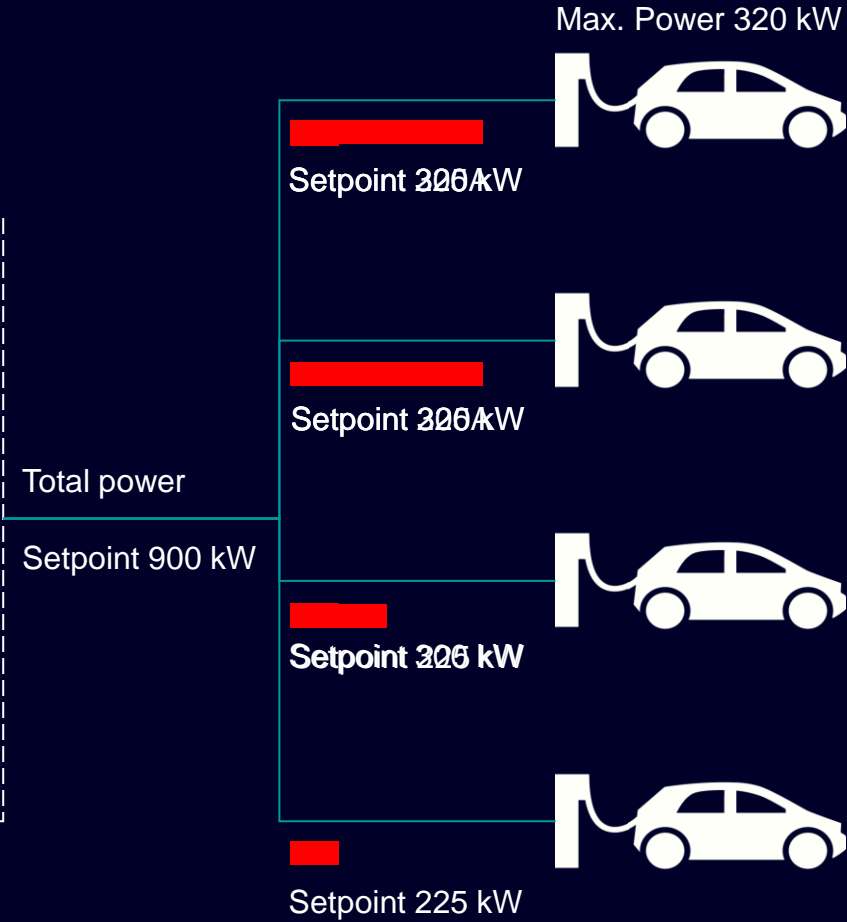
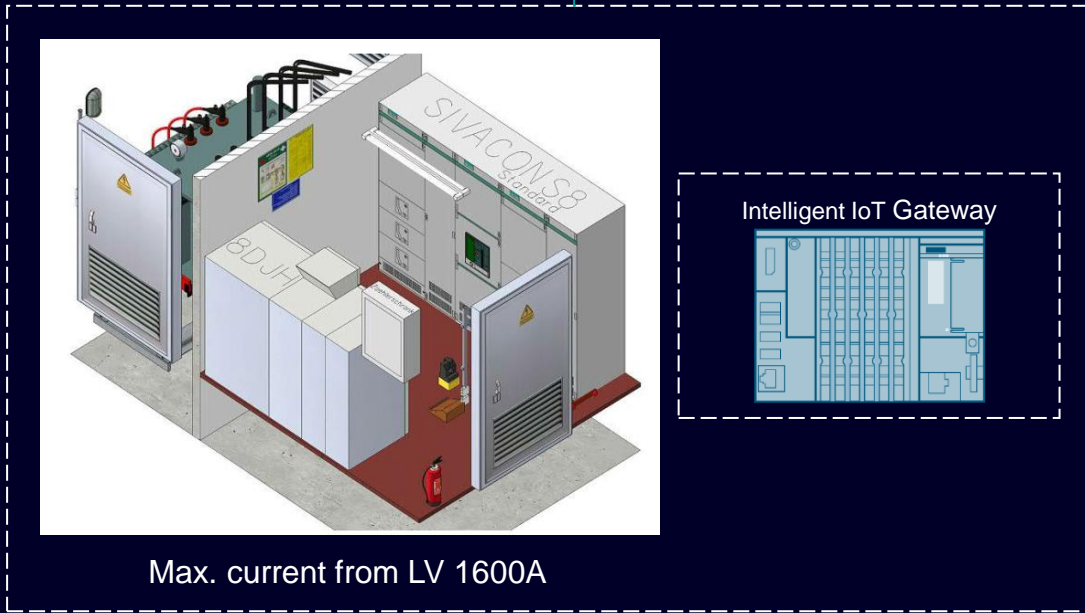
- Follow power restraints set by the DNO¹
- Reduce power consumption through maintenance
- Share the power according to the requested load
- Divide power across all chargers without discrimination
- Switch the feeder off and on to reactivate the frozen charger

1) DNO: Distribution Network Operator, 2) BESS: Battery Energy Storage System

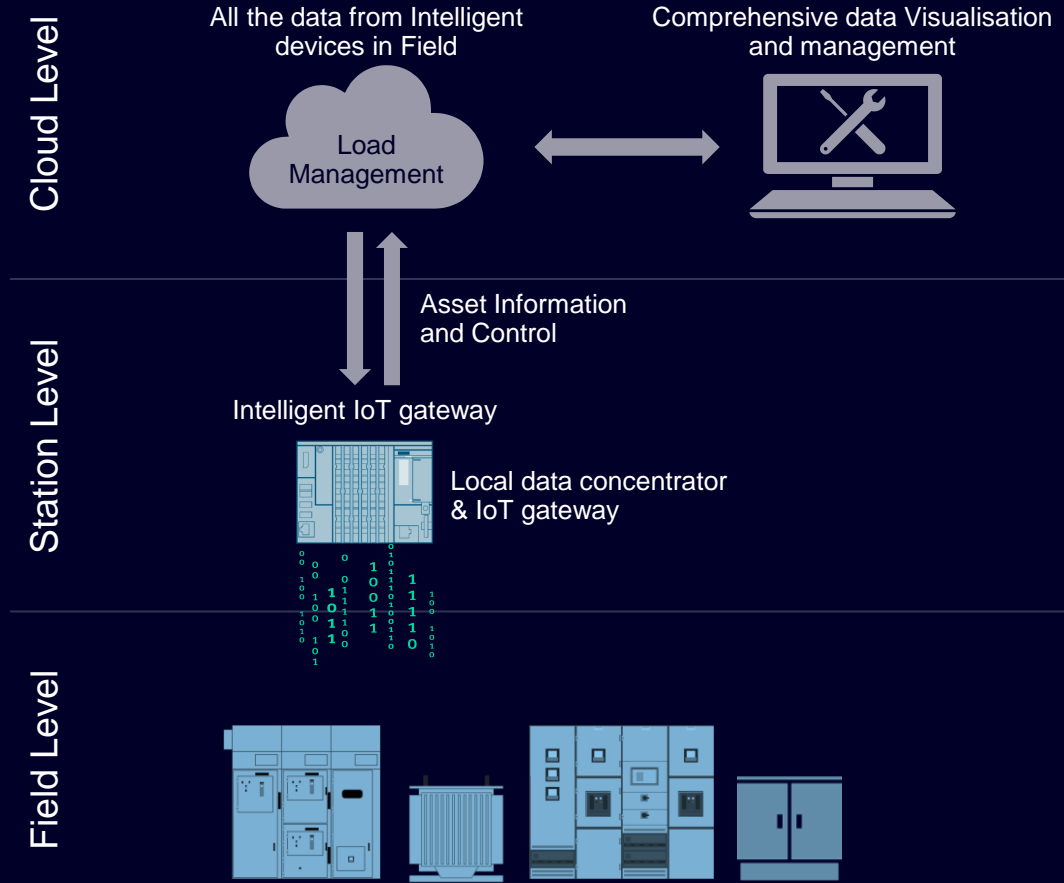
Local load management

Equal power distribution between active chargers (Split)

DNO/DSO controller
Reduction
e.g. Setpoint 75%



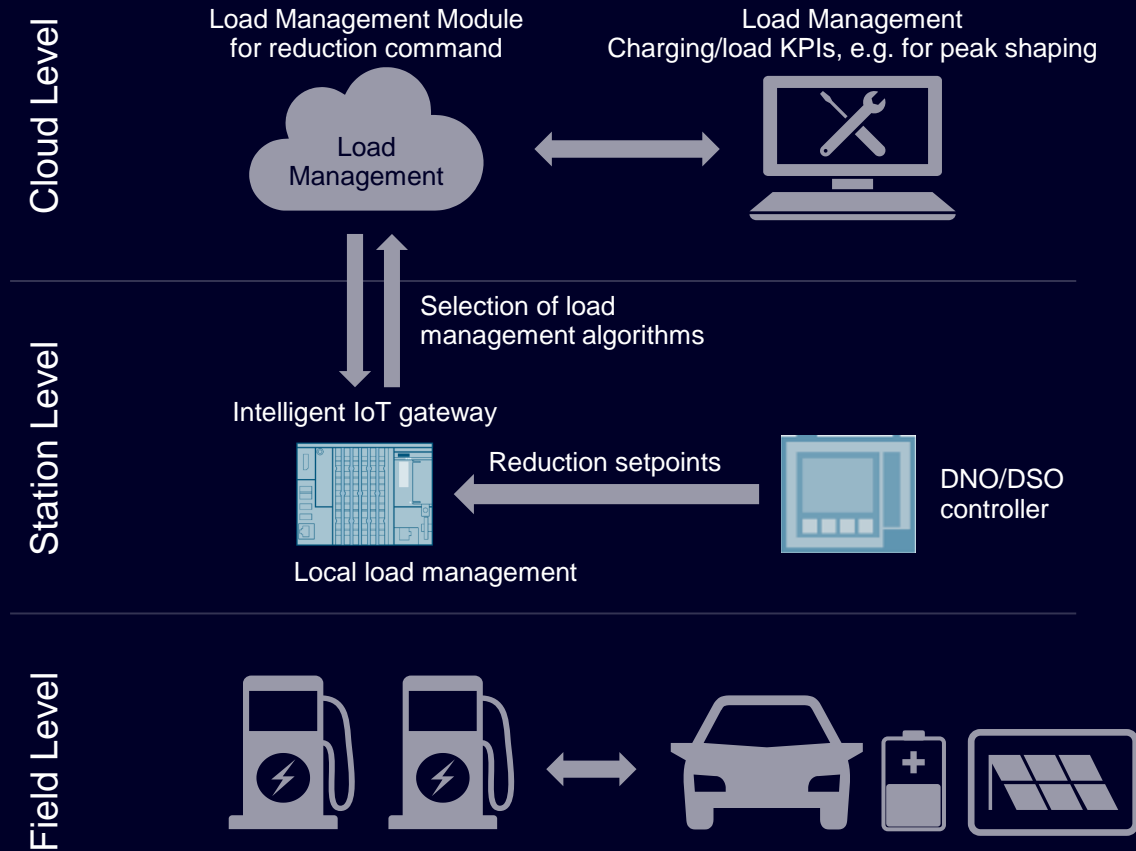
Asset Management



Save time and money with early warnings from:

- Temperature monitoring (overheating)
- Humidity monitoring (corrosion)
- Smoke detection (cable overheating)
- Motion detection (rodents)
- Door contact (intruder)
- Switching operations (tip currents)

Dynamic Load Management



Rising Demands:

- **DNO Requirements:** The system is designed to meet future demands from DNOs, including requirements such as reactive power compensation, peak shaving.

Integration of PV and BESS:

- **Photovoltaic (PV) Systems:** The system can integrate with PV systems, allowing the charging stations to harness solar energy and reduce reliance on the grid.
- **Battery Energy Storage Systems (BESS):** Integration with BESS enables efficient energy storage and management, providing backup power and enhancing grid stability.

1) DNO: Distribution Network Operator, 2) BESS: Battery Energy Storage System

Conclusion

Summary:

Key Points:

- **Scaling Challenges:** Issues due to expanding EV charging networks.
- **IoT/Cloud System:** Load management enabled by IoT and cloud.
- **Dynamic Management:** Load management and DNO compliance.
- **Real-Time Monitoring:** Monitoring and fault localization.
- **Future-Proofing:** Integration with PV and BESS.

Main Takeaways:

- **Increased Up-time:** Remote access for quick failure resolution.
- **Reduced OPEX:** Fewer trips to charging stations for troubleshooting.
- **Reduced OPEX:** Efficient load management prevents overloads.
- **Compliance:** Adheres to DNO set points.

Contact

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