How to guarantee the continuity of power supply through grid edge automation

SIEMENS Minerals Week, 21 July

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Speaker

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Industrial process: How to protect and secure power supply?

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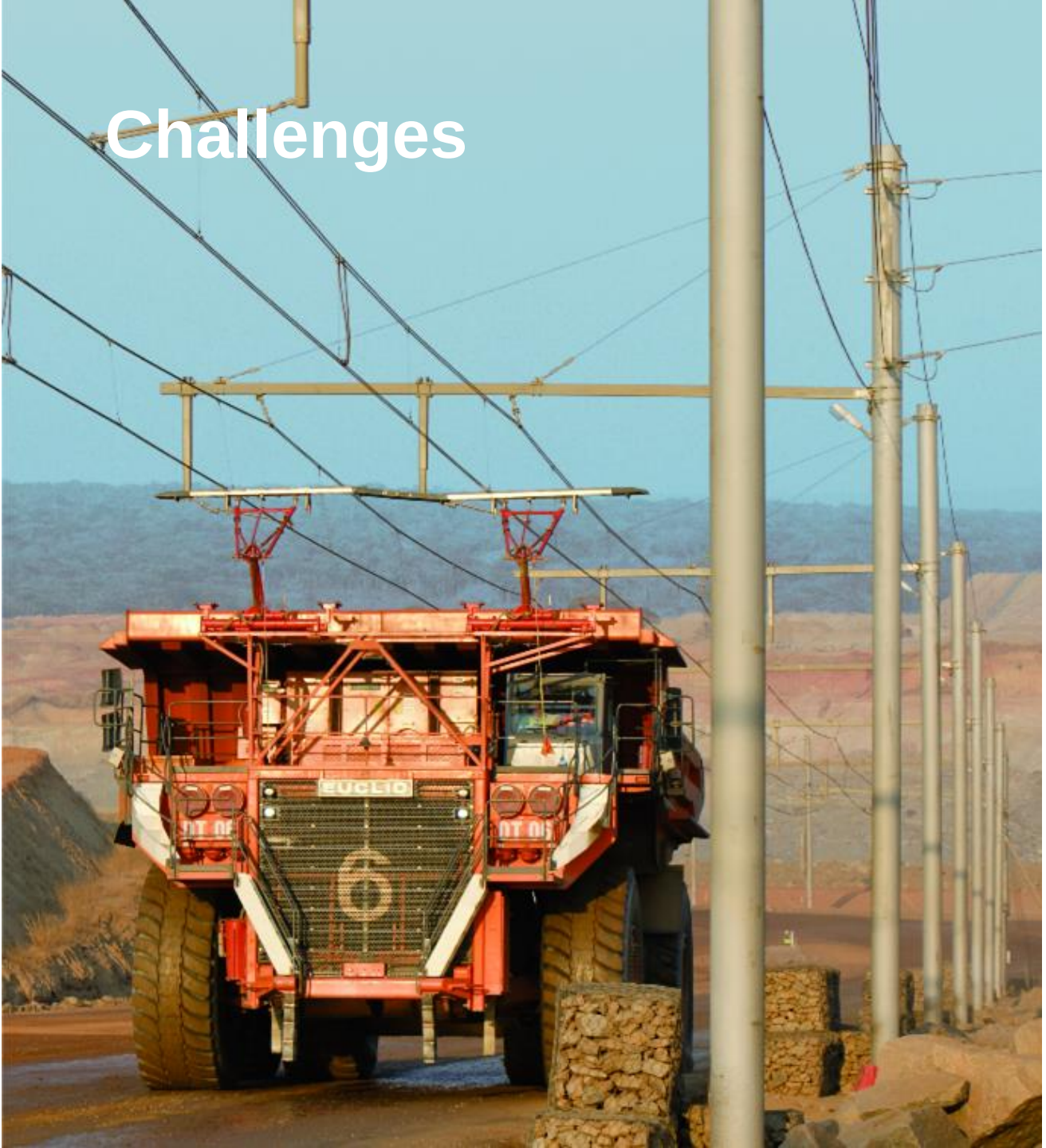
Challenges



- **Protect critical loads from power interruptions**
- **Avoid overload scenarios**
- **Reduce outage size and duration**
- **Locate faults faster**
- **Reduce crew size to isolate and restore**

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General Overview

220kV

SVC
Filter Harmonics

S/E Siemens
8DA10

Transmission Network
- GIS High Voltage SE
- Filter Harmonics

HV
MV

23kV

Primary Distribution Network
- Main Substaton MV

NOP

Mining Loop

S/E Siemens
8DA10

Cable 23kV

Secondary Distribution Network
- Transformer Substation
- Mobile S/E
- Mining Electrical Loads

Mobile S/E

3-8MVA

6,9kV

6,9kV

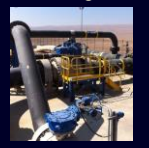
Mix Cables
and Lines

0,5-2,5MVA

0,4/3,45kV

Electric Shovel 6,6kV

Electric Drill 6,6kV



Impulsion Water Pump &
Others critical process

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Grid edge automation: Main principle

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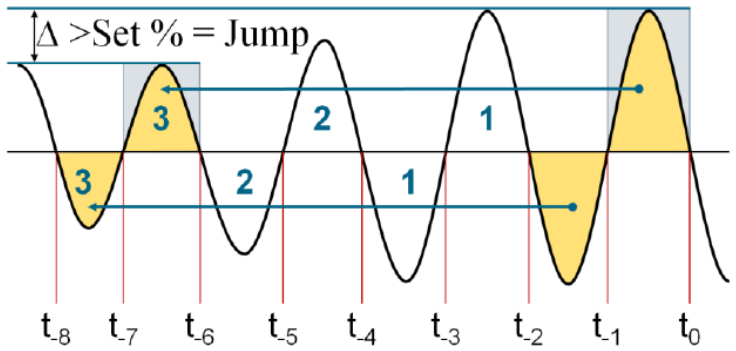
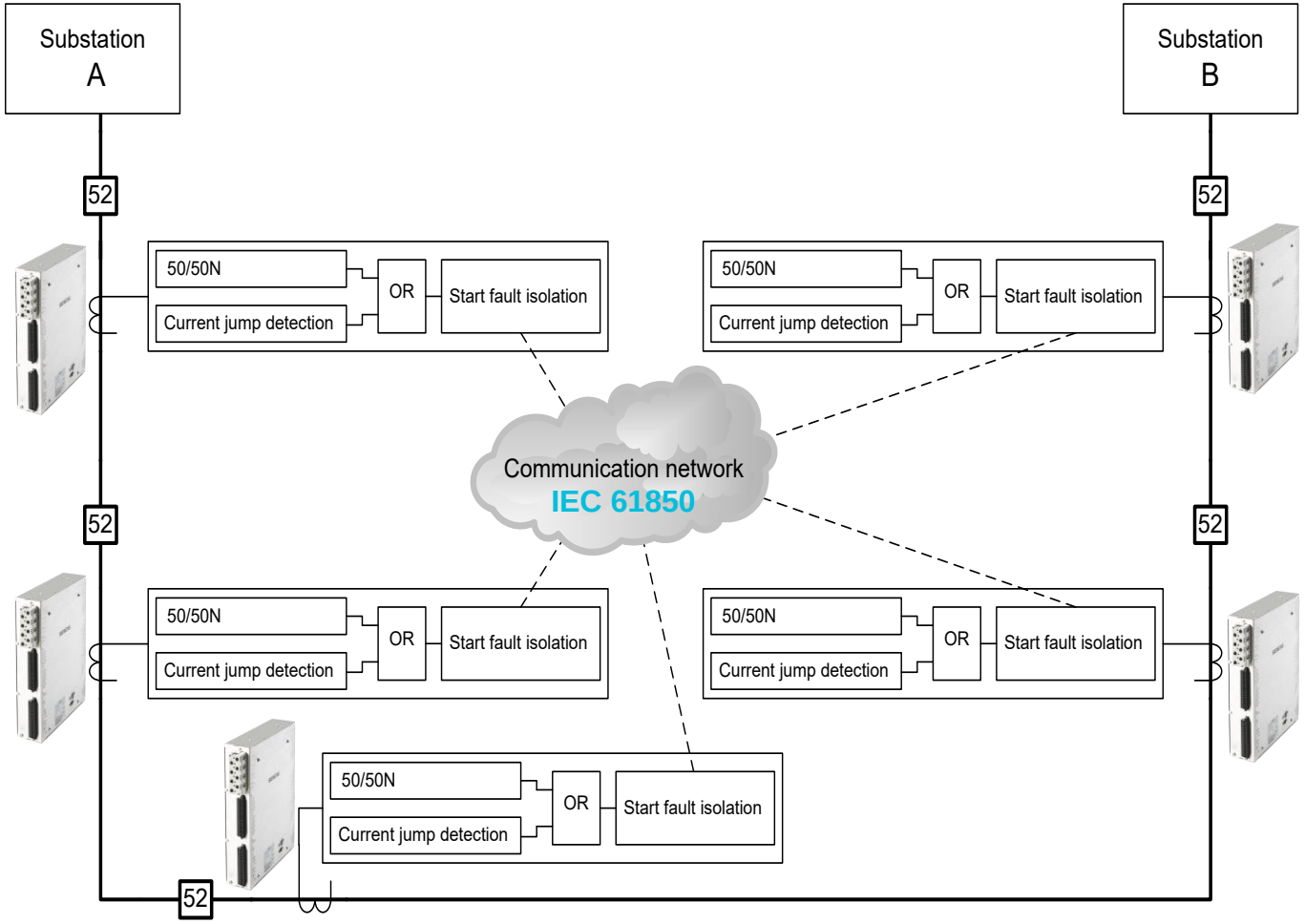
Field level: Grid edge devices
Decentralized automation based on protection devices

- **Jump differential (jDiff)**





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Grid edge automation:
Main application cases

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Fault and outage management

Automated switching for isolation and service restoration

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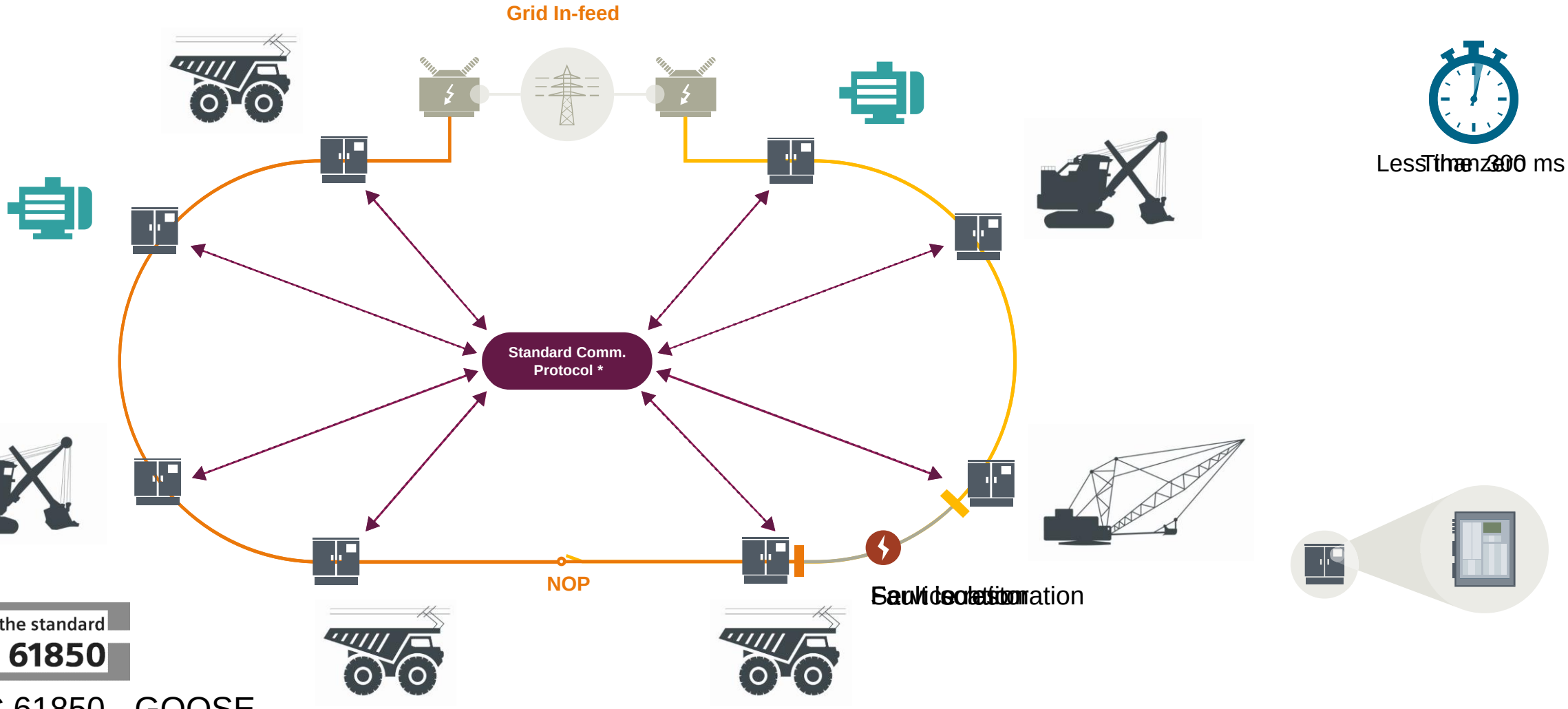
Field level: Grid edge devices

Decentralized automation based on protection devices



Meet the standard IEC 61850

* IEC 61850 - GOOSE

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Load Management

Automated switching for dynamic reconfiguration

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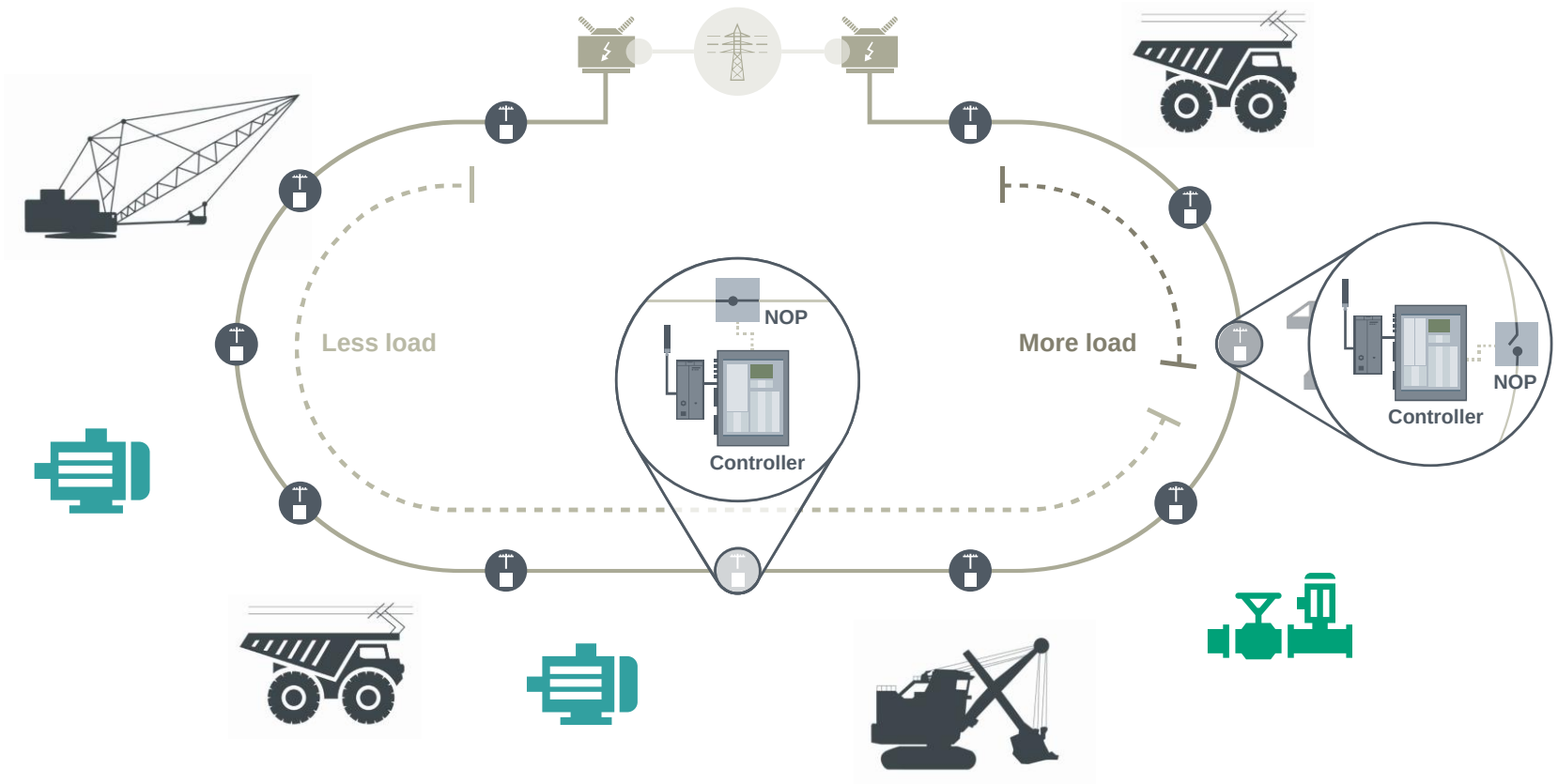
Field level: Grid edge devices

Decentralized automation based on protection devices



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Grid edge automation:
System architecture benefits

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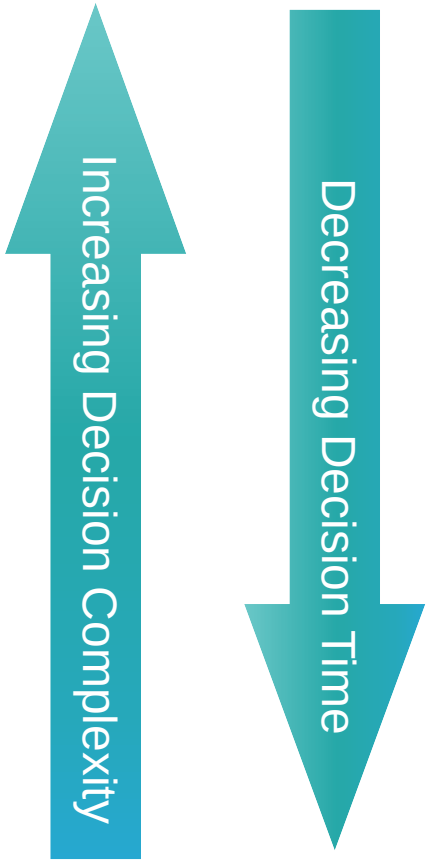
Grid edge automation
Decision and control hierarchy

Decision and Control Hierarchy

Distribution Automation Control Hierarchy	Decision Level	Decision Parameters	Target Configurations
Control Center	Distribution Grid Supervision and Delivery Optimization	Substation Tie Capacity, Load and Voltage Analysis, Actual Feeder Connectivity, Energization, Fault	Total Distribution Grid, Substations, Feeders, Devices and All Interconnections
Regional Controller	Interconnected Substation and Feeder Circuits	Substation Tie Capacity, Load and Voltage Analysis, Actual Feeder Connectivity, Energization, Fault	Medium/High Load Substations/Feeders with Significant Substation Interconnections
Secondary Substation	Interconnected Feeder Circuits	Load and Voltage Analysis, Actual Feeder Connectivity, Energization, Fault	Medium/High Load Feeders with Significant Interconnections
Super Device (Group of Devices)	Feeder Circuit	Implied Feeder Connectivity, Energization, Fault	Low Load Radial Feeders with Few Interconnections
Individual Device	Feeder Circuit Section	Energization, Fault	Low Load Radial Feeders with Few Interconnections



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Grid edge automation: Comm. overview

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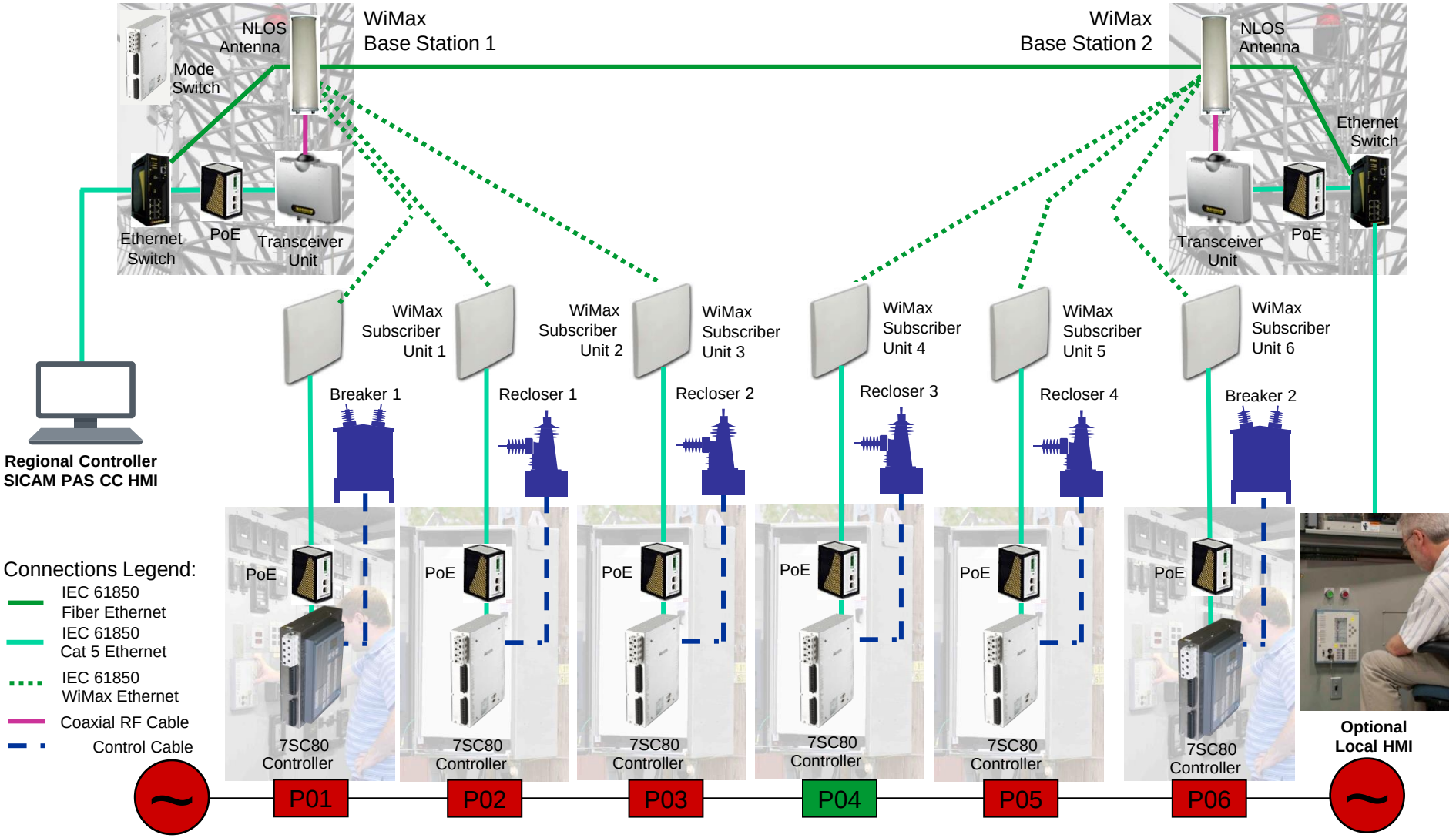
Grid edge automation
Typical communication architecture (WiMax example)



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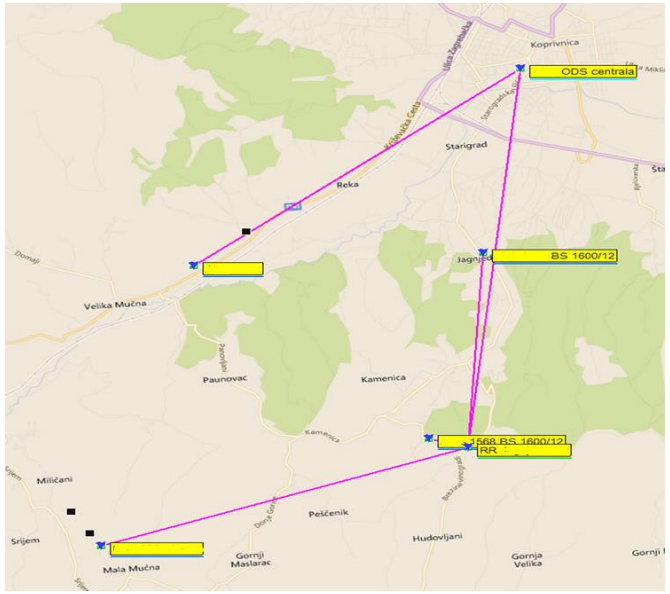
Grid edge automation
Comm. - Project example

- Preliminary planning was needed due to difficult terrain
- Telecommunication pole 70m hight - to achieve direct optical visibilit
- Microwave radio equipment, frequency range 5.4 GHz
- Point-to-point and point-to-multipoint links
- Testing on all location to ensure that links have enough:
  - Troughput 25 Mbit/s
  - High reliability (≥99.99%)
  - Low latency
- Antennas are located at 8m height on poles



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Summary

Grid edge devices

- Secure and efficient network operation

Benefits

- Prevent power outages
- Protection of primary equipment from damage (e.g. generators, switchgear, transformers, cables)
- Decentralized automation for mission-critical operation
- Faster grid operation / reconfiguration
- Avoid overload scenarios

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