Efficiency of AC conductive eRoad charging system

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eRoad Arlanda project

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ELWAYS
NCC
Kilen
ABT
Airport City
Swedavia
Sigtuna kommun

ARLANDASTAD HOLDING
Bilprovningen
e-Traktion
DAF
Cosmo Truck Center
vti
KTH

postnord
VATTENFALL
training partner
FIRST
System overview

A rail in the road, AC

A pickup at the vehicle
System overview

Rail supply and sectioning

• 50m sections
• Sections energised on-demand one-at-a-time
• Grouped into 4 sections per contactor station
Data collection

- 2019-05-20

- Vehicle CAN bus
- Ethernet switch
- Truck front camera
- Power Analyzer
- USB Ethernet
- Raspberry Pi Linux logger
- USB connection
- CAN Interface
- LTE Internet connection
- Vehicle CAN bus
- Ethernet switch
- Fiber optic link
- USB connection
Results of individual tests

Synchronised data collected:

- Power – supply and vehicle
- Current/Voltage – supply and vehicle
- Battery power – vehicle control system
- Speed and position
Results of individual tests
Results of individual tests
Results of individual tests

2018-12-04 High power charging test

Active power losses (kW) vs. Vehicle active power (kW) with sample density.
Analysis of losses in system

Losses:

• Transformer (out of scope here)
• Lines to contactor stations
• Lines from contactor stations to rail sections
• Rail sections
• Leakage current
• Conductive losses in pick-up
• Vehicle power electronic (out of scope)
Analysis of losses in system
Conclusion

Feeder cabling to the rail needs to be generously dimensioned

Placement of transformer stations needs to me optimised for expected load

Anti-ice treatment methods need to consider leakage currents on rail

The rail is kept clean by being used, however robust methods for clearing of leaves, pine-needles, sand and gravel are essential for reliable operation. Most major highways are less affected by this.