CEDR Workshop on Electric Road Systems

Agenda for Day 1

13:00 – 14:00  Lunch  All
14:00 – 14:15  Participants’ introductions  All
14:15 – 14:45  Presentation of test track for Siemens’ ERS concept (eHighway)  Siemens
14:45 – 16:00  Visit to test track with eHighway-trucks in operation  Siemens
16:00 – 16:30  Decarbonisation of road transport - Comparison of technical options including electric road systems  Oeko Institut
16:30 – 17:00  Electric Roads around the world  Viktoria ICT
17:00 – 18:00  Presentation of on-going ERS demonstration and development activities  BASt
  • Technical Review of eHighway
  • Pre-commercial procurement of ERS demonstration projects  Trafikverket
18:00 – 19:00  Presentation of proposed ERS field trial or pilot projects  Norway
  • Planned ERS project  Siemens
  • German field trial
19:00 – 20:00  Return to hotel  All
20:00 – 22:00  Dinner  All
# CEDR Workshop on Electric Road Systems

## Agenda for Day 1

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eHighway test site introduction

CEDR Workshop on Electric Road Systems - Day 1

March 14, 2016
Groß Dölln, Germany
The airfield and the region
Overview

History of Groß Dölln

Groß Dölln today

Schorfheide-Chorin Biosphere Reserve
History of the airfield

Special purpose airfield of the Soviet Army with barracks, residential zone and nuclear missile silos

• 1952: Start of construction
• 1955 – 1994: the largest military airfield in Europe
• 1987 – 1988: Reconstruction and modernization: Underground facilities to supply planes with fuel and electricity
• 1991: Dissolution of the USSR
• 1994: Last transport flights as part of the withdrawal
History of the airfield

Occupancy

- 1955: Il-28-Bomber
- 1956-1970: Combat air force of the 787th regiment
- Since 1969: Helicopter squadron
- Irregularly: Strategic bomber Type Tu-16, Tu-22 and Tu-22M and transport aircrafts
The Buran orbital vehicle program was developed in response to the U.S. Space Shuttle. The program was military in nature. Buran completed one unmanned spaceflight on the 15th of November 1988. First space shuttle to perform an unmanned flight, incl. landing in fully automatic mode. The project was cancelled after the dissolution of the Soviet Union. A Buran space shuttle prototype, which never flew to space can be seen at Technik Museum Speyer, Germany. The airfield Gross Dölln served as alternative to the Baikonur Cosmodrome landing location.
Gross Dölln today
Driving Center

• Uses a major part of the former flight operating areas
• Offers amongst others driver safety training and professional and leisure motor sport events
• Race track of app. 4.350 Meter and several circuit versions
• Used by OEMs for test and training purposes
• BKA and Bundeswehr are using the facility for special training purposes
• The shelters were reconstructed for events of all kinds
Gross Dölln today
Solar park Gross Dölln

Before

After
Gross Dölln today
Solar park Gross Dölln

- No other concept for the commercial use of the airfield after closing the operation
- During the boom phase of solar power in Germany in 2012 the area was purchased by the company Belectric
- The solar park with app. 1.5 Mio. solar modules on an area of 214 hectares (1 hectare = 10,000 m²) was erected within 4 month
- Biggest solar park in Germany
- Provides app. 35,000 households with 4 persons in Berlin with Energy
- Electricity generation capacity of 128 MW (peak)
- For the construction more than 2,000 metric tons of waste and fuel contaminated soil had to be removed
- Despite the generation of renewable energy environmental activists remain critical due to the use of poisonous cadmium within the solar modules
Uckermark
Schorfheide-Chorin Biosphere Reserve
ENUBA 1 & 2 test tracks
Locations
eHighway - System and subsystems

The complete system...

1. Vehicle
   - Pantograph
   - Drive System
   - Energy Storage
   - Control System

2. Power Supply
   - Substation
   - Contact Line

3. Road Way
   - Passive Protection
   - Pavement

4. Operation
   - Maintenance
   - ITS & Signalling
Traction Power Supply: DC substation 670 V nom. voltage; recuperation to the public grid
Contact Line: 2-pole catenary system with positive and negative pole
ENUBA1 pantograph
Functional prototype

Active pantograph

• Two poles like trolley bus, but modified
• Inverted by 180°
• Carbon contact strips instead of "shoes" as used by trolley busses
• Actively compensates driving moves in the lane (e.g. in curves or due to wind)
eHighway projects and pantograph generations

- Rigid 18 t truck with serial hybrid drive
- Super caps as energy storage
- Equipment compartment 1.5 m depth as pantograph base and for drive components

lessons learned => it is possible to integrate pantograph prototypes into different hybrids

coming up => to address markets and fleets standardization is to be pushed for

- 40 t semi-trailer configuration with parallel hybrid drive
- Traction battery as energy storage and for short off-line electric drives
- Pantograph base/lift at 0.5 m depth
ENUBA2 test track
Overview infrastructure
ENUBA2 overhead contact line
Cross profile

1. Lane
2. Pole
3. Traverse beam
4. Droper column
5. Steady arm
6. Toprope
7. Messenger wire
8. Contact wire
9. Foundation
ENUBA2 overhead contact line
Curve design

Radius 700m, 900m, 900m
Warped between pole 4 and 13
Messenger and contact wire are not vertically aligned. Instead of forming a straight axis the contact wire is forced to follow the gradient of the curve.
ENUBA2 overhead contact line
Gantry

- Lowered system heights
- Lowered catenary heights 4,75m
System efficiency

- average vehicle efficiency pantograph to wheel: **87 - 92 %**
- average infrastructure efficiency substation and contact line: **87 - 92 %**
- system efficiency substation in-feed to wheel: **80 - 85 %**

Detailed measuring and simulation* results

- **substation** efficiency: 95 % (supply) 94 % (recuperation)
- **contact line** efficiency: 95 % (supply) 96 % (recuperation)
- **pantograph** efficiency: 99 % (supply) 99 % (recuperation)
- **traction engine** efficiency: 95 % (supply) 95 % (recuperation)
- **traction inverter** efficiency: 98 % (supply) 98 % (recuperation)

* simulations performed with certified and validated simulation tools for railway electrification and drive systems
ENUBA2 test track
Safety information
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