



Steven Dorresteyn / 29-01-.2013

# Fast Charging network for electric cars Project “ELMO” in Estonia

Photo of the car: [www.elmo.ee](http://www.elmo.ee)

# ABB is following the OEM Fast Charging standards CHAdeMO / 22 kW AC / Combo 2



2010  
CHAdeMO



Mid 2013  
Combo 2



Q3 2012  
22 kW AC



# ABB DC fast charge installations

## Proven technology in the field since May 2010

- **Actual:**

Germany, Norway, The Netherlands, UK, Ireland, Finland, Denmark, Sweden, Switzerland, Austria, France, Czech, Estonia, Turkey, Hungary, Italy, Hong Kong, China, USA, Taiwan, Slovenia, South Africa, Belgium, Slovakia, Bulgaria, Poland, China, Canada, Chile, Singapore

- **Two large projects**

- ViteaMobility: network of 50 DC Fast Chargers (20kW) in Belgium

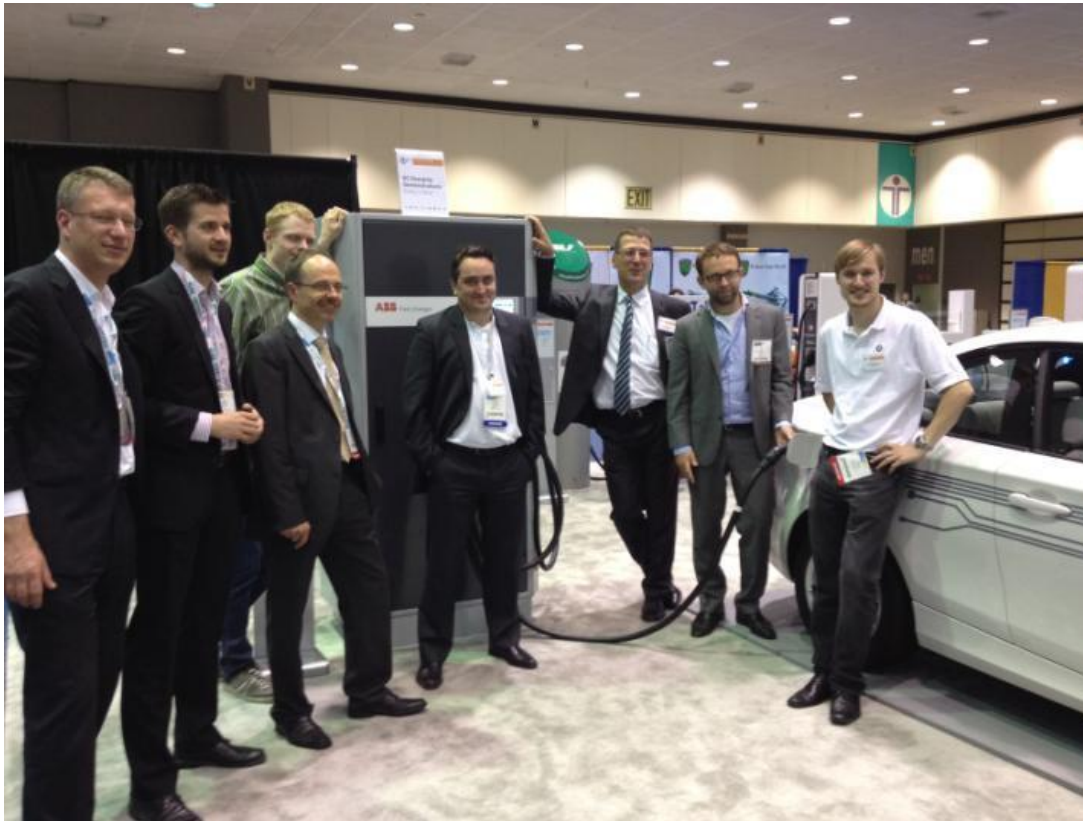


- CLEVER: roll out 50 connected DC Fast Chargers (50kW) in Denmark





# ABB shows live functional SAE/Combo DC charging EVS26 in Los Angeles / LCV2012 in UK / eCarTec in Munich



- ABB demonstrated live functional SAE/Combo DC charging system at:
  - EVS26 in Los Angeles,
  - LCV2012 near London,
  - eCarTec in Munich
- Charging a BMW ActiveE electric car within 30 minutes 50kW charging power via the new SAE / Combo-1 connection
- Communication via PLC according to SAE/ISO15118 standard

# DC-Fast Charging is happening in Europe

## Taking a global perspective



# Estonia (Republic of Estonia)

## Some background

- 1.3 Million inhabitants
- Largest city: Tallinn (capital) with 0.4 M inhabitants
- Listed as a "high-income economy" by the World Bank
- Identified as an "advanced economy" by the International Monetary Fund
- 2nd (and last) Soviet occupation 1944 – 1991
- Inventors e.g. of Skype
- Source: Wikipedia



# ELMO

## Estonian Electromobility Program

- ELMO program promotes emission free personal transportation and electric cars in order to achieve better city environment, energy efficiency and fuel independence.
- The Government of the Republic of Estonia concluded a contract with Mitsubishi Corporation for the sale of 10 million AAUs CO2 emission quota to start the Estonian electromobility program.
- The program consists of three parts:
  - 507 Mitsubishi i-MiEV electric cars will be used by the Ministry of Social Affairs as an example
  - the Ministry of Economic Affairs and Communications will develop a support system for private persons for acquisition of electric cars
  - quick charging infrastructure for electric cars will be created to cover the whole country.
- The creation of both the support scheme and infrastructure is organized and managed by KredEx.



# The ELMO Project

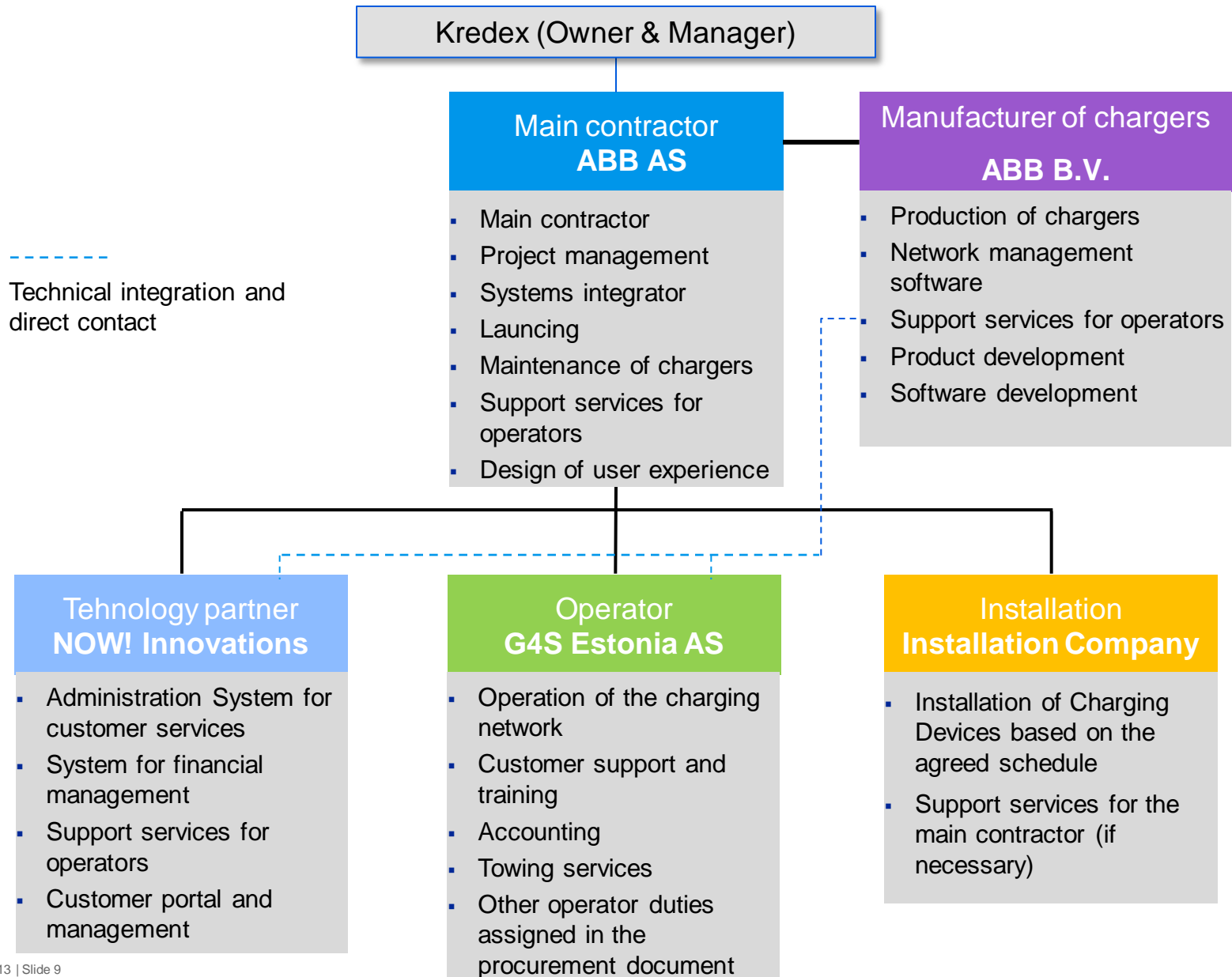
## Offer from ABB to Kredex

- Supply of 200 chargers (50 kW DC and 22kW AC) (Terra 52)
- Supply of 507 AC Charge posts
- Installation and commissioning at prepared sites
- “Administration System”, consisting of
  - network management system for installed base of fast chargers
  - back-office system for customer-related services, such as subscriber management, tariffing, billing
- Managed operations for a period of five years
  - Helpdesk (24/24)
  - Services hosting platform
  - First-line Support
  - End-user support and training
- Partnership with **NOW! Innovations** and **G4S** for complete system & services





# Structure of the organization



# Terra 52 Charge Station

## Fast charge all AC and DC cars on the road today



- Compatible with AC and DC (CHAdeMO) cars
- 50kW DC & 22 kW AC
- Smart power sharing between AC and DC
- Automatic switching between 16A & 32A AC

Product	Terra 51+AC			
AC Input	3 $\Phi$ , 400 VAC $\pm$ 10%			
Maximum output power	DC	50kW	AC	11/22kW
Output voltage		50-500 V		400 VAC
Output current		120A		3 x16 A/ 3 x 32A
Efficiency	> 92%			
Power factor	> 0,98			
RFID system	13,56MHz, ISO 14443A			
Communication	CDMA / 3G / Ethernet			
Protection class	IP54			
Temperature range	-30°C ... +45 °C, with low-temp option			
Software	Remote update / download			
User interface	High brightness full colour LCD, Start/Stop & Emergency stop			

# The beginning

## The first charger in operation in wk 2012-24



# Actual status of ELMO

- Full nationwide coverage (every 50 km a fast charger on the main roads)
- Just over 150 fast chargers are up and running
- The rest of the chargers will be installed in the coming months (these are more difficult cases concerning the permit process).
- Opening and handover ceremony is being scheduled for February 2013; agenda's are being checked to finalize the date





# 150+ DC Fast Chargers (CHAdemo) operational

## Actual status



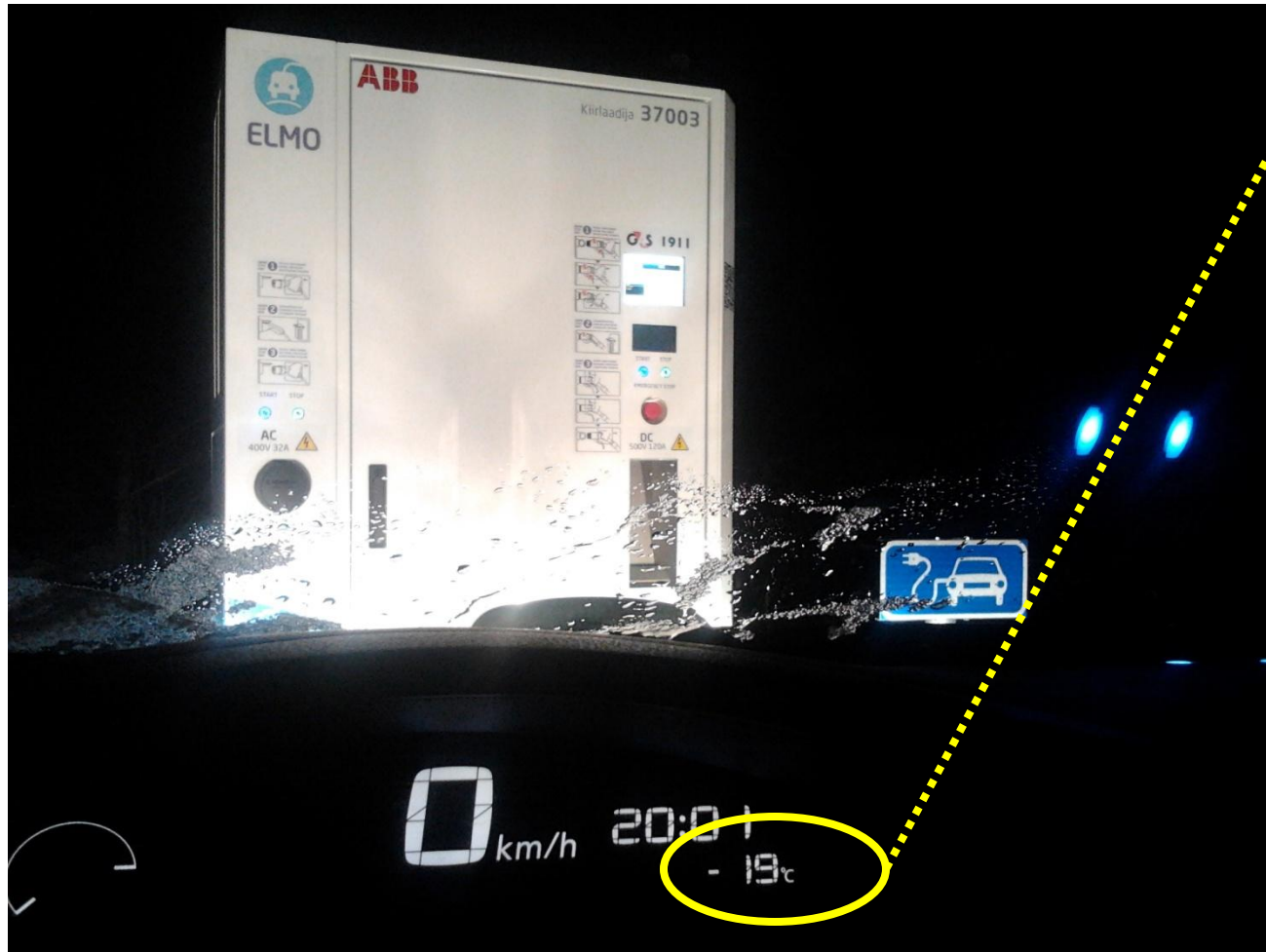
# 150+ DC Fast Chargers (CHAdemo) operational

## Operating in extreme conditions





# Extreme conditions: low temperatures



This example is at  
-19 degC

Lowest measured  
temperature was  
at -26 degC

# Biggest group of users

## Ministry of Social Affairs - Social Workers



All cars are equipped with GPS/GPRS enabled data loggers for future R&D of usage of electric cars



# Most active users

## E-Taxi company



# Connection to Backoffice

## Actual situation

- Since ca. 2 weeks the connection with the backoffice is enabled (runs via OCPP link)
- Authorization is now with
  - RFID card, SMS, Website, SmartPhone App.
- Download of the Android application via:  
[https://play.google.com/store/apps/details?id=ee.parknow.elmo&feature=search\\_result#?t=W10](https://play.google.com/store/apps/details?id=ee.parknow.elmo&feature=search_result#?t=W10)
- iOS app will follow soon.
- For this moment IVR (Interactive Voice Response) and NFC (Near Field Communication) are not yet enabled.

# NOW! Innovations

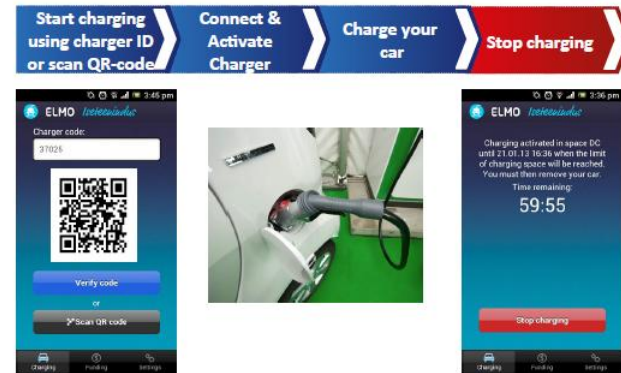
## Different authorization / payment methods



### SMS



### SmartPhone APP



### RFID Card



### Prepaid card



# Connection to BackOffice

## Basic architecture

**ABB**

**NOW!**  
INNOVATIONS

Network administration  
“Helios”

Customer and financial  
management system  
“ChargeNOW!”



Remote control  
System log  
Rights  
Load analysis  
Monitoring

Server

OCPP

Charging sessions  
User accounts  
Identification  
Tariff engine  
Customer supports  
Accounting  
Analysis & statistics



Internet





# G4S

## Some roles of G4S



- operating the customer call center; always the first contact for the customer.
- sends out patrols in case of (sensor) alarm messages
- does everything necessary to ensure the intended and suitable functioning of Charging Devices, keeps them clean and eliminates unauthorized stickers and damage to the paintwork
  - Every month patrol cars of G4S inspect the visual integrity and appearance of Charging Devices
- G4S guarantees transport of customer's car to the nearest charging point, in case the malfunction of the Charging Device the customer is using cannot be fixed within 60 minutes of receiving the error message

# NOW! Innovations

## Public website: map of chargers with status



- On public website <http://elmo.ee/laadimispunktide-vorgustik/> map with current status of EV chargers in real-time is displayed:
  - **Blue** - operational;
  - **Yellow** - currently in use
  - **Red** - not provisioned yet

# Statistics from November 2012



- 2.900 successful charging sessions
- 17.800 kWh charged
- Average session 6 kWh

# Pricing Packages (all prices with VAT)

<http://elmo.ee/pricing/>

- **Combined package**

- EV owner, who will use quick charging 1-2 times per week.
- Monthly fee: 10 EUR / Pay per charge: 2,5 EUR

- **Flex package**

- EV owner, who will use quick charging 1-2 times per month.
- Monthly fee: - / Pay per charge: 5 EUR

- **Volume package**

- EV owner, who will use quick charging more than 1-2 times per week.
- Monthly fee: 30 EUR / Pay per charge: 1,2EUR after monthly limit of 150kWh is exceeded.



# Some learning points

- Range decreased at very low temperatures
- Fast charging time increased at low temperatures
- Fast Chargers giving no serious issues at low temperatures
- Fast learning-curve by feedback from the Fast Chargers in the ELMO project, chargers at Polar circle and the other networks which are currently rolled-out

# Videos on YouTube / Website

See ABB movie on the: Estonia project on:

<http://www.youtube.com/watch?v=CzslGzUuj0O>

See ELMO movie on:

<http://www.youtube.com/watch?v=P9kC47iuqXE>



**Website:** <http://elmo.ee>

And the good thing: Everybody can handle it 😊  
(with many thanks to my colleague Criss in Estonia)



It is all about making your business work  
We are looking forward to empowering you!





# Contact information



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for a better world™

