

E.D.I.S.O.N.

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Electric vehicles in a **D**istributed and **I**ntegrated market using
Sustainable energy and **O**pen **N**etworks



Morning session

9.30 Welcome

9.45: Why does the power system need EV's? /*Kim Behnke, Energinet.dk*

10.15: Peugeot perspective on E-mobility /*Jens Andersen, Peugeot*

10.45 Coffee break

11.00 An overview of the EDISON project /*Jørgen S. Christensen, Dansk Energi*

11.30 The EDISON picture on EV charging /*Lars Henrik Hansen, Dong Energy*

12.00 The need for EV standardisation /*Claus A. Andersen, Eurisco*

12.30 Lunch

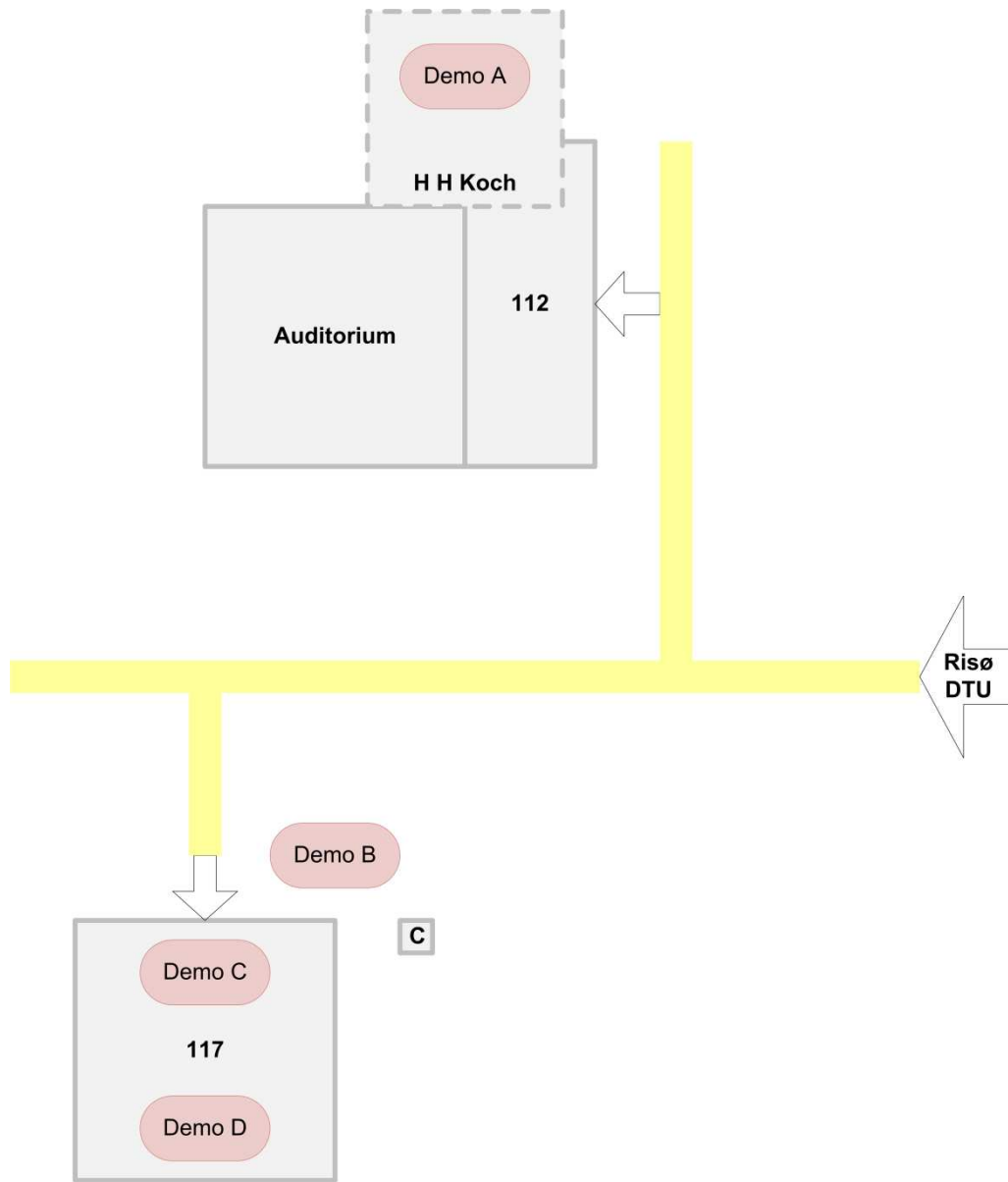


Afternoon session

13.30 Demonstrations/workshops:

4 groups circulating between:

- A: Fleet operation for mutual benefits
- B: The user is important
- C: The fast charging option
- D: The power balancing option
- A few opportunities for EV driving



EDISON



EDISON

Project story

Copenhagen 12 of August 2010



Jørgen S. Christensen
Head of R&D Department
Danish Energy Association



Agenda

- Project
- Energy political challenges
- Future power system in Denmark
- Why electric vehicles?
- EVs as flexible customers in the distribution grid

History



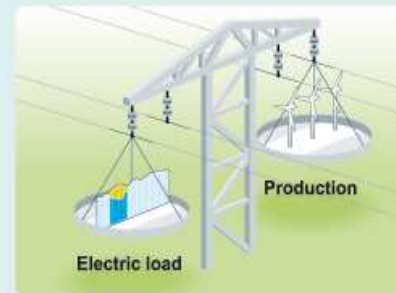
- In 1914 Thomas Edison was the first to buy an EV from Detroit Electric Automobile based on their Model 1913.



- 1916 - Thomas Edison with Bailey Electric after driving 1.000 miles based on a EDISON battery

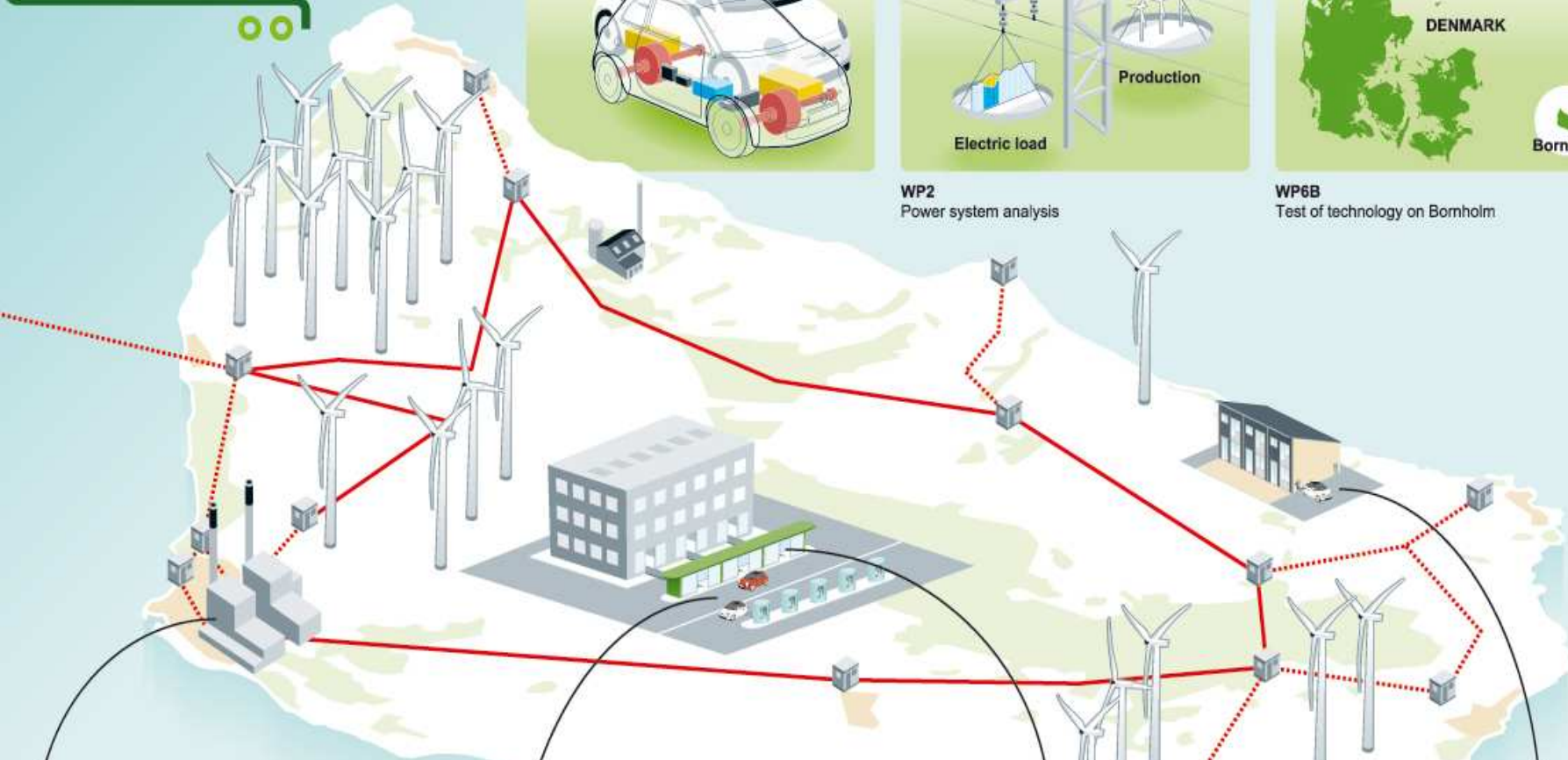
EDISON

WP1
Electric vehicle
technology



WP6B
Test of technology on Bornholm

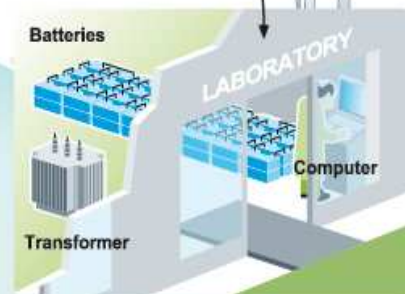
WP2
Power system analysis



WP3
Aggregated charging control software



WP4
Assessment of fast charging and battery swapping

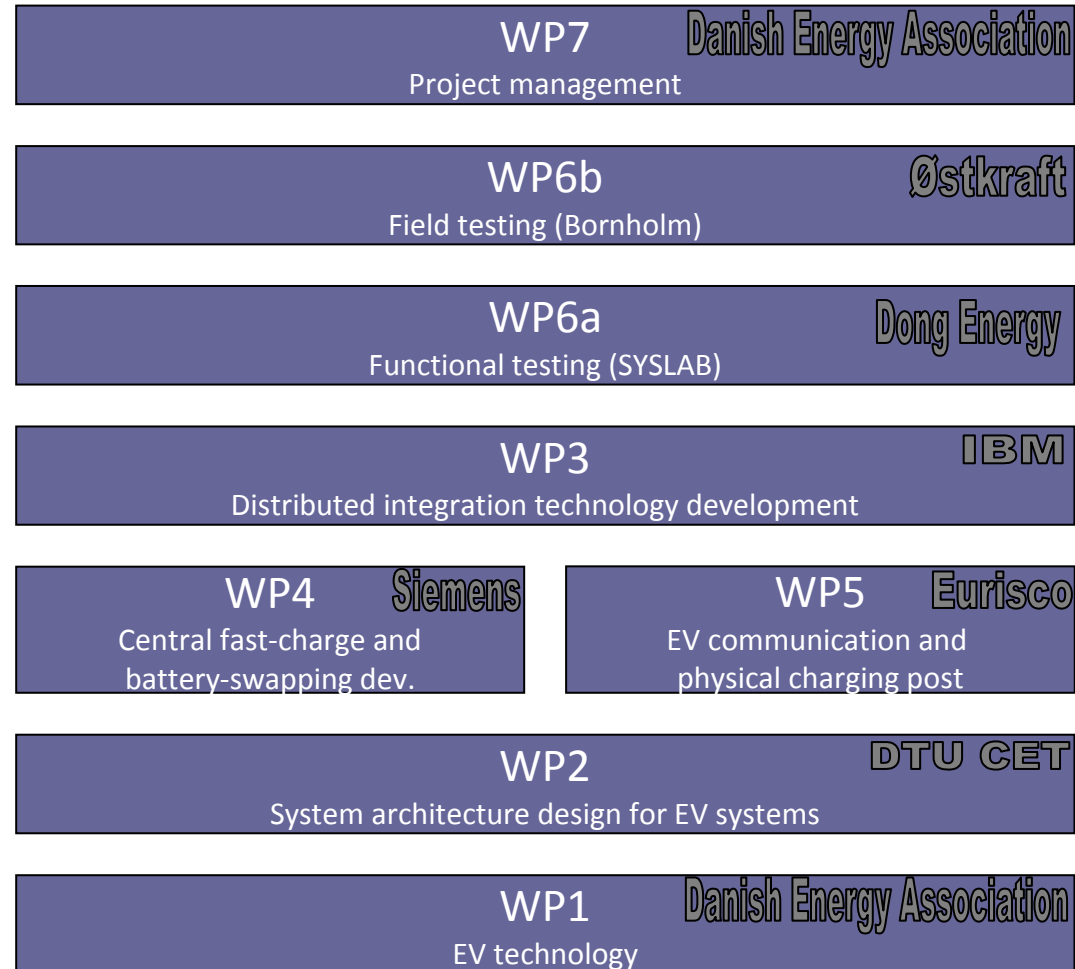


WP6A
Test of technology in laboratory



WP5
Communication between car and charge spot

Consortium structure



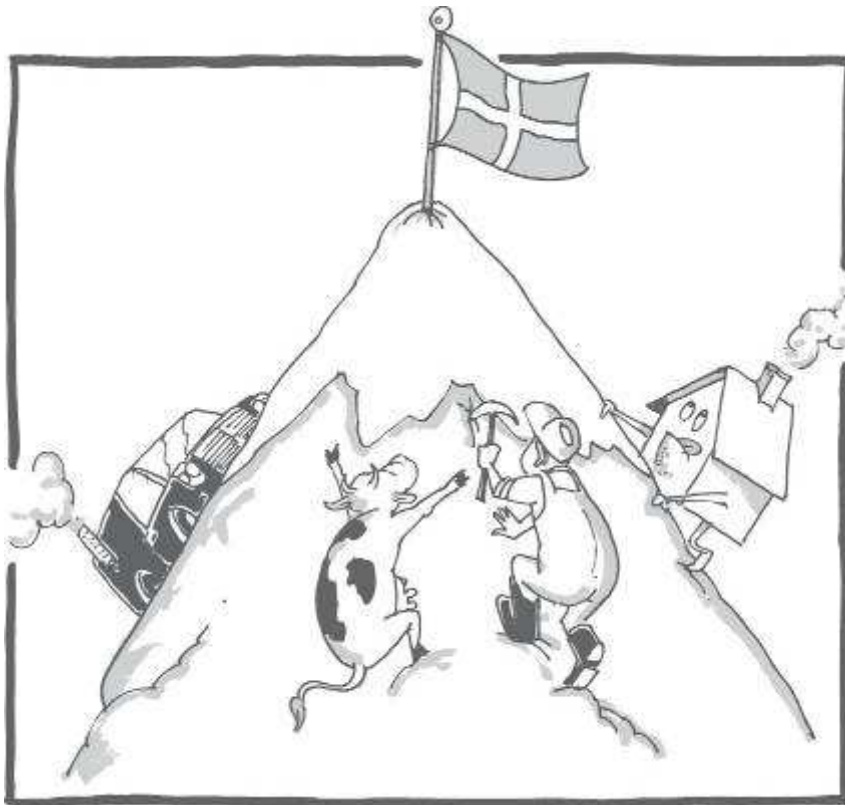
Key figures

- Official establishment of consortium was **25 February 2009**.
- Total budget of the project is approximately **6.5M€**
- Public funding from FORSKEL program is approximately **4.4M€**

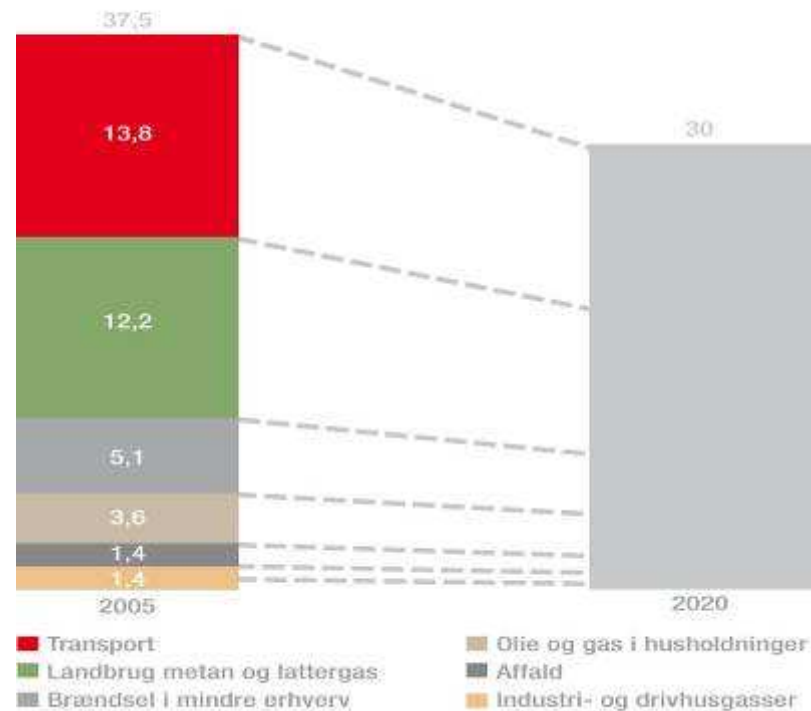


CO₂ reduction outside the ETS

The job of the national states



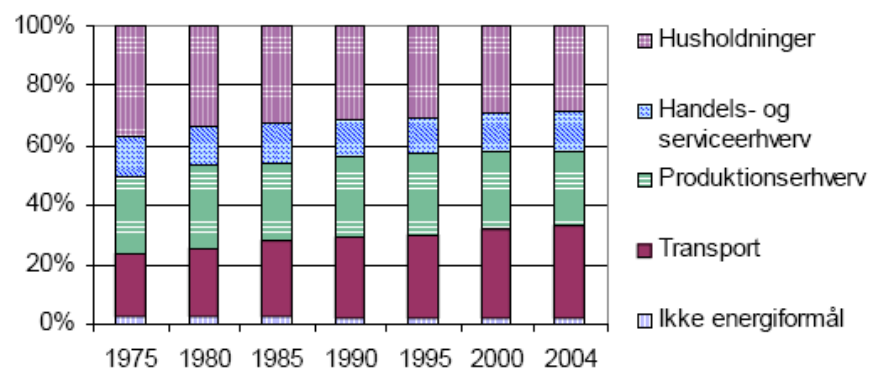
CO₂ udledning fra de ikke-kvoteomfattede sektorer
mio. ton



Energy consumption in the transport sector

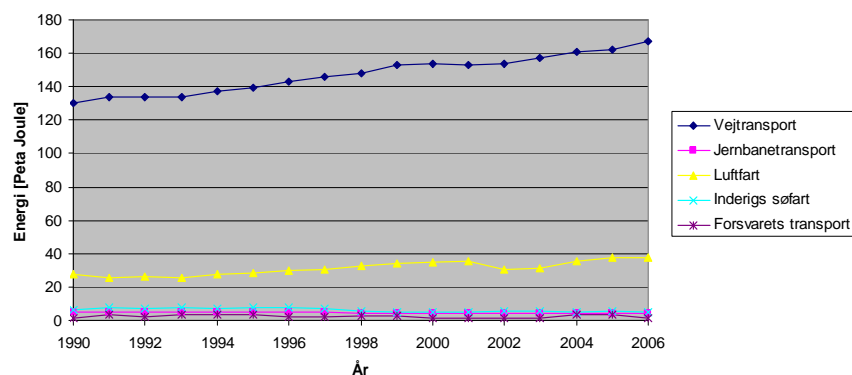
Transport is the sector which energy consumption is increasing the most in DK.

Endelige indenlandske energiforbrug



Energiforbrug til transport efter sektor

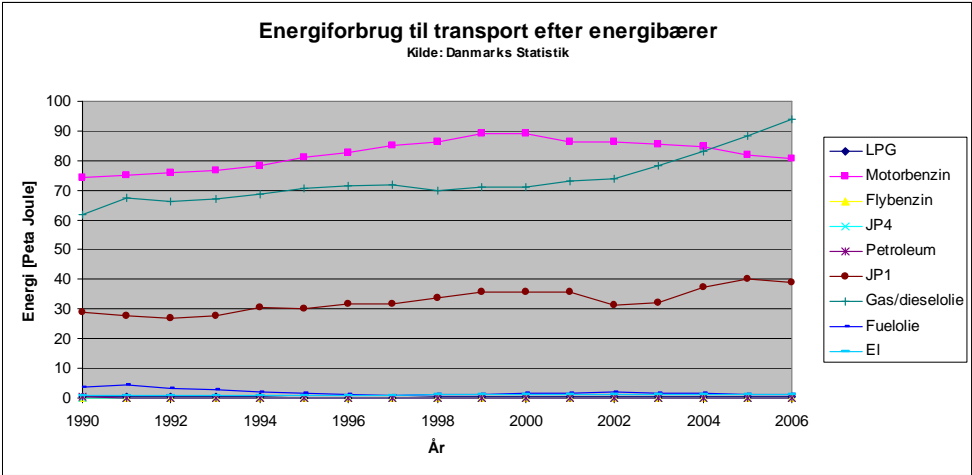
Kilde: Danmarks Statistik



Road transport is the part of the national transport work which by far has the largest energy consumption.



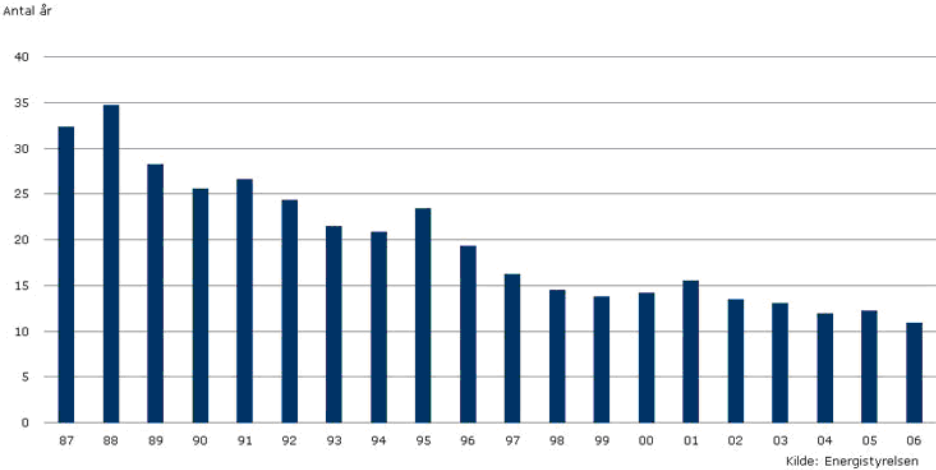
Security of supply



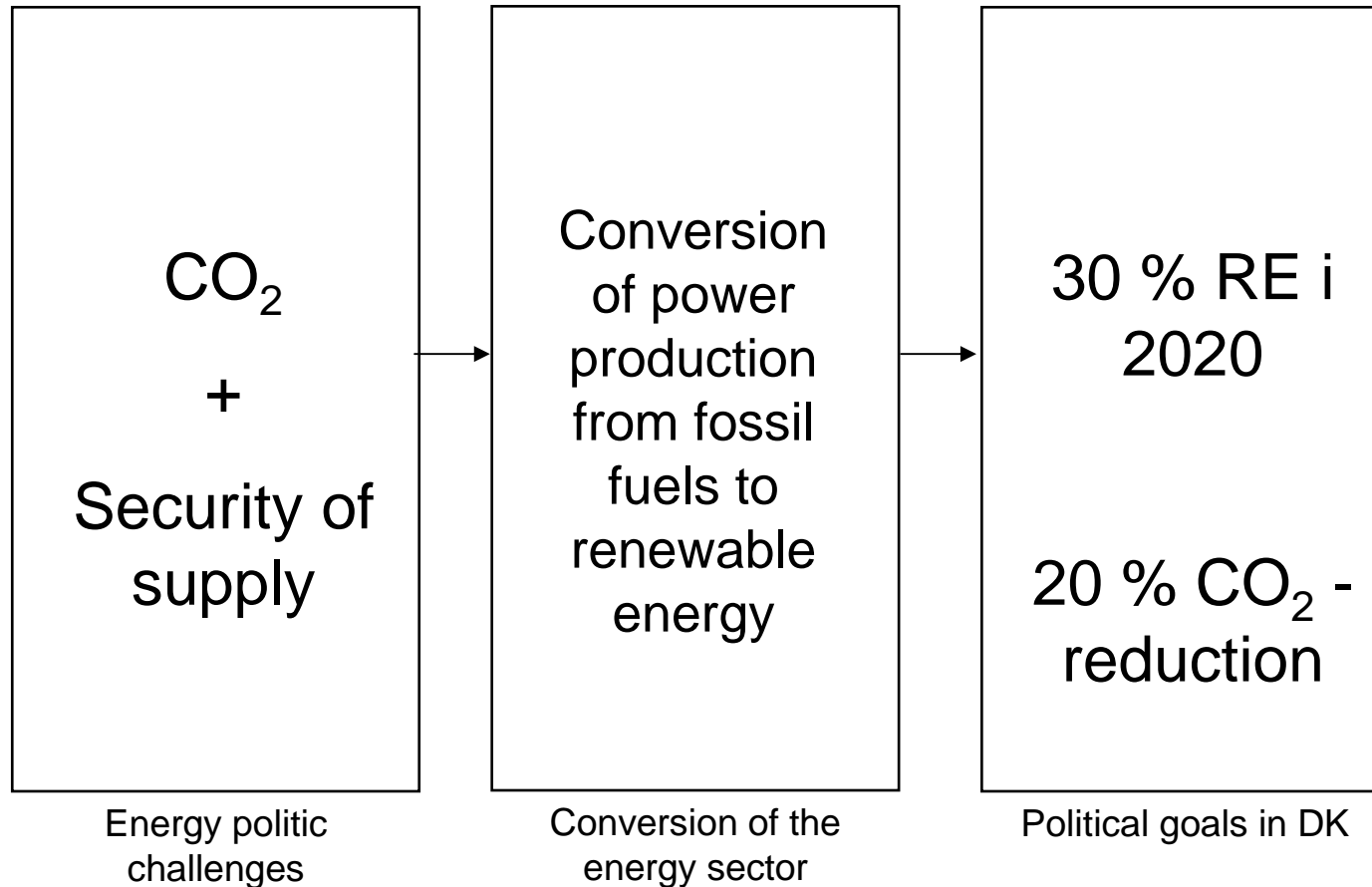
The transport sector is addicted to oil

Declining P/R-ratio in DK

(Production/reserves for Denmark's oil production)



The energy political goals



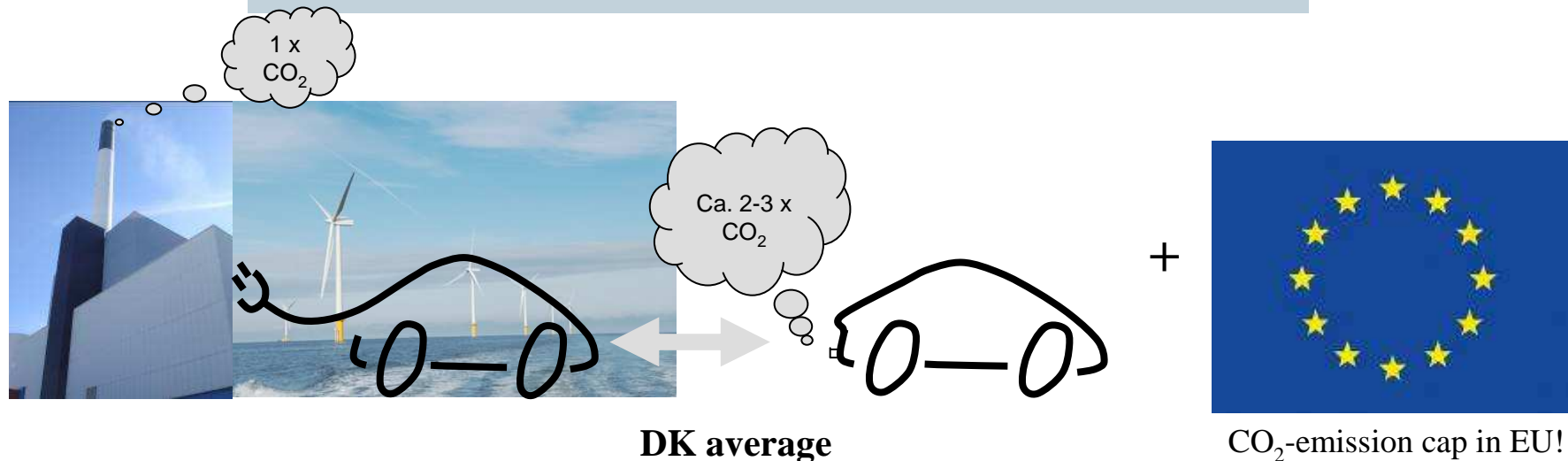
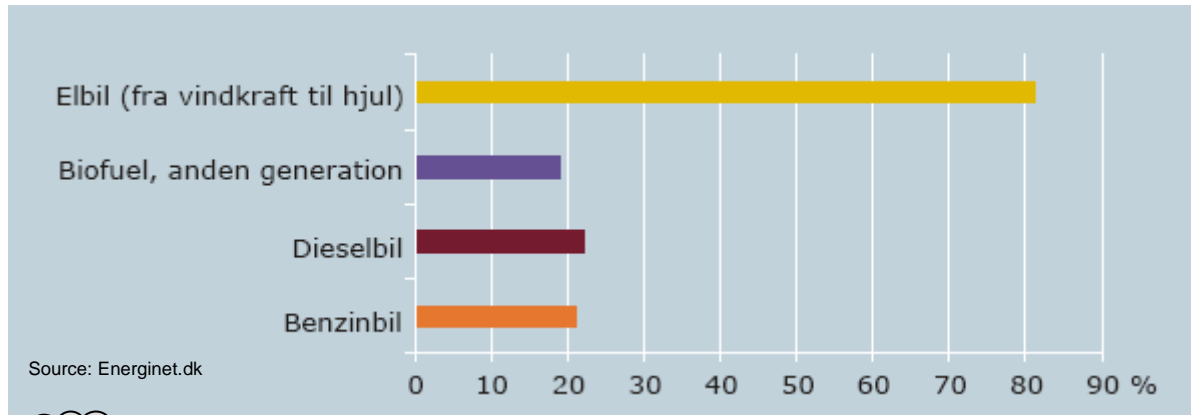
Why electric vehicles?

Particles and noise

- **No local tailpipe emissions from EVs**
- **Lower noise level compared to ICE cars (significant at low speeds)**

Why electric vehicles?

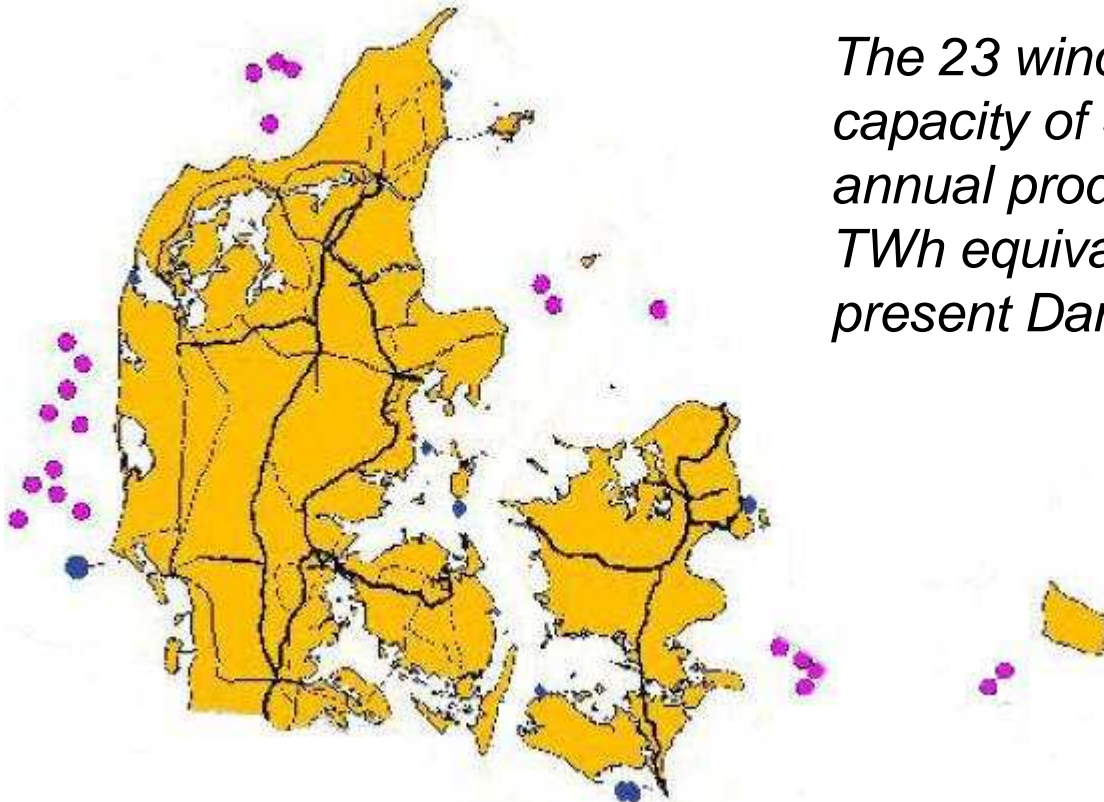
Energy efficiency and CO₂



Future DK power system

- "Off shore wind farms – 2025"

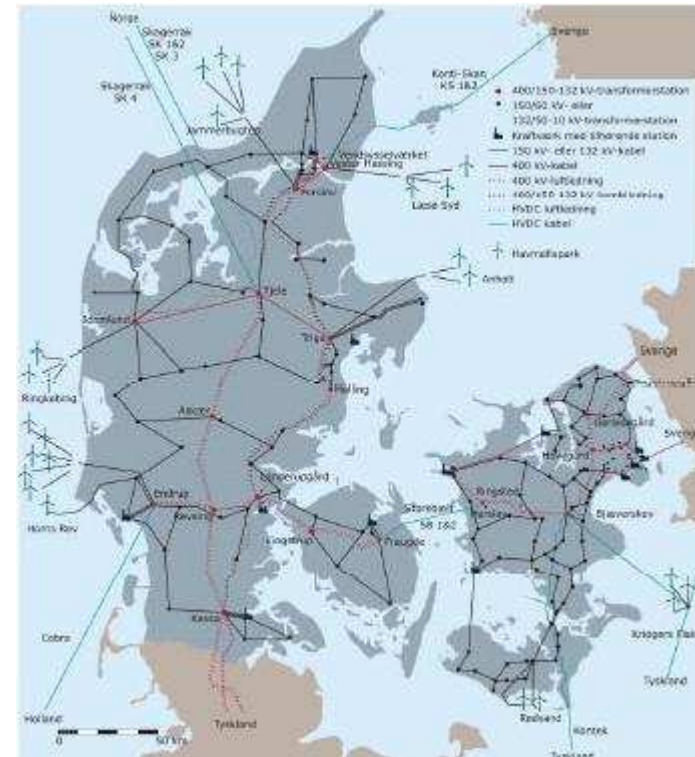
The 23 wind farms can have a total capacity of 4.600 MW, with an annual production of approx. 18 TWh equivalent to half of the present Danish consumption



Source: Energistyrelsen

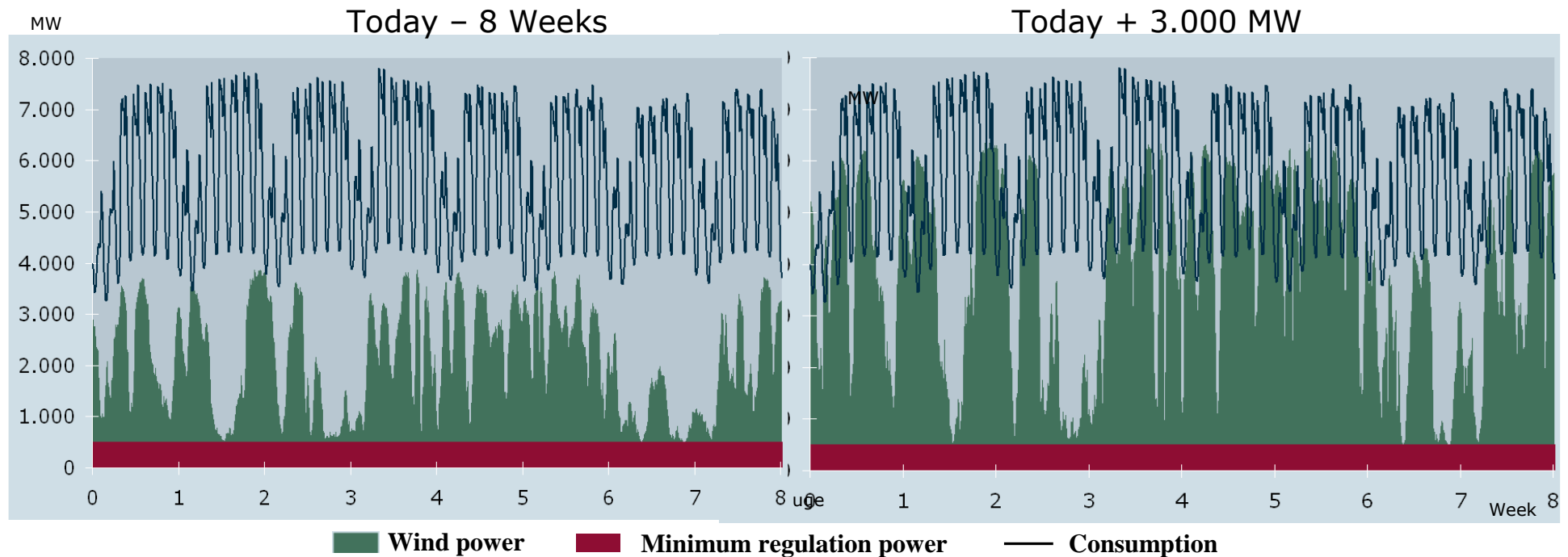
Future DK power system

- A recent national plan for development of the transmission grid forecasts and increase in consumption from 37 TWh today to 52 TWh in 2025:
 - Mainly wind
 - Biomass in conventional power plants
 - CCS on coal fired power plants



Source: Energinet.dk

Balance between production and demand



The cost of ancillary power system services is estimated to rise from 1 billion DKK p.a. today to 2 billion DKK p.a. in 2020

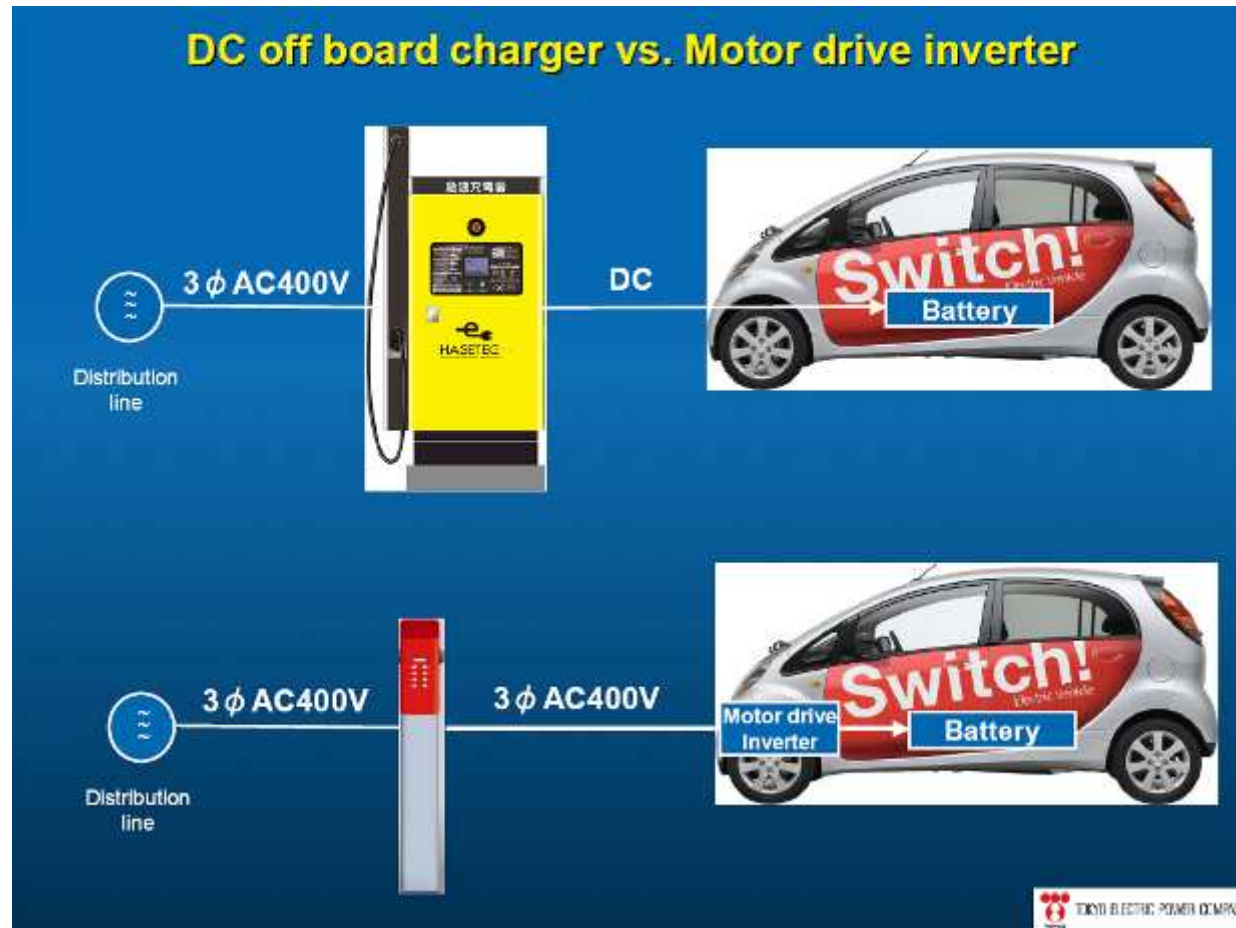
Source: Energinet.dk

The infrastructure

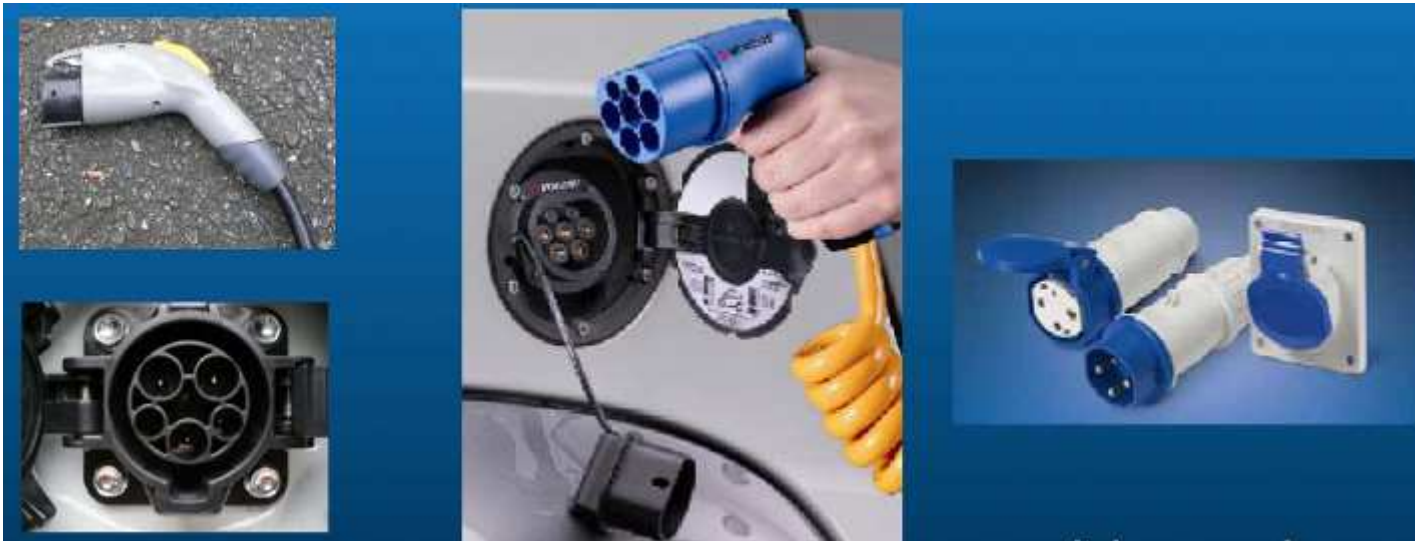
- Power demand
 - Slow charging (inverter in car)
 - Fast charging (external charger)
 - Battery exchange station



A choice of Technology



Stik IEC62196-2



**SAE AC
Standard**

Mennekes

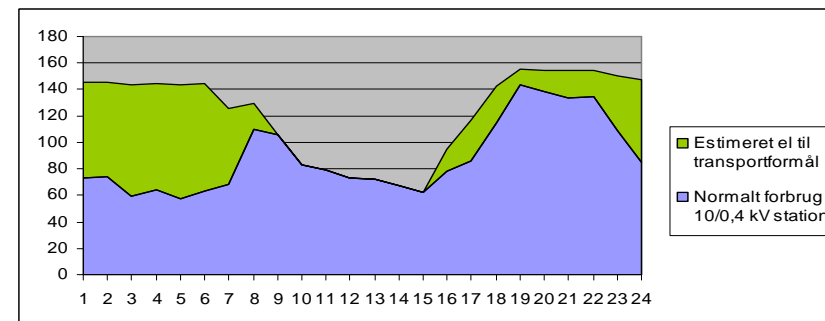
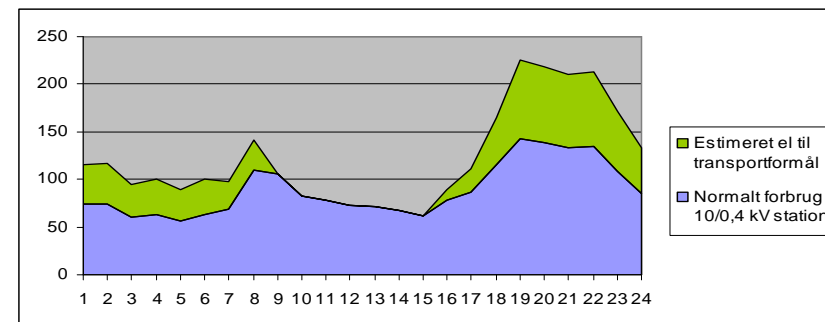
**Italy
proposal**

EV's as flexible consumers

- A typical passenger car is parked more than 20 hours per day of which 12-16 hours are at the owners households
- Future EV's probably need to be charged 1-4 hours per day – That gives flexibility!
- If the EV owner gets the right incentives, the battery can be a part of the energy system

Phase 1: Controlled charging

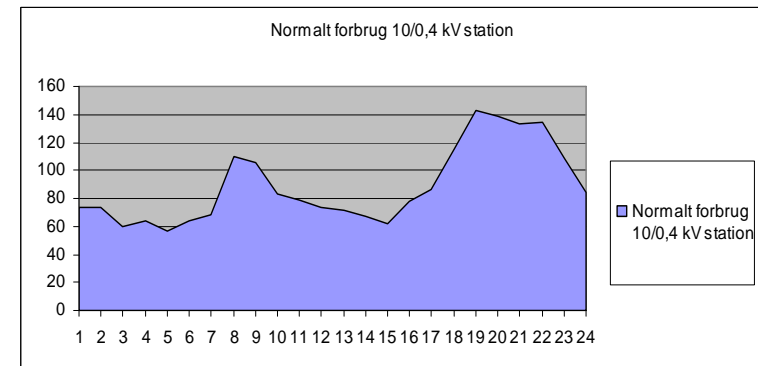
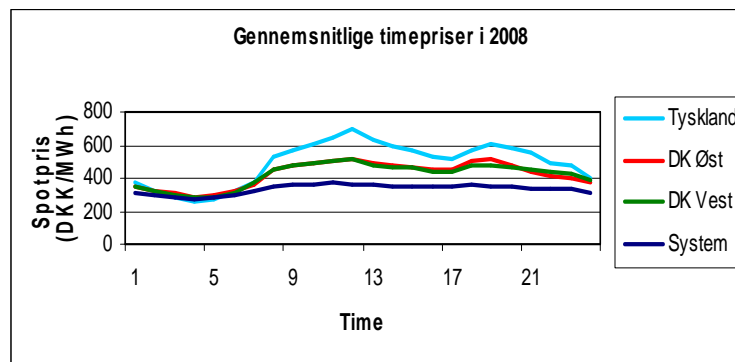
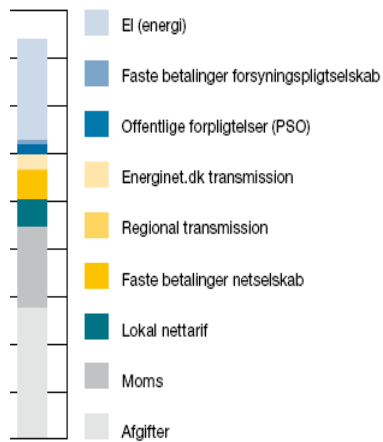
- EV's are parked around 5 pm at owners' household
- Charging is delayed until 11 pm.
- Opportunity of stopping the charging as an ancillary service to the grid
- A "central controller" controls the charging according to subscribed service
- **25% reduction on the energy price**



Phase 2: Virtual power plant

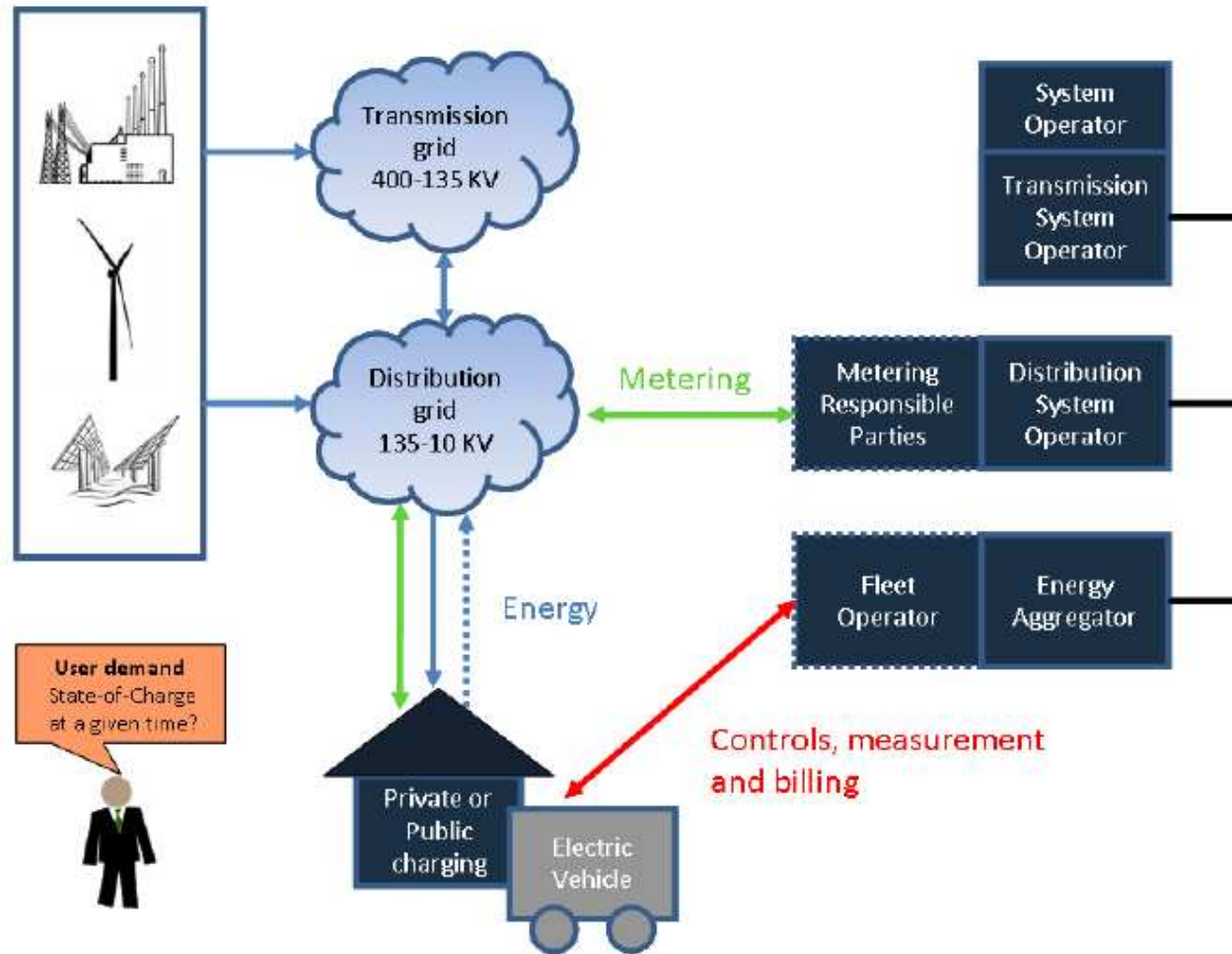
- EV's can be flexible consumers that delivers energy back to the grid
- EV's "log in" to the grid, when connected to a charging pole
 - Charges when energy prices is low
 - Delivers energy to the grid, when prices are high
 - Ancillary services
- **50% reduction on energy prices or for free?**

Consumer incentives



- Economy will be the incentive for the consumer
- Can the market prices be used to control consumption?
- How will market prices look when we reach 50% wind power penetration?
- What about the other components of the end user price?

Example of system design



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Example of user-interface



Source:
EURISCO
RESEARCH & DEVELOPMENT



Follow our project at:
www.edison-net.dk

QUESTIONS?

EDISON



EURISCO
RESEARCH & DEVELOPMENT

SIEMENS

DONG
energy

ØSTKRAFT
energi til gode oplevelser

