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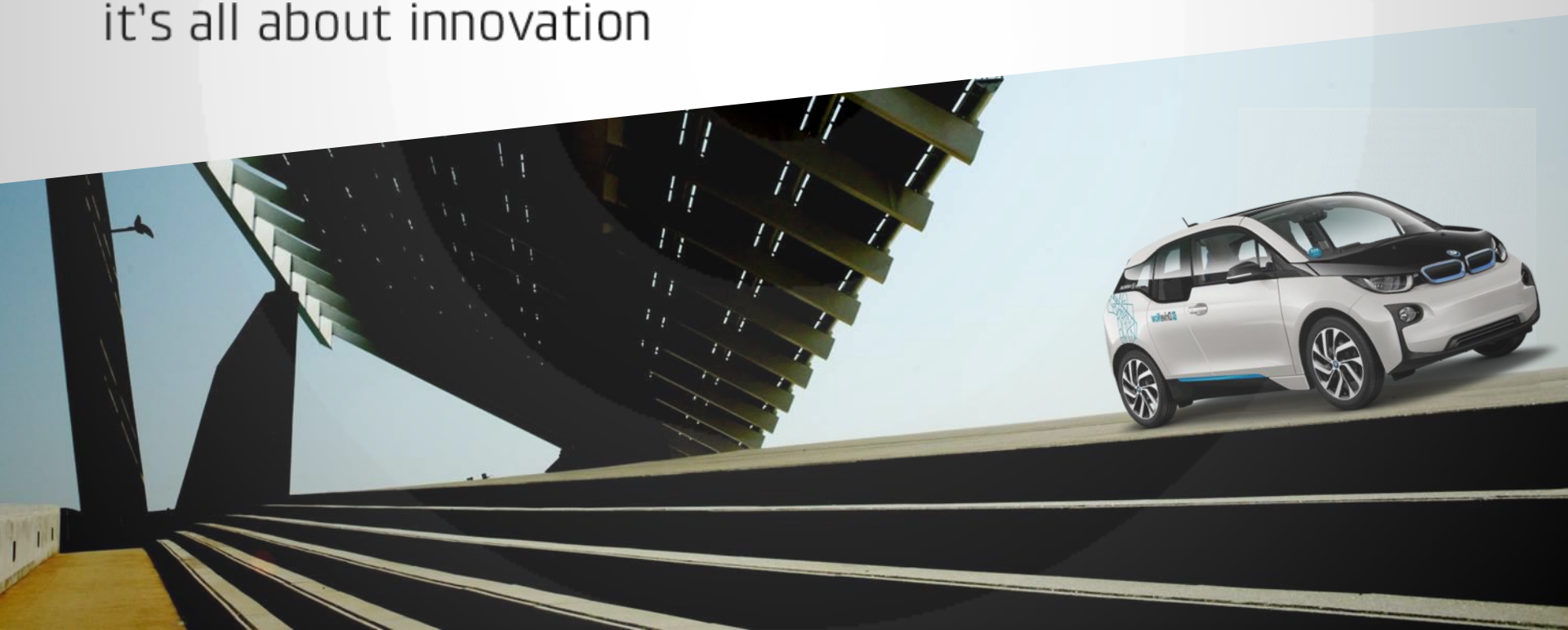
it's all about innovation



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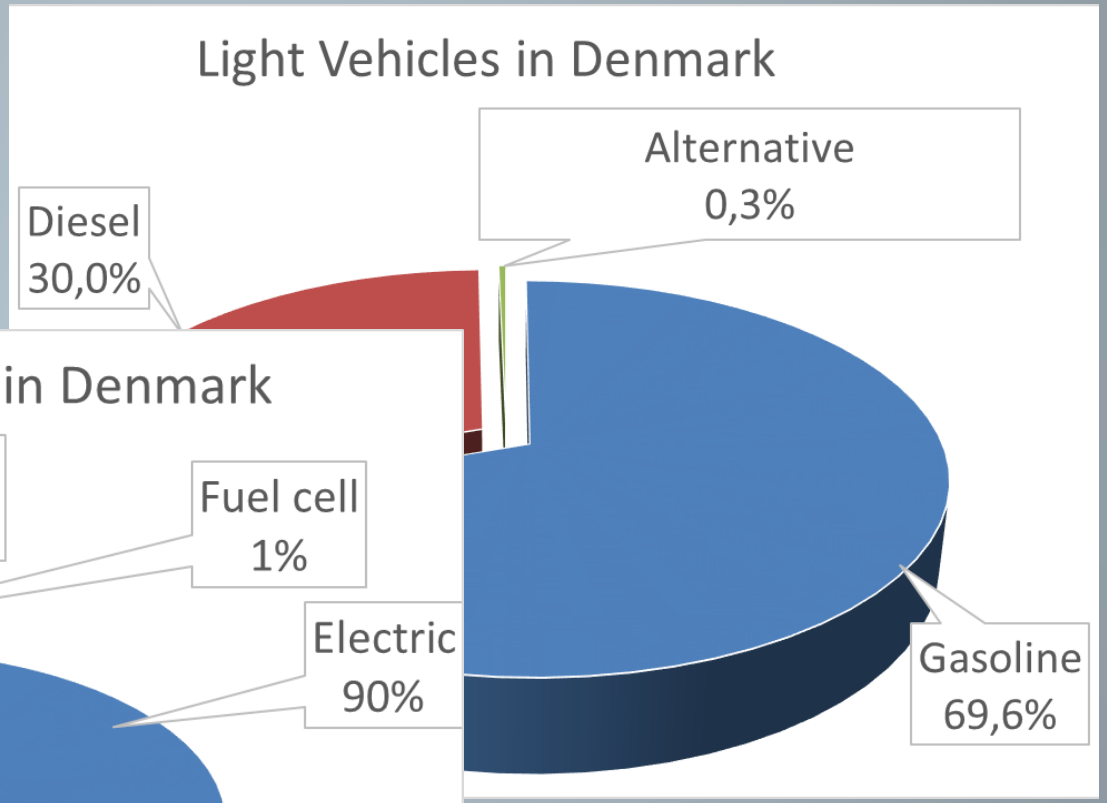
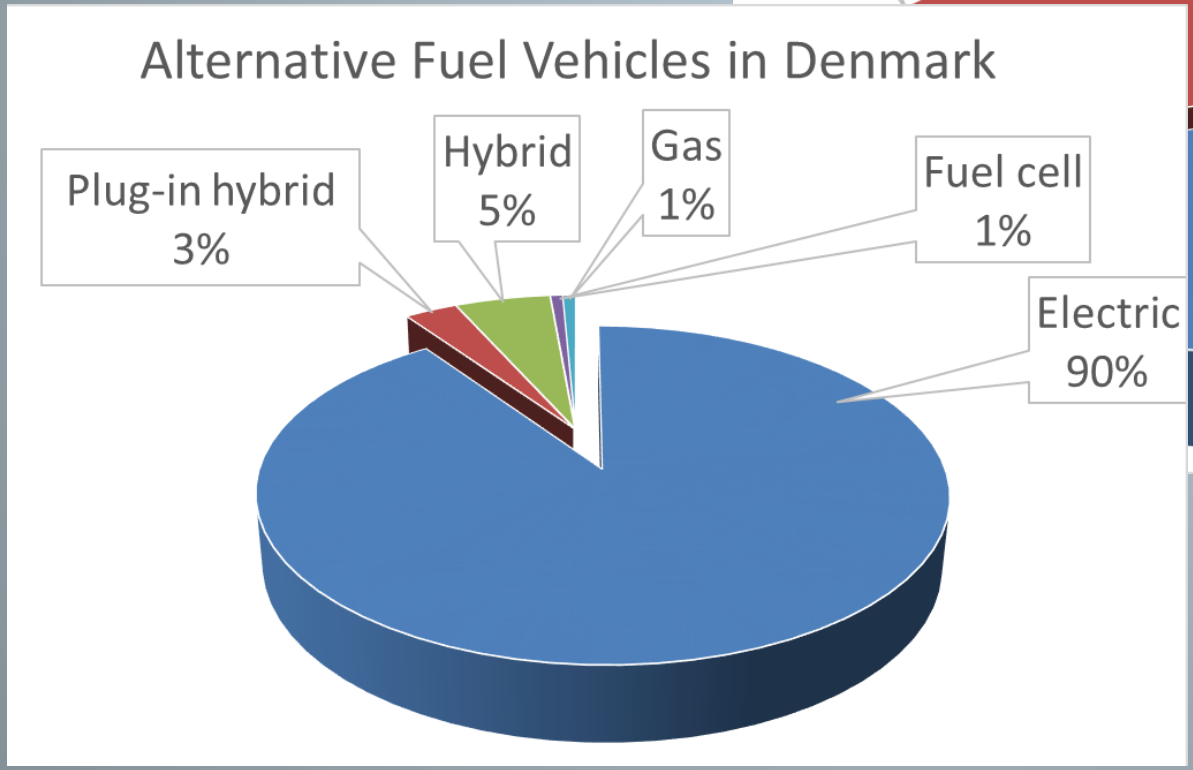
Potential strengths and weaknesses of green vehicles

CNCA January 21st 2016

Kim Winther

Current technology mix

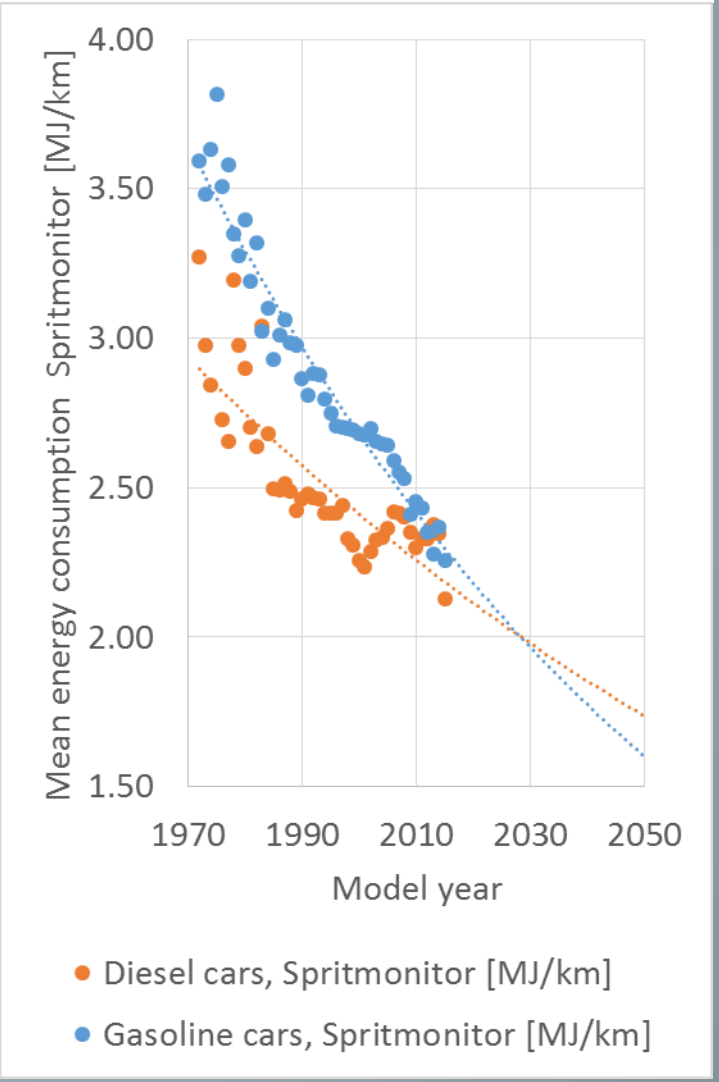




Diesel

A problem child

- Diesel cars have become more powerful
- Are driven like gasoline cars nowadays
- Almost matched by gasoline in efficiency
- Tough emission limits
  - NOx
  - Particulate
  - Cold start emissions
- Should only be used for long range transports

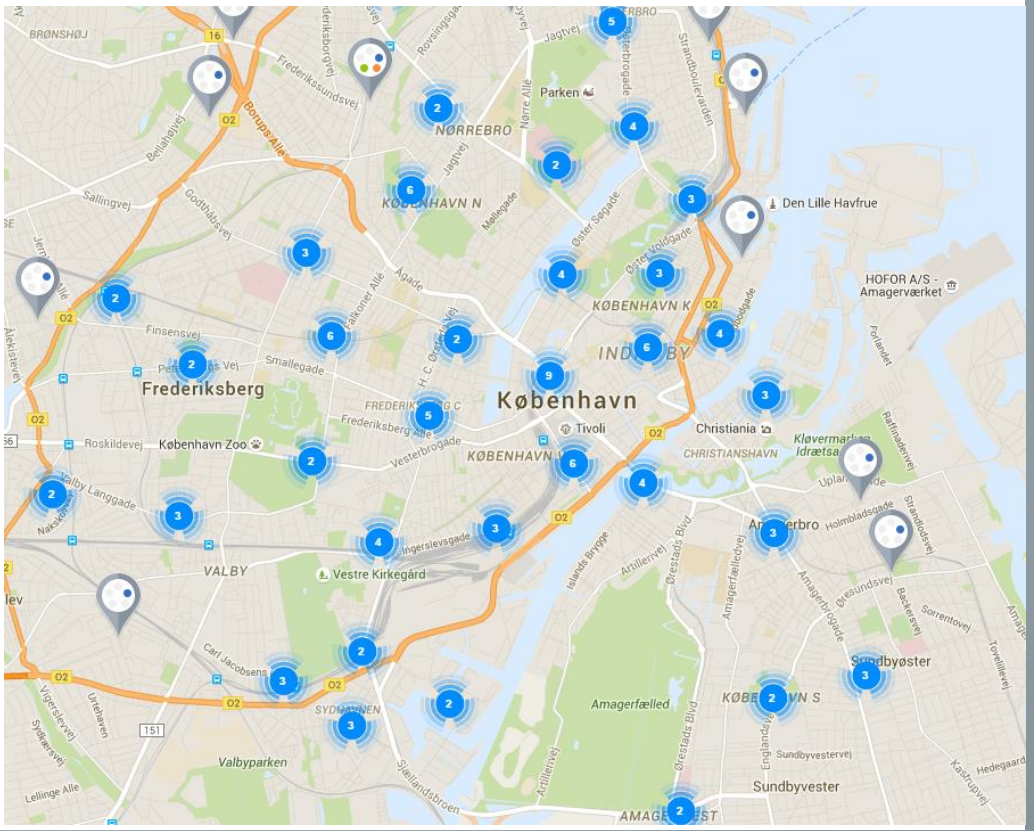


City Driving

Battery electric vehicles

Electric car might be dominant in cities:

- No local emission
- No engine noise
- Short trips, low speed
- Easy automation
- Energy grid available
- Smart grid is coming*



City Distribution

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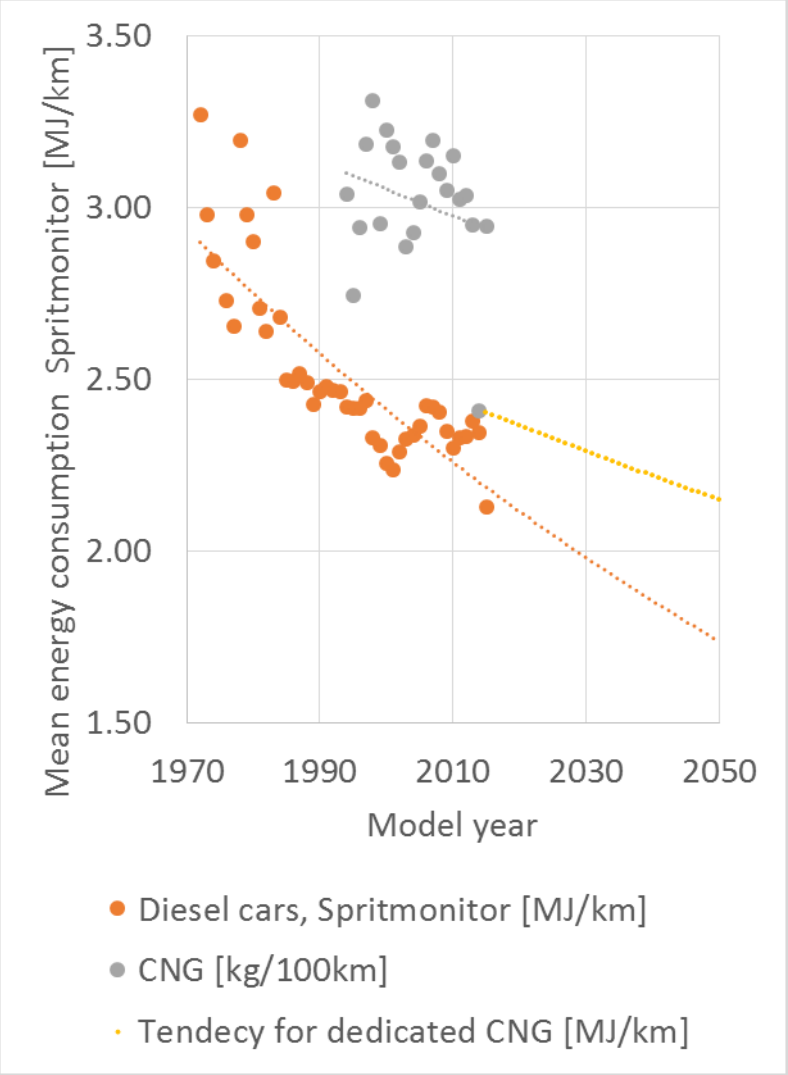
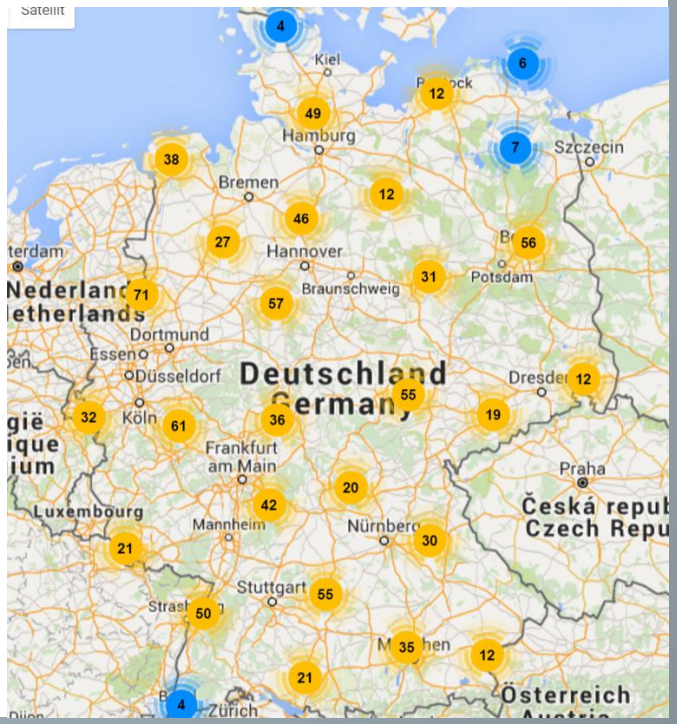
CNG

- Longer range than electric vehicles
- Available in the medium duty size
- Quieter, cleaner than diesels
- CNG is a cheap energy source
- Potentially diesel-like efficiency



Long distance driving

- CNG
  - Medium range
  - Faster refueling than battery recharging
  - Steadily growing in Germany and other countries.
  - Have recently had a technology leap, is expected to have another
- Fuel cell
  - Medium range
  - Faster refueling than battery recharging
  - Slowly growing, not quite ready yet
  - Few fueling stations
- Alcohols, Methanol, Ethanol
  - Some cars are ready for multi-fuel
  - To expensive compared to oil



Public transport and heavy goods

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- CNG
  - Refuse trucks
  - Busses

- LNG
  - Diesel alternative
  - Long distance transports

Transitional vehicles

Plug-in hybrids and Range-extenders

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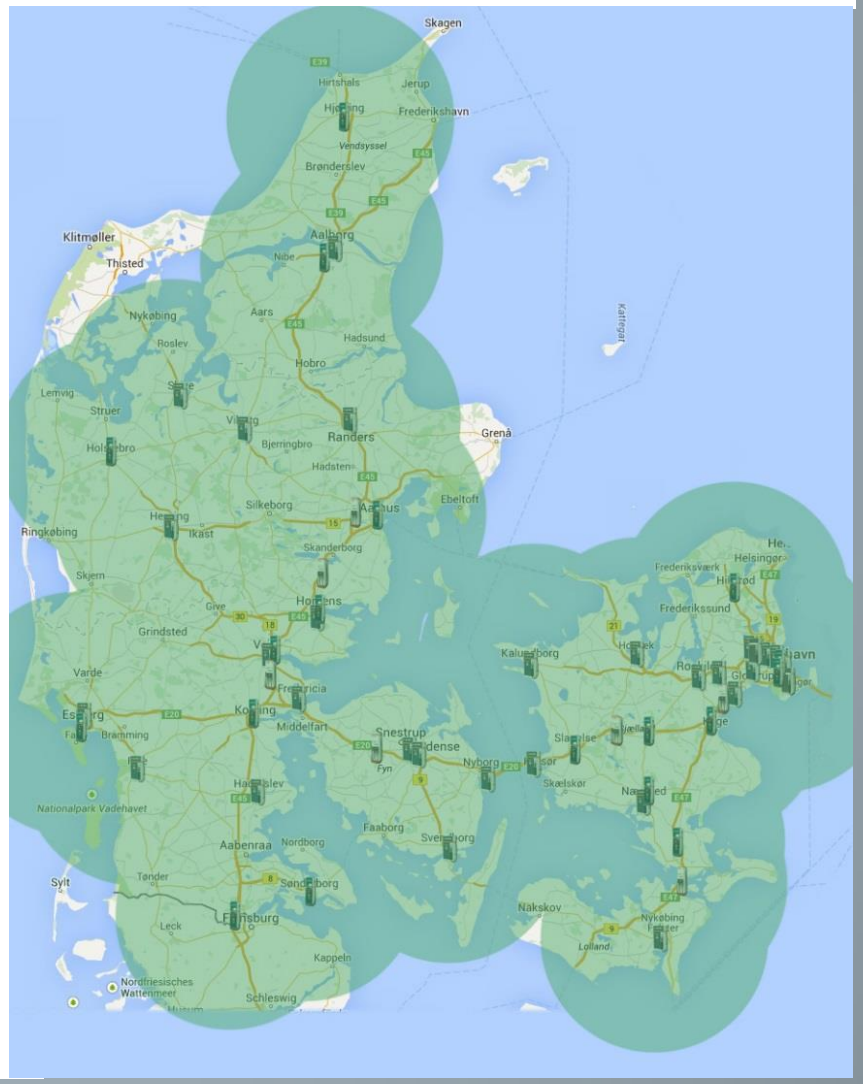
Plug-in Hybrid using only battery in cities

- All the pros from the BEV
- Transition car
- Higher efficiency than ICE vehicles
- Lower efficiency than BEV
- Longer range than BEV
- Most people don't need long range
- Fast-chargers are well distributed
- People want to feel safe
- Some might never use the fuel
- Next car might be clean BEV



Current Electric Vehicles

State of the art

- Tesla model X
- BMW I3 BEV
- Nissan Leaf II
- Renault Zoe

Power: 69kW
Range: 240km
Price: 26260 Euro

Current Plug-in Hybrids

State of the art

- Chevrolet Volt
- BMW I8
- Audi E-Tron
- BMW I3 REX
- Honda Accord
- VW Golf GTE

Power: 75kW
Consumption: 0,8L/100km
Price: 35000 Euro

Current Fuel Cell Vehicles

State of the art

- Toyota Mirai
- Honda FCX Clarity
- Hyundai ix35 Hydrogen

Power: 100kW
Range: 500km
Price: 66200 euro

Current CNG Cars

State of the art

- VW Golf TGI
- Mercedes B200C
- SEAT MII Ecofuel

Power: 81kW 105kW
Range: 490km (CNG) 450km
Price: 12000 euro 13000

Upcoming Green Vehicles

Production ready

- Hyundai Ioniq
  - BEV
  - Plug-in hybrid
  - Hybrid
- Chevrolet Bolt
- BMW X5 e-drive
- Mercedes PHEV
- Etc.

Benchmarking of alternative fuel cars

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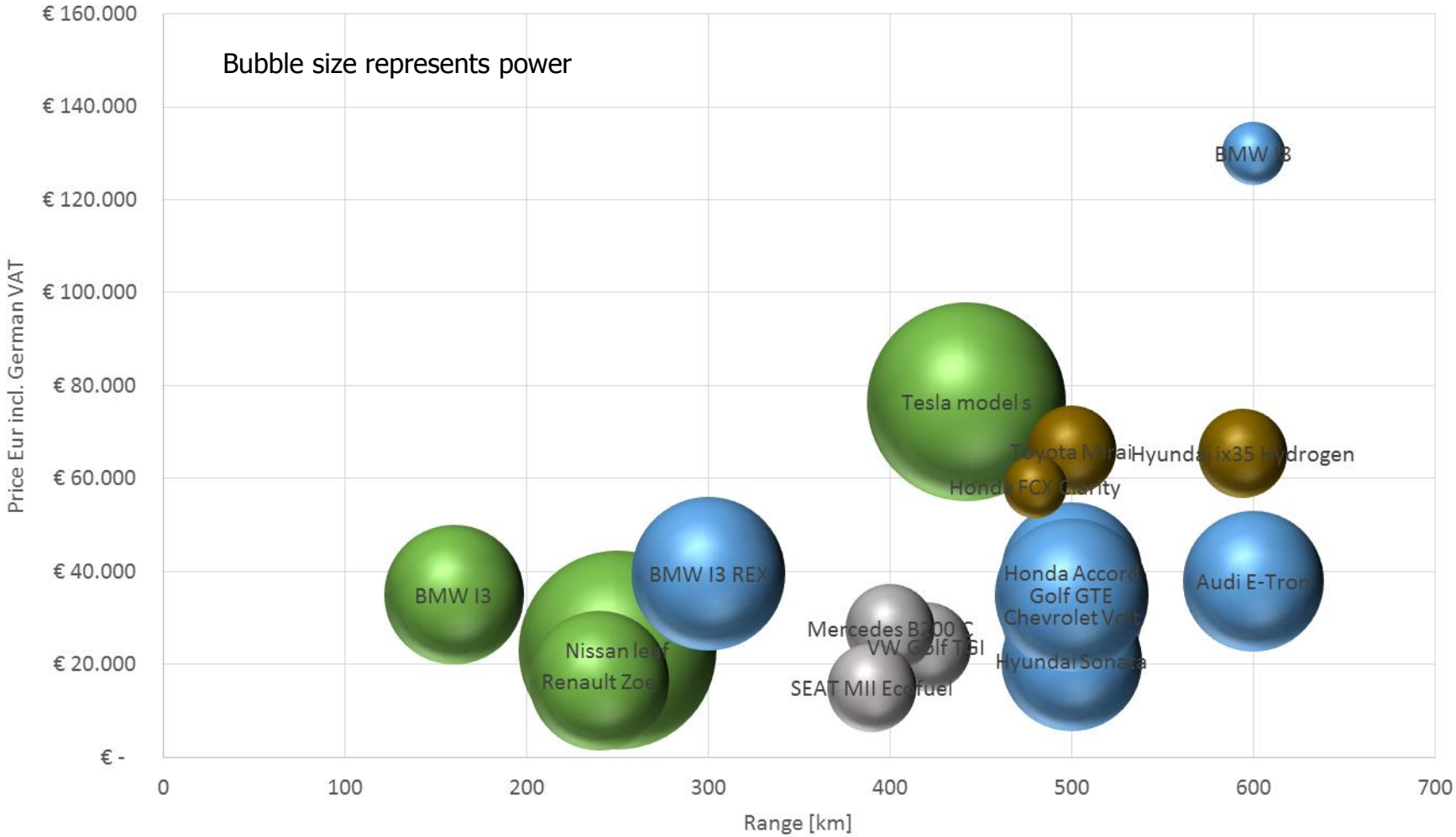

Car sharing

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- DriveNow (Movia)
  - 400 BMW I3 BEV
- LetsGo
  - Different car models
  - Cheaper for daily use

- Reduce number of cars in cities
- Pay per use
- Easier maintenance for users
- Integration of BEVs

Smart grid

Energy storing

Electric and plug-in hybrid cars could be used for energy storage

The energy output from green sources are fluctuating.

When we don't need the power it is in abundance, when we need it there is not enough.

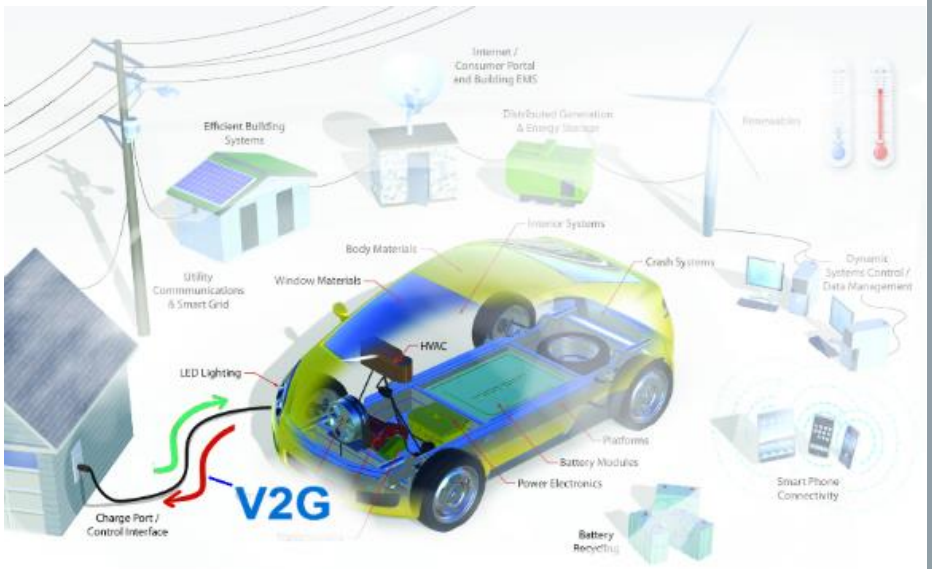
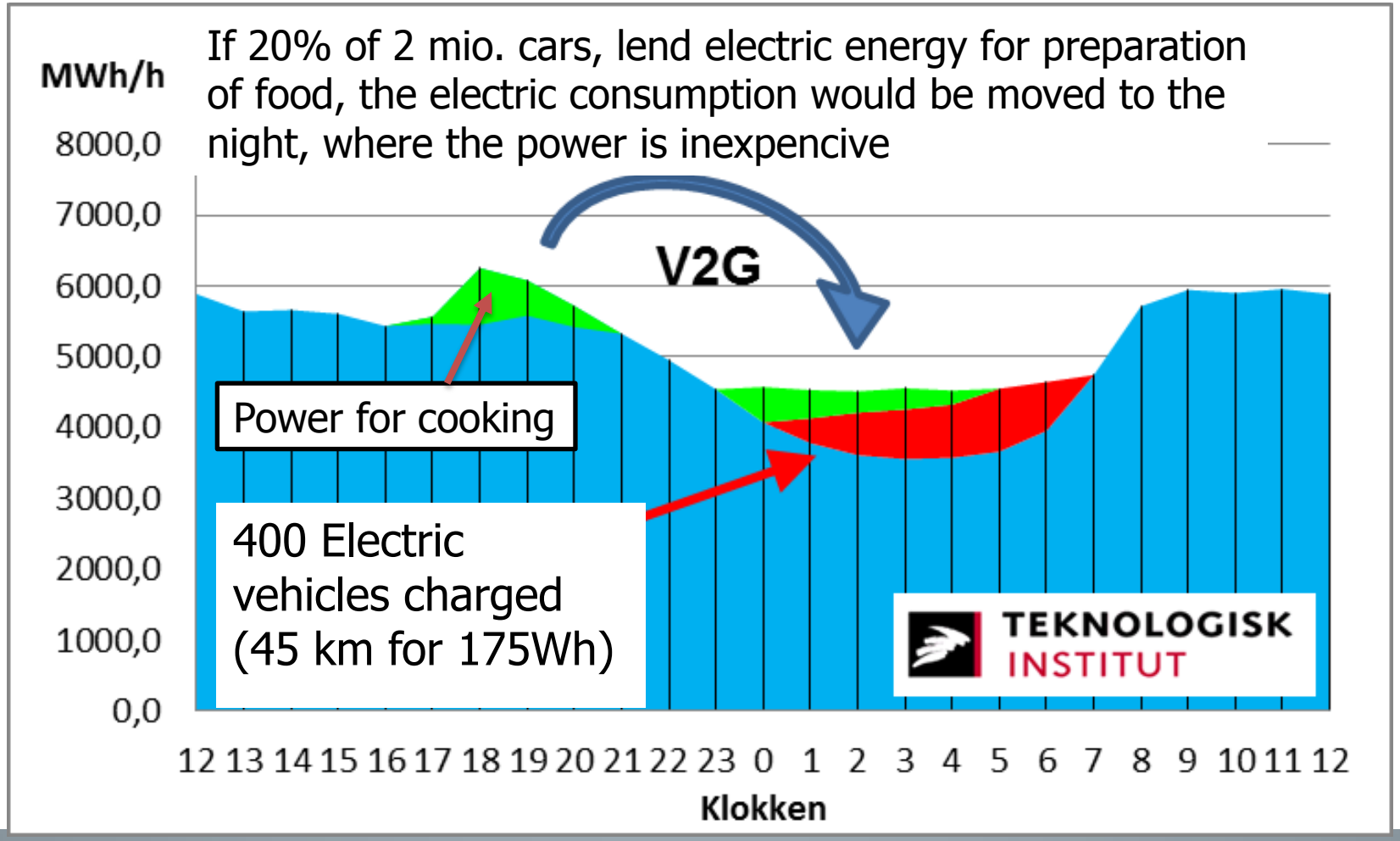


Image credit: https://www.plughybrid.de/

Smartgrid V2G



Thank you for your attention

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