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EVs and RES-E – are they mutual beneficiaries?

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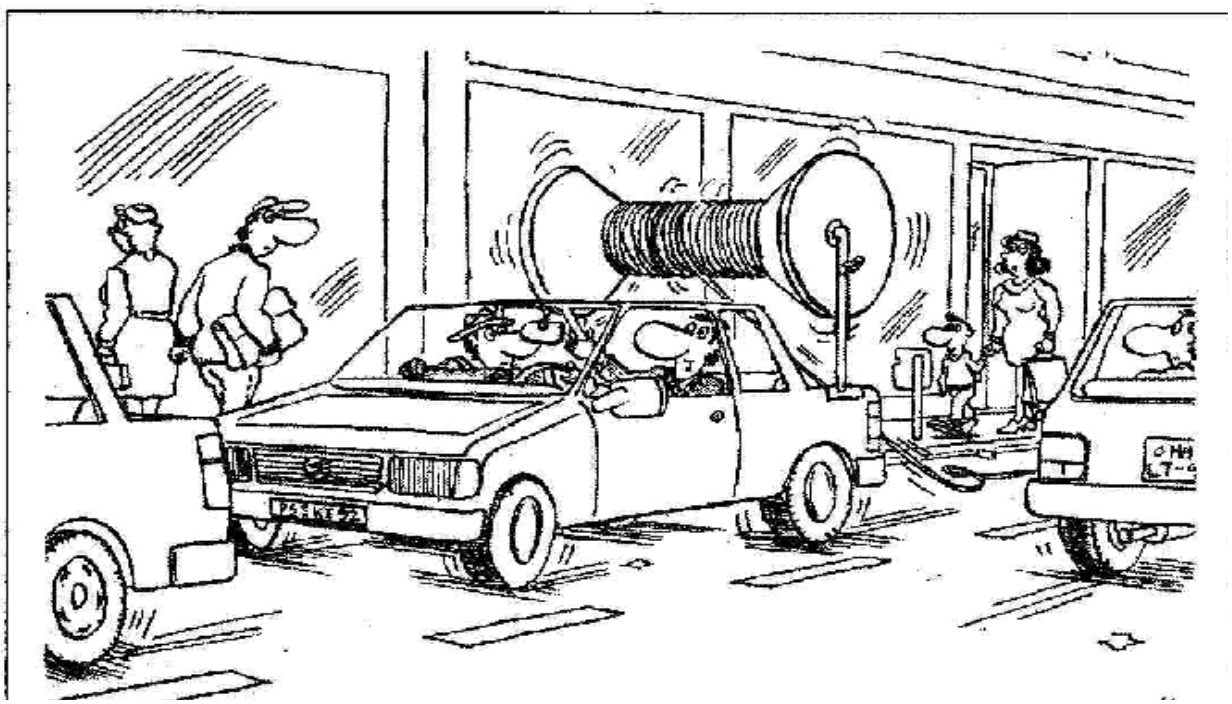
ECN Policy Studies

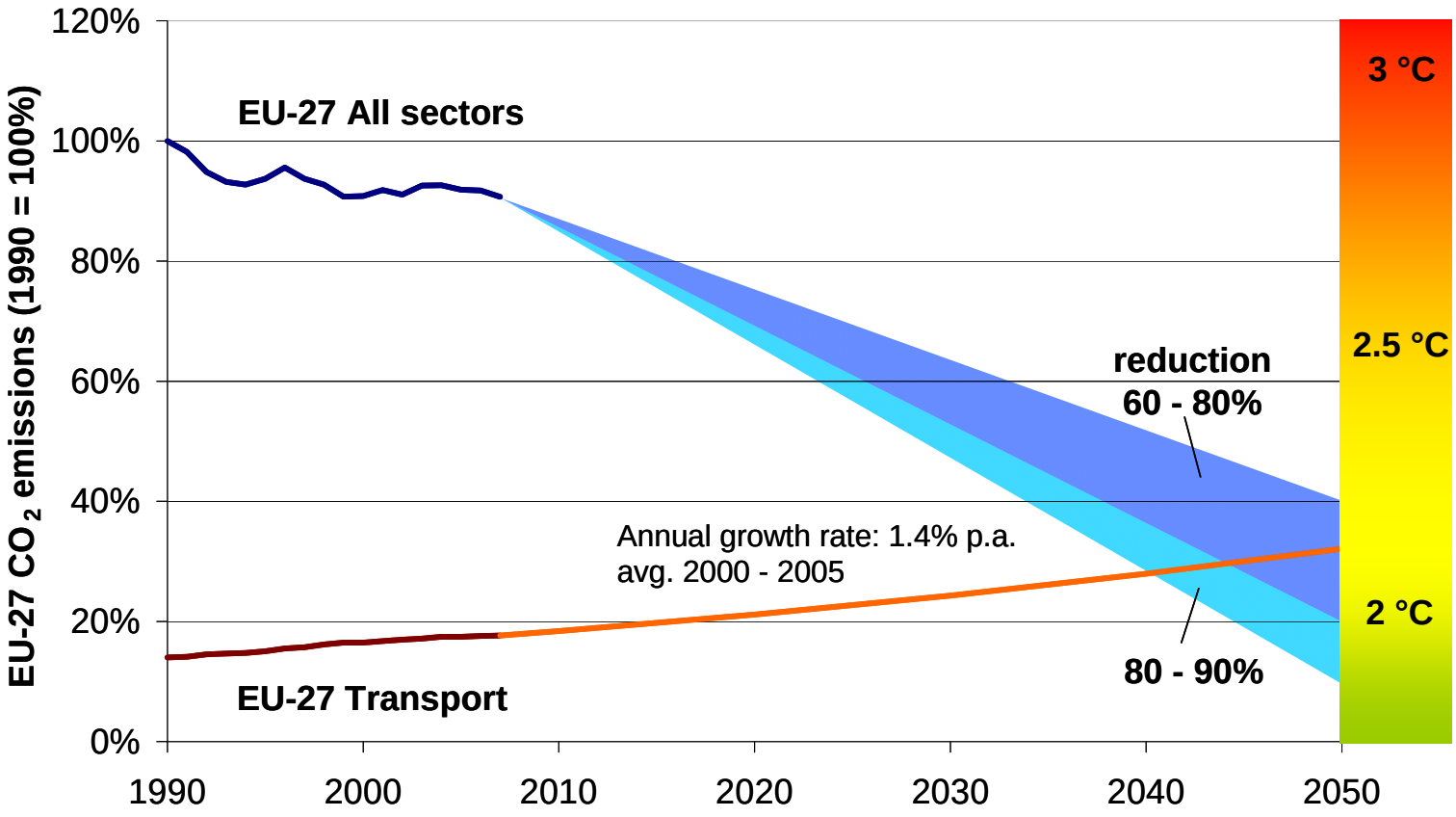


"I just don't understand what people have against electric vehicles – my power cable reaches from home to work.

Main messages

- The CO_2 emission reduction from electric vehicles can be substantial…
  - depending on the method of electricity generation
- Electric vehicles need innovation policy, to be coordinated with power sector to realize full potential
- RES-E has advantages over nuclear due to its flexibility in terms of location and size
- (Political) Action is required now to bring about the desired changes

The challenge



(graph adapted from [EEA 2009])

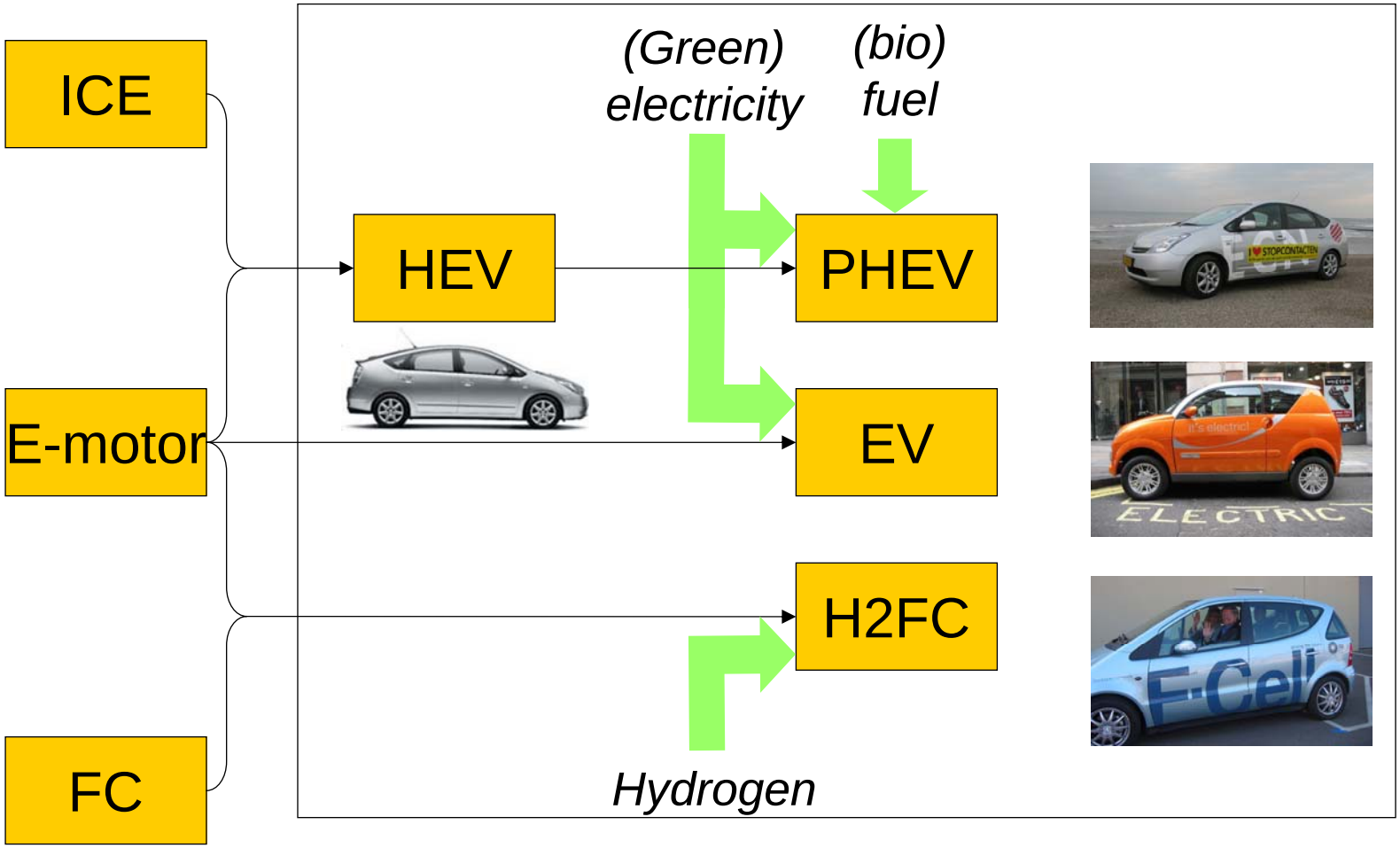
Policy options - road transport

1. Reduce transport demand
2. Improve driving behaviour
3. Improve vehicle efficiency
4. Use low carbon fuels

… extra innovation?

Biofuels
Hydrogen in fuel cell cars
Electric cars and plug-ins
Intelligent Transport Systems

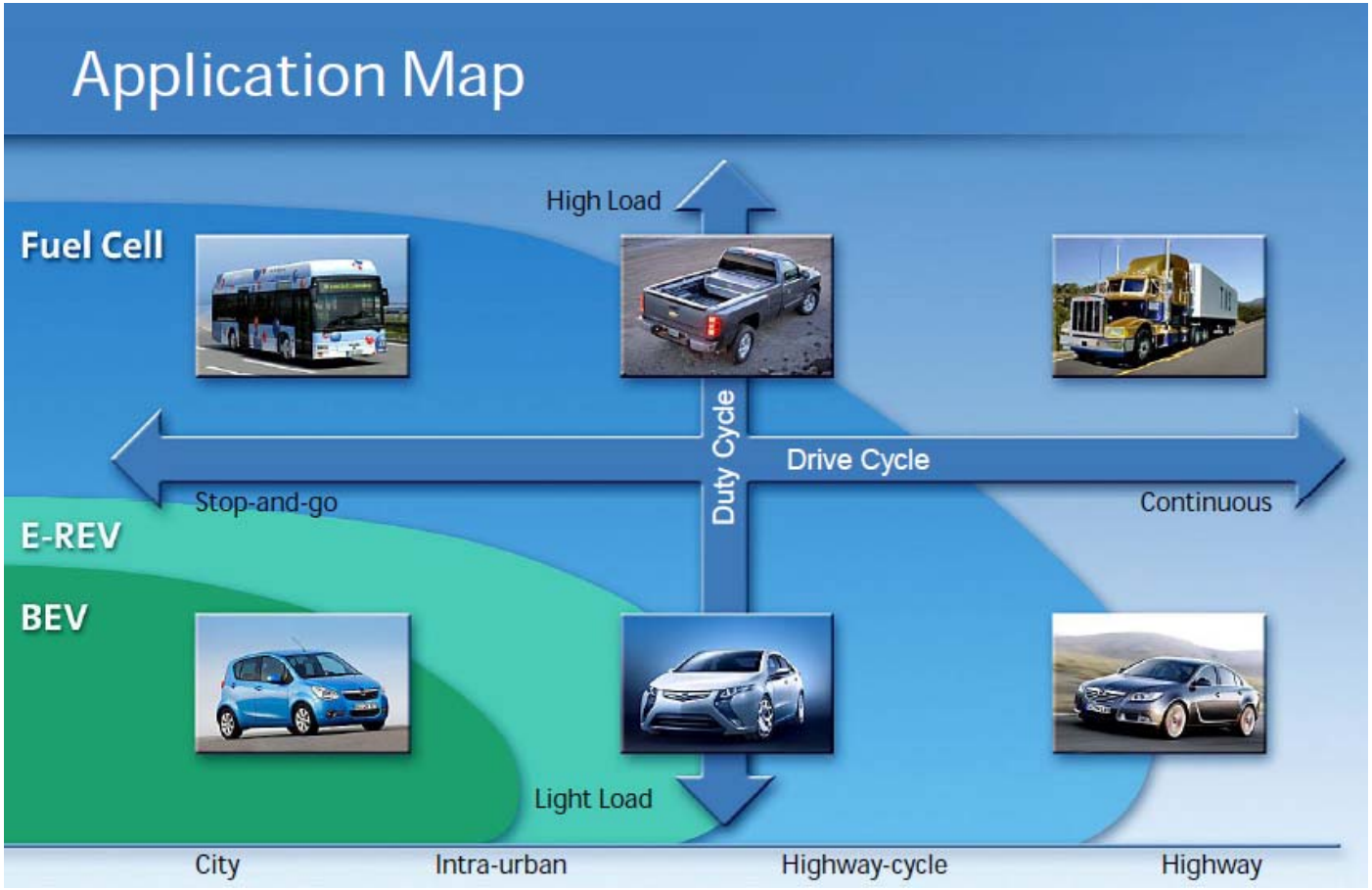
Our future car: PHEV, EV or H2FC?



ICE: internal combustion engine; FC: fuel cell; HEV: hybrid-electric vehicle; PHEV: plug-in hybrid-electric vehicle; EV: electric vehicle; H2FC: hydrogen fuel cell vehicle

Reduction of CO_2 and local emissions

Every option has individual advantages in the market segment

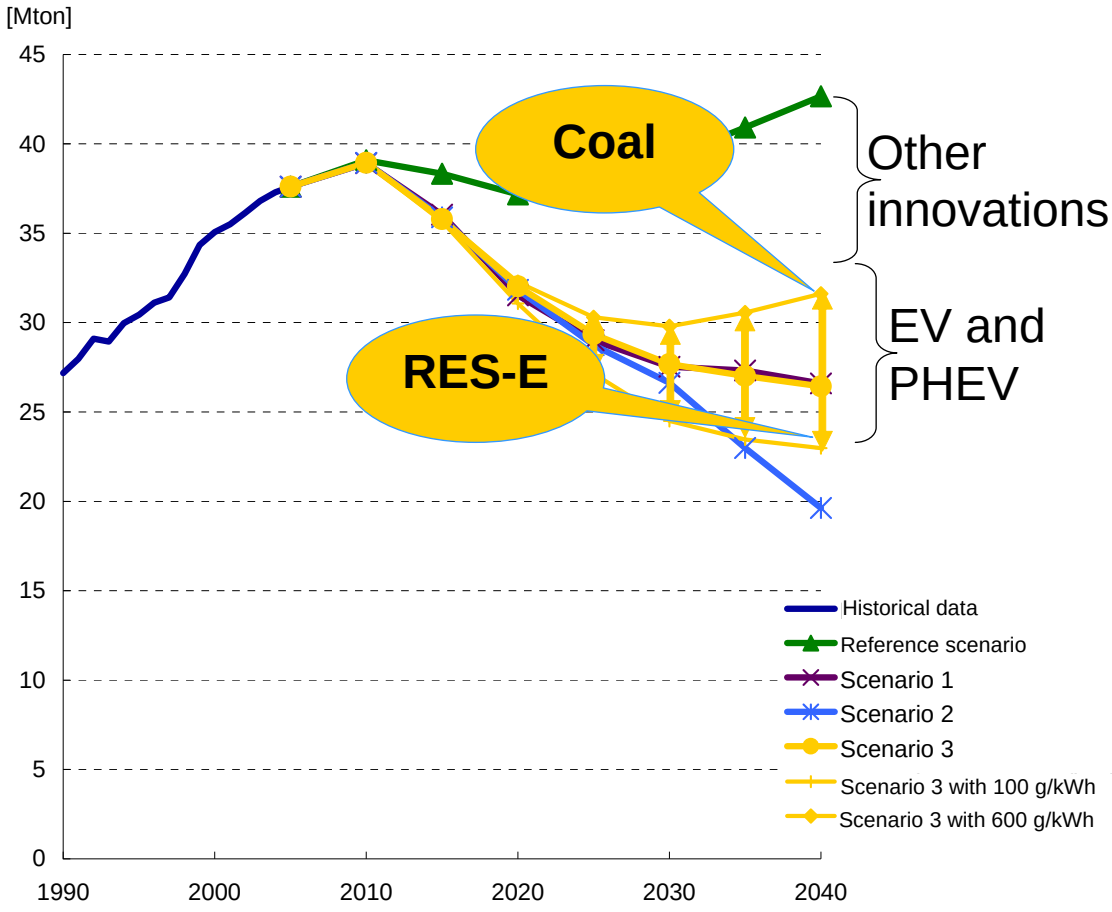


Source: Lars-Peter Thiesen, GM Europe

New market actors

CO_2 emissions depend on electricity generating mix

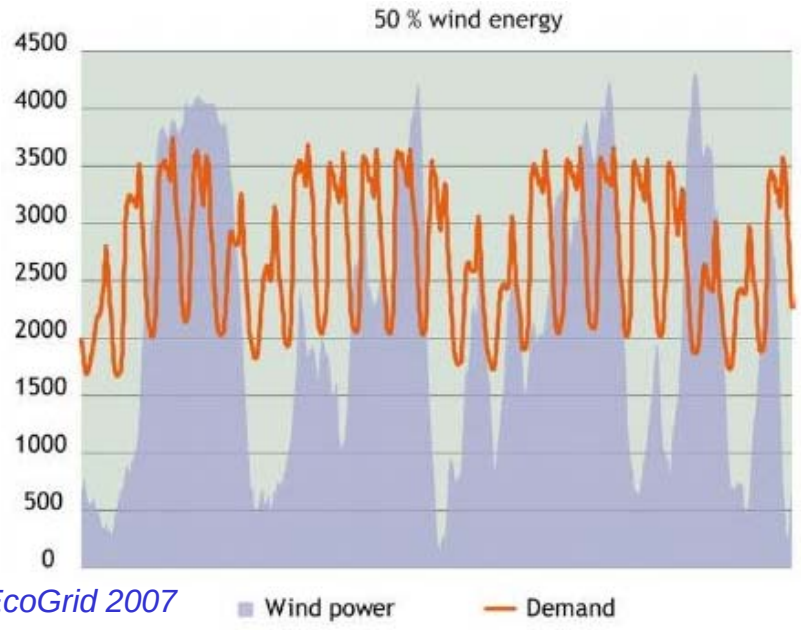
- Strongly depend on renewable or sustainable RES-E
- Moment of charging!
- Incremental options do not offer sufficient savings potential
- AND: It saves primary energy because it is more energy efficient



Grid impact of increased RES-E

The often variable nature of RES-E (wind, solar) can cause a mismatch between supply and demand when a high share of renewable energy is to be implemented

Example: wind energy providing 50% of all electricity



Source: EcoGrid 2007

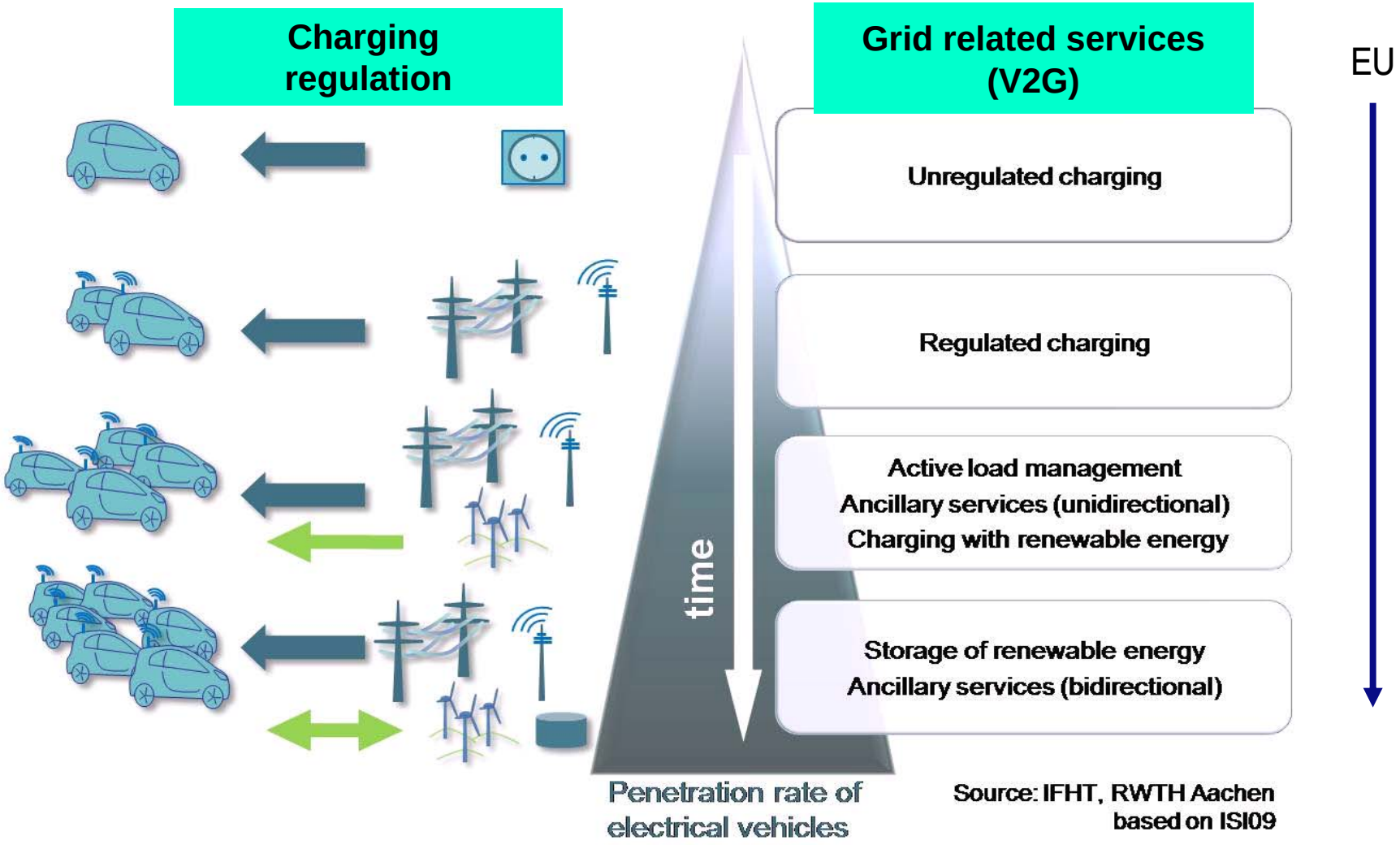
production > demand

demand > production

→ Storage / backup needed

Stages for grid related services of EVs

Two main options to use EVs as enablers for increased RES-E



Developing world: window of opportunity for EVs because of lower consumer demands?

→

Policy options to stimulate EVs

- To stimulate large scale introduction of EV's and co-evolution with RES-E, a two-phased, long term policy approach is needed:

Phase 1
Market Preparation

Prepare for EV's	Increase RES-E production	Ensure balanced grid development
• Infrastructure and standardization • Pilot fleets in niche markets - learning effects and cost reductions • Provide long term perspective to industry	• Feed-in tariffs or premiums • RPS or obligations • Cap and trade	• Priority access for renewables • Coordinate technical and institutional efforts • Smart grids and active load management

Phase 2
Deployment

Increase deployment of EV to reach mass markets

Increase system integration to enable higher use of EV and RES-E

Current RES-E policies are strengthened with increased penetration of EVs

RES-E target as % of electricity demand	• *Direct incentive* because *absolute* RES-E target increases with growth of electricity consumption from EV
Feed-in tariffs or premiums	• *Indirect incentive* when preferential charging improves the profitability of e.g. wind power - more RES-E supported with same subsidy budget
Certificate systems	• *Enabling role* in providing transparency to EV owner
Cap and trade systems	• *Indirect incentive* through increased CO_2 price to RES-E or other low-carbon electricity

In Europe, EVs shift part of transport sector's energy consumption under ETS

ETS

Non-ETS

Direct transport emissions

EVs substituting conventional cars:

- **More CO_2 in ETS**
- **Incentive for RES-E or CCS**
- **Post 2012 ceiling to be negotiated**
- **Refineries included in ETS**

New policies to provide a direct linkage?

DSO

- Invest energy tax for traction current in additional RES-E deployment via energy fund
- Requires smart metering

OEM

- Allow to count EV's as ZEV if financial contribution per sold EV goes to energy fund (depending on vehicle type MJ/km)
- Helps lower overall fleet emissions

Utilities

- System stabilizing bonus if consumers connect their car to the grid
- Set up independent energy fund that invests in RES-E deployment, financed from DSO and OEM

Government

- Hard coupling: increase RES-E share in the system with growing EV market penetration
- Tax exemption on traction current if from RES-E

Conclusions

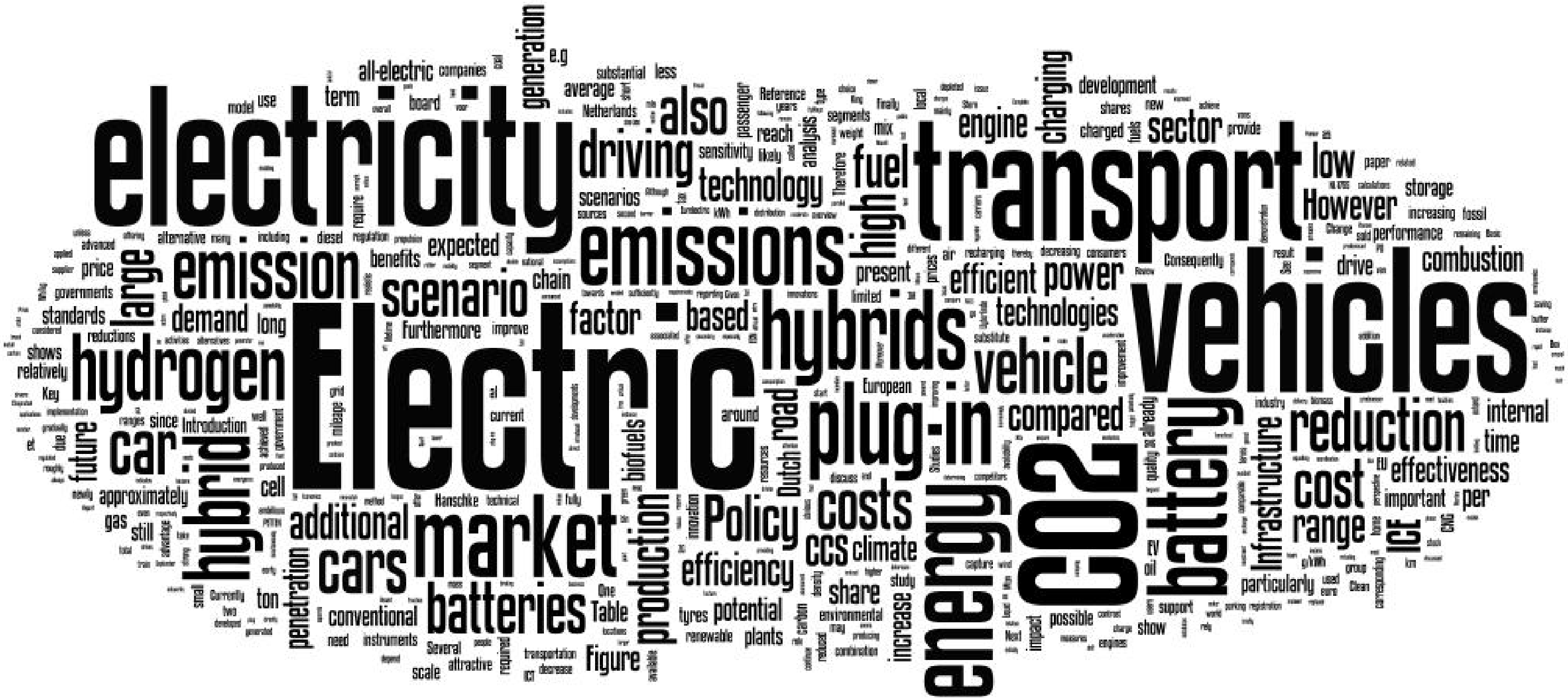
- Renewables **are not dependent** on EVs for their full deployment
  - BUT EVs may help to increase the uptake of renewable energy

- EVs **do need renewables** to realise their full benefit:
  - Reducing greenhouse gas emissions
  - Reduce dependence on fossil fuels

- A **co-evolution** between the introduction of electric vehicles and increased renewable electricity production may provide a range of synergies:
  - Buffering peaks in renewable electricity production
  - Vehicle-to-grid functions: grid stabilisation
  - Improve the business case for electric vehicles and for renewable electricity

- **Coordinated policy approaches** needed for a balanced development in transport and power sector

Thank you!



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Acknowledgements

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http://www.iea-retd.org