



# Opportunities and Risks of Electric Mobility in Switzerland

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Zentrum für Technologiefolgen-Abschätzung  
Centre d'évaluation des choix technologiques  
Centro per la valutazione delle scelte tecnologiche  
Centre for Technology Assessment



# From Hype to Analysis

Again and again: hoping for new mobility technologies that are sustainable without need for changing behavior:

- Electric cars of the 90ies
- Natural gas cars
- Hybrid cars
- Hydrogen cars
- Electric cars of today







... but emobility is not THE solution...

➔ **When is emobility part of the solution („opportunity“), when is it part of the problem („risk“)?**

# Scope of the study

- Future development of cars, power supply and user behavior for the years **2012, 2020, 2035** und **2050**.
- eMobility = electric engine + >50% power from grid: H<sub>2</sub>-cars and hybrids are excluded

Drive Train	 Fullsize	 Compact	 Micro	 3 Wheeler
Combustion engine <b>ICE</b>	<b>X</b>	<b>X</b>	<b>X</b>	
Plug-in Hybrid <b>PHEV</b>	<b>X</b>	<b>X</b>	<b>X</b>	
Battery Electric <b>BEV</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>

# Methods

Future development of car components (Literature study)

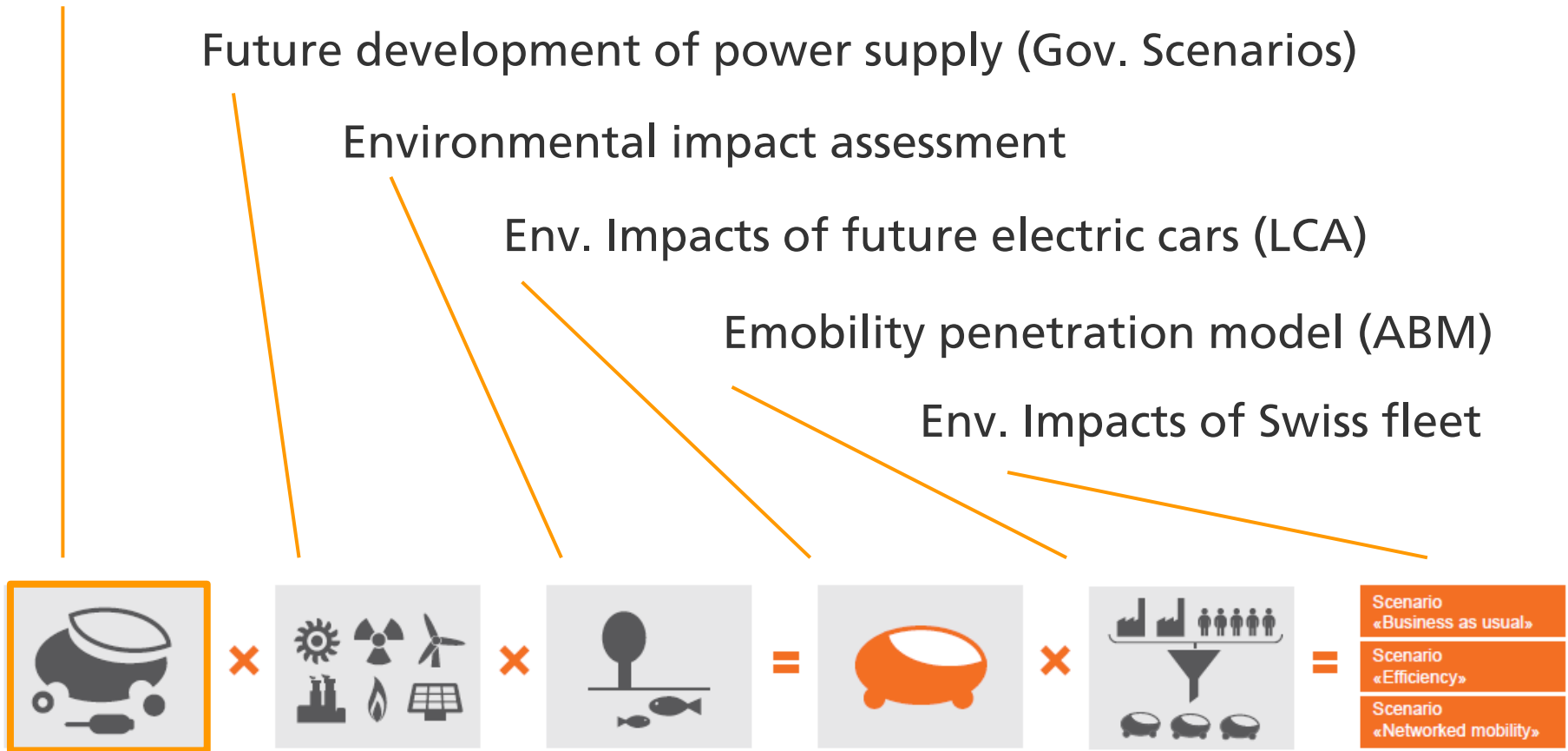
Future development of power supply (Gov. Scenarios)

Environmental impact assessment

Env. Impacts of future electric cars (LCA)

Emobility penetration model (ABM)

Env. Impacts of Swiss fleet



# Technology development: key factors

## BEV

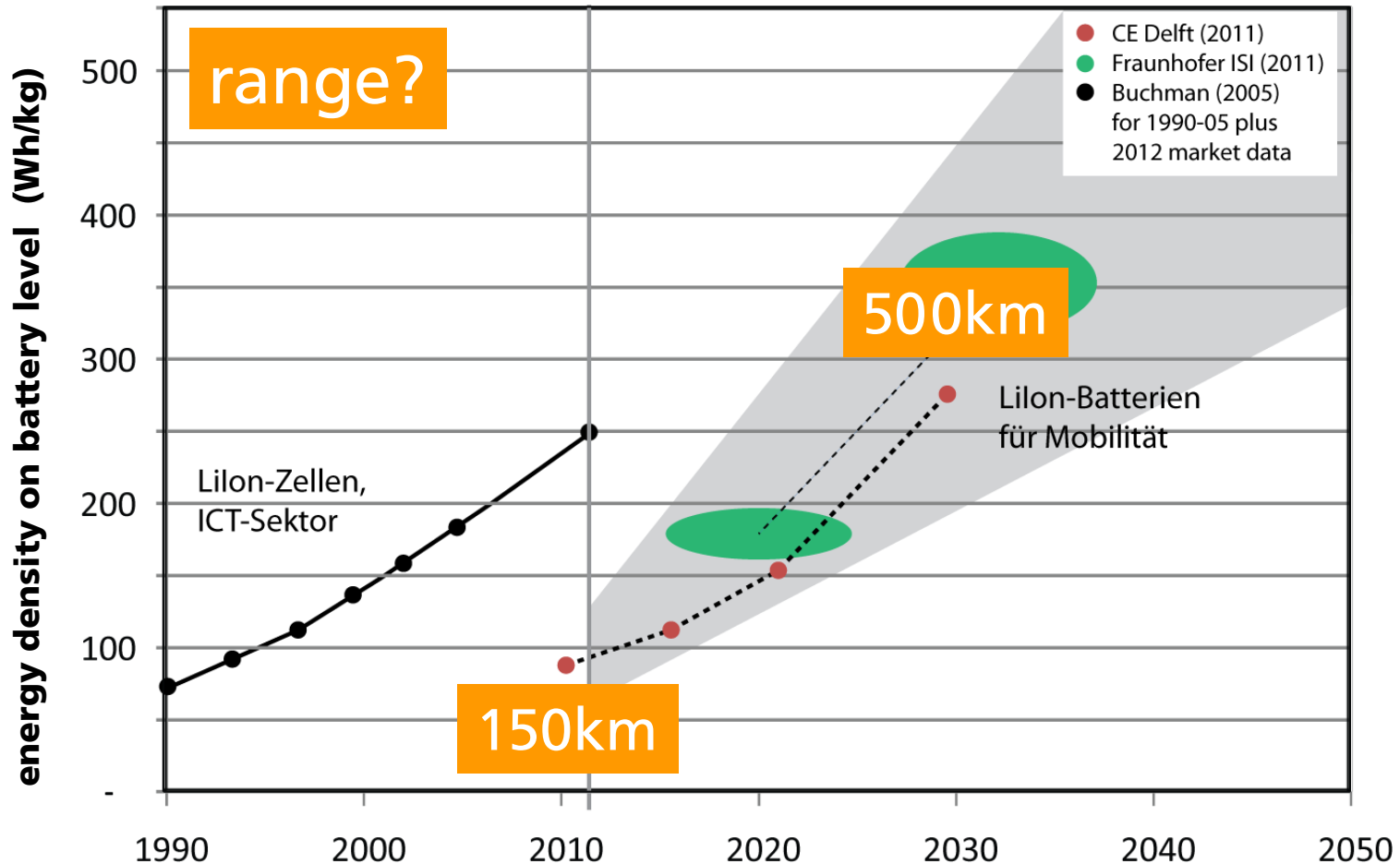
- Costs and energy density of batteries
- Car heating

## ICE

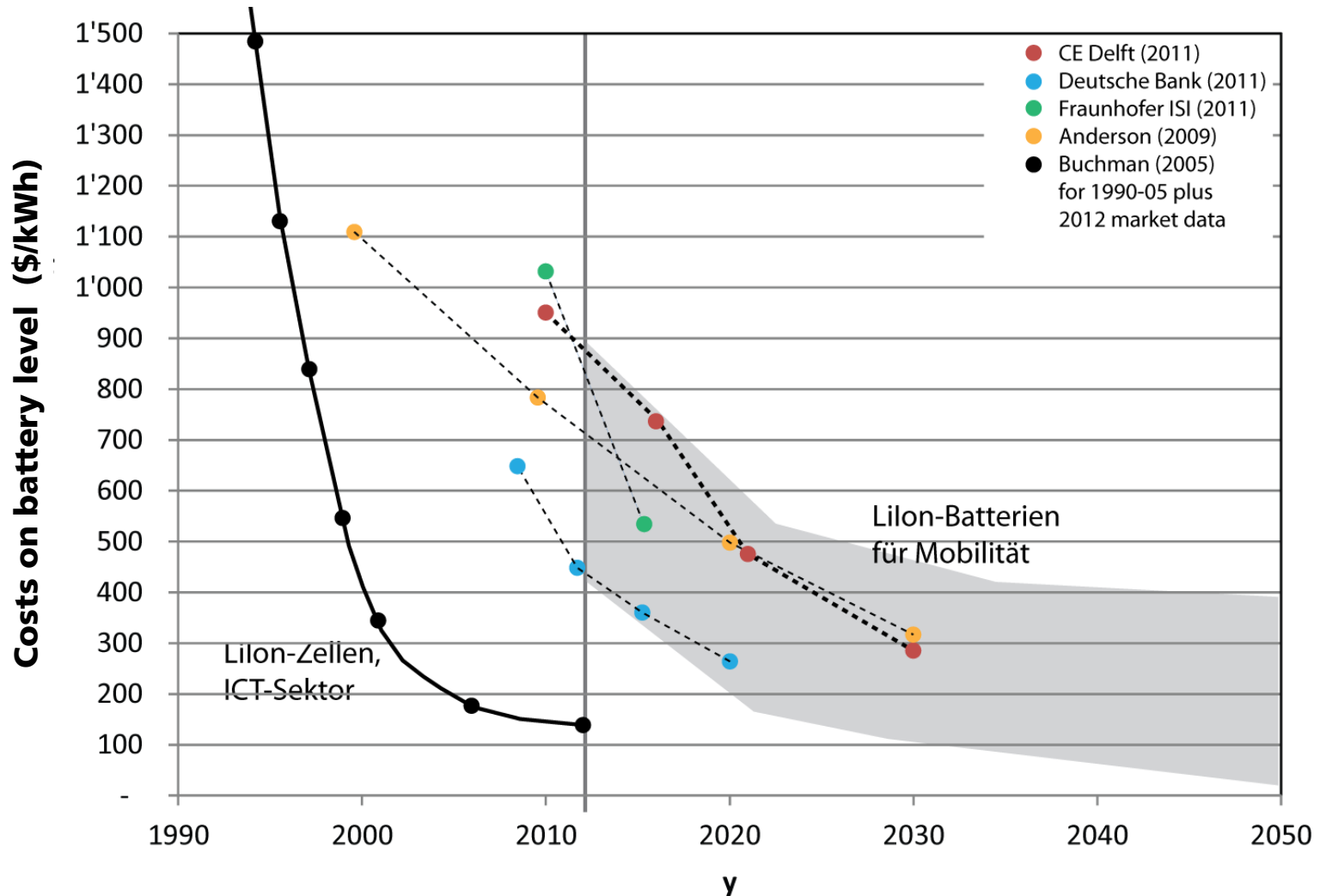
- Efficiency of drive train

**> 30% gain in efficiency  
until 2035**

# Batteries as key factor for emobility penetration



# Potential development of battery costs



# Methods

Future development of car components

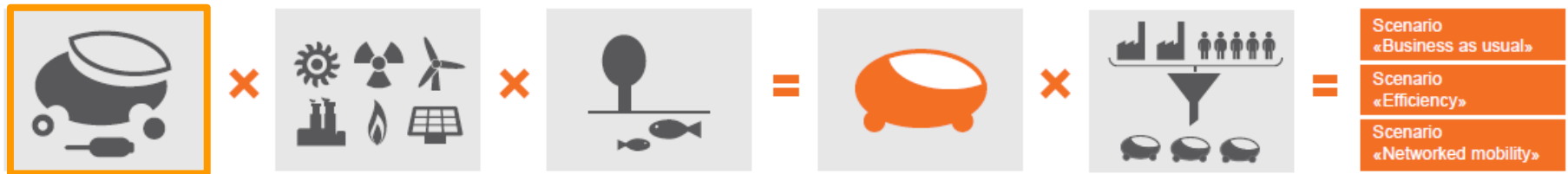
Future development of power supply

Environmental impact assessment

**Env. Impacts of future electric cars**

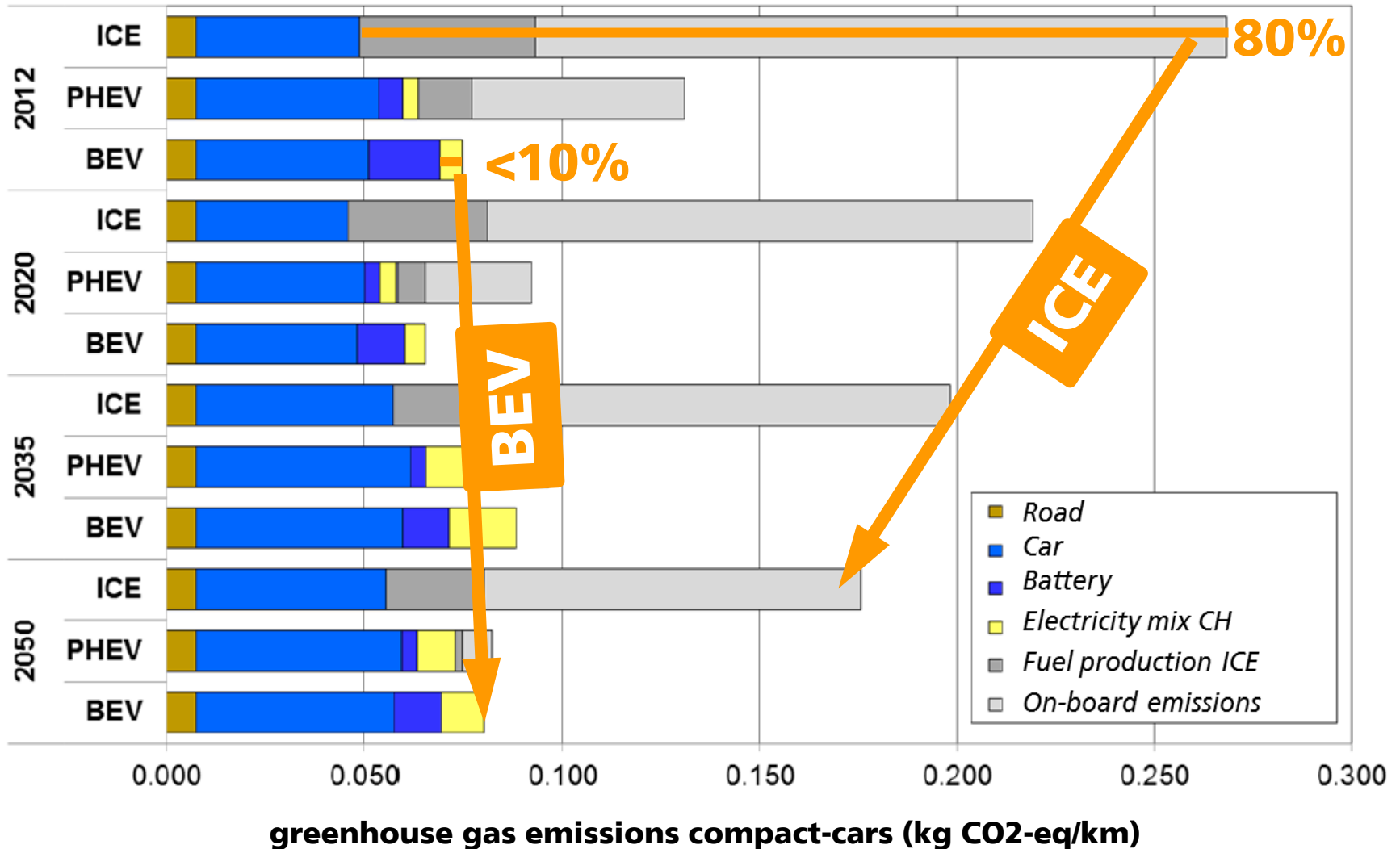
Emobility penetration model

Env. Impacts of Swiss fleet

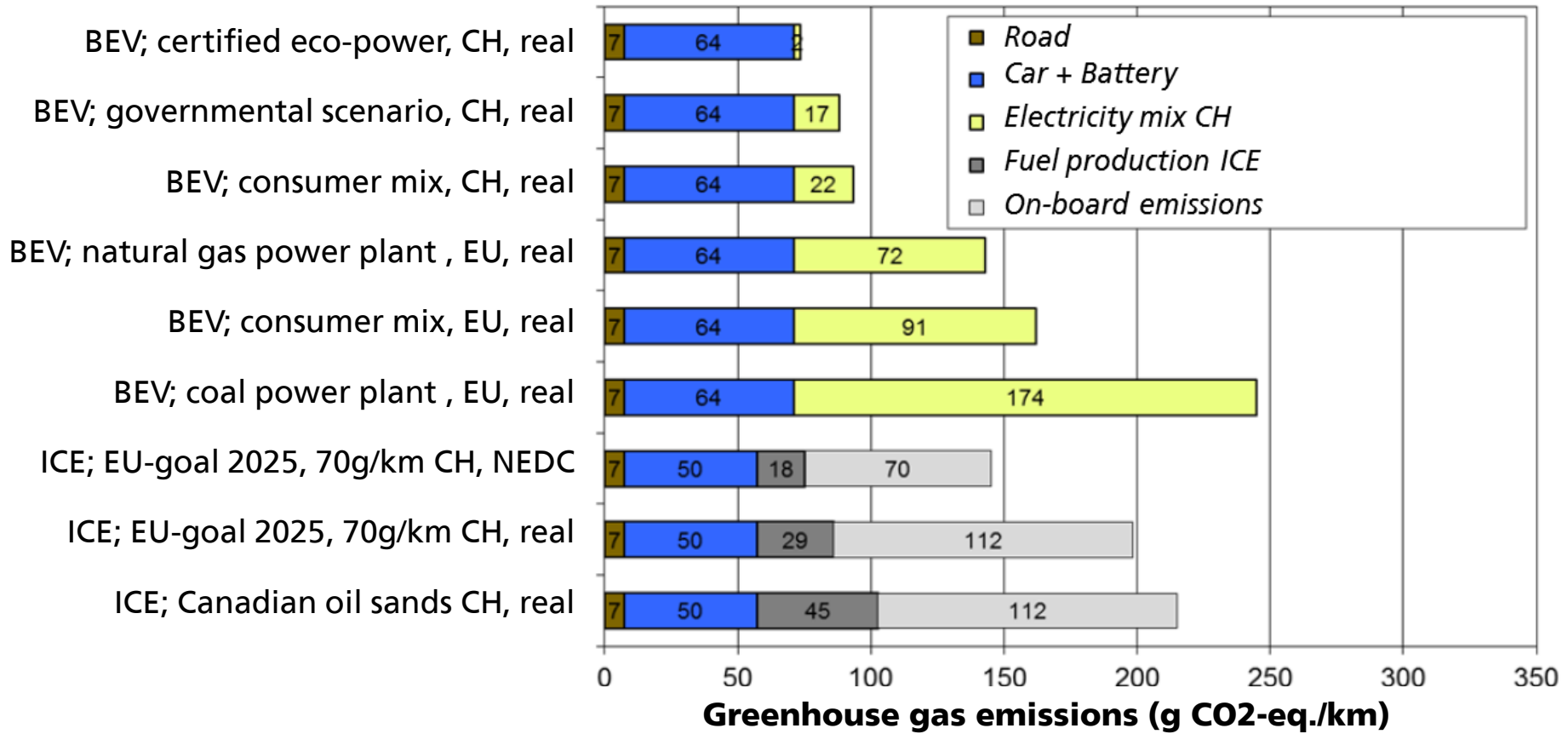




# Development of Life Cycle GHG Emissions



# The role of the electricity mix



# Methods

Future development of car components

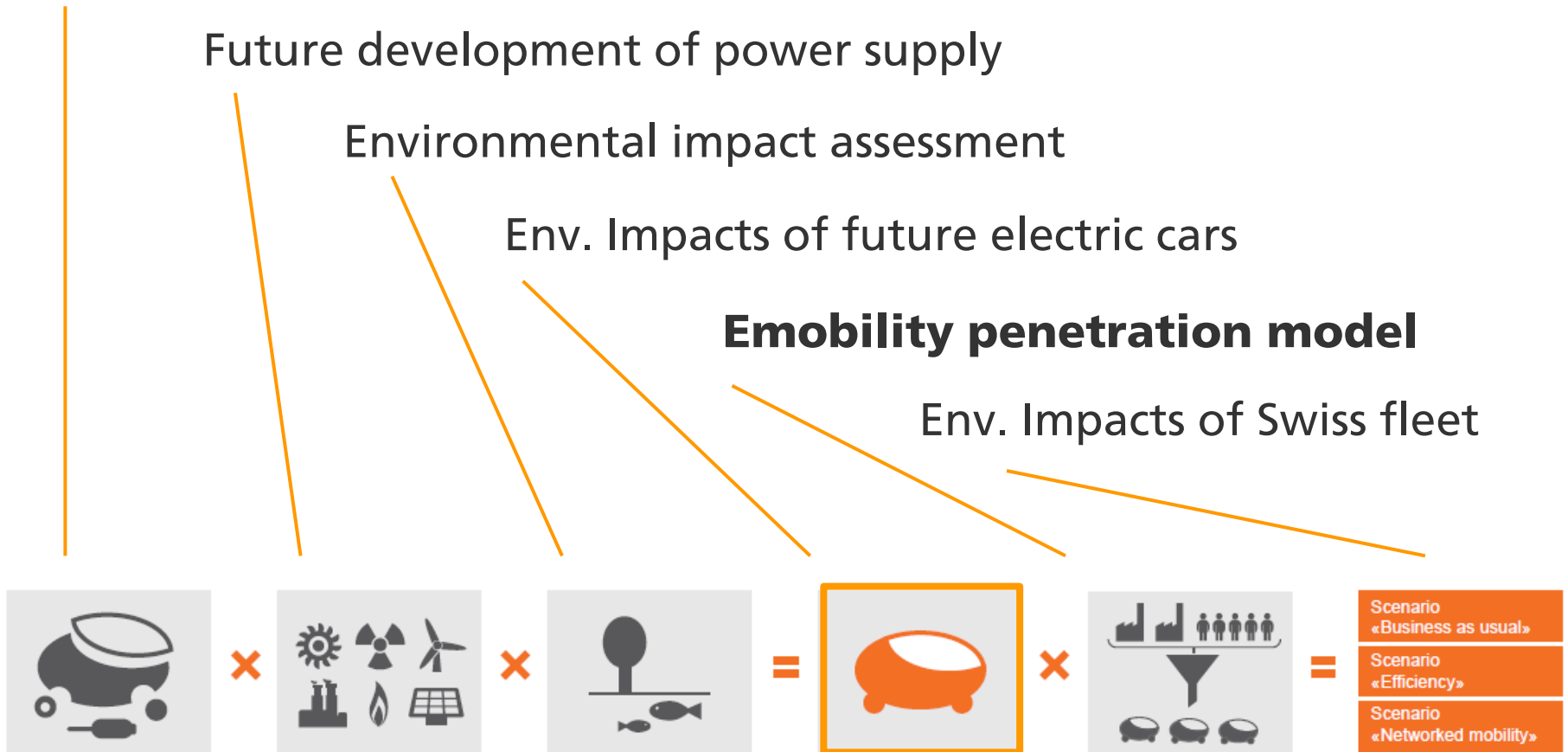
Future development of power supply

Environmental impact assessment

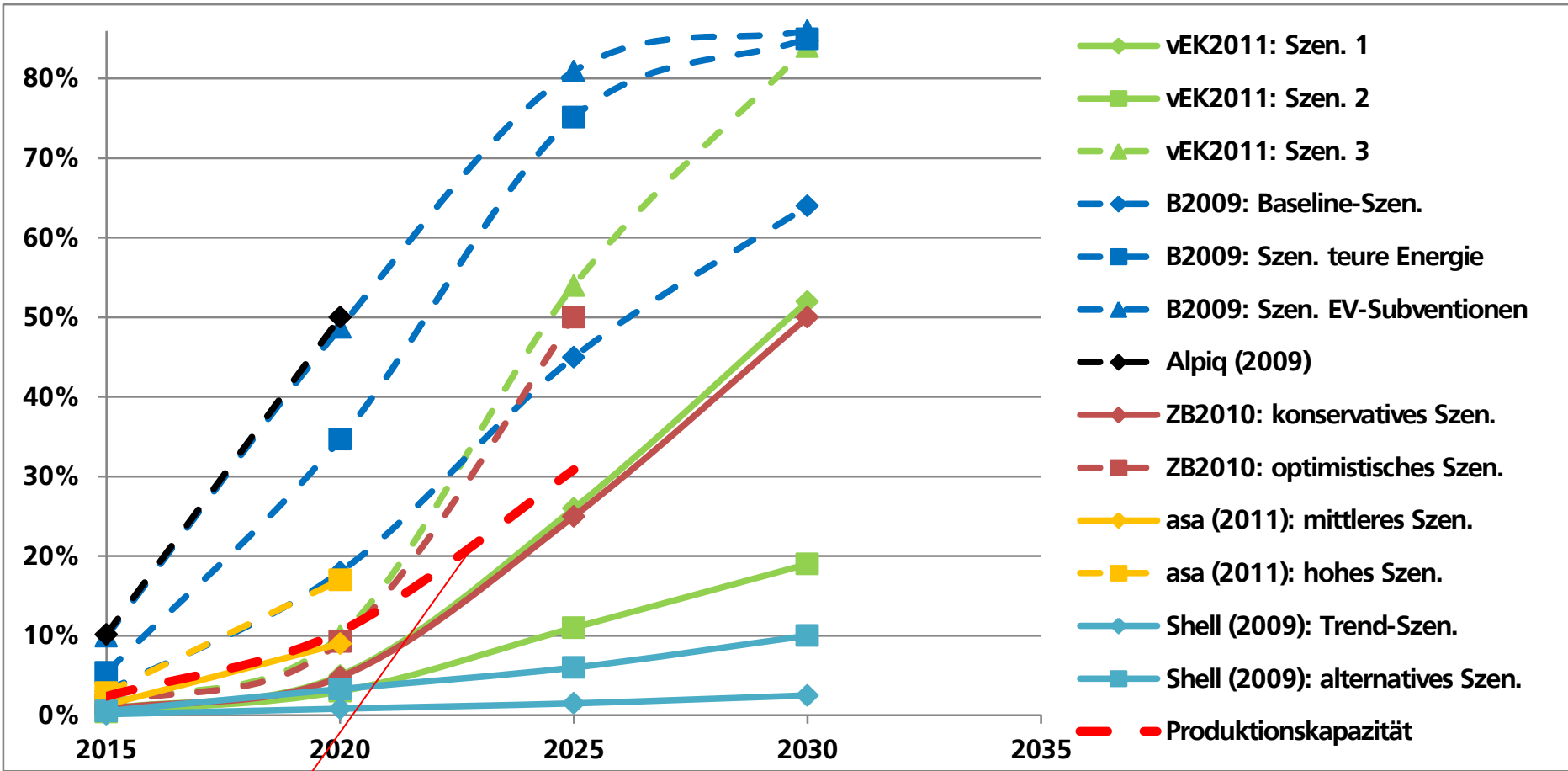
Env. Impacts of future electric cars

**Emobility penetration model**

Env. Impacts of Swiss fleet



# Many forecasts are higher than the technical production capacity of electric cars!

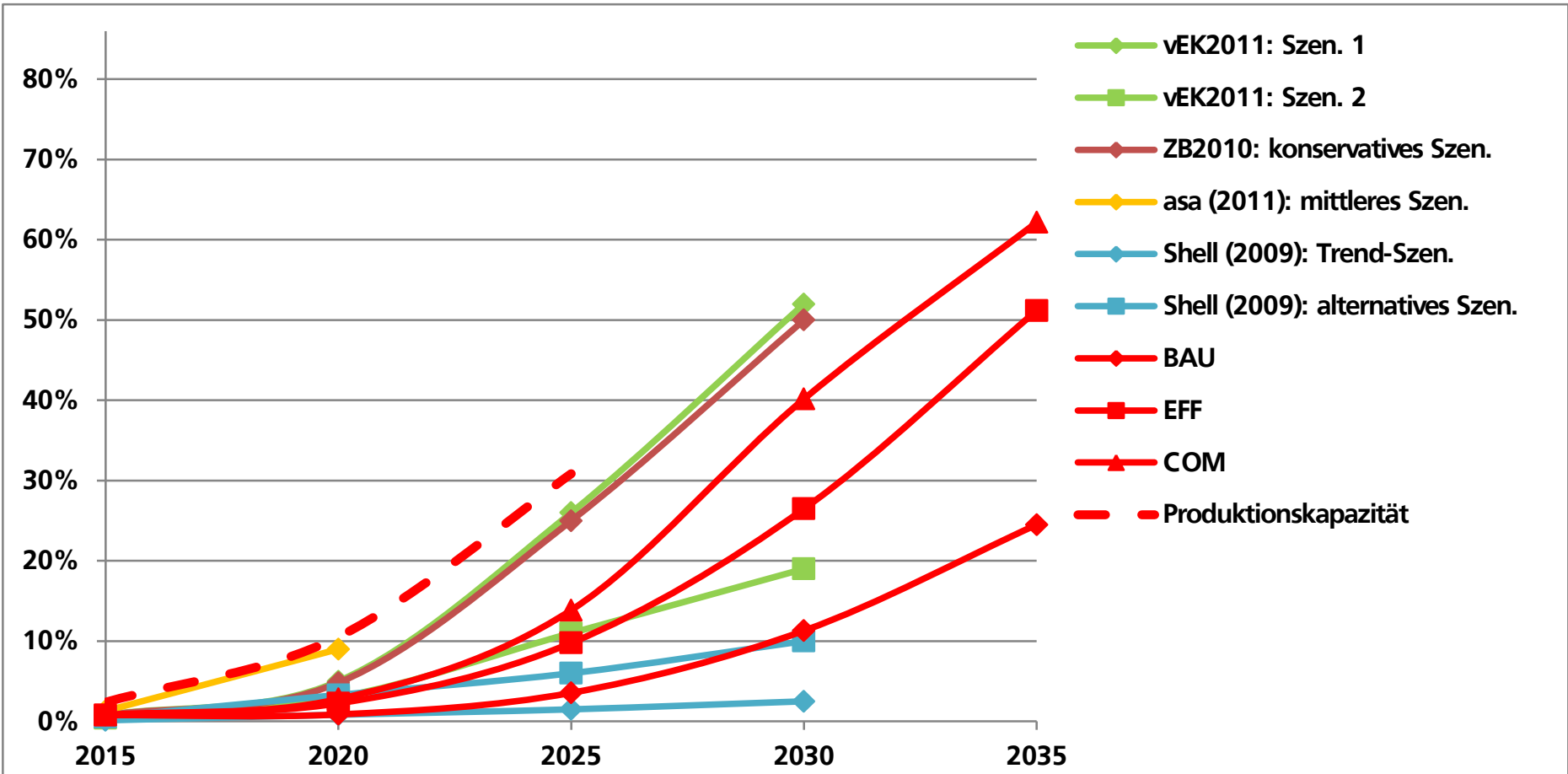


**Maximum global production capacity**

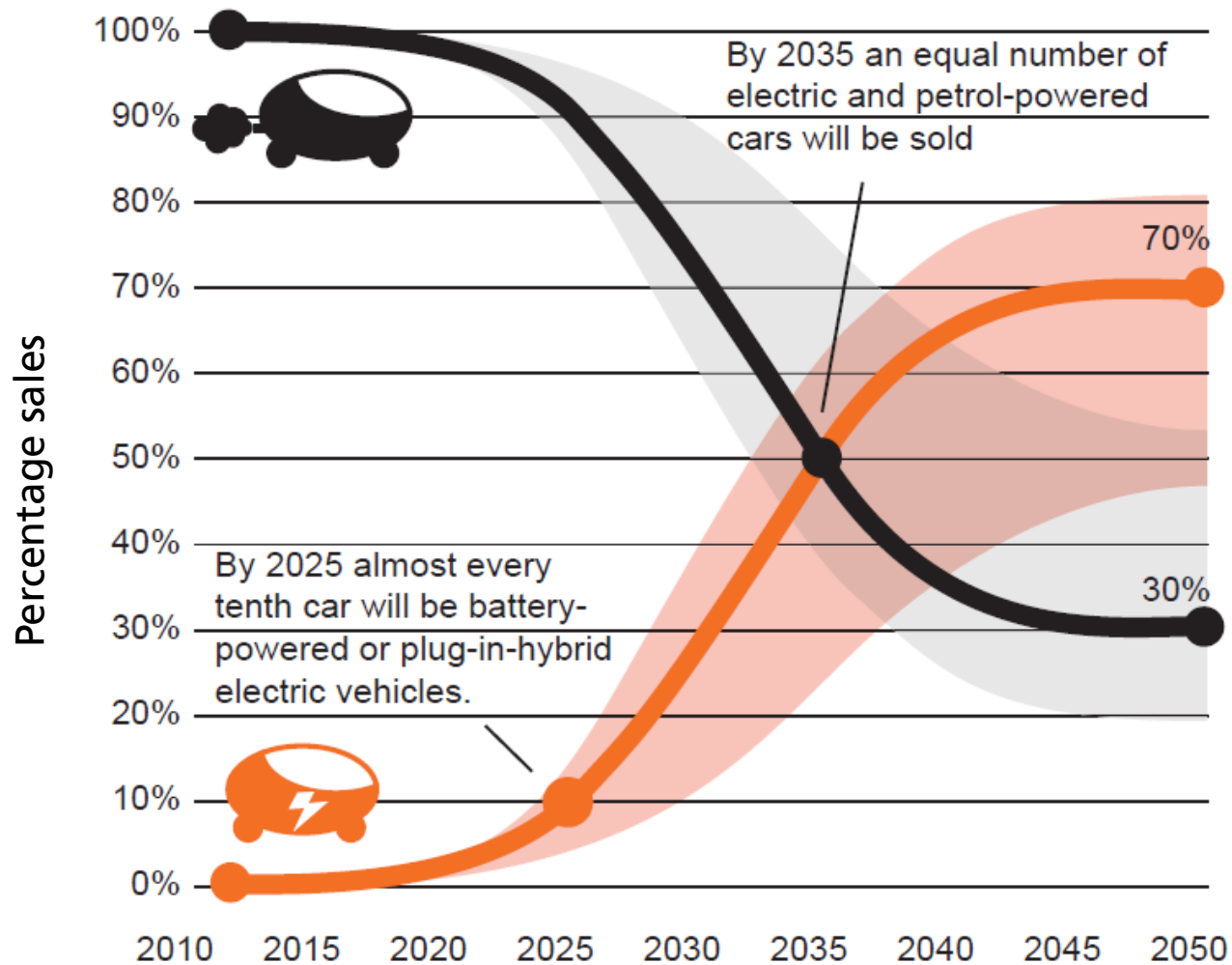
# Scenarios

<b>Business as usual</b>	<b>Efficiency</b>	<b>Connected Mobility</b>
<b>BAU</b>	<b>EFF</b>	<b>COM</b>
<p>Normal technological development:</p> <p>Cars are getting slightly more efficient but not smaller</p>	<p>Governmental pressure towards efficiency:</p> <p>cars are getting smaller, lighter and more efficient</p>	<p>Change in mobility behaviour:</p> <p>«Pull»: electric cars are trendy, social networks for car sharing, good public transport</p> <p>«Push»: km-pricing; traffic jams</p>

# Modelled penetration rates for BAU, EFF, COM



# Electric mobility will never reach 100%; Co-existence with ICE cars even after 2050



# Methods

Future development of car components

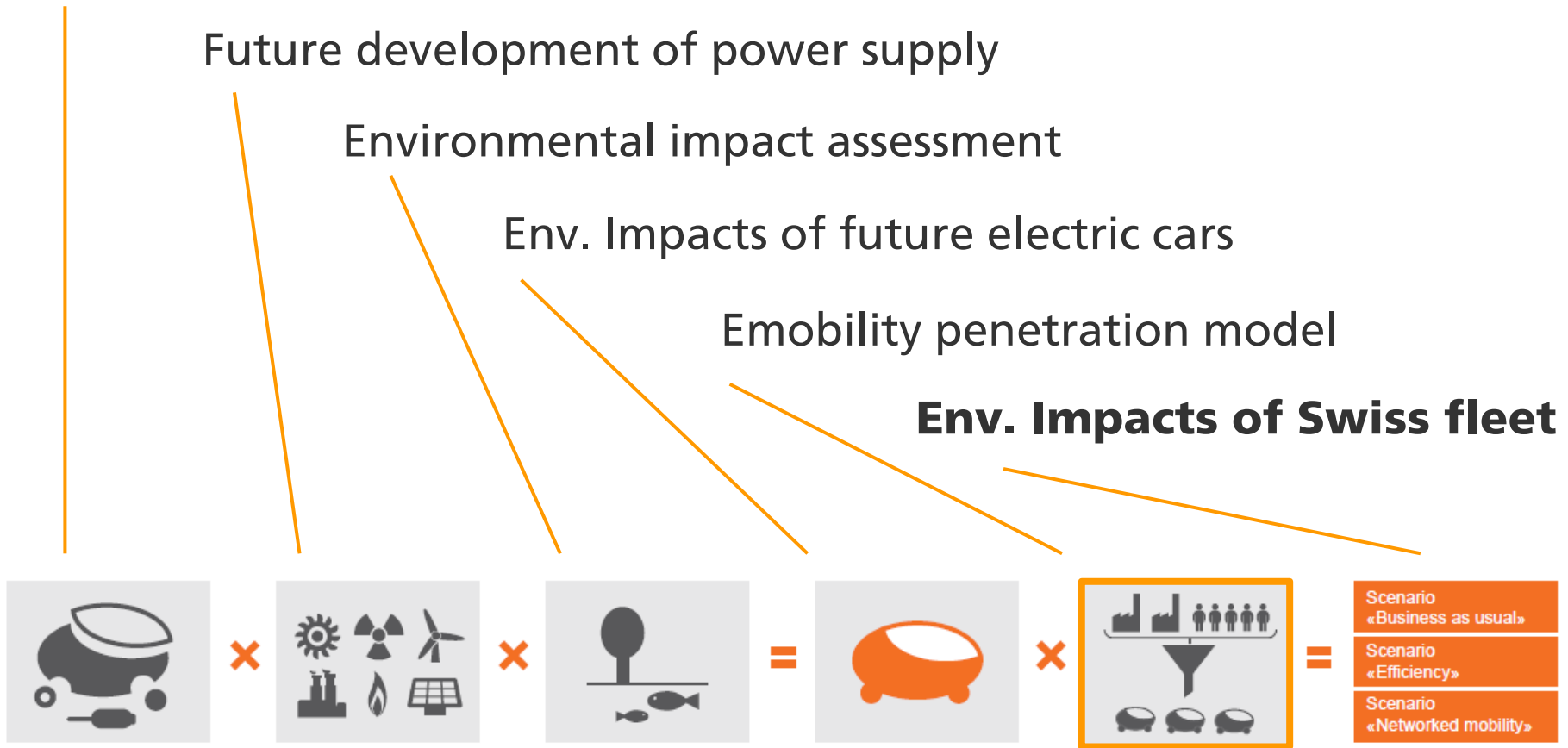
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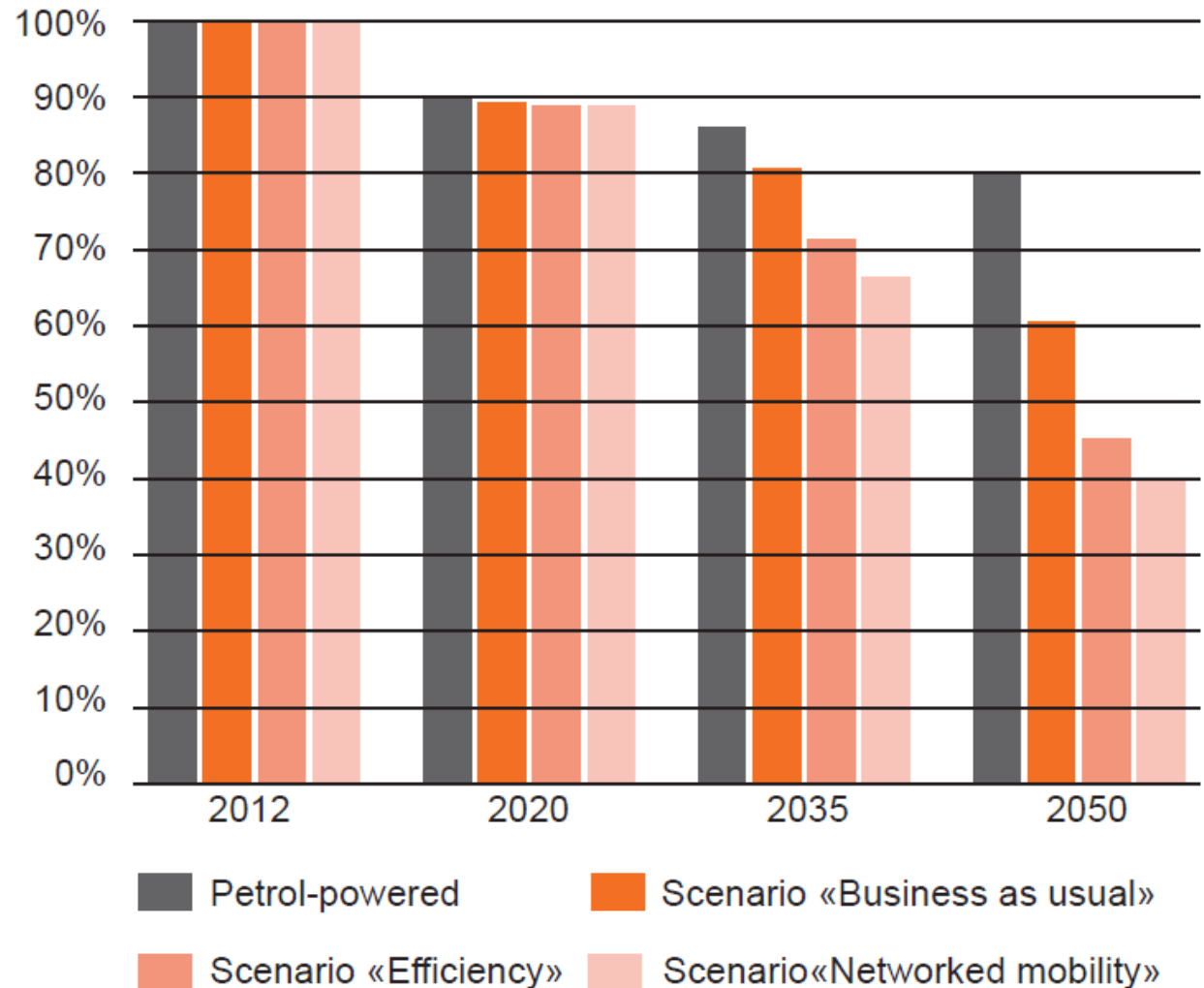
**Env. Impacts of Swiss fleet**





# How are GHG emissions developing?

Greenhouse gas emissions of the Swiss individual car fleet relative to 2012



# Key questions of the session

- Is electric mobility a promising pathway towards sustainable mobility?
  - YES, as sustainability of fossil mobility is generally limited
  - BUT risk of increased impacts in car production, electricity generation and rebound effects
- Are new infrastructures for intermodal transport an additional or an alternative approach?
  - Door opener for eMobility

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*Peter de Haan, Rainer Zah*

## **Chancen und Risiken der Elektromobilität in der Schweiz**

**vdlf**

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