
Energy Economics Group

Vienna University of Technology

Electric Vehicle related Projects

- **ELEK-TRA Project (2008-2009):**

Joanneum Research Forschungsgesellschaft mbH
AVL List GmbH

Hybrid & Electric Vehicles

- Technological Assessment
- Ecological Assessment
- Economic Assessment
- **Model-Based Scenarios of market- & fleet penetration**



- **Vehicle-to-Grid Strategies (2010-2012)**

AIT

ICT - Vienna University of Technology
Salzburg AG

Interaction of EV an Grid

- Grid Requirements
- Load Profiles
- Charging Infrastructure
- Business Models

- **Vehicle-to-Grid Interfaces (2010-2011)**

ICT - Vienna University of Technology

CURE

Salzburg AG

- Interfaces for EV use

***MARKET- AND FLEET-PENETRATION OF
HYBRID AND ELECTRIC CARS IN AUSTRIA
MODEL BASED ANALYSIS 2010-2050***

Maximilian Kloess

Energy Economics Group – Vienna University of
Technology

Background:

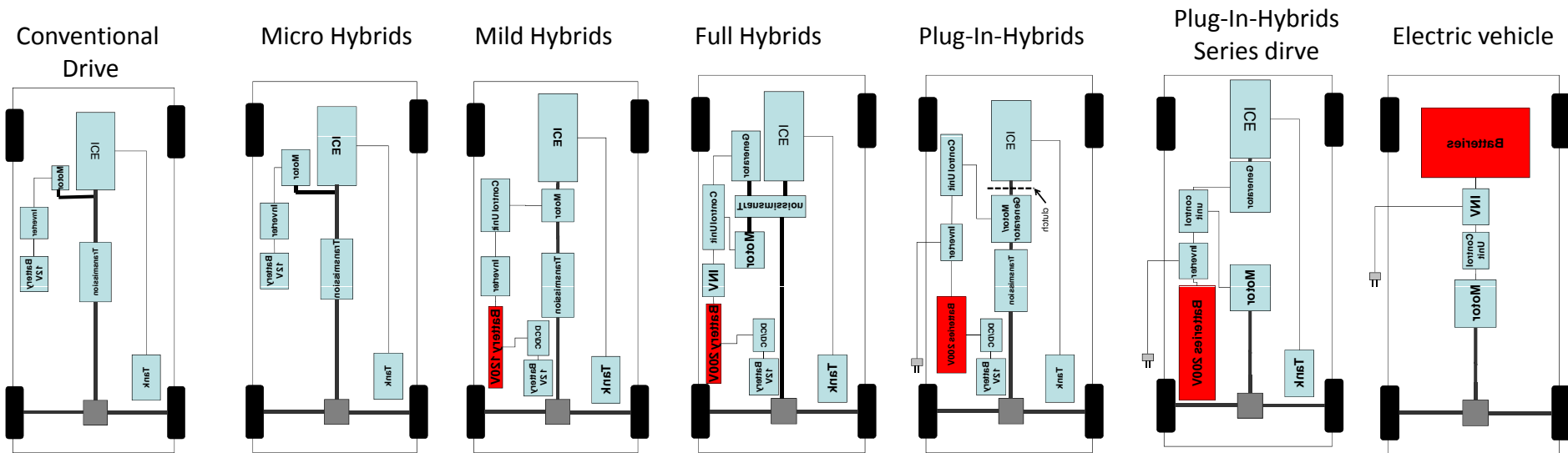
- ELEK-TRA Project 2008/2009:

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AVL List GmbH



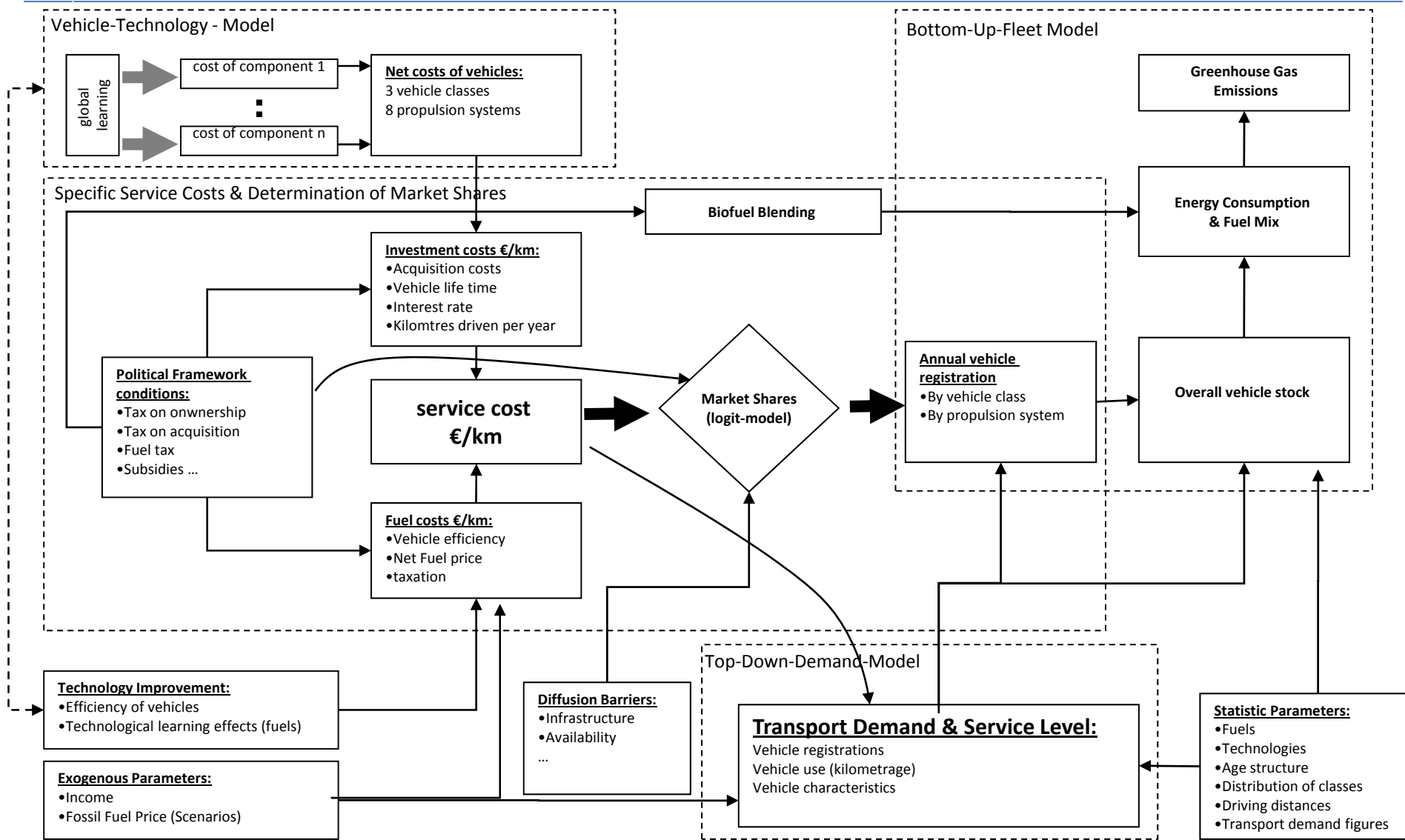
Hybrid & Electric Vehicles

- Technological Assessment
- Ecological Assessment
- Economic Assessment
- **Model-Based Scenarios of market- & fleet penetration**



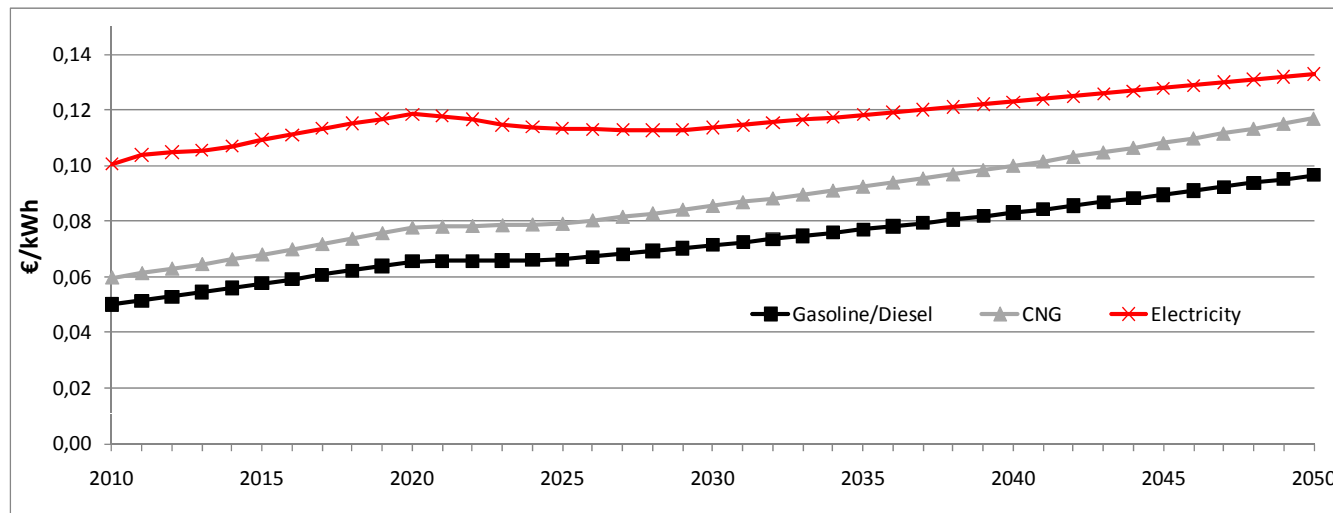
- **Combination of bottom-up and top-down modelling approaches**
 - Bottom-up vehicle technology model
 - Bottom-up fleet model
 - Top down modeling of transport demand and service level
 - Dynamic cost comparison of propulsion systems and fuels
 - Logit-model approach for consumer decision modelling (→ market shares of technologies)
 - **Input parameters**
 - Fuel prices
 - Income level
 - Costs of technologies (components → vehicles)
 - Political framework conditions
- **Scenarios 2010-2050**
- Market- and fleet penetration of vehicle technologies
 - mean vehicle characteristics (mass, power, efficiency)
 - Energy Consumptions (well-to-wheel)
 - Greenhouse gas emissions (well-to-wheel)

Scheme of the model



Scenario framework conditions:

- Fossil fuel price development (scenarios)



Scenario framework conditions:

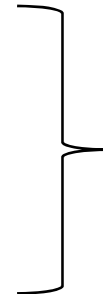
- Fossil fuel price development (scenarios)
- Political framework conditions (taxes, subsidies etc)

– Fuel Taxes: gasoline: 0,45€

 diesel: 0,35€

– Tax on acquisition: 0-16%

– Tax on ownership: 0 - 1500€



Policy Scenarios 2010 - 2050

Scenario framework conditions:

- Fossil fuel price development (scenarios)
- Political framework conditions (taxes, subsidies etc)
- Technological Learning of alternative powertrain technologies (key components)
- Fuel supply scenarios:
 - Biofuel blending
 - Sources of Electricity

Assumptions for presented results:

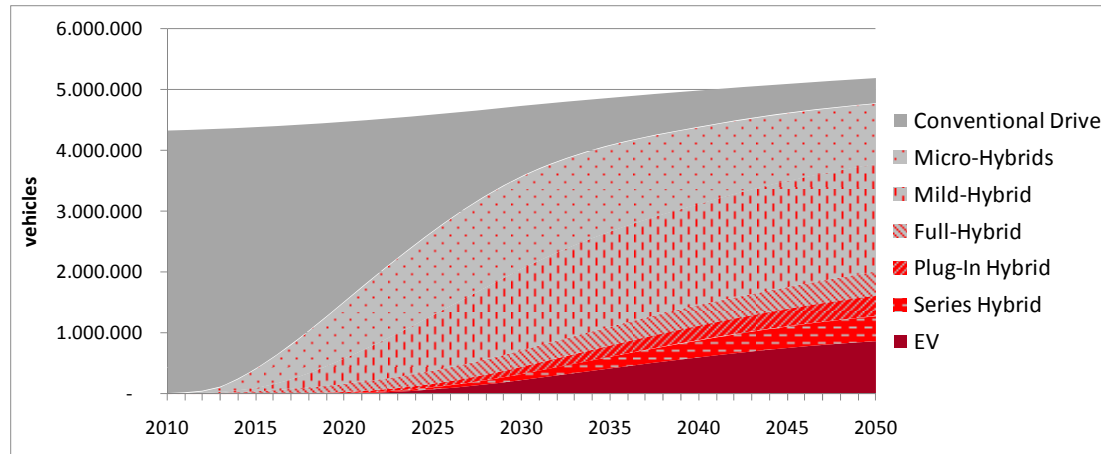
- Policy – Business-as-usual (BAU)
 - Policy – Active
- } + low fuel price scenario

		Business as Usual Policy											Active Policy																														
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Vehicle Taxes	Tax On Ownership Engine Power	[Grey bar]																																									
	Tax on Acquisition Status 2010	[Grey bar]																																									
	CO2 threshold-140g/km	[Grey bar]																																									
	CO2 threshold-120g/km CO2 threshold-100g/km	[Grey bar]																																									
Fuel Taxes	Fuel Tax Status 2010	[Grey bar]																																									
	Scheme 1	[Grey bar]																																									
	Scheme 2	[Grey bar]																																									
	Scheme 3	[Grey bar]																																									
	Scheme 4	[Grey bar]																																									

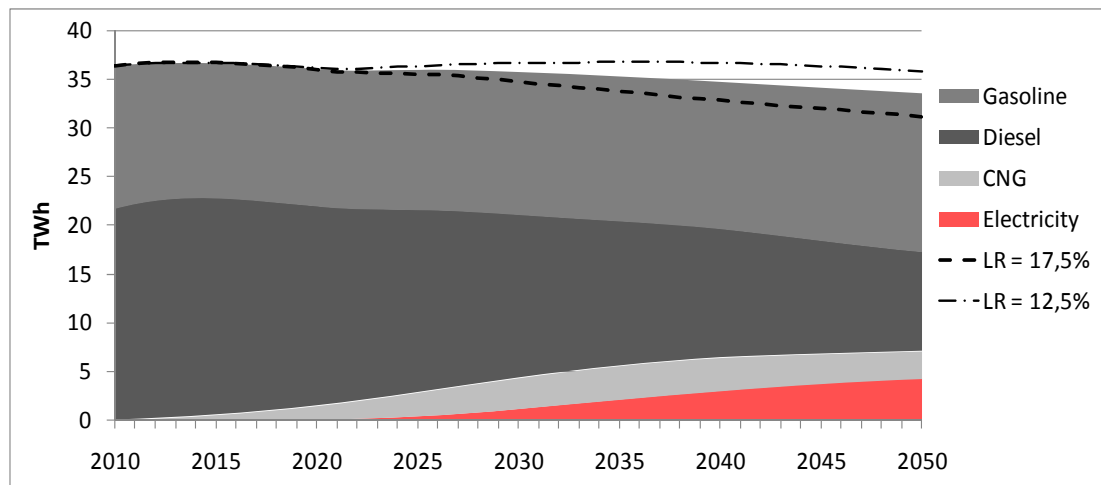
		Status 2010	Scheme 1	Scheme 2	Scheme 3	Scheme 4
Gasoline	€ kWh-1	0.051	0.051	0.05	0.07	0.10
Diesel	€ kWh-1	0.036	0.036	0.05	0.07	0.10
CNG	€ kWh-1	0	0.036	0.05	0.07	0.10
Electricity	€ kWh-1	0	0	0	0	0.02

Business-as-usual (BAU)

Fleet development:

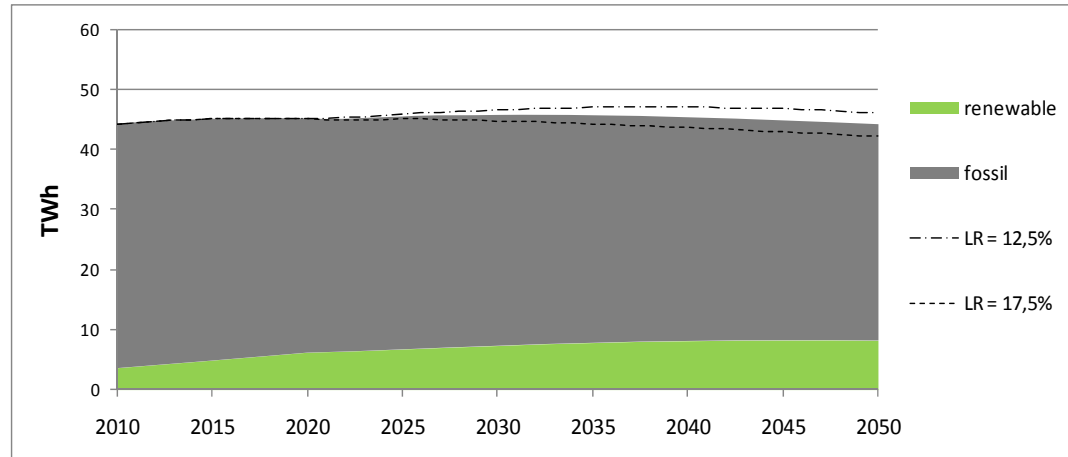


Final energy consumption:

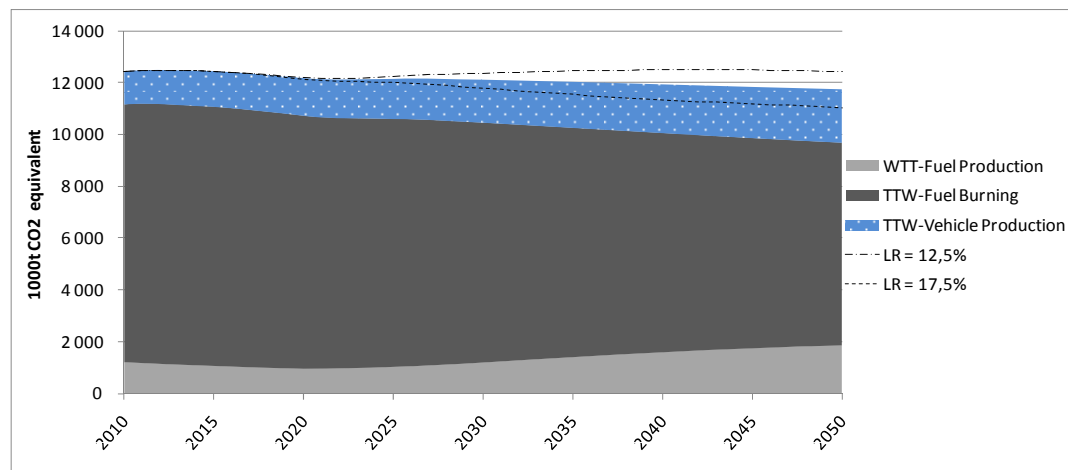


Business-as-usual (BAU)

WTW – Energy Consumption:



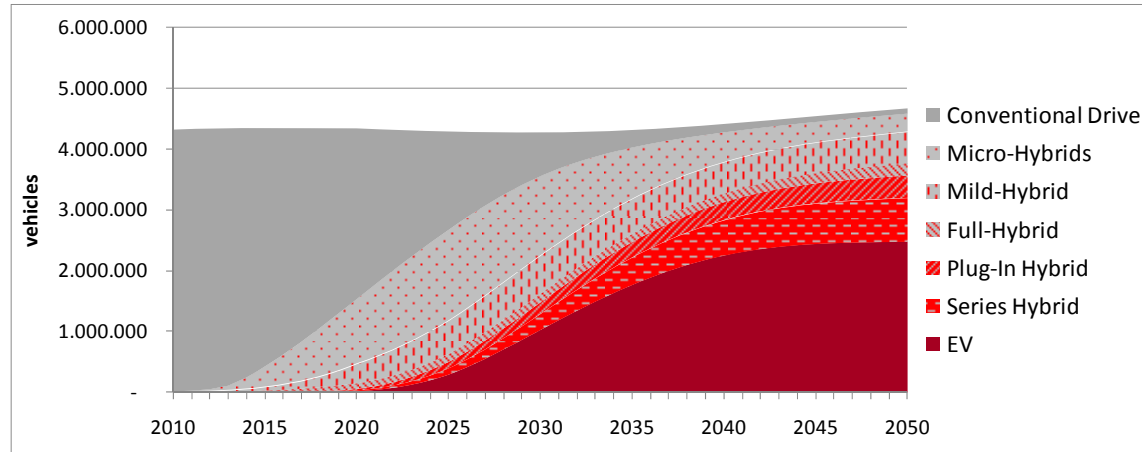
WTW – Greenhouse Gas Emissions:



Policy – Active

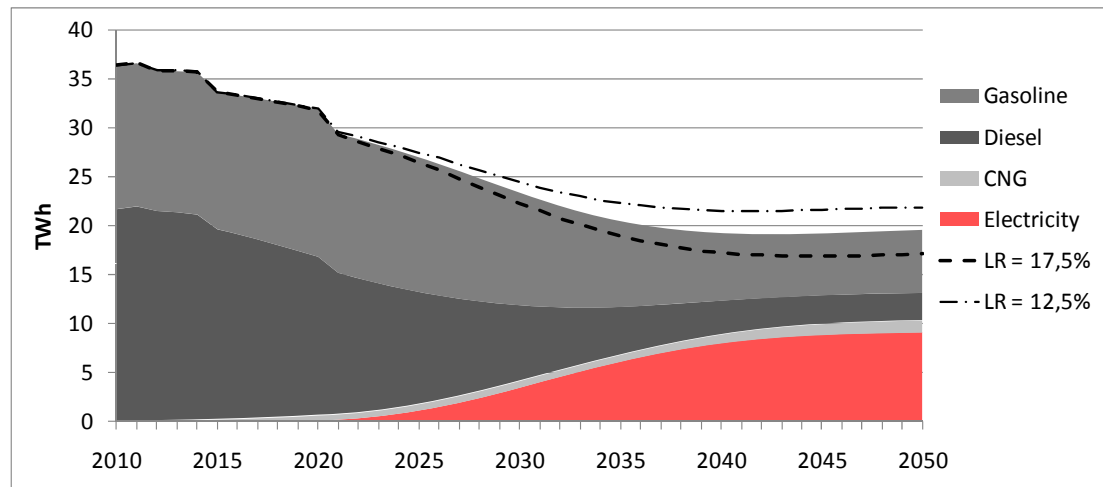
Fleet development:

2050:
70% Electric or
Plug-In Hybrid Cars



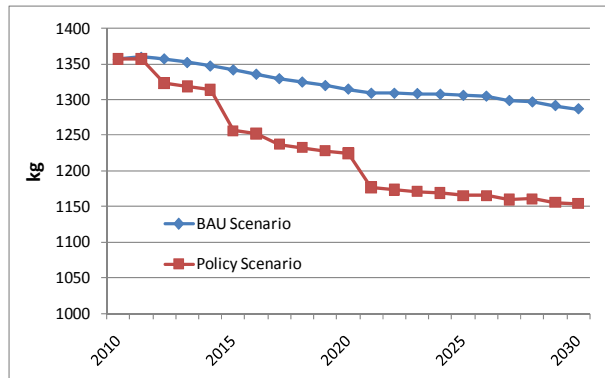
Final energy consumption:

2050:
50% electricity in the energy supply

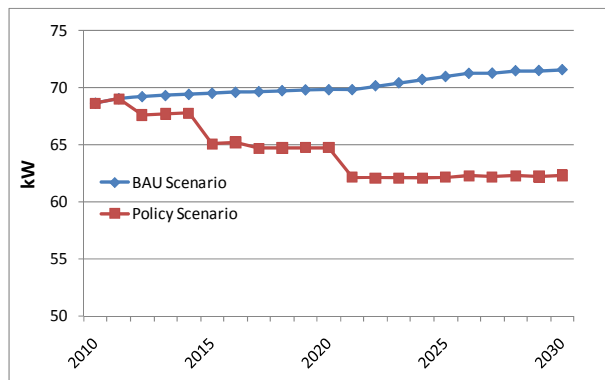


Characteristics of new cars in the two scenarios:

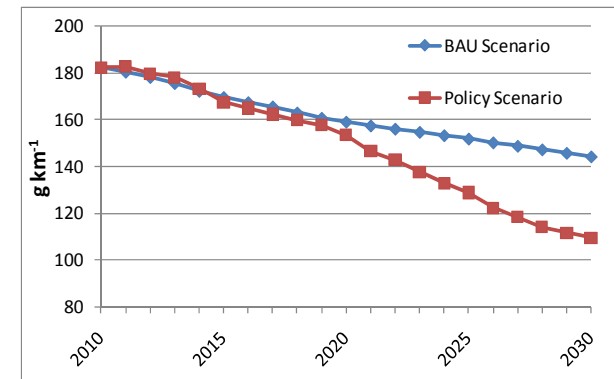
Average mass:



Average power:



Greenhouse gas emissions:

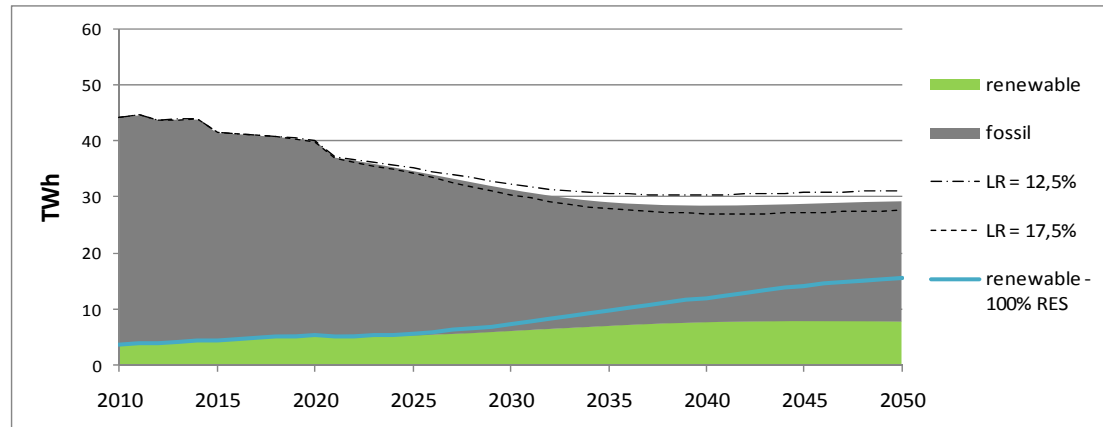


Policy – Active

WTW – Energy Consumption:

2010-2050:

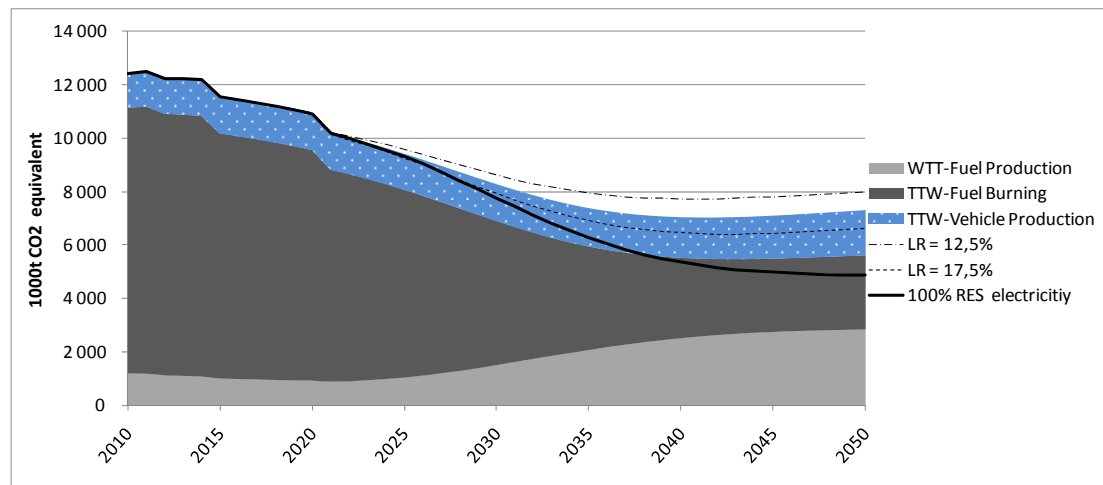
-50% fossil energy demand
with with 100% renewable electricity



WTW – Greenhouse Gas Emissions:

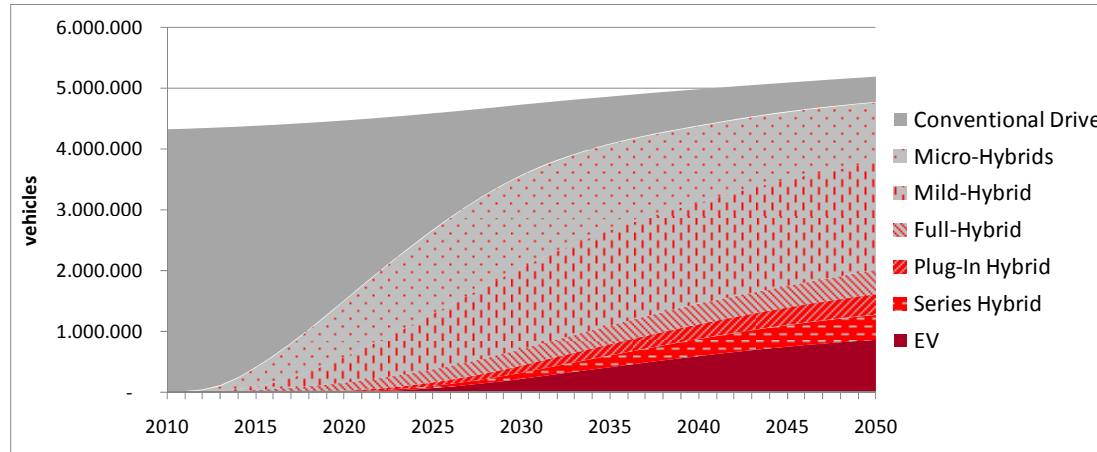
2010-2050:

-50% with fossil electricity (nat. gas)
-65% with 100% renewable electricity



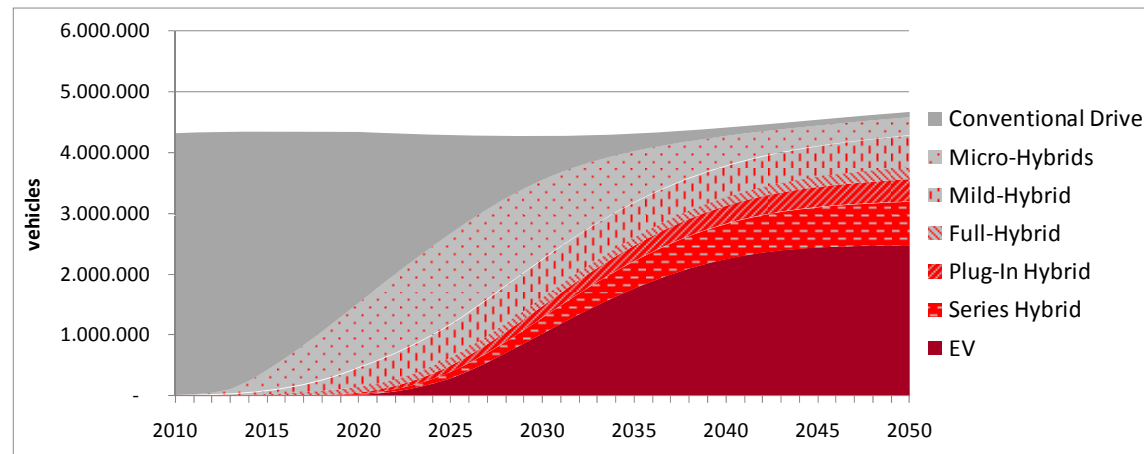
Business-as-usual (BAU)

Fleet development:



Active Policy Scenario

Fleet development:



Thank you for your attention!

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