The role of Electrical vehicles in Europe

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Outcome from the ERA-Net Project EV-STEP

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Motivation and objective

- What will be the perspective electro-mobility in the transport sector of the EU-28 as a whole and in the countries is one main question at the moment ?
- Varied assumptions concerning energy, climate and environmental policy in the EU can have impact on the role of electro-mobility.
- The penetration of electric vehicle concepts can have impacts on the sustainability of both, transport sector and the total energy system.

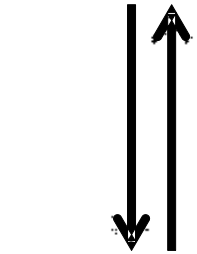
Analyze with a scenario analysis the role of electro-mobility in the energy system in the EU-28 and there member states

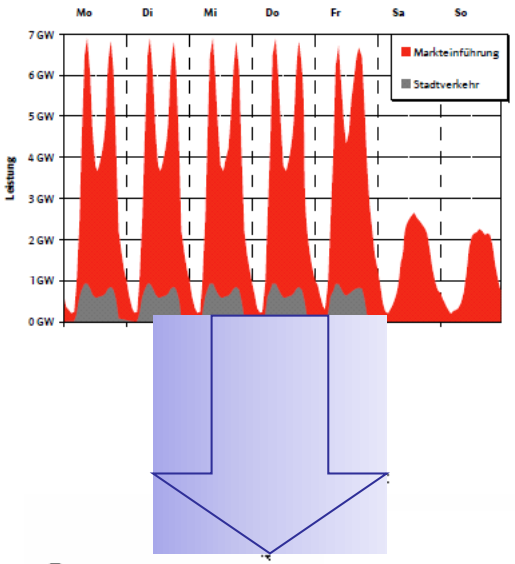
TIMES PanEU

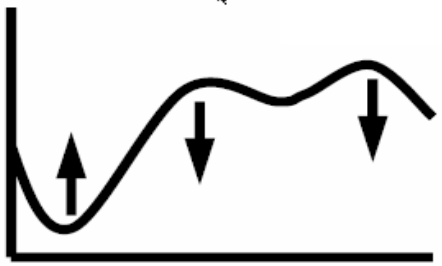
- **Technology oriented bottom-up partial equilibrium model**
- **30 region model (EU 28, No, CH, IS)**
- **Energy system model**
  - **SUPPLY: reserves, resources, exploration and conversion Country specific renewable potential and availability (onshore wind, offshore wind, ocean, geothermal, biomass, biogas, hydro)**
  - **Electricity: public electricity plants, CHP plants and heating plants**
  - **Residential and Commercial: End use technologies (space heating, water heating, space cooling and others)**
  - **Industry: Energy intensive industry (Iron and steel, aluminium copper ammonia and chlorine, cement, glass, lime, pulp and paper), food, other industries, autoproducer and boilers**
  - **Transport: Different transport modes (cars, buses, motorcycles, trucks, passenger trains, freight trains), aviation and navigation**
- **Country specific differences for characterisation of new conversion and end-use technologies**
- **Time horizon 2010 - 2050**
- **GHG: CO2, CH4, N2O, SF6 /Others pollutants: SO2, NOx, CO, NMVOC, PM2.5, PM10**

Schematic representation of the consideration of Vehicle-to-Grid (V2G) energy storage in TIMES PanEU

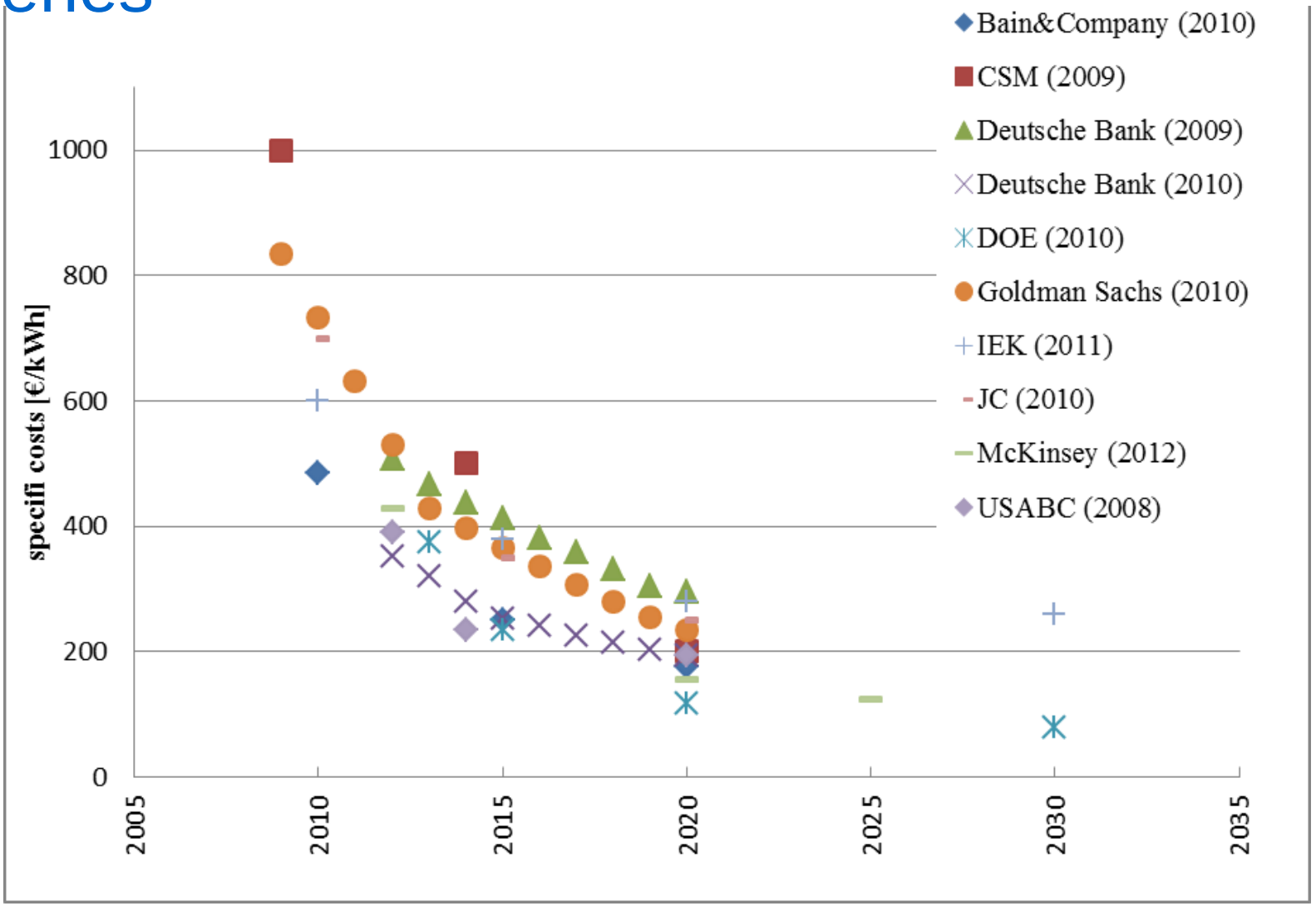
- Idea: Electric vehicles (BEV, PHEV) serve as energy storage if connected to grid
- Thus, they could provide (peak) electricity if necessary
- Recharging during off -peak times
- However, keep sufficient energy for vehicle trips
- Additional battery cycles decrease battery lifetime!







Development of specific investment cost of batteries



Overview of the scenarios

	REF	REF-	EU	EU-
GHG reduction target	EU-ETS: -21% till 2020 comp. 2005 afterwards -1,74% p.a.		Overall GHG reduction -20% till 2020 and -80% till 2050	
Renewable	**Increasing reliance on RES, 60% share in electricity consumption 2050**			
Electromobility	**national targets**	**no**	**national targets**	**no**
Biofuels	**national targets**	**no**	**national targets**	**no**

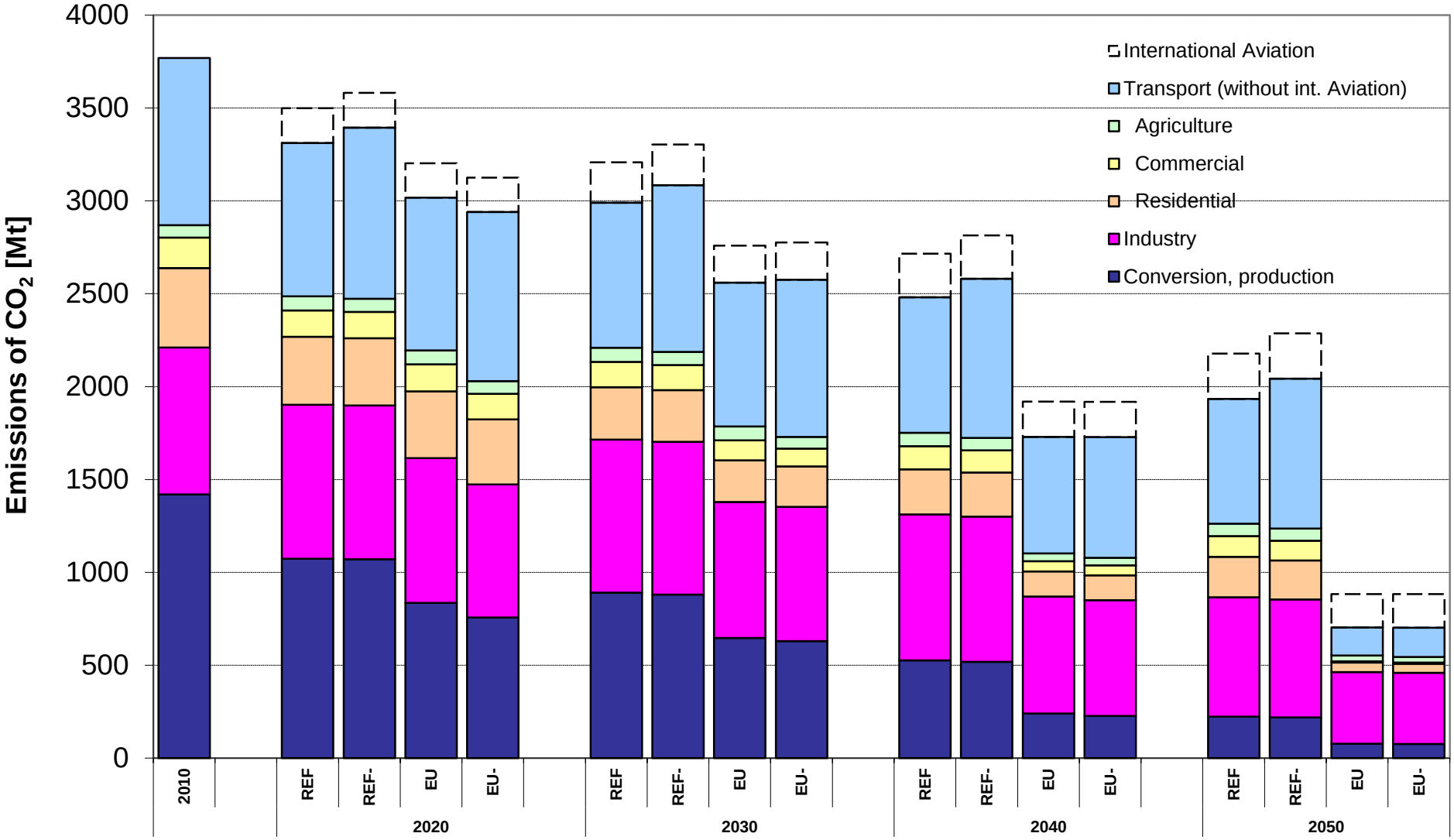
Social economic assumptions:

		2010	2020	2030	2040	2050
Population	Mio.	497	500	499	491	476
Average growth per annum	%		0,01	0,00	-0,2	-0,3
GDP	$10^{12}€_{07}$	12,0	15,1	17,9	20,9	24,5
Average growth per annum	%		1,7	1,7	1,6	1,6

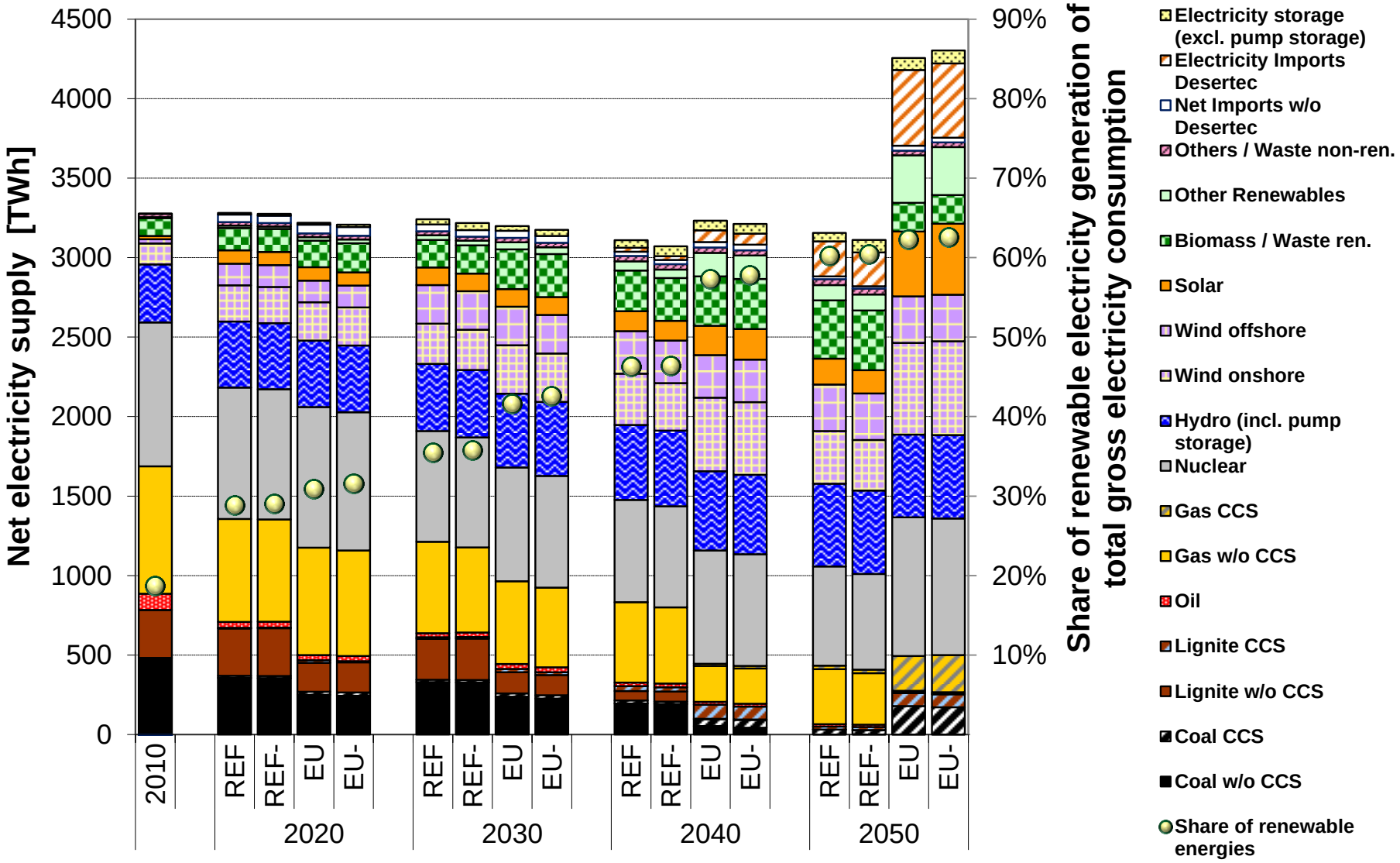
Mobility demand in the EU28

		2005	2020	2030	2040	2050
EU-28						
Passenger traffic (without aviation)	**Bio. Pkm**	**5.857**	**6.458**	**6.796**	**6.884**	**6.911**
car/motorcycles	*%*	*83,6*	*83,8*	*84,0*	*84,2*	*84,5*
bus	*%*	*8,8*	*8,4*	*8,1*	*7,9*	*7,7*
train	*%*	*7,6*	*7,8*	*7,9*	*7,9*	*7,8*
Aviation	**PJ**	**2.066**	**2.947**	**3.399**	**3.634**	**3.787**
Good transport	**Bio. tkm**	**2.549**	**3.268**	**3.762**	**4.009**	**4.133**
trucks	*%*	*72,3*	*74,8*	*75,1*	*75,2*	*75,0*
rail	*%*	*16,7*	*14,7*	*14,4*	*14,5*	*14,6*
navigation	*%*	*11,0*	*10,4*	*10,5*	*10,3*	*10,3*

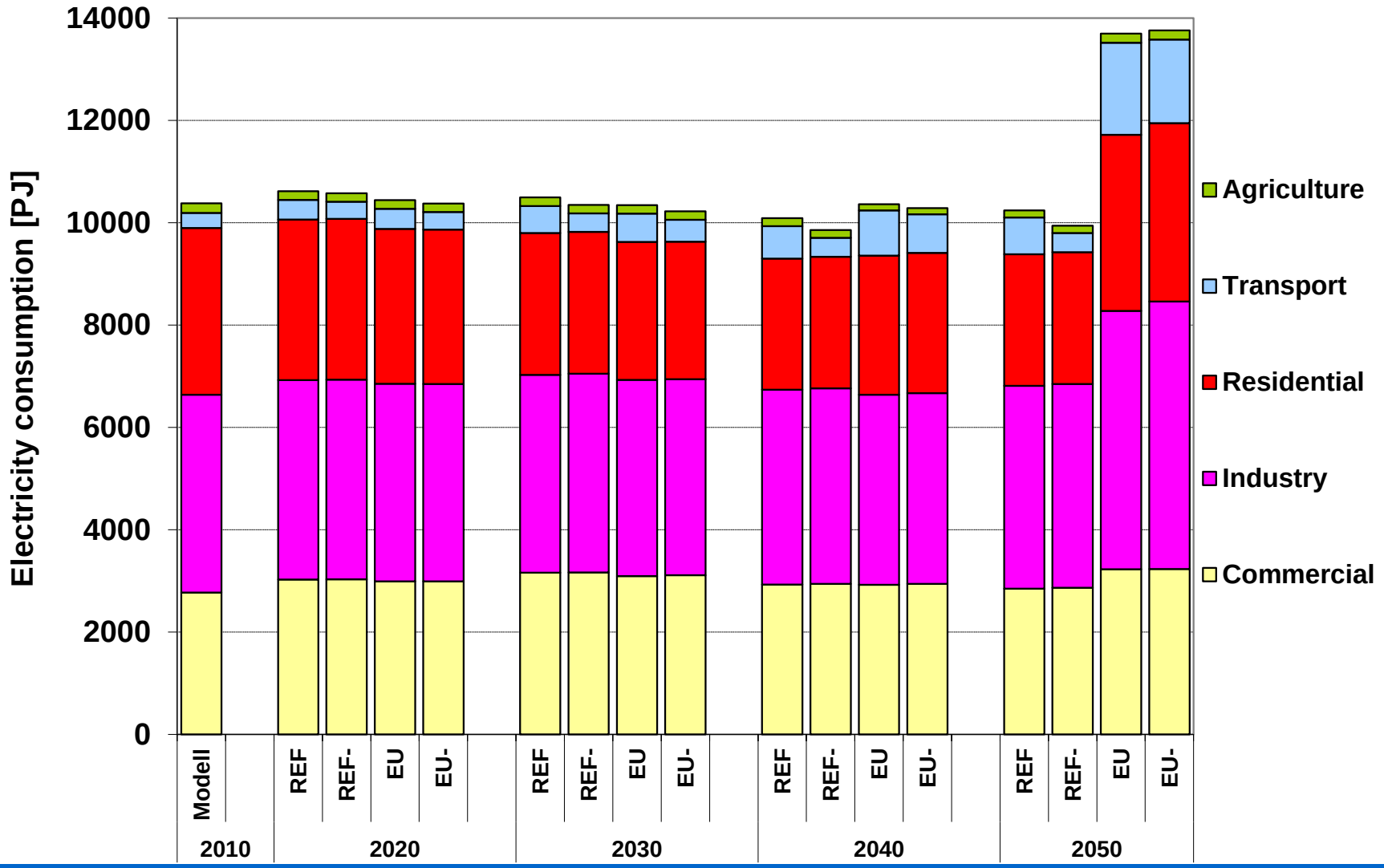
Scenario analysis CO_2 Emissions (EU-28)



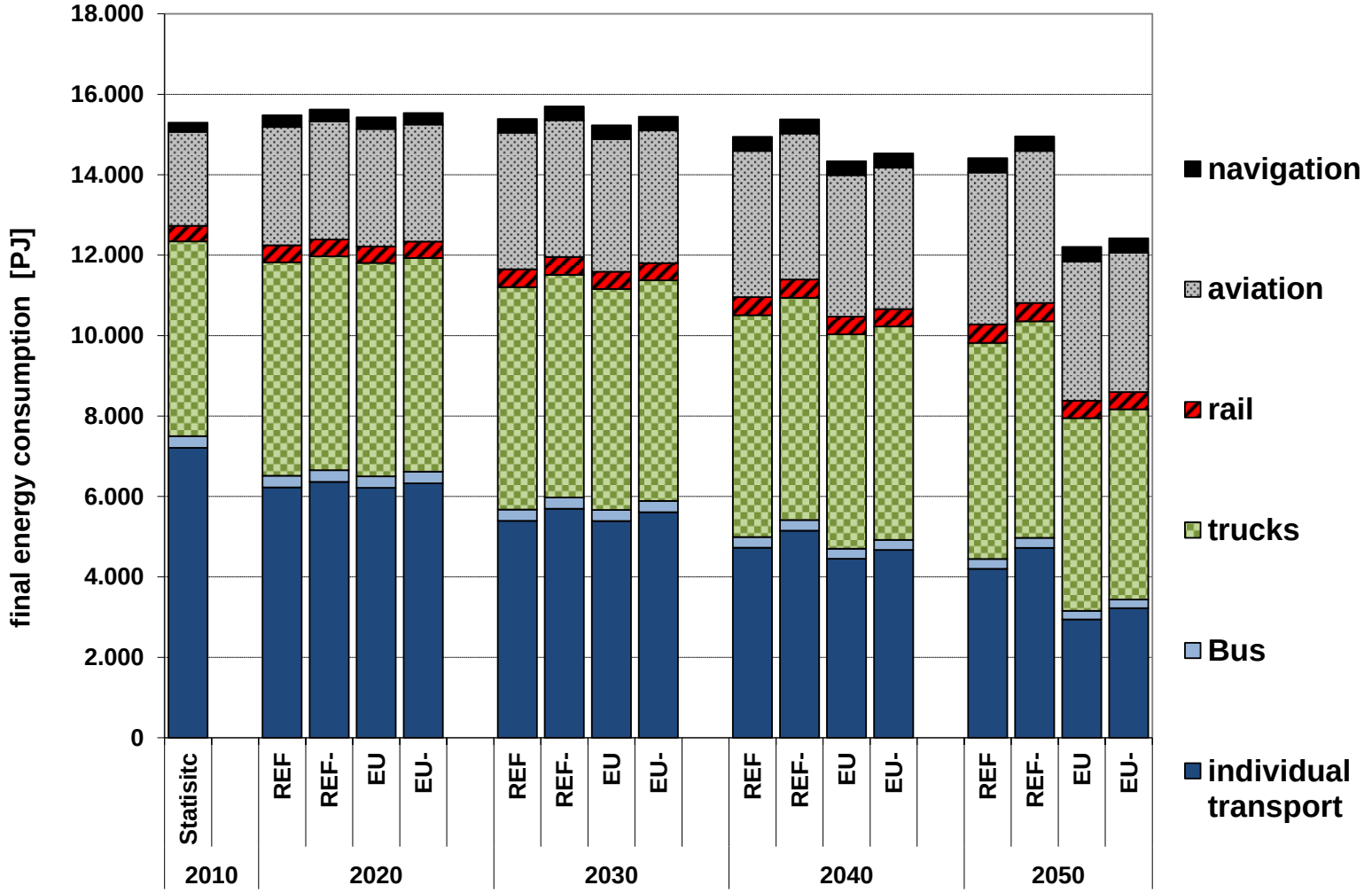
Net Electricity Supply (EU-28)



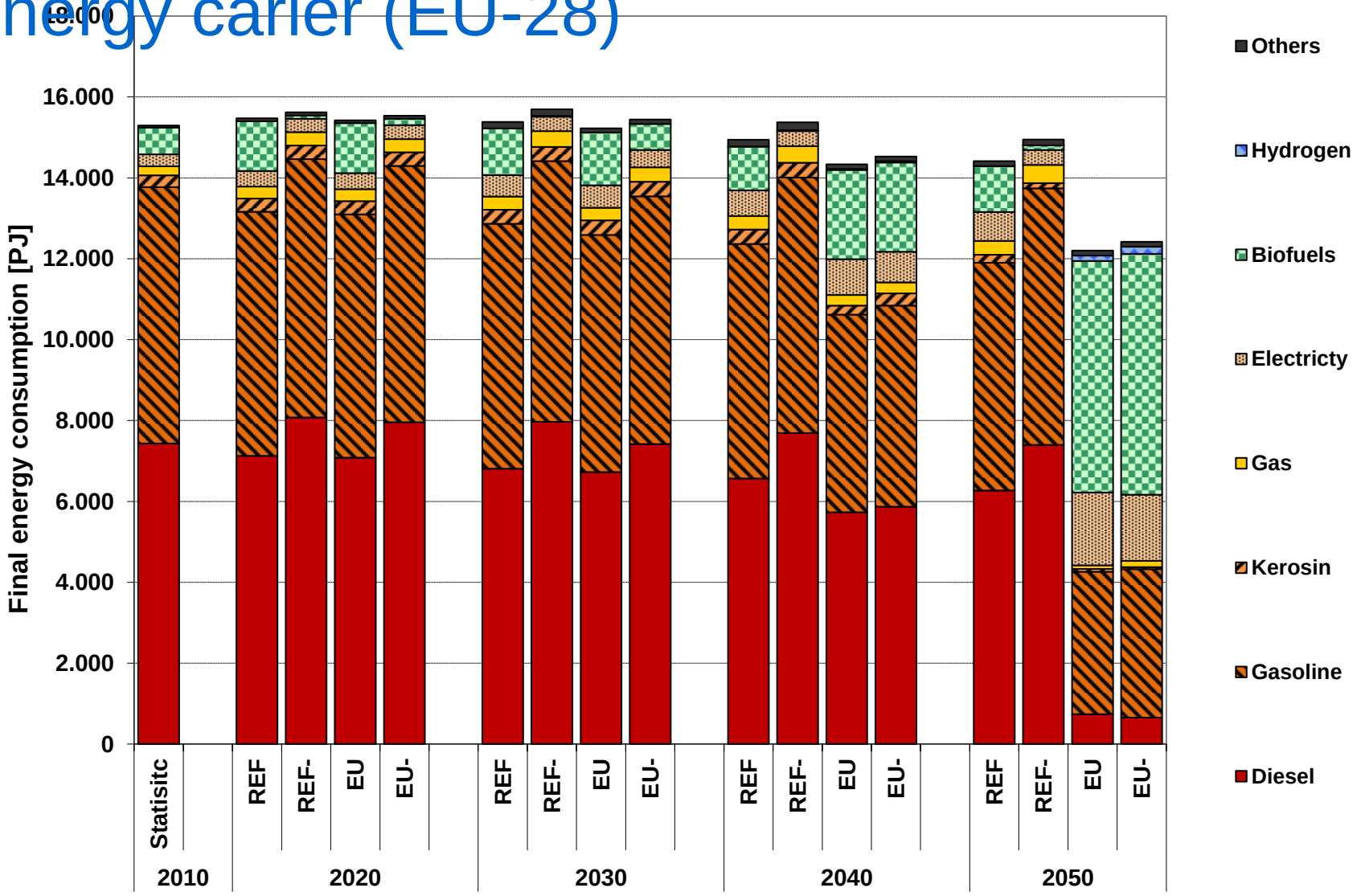
Final Energy Consumption Electricity (EU-28)



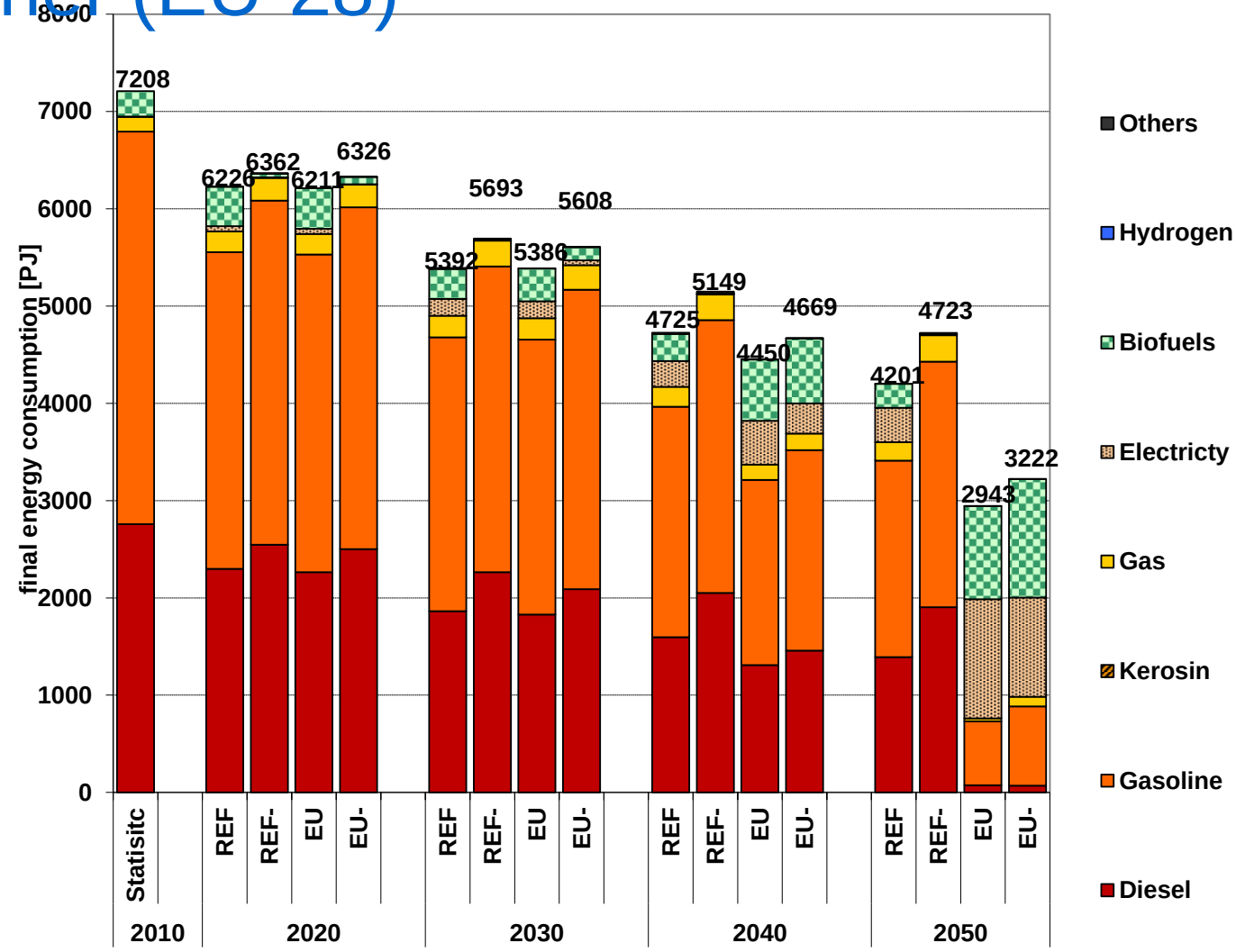
Final energy consumption transport by transport mode(EU-28)



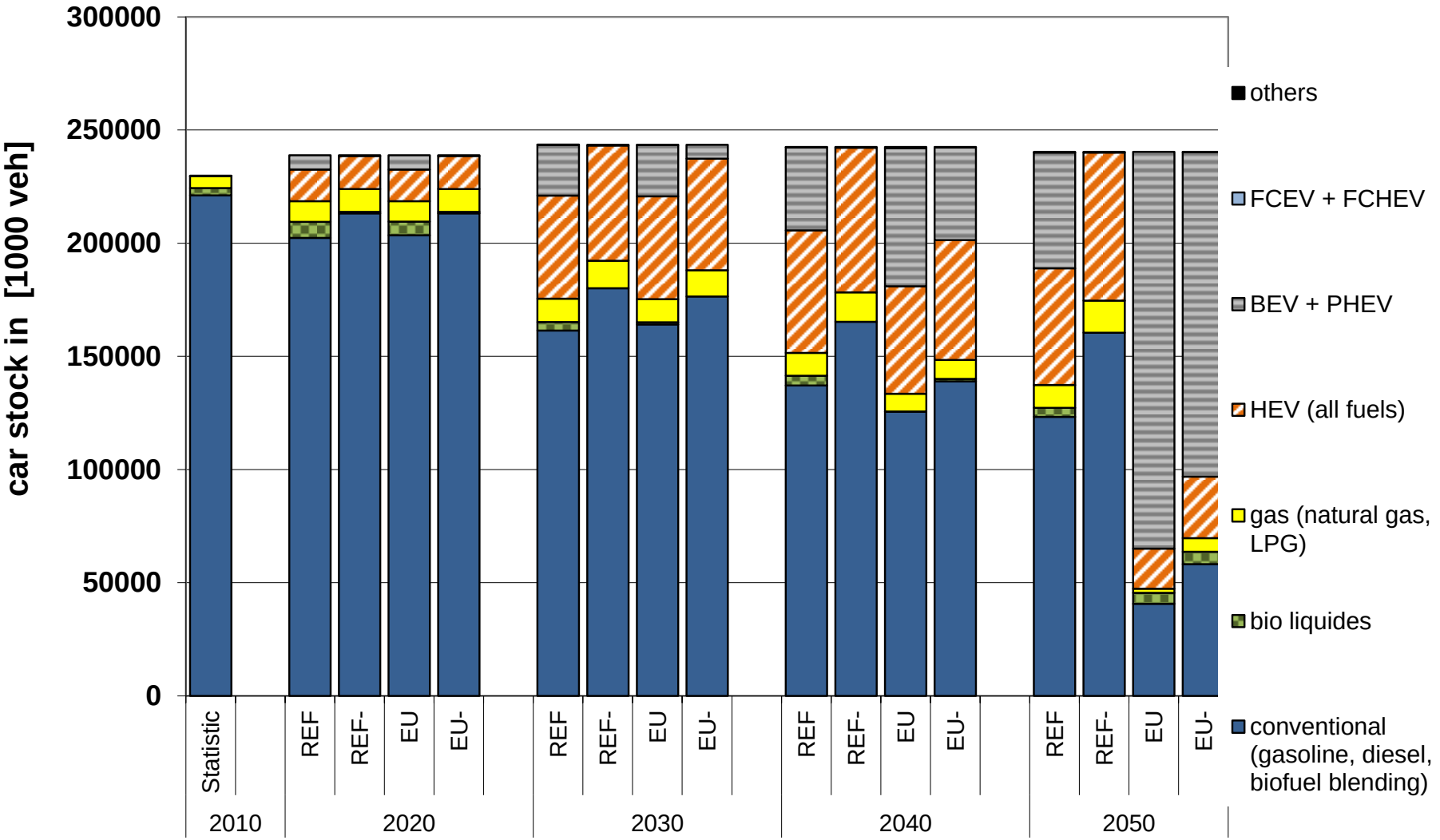
Final energy consumption transport by energy carier (EU-28)



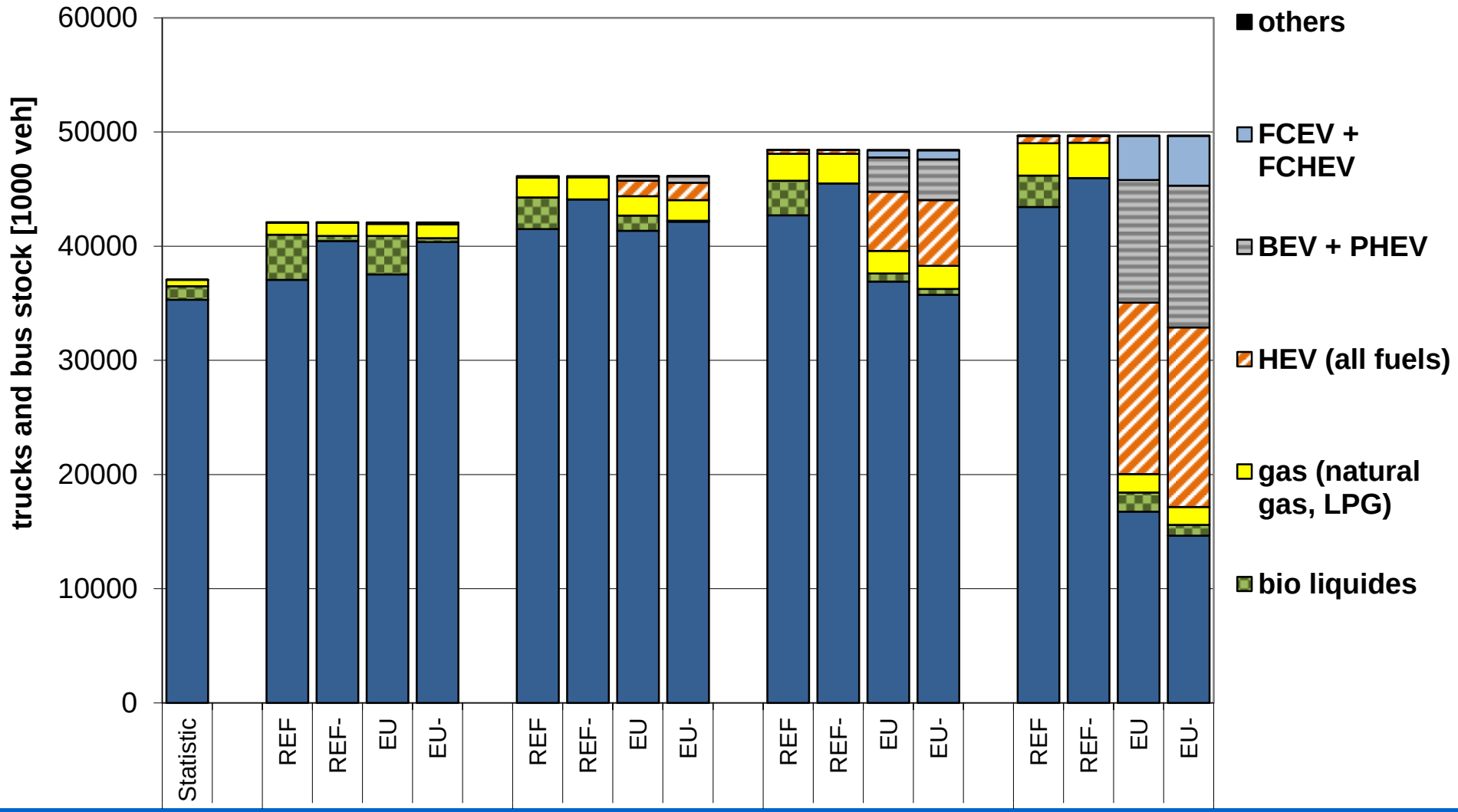
Final energy consumption cars by energy carrier (EU-28)



Stock of cars by engine type (EU-28)



Stock of trucks and buses (EU-28)



Conclusion and Outlook

- The penetration of electrical vehicles not only depends on the share of renewables it is influenced mainly by the GHG reduction target.
- Till 2030 the assumed cost reduction for batteries and the GHG reduction targets are to low to bring electro-mobility in the transport sector without subsidies.
- Supporting electro-mobility influence the penetration in the midterm, in the long term it's the option to decarbonize the transport sector.
- A sensitivity analysis related the battery cost and the share of renewable electricity generation of the gross electricity generation will follow.

Thank you for your attention !

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