Prospects for alternative transport fuels in EU-15 countries up to 2050 from an energetic and economic point-of-view

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1. Introduction: Core objectives

- …to provide an appraisal of prospects of new alternative fuels and technologies from energetic and economic points-of-view
- …to investigate future market prospects of alternative powertrains like BEV, HEV and FCV in comparison to conventional passenger cars
- Analysis conducted for the average conditions in EU-15 countries in a dynamic framework till 2050 in comparison to fossil fuels.

Introduction

Mature AEC

Electricity
Pellet
1st gen. biofuels:
Biodiesel
Bioethanol
Biogas

Inmature AEC

2nd gen. biofuels:
Bioethanol from lignocellulose
Ficher-Tropsch Diesel
Bio-SNG
Bio-DME
Bio-Methanol
Hydrogen

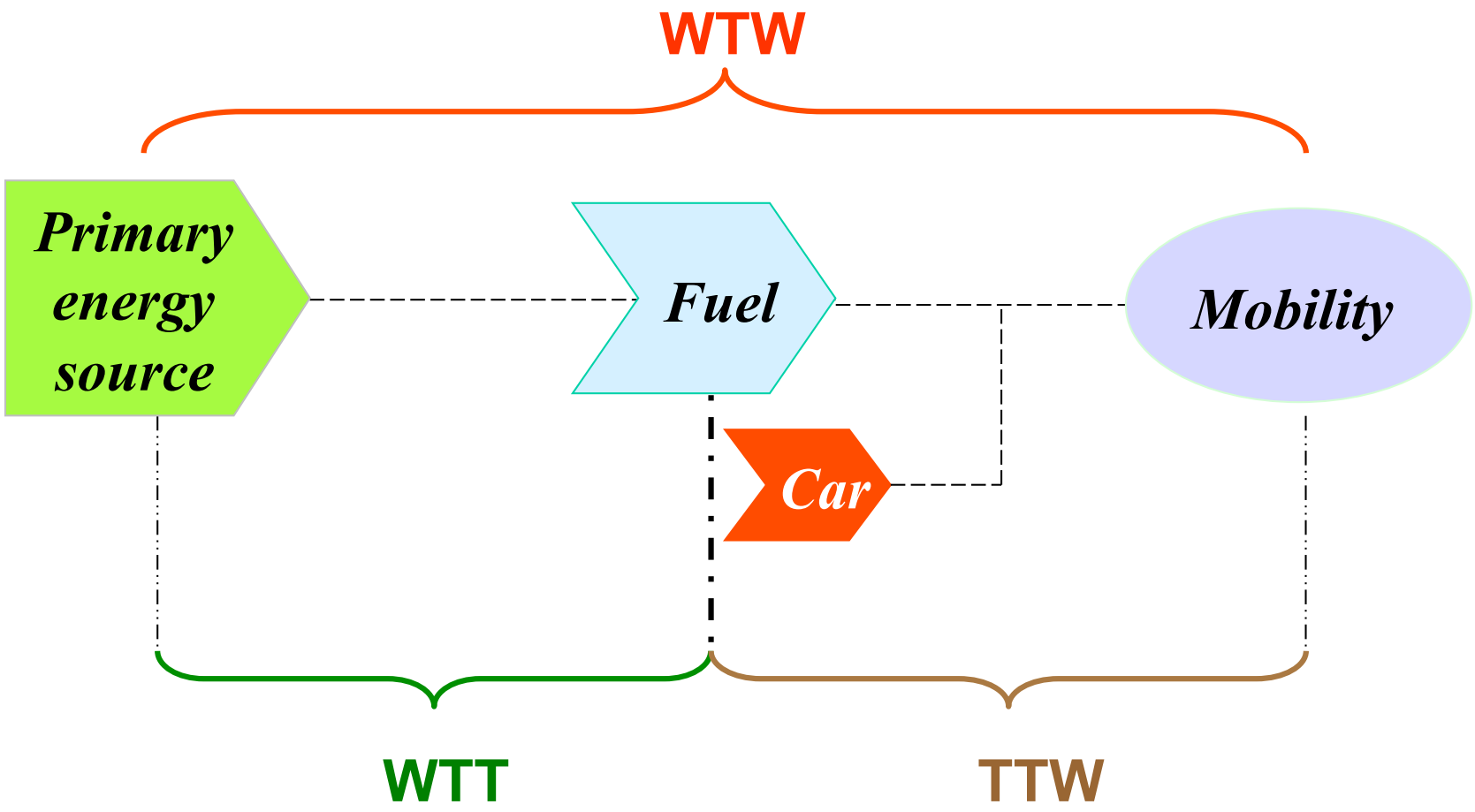
AEC in labour stage

Hydrogen
(thermochemical-, photoelectrochemical-, biological process)
3rd gen. biofuels:
Biofuels from algae
…

Technology surprise!

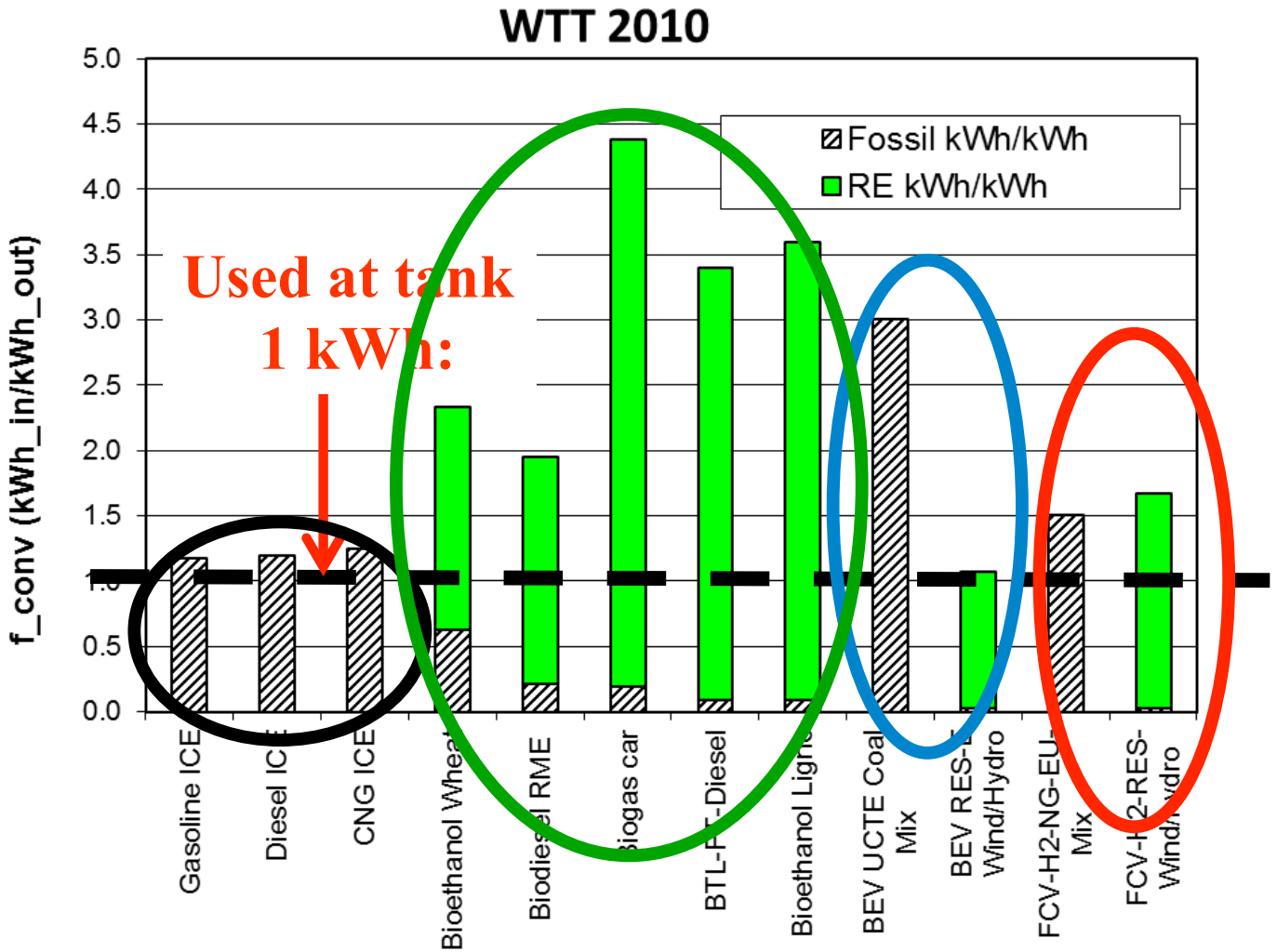
4th gen. biofuels:
…

2. Method of approach: Well-to-Wheel assessment

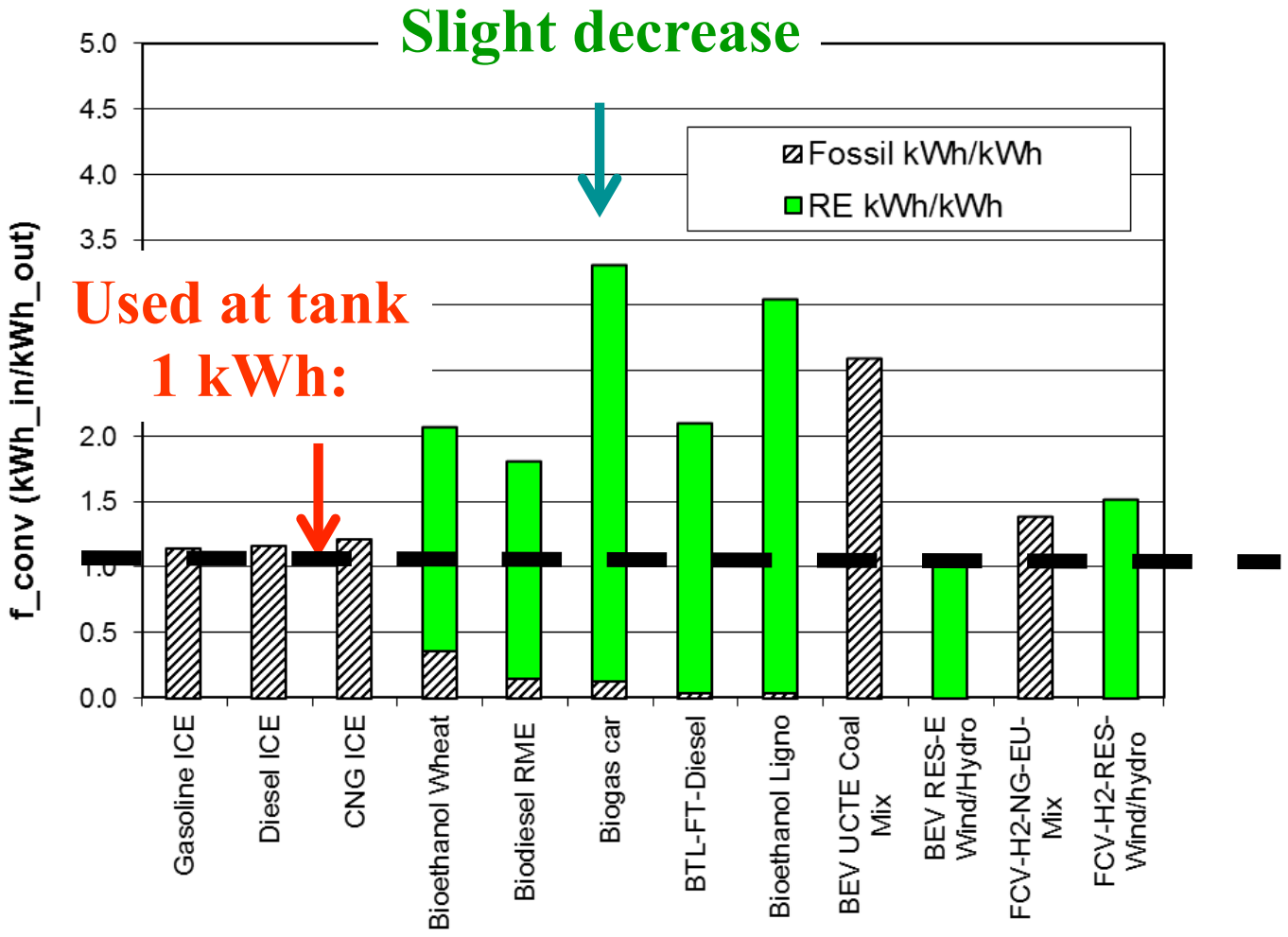


The energy chain for providing the service mobility

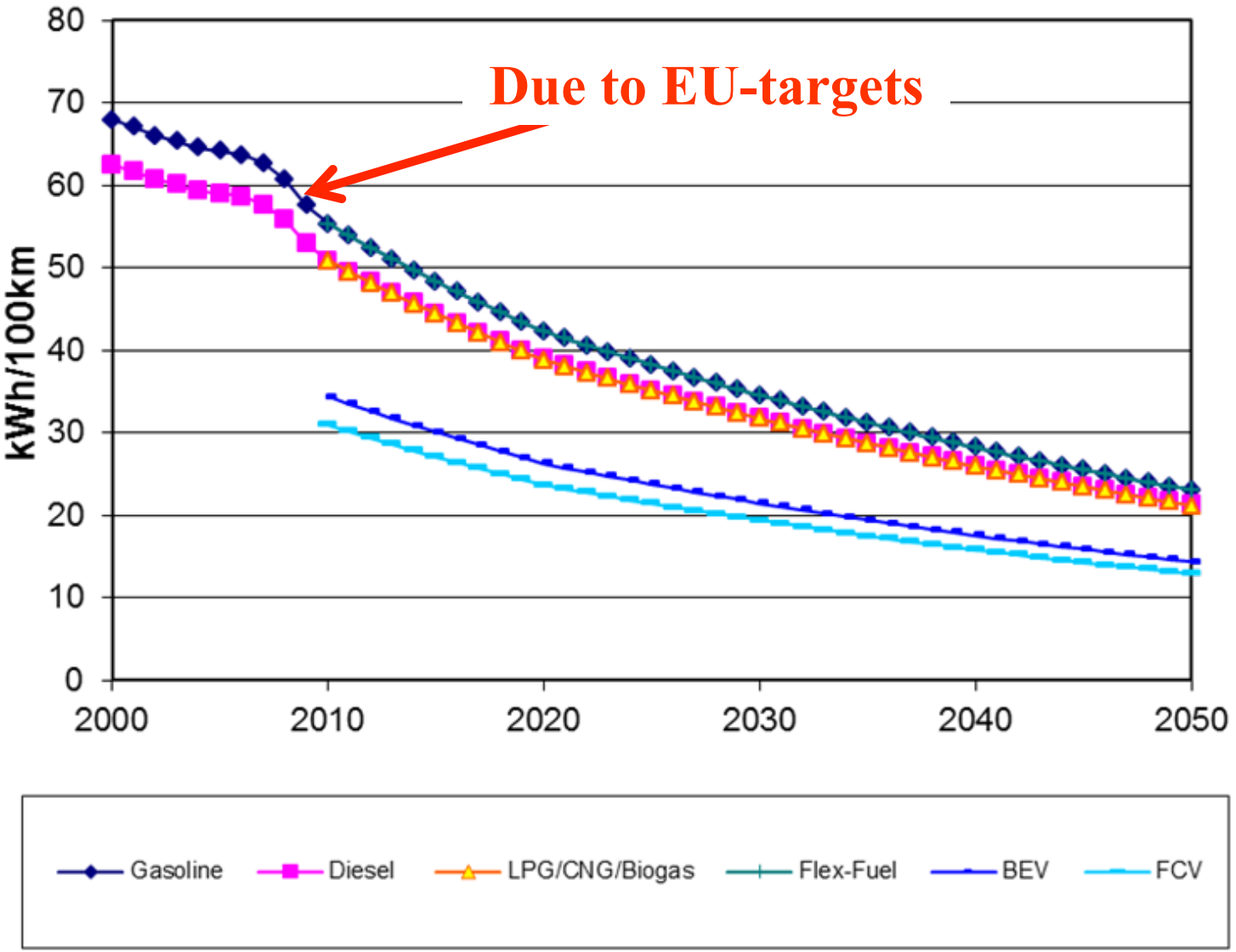
Well-to-Tank assessment: fuel conversion factor



Well-to-Tank assessment

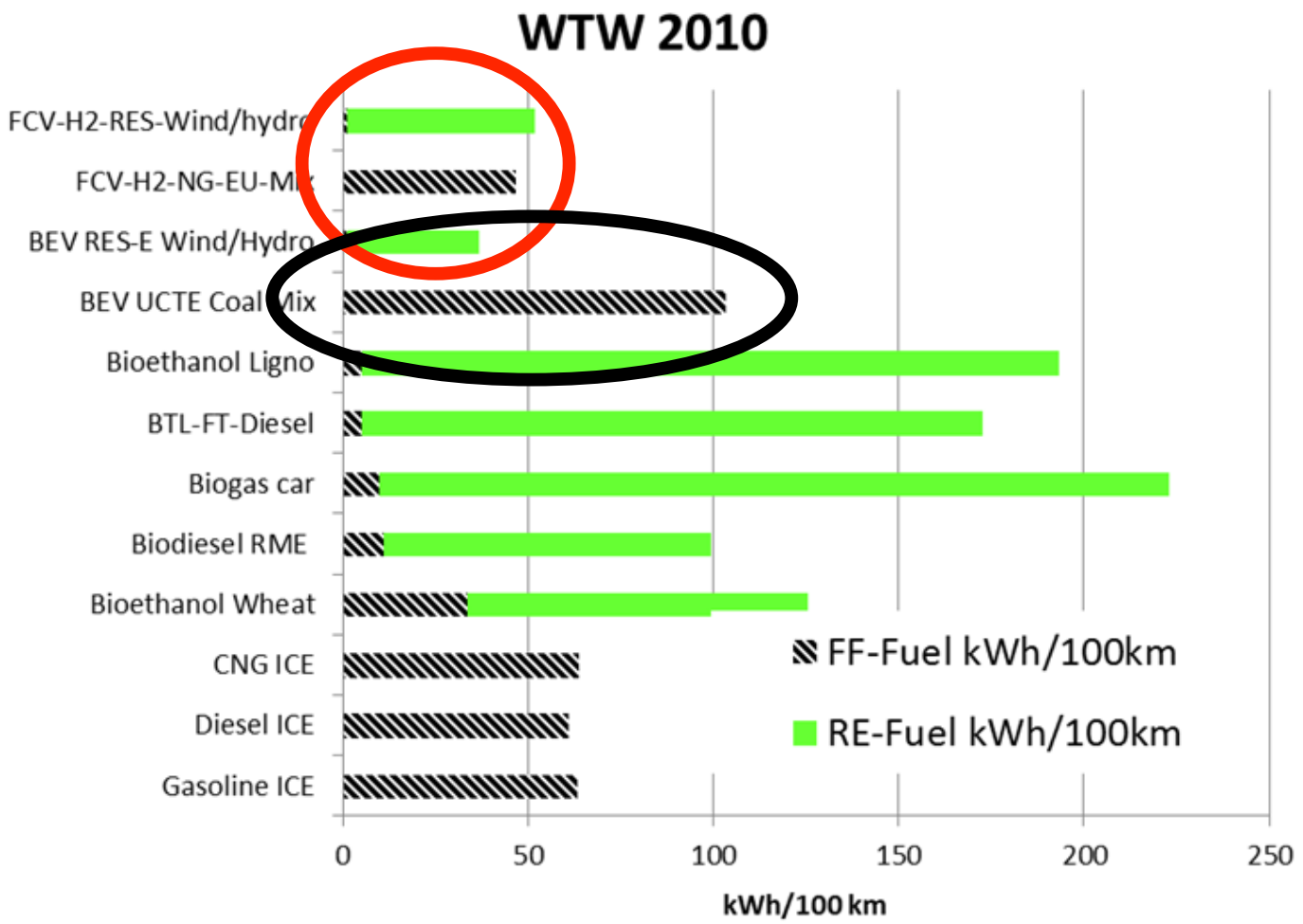


TTW: Fuel intensity

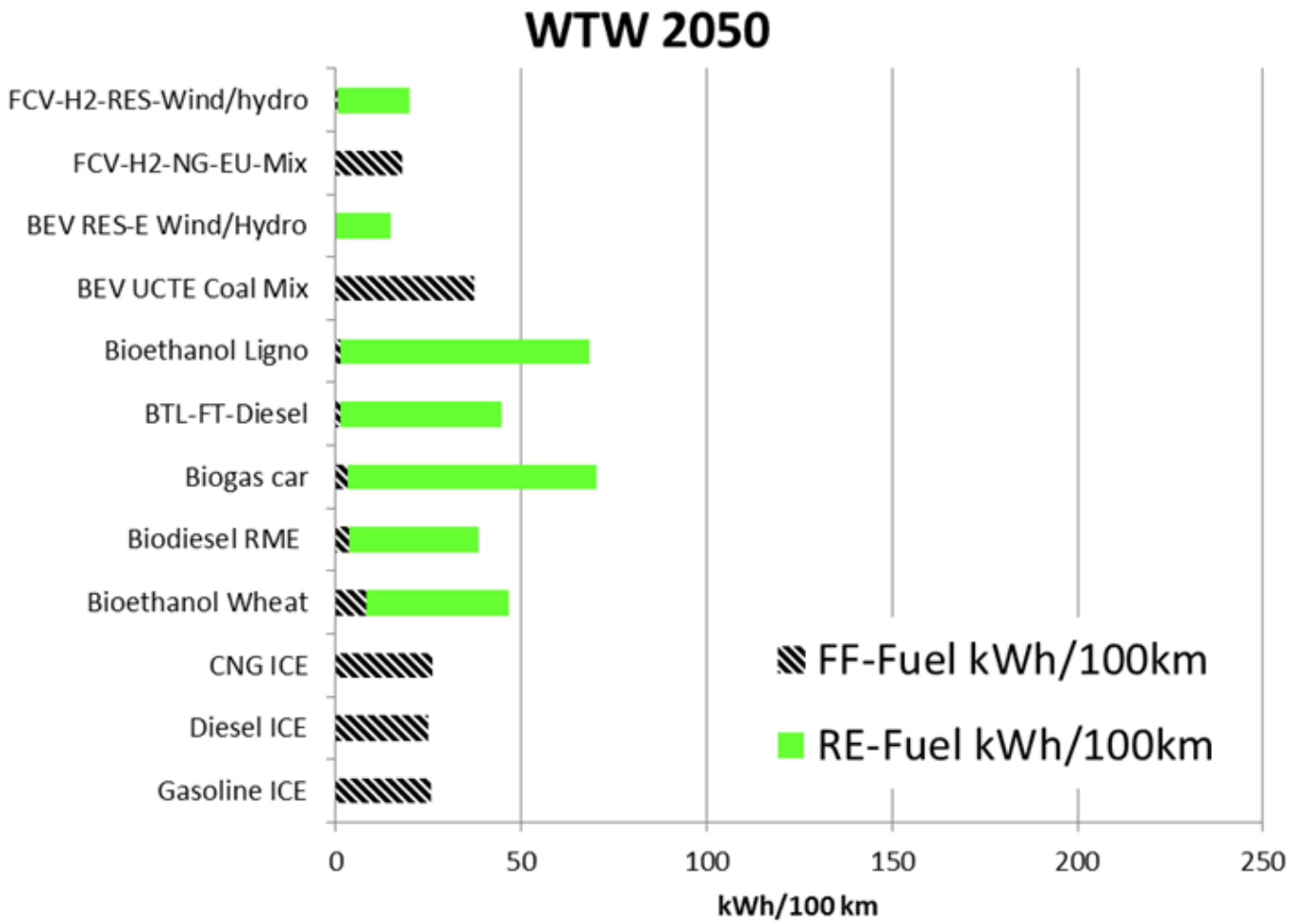


Average car size: 80kW

Well-to-Wheel assessment 2010: kWh/service mobility

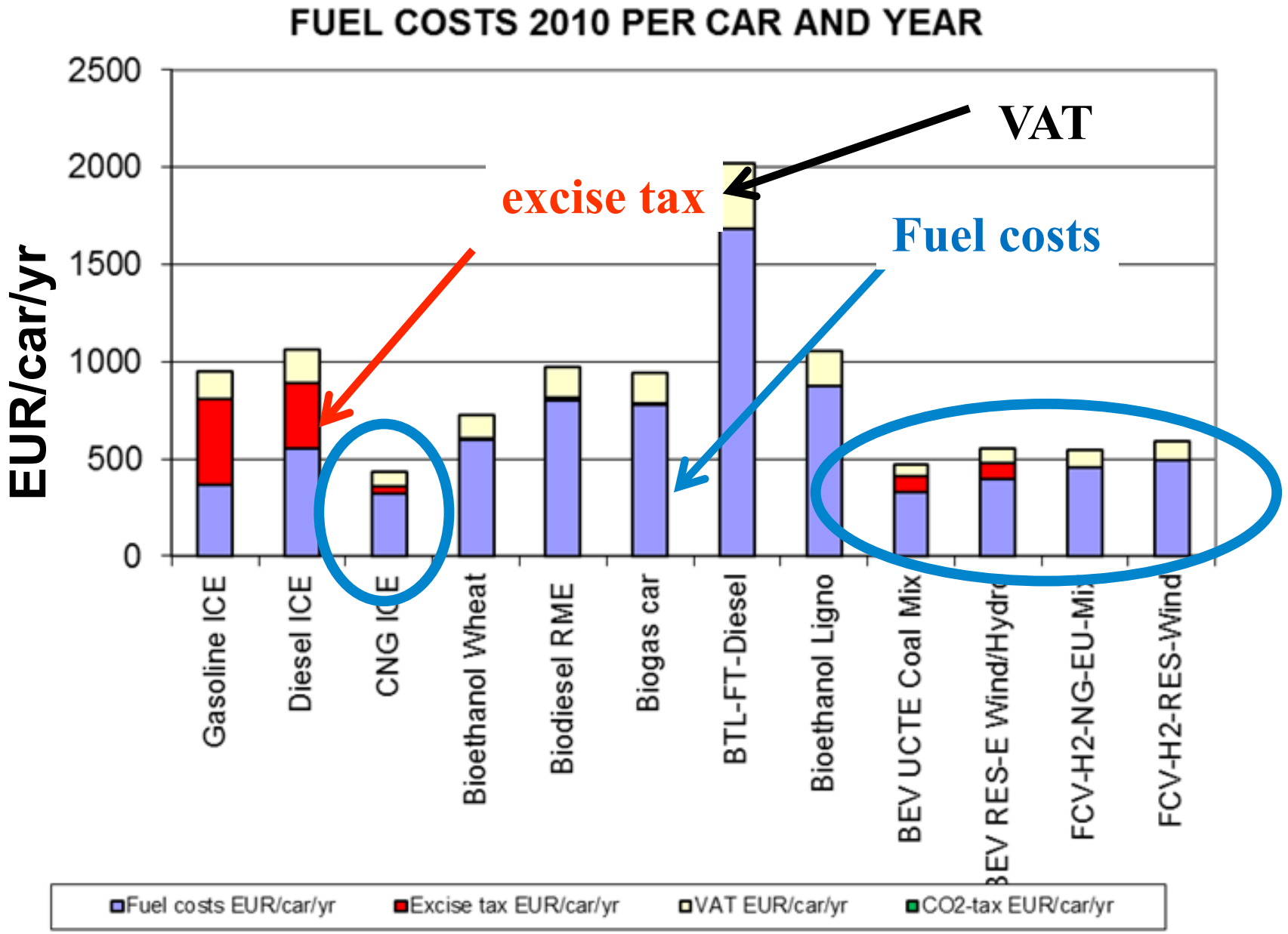


Well-to-Wheel assessment 2050: kWh/service mobility

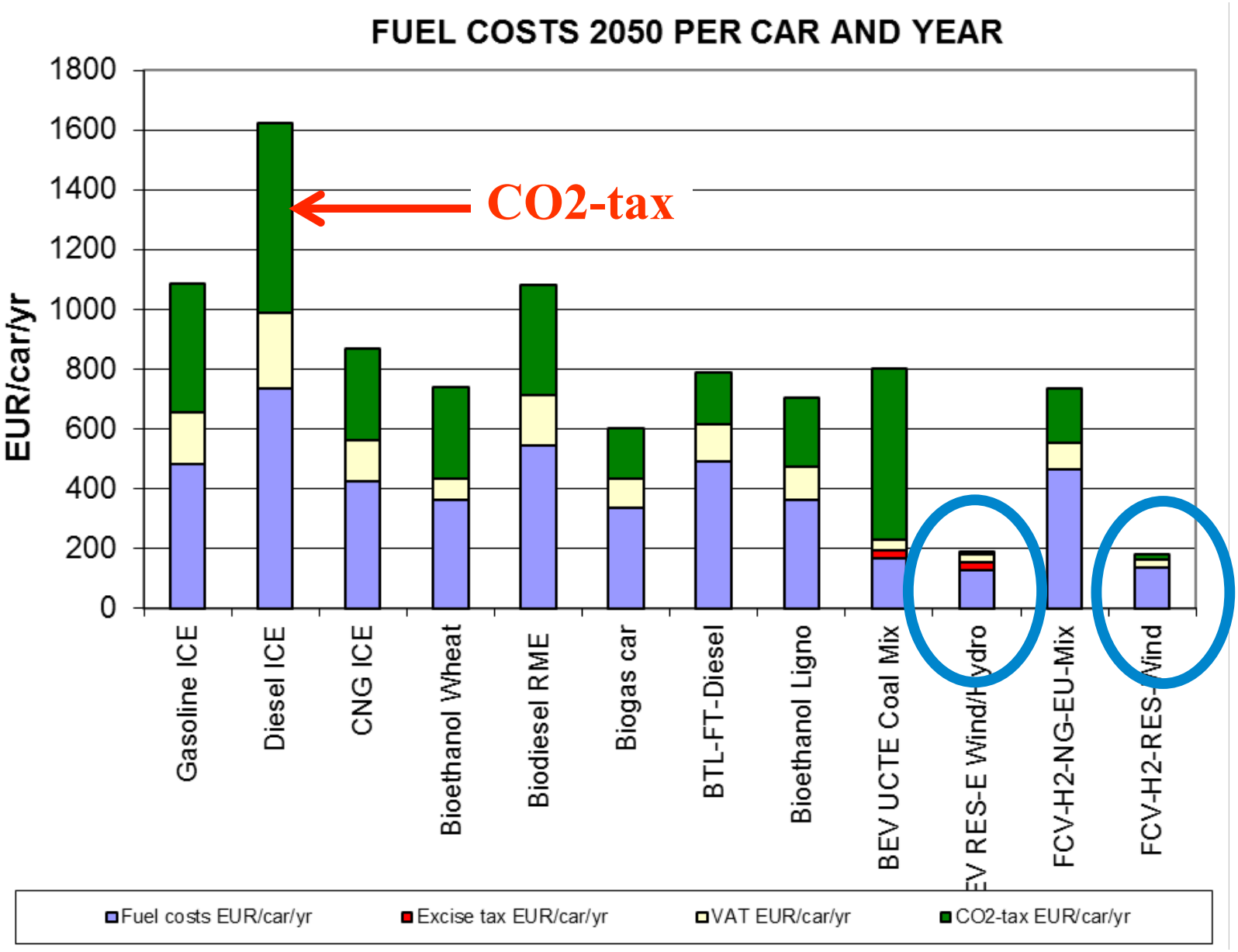


→ Major effect: Fuel intensity has more impact than WTT-conversion!

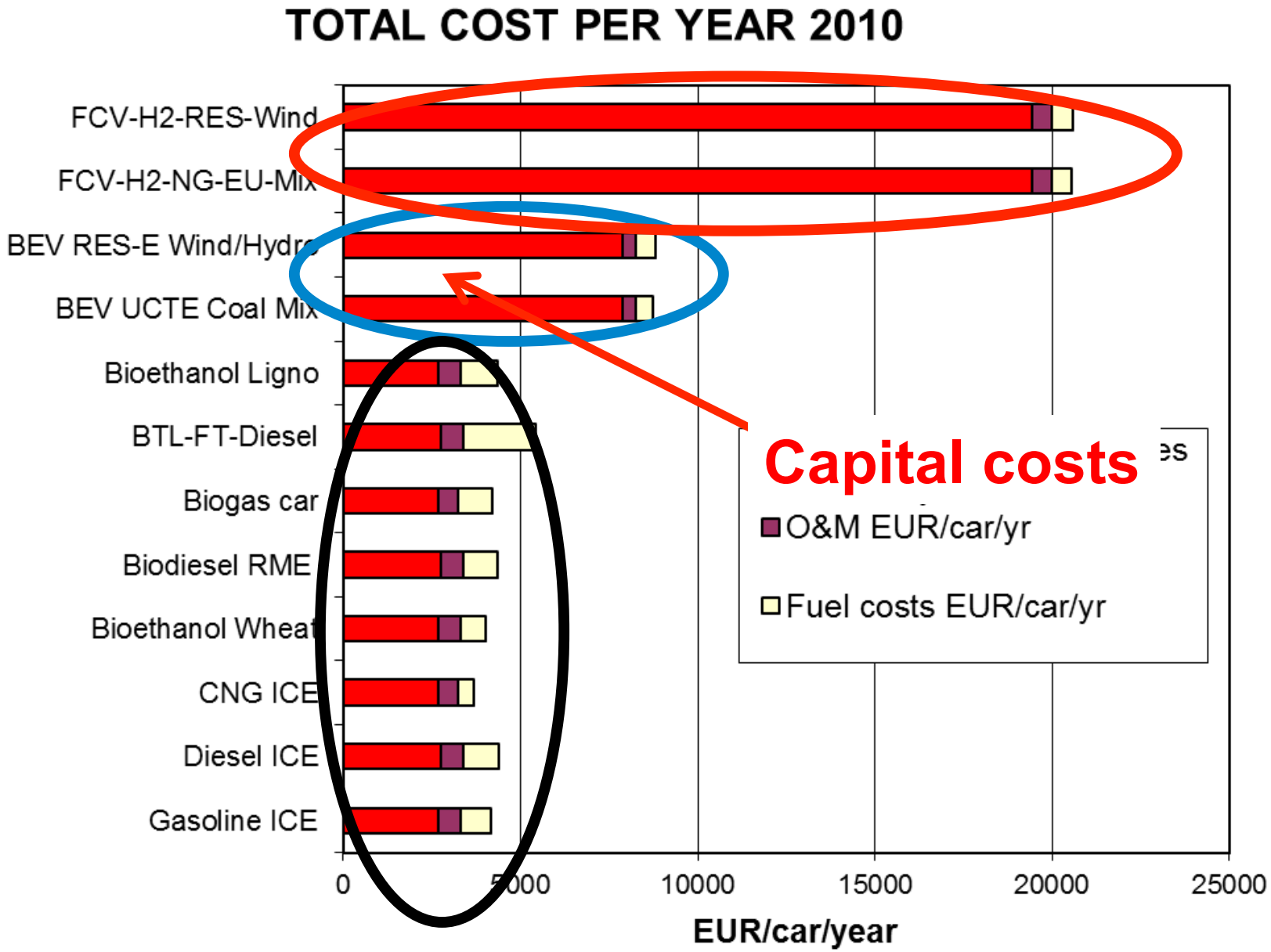
3. Economic assessment: Total fuel costs of cars 2010



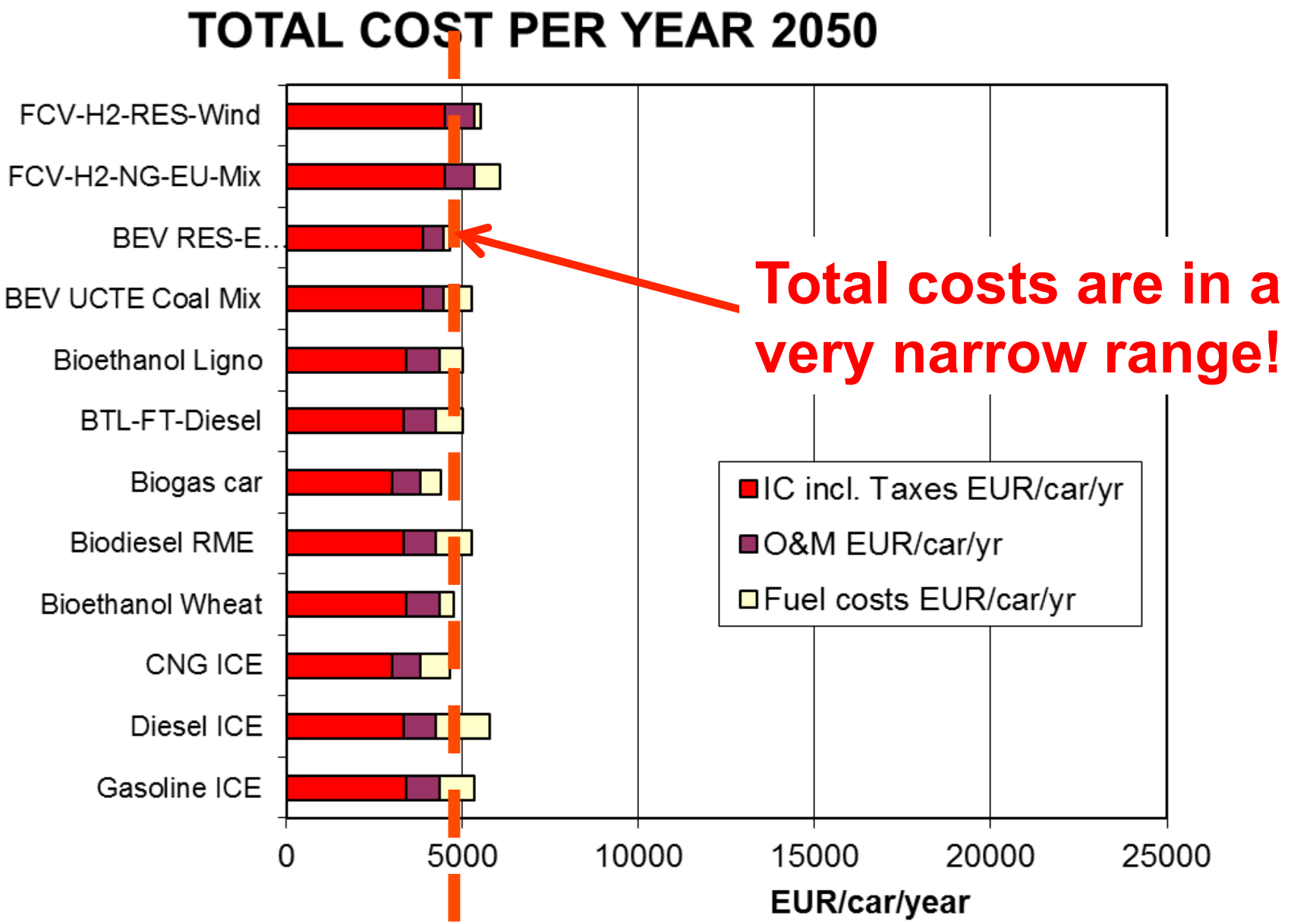
Economic assessment: Total fuel costs of cars 2050



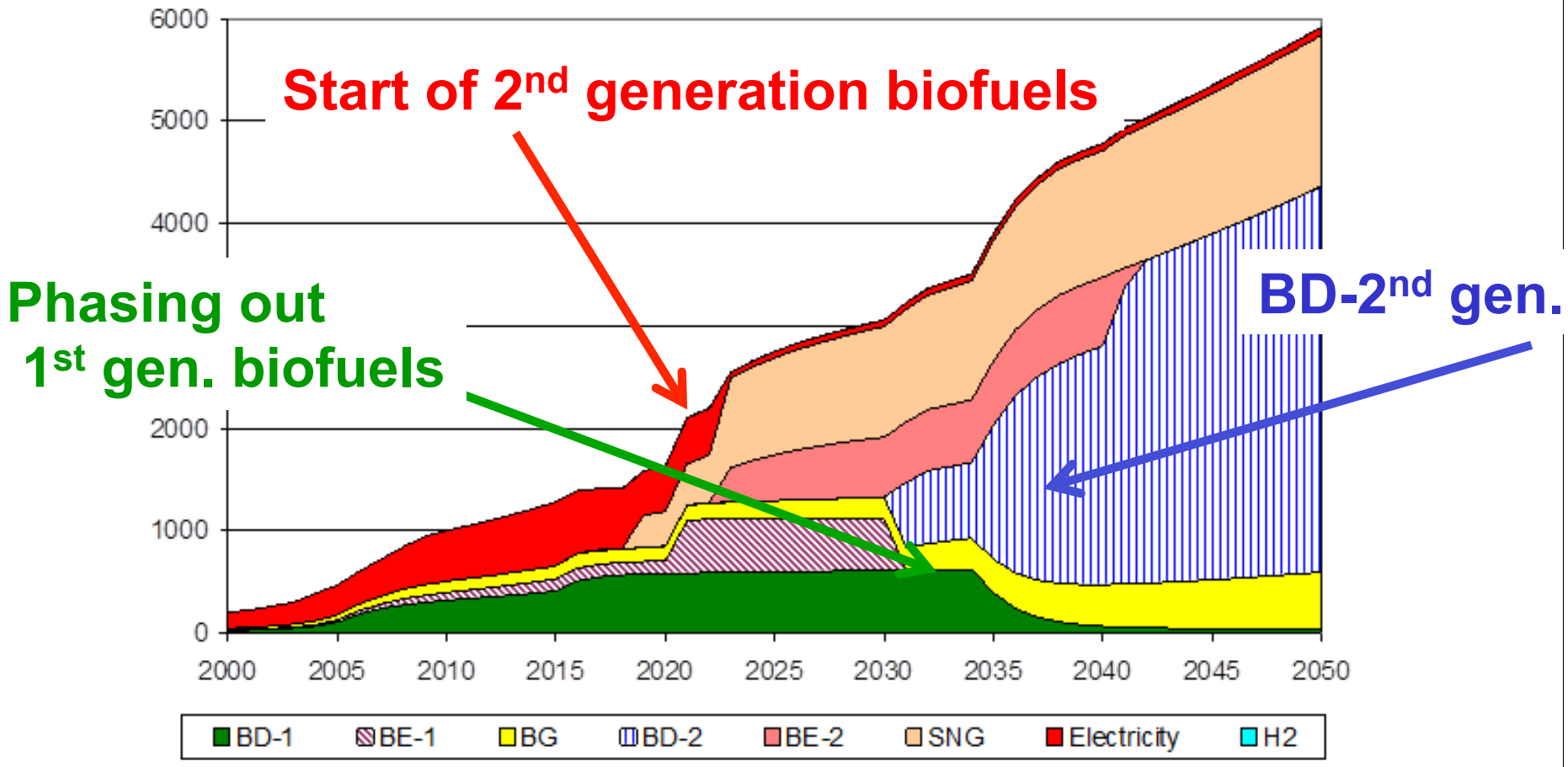
Economic assessment: Costs of service mobility 2010



Economic assessment: Costs of service mobility 2050



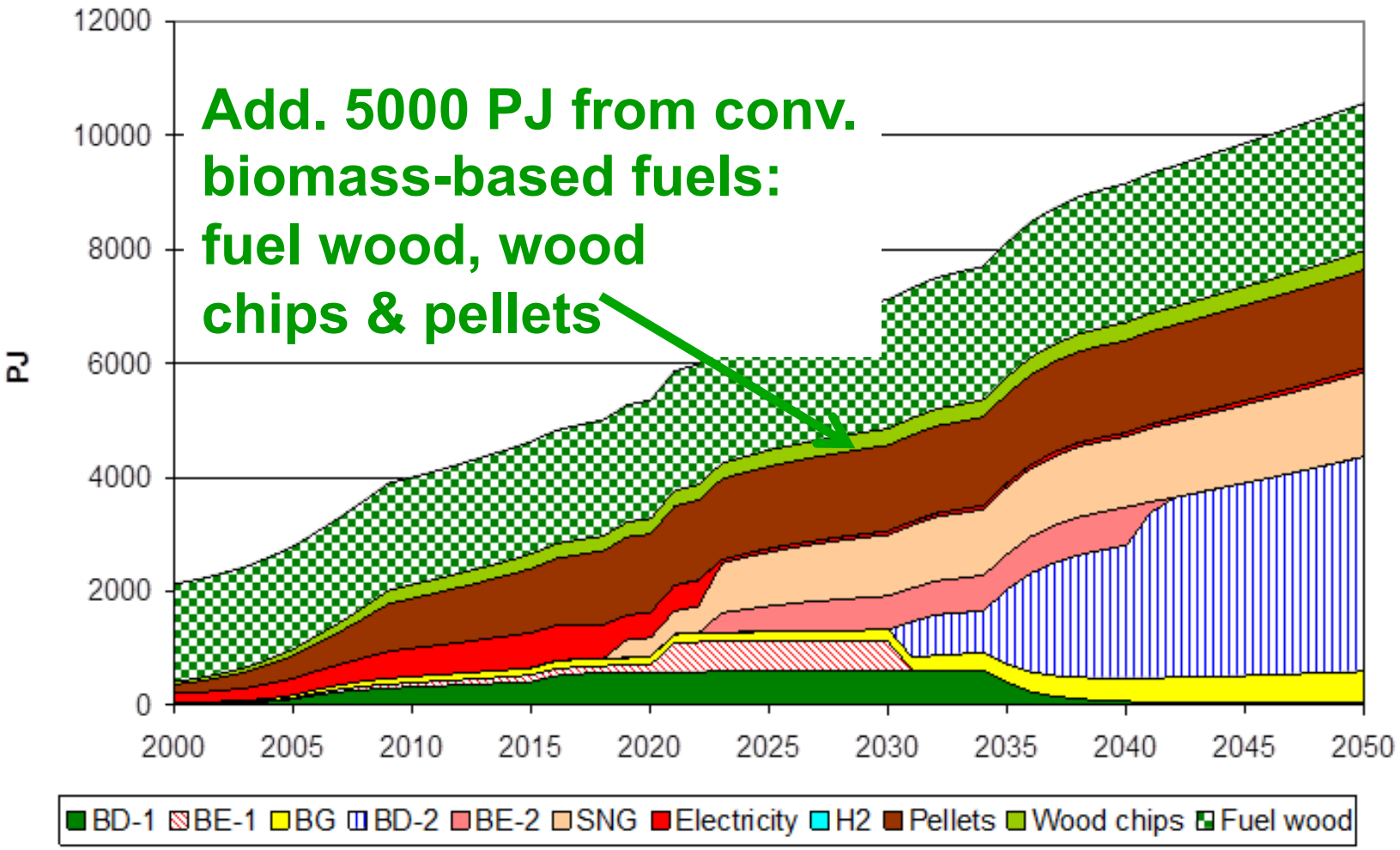
4. Scenario: energy potential of „new“ biomass-based fuels



Total potential: 6000 PJ

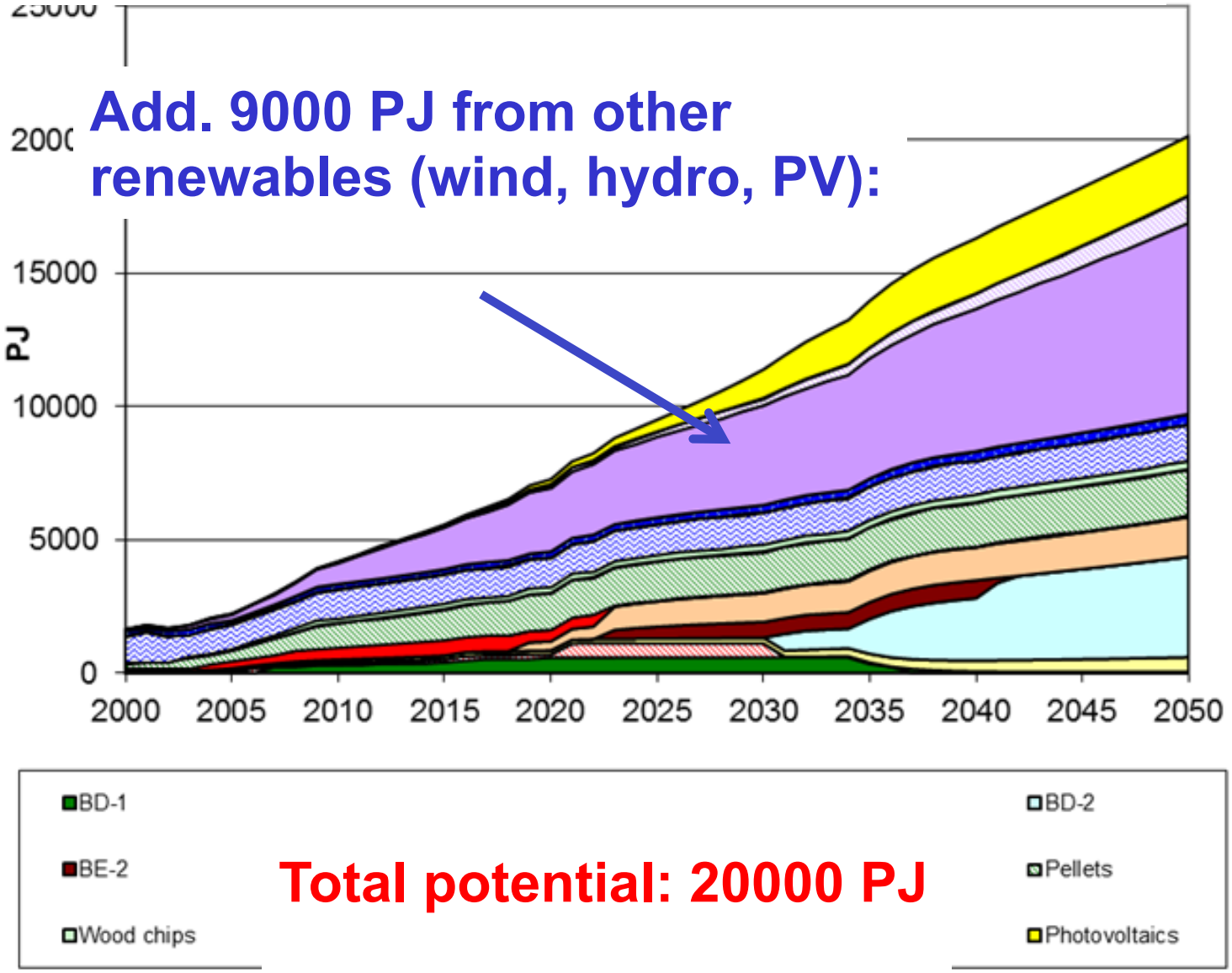
Policy Lead Scenario: max. 30% arable land in 2010, with CO2 tax, and with priority for biofuels

Policy scenario: energy potential of all biomass-based fuels



Total potential: 11000 PJ

Policy scenario: energy potential of all renewable fuels



Total potentials:

Potentials: AEC from new biomass: **6000 PJ**

AEC from convent. Biomass: **5000 PJ**

AEC from other RES: **9000 PJ**

Total: **20000 PJ** up to 2050

Total final energy consumption 2010: **40000 PJ**

Conclusions: Major barriers

	Production	*Storage*	*Conversion into services*	*CO_2 emissions*
BD-1& BE-1	Minor problems of production but social problems of use of agricultural areas (food vs fuel discussion)	No problem	No problem	Problem of still large shares of fossil inputs
Bio-methane	Problem of high investment costs & low scaling and learning effects	No problem	No problem	No problem
BD-2& BE-2	Problem of high investment costs. Problem, that the technology is so far not mature.	No problem	No problem	No problem
Elec-tricity	No problem	Storage is still a costly problem	No problem	Depends on source of production (no problem with RES)
Hydro-gen	No problem	No problem	A proper reliable and of affordable conversion technology (fuel cells) is not yet available	Depends on source of production (no problem with RES)

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