OMV Aktiengesellschaft

Gasoline&Diesel: Is there a real Alternative?

Graz, 30. Januar 2013

Walter Böhme
OMV AG

Move & More.

OMV today – Integrated Oil and Gas Company

Exploration & Production:

- 318,000 boe/d oil and gas production
- 1.15 bn boe proven oil and gas reserves
- Active in the core countries Romania and Austria as well as in its balanced international portfolio

Refining & Marketing (incl. Petrochemicals):

- 26 mn tons total annual refining capacity
- Operates a network of over 4,800 filling stations
- Market share in the Danube Region is approx. 20%

Gas & Power:

- 2,000 km natural gas pipeline network in Austria
- Gas fired combination power plants in Romania and Turkey
- Operates a gas pipeline network in Austria with a marketed capacity of 89 bcm

Content

Important daily data's

OMV	30,50	EUR/share	29.01.2013	Share Price
Oil	**113,67**	USD/barrel	28.01.2013	Brent dated
Oil	**50,25**	EUR/MWh	28.01.2013	Brent dated
Gas	**26,23**	EUR/MWh	29.01.2013	CEGHIX VTP Austria
Power	**32,27**	EUR/MWh	29.01.2013	EPEX day ahead (D/AT Base)
CO2	**4,07**	EUR/t	28.01.2013	EEX Spot Index
FX	**1,34**	EUR/USD	28.01.2013	ECB Reference

Passenger Transport EU-27 and World

	EU27	USA	JAPAN
	2010	2009	2010(1)
Passenger Car	**75,2 %**	**80,2 %(2)**	**57,9 %(3)**
Bus + trolley-bus + coach	8,1 %	6,7 %	6,6 %
Railway	6,4 %	0,6 %	**29,7 %**
Tram + metro	1,4 %	0,2 %	(5)
Waterborne	0,6 %	0,0 %	0,3 %
Air (domestic/intra-EU-27	8,3 %	12,2 %	5,6 %
Total billion pkm	6304,3	7265,0	1324,8

(1) Japan: data for passenger cars, bus+trolley-bus+coach and waterbone vehicles
(2) USA: including light trucks / vans
(3) Japan: including light motor vehicles and taxis
(4) China: including buses and coaches
(5) Japan: included in railway pkm

Source:Statistical Pocketbook 2012, EU Transport in Figures, page 34

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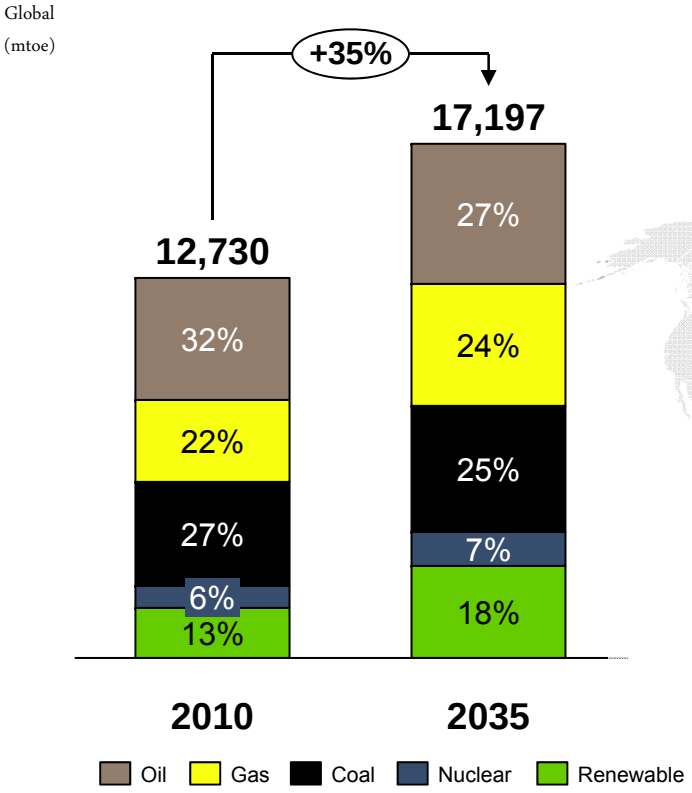
Freight Transport EU-27 and World

	EU27	USA	JAPAN	CHINA	RUSSIA
	2009	2008 (6)	2010	2009	2010
Road	**45,9 %**	31,4 %	**62,6** %(8)	30,5 %	4,2 %
Rail	10,2 %	**41,2 %**(7)	3,8 %	20,7 %	**42,4** %
Inland waterways	3,9 %	7,4 %		14,8 %	1,1 %
Oil pipeline	3,2 %	15,0 %		1,7 %(9)	**50,2** %
Sea (domestic/intra-EU-27)	37,0 %	5,0 %	33,6 %	32,4 %	2,1 %
Total billion pkm	3828	6128	535	12201	4747

(6) USA: data for road is from 2007
(7) USA: Class I rail
(8) Japan: 2009
(9) China: oil and gas pipelines

Source:Statistical Pocketbook 2012, EU Transport in Figures, page 34

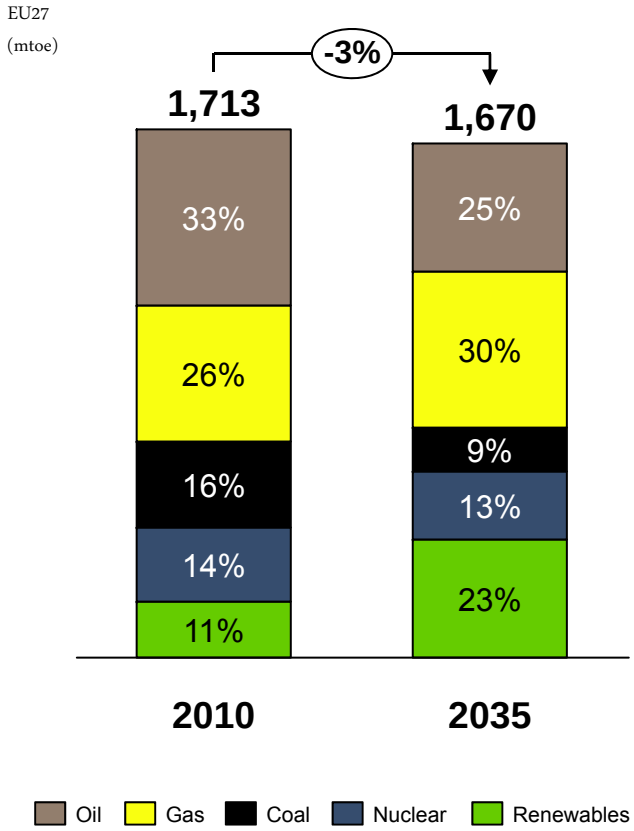
Key Perspectives – Based on IEA World Energy Outlook



- **Global energy demand to increase by 35%**
  - Increase of 4.5 Gtoe per between 2010 and 2035 (annual need for additional supply: 3,6 mboe/d)
  - Driven by population growth and increase in living standard
- **All energy sources to contribute to meet demand**
  - Main challenge will be supply of energy
  - In 2035 still about 75% covered by fossil fuels (51% oil & gas)
- **Gas and Renewable take main share**
  - About 1.4 Gtoe additional demand growth for each
  - Annual growth: gas +1.6%, renewables 2.4%

Source: IEA World Energy Outlook 2012 / New Policy Scenario

Europe Has to Manage the Transformation to Renewables & Gas



- EU27 energy demand to decrease by 3%
  - Decrease of 43 mtoe between 2010 and 2035
  - Growth is moderate and flattening
- Shift in energy sources main challenge
  - About 287 mtoe of oil and coal to be substituted
  - 69% by renewables and 23% by Gas
- Gas will be the main energy source by 2035
  - 30% share in primary energy demand expected
  - Additional 65 mtoe demand expected

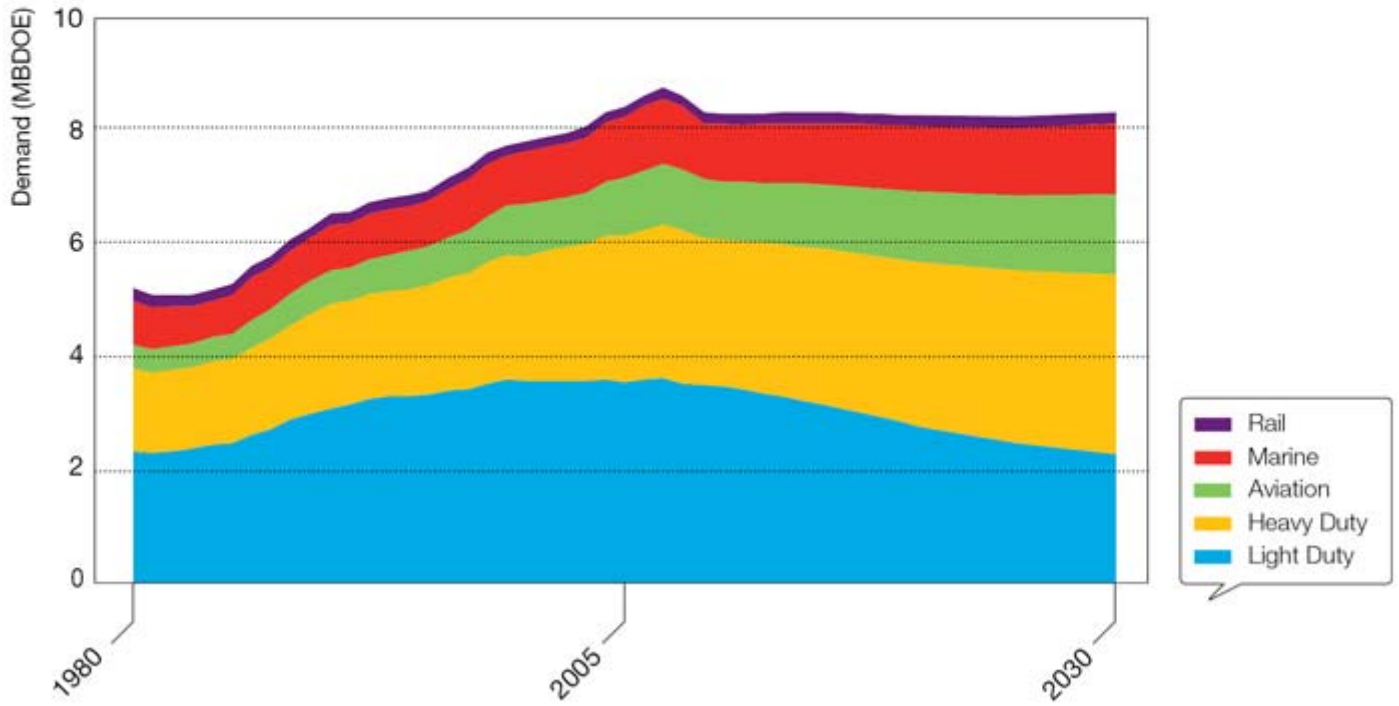
Source: IEA World Energy Outlook 2011 / New Policy Scenario

EU 27 Transport fuel demand

EU-27 TRANSPORT FUEL DEMAND INCLUDING BIOFUELS

(in Millions Barrels per Day of Oil Equivalent, MBDOE)

Source : ExxonMobil

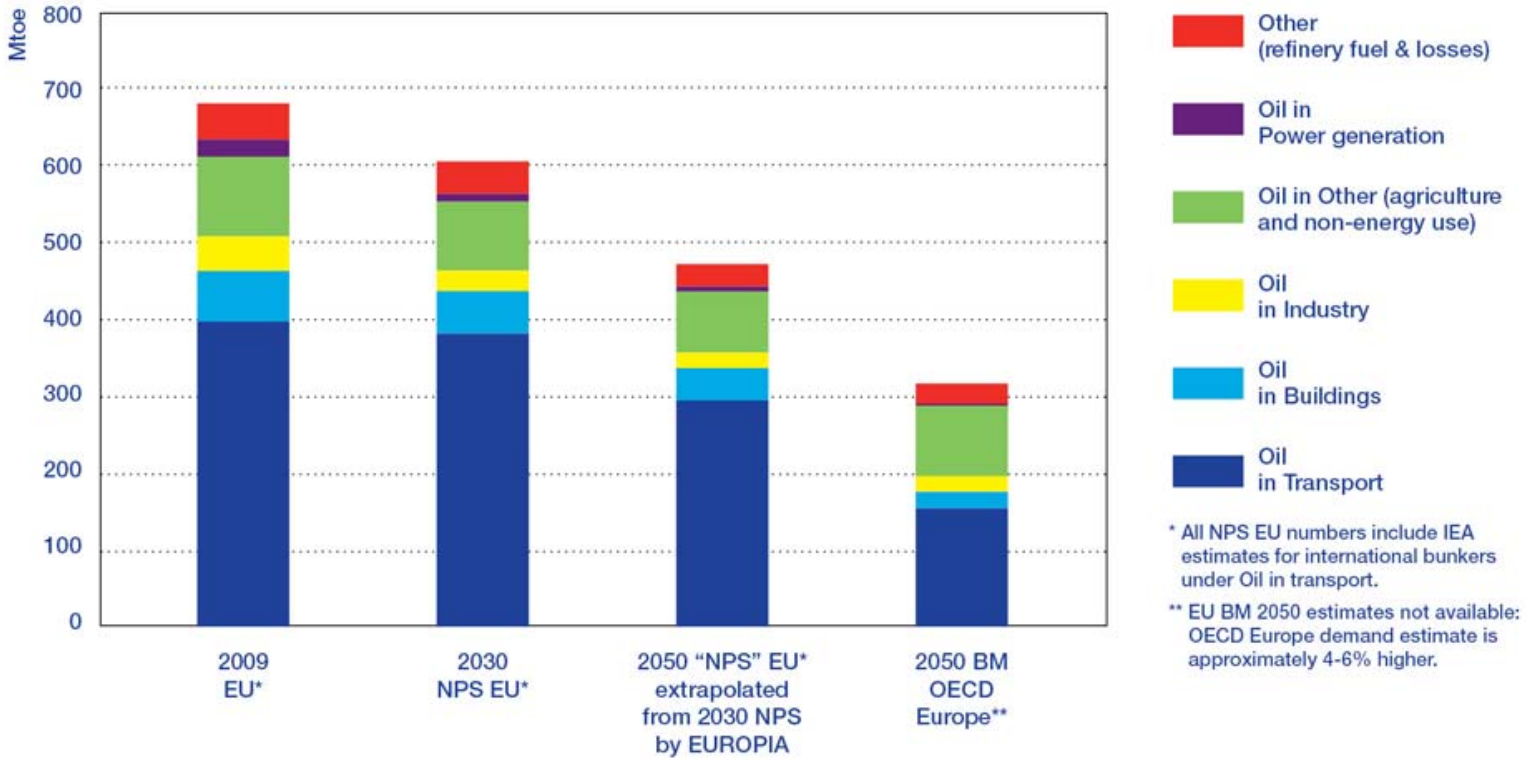


Source: www.fuellingeuropesfuture.eu;

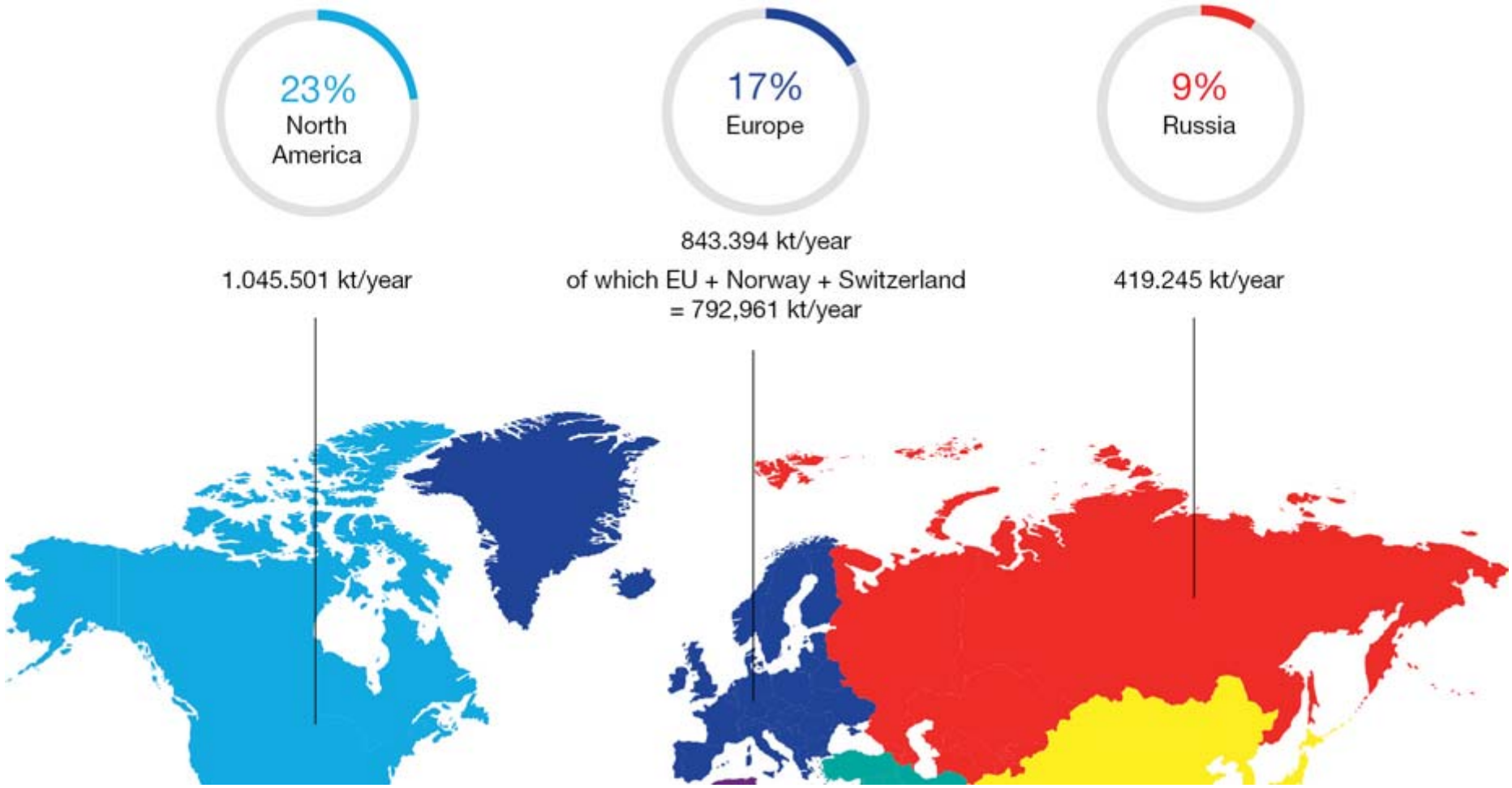
Europe: Major Changes in Transport

OIL DEMAND IN EUROPE COULD CHANGE DRASTICALLY BETWEEN 2030 AND 2050 DEPENDING UPON ASSUMPTIONS MADE

Source : IEA WEO 2010 & ETP 2010 and EUROPIA

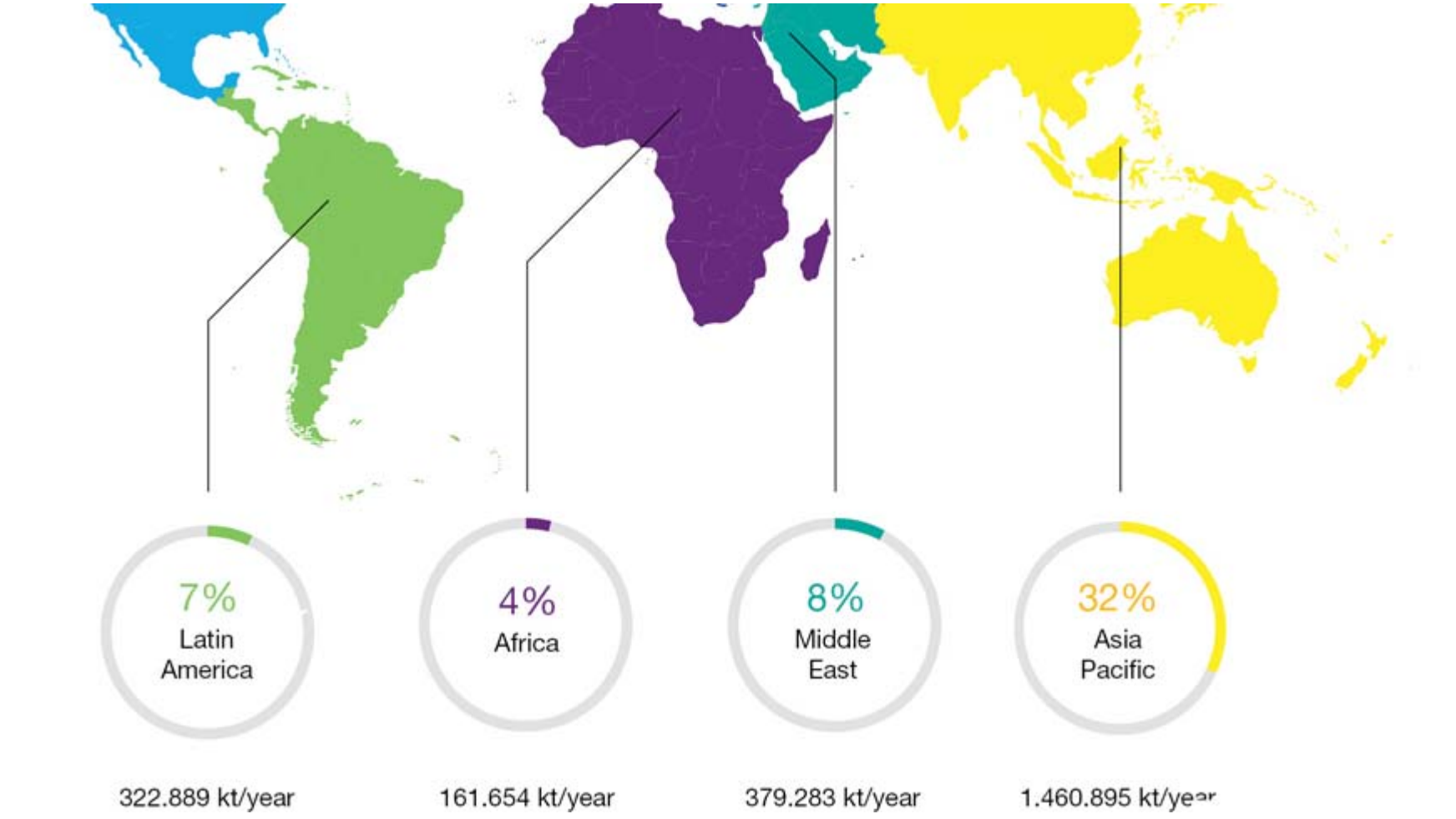


Global Refining Capacity as of 2011



Source: PFC Energy

Global Refining Capacity as of 2011



Source: PFC Energy

European Refineries – as of September 2011

9 Closed (6+3 announced)

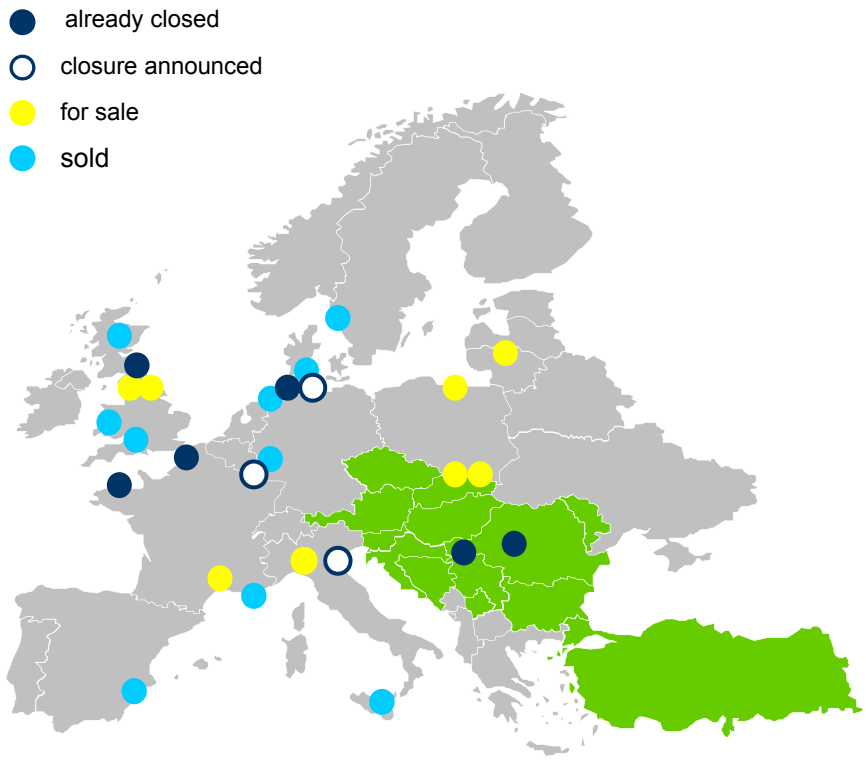
- 36 Mt/y in Europe closed
- 14 Mt/y announced to be closed
- This is 6% of European capacity

8 For Sale

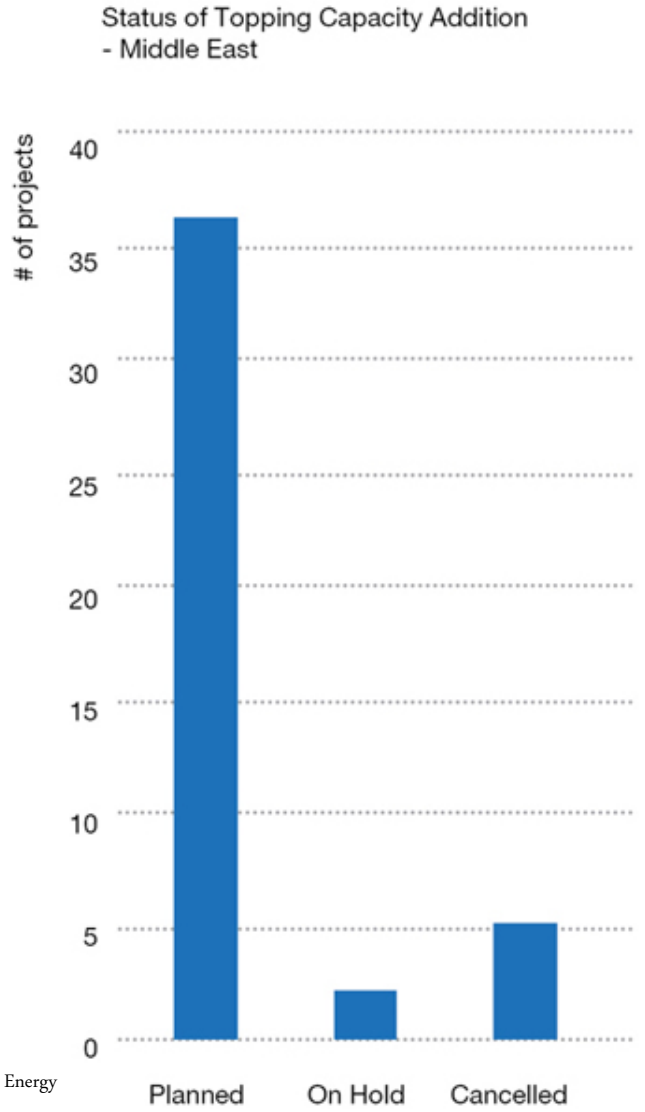
- Official about 49 Mt/y capacity are for sales
- This is ~6% of total European capacity

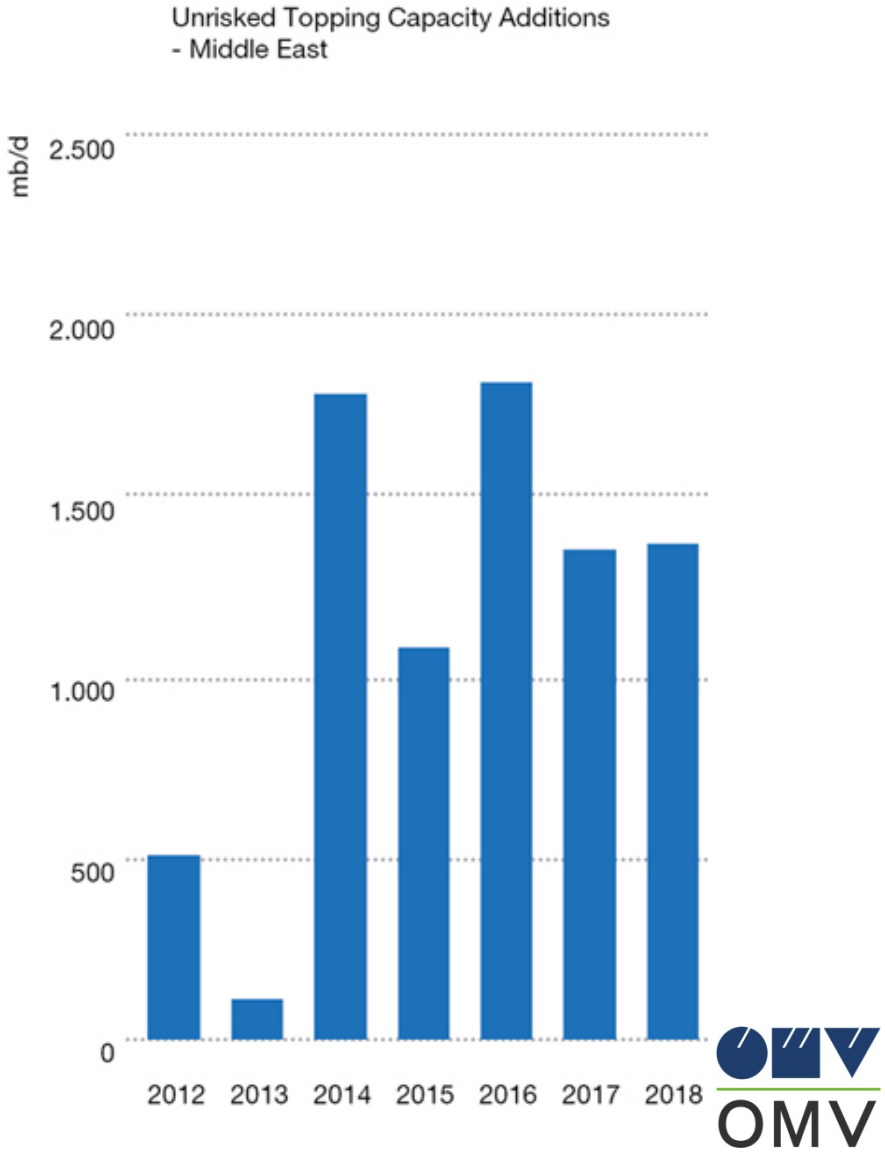
10 Sold

- 80 Mt/y refining capacity sold
- This is ~10% of total European capacity



The Bulk of global Capacity Additions will be in the Middle-East

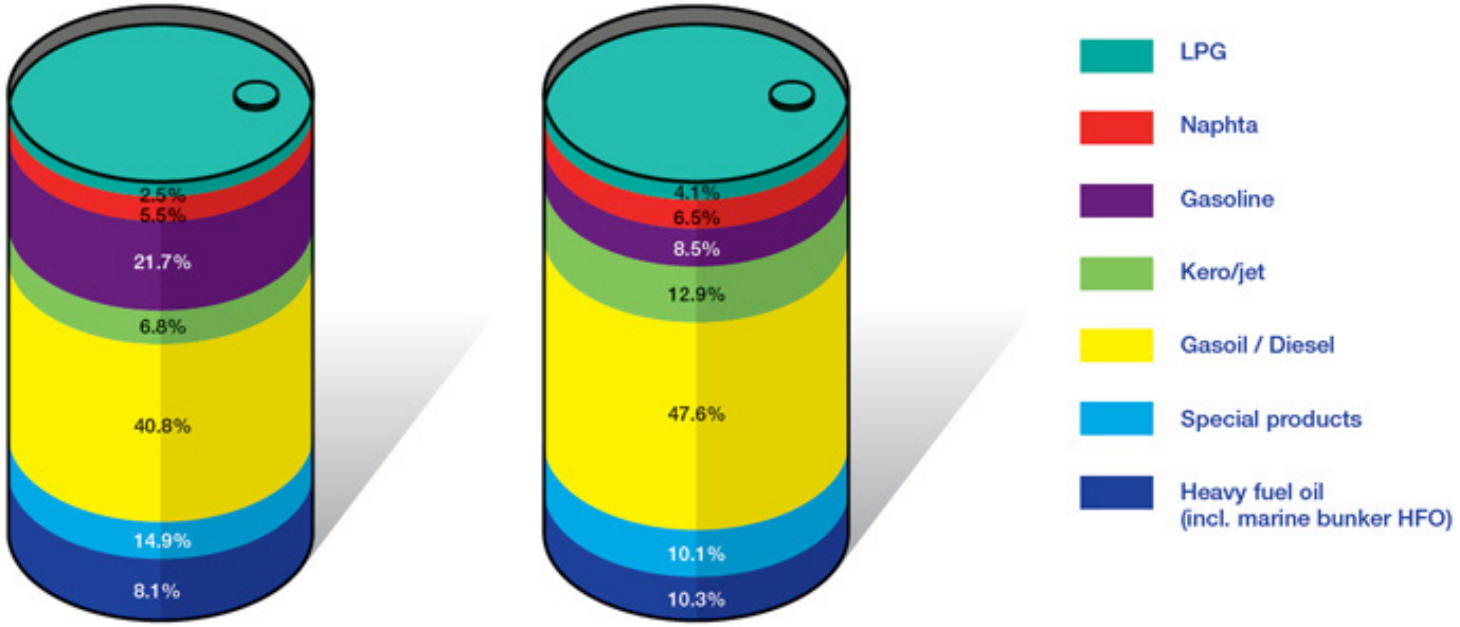




Source: PFC Energy

EU Refinery Production and Demand

EU refinery production in 2007 compared to estimated EU demand in 2030 (excluding refinery fuel & losses).

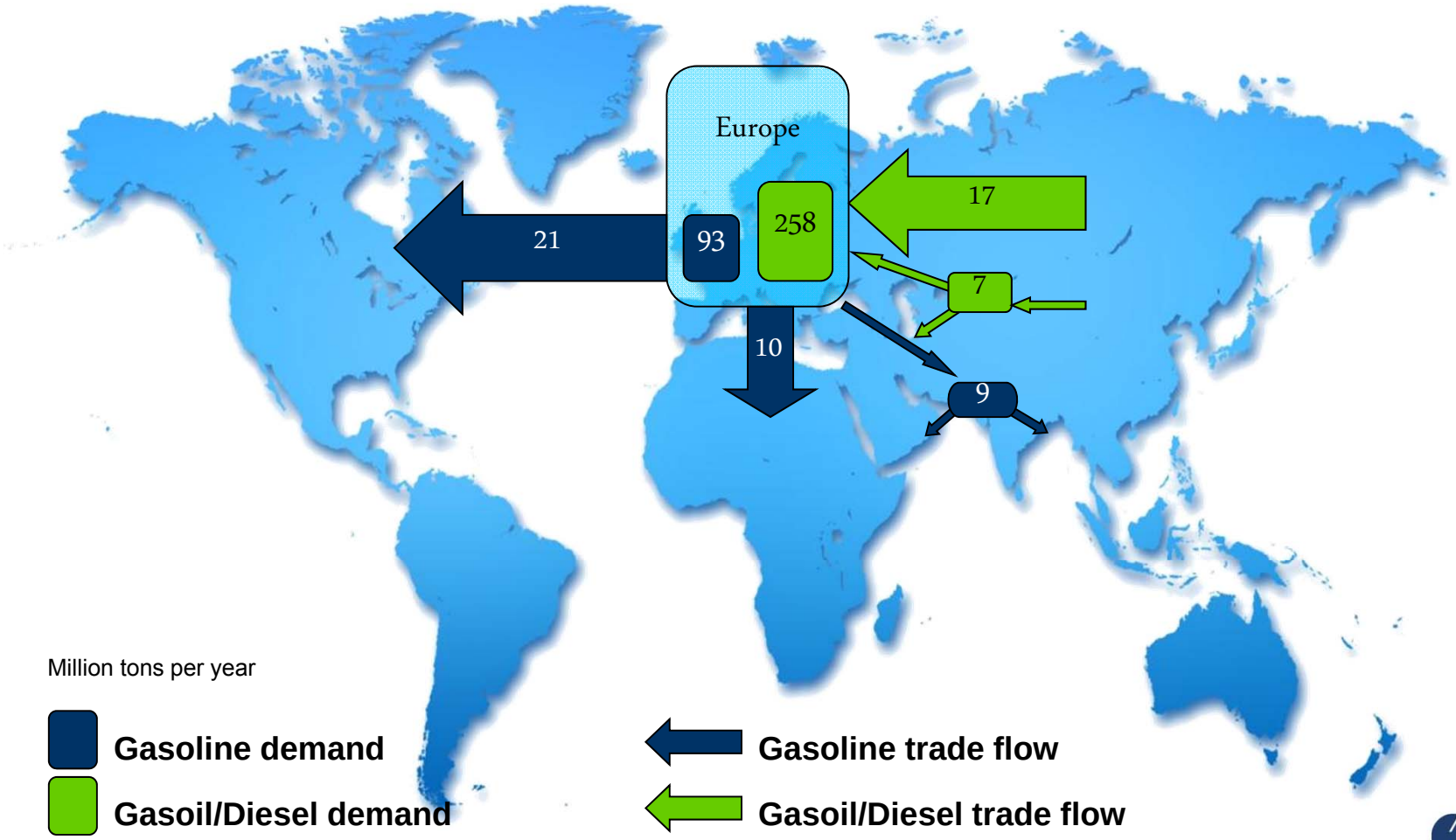


EU production in 2007 (IEA)

EU demand in 2030 (CONCAWE)

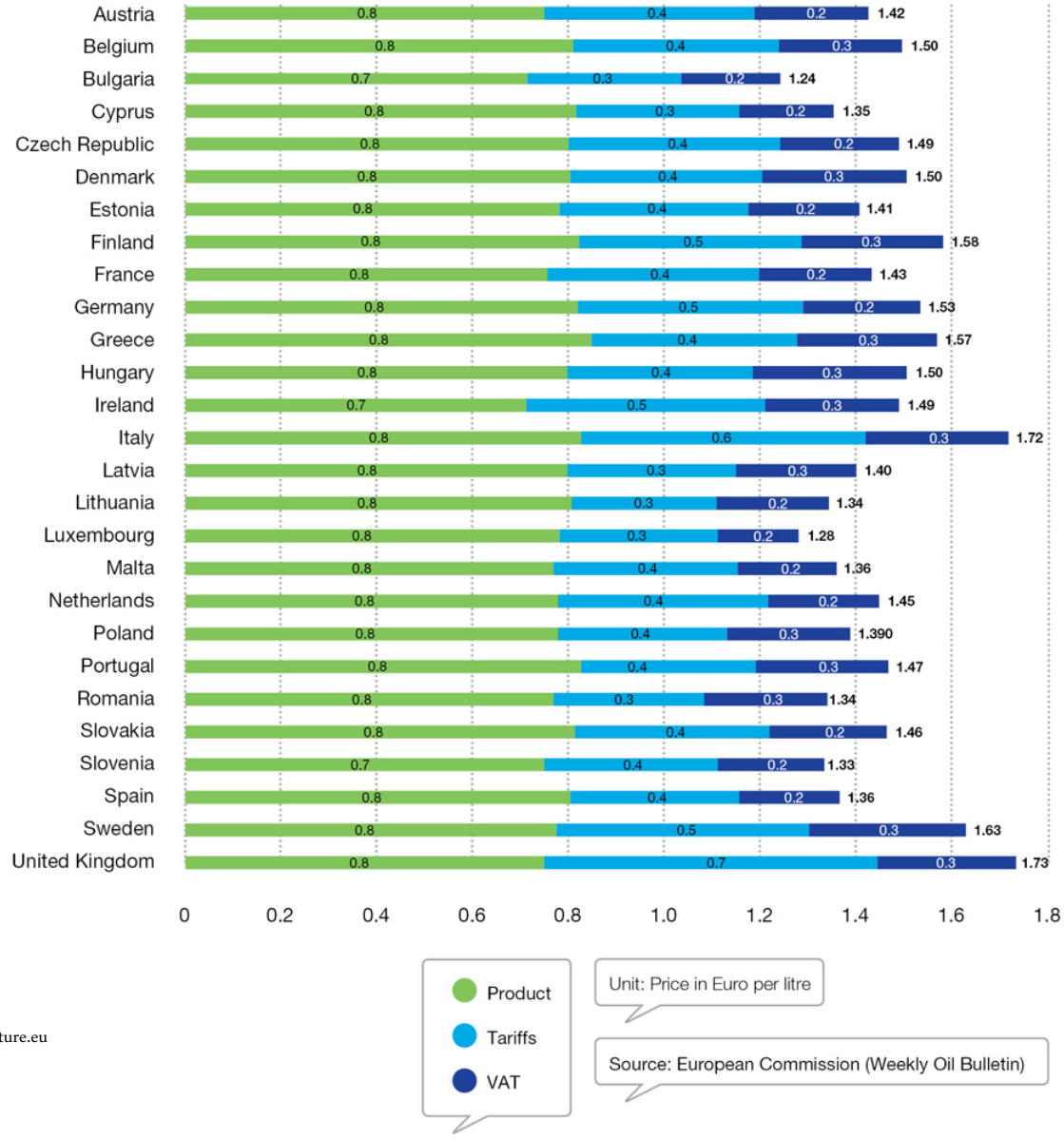
Source: International Energy Agency and CONCAWE

Trade Flows in Europe by 2009



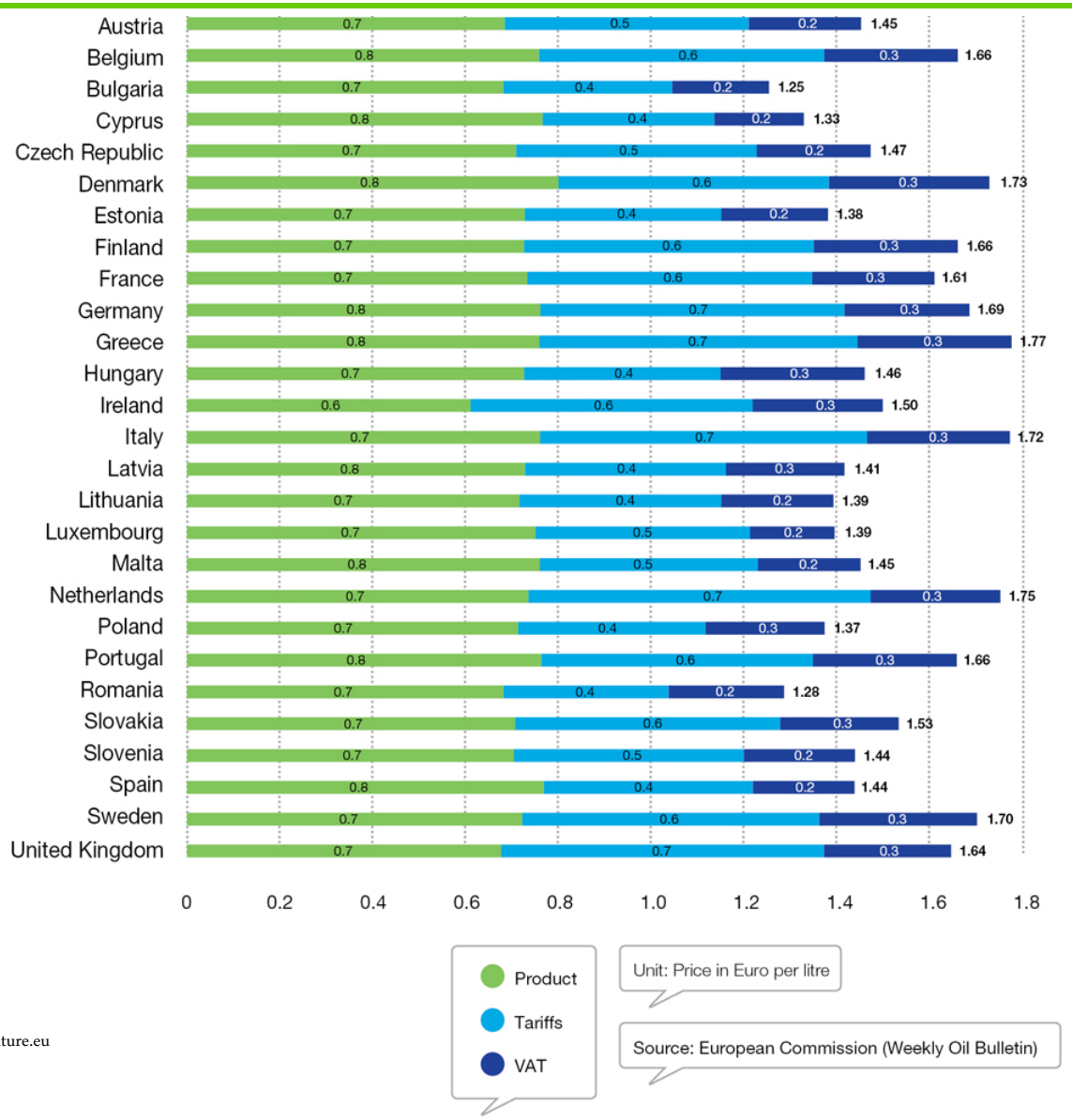
Source: Eurostat 2011

Breakdown of automotive Diesel Prices across EU (December 2011)



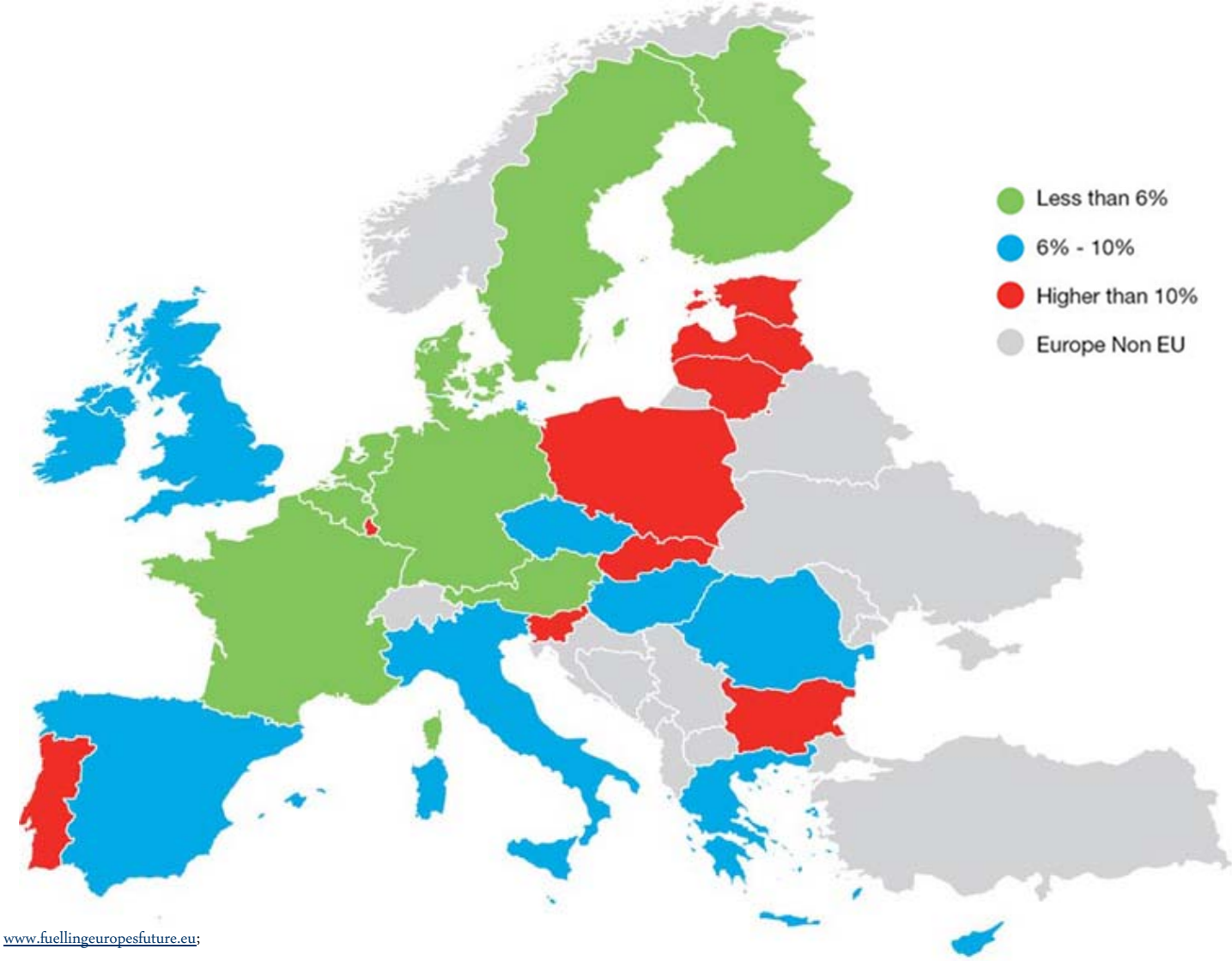
Source: www.fuellingeuropesfuture.eu

Breakdown of unleaded Petrol Prices across EU (December 2011)



Source: www.fuellingeuropesfuture.eu

Fuel Taxes make a significant Contribution to Member State National Income



Source: www.fuellingeuropesfuture.eu;

Content

Challenge CO_2

Hydrocarbon

$$\mathbf{C}_x H_y + O_2 = \mathbf{C}O_2 + H_2O + \text{Energy}$$

Biomass

$$\mathbf{C}_x H_y O_z + O_2 = \mathbf{C}O_2 + H_2O + \text{Energy}$$

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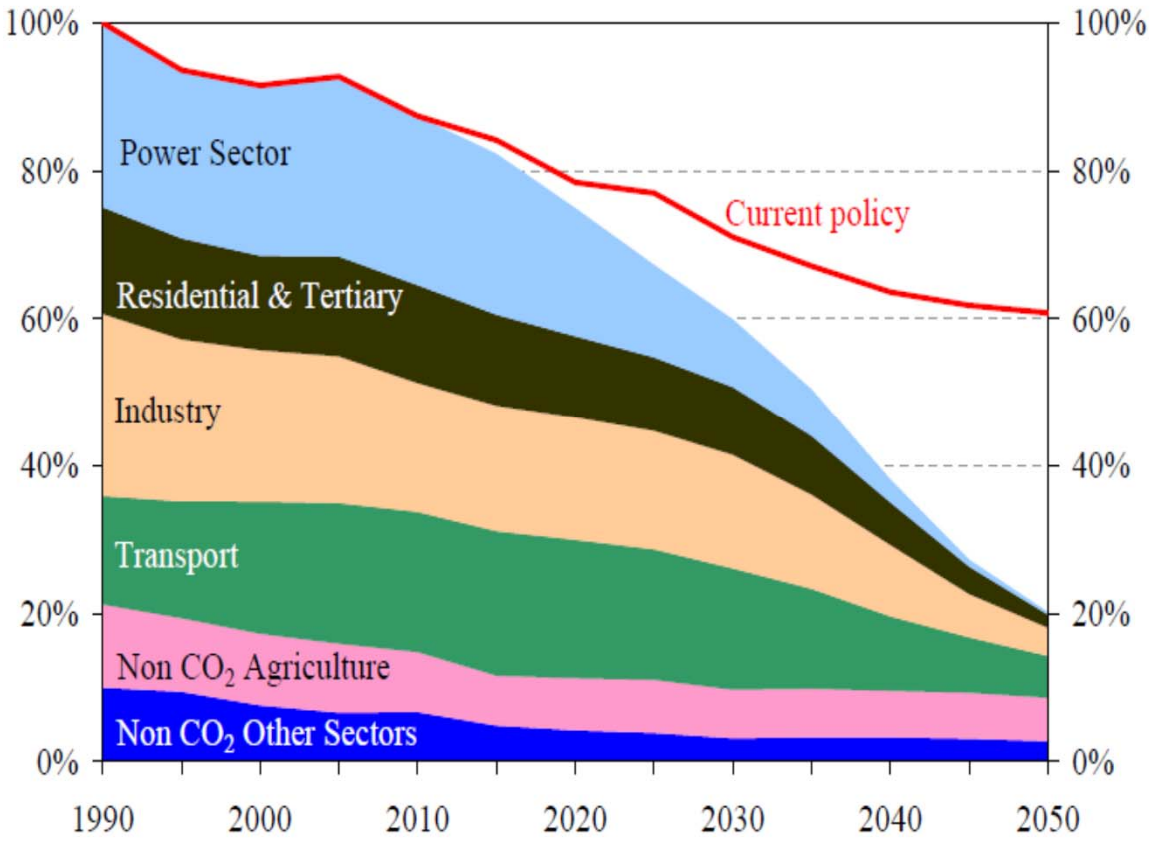
EU Roadmap for Moving Towards a „Low Carbon Economy“

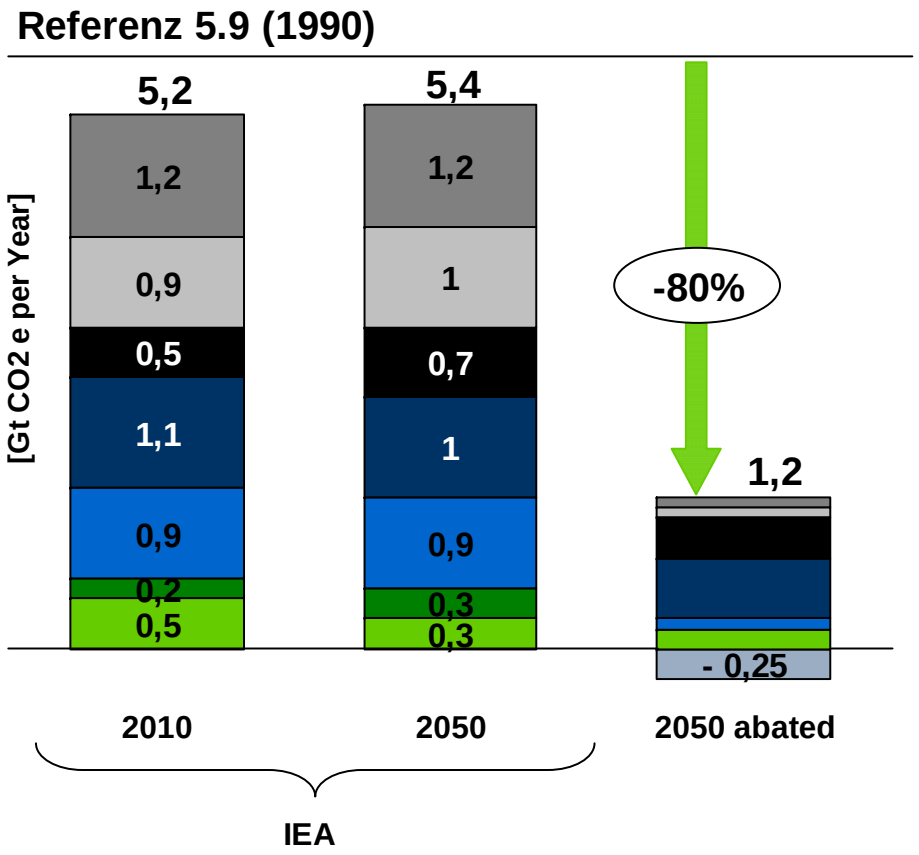


Source: „A roadmap for moving to a low carbon economy 2050“

- GHG-Emissions
  2020: -25%
  2030: -40%
  2040: -60%
  2050: -80%
- Costs: EUR 270 bn p.a.
- Savings: EUR 175-320 bn p.a.
  (depending on scenario)
- Technically feasible without break-through technologies (i.e. nuclear fusion) but with high carbon price
  (EUR/t CO_2 100-370)
- Finance instrumentals necessary (i.e. tax rebates, preferential loans for low carbon technologies)

EU CO2 Reduction Goal for 2050

- 80% decarbonisation overall by 2050 requires
- 95% decarbonisation of the road transport sector



95-100% Power

95% Road Transport

50% Air& Sea Transport

40% Industry *

95% Buildings

100% Waste

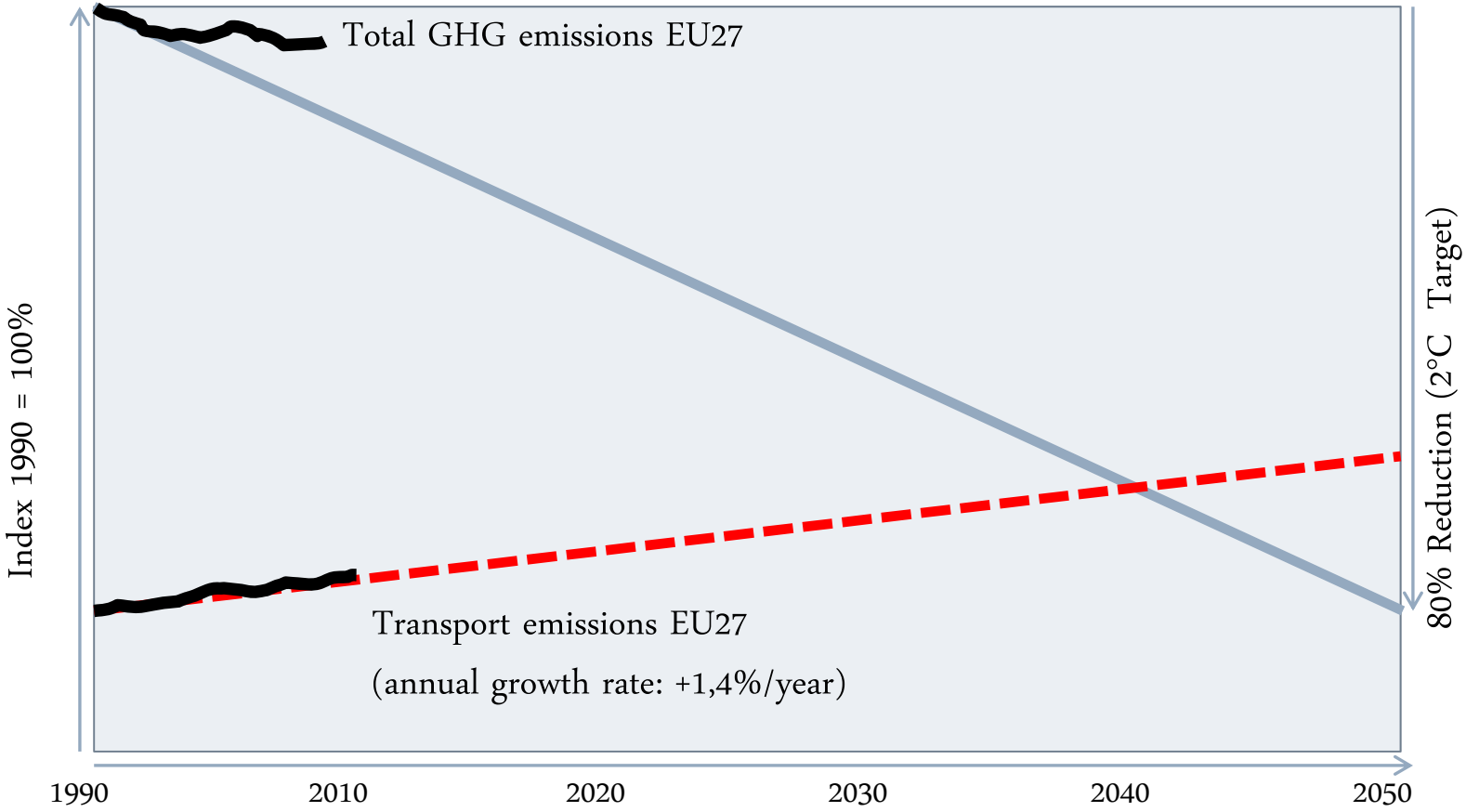
20% Agriculture

-0,25GtCO2 Forestry

*** CCS applied to 50% of large industry**

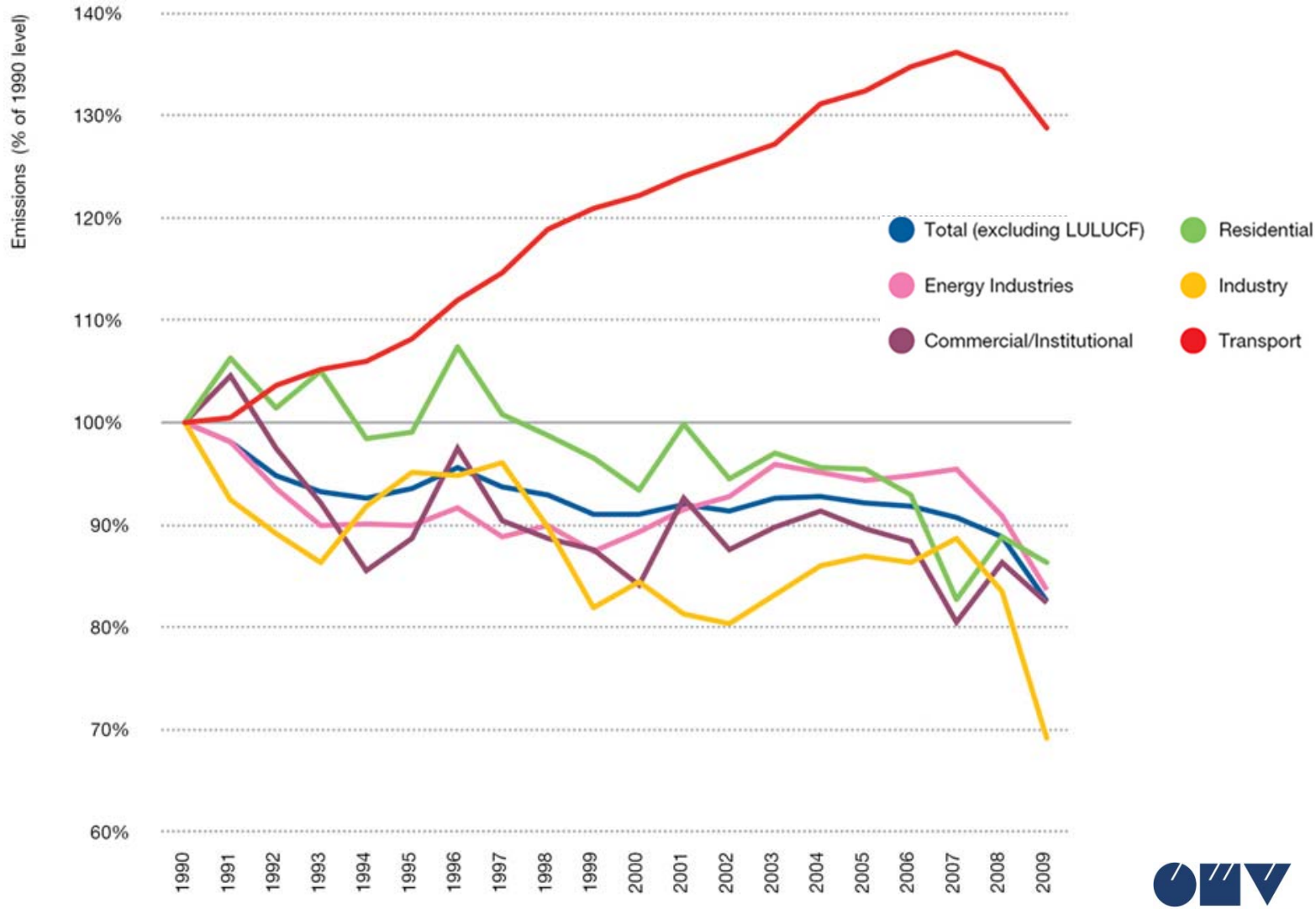
source: www.roadmap2020.eu

CO2eq. Emissions and EU-Targets



Source: European Environment Agency

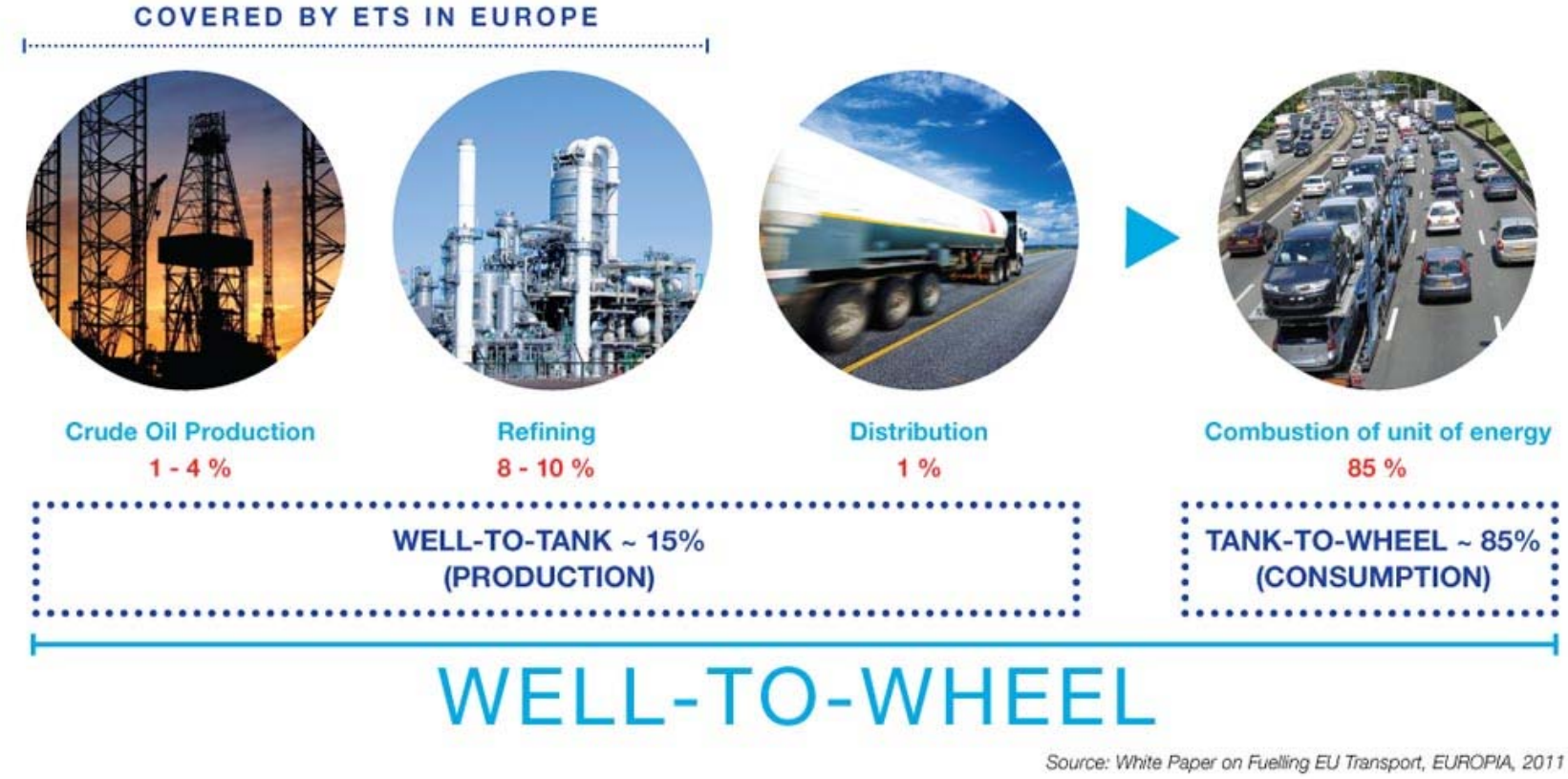
EU CO_2 Emissions, Trend by Sector



Source: www.fuellingeuropesfuture.eu

Fossil Fuels: CO2 - WTW

85% of GHG emissions are emitted
during the combustion of fuel use in vehicles.



Source: White Paper on Fuelling EU Transport, EUROPIA, 2011

Source: www.fuellingeuropesfuture.eu;

Future Transport

- Today's Transportation Fuels

CO2 Reduction 2020

Road Transport

- Passenger Cars (gasoline, diesel)
- Busses (diesel)
- Trucks (diesel)

→ **- 95%**

Other transport modes

- Railways (electricity, diesel)
- Off-road (diesel, gasoline)
- Ships (diesel, bunker fuels)
- Airplanes (Jet, gasoline)

→ **- 50%**

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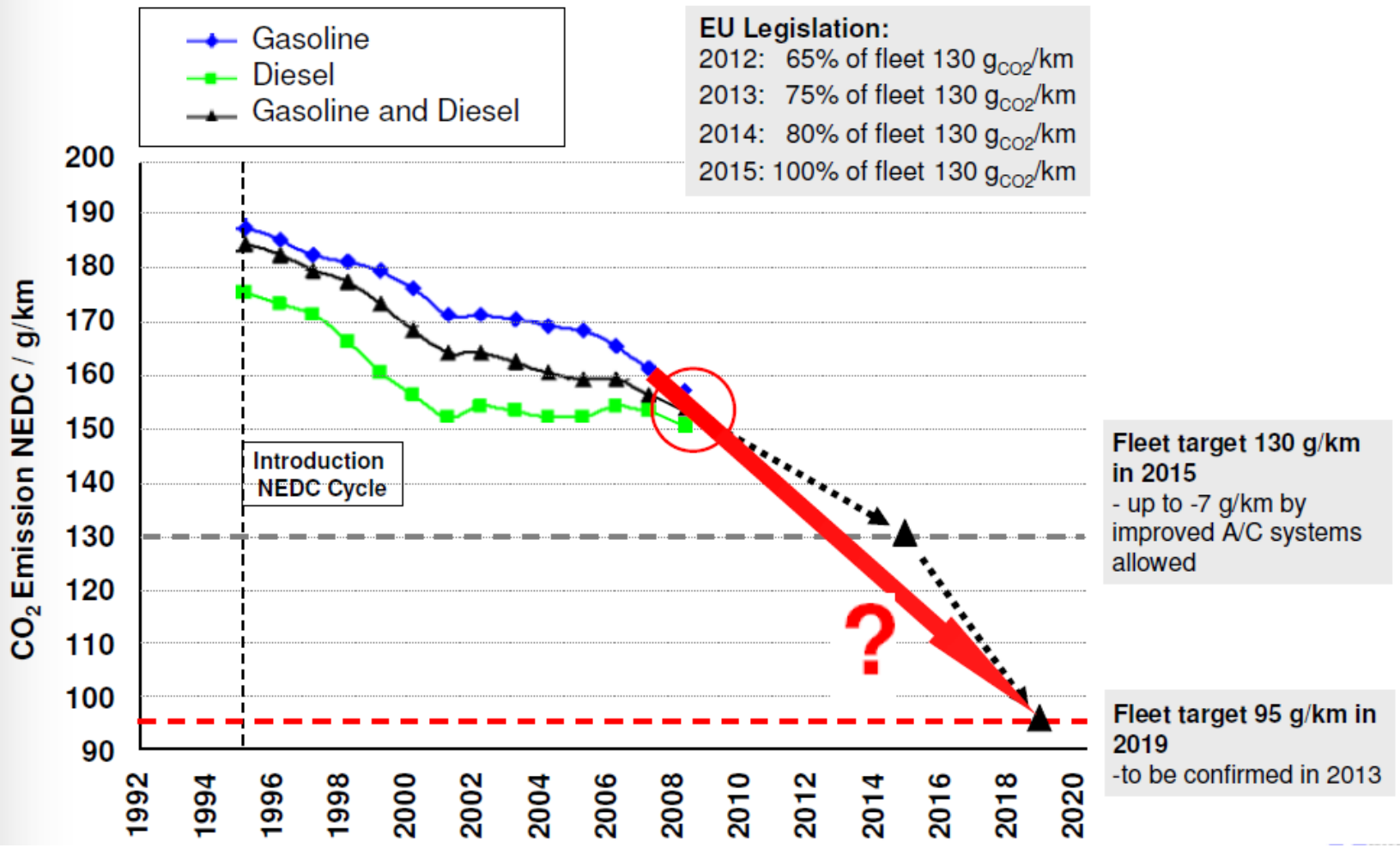
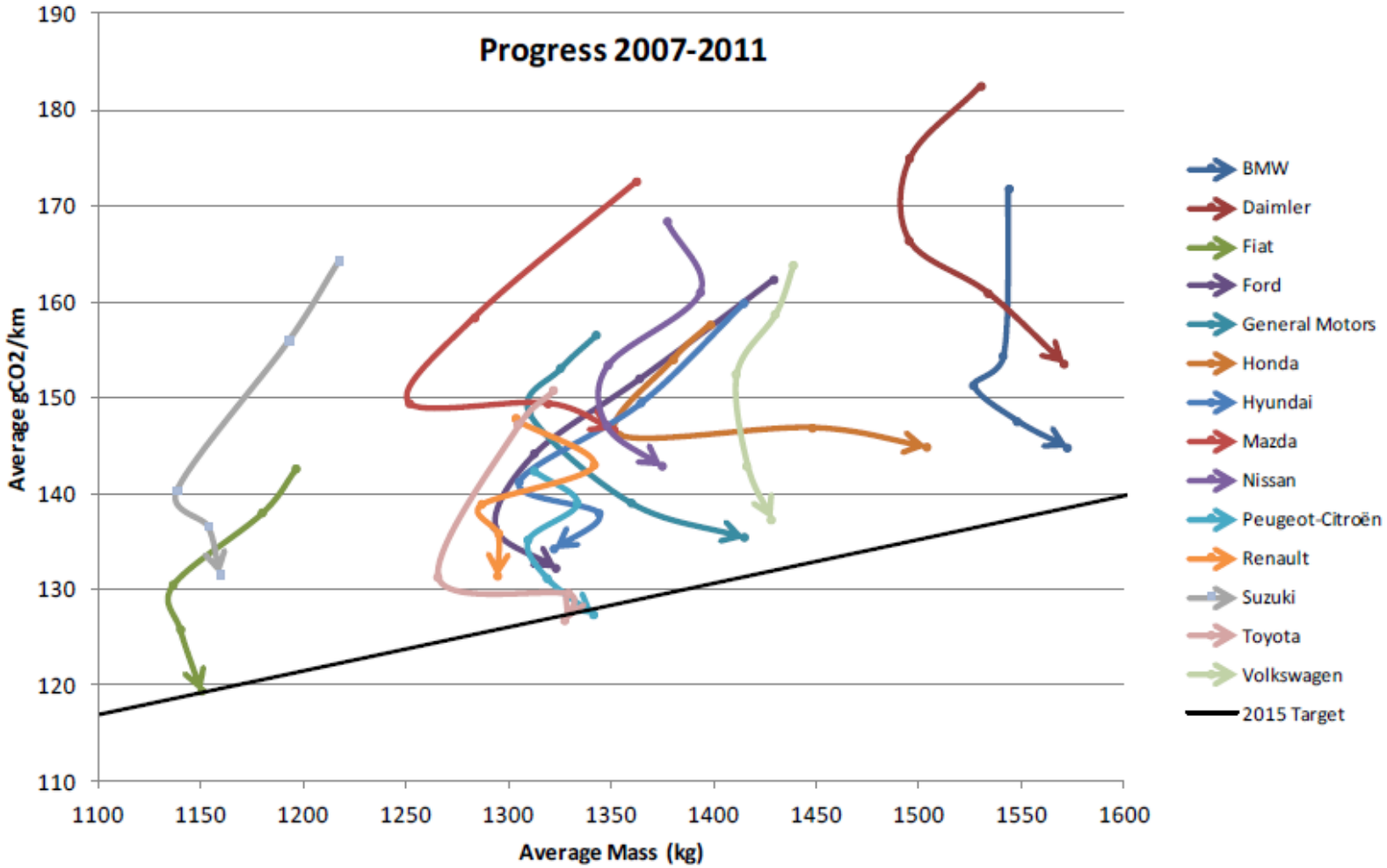
OEM's CO_2 Targets 2020



Development in fleet-average weight and averange CO_2 per OEM



Source: Transport & Environment - Report: How clean are Europe´s cars? Dec. 2012, Graph 5

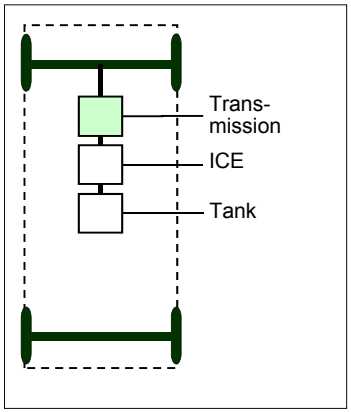
Content

Different powertrain technologies are analyzed: ICE, FCEV, BEV, PHEV

ICE powertrain | Transmission | Electric powertrain | Battery | FC powertrain

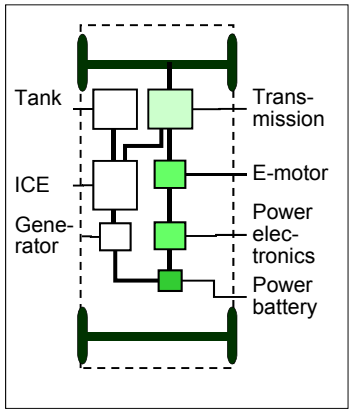
Internal combustion engine (ICE) vehicle

Current technology (2010)



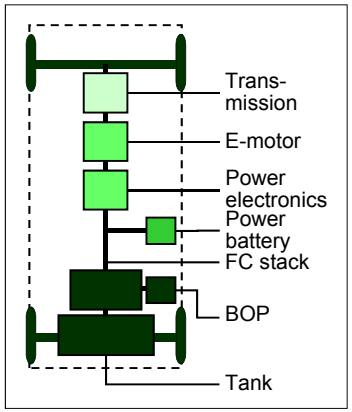
- **Conventional** internal combustion engine
- **No dependence** on electric infrastructure
- **High fuel consumption** and exhaust emissions
- **High range** typically 800-1200 km

Advanced (2015/20)



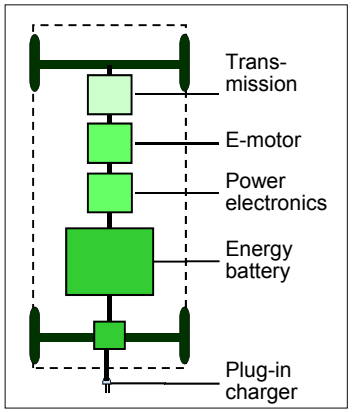
- **Parallel** hybrid configuration of electric and ICE drive; also known as hybrid electric vehicle (HEV)
- **ICE is primary mover** of the vehicle with support from small electric motor
- **Small battery** charged by the ICE
- Fully electric driving only at **low speed** for **smaller distances** (<5 km)
- **Better fuel economy** than conventional ICE

Fuel cell electric vehicle (FCEV)



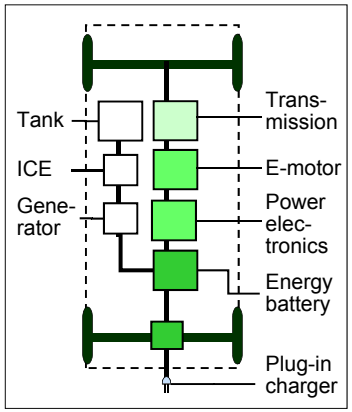
- **Series** configuration of fuel cell system and electric drive
- **Fuel cell stack** based on (PEM) technology
- Hydrogen tank pressure typically 350 or 700 bar
- **Medium range** (typically 400-500 km)

Battery electric vehicle (BEV)



- **Purely electric** drive
- Large battery capacity, Li-ion technology
- **Short range** (typically 100-200 km)
- Only charging of battery **from the grid** while stationary[1]

Plug-in hybrid electric vehicle (PHEV)

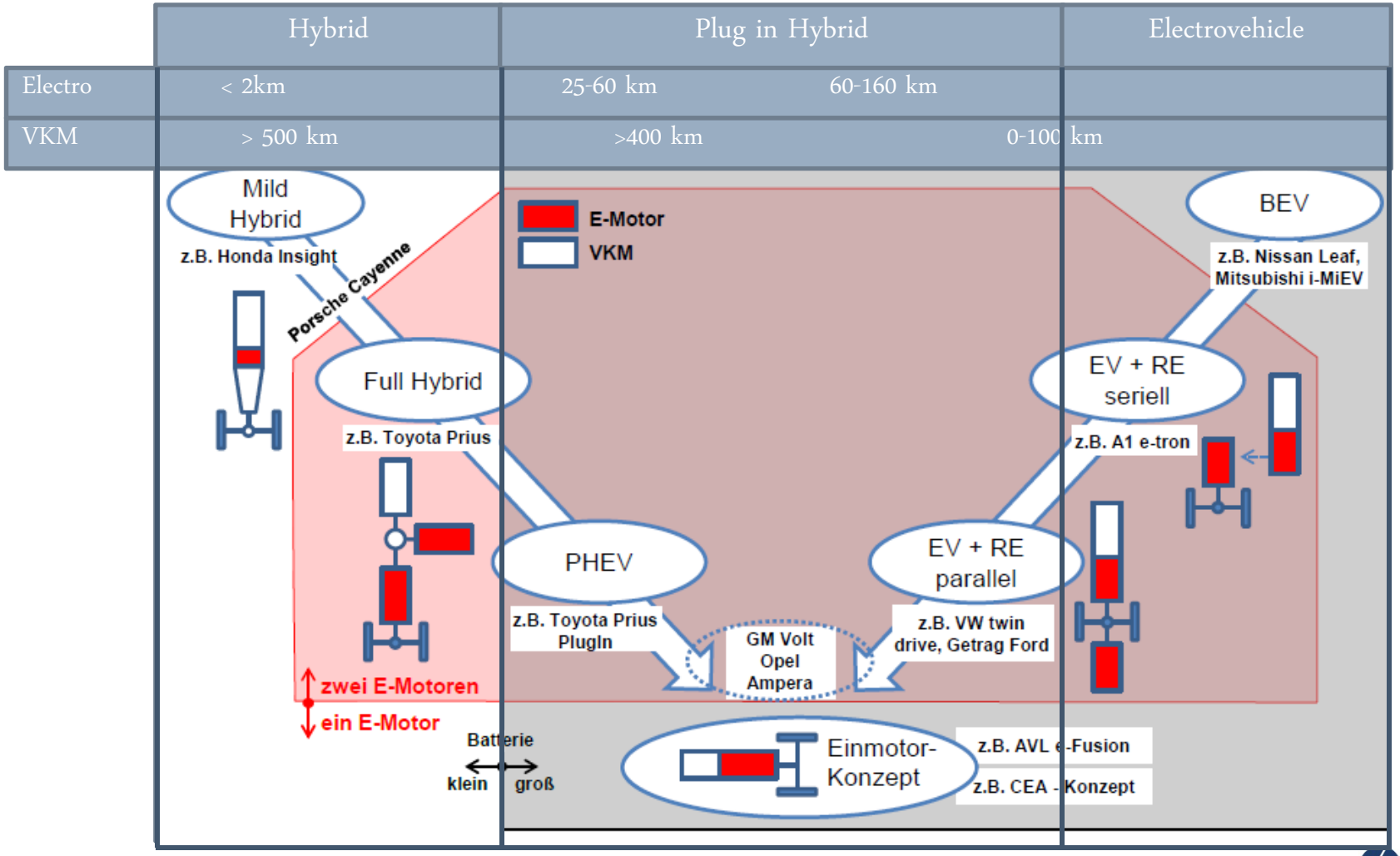


- **Series hybrid** configuration of electric and ICE drive
- **Smaller battery capacity** than BEV, (Li-ion)
- **Short range** (typically 40-60 km) electric driving
- Vehicle can be **plugged-in** to charge from the grid
- **Small ICE**-based generator for larger range ('range extender')

1 Exchange of battery pack is possible, but not considered in this study

SOURCE: Coalition workshops, Working team analysis

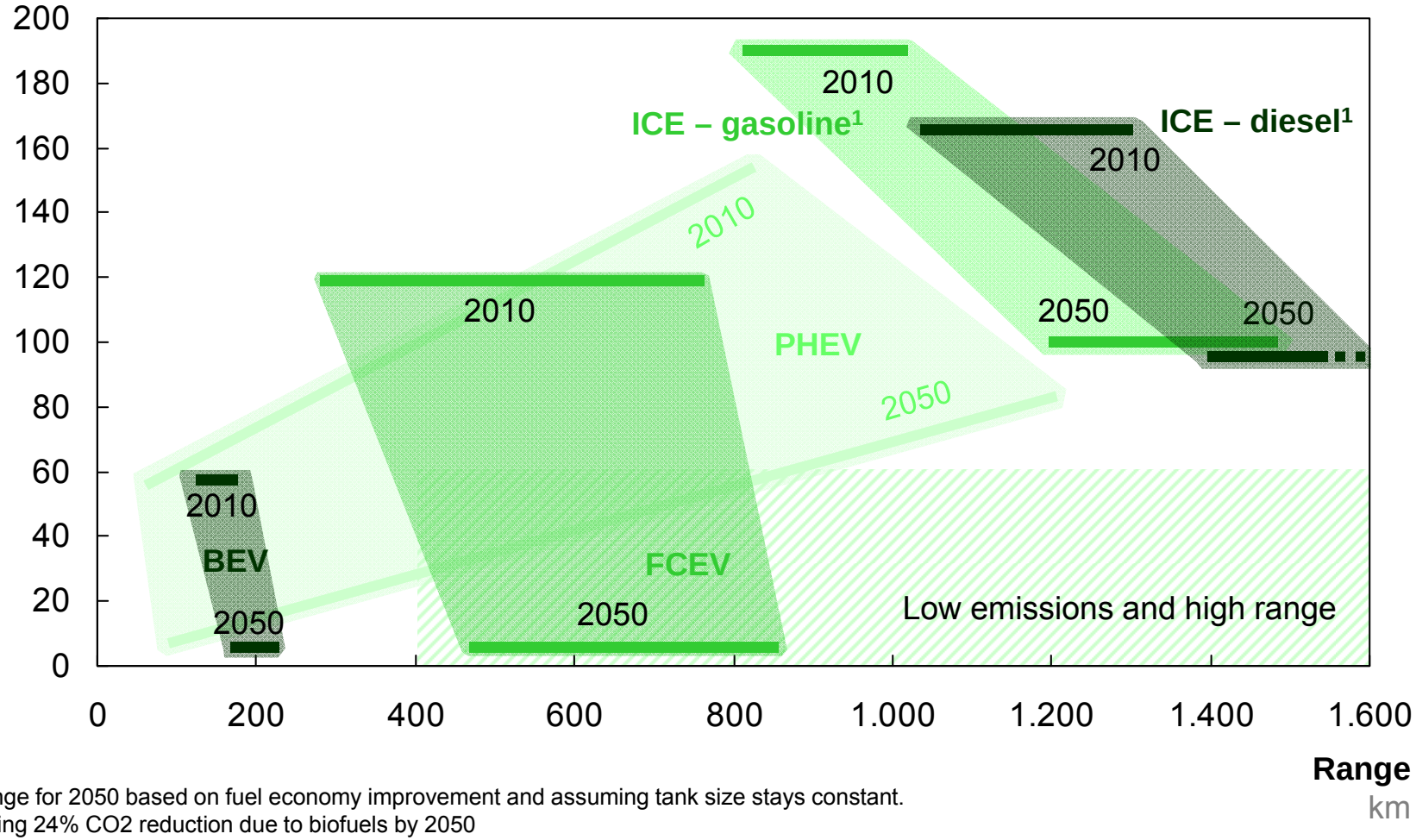
Electrification of Powertrain



Source: Prof. Hohenberg, Prof. Beidl, Vortrag ÖVK 2012

Electric vehicles (BEV, PHEV, FCEV) can achieve near zero CO2 emissions with BEVs showing limitations in driving range

This study assumes biofuels blending in gasoline and diesel is limited to 24% beyond 2030



1 ICE range for 2050 based on fuel economy improvement and assuming tank size stays constant. Assuming 24% CO2 reduction due to biofuels by 2050

SOURCE: Clean team sanitized data, coalition workshops, Working team analysis

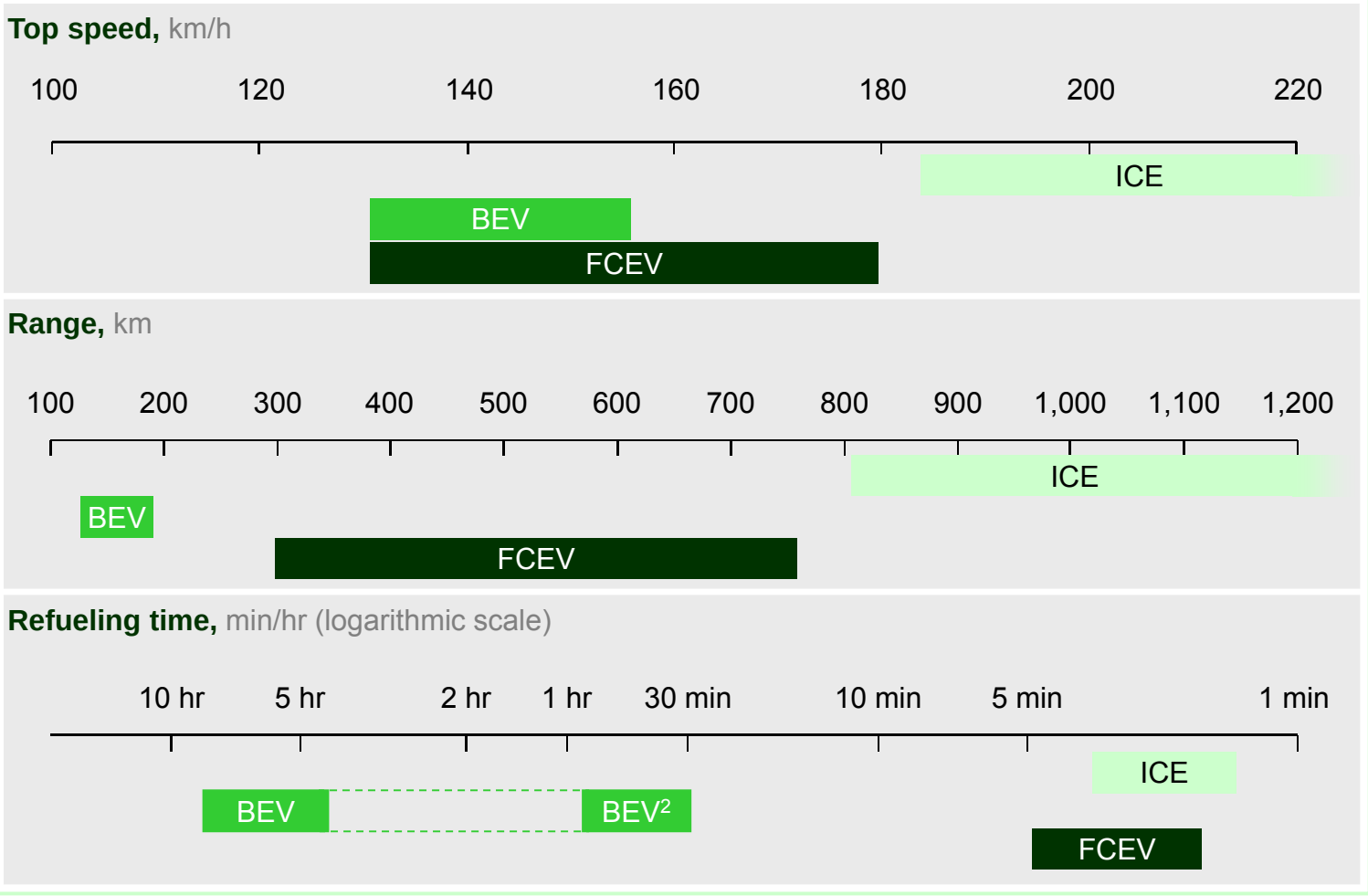
FCEVs can close the performance gaps to the ICE

Similar performance

- Acceleration
- Curb weight
- Payload
- Cargo volume

Differentiated performance[1]

Poor ← → Excellent



1 Bars represent range of performance across reference segments
2 Fast charging; implies higher infrastructure costs, reduced battery lifetime and lower battery load

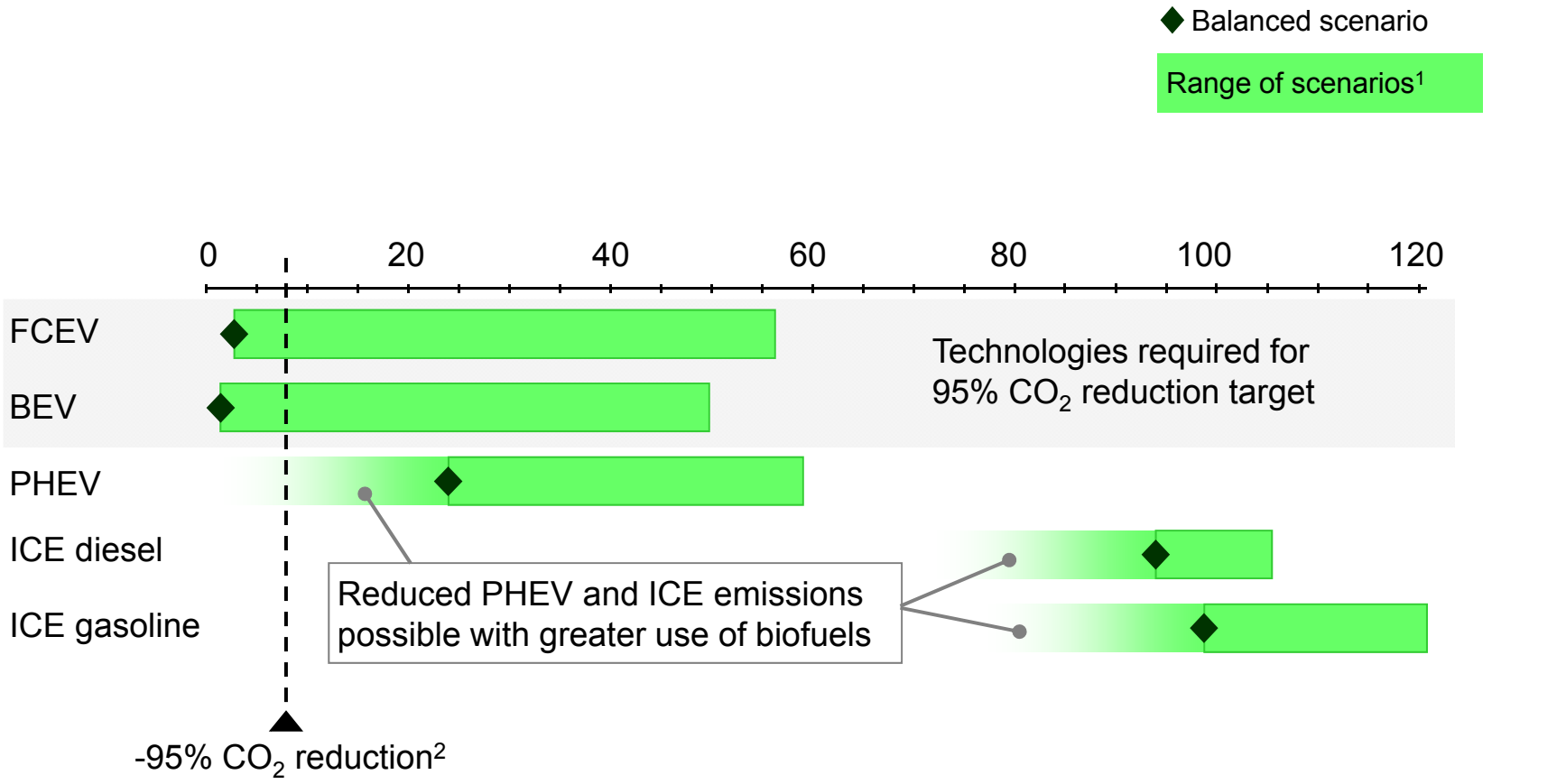
SOURCE: Clean team sanitized data, coalition workshops, Working team analysis

BEVs and FCEVs can abate 95% of the CO_2 emissions

Well-to-wheel CO_2 emissions, g CO_2/km

25% FCEV WORLD

2050 | C/D SEGMENT



1 Scenarios refer to a range of potential futures of varying electricity decarbonization and biofuel implementation:
Balanced - Decarbonized electricity sector via renewables, CCS and nuclear, and 24% well-to-wheel reduction in diesel and gasoline CO2 footprint
High CO2 - Central SMR for H2 production, EU 2010 electricity mix, and 6% well-to-wheel reduction in diesel and gasoline CO2 footprint
2 C/D segment emission limit set to 4% of current 2010 vehicle emissions to achieve 95% CO2 reduction allow 20% more vehicles in 2050

SOURCE: Clean team sanitized data, coalition workshops, Working team analysis

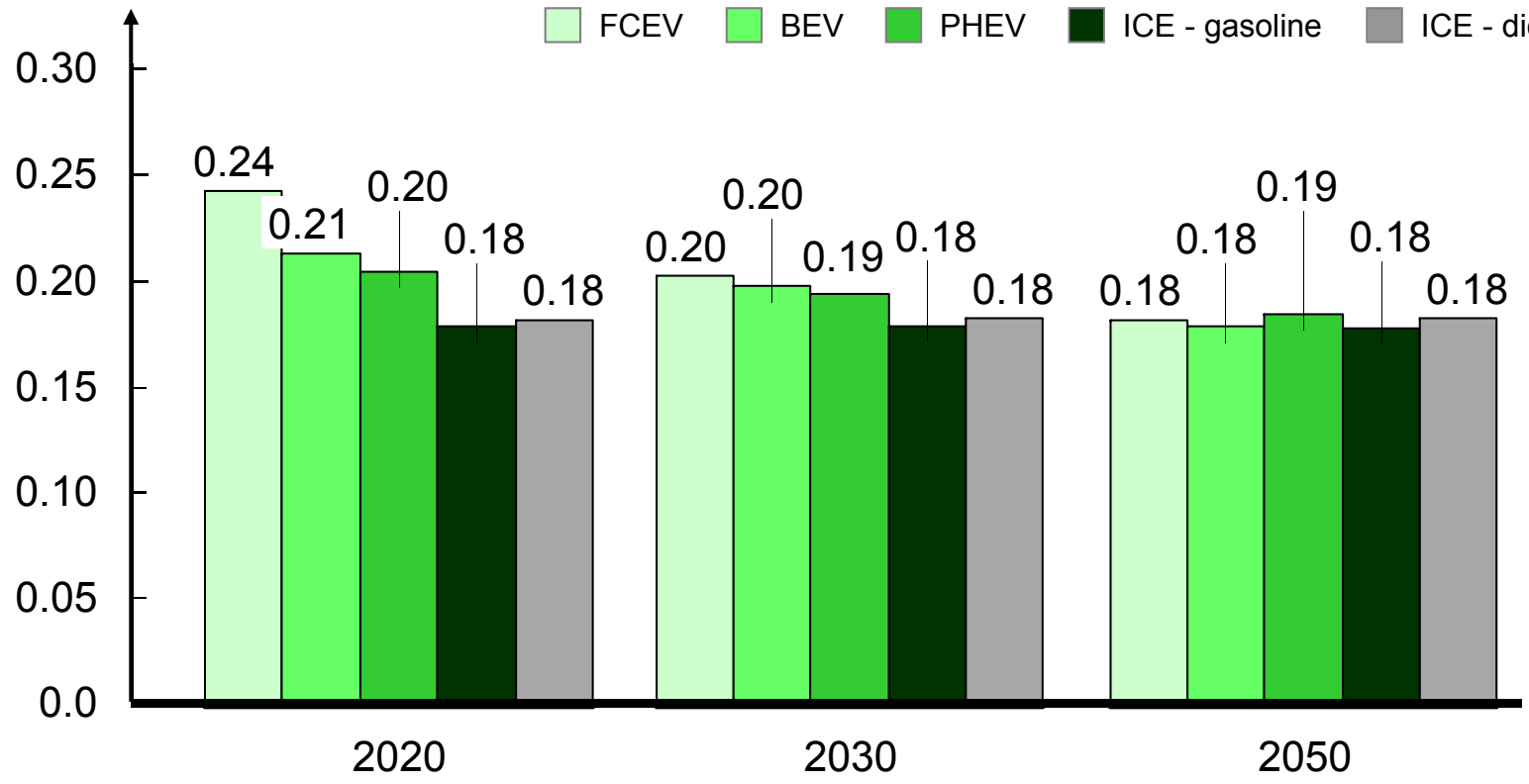
Electric powertrains can become cost competitive with ICE over the next decades

25% FCEV WORLD

C/D SEGMENT

Total Cost of Ownership (TCO[1])

EUR/km

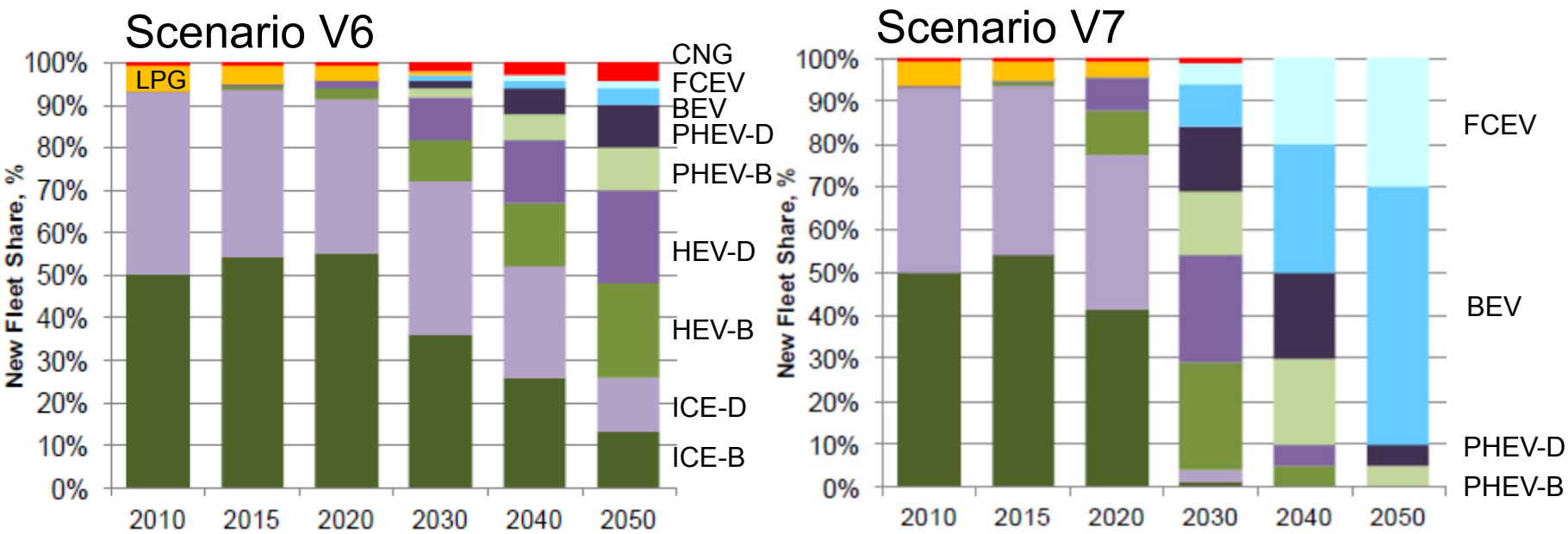


1 Based on 15 years vehicle lifetime, 12,000 km annual driving distance, no tax
2 Delta between FCEV TCO and ICE gasoline TCO calculated in EUR/month/vehicle

SOURCE: Clean team sanitized data, coalition workshops, Working team analysis

Technology deployment rates needed to achieve GHG reductions (EU27)

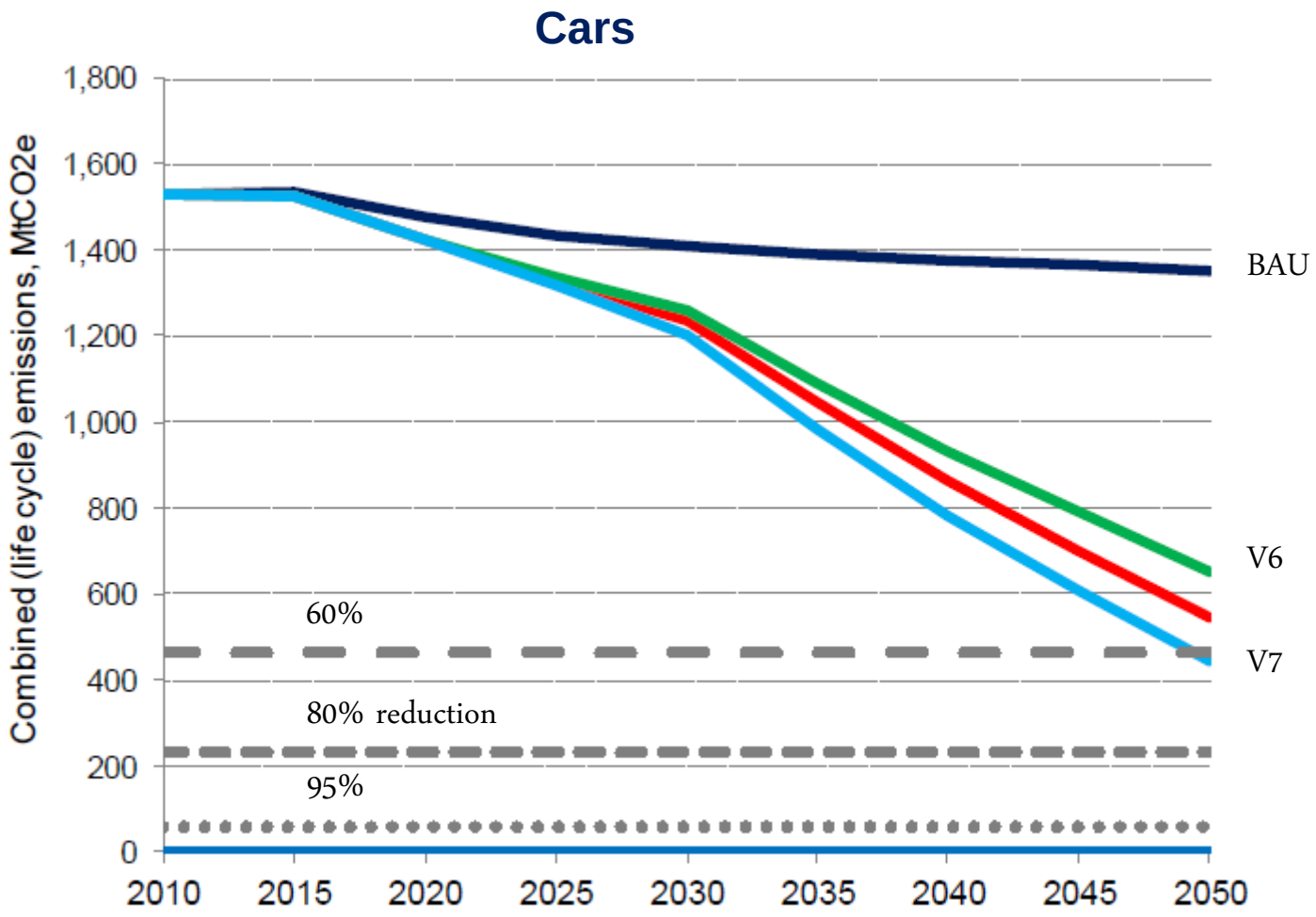
New fleet share passenger cars



CNG…	Compressed Natural Gas
LPG…	Liquified Petroleum Gas
FCEV…	Fuel Cell Electric Vehicle
BEV…	Batterie Electric Vehicle
PHEV-D/B…	Plug In Hybrid Electric Vehicle Diesel/Gasoline
HEV-D/B…	Hybrid Electric Vehicle Diesel/Gasoline
ICE-D/B…	Internal Combustion Engine Diesel/Gasoline

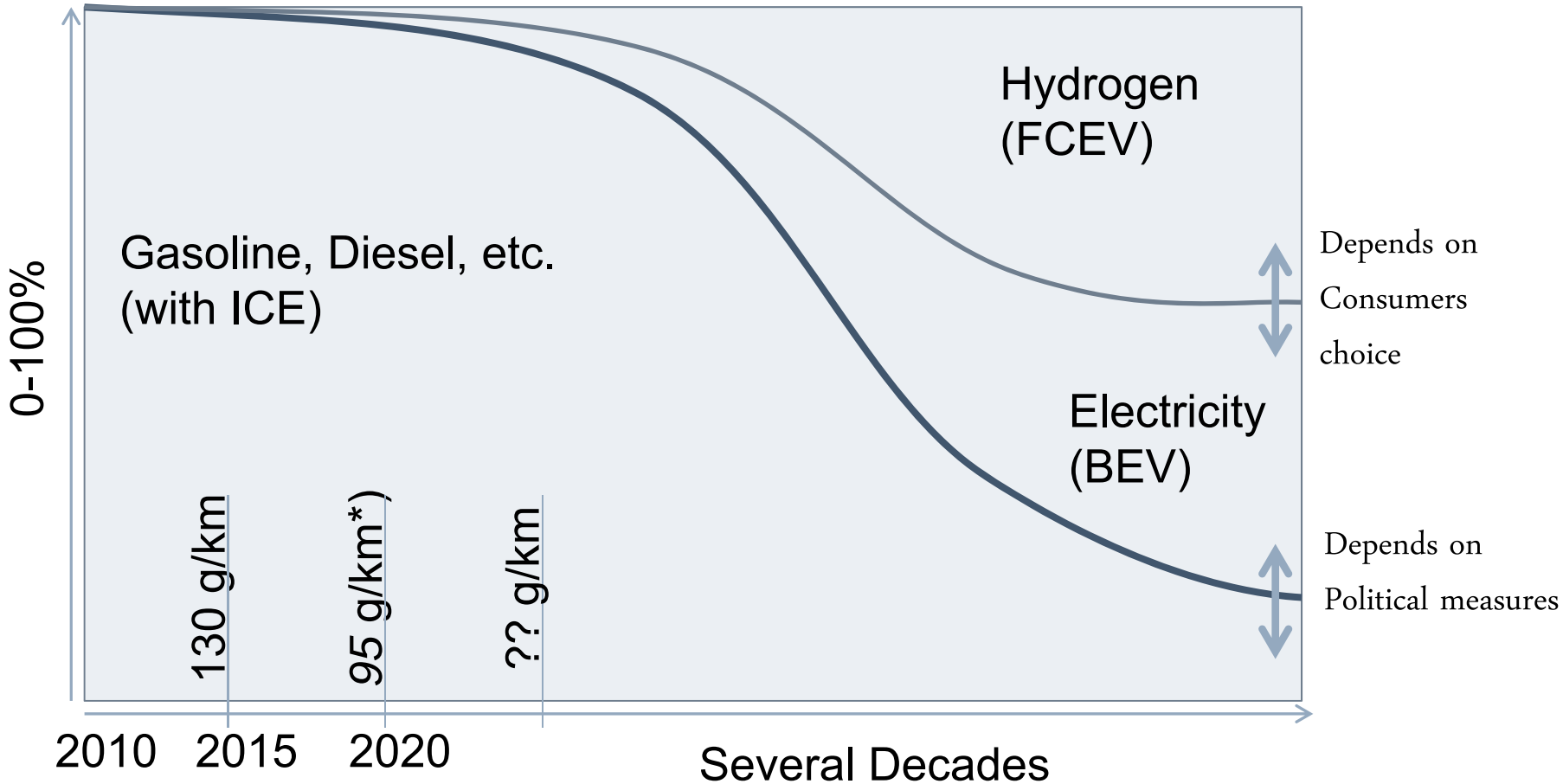
Source: Report EU Transport GHG: Routes to 2050? Figure 10.12

Total Combined (life cycle) GHG emissions



Source: Report EU Transport GHG: Routes to 2050? Figure 10.13

CO_2-Emission Reduction on Passenger Cars



ICE…Internal Combustion Engines
FCEV…Fuel Cell Electric Vehicle
BEV…Battery Electric Vehicle
*) proposal, values for the average weighted fleet

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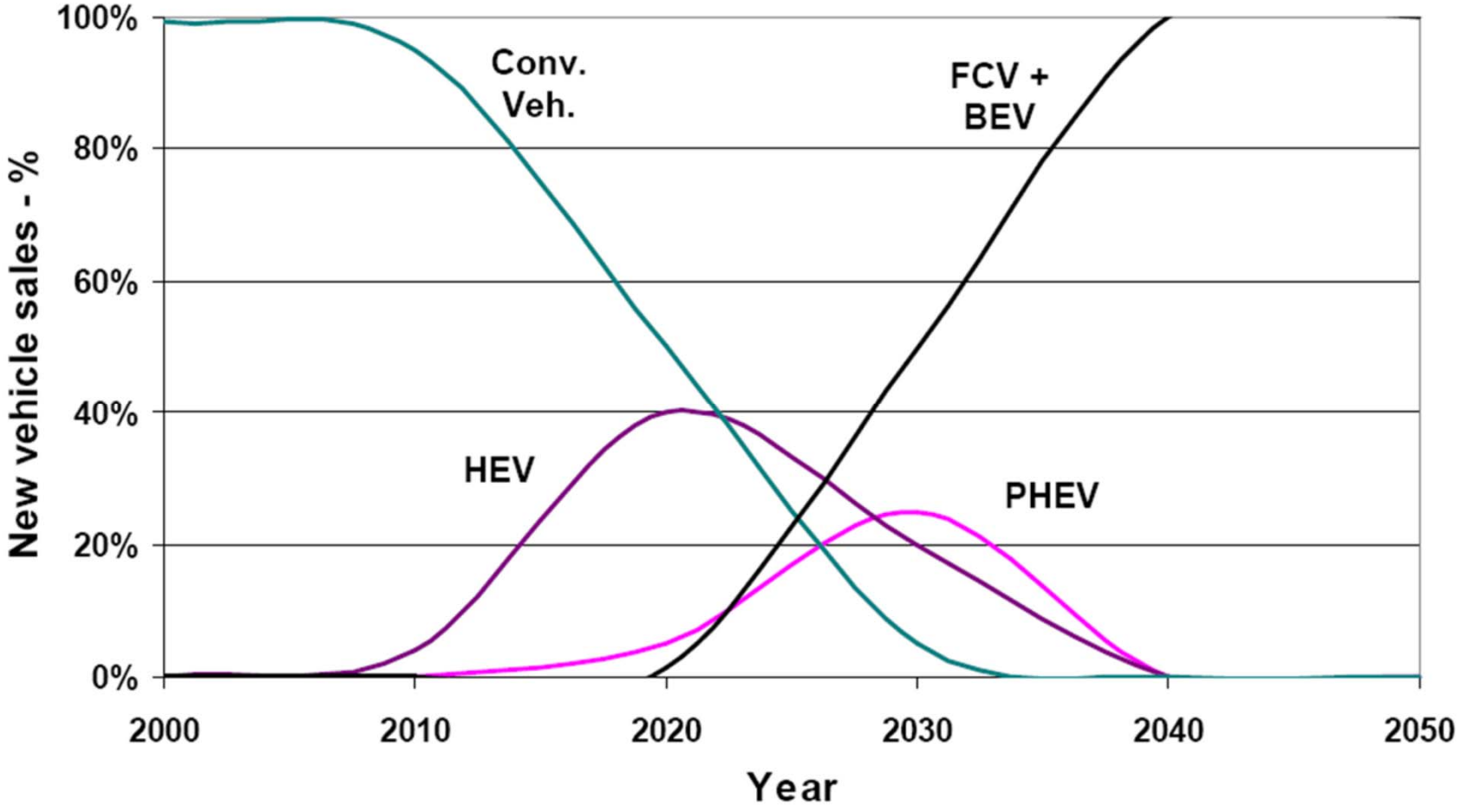
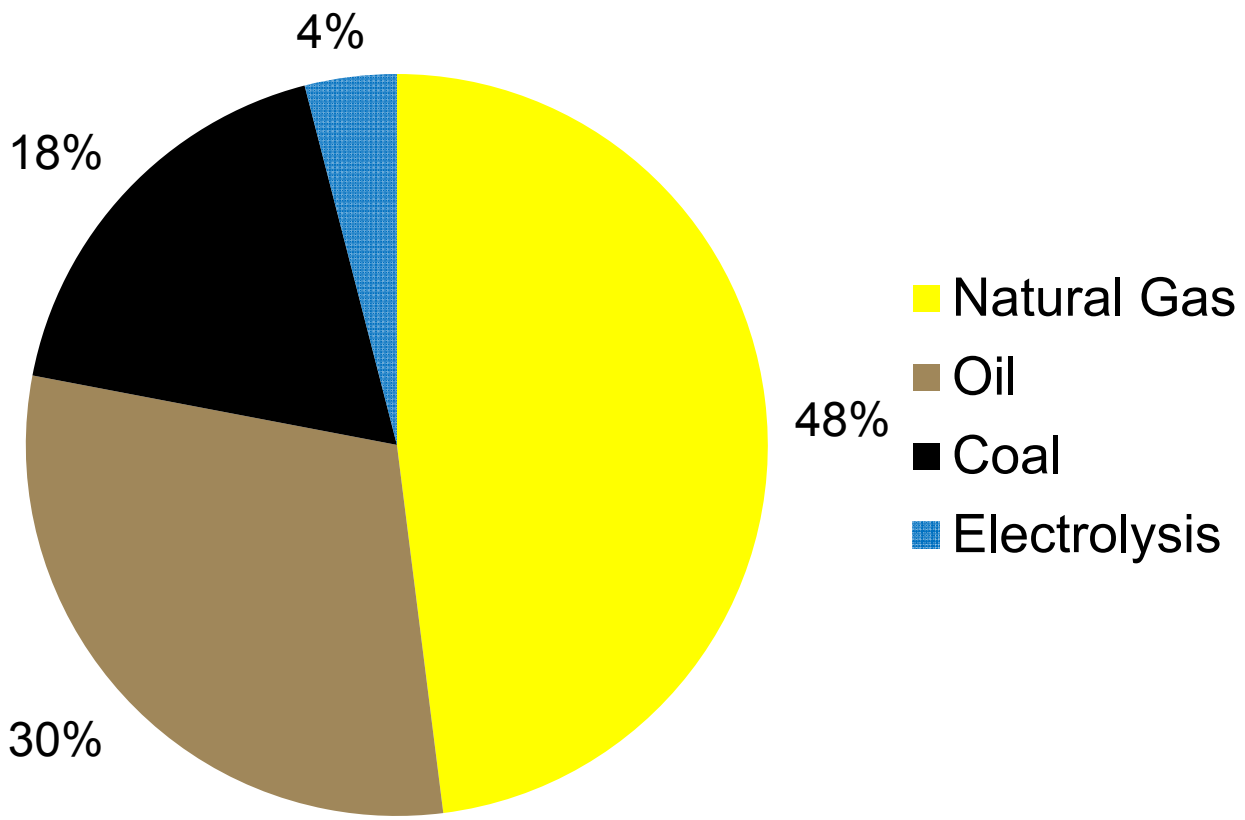
The Future of the ZEV in California



Source: http://www.arb.ca.gov/board/books/2011/062311/11-4-3pres.pdf

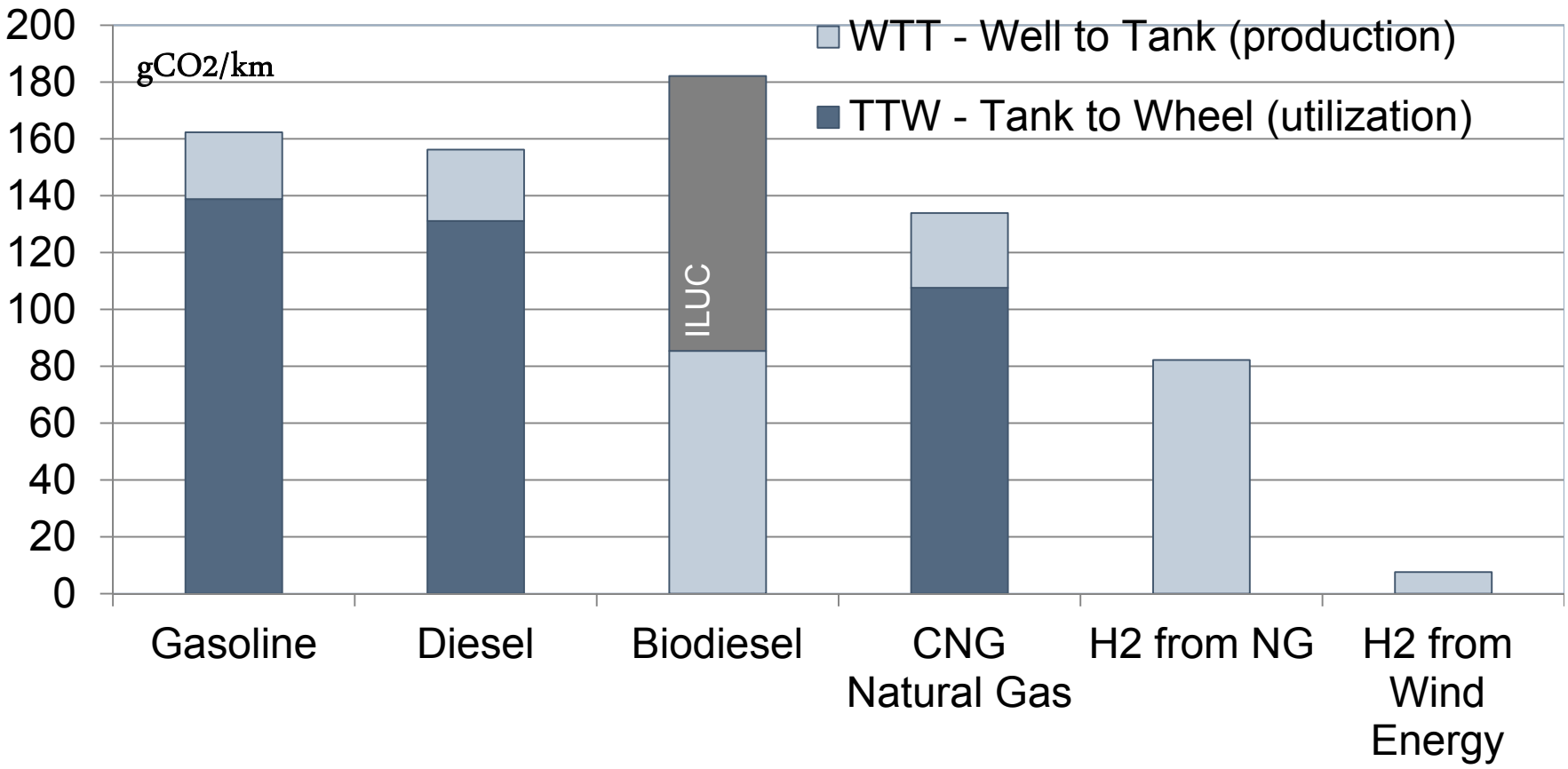
Sources of current Worldwide Hydrogen Production



The world produces enough hydrogen right now to fuel 200 million fuel cell-electric vehicles (FCEVs), Austria ~ 1 million cars!

Source: www.iphe.net

CO_2 Footprint – Fuel and Propulsion Systems



Source: Daimler Technicity 02/2010

Car: Mercedes B-Class, H2 im Brennstoffzellen-Fahrzeug, Biodiesel w/wo ILUC Indirect Land Use Change - Factor

Daimler’s Fuel Cell “Engine”

GM’s Fuel Cell “Engine”

GM Project Driveway Fuel Cell Powercube

GM Next Generation Fuel Cell Powercube

Fuel Cell Vehicles

	Daimler	Toyota	Honda	Hyundai	GM	Nissan
						
Model	B-Class	FCV-R	FCX Clarity	Tucson ix35 FCV	Equinox HydroGen4	X-Trail FCV (Terra)
Range NEDC/Japan 10-25	400 km	> 700 km	385 km	644 km	320 km	500 km
FC-performance	100 kW	90 kW	100 kW	100 kW	93 kW	90 kW
V max	170 km/h	unknown	160 km/h	160 km/h	160 km/h	150km/h
Stack-Supplier	AFCC	own development	own development	own development	own development	own development
Fuel capacity/ Tank technology	3,7 kg/ 700 bar, Typ 4	~ 4 kg/ 700 bar, Typ 4	3,92 kg/ 350 bar	5,6 kg/ 700 bar	4,2 kg/ 700 bar, Typ 4	5,8 kg/ 700 bar, Typ 4
Testing status End of 2011	> 2 Mio km in fleet tests	> 2 Mio km in fleet tests	not specified	> 2 Mio km in fleet tests	> 1,6 Mio km in fleet tests	not specified
Planned commercialization	2014?	2015	2015	Start 2012 (1000 Eh/year)	2015	2015

Source: Presentation Audi at AVL Conference September 2012

NEDC: (New European Driving Cycle)

FC: Fuel Cell

Hydrogen on Tour (Demonstration Projects)

European Hydrogen Road Tour 2012 Sept./Oct. 2012

F-CELL World drive

ZERO Drives

How to overcome the HEN-EGG dilemma?

Directive on the deployment of alternative fuels infrastructure, COM (2013) 18/2 (proposal) II

“Alternative fuels” mean fuels which substitute fossil oil sources in the energy supply to transport and which have a potential to contribute to its decarbonisation - breaking the oil dependence of transport through diversification.

These fuels are:

- Electricity
- Hydrogen
- Biofuels
- Synthetic Fuels
- Natural Gas, including biomethane, CNG (compressed),
- Liquified Natural Gas, LNG
- Liquified Petroleum Gas, LPG

Directive on the deployment of alternative fuels infrastructure, COM (2013) 18/2 (proposal) I

Legal elements

- Establishing national policy framework
  - Market deployment of alternative fuels (2020)
  - Minimum infrastructure build-up (2020/2025)
    - Mandatory for electricity, hydrogen, CNG and LNG
  - Implementation of common technical specifications (2014)

Policy measures to support

- Direct incentives (vehicle, infrastructure)
- Tax incentives
- Use of public procurement
- Demand side non-financial incentives

Directive on the deployment of alternative fuels infrastructure, COM (2013) 18/2 (proposal) III

"Alternative fuel"	Mandatory measure (31.12.2020)
Electricity	8.000.000 recharging points (10% publicly accessible)
Hydrogen	< 300 km retail network
Biofuels	RED, no add. measure
Synthetic Fuels	Fully fungible with conv. fuels, no. measure
Natural Gas, including biomethane, CNG (gaseous),	<150 km retail network
Natural Gas, LNG (liquified)	< 400 km TEN-T Core Network (street), all inland (31.12.2025) and maritime ports of TEN-T
Liquified Petroleum Gas, LPG	No measures, nice market

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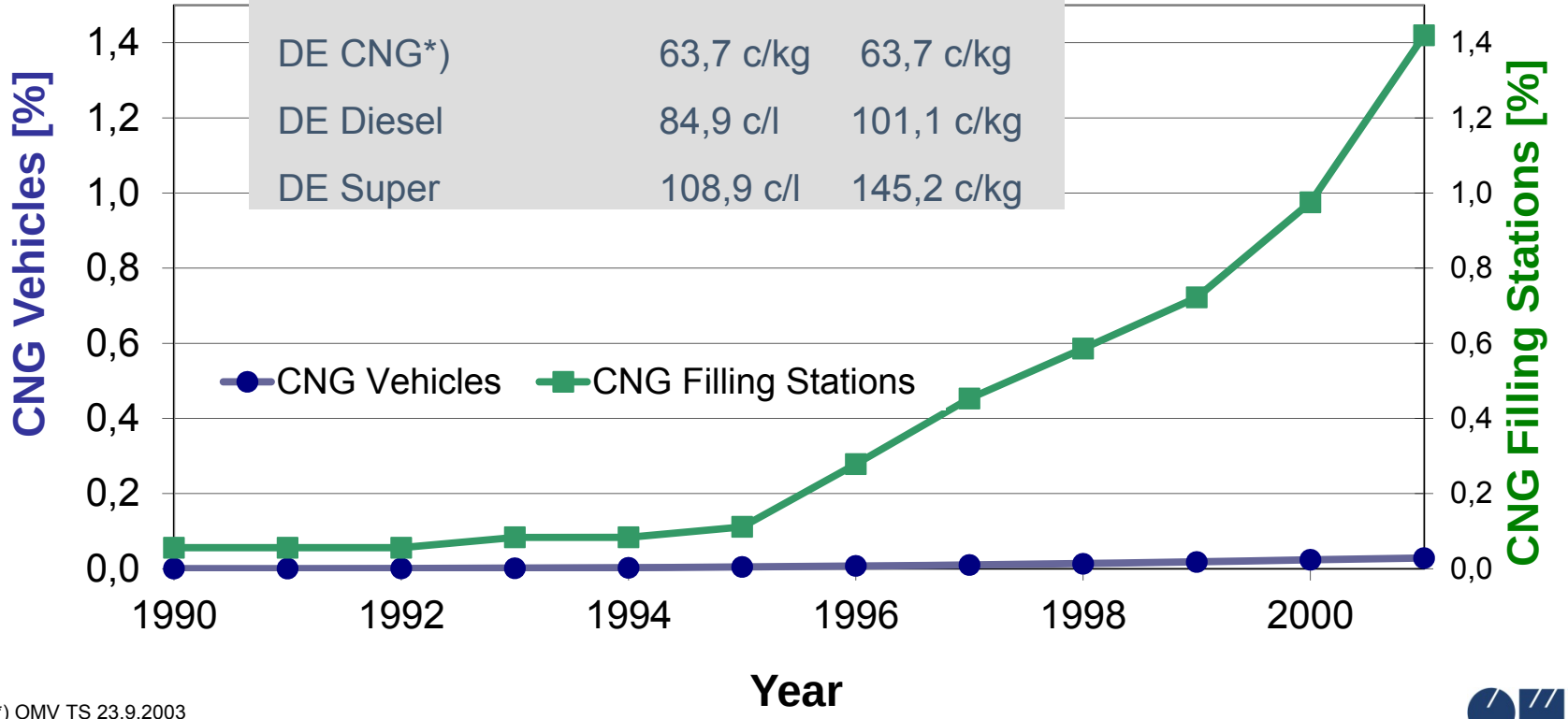
Development CNG Market Germany (DE)

2012:	CNG Vehicles	DE 0,18%	AT 0,10%
	CNG Filling station	DE 5,70%	AT 6,00%

[%] market

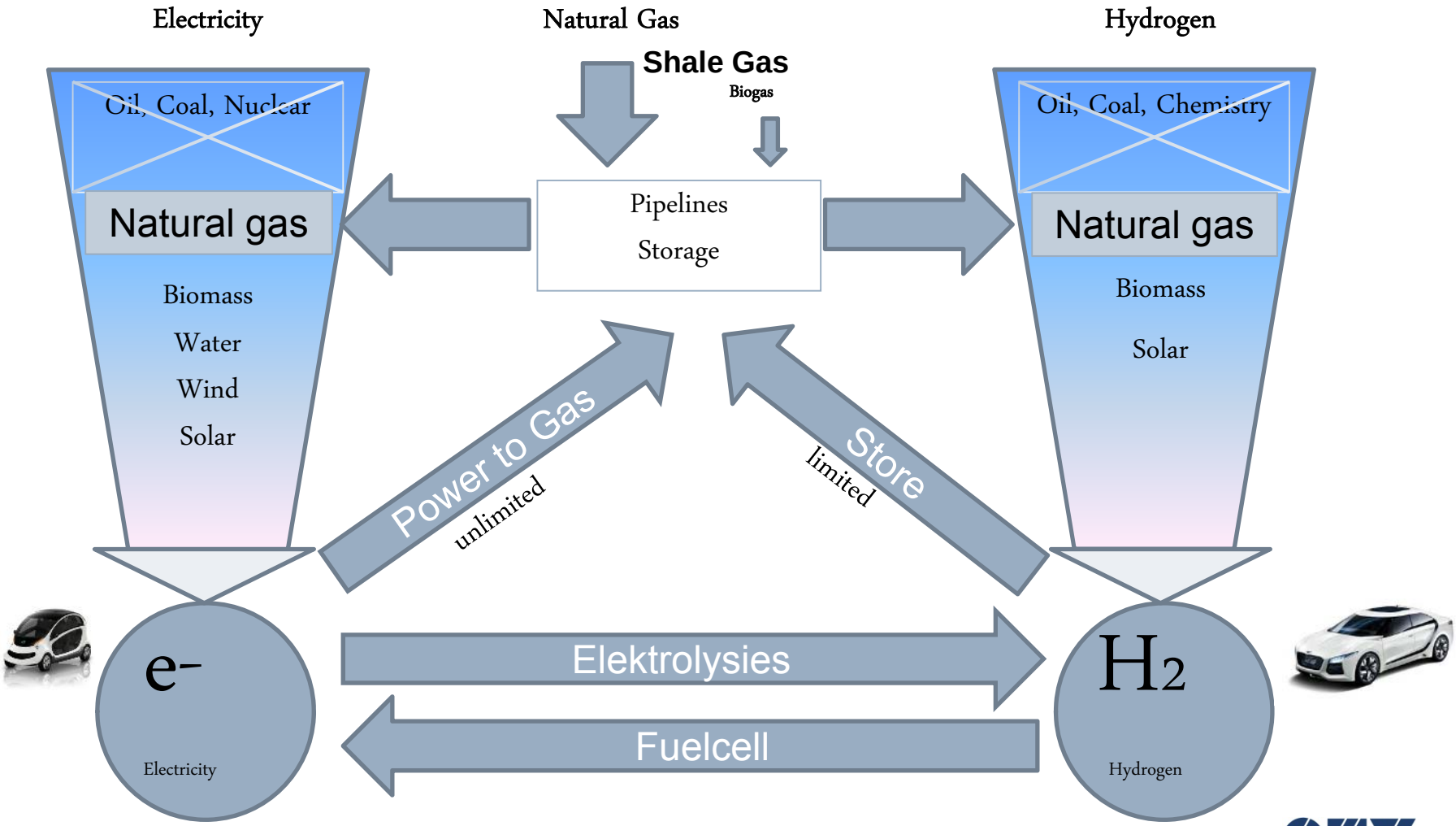
	2003	2012
DE CNG*)	63,7 c/kg	63,7 c/kg
DE Diesel	84,9 c/l	101,1 c/kg
DE Super	108,9 c/l	145,2 c/kg



*) OMV TS 23.9.2003

Content

Post 2050 Energy System
Natural Gas – Backbone of renewable energy system?



Summary

There is a lot of uncertainty,

but

definitely a lot to do……..

Thank you.

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