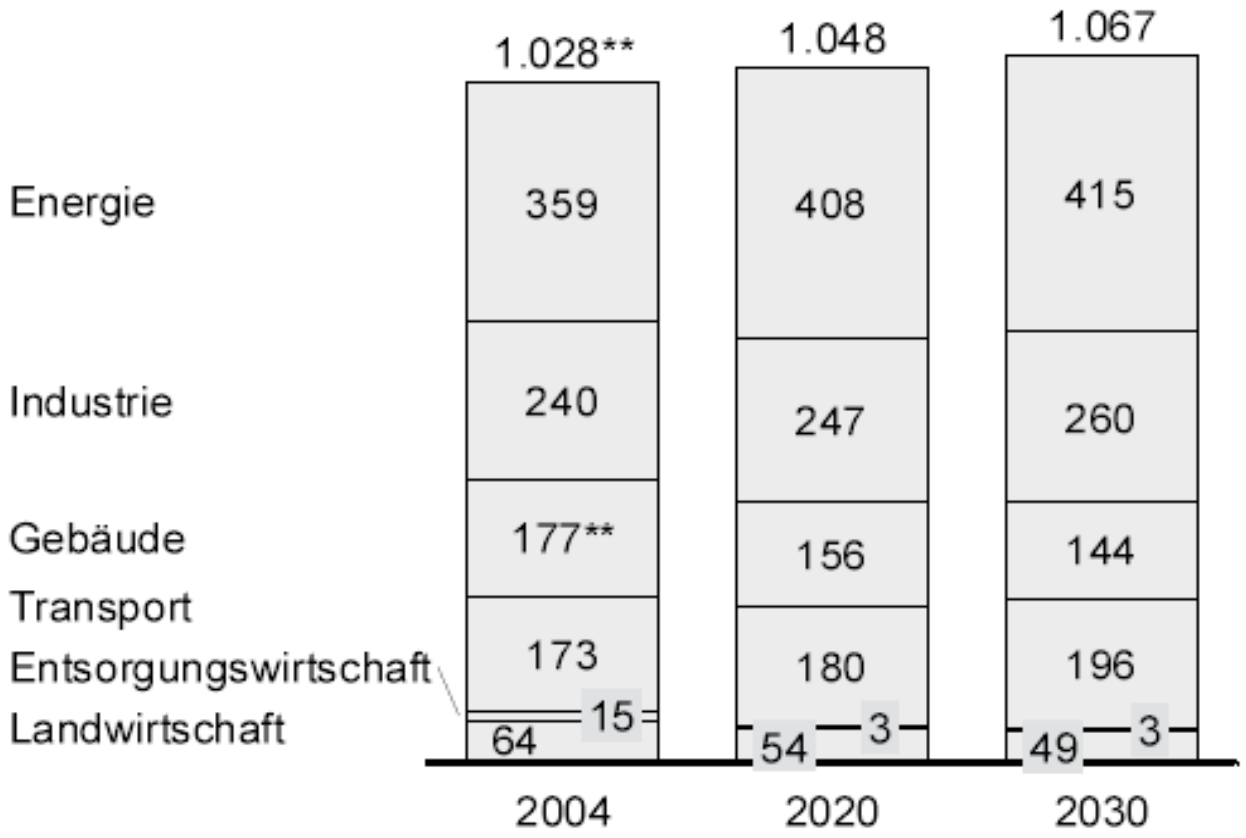
„Stand der Technik" – Projektion Treibhausgasemissionen Deutschland 2004-2030*

- In Mt CO2e

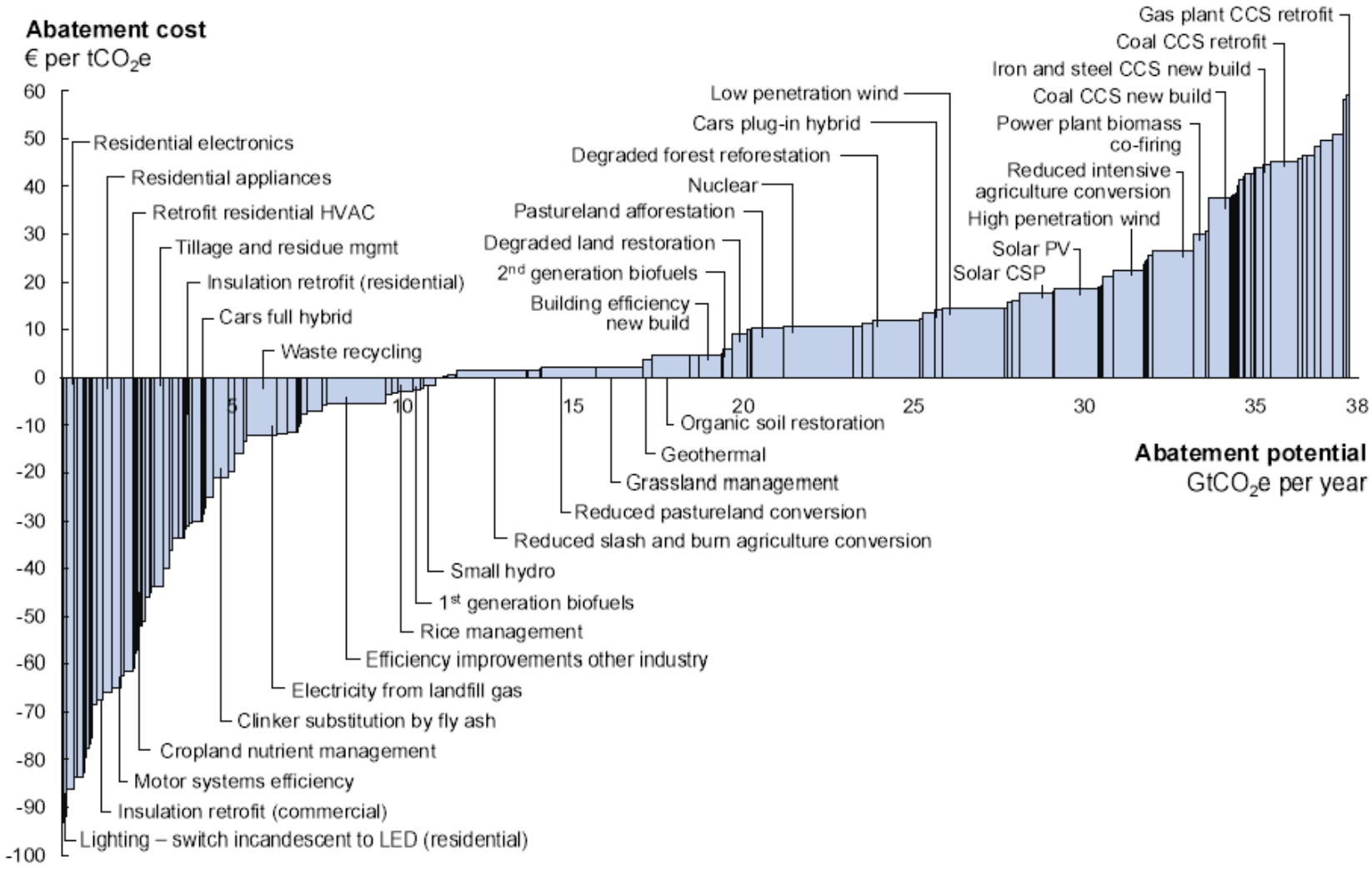


*Bei Beibehaltung Kernkraftausstieg

**Klimaadjustiert für 2004. Temperaturkorrektur auf Basis Gradtage

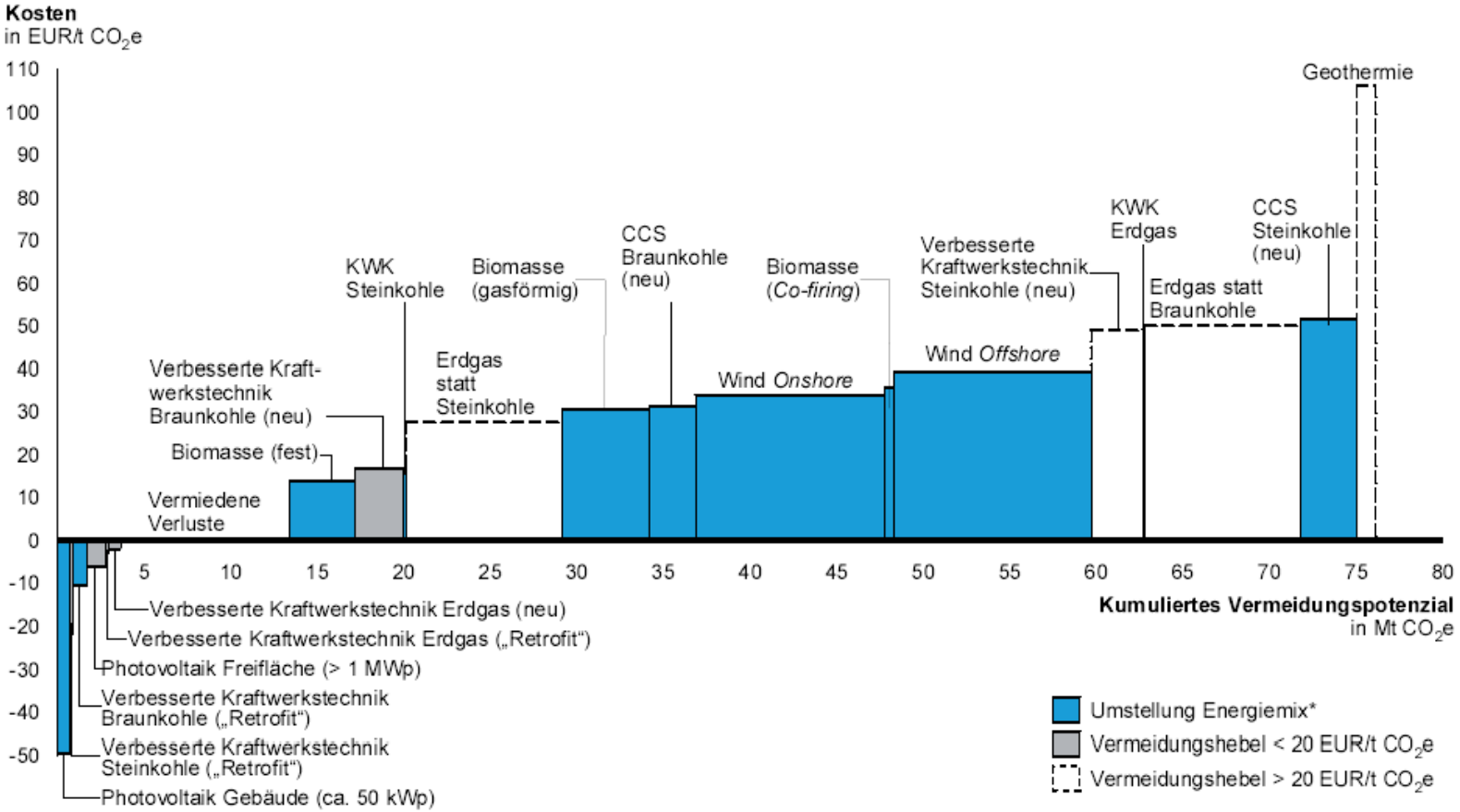
Source: McKinsey

Global GHG abatement cost curve beyond business-as-usual 2030



Source: McKinsey

Energiesektor: Vermeidungskostenkurve Deutschland 2020*

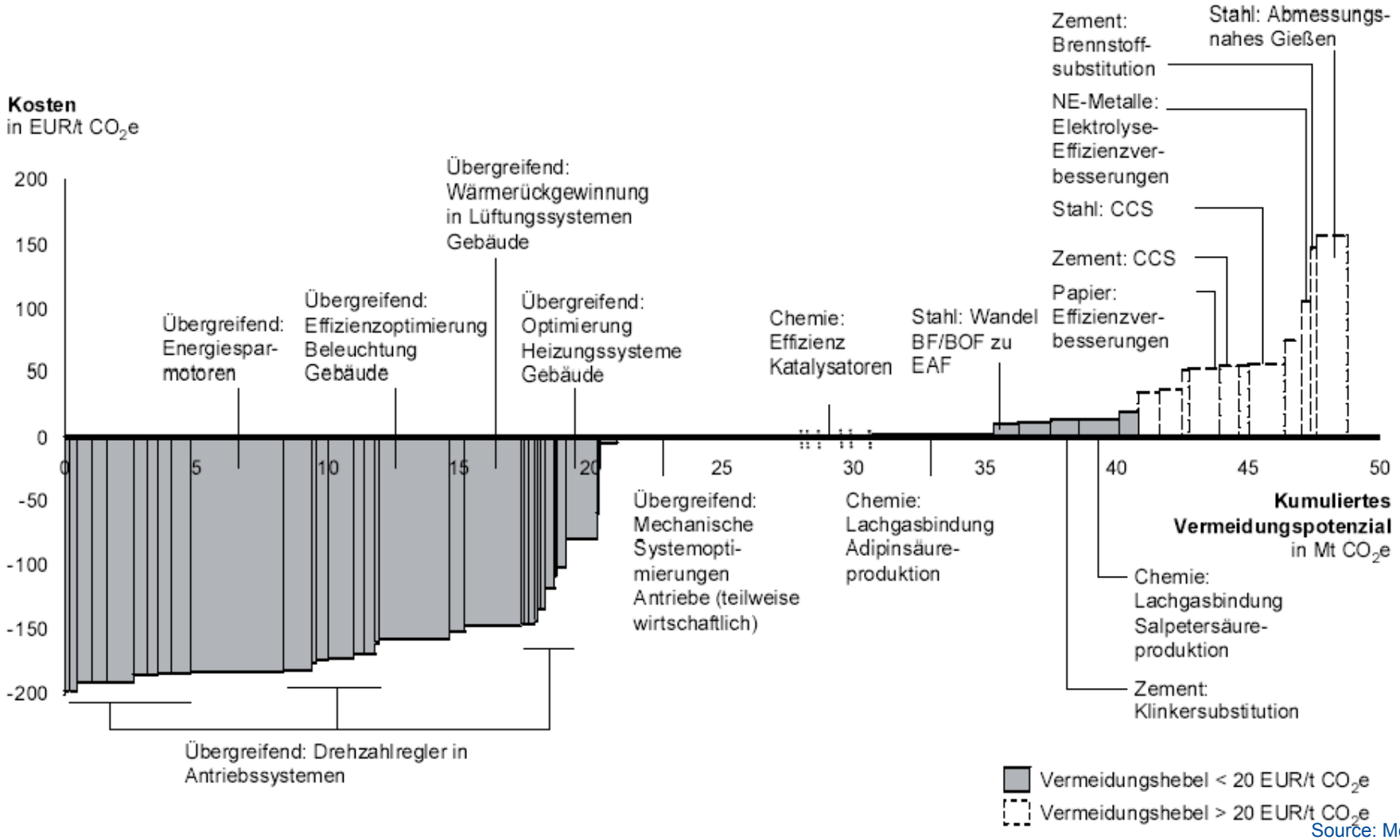


* Bei Beibehaltung Kernkraftausstieg und unter Berücksichtigung von Fördermitteln für erneuerbare Energien (EEG)

Quelle: Studie „Kosten und Potenziale der Vermeidung von Treibhausgasemissionen in Deutschland" von McKinsey & Company, Inc. im Auftrag von „BDI initiativ Wirtschaft für Klimaschutz" – AG Energie

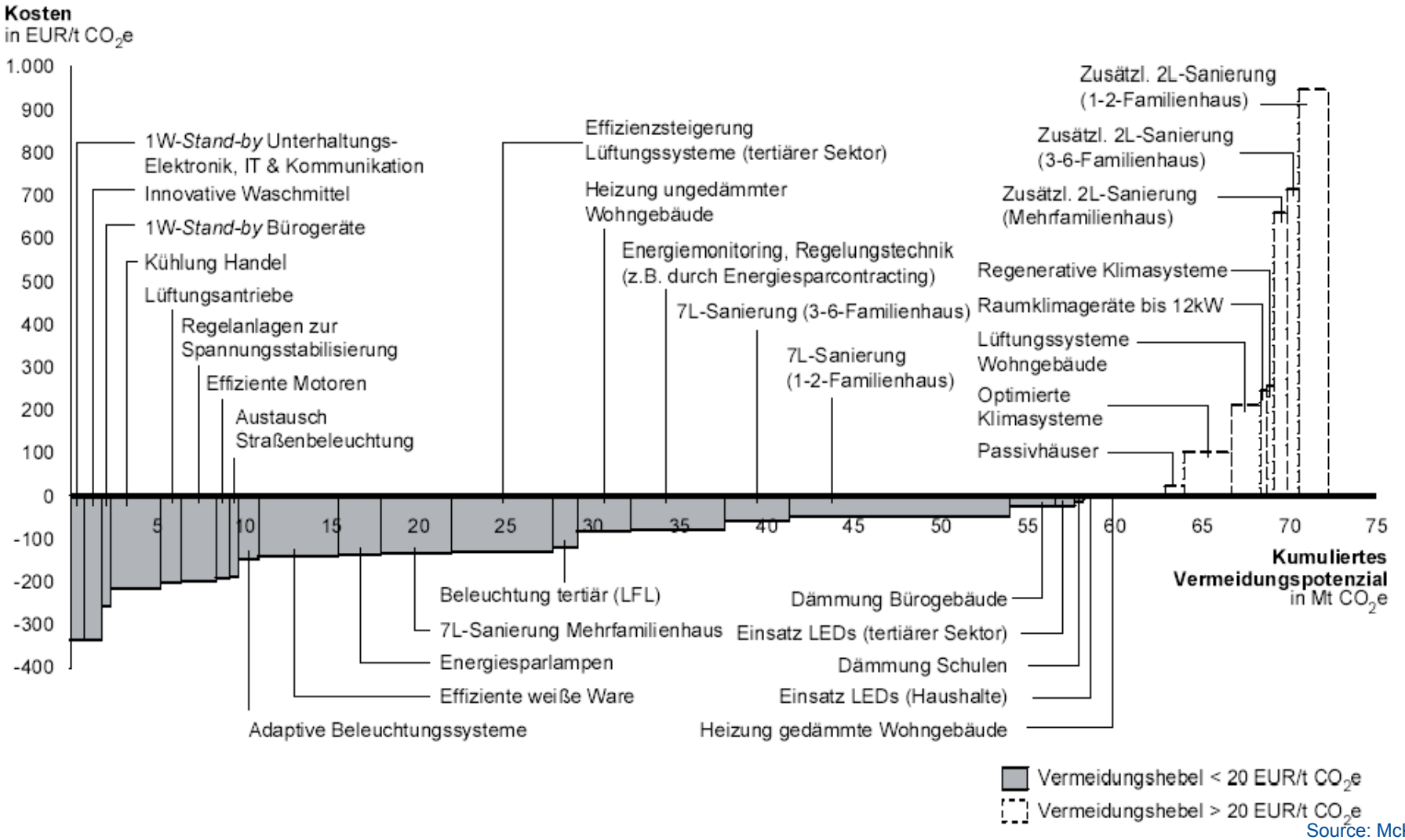
Source: McKinsey

Industriesektor: Vermeidungskostenkurve Deutschland 2020



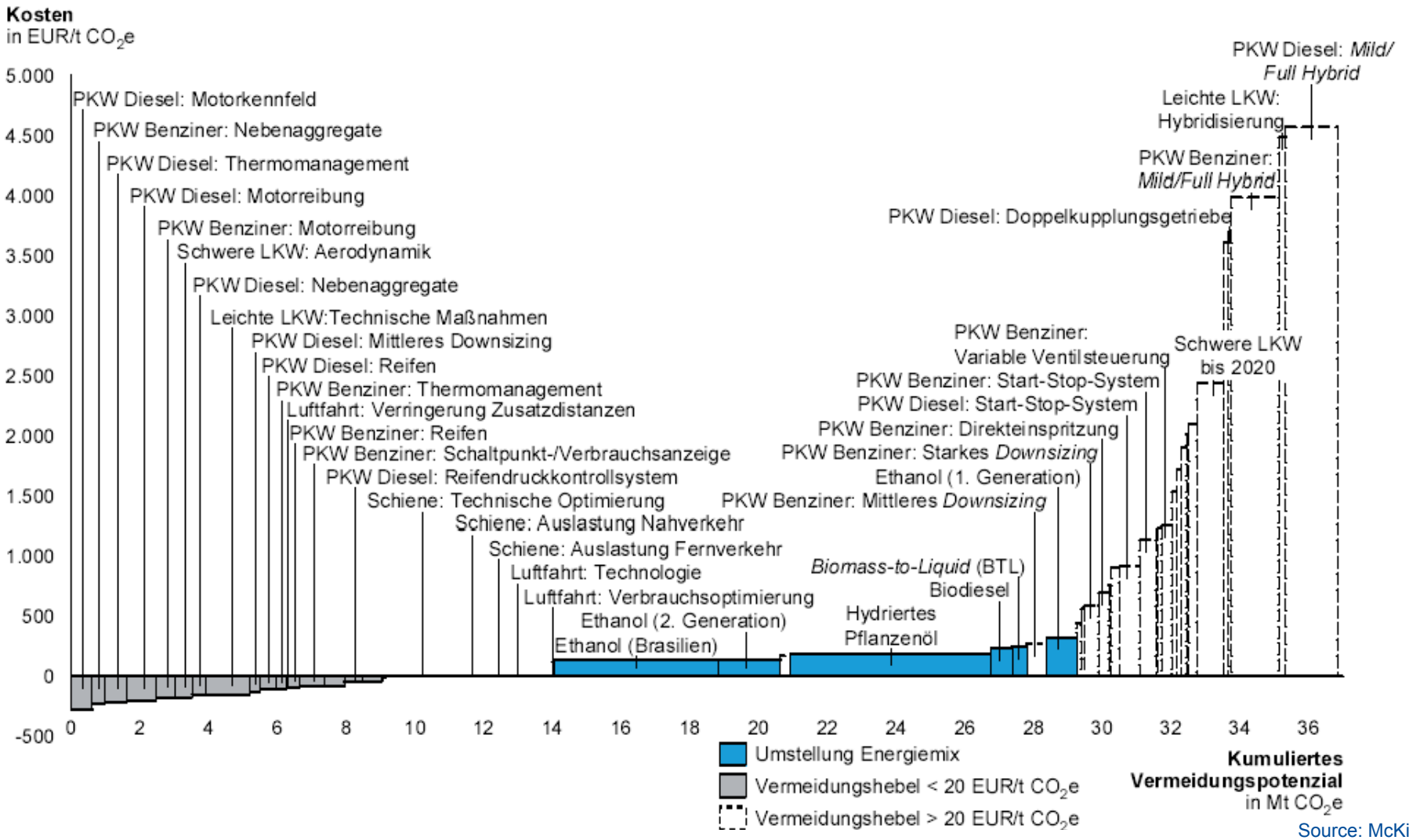
Source: McKinsey

Gebäudesektor: Vermeidungskostenkurve Deutschland 2020



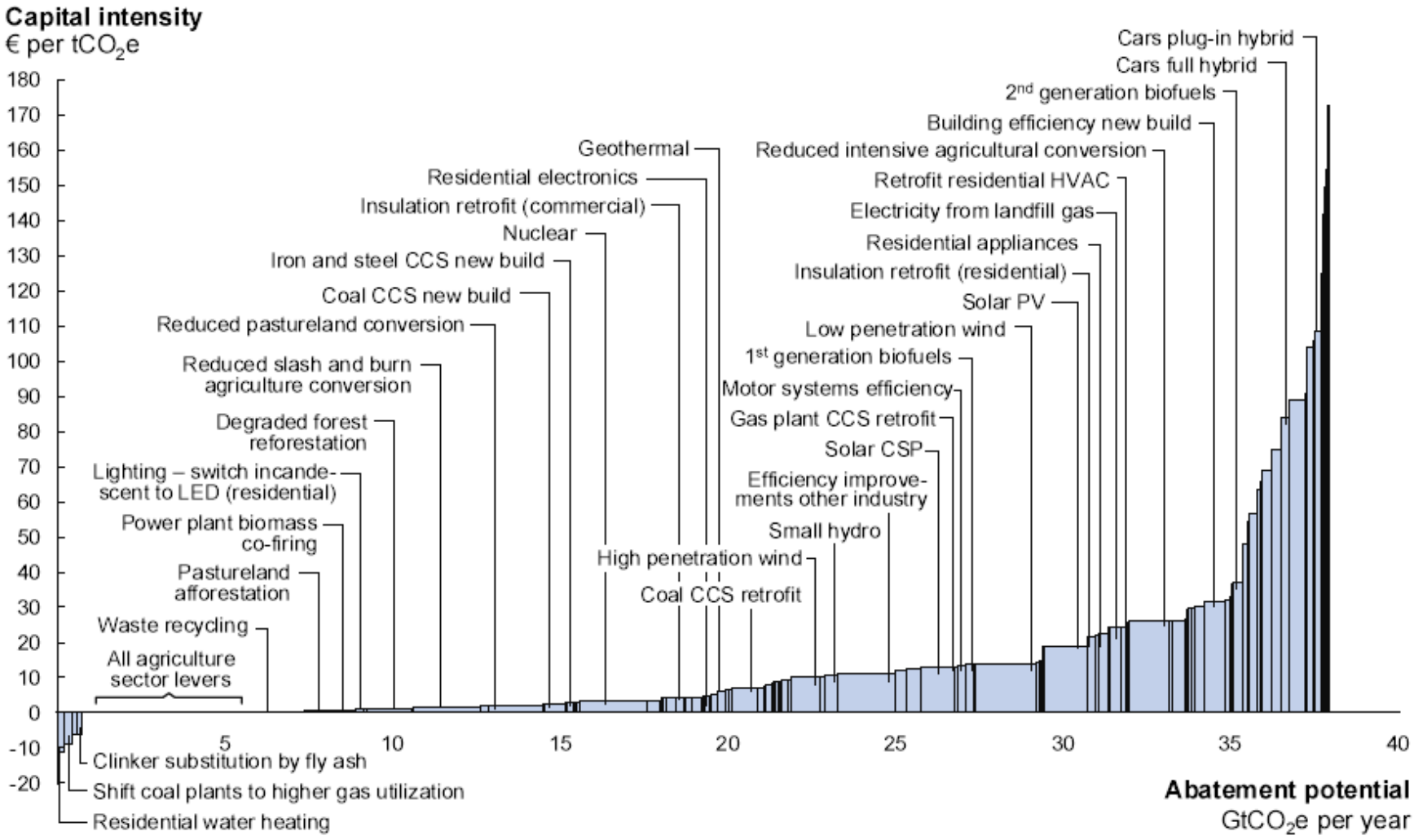
Source: McKinsey

Transportsektor: Vermeidungskostenkurve Deutschland 2020



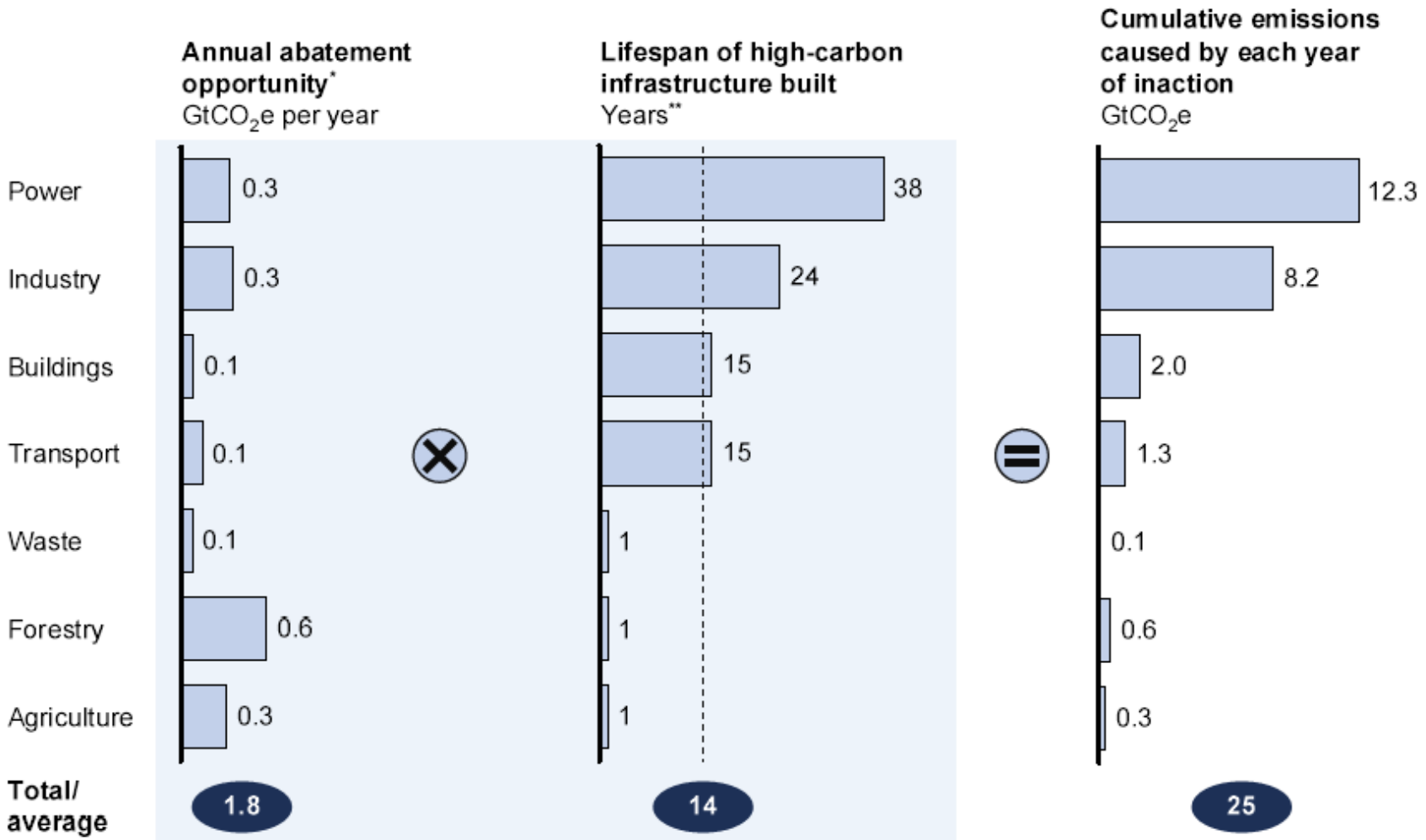
Source: McKinsey

Capital intensity by abatement measure



Source: McKinsey

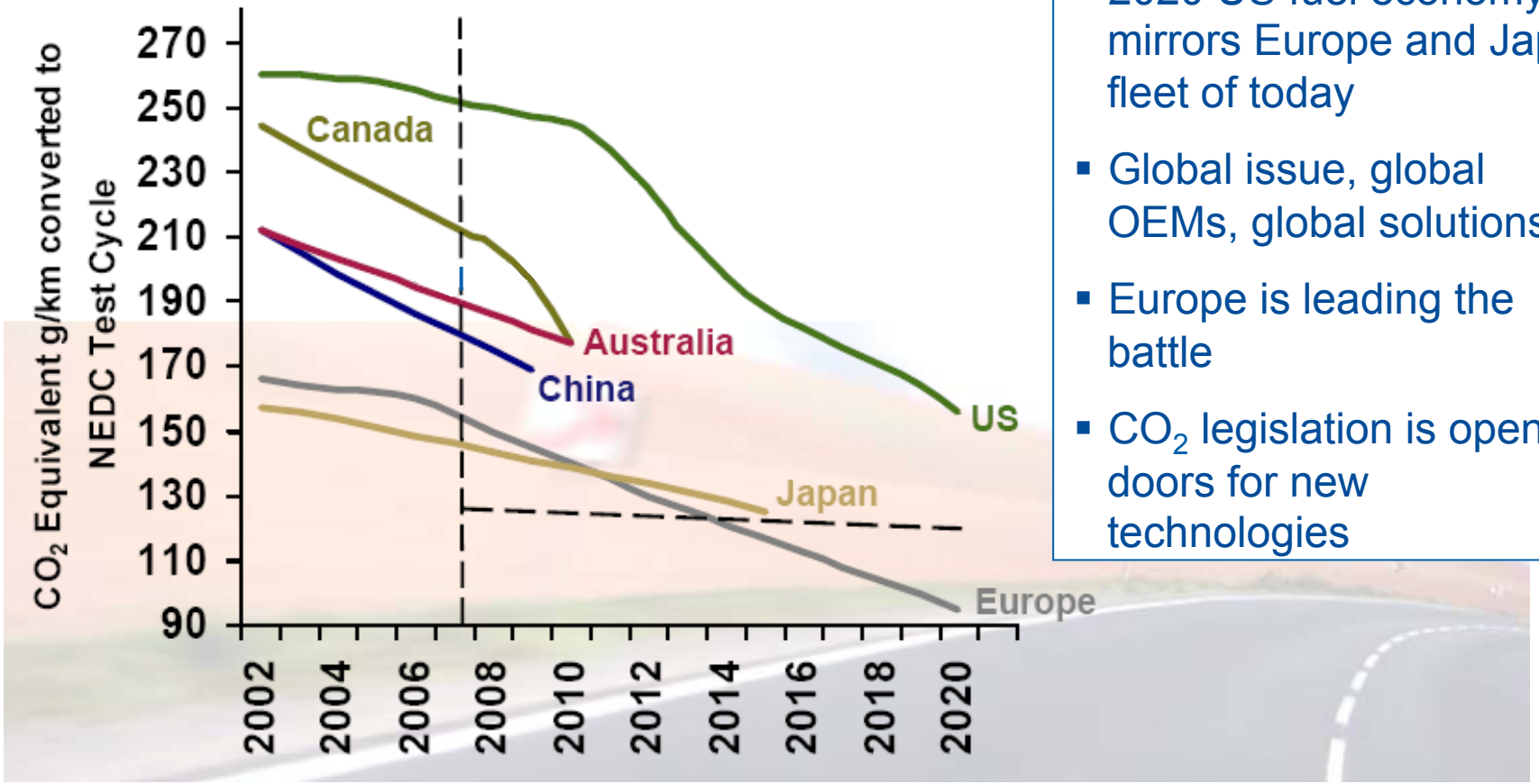
Lock-in into high-carbon infrastructure



Source: McKinsey

CO2 Limitation Forecast worldwide

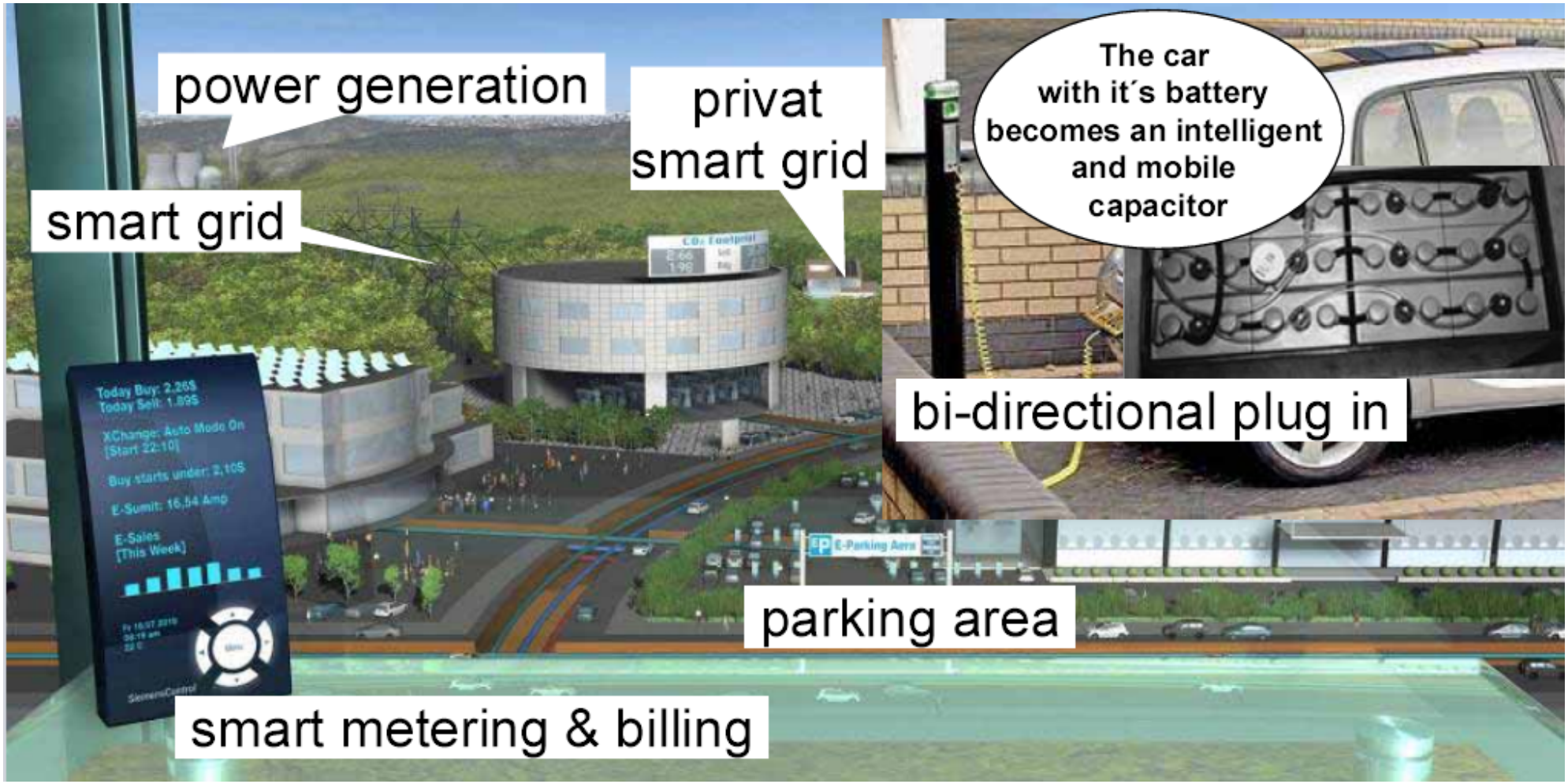
GHG Emission for Passenger Vehicle by Country



- 2020 US fuel economy mirrors Europe and Japan fleet of today
- Global issue, global OEMs, global solutions
- Europe is leading the battle
- CO_2 legislation is opening doors for new technologies

Source: Feb. 2009 CSM Automotive Market Foresight, "CO" Reduction Solutions"

Several players have to be a part in the game...



Source: Siemens

Begin of standardisation

up to :

- 63 Amps
- 400 Volt
- three phase

=> 40 kW max

THEORIE: ENERGIETRÄGER FÜR 0,5 kWh

- Tafel Schokolade: 85 g

- Benzin: 55 g

- Lithium Ionen: 5.263 g

Source: AVL

PRAXIS: UM 0,5 kWh ENERGIE ZU ERZEUGEN BENÖTIGT MAN…

- Tafel Schokolade: 85 g

- Benzin: 165 g

- Lithium Ionen: 14.620 g (@40% SOC range)

Source: AVL

Az áram előállítási költsége ma:

2,5-6 ct/kWh

Mennyibe kerül a tárolása egy lítium-ion akkumulátorban?

Mennyibe kerül a tárolása egy lítium-ion akkumulátorban?

1 kWh-s lítium-ion akkumulátor perspektivikus ára: **200 €**

Maximális élettartama: **10 év**

Maximális ciklusszáma (200 munkanap/év): **2000**

Tényleges kihasználható kapacitása: **0,4-(0,5) kWh**

Így 1 kWh tárolási költsége > **20 ct**

Mennyi energiát takarítunk meg az elektromos autóval?

Energiebedarf in kWh/100km		StadtfahrerIn		ÜberlandfahrerIn	
Österreich	Diesel-PKW	93,9	100 %	92,4	100 %
	E-PKW	62,4	66 %	64,9	70 %
Europäische Union	Diesel-PKW	91,1	100 %	89,5	100 %
	E-PKW	87,0	95 %	92,3	103 %

Source: ÖVK

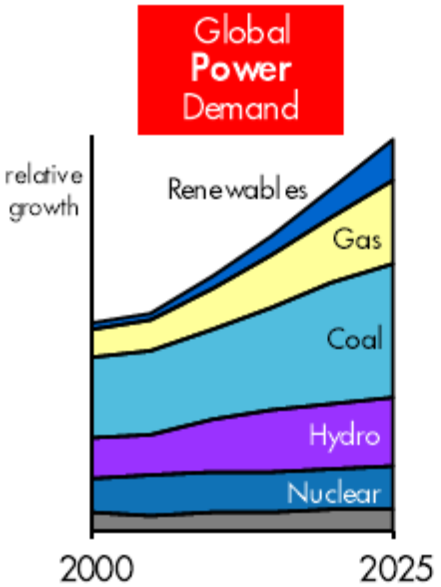
Milyen messzire jutunk az elektromos autóval?

Reichweite abzüglich einer Reservereichweite von 25 km Fahrzeug	Umgebungstemperatur 20 °C ohne Heizung und Klimaanlage	0 °C inkl. Heizung	-10 °C inkl. Heizung
Mitsubishi i-MiEV	83 km	48 km	41 km
Mercedes Benz A-Klasse E-Cell	150 km	101 km	85 km
Smart Fortwo Electric Drive	100 km	64 km	52 km
Nissan Leaf	76 km	53 km	41 km
Volkswagen Polo BlueMotion	1.090 km	1.036 km	989 km

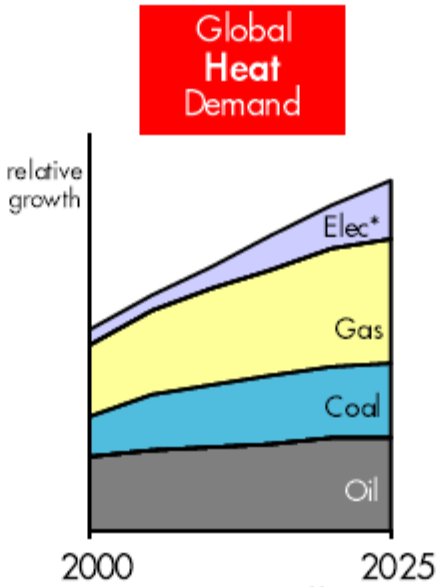
Source: ÖVK

Shell Scenarios

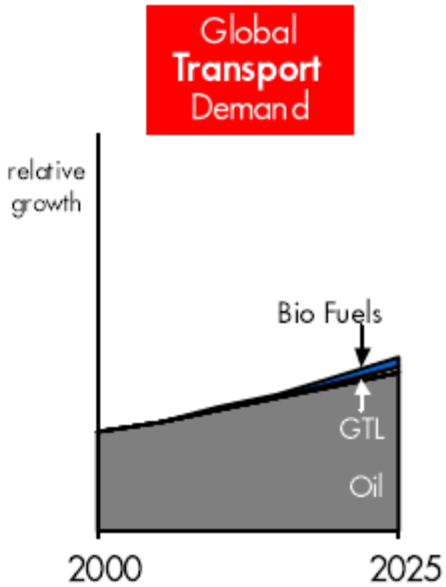
Power growth primarily from coal, gas and renewables



Heat draws primarily gas for growth....



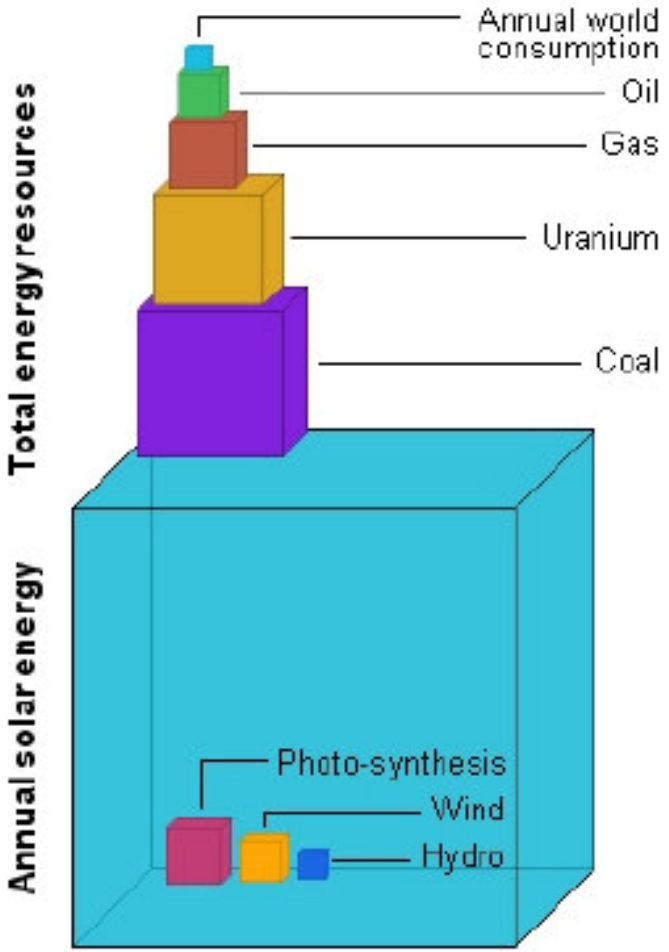
...while transport continues to be the preserve of oil



⇨ **The transport sector will be the natural home for the growing oil demand.**

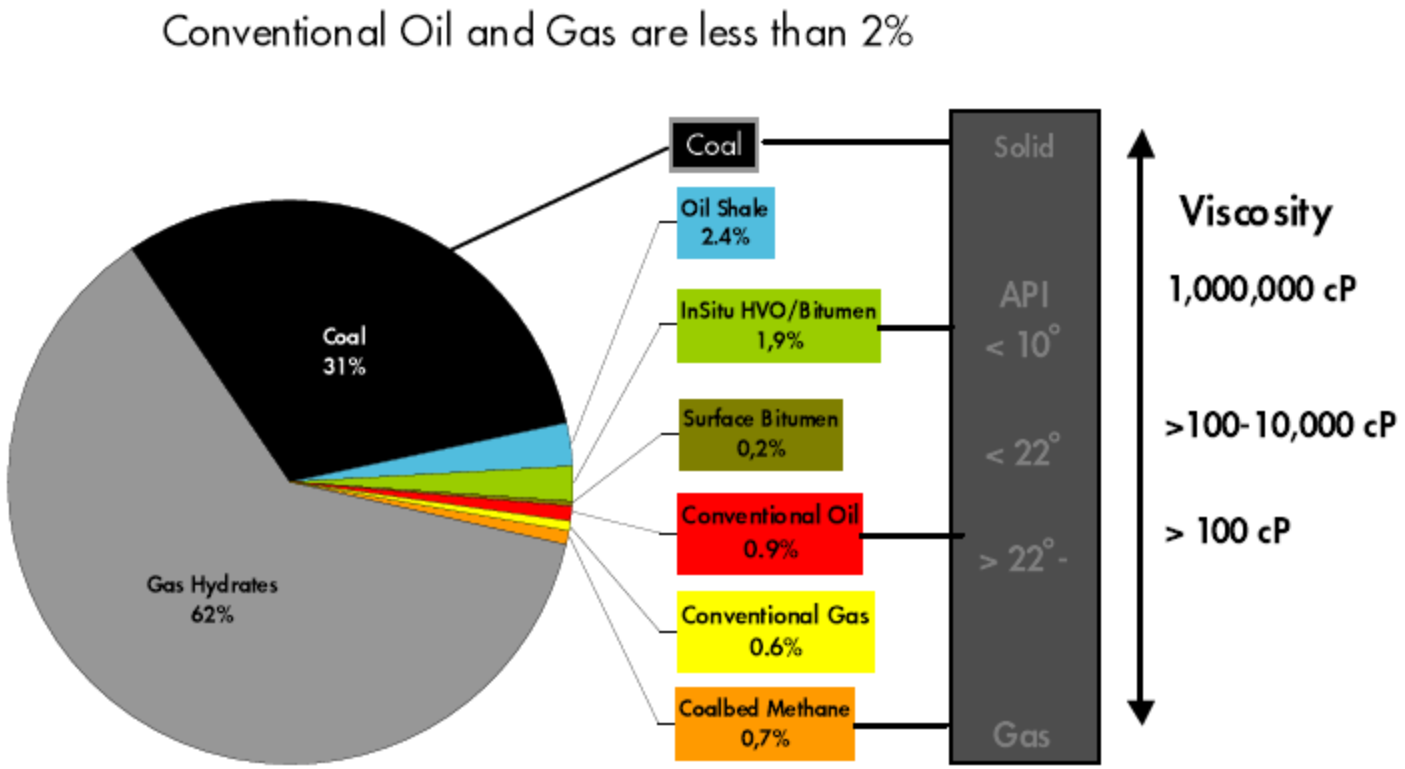
Source: Shell

Indicative Order of Magnitude of Energy Resources



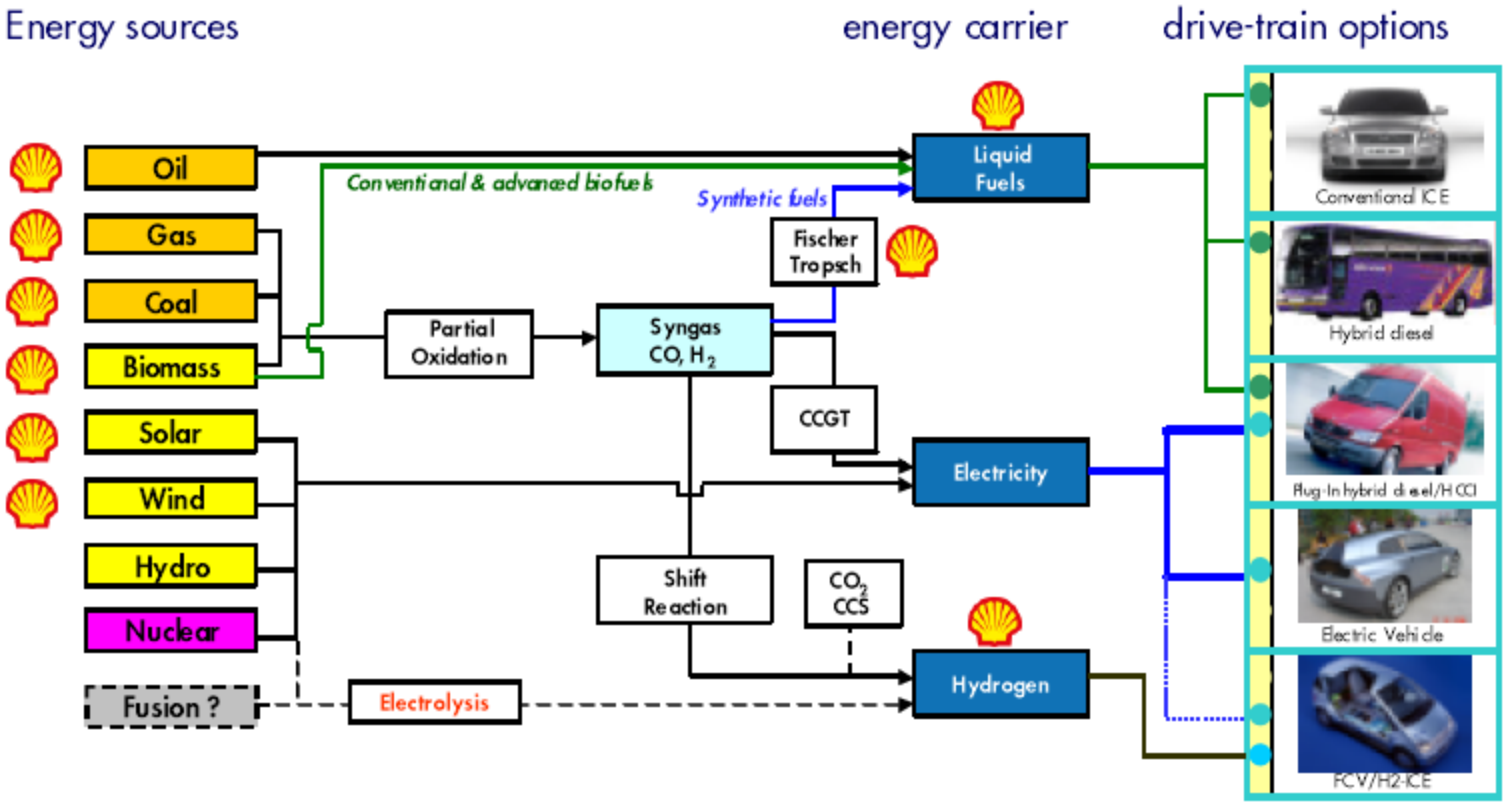
Source: Shell

World Hydrocarbon Resources



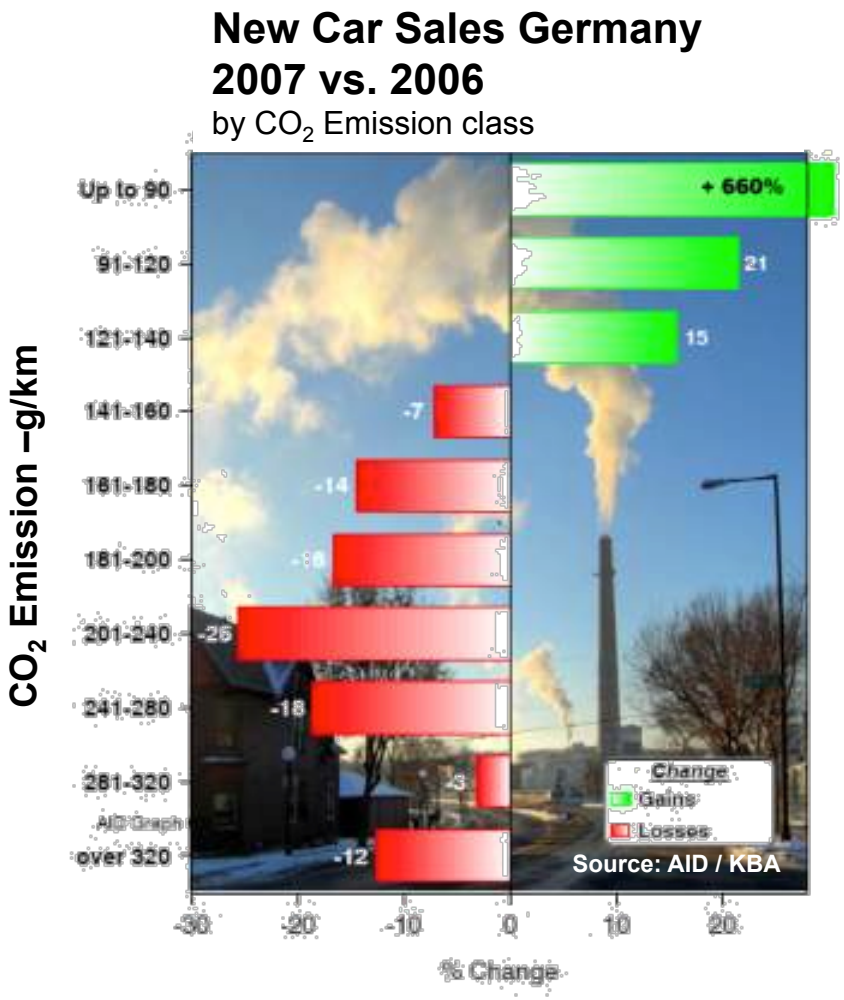
Source: Shell

Options for Transport Fuels



Source: Shell

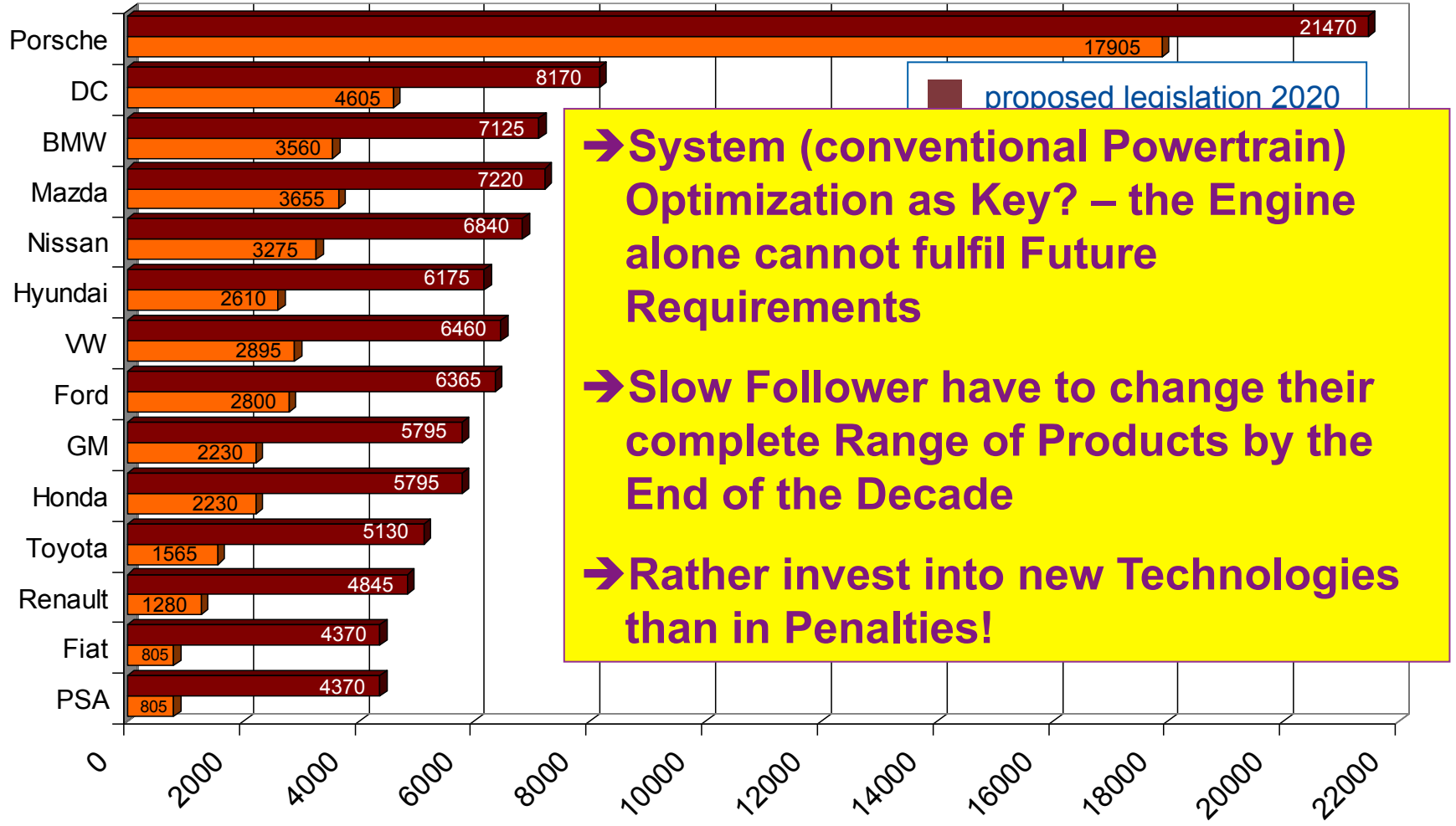
Passenger Car Sales Germany 2007 vs. 2006



- Clear consumer trend towards more fuel efficient vehicles already in 2007 (not only in Europe but also worldwide)
- This trend will increase during the next years

➔ Fuel economy / CO_2 will become the key buying factor with passenger cars

CO2 Penalties according to EU Legislation



➔**System (conventional Powertrain) Optimization as Key? – the Engine alone cannot fulfil Future Requirements**

➔**Slow Follower have to change their complete Range of Products by the End of the Decade**

➔**Rather invest into new Technologies than in Penalties!**

Penalty per Vehicle by Brand [EURO]*

* Based on Vehicle Sales & average CO_2 Emission in 2007

Technology OEM On-Cost vs. Benefit (related to Gasoline)

	Conventional	Stop / Start	Mild HEV	Full HEV	Conv.Diesel
On-Costs					
Fuel Consumption Potential					
Cost/Benefit Ratio (FC)					
CO_2 Emission Reduction Potentia					
Cost/Benefit Ratio (CO_2 Reduction)					
Total Cost/Benefit Ratio	**Reference**	**50 € / %**	**87 € / %**	**136 € / %**	**90 € / %**

➔Changes in Conventional Gasoline Powertrain leads to limited Improvement in FC and CO_2-Reduction - only Near Term Solution

➔OEMs are looking for the lowest Cost per Benefit Ratio

➔Low Cost/Benefit Ratio @ Stop / Start Functionality, but limited Improvement

➔Best Cost/Benefit Ratio @ Mild Hybrid (today) compared to conventional Diesel Technology

➔Higher Energy Demand and higher Battery Costs for Full Hybrid leads to high Cost/Benefit Ratio. Situation might change in Future.

The future Powertrain will be Different…