

The 2025 CO₂ standard for new cars: A look at technology penetration, CO₂ reduction potential and cost

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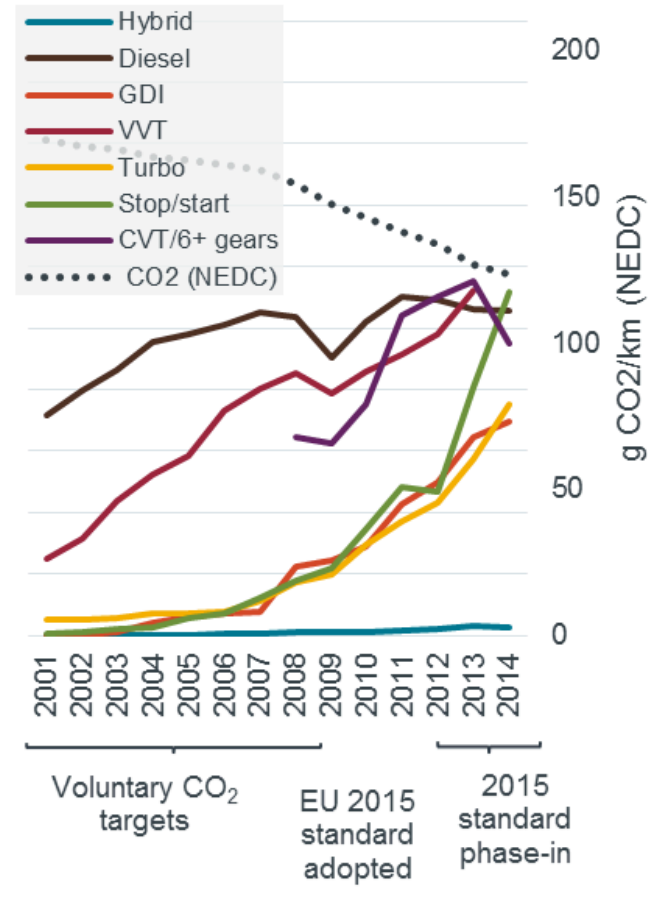
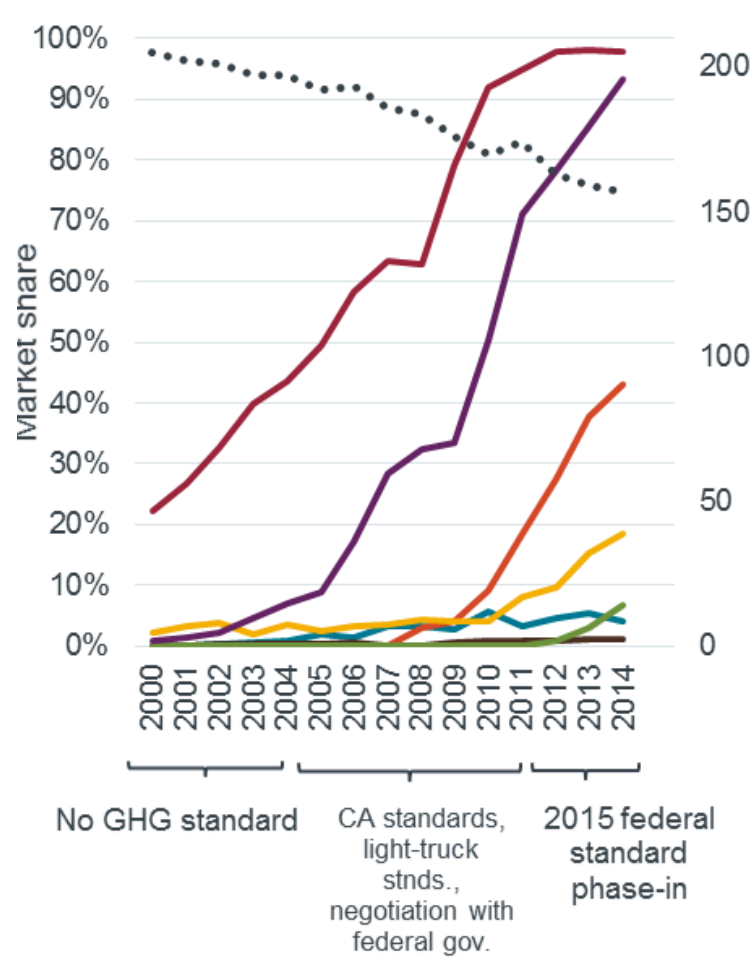
**“Road to efficiency” workshop
Brussels, June 9, 2016**

The logo for the International Council on Clean Transportation (ICCT). It features the lowercase letters 'icct' in a bold, dark blue font. The letter 'i' has a small blue circle above it. Below the letters, the full name 'THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION' is written in a smaller, blue, all-caps font.

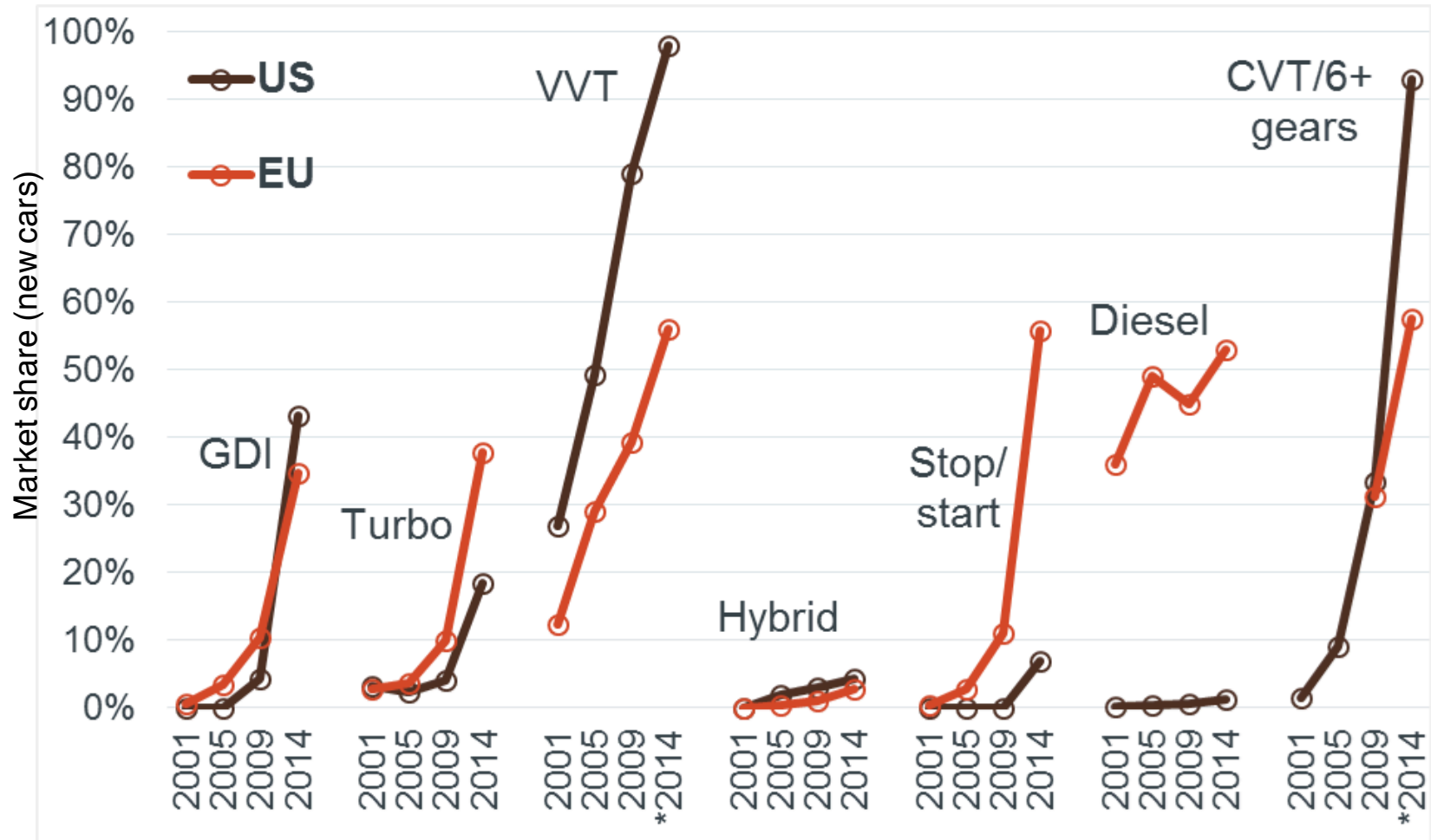
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Looking back: Technology penetration and cost estimates in the past

CO₂ regulations are driving new technologies into the market, both in the EU and U.S.

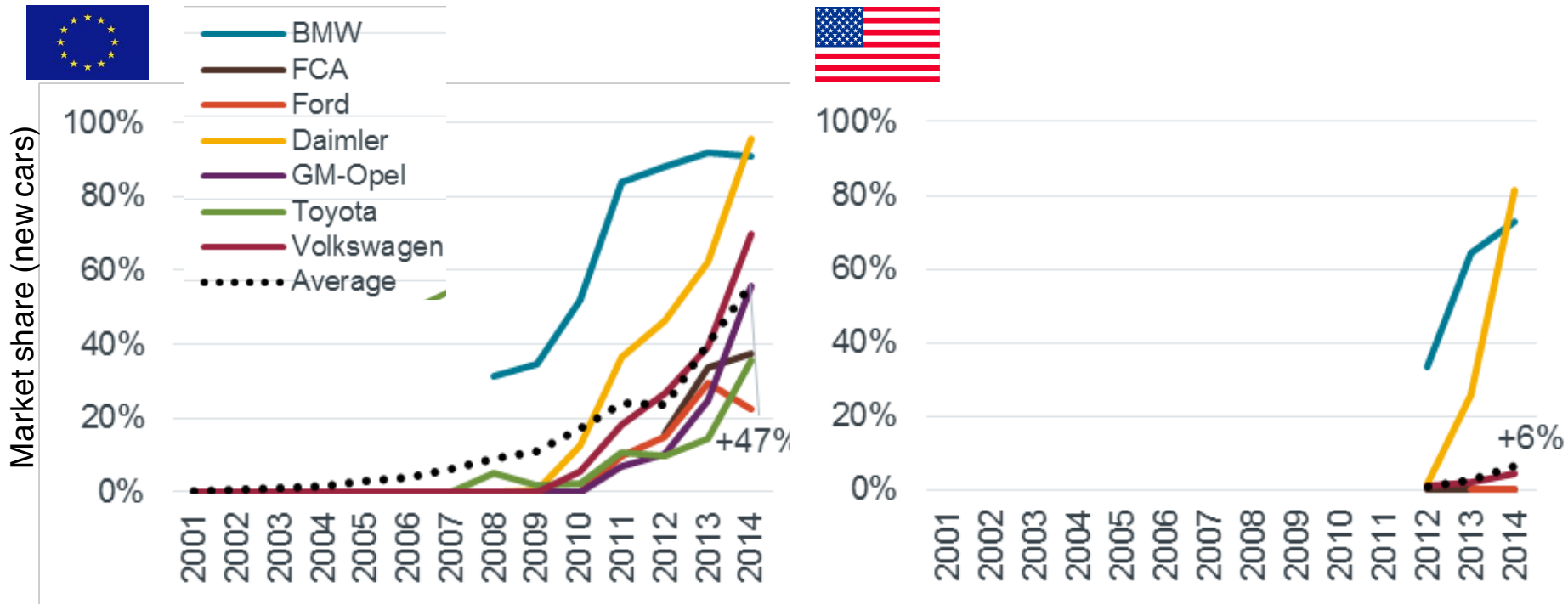


For some technologies the uptake is similar in both markets, for others there are striking differences



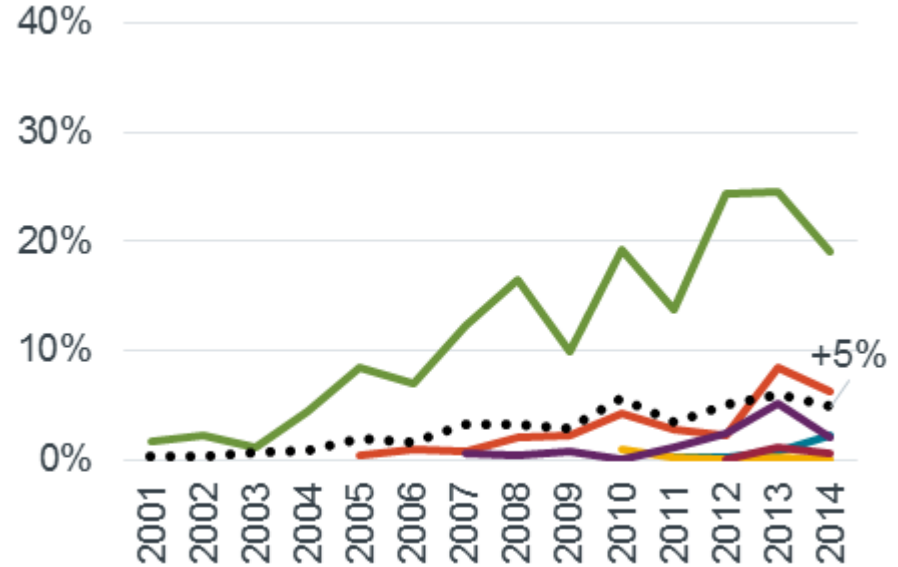
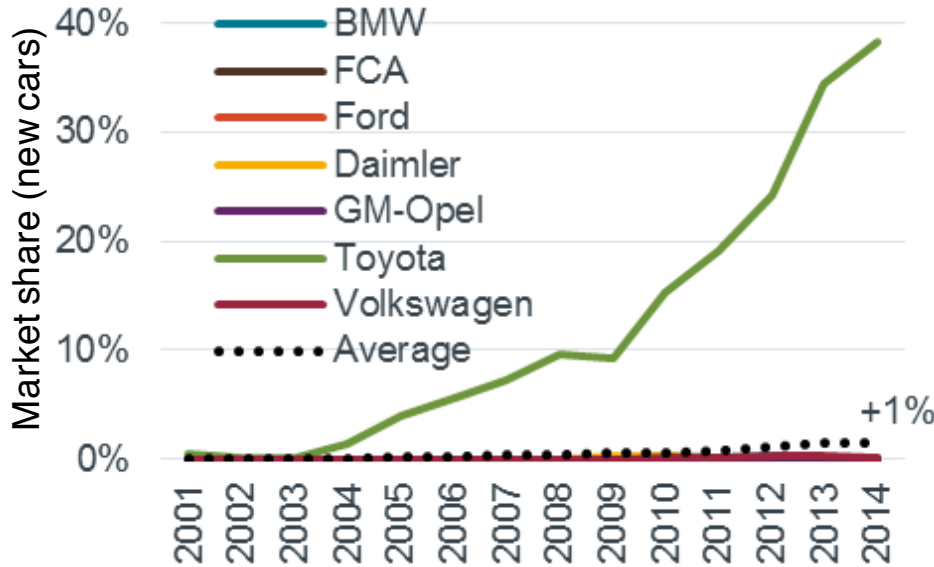
The CO₂ reduction effect for start-stop is high in NEDC but much lower for US-FTP and real-world

Start-stop



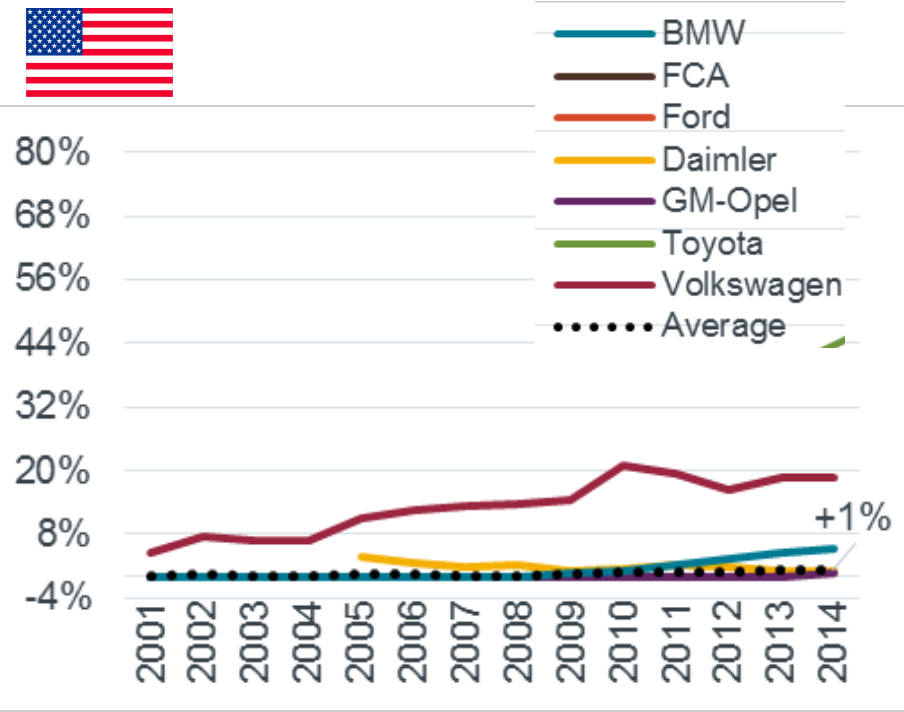
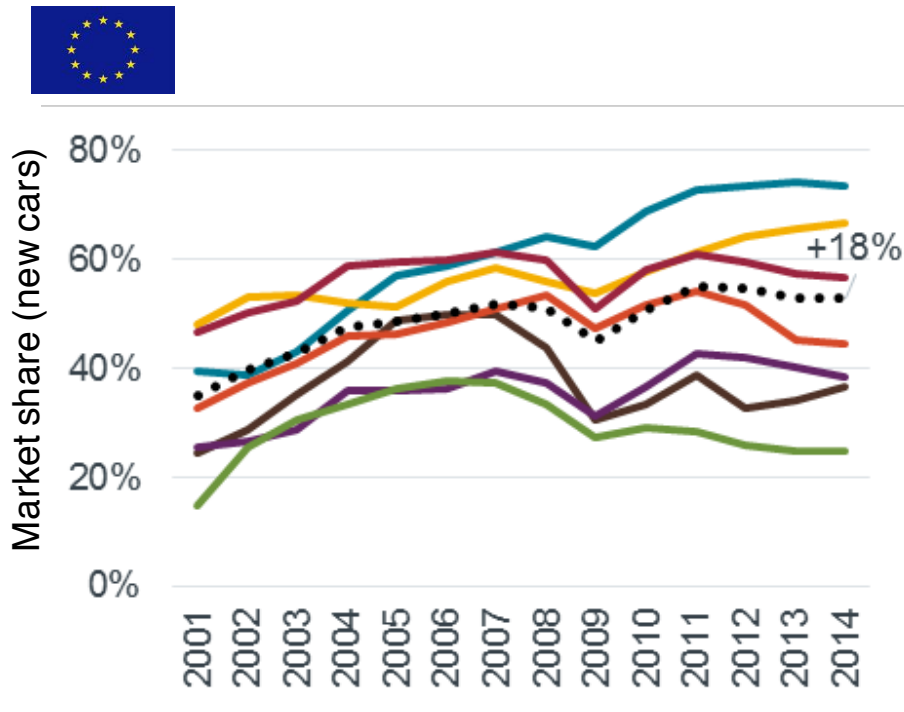
The market for hybrid cars is still mostly driven by one manufacturer, both in the EU and U.S.

Hybrid

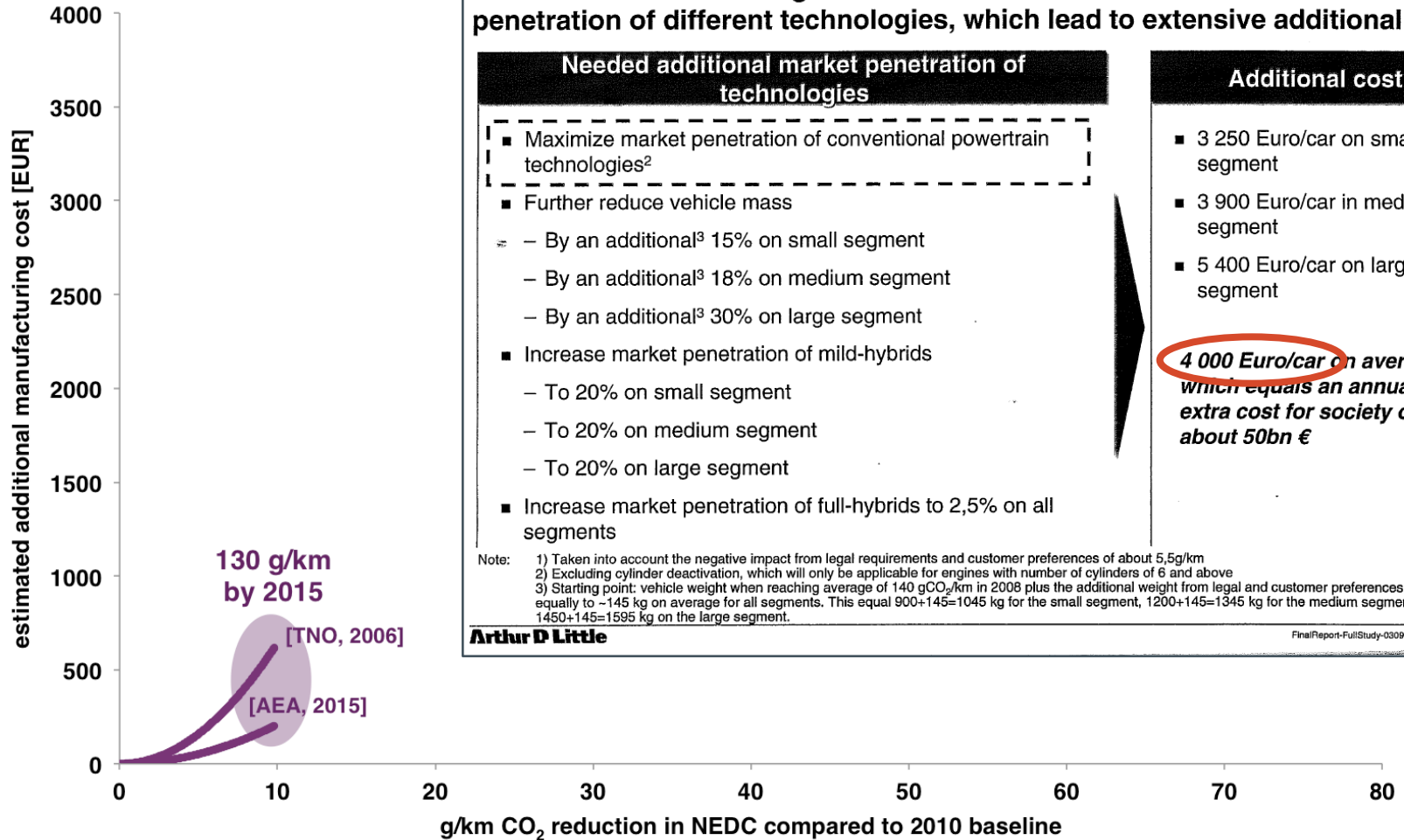


Share of diesel is much smaller outside the EU, requiring more reductions from other technologies

Diesel



The original penetration and cost estimates for the 130 g/km target for 2015 turned out to be too high



To reach the level of 120g/km¹ the OEMs will have to force an increased market penetration of different technologies, which lead to extensive additional cost

Needed additional market penetration of technologies

- Maximize market penetration of conventional powertrain technologies²
- Further reduce vehicle mass
 - By an additional³ 15% on small segment
 - By an additional³ 18% on medium segment
 - By an additional³ 30% on large segment
- Increase market penetration of mild-hybrids
 - To 20% on small segment
 - To 20% on medium segment
 - To 20% on large segment
- Increase market penetration of full-hybrids to 2,5% on all segments

Additional cost

- 3 250 Euro/car on small segment
- 3 900 Euro/car in medium segment
- 5 400 Euro/car on large segment

4 000 Euro/car on average, which equals an annual extra cost for society of about 50bn €

Note: 1) Taken into account the negative impact from legal requirements and customer preferences of about 5,5g/km
 2) Excluding cylinder deactivation, which will only be applicable for engines with number of cylinders of 6 and above
 3) Starting point: vehicle weight when reaching average of 140 gCO₂/km in 2008 plus the additional weight from legal and customer preferences which is set equally to ~145 kg on average for all segments. This equal 900+145=1045 kg for the small segment, 1200+145=1345 kg for the medium segment and 1450+145=1595 kg on the large segment.

Arthur D Little

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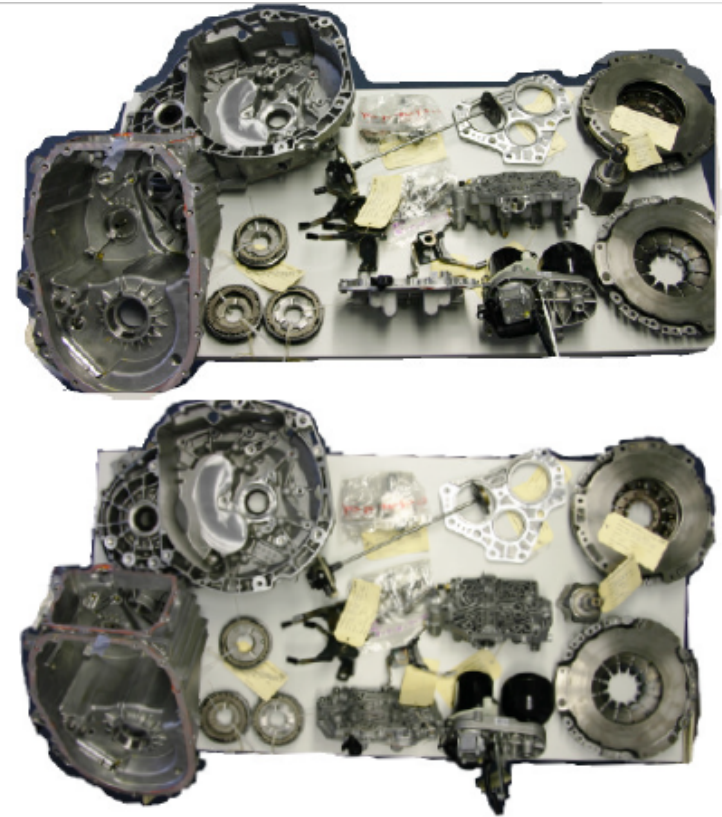
For determining feasible CO₂ reduction rates and the associated cost there are different approaches

Industry survey

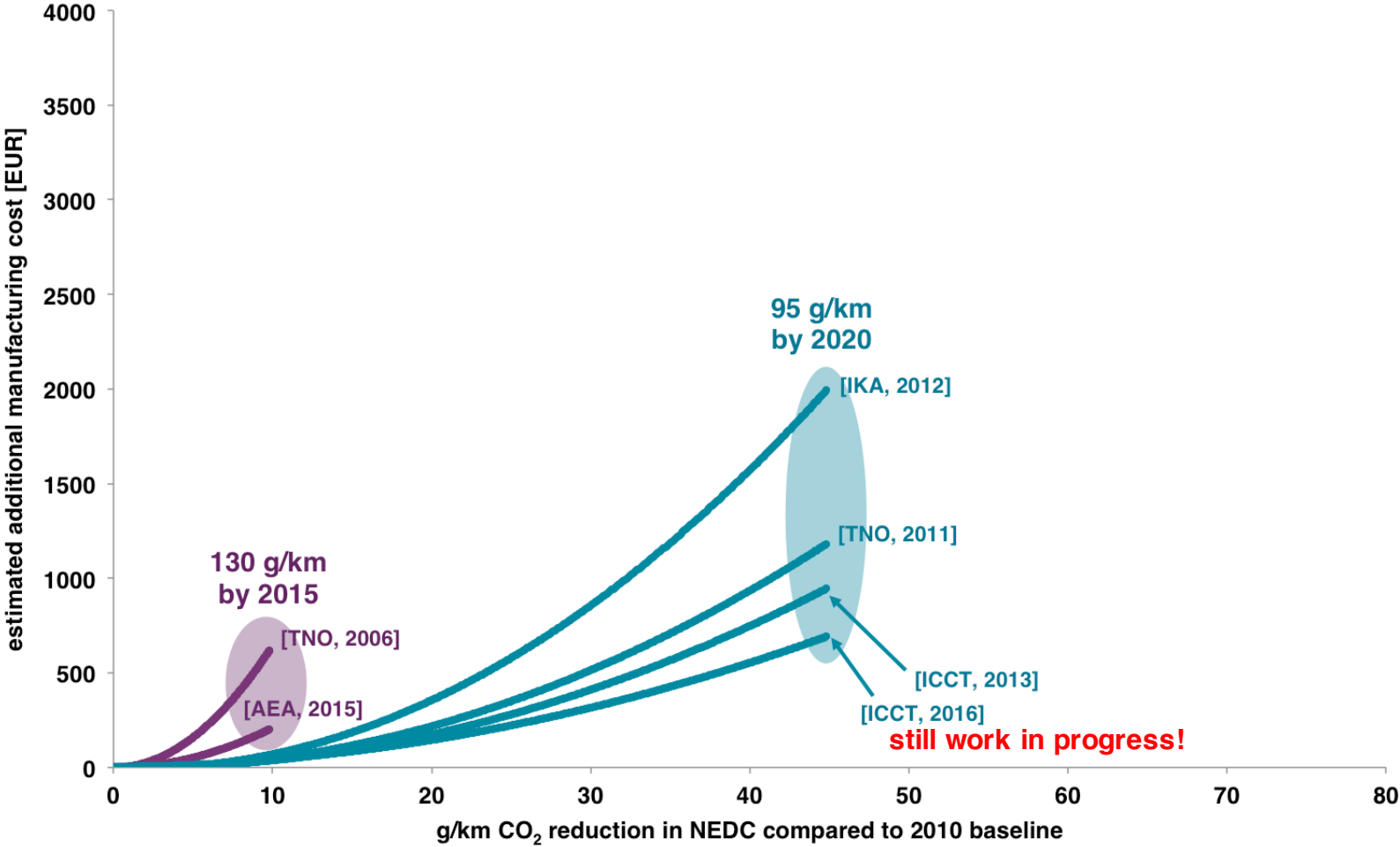
Industry representatives share data on CO₂ reduction potential and costs for technologies / technology packages

In-depth bottom-up analysis

Computer simulation of CO₂ reduction potential for technology packages
+ tear-down cost estimates

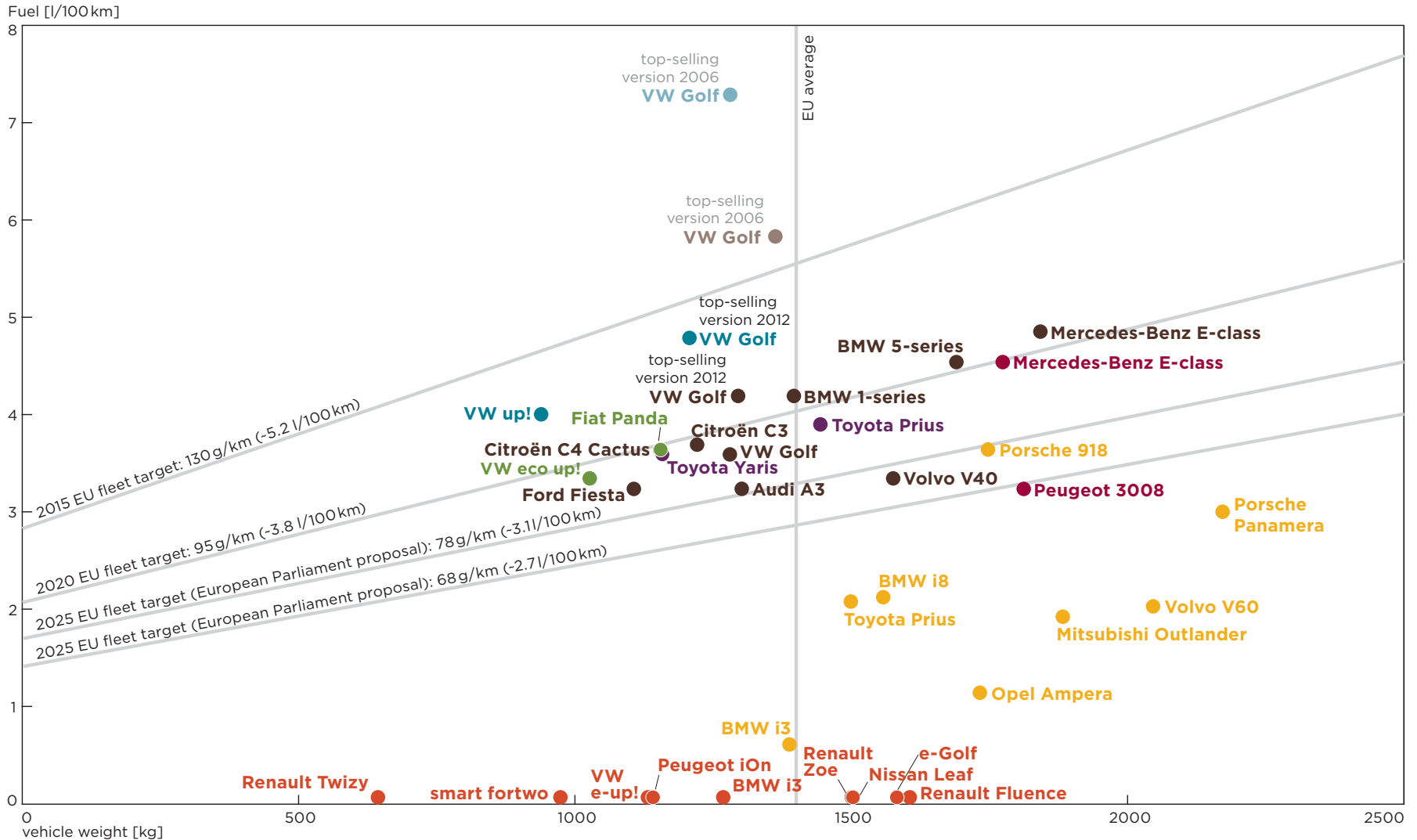


The assessment for meeting 95 g/km by 2020/21 was more thorough but still likely overly pessimistic



Looking forward: What are the technologies to reach a 2025 target?

There is a variety of technical options to reduce CO₂ emissions of new vehicles, already today



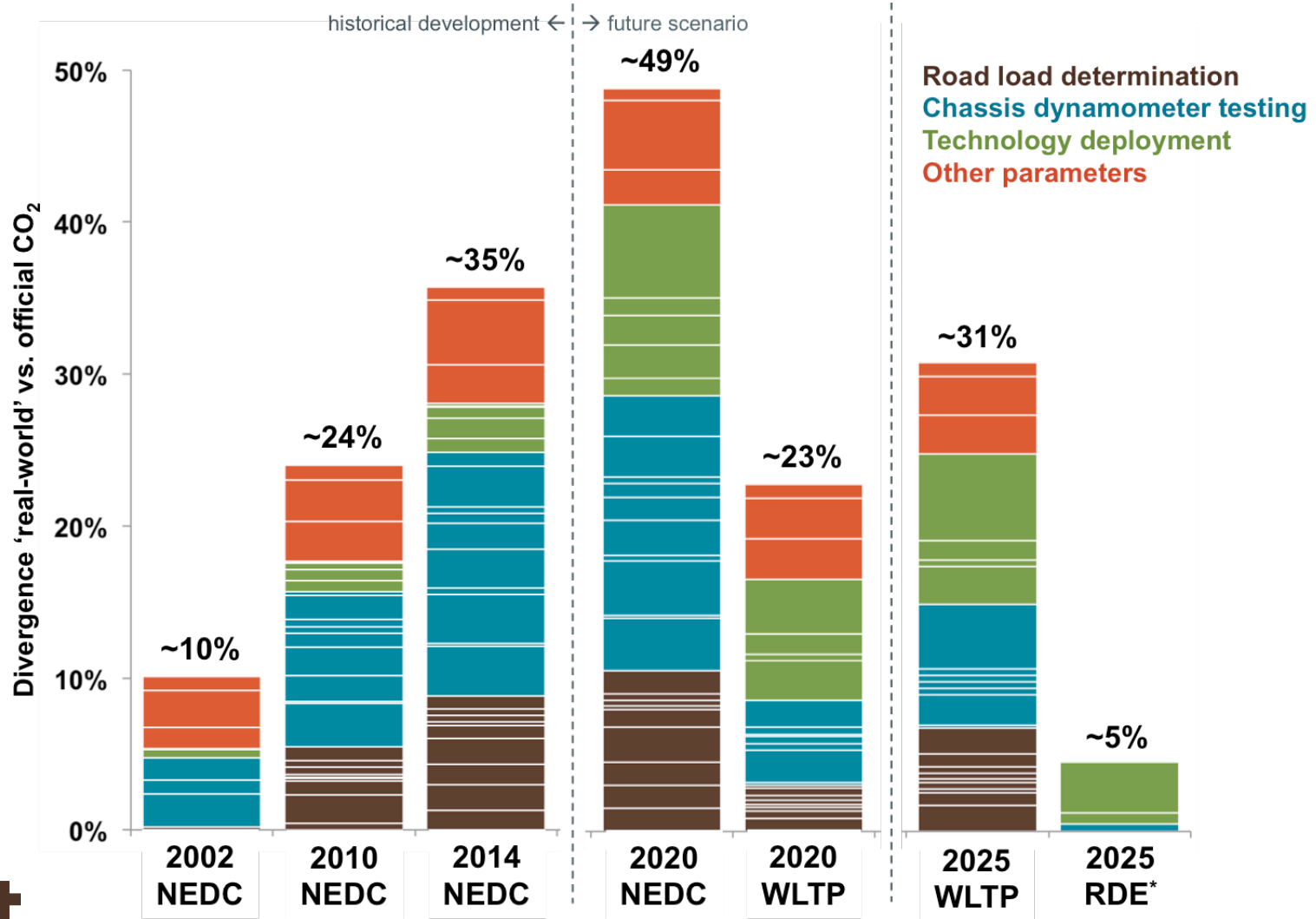
Data source: (DAT, 2014), manufacturers' websites.
Only a selection of available vehicles is shown.

Gasoline Gasoline hybrid Diesel Diesel hybrid Plug-in hybrid Natural gas Full electric

There is a variety of technical options to reduce CO₂ emissions of new vehicles, already today

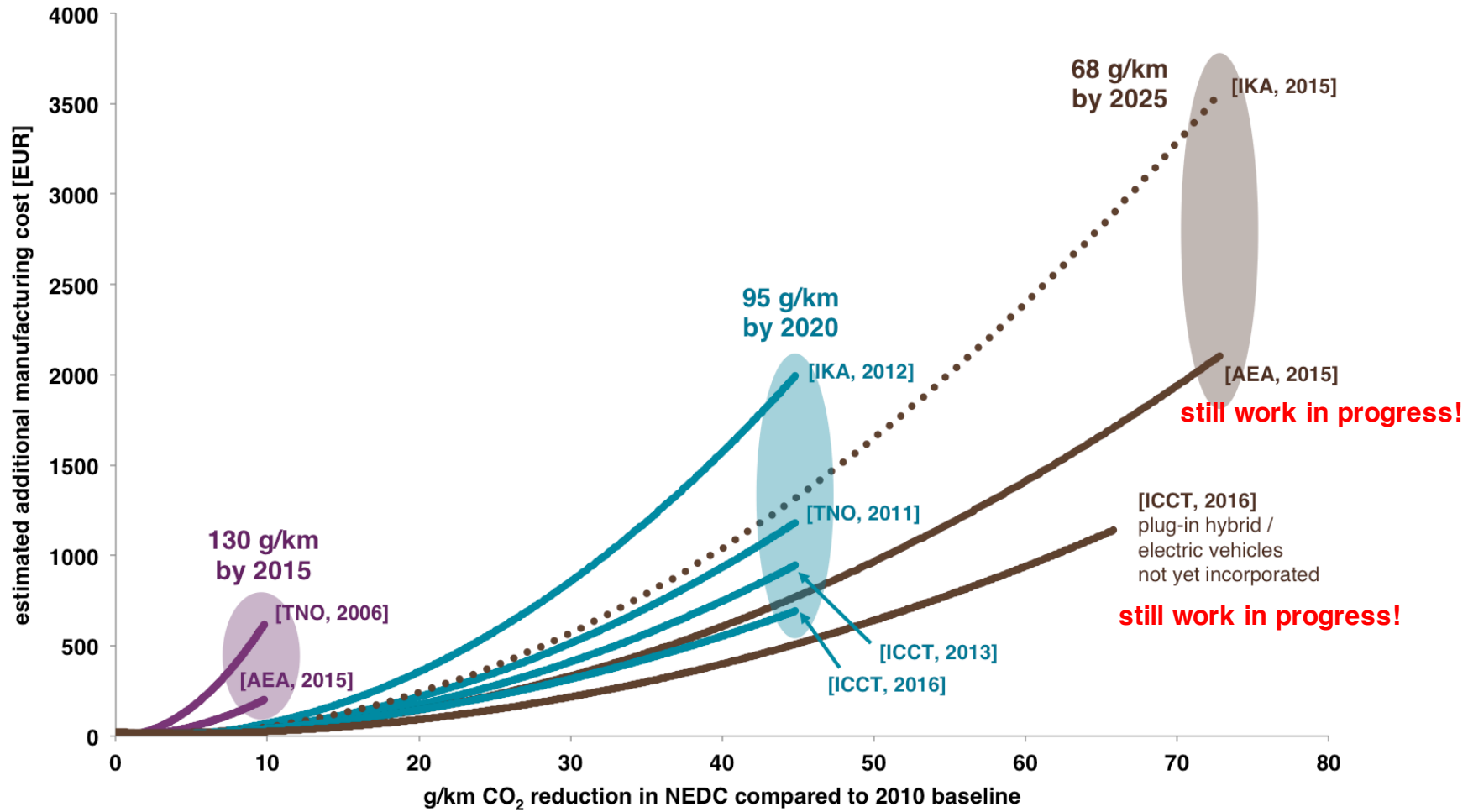
- **Improving the gasoline engine**
(still large potential for evolutionary development)
- **Improving the diesel engine**
(less potential than for gasoline? exhaust aftertreatment? cost-benefit?)
- **Improving the transmission system**
(more gears, moving to dual-clutch transmission)
- **Moving towards increased electrification**
(mild hybrid → full hybrid → plug-in hybrid → range extender → fully electric)
- **Improving the vehicle road-load**
(light-weighting aerodynamics, tires)
- **Technology is always evolving!**

The gap between official and real-world CO₂ data is expected to continue to increase, even with WLTP

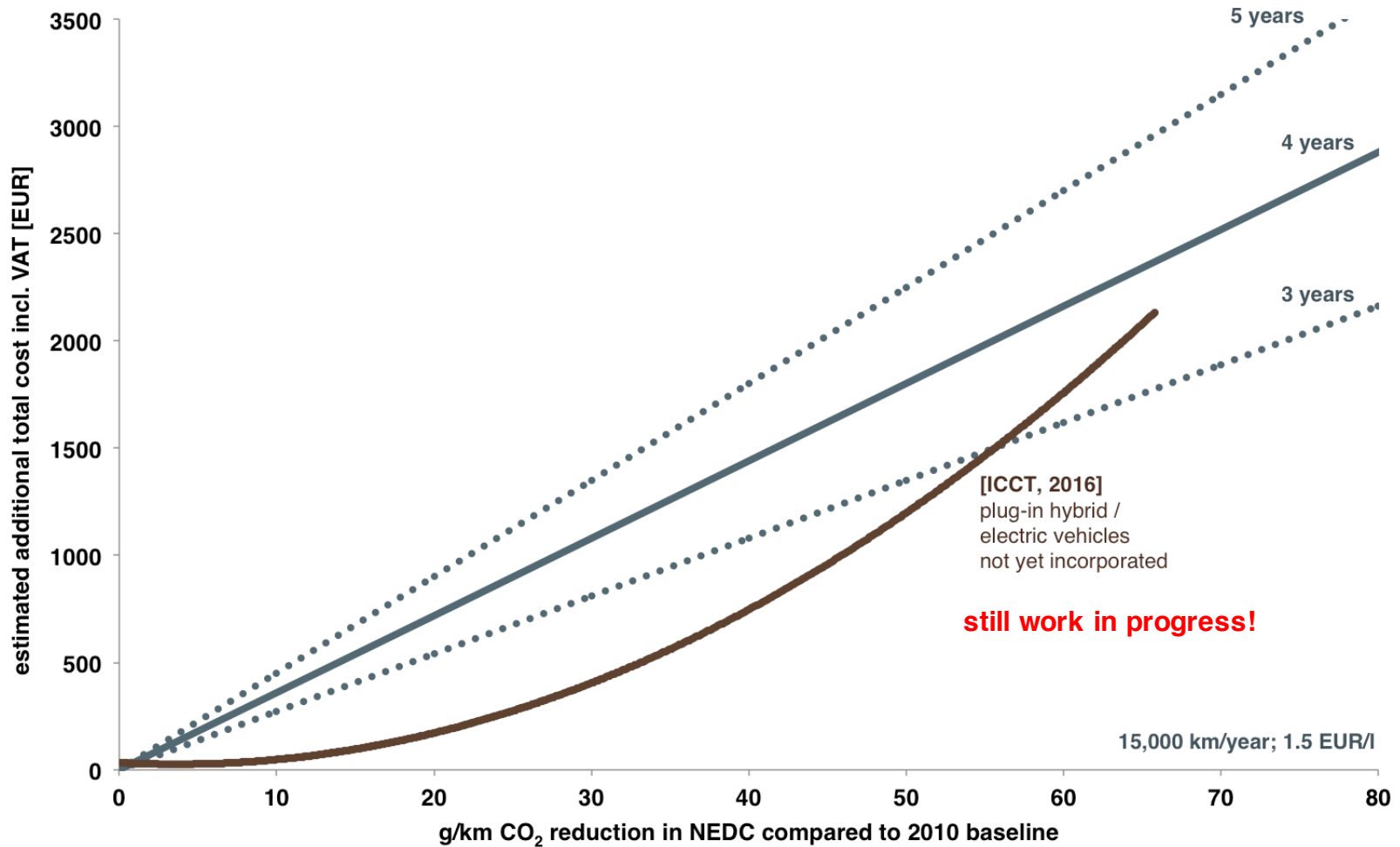


RDE* = comprehensive in-use conformity and on-road testing scheme

Results so far suggest that a 2025 target of ~70 g/km is reachable without a large share of electric vehicles

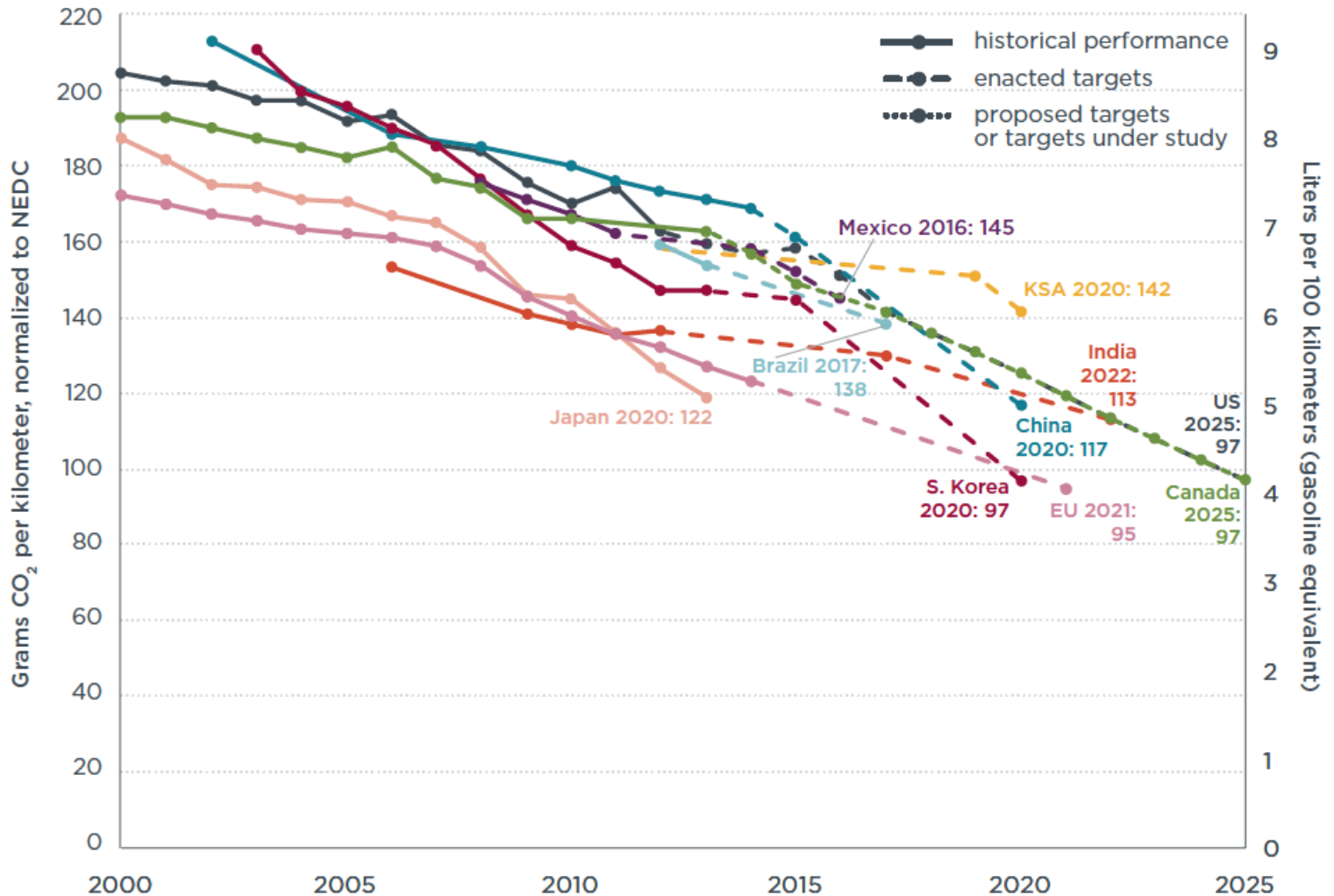


Payback for post-2020 target(s) is most likely still well within holding period of first hand owner

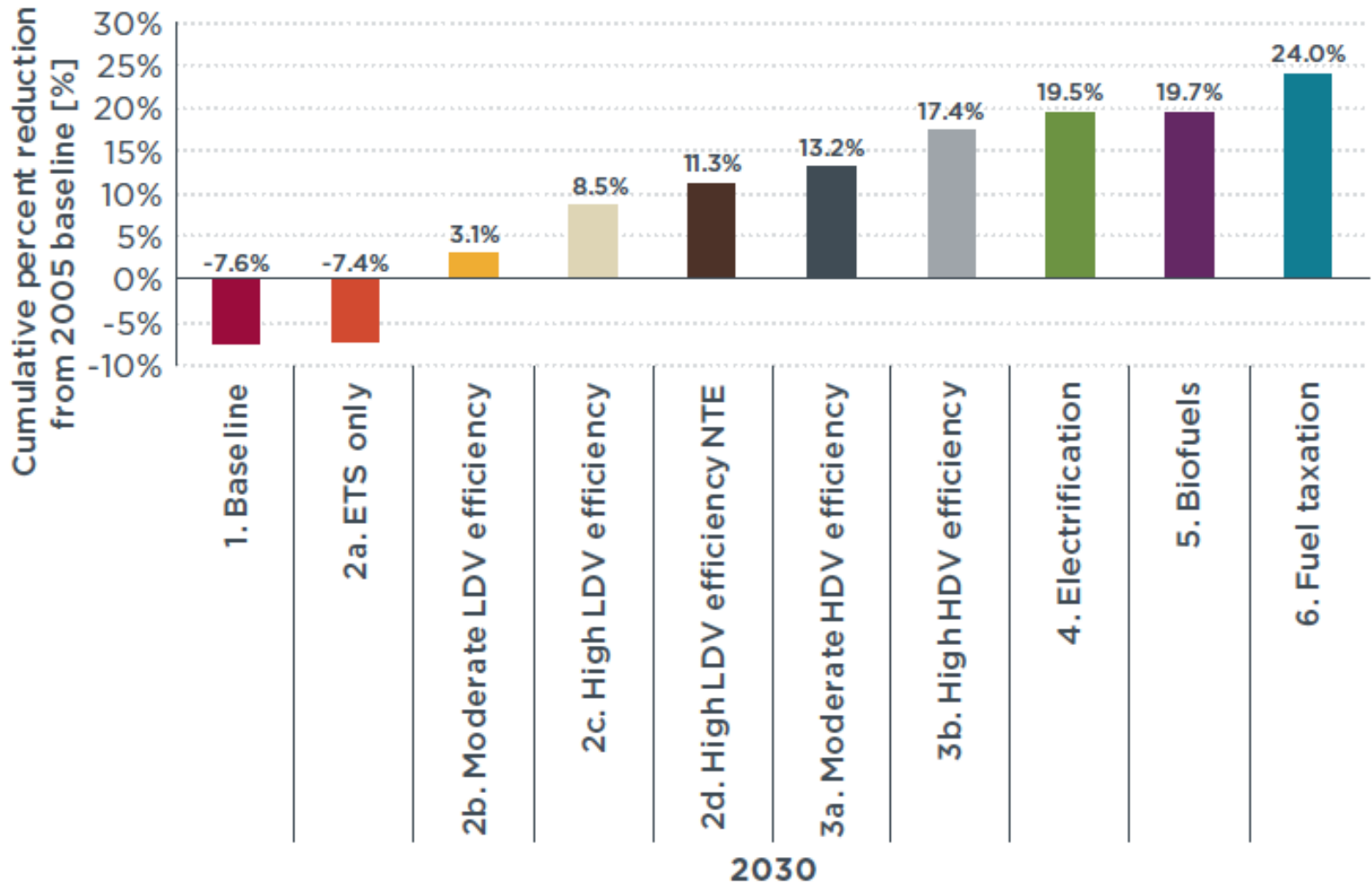


The bigger picture: What do we have to achieve in the mid and long term?

Globally, there is a competition to introduce more efficient vehicles and to reduce CO₂ emission levels

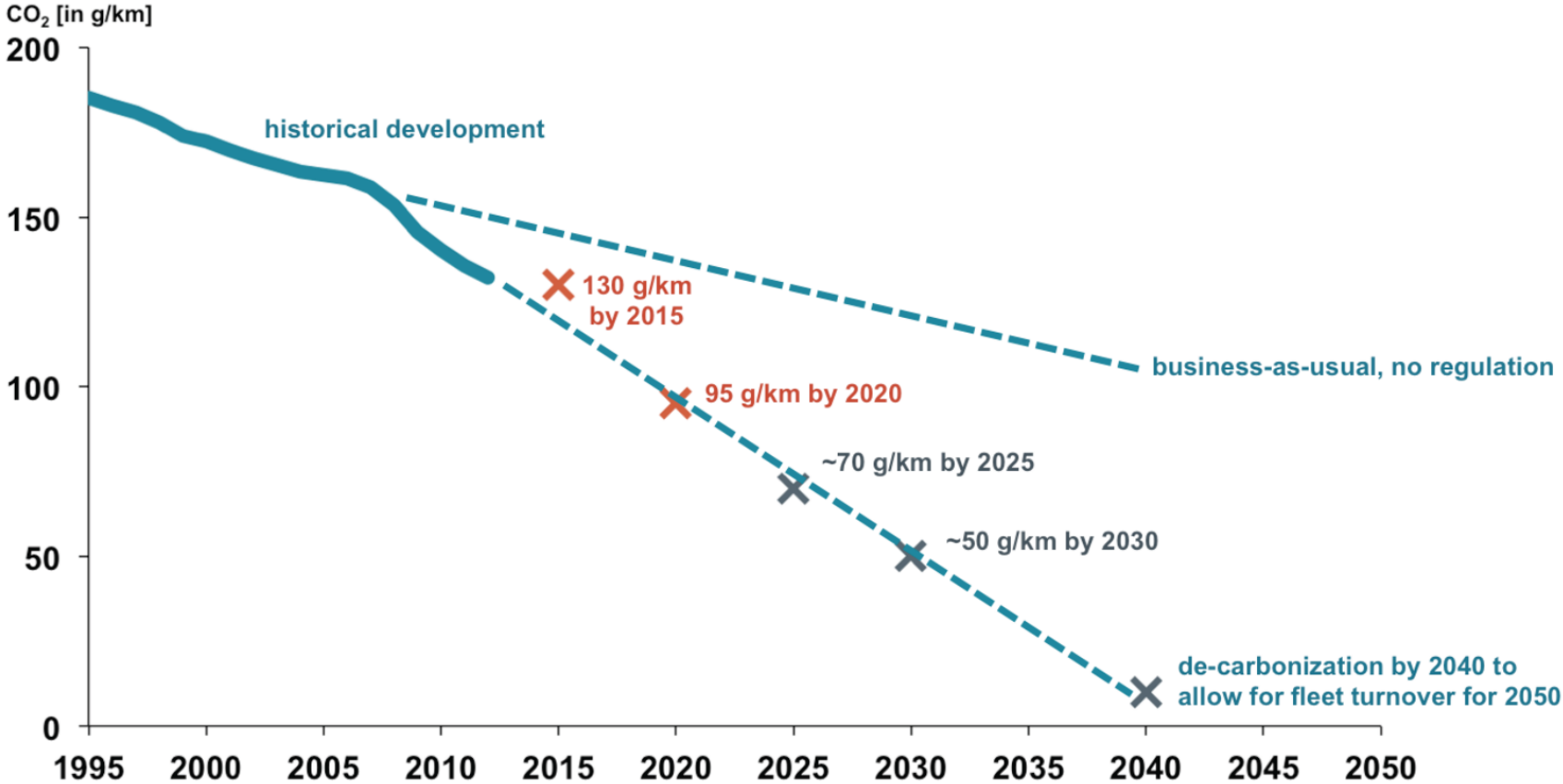


For reaching the CO₂ reduction targets for 2030, we need a combination of all available measures

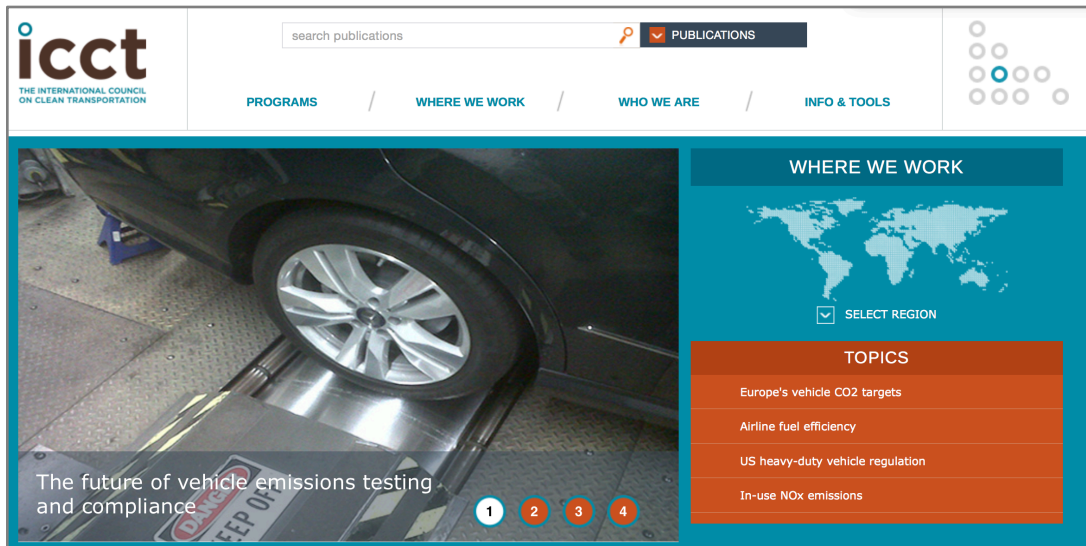


Agreed long-term targets will require essentially the de-carbonization of our vehicle fleet

Pathway for CO₂ emission levels of new cars in the EU



For more information, please visit our website and/or get in touch with our team at ICCT



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<https://www.theccc.org.uk/publication/impact-of-real-world-driving-emissions/>

<http://www.theicct.org/laboratory-road-2015-update>

<http://www.theicct.org/future-of-vehicle-testing>

<http://www.theicct.org/wltp-how-new-test-procedure-cars-will-affect-fuel-consumption-values-eu>

<http://www.theicct.org/road-transport-eu-emissions-trading-system-engineering-perspective>

<http://theicct.org/how-taxes-influence-vehicle-co2-emission-levels>

<http://www.theicct.org/overview-heavy-duty-vehicle-market-and-co2-emissions-european-union>

<http://www.theicct.org/real-world-fuel-consumption-popular-european-passenger-car-models>