

# EU vehicle technology study: Development of preliminary cost curves for the EU market

ICCT International Workshop on greenhouse gas reduction potential  
and costs of light-duty vehicle technologies

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*Brussels*

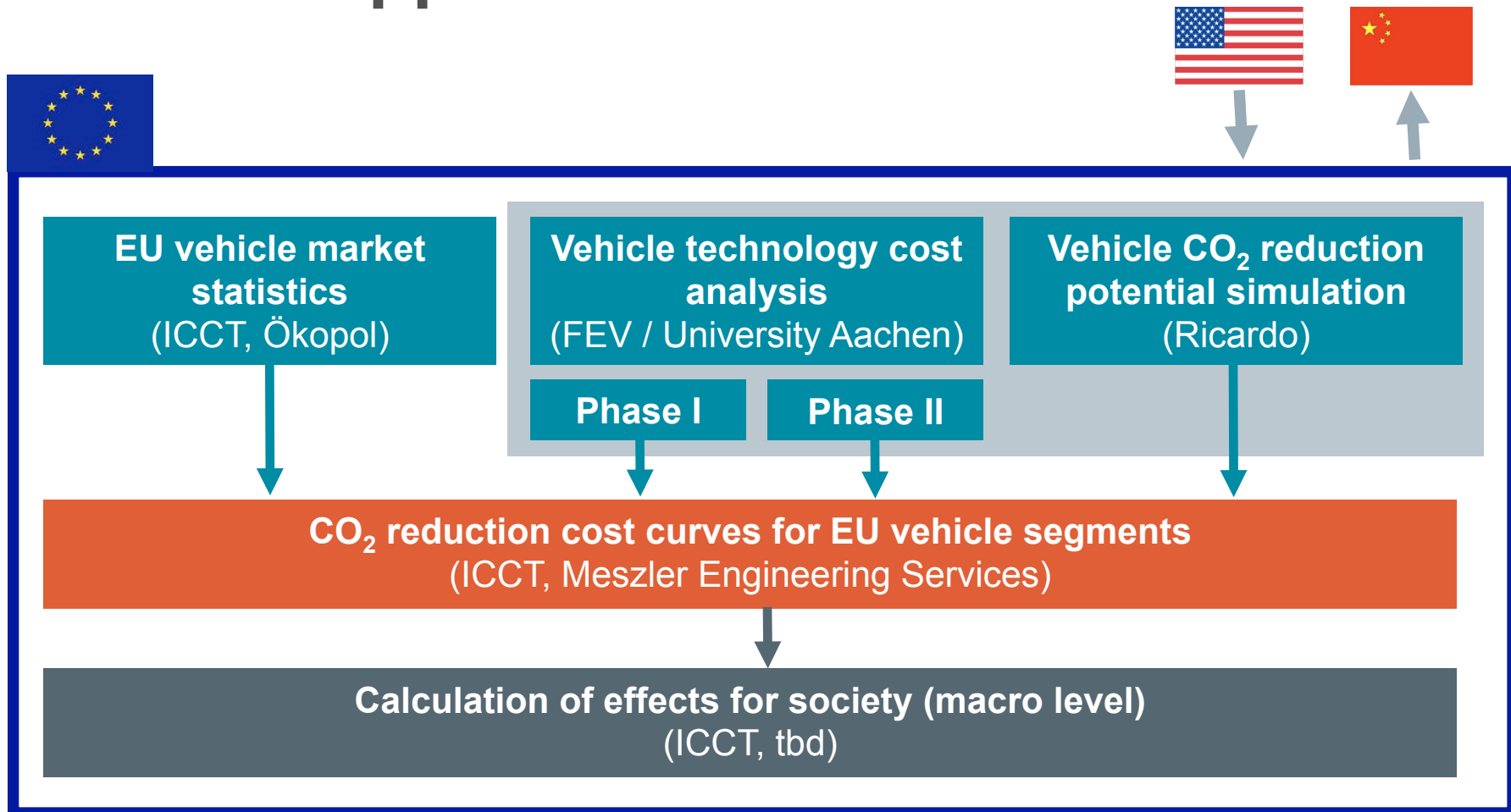


# Agenda

- 1** Methodology for developing the curves
- 2** Preliminary results
- 3** Conclusions and outlook

# Methodology

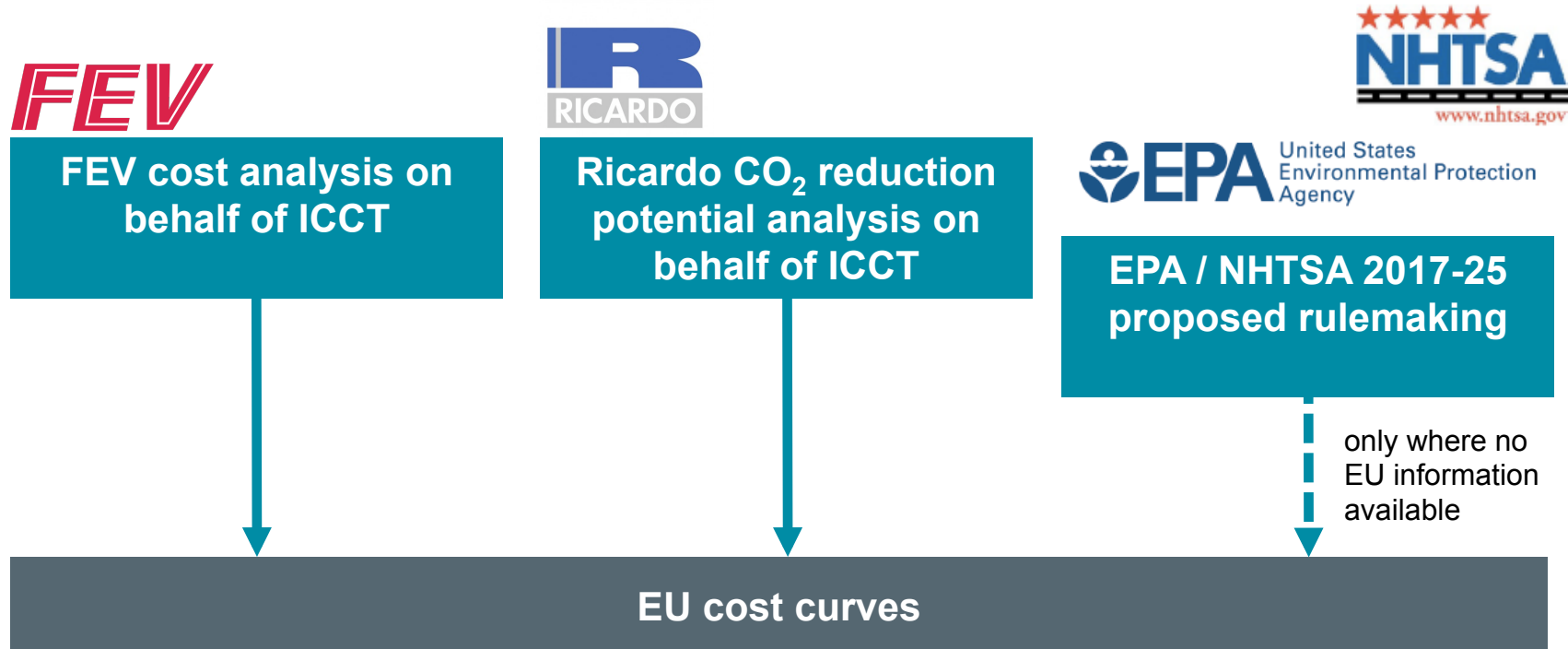
## The ICCT approach



accompanying workshops, briefings and publications

# Methodology

## Data sources



# Methodology

## The baseline vehicles

**C-segment**  
(32% market, 38% diesel)



|                                | Gasoline                      |                                  | Diesel                    |                                  |
|--------------------------------|-------------------------------|----------------------------------|---------------------------|----------------------------------|
|                                | Ricardo                       | EU-27                            | Ricardo                   | EU-27                            |
| <b>Vehicle model</b>           | Ford Focus                    | n/a                              | Ford Focus                | n/a                              |
| <b>Engine size</b>             | 4 cyl., 1.6 l                 | 4 cyl., 1.6 l                    | 4 cyl., 1.6 l             | 4 cyl., 1.7 l                    |
| <b>Engine power</b>            | 88 kW                         | 86 kW                            | 75 kW                     | 83 kW                            |
| <b>Engine type</b>             | PFI                           | PFI (MS DI≈19%)                  | n/a                       | n/a                              |
| <b>Vehicle weight</b>          | 1,257 kg                      | 1,270 kg                         | 1,413 kg                  | 1,360 kg                         |
| <b>Transmission</b>            | 6-MT                          | MT (MS≈91%)*                     | 6-AT                      | MT (MS≈91%)*                     |
| <b>Acceleration 0-100 km/h</b> | ---                           | 11.3 s                           | 10.0 s                    | 11.6 s                           |
| <b>CO<sub>2</sub> in NEDC</b>  | 139 g/km                      | 156 g/km                         | 124 g/km                  | 131 g/km                         |
| <b>Remarks</b>                 | Start-Stop/Reg.<br>Euro 5 eq. | no Start-Stop<br>Euro 4 (MS≈60%) | Start-Stop/Reg.<br>Euro 5 | no Start-Stop<br>Euro 4 (MS≈60%) |

# Methodology

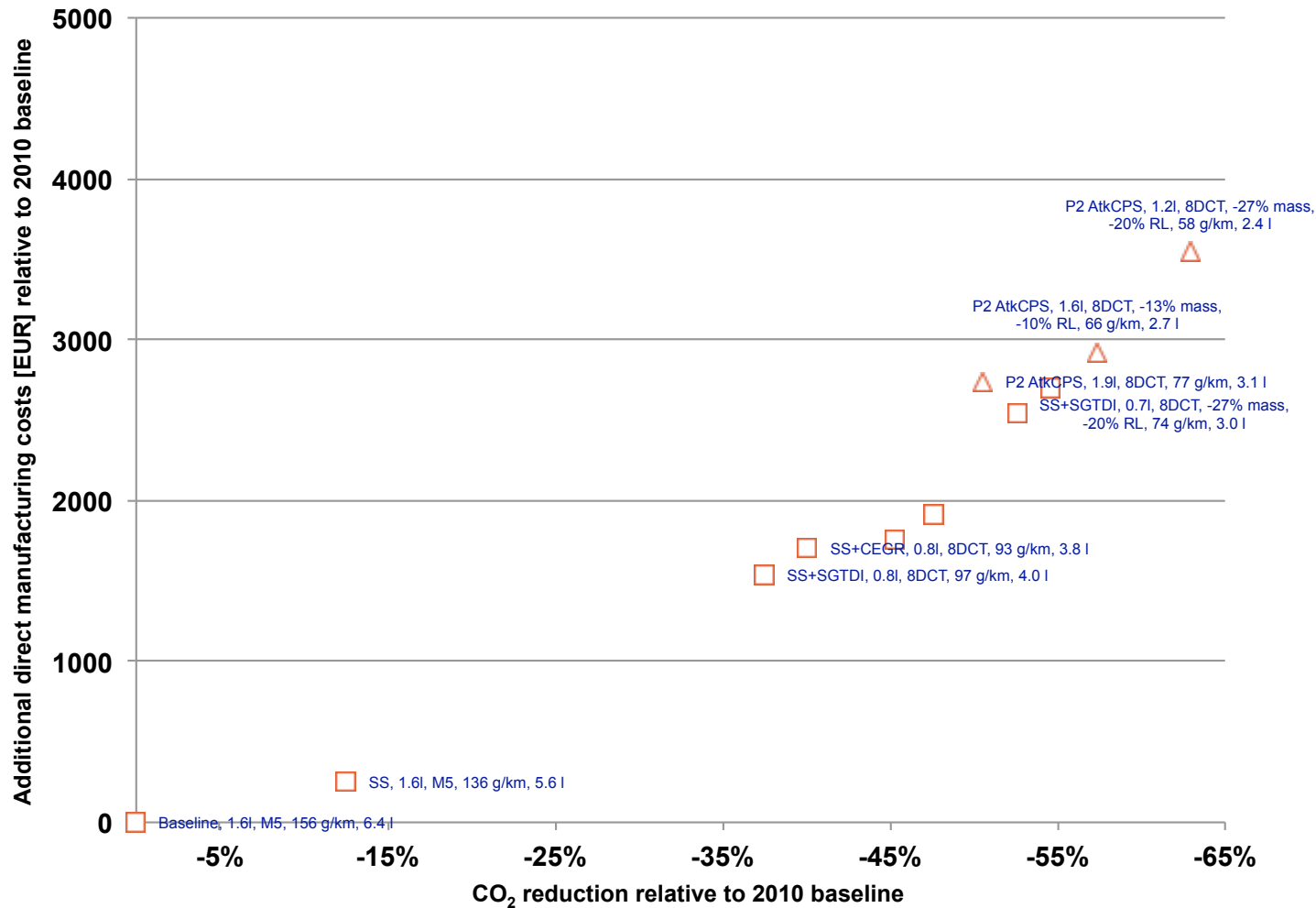
## Arriving at the starting point

- **Ricardo baseline vehicles include start-stop and improved alternator**
  - Factoring out alternator efficiency improvement (55% vs. 70%)  
→  $\approx -3\%$  effect
  - Factoring out effect of start-stop system, taking into account idling times in European driving cycle →  $\approx -10\%$  effect
- **Ricardo baseline vehicles include automatic transmissions in some cases**
  - For all EU segments: manual transmission as starting point
  - E.g. going from A6 to M6 →  $\approx 4\%$  effect

# Methodology

## Plotting technology packages

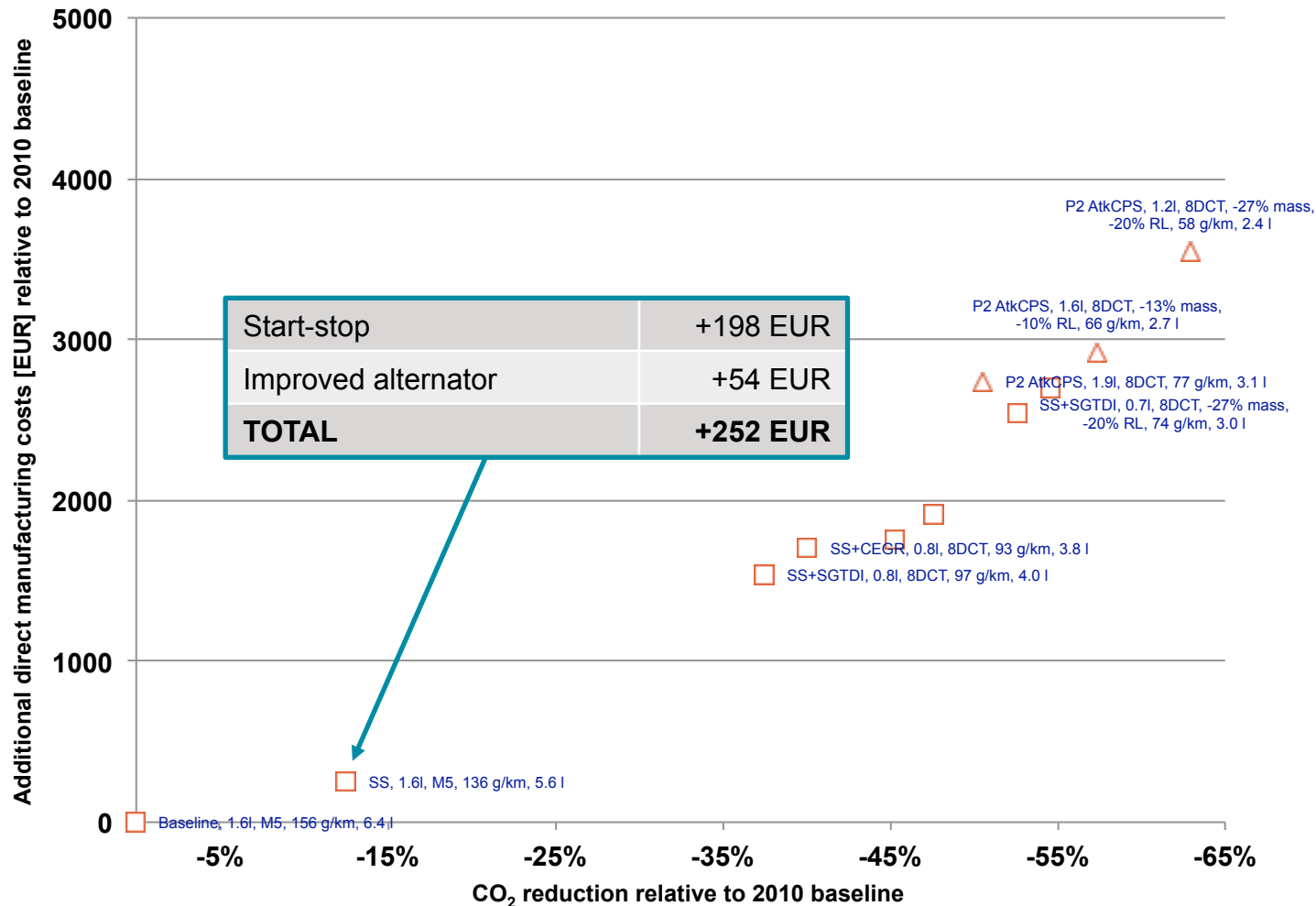
- C-segment gasoline



# Methodology

## Plotting technology packages

- C-segment gasoline

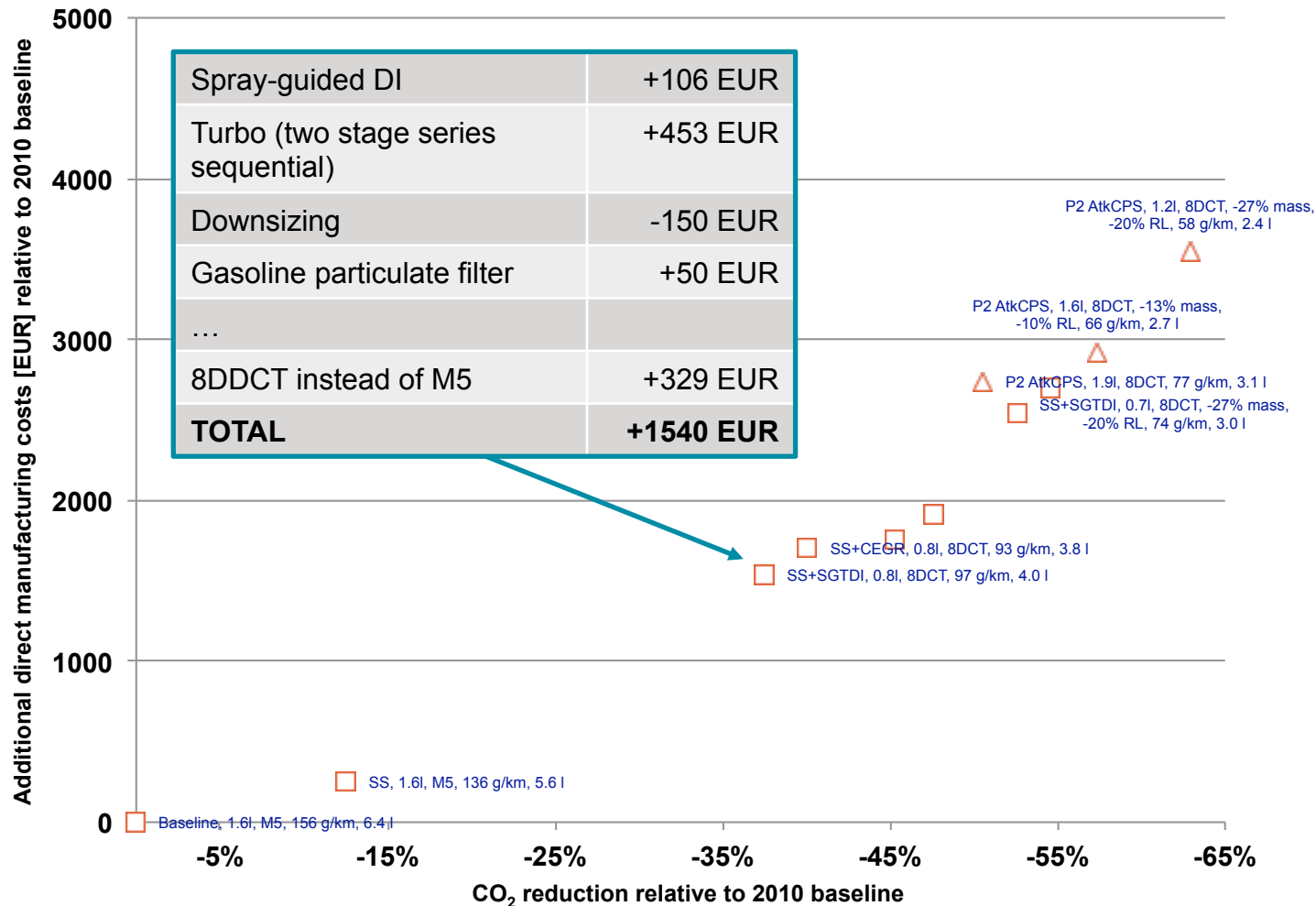




# Methodology

## Plotting technology packages

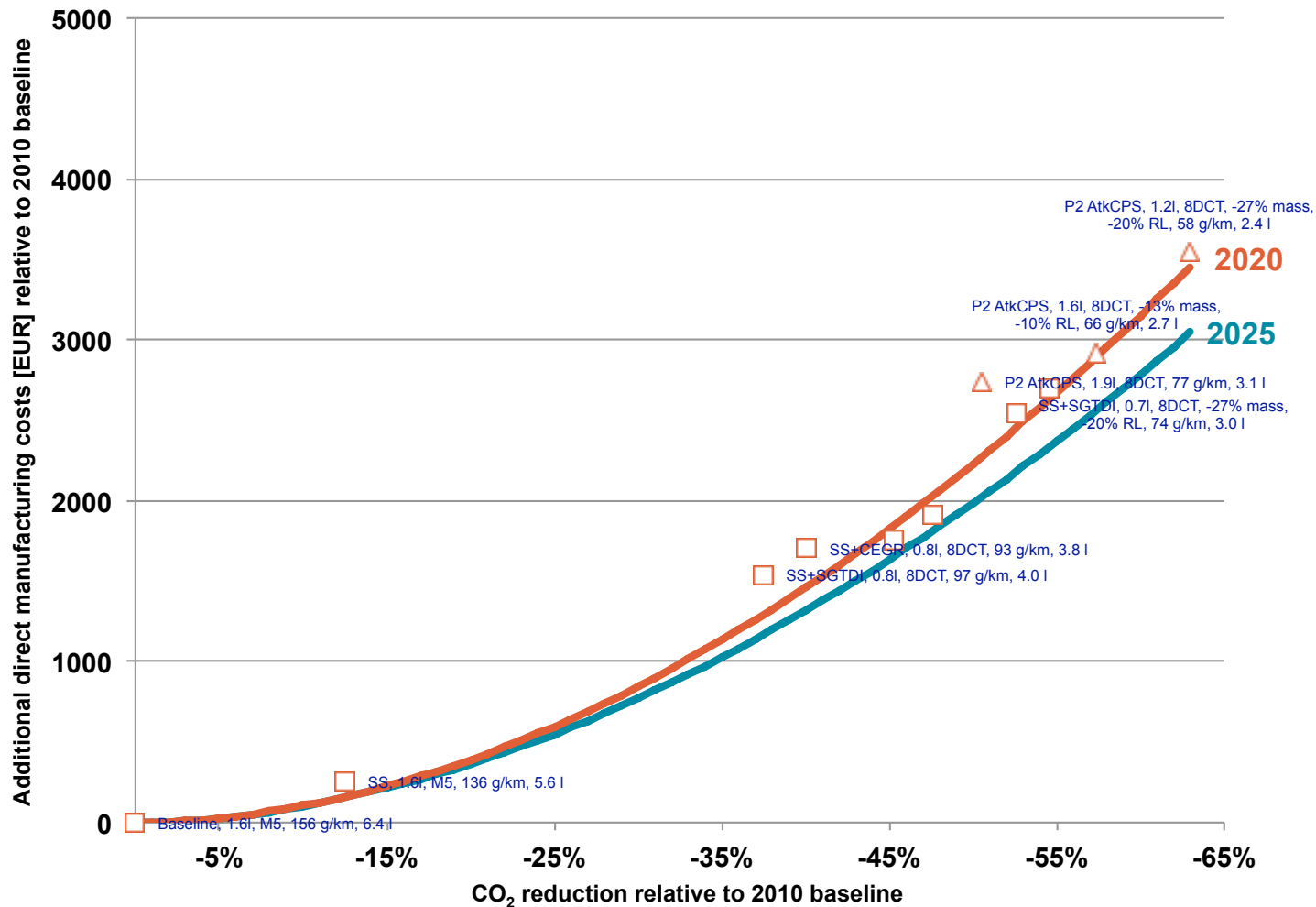
- C-segment gasoline



# Methodology

## Fitting the cost curves

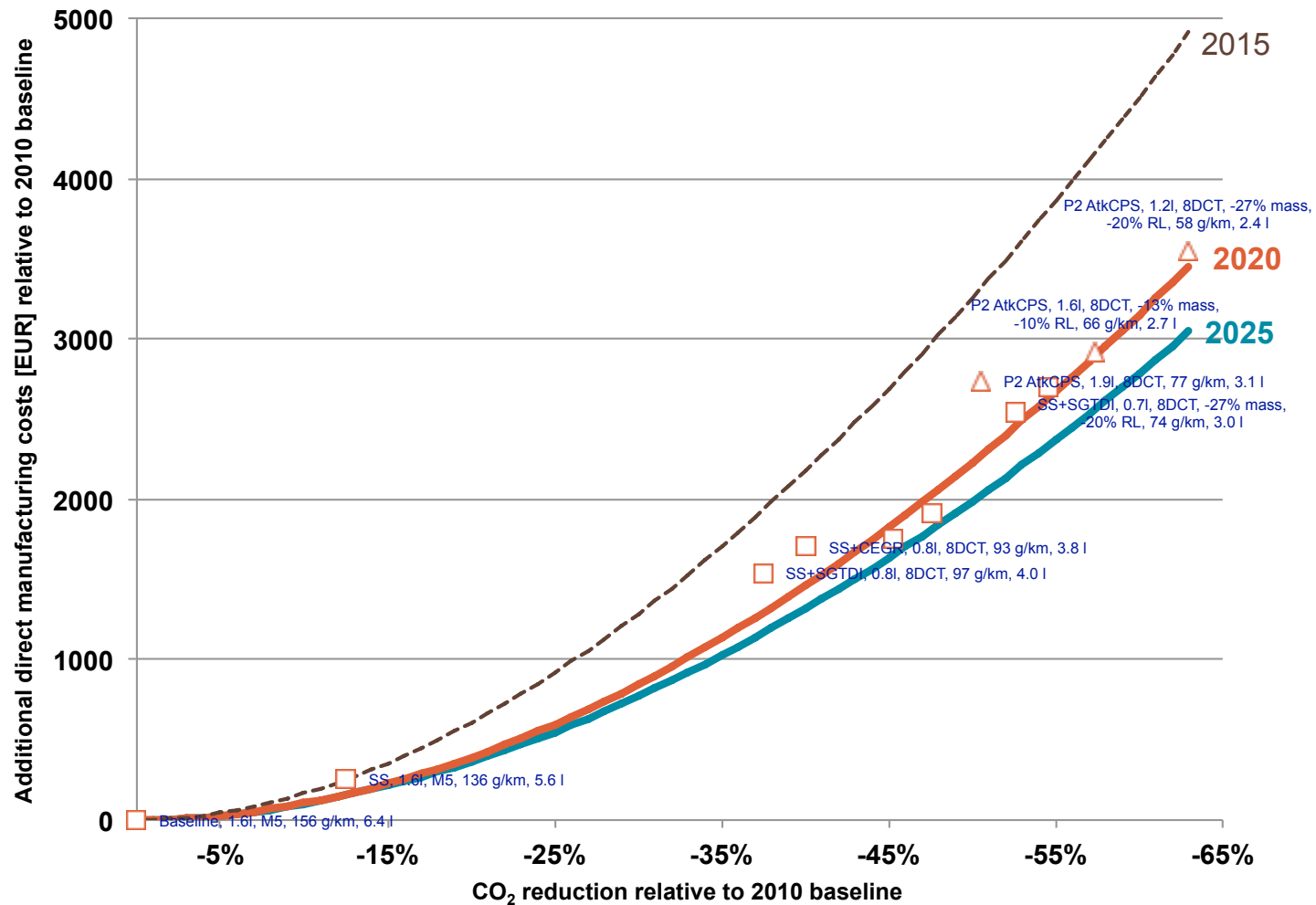
- C-segment gasoline



# Methodology

## 2015 curve for illustrating purposes

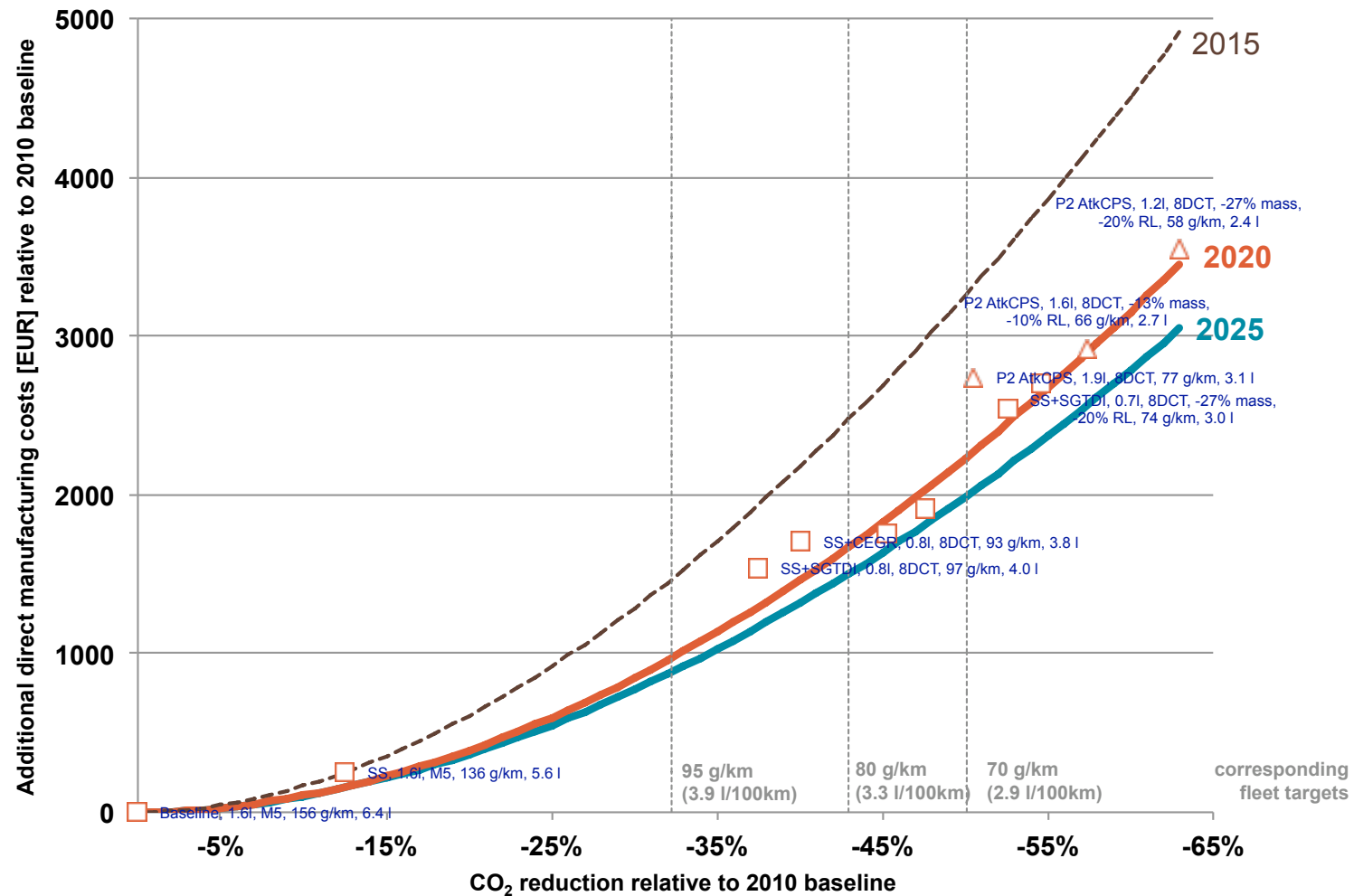
- C-segment gasoline



# Methodology

## The final result

- C-segment gasoline



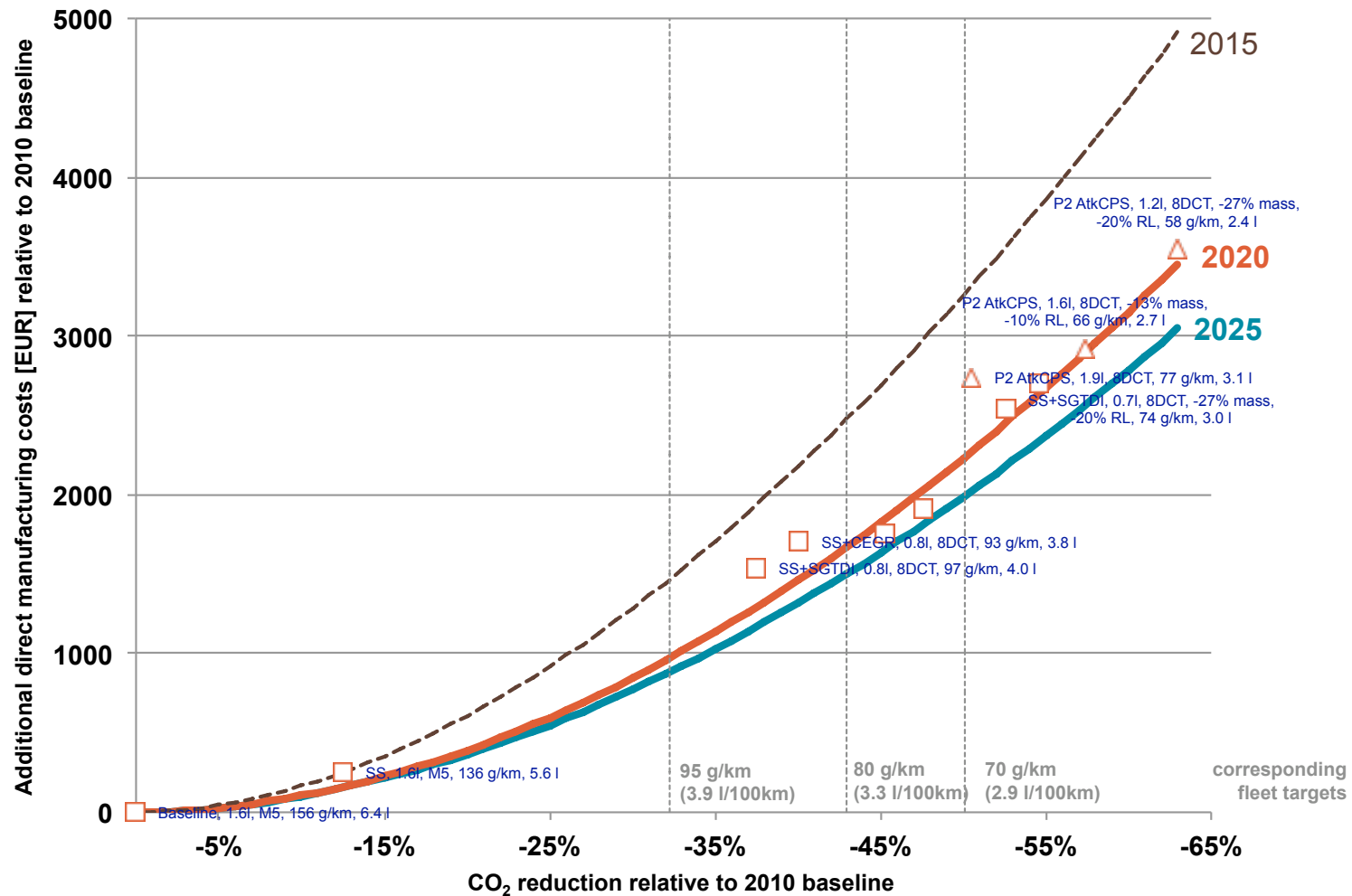
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# Preliminary results

## C-segment cost curve

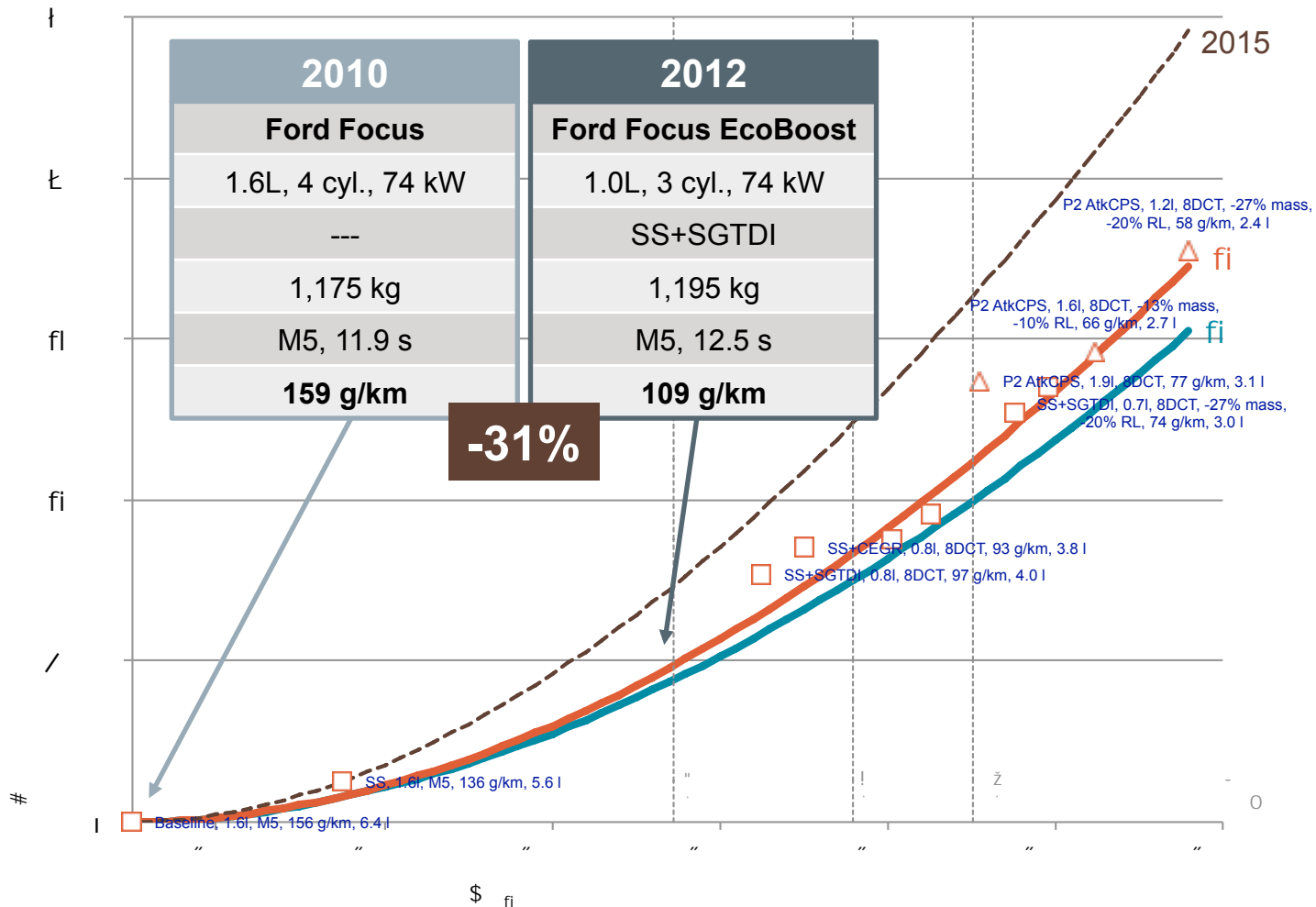
- C-segment gasoline



# Preliminary results

## Comparison with vehicles on the market

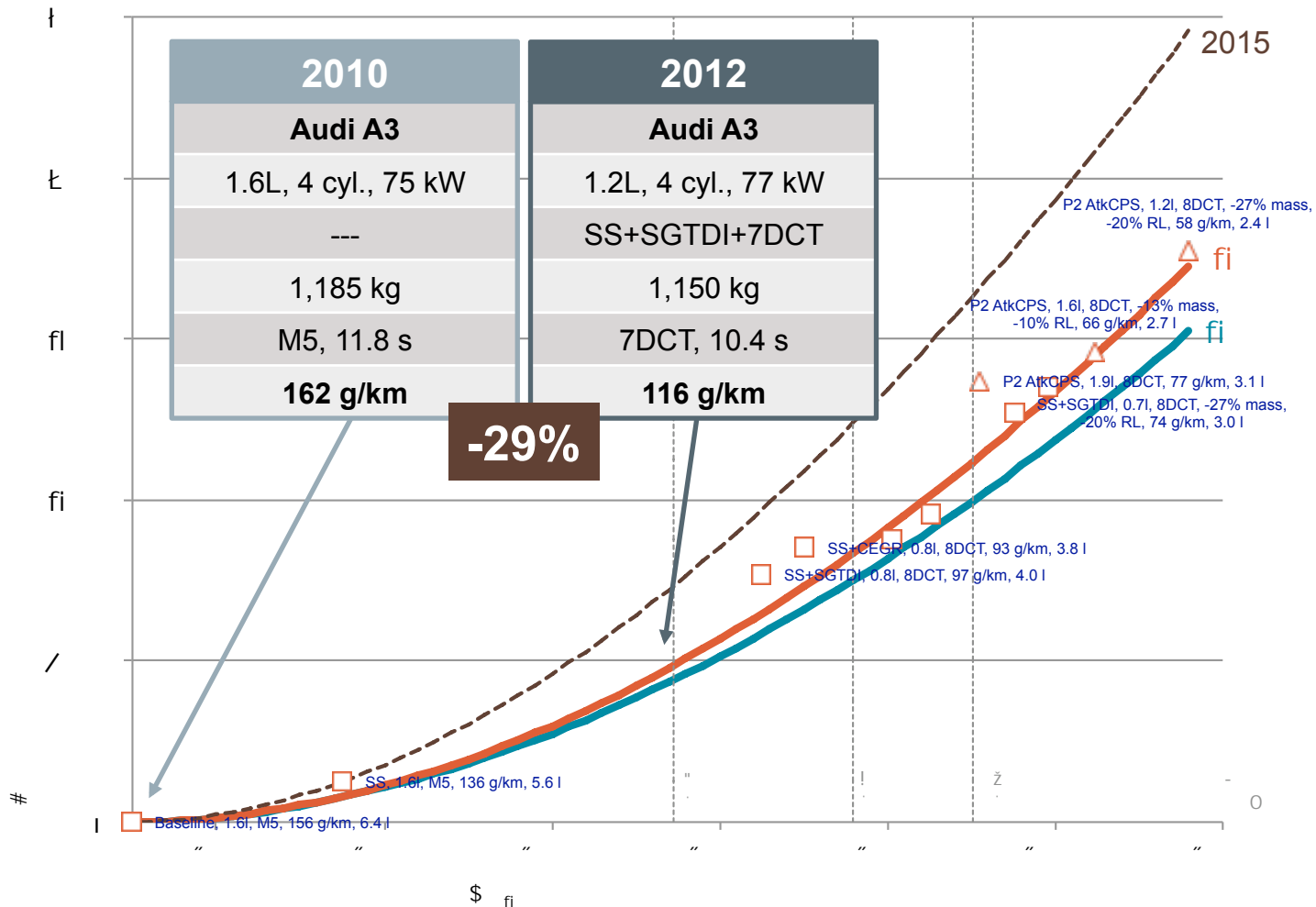
- C-segment gasoline**



# Preliminary results

## Comparison with vehicles on the market

- C-segment gasoline**

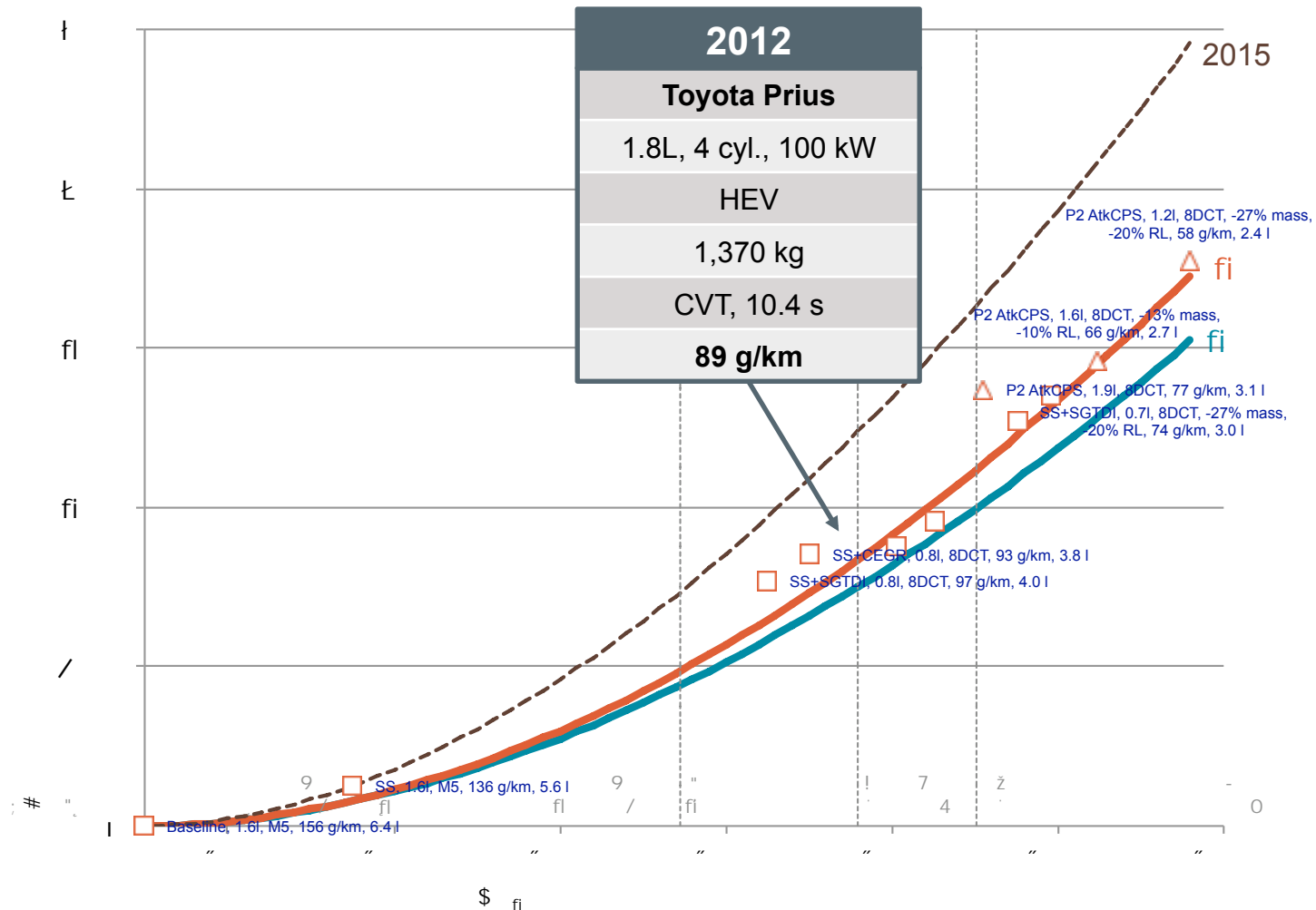




# Preliminary results

## Comparison with vehicles on the market

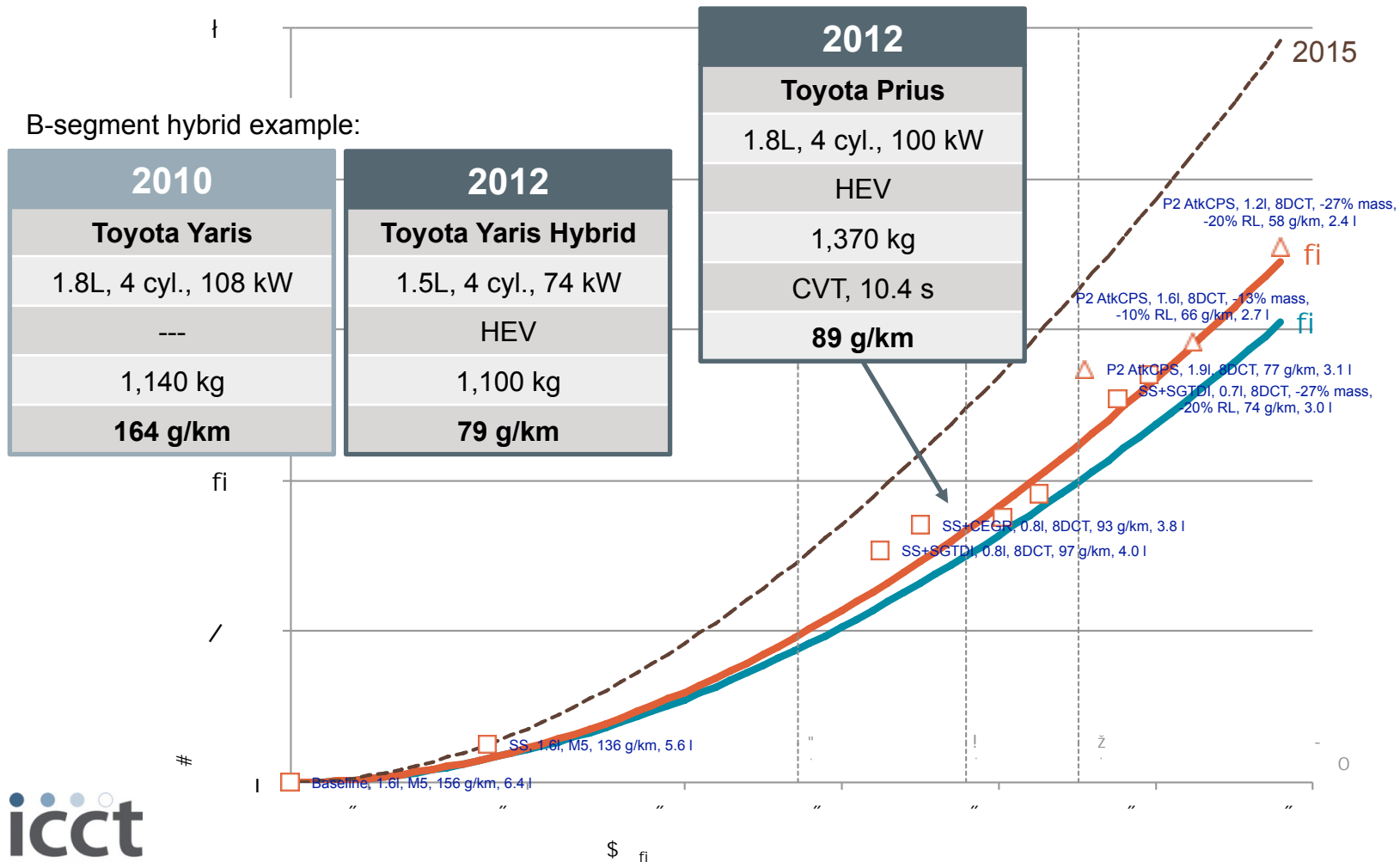
- C-segment gasoline



# Preliminary results

## Comparison with vehicles on the market

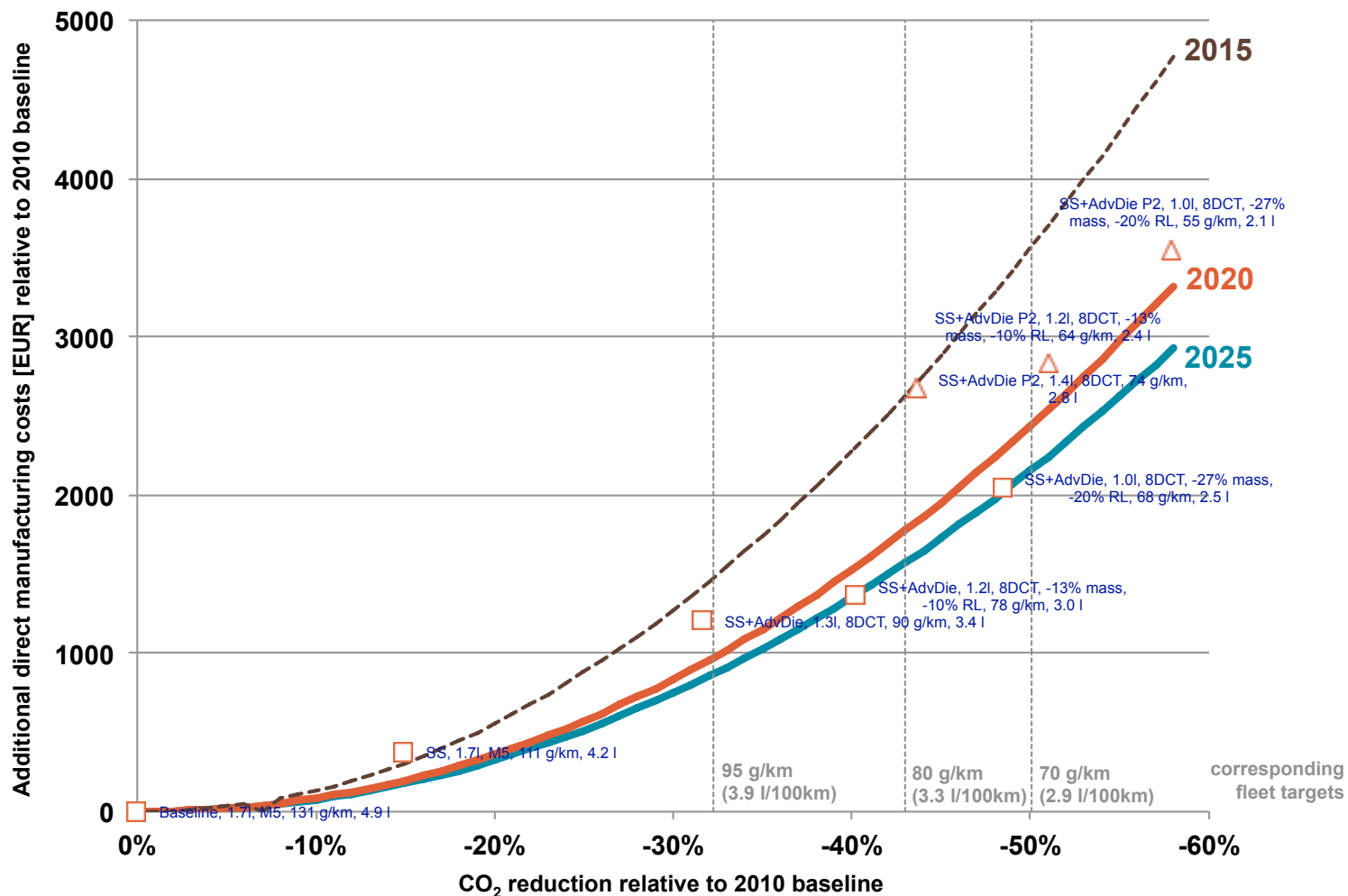
- C-segment gasoline**



# Preliminary results

## C-segment cost curve

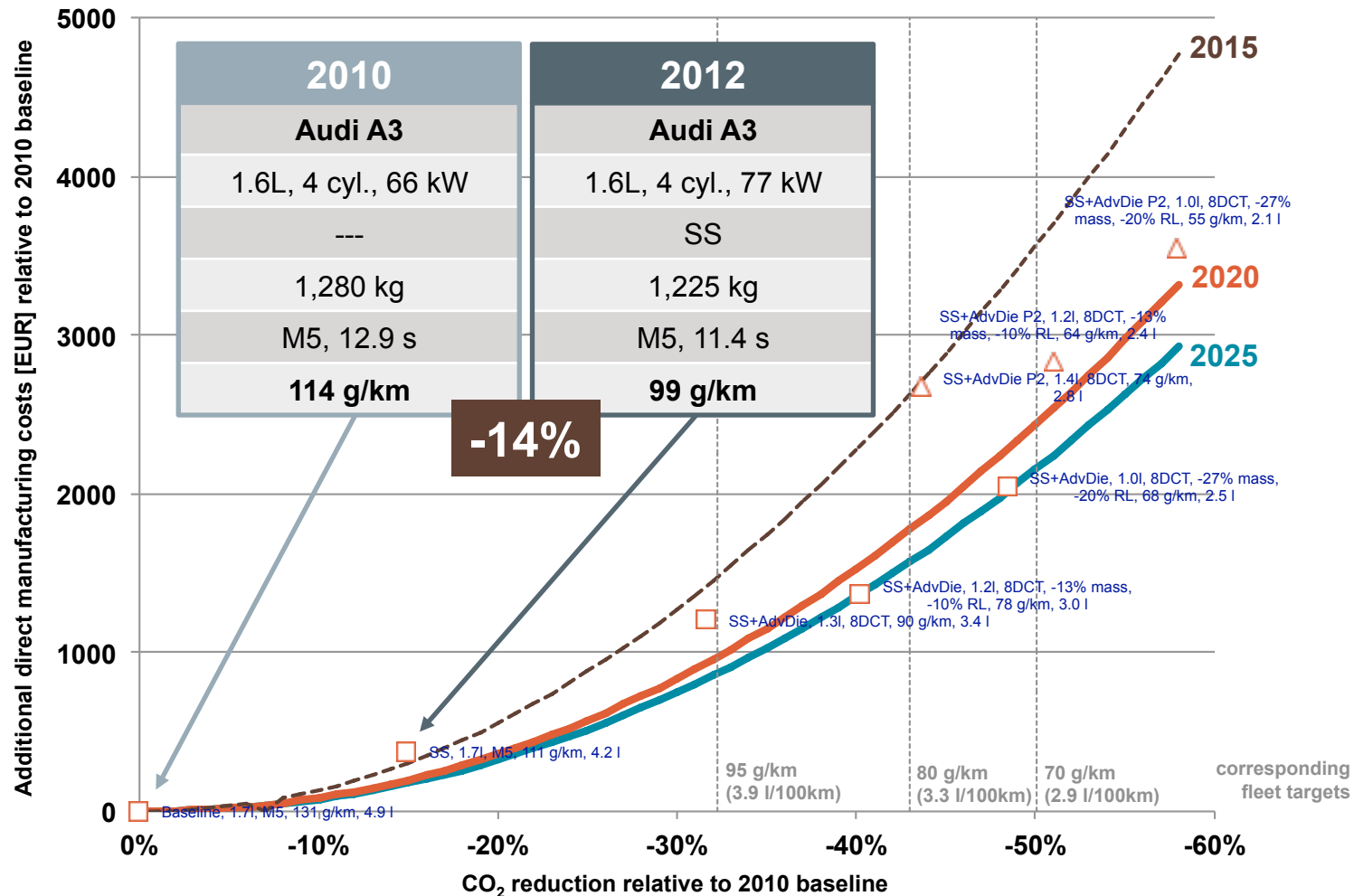
- C-segment diesel



# Preliminary results

## Comparison with vehicles on the market

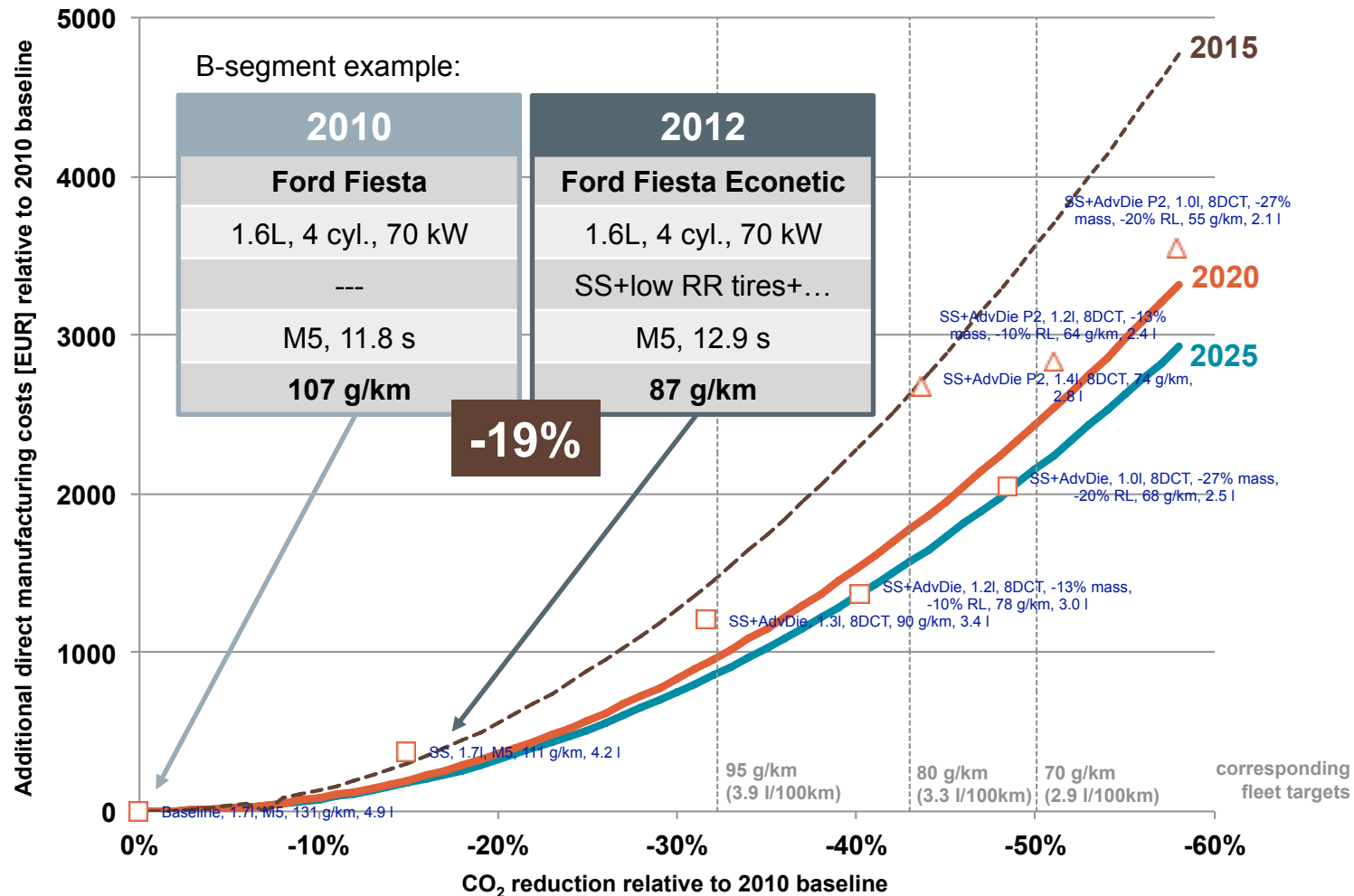
- C-segment diesel



# Preliminary results

## Comparison with vehicles on the market

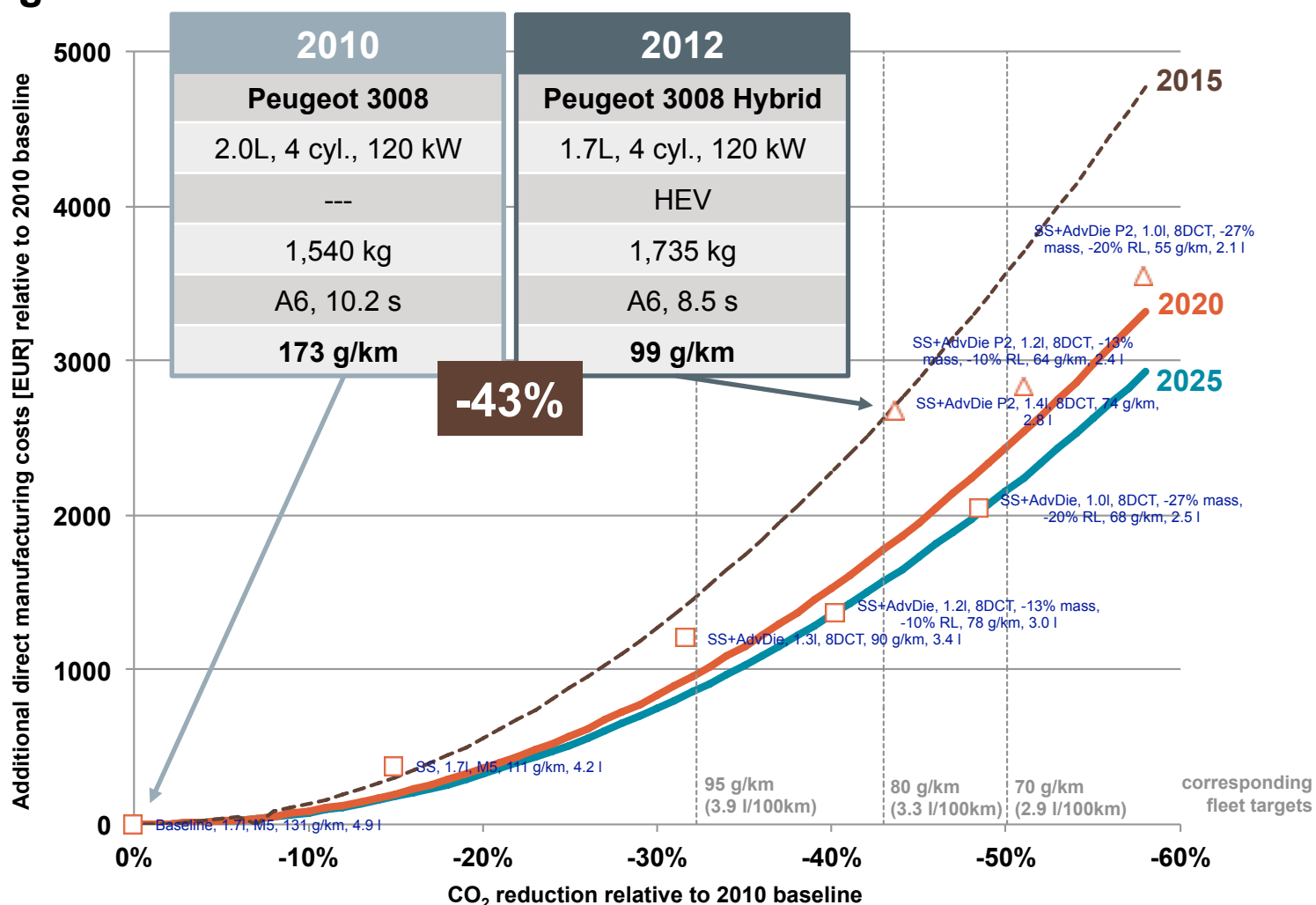
- C-segment diesel



# Preliminary results

## Comparison with vehicles on the market

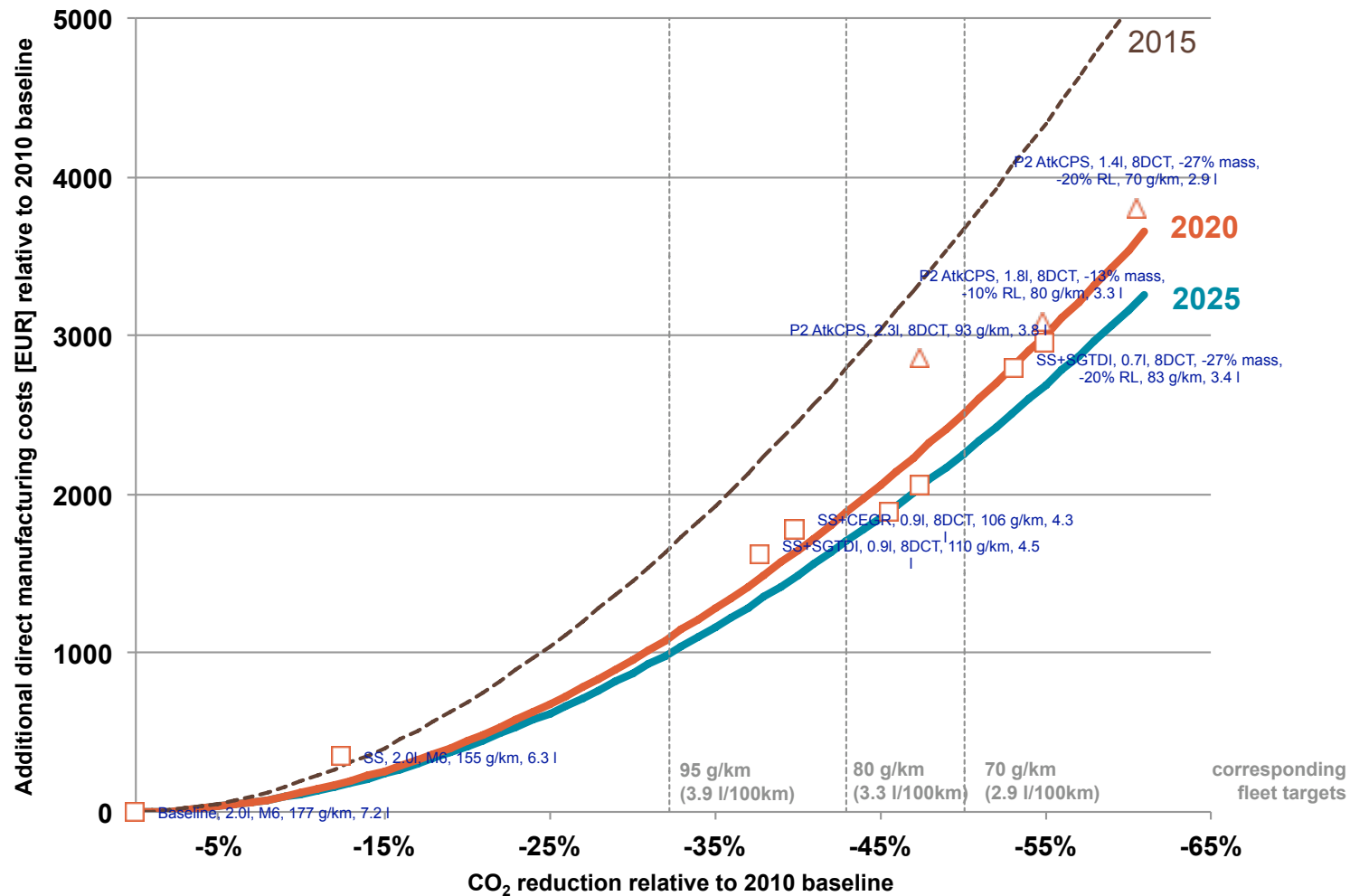
- C-segment diesel**



# Preliminary results

## D-segment cost curve

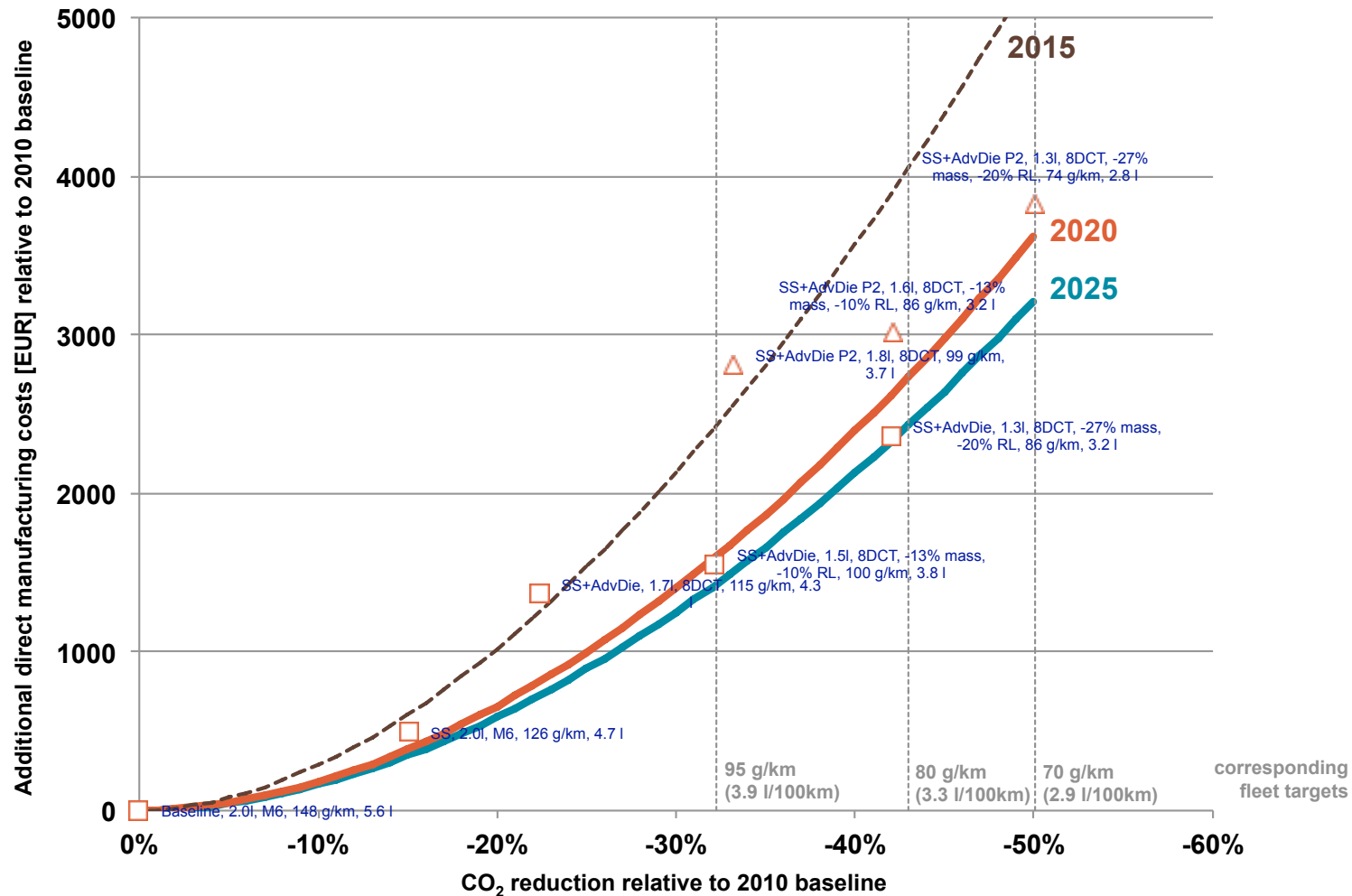
- D-segment gasoline



# Preliminary results

## D-segment cost curve

- D-segment diesel

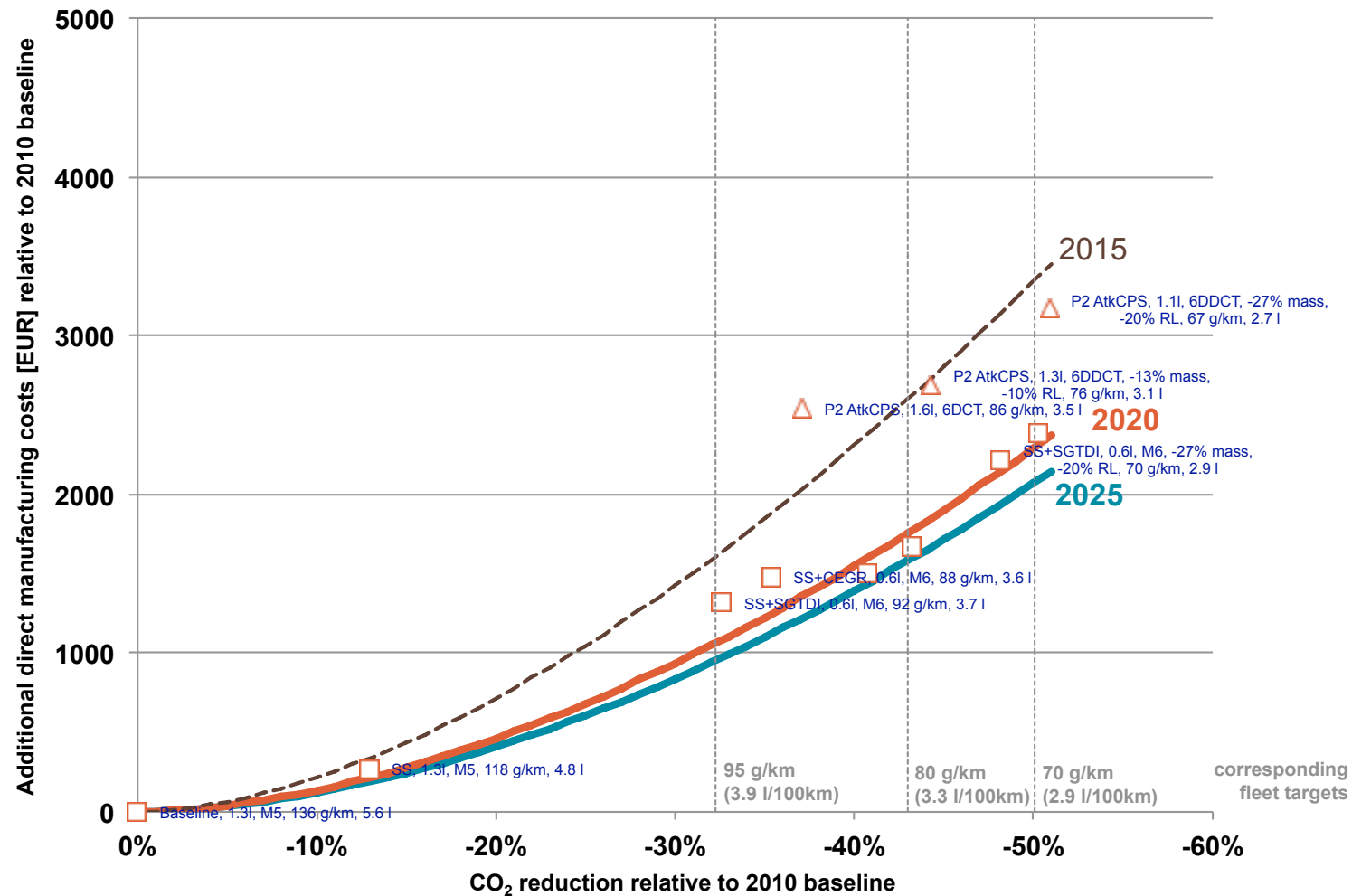




# Preliminary results

## B-segment cost curve

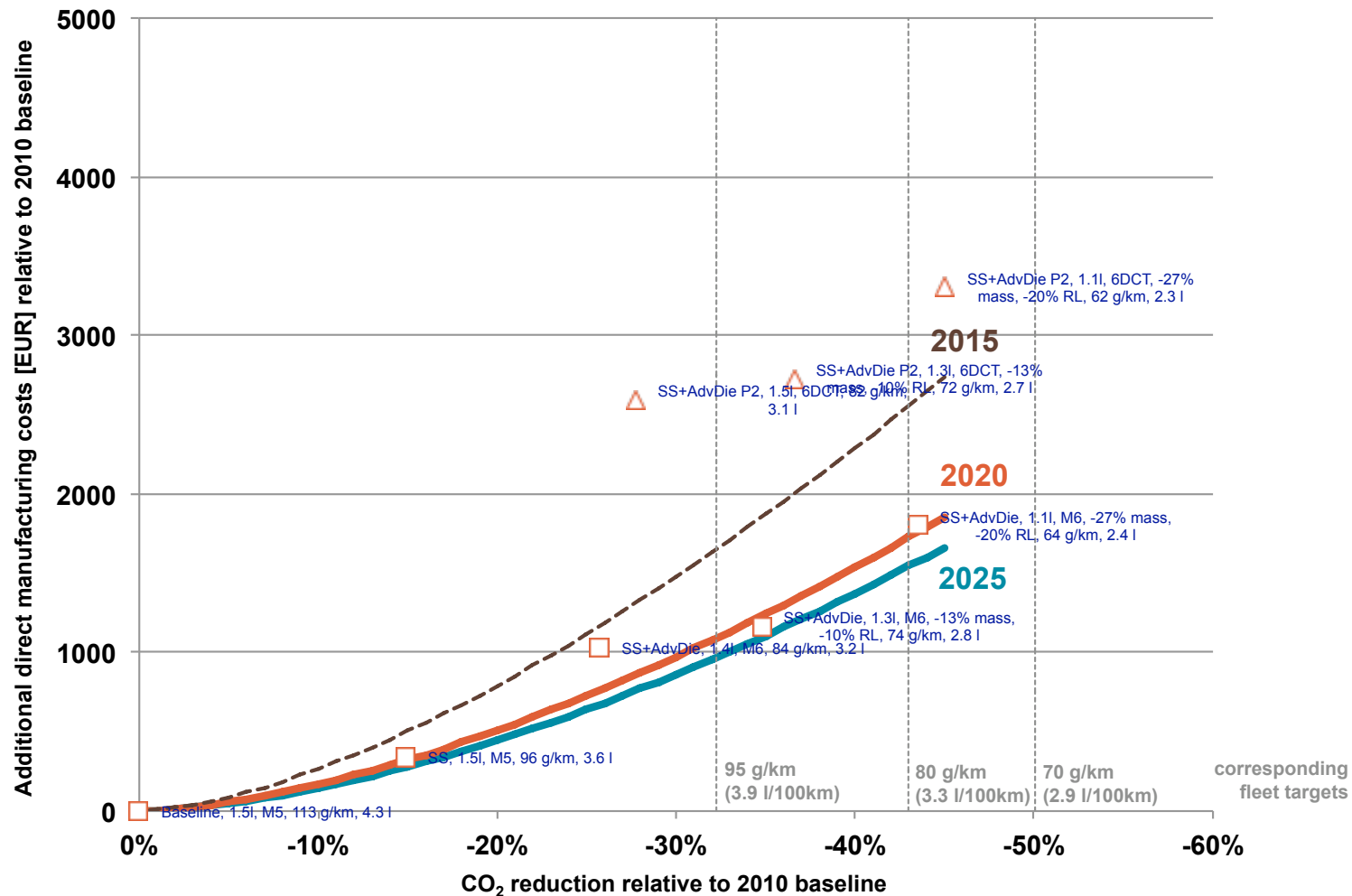
- B-segment gasoline



# Preliminary results

## B-segment cost curve

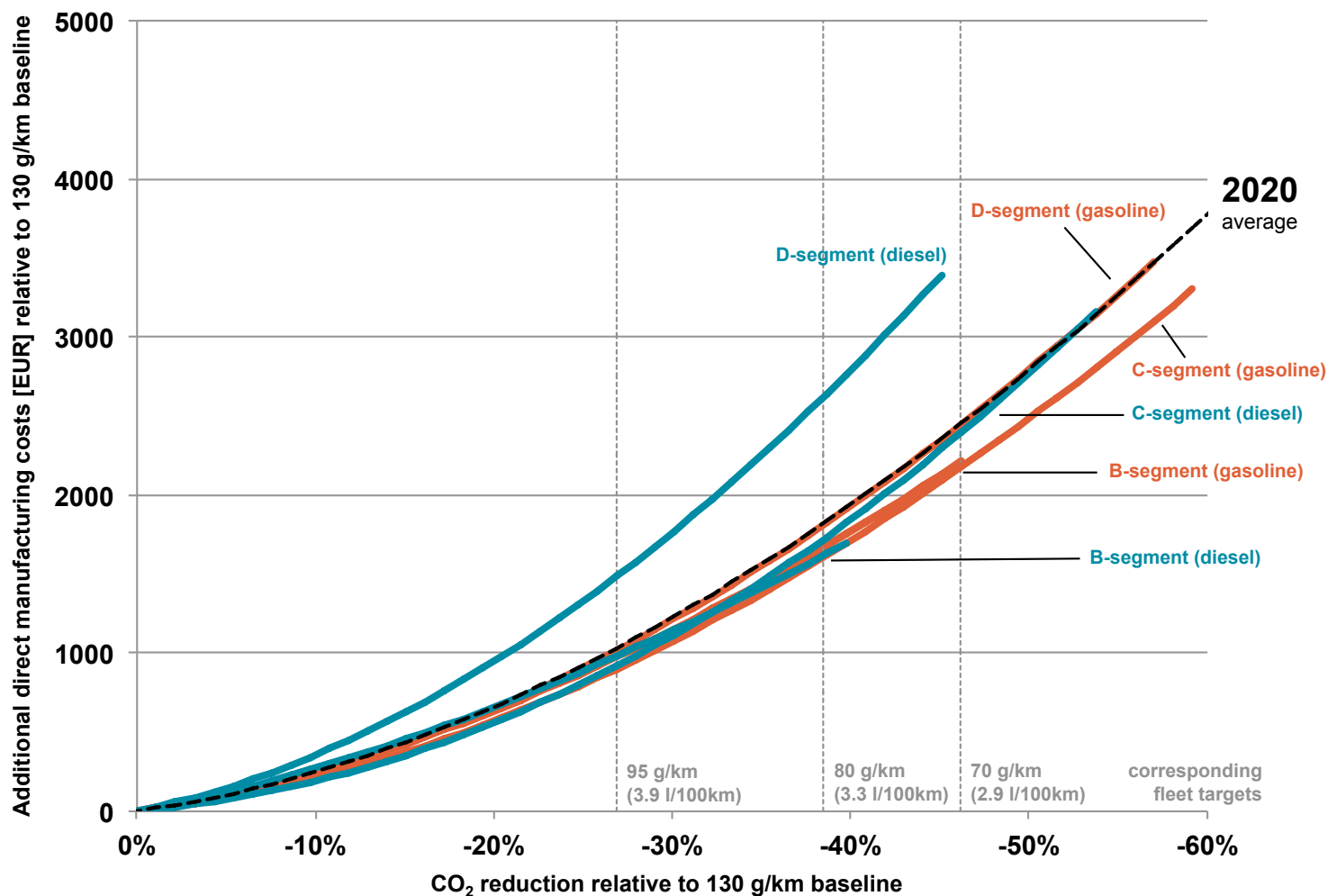
- B-segment diesel



# Preliminary results

## All vehicle segments

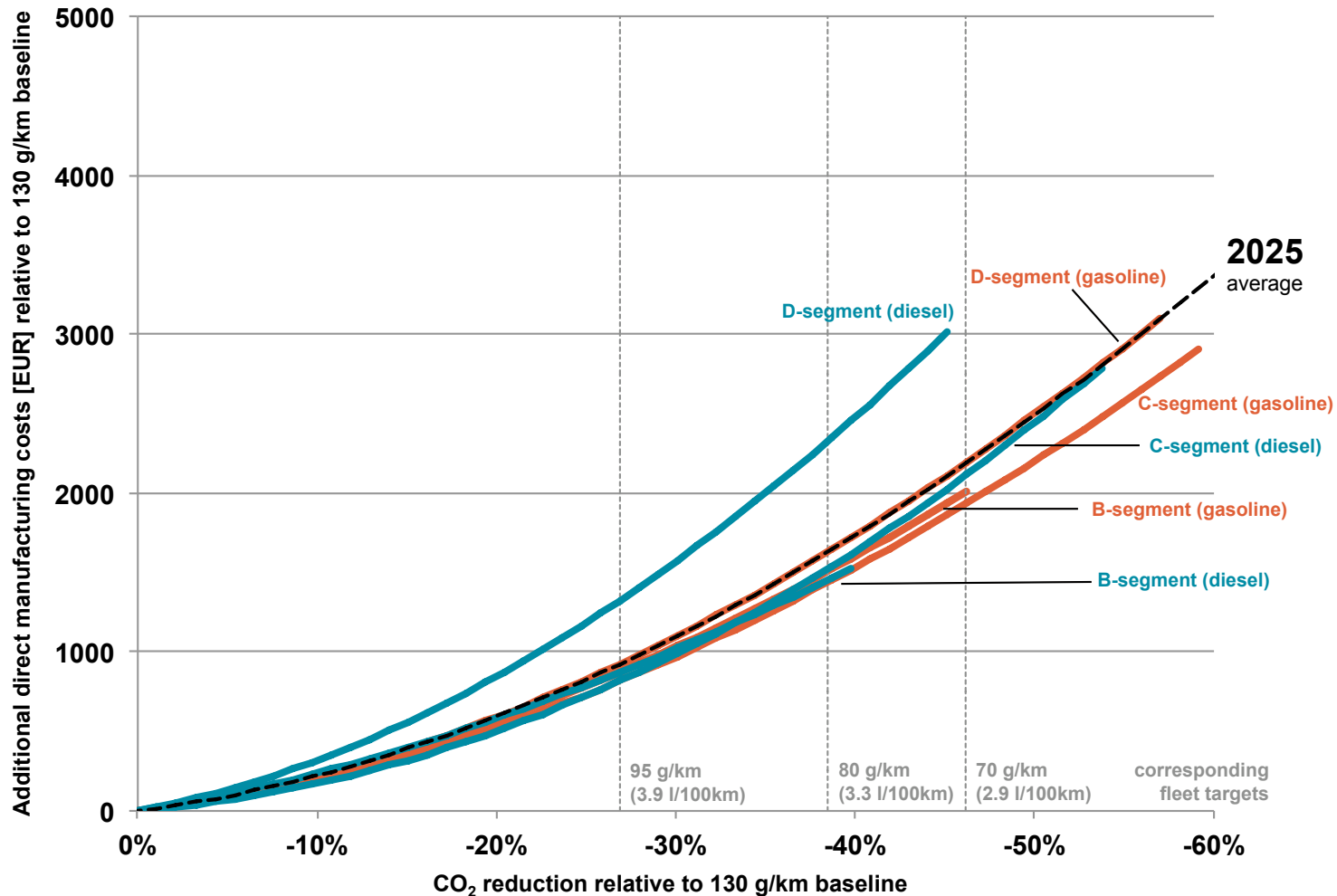
- From a 2020 perspective



# Preliminary results

## All vehicle segments

- From a 2025 perspective



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# Conclusions and outlook

## Main conclusions

- **Based on preliminary EU cost curves**
  - Technologies to meet 95 g/km target are already in the market
  - For average market, 95 g/km can be met by making use of improved combustion engines
  - Going beyond 70-80 g/km will require some lightweighting and / or hybrid electric technology
  - Additional manufacturing costs:
    - for meeting 95 g/km in 2020  $\approx$  1,000 EUR
    - for meeting 70 g/km in 2025  $\approx$  2,200 EUR
  - Technology requirements and costs may be different for individual manufacturers
  - Payback period from consumer perspective:  $\approx$  3 years for 95 g/km

# Conclusions and outlook

## Outlook

- **Additional results to come soon**
  - Cost curves for N1 (vans) vehicles
  - New lightweighting cost results from FEV
- **Next steps**
  - Summarizing report on methodology and results
  - Macro-economic modeling

# Contact details

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