Car CO_2 regulation: beyond 2020?

Baltic Investors Forum 4 June 2015

Overview

- *'2020' car CO_2 target*
- *2050 ambition*
- *2030 framework*
- *Impact of CO_2 standards on automotive competitiveness*

Current legislative framework

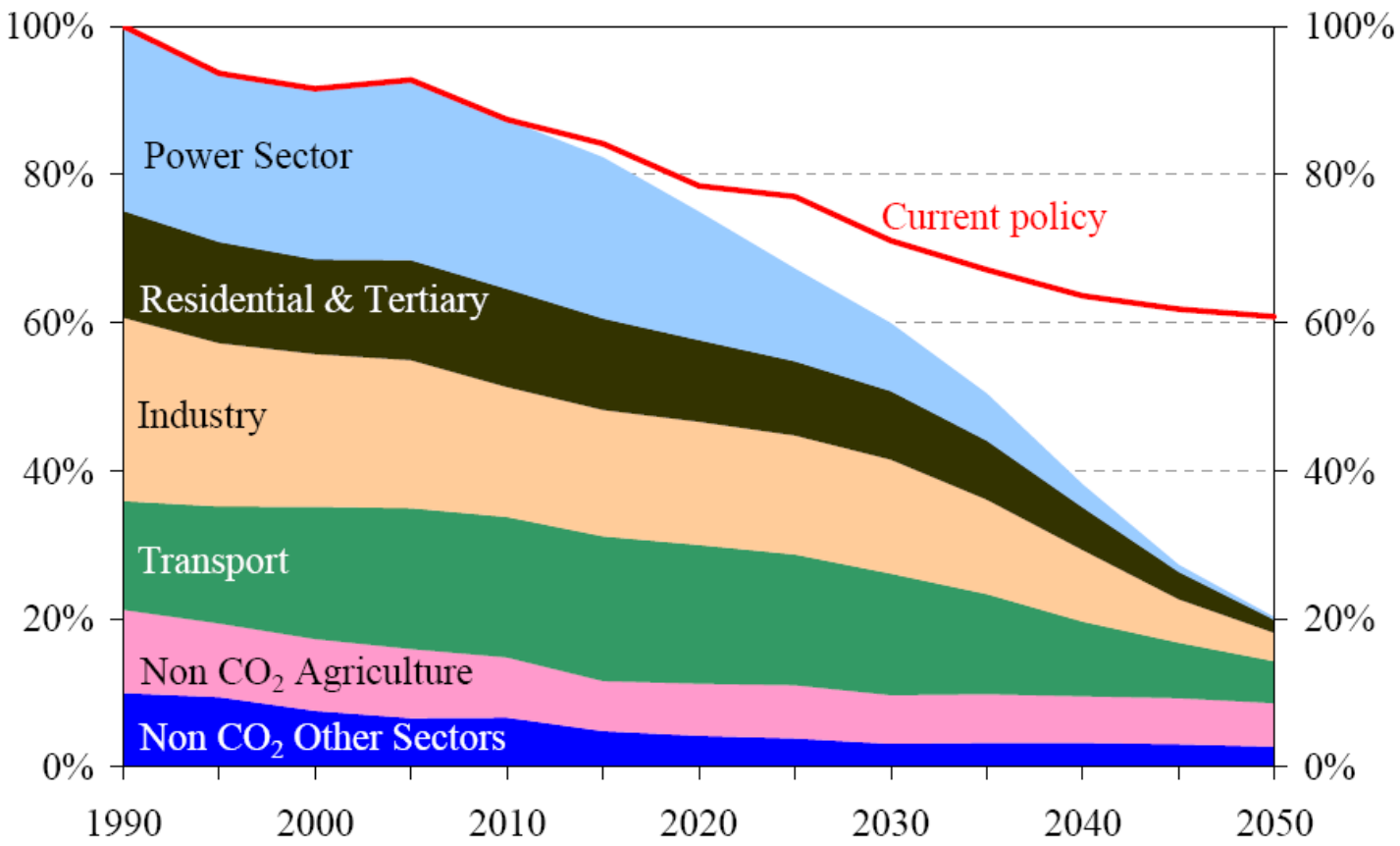
EU Regulation elements :

- *new car fleet average target of 95g CO_2/km in 2021*
- *Eco-innovations*
- *Derogations*

Regulation requests the Commission to review the targets and modalities for the period beyond 2020.

A wide range of studies have been carried out to provide the necessary information.

Low Carbon Economy Roadmap



PRIMES-TREMOVE modelling to achieve 80% GHG reduction by 2050 compared to 1990: http://ec.europa.eu/clima/policies/roadmap/index_en.htm

European Commission

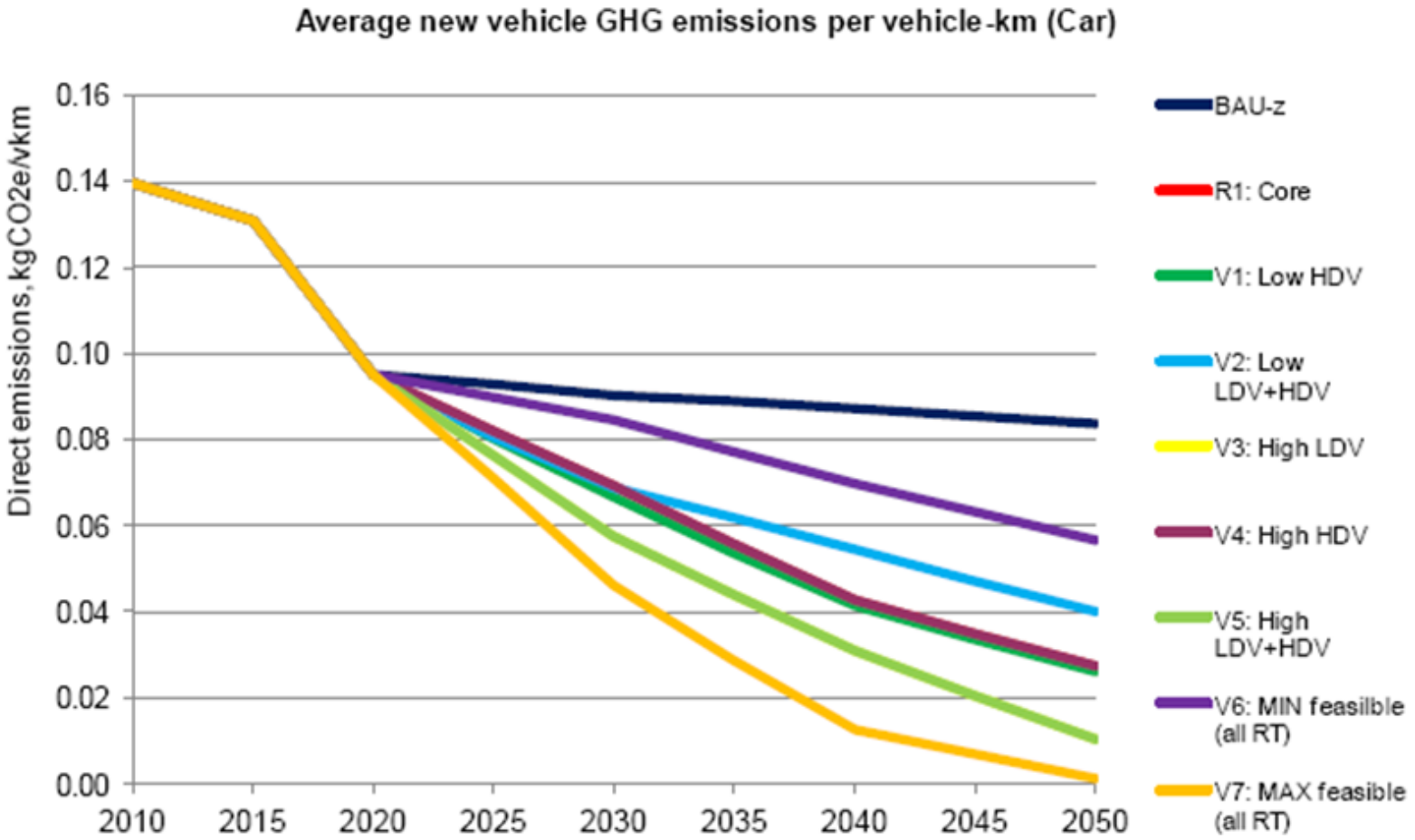
Transport 54-67% reduction from 1990 level

Three levers to reduce road transport GHG:

1. **Energy efficiency: Energy use per unit of activity**
2. **Decarbonise energy: GHG per unit of energy**
3. **Activity: Level or type**

European Commission

Necessary level of ambition?



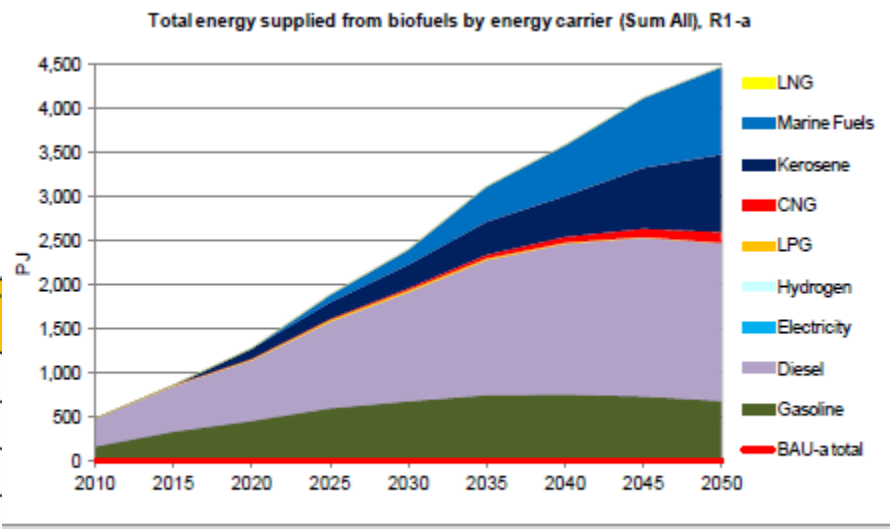
http://www.eutransportghg2050.eu/cms/assets/Uploads/Reports/EU-Transport-GHG-2050-II-Task-11-Paper-2-FINAL-12Jul12.pdf

Routes to 2050?

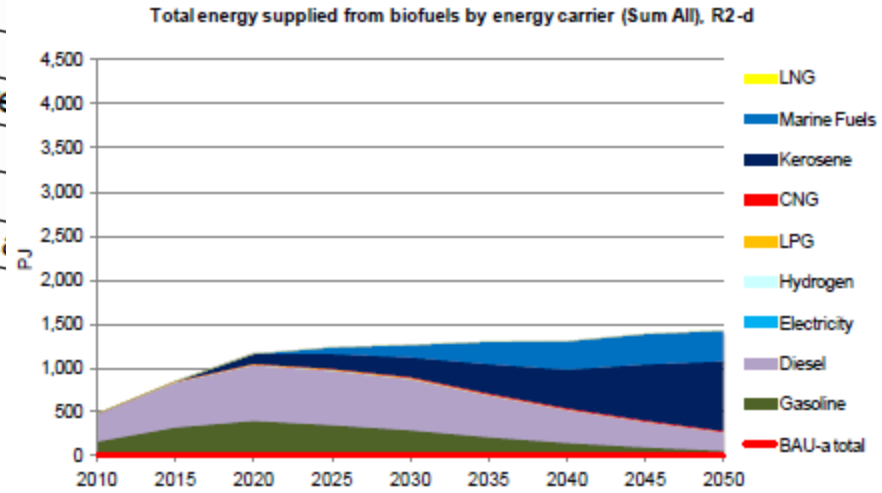
European Commission

Biofuel?

⇩	Additional measures to be…strengthened or
1	Eco-driver training (road/rail)
2	Speed enforcement for road vehicles
3	Tighter motorway speed limits
4	Further improvements in spatial planning
5	Tighter LDV new vehicle GHG standards (intermediate)
6	Tighter HDV new vehicle GHG standards (intermediate)
7	Further modal shift (passenger and freight) (intermediate)
8	Further maritime efficiency measures
9	Further increase in harmonisation of fuel taxes (intermediate
10	Tighter LDV+HDV new vehicle GHG standards (high)
11	Further improvements of new ship efficiency
12	Further improvements in new aircraft efficiency (from 1.5% p.a



R1-a: Core GHG Reduction Scenario



R2-d: Low Biofuel Savings (Alt.)

http://http://eutransportghg2050.eu/cms/assets/Uploads/Reports/EU-Transport-GHG-2050-II-Task-6-FINAL-8Jun12.pdf

Biofuel?

ILUC

"…the share of energy from biofuels produced from cereal and other starch-rich crops, sugars and oil crops and from other crops grown as main crops primarily for energy purposes on agricultural land shall be no more than 7% of the final consumption of energy in transport in the Member States in 2020"

Provisional estimated indirect land-use change emissions from biofuels (gCO_{2eq}/MJ)

Feedstock group	Mean*
Cereals and other starch-rich crops	12
Sugars	13
Oil crops	55

Biofuel?

European Commission

COMMUNICATION FROM THE COMMISSION
A policy framework for climate and energy in the period from 2020 to 2030
COM(2014)15

"The Commission does not think it appropriate to establish new targets for renewable energy or the greenhouse gas intensity of fuels used in the transport sector or any other sub-sector after 2020. The assessment of how to minimise indirect land-use change emissions made clear that first generation biofuels have a limited role in decarbonising the transport sector. The Commission has already indicated, for example, that food-based biofuels should not receive public support after 2020. A range of alternative renewable fuels and a mix of targeted policy measures building on the Transport White Paper are needed to address the challenges of the transport sector in a 2030 perspective and beyond."

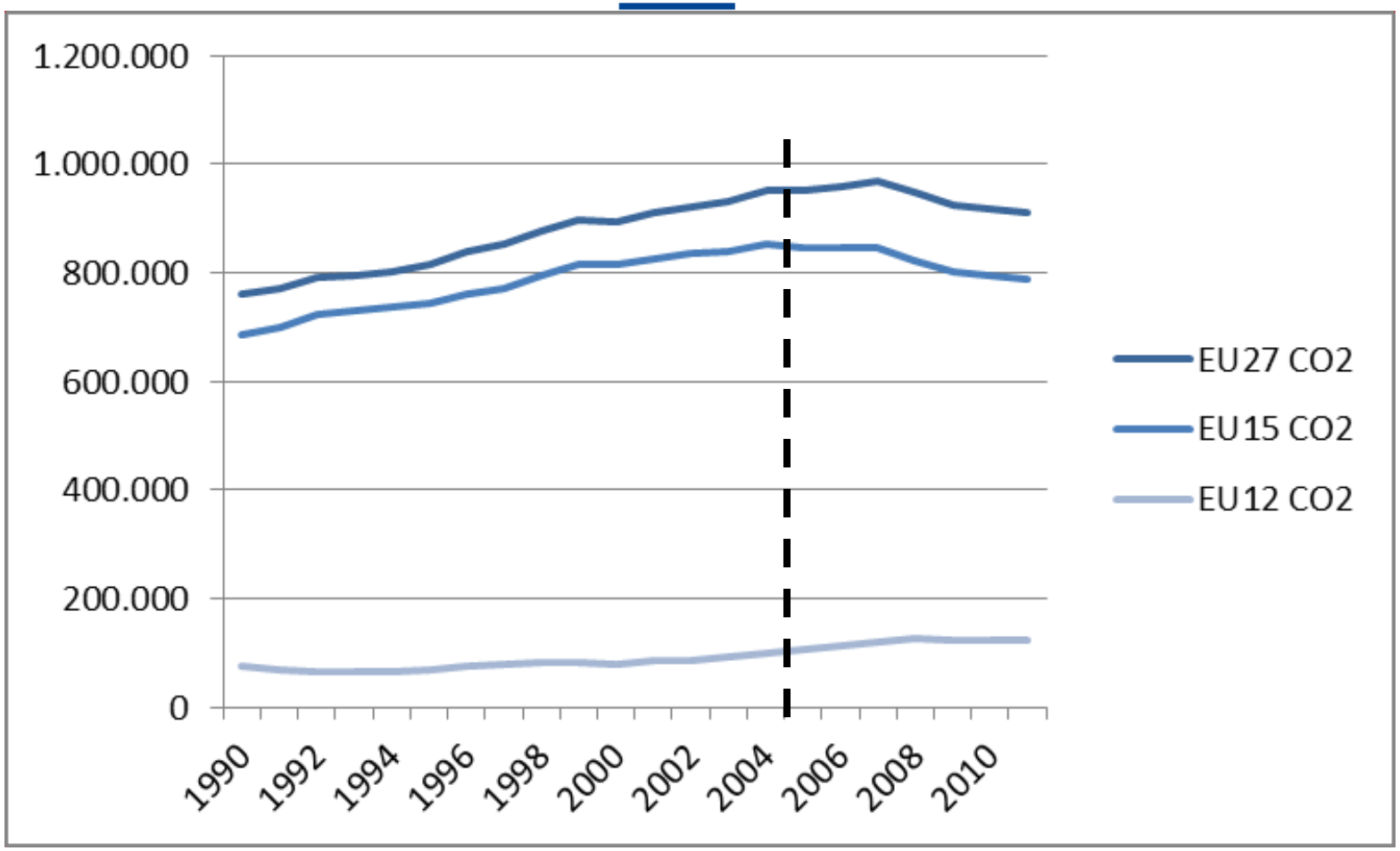
2030 Climate & Energy Framework

European Council October 2014 conclusions on the 2030 Climate and Energy framework.

- 30% non-ETS reductions compared to 2005.
- Invites the Commission to:

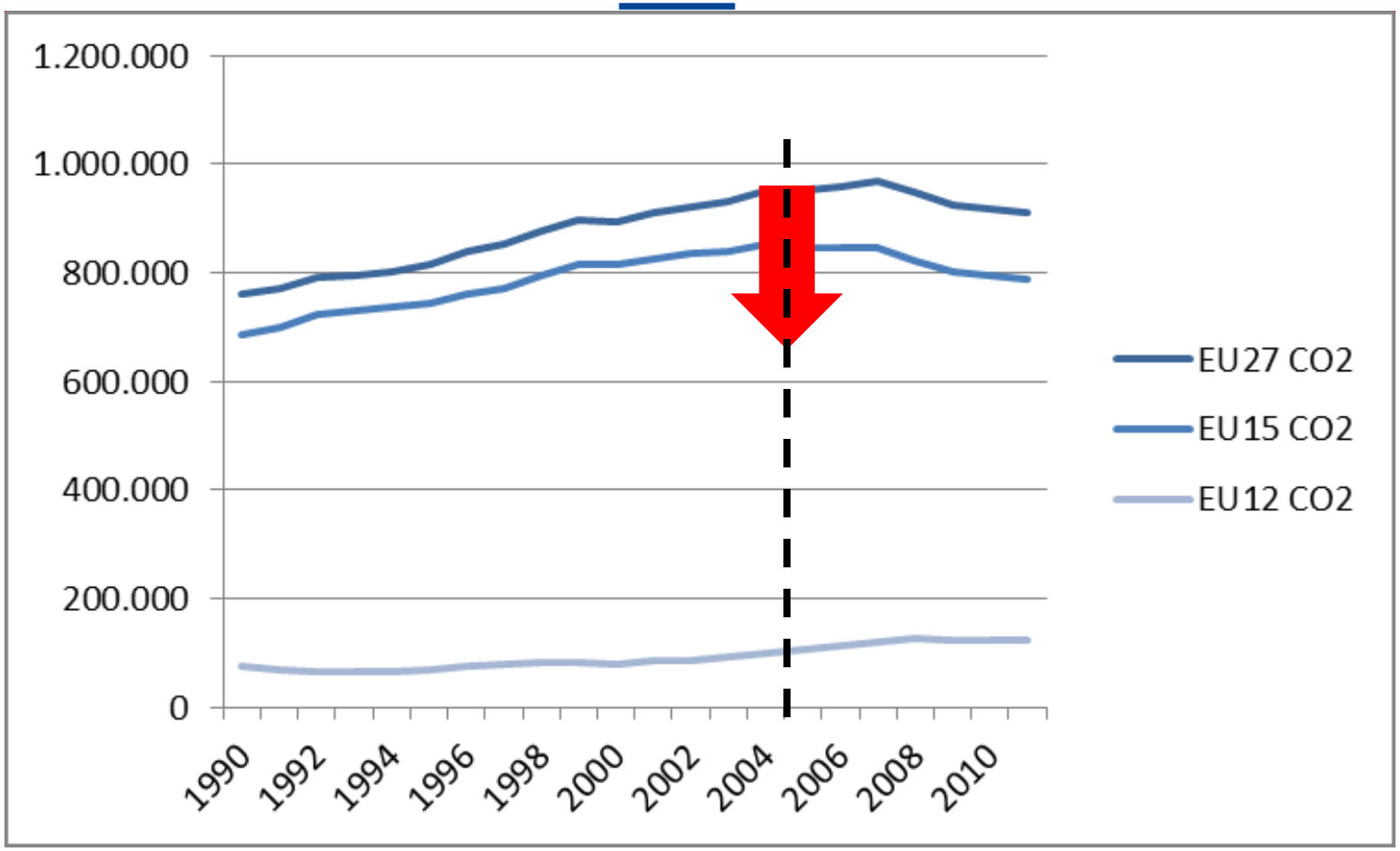
"…further examine instruments and measures for a comprehensive and technology neutral approach for the promotion of emissions reduction and energy efficiency in transport, for electric transportation and for renewable energy sources in transport also after 2020".

EU road transport CO_2



http://www.eea.europa.eu/publications/ghg-trends-and-projections-2012

EU road transport CO_2



http://www.eea.europa.eu/publications/ghg-trends-and-projections-2012

European Commission

Energy union Communication adopted by the European Commission in February 2015:

- *"…necessary to fundamentally rethink energy efficiency and treat it as an energy source in its own right"*
- *"…a continued focus on tightening CO_2 emission standards for passenger cars and vans post-2020"*

Review of Regulations setting emission performance standards to establish post-2020 targets for cars and vans	Commission	2016 - 2017	

Regulations request

Commission requested to review and make proposals for LDV CO_2 Regulation for period beyond 2020.

Specific issues raised:

- **Assess necessary rate of reduction to be in line with EU long term climate goals**
- **Consider GHG emissions related to energy supply and vehicle manufacturing**
- **Consider whether a utility parameter is still needed and if so whether footprint is more appropriate (for cars)**

European Commission

Supporting analysis.

- Impact of regulatory approaches
- Impact of regulatory metrics
- Evaluation of current Regulations
- Competitiveness impacts
- Downweighting and utility parameter
- Mileage
- Technologies and costs
- Understanding of the test-real world gap
- Modalities of future Regulation

Competitiveness

- Large scale study carried out for EU Commission.
- Completed early 2015
- Industry stakeholders consulted on the approach
- Explores in a detailed way:
  - **The mechanisms through which the Regulations impact on business**
  - **The ways in which the mechanisms can have a differential impact on EU or non-EU industry**
  - **Assesses possible impacts on vehicle manufacturers, component suppliers, energy suppliers and end users.**

The study assessed:

Three elements of competitiveness:

- **Cost competitiveness**
- **Innovation competitiveness**
- **International competitiveness**

From a manufactur**er** and a manufactur**ing** perspective

Cost competitiveness

Vehicle manufacturer perspective:

- Many possible positive or negative impact pathways for EU OEMs.
- Large net impacts less likely as high number of compliance mechanisms, resources and capabilities.
- Specific element choices could alter possibility of impacts occurring.
- Capability of EU OEMs to develop advanced ICEVs and AFVs may be less e.g. if electrification is an important compliance mechanism.
- Various impact pathways related to ability to manufacture vehicles with CO_2-reducing technologies at competitive cost.
- Ability to sell new technologies on EU market better for (some) premium EU OEMs.
- Being a premium or volume manufacturer may have more impact than EU or not.
- Lead time between announcement of target and target year, is expected to affect impacts.

Cost competitiveness

Vehicle manufacturing

No **direct impact** on cost competitiveness of EU manufacturing.

Limited number of possible **indirect impacts:**

- Access to materials and their cost could be different for EU and non-EU OEMs.
- Possible regional differences in component cost for advanced powertrains depending on relative stringency of legislation or whether component are mainly made outside Europe.
- Regional differences in labour costs - impact of unknown sign.
- Some potential pathways relating to differences in costs of capital goods, transport costs and tariffs, and sales volume over which R&D costs can be divided.

European Commission

Car manufacturers and suppliers

- Impact on product innovation and prioritisation of R&D expenditure.
- Limited resources mean innovation in CO_2 reduction technologies may be at the expense of other innovation.
- Enhances trend of OEM RDI externalisation to Tier 1 suppliers and joint R&D with other OEMs
- Likely increased demand for AFVs, particularly electrification, and innovation requirements - demand for specific R&D personnel.

International Competitiveness

Car manufacturers and suppliers

- Partly depends on cost competitiveness impacts
- EU strong international competitive positions in cars and components but not LCVs
- Little change in trade competitiveness.
- Likely to be trade-neutral as stringency of legislation will be broadly similar in the EU and main competing regions
- Many positive or negative second-order effects possible.
- Impacts possible in narrow defined markets.
- EU may lose competitiveness in petrol but gain in diesel
- Asian suppliers may benefit for electric components.
- Possible extra inward FDI flows of unclear magnitude.

Technology and costs post 2020

Technology Tabs

Type	#	Description	TechnologyCode	
Base Engine	1	Natural Gas Vehicle	CNG	Goto Sheet
Base Engine	2	Combustion improvements for SI engines: Level 1	G-WALL	Goto Sheet
Base Engine	3	Combustion improvements for SI engines: Level 2	COMPR	Goto Sheet
Base Engine	4	Combustion improvements for SI engines: Level 3	VCR	Goto Sheet
Base Engine	2	Combustion improvements for CI engines: Level 1	COMB1	Goto Sheet
Base Engine	3	Combustion improvements for CI engines: Level 2	COMB2	Goto
Base Engine	4	Combustion improvements for CI engines: Level 3	VCR-D	Goto
Base Engine	5	Direct injection - homogeneous	DI-H	Goto
Base Engine	6	Direct injection - stratified charge & lean burn	DI-SC	Goto
Base Engine	7	Thermodynamic cycle improvements (a)	TCYCLE-A	Goto
Base Engine	8	Thermodynamic cycle improvements (b)	TCYCLE-B	Goto
Base Engine	9	Cylinder deactivation	CYLD	Goto
Base Engine	10	Mild downsizing (15% cylinder content reduction) + boost	DS-MLD	Goto
Base Engine	11	Medium downsizing (30% cylinder content reduction) + boost	DS-MED	Goto
Base Engine	12	Strong downsizing (>=45% cylinder content reduction) + boost	DS-STG	Goto
Base Engine	10a	CI Mild downsizing (15% cylinder content reduction) + boost	DS-MLD-D	Goto
Base Engine	11a	CI Medium downsizing (30% cylinder content reduction) + boost	DS-MED-D	Goto
Base Engine	12a	CI Strong downsizing (>=45% cylinder content reduction) + boost	DS-STG-D	Goto
Base Engine	13	Cooled low-pressure EGR for SI engines	C-EGR	Goto
Base Engine	13a	CI Cooled low-pressure EGR for SI engines	C-EGR-D	Goto
Base Engine	14	Cam-phasing	CAM-P	Goto
Base Engine	15	Variable valve actuation and lift for SI engines	VVA	Goto
Base Engine	15a	CI Variable valve actuation and lift for SI engines	VVA-D	Goto
Base Engine	16	Engine friction reduction: Level 1	E-FRIC1	Goto
Base Engine	17	Engine friction reduction: Level 2	E-FRIC2	Goto
Hybridisation	1	Start-stop system	S-STOP	Goto
Hybridisation	2	Micro hybrid - start-stop, plus regenerative braking	H-MCR	Goto
Hybridisation	3	Mild electric hybrid - torque boost for downsizing	H-MLD	Goto
Hybridisation	4	Full electric hybrid - with limited full electric operation	H-FLL	Goto
Hybridisation	5	Air hybrid	H-AIR	Goto
Hybridisation	6	Flywheel hybrid	H-FLY	Goto
Transmission	1	Automated manual transmission (AMT)	AMT	Goto
Transmission	2	Dual clutch transmission (DCT)	DCT	Goto
Transmission	3	Continuously variable transmission (CVT)	CVT	Goto
Transmission	4	Optimising gearbox ratios / downspeeding	GEAR-R	Goto
Transmission	6	Downspeeding via slip controlled clutch and DMF removal	DSPD	Goto
Transmission	7	Improved Manual Transmission	IMP-MT	Goto
Transmission	8	Multi-speed gearbox for xEVs	xEV-GEAR	Goto

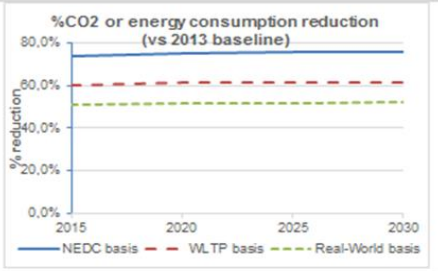
TECHNOLOGY CO2 OR ENERGY CONSUMPTION REDUCTION — Draft Data

By Segment and Powertrain

Lower Medium Car | SI ICE+HEV | Petrol

%CO2 or energy consumption reduction (vs 2013 baseline)

Cycle	2015	2020	2025	2030
NEDC basis	74,0%	75,3%	75,6%	75,7%
WLTP basis	60,2%	61,3%	61,5%	61,6%
Real-World basis	50,9%	51,8%	51,9%	52,0%

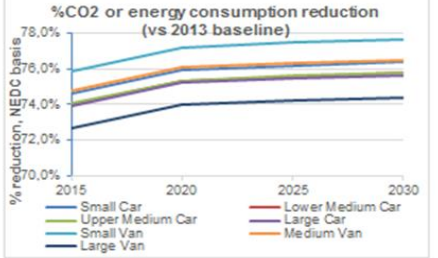


By Cost Scenario and Powertrain

NEDC basis | SI ICE+HEV | Petrol

%CO2 or energy consumption reduction (vs 2013 baseline)

	2015	2020	2025	2030
Small Car	74,6%	75,9%	76,2%	76,4%
Lower Medium Car	74,0%	75,3%	75,6%	75,7%
Upper Medium Car	74,0%	75,3%	75,6%	75,8%
Large Car	73,9%	75,2%	75,5%	75,7%
Small Van	75,8%	77,2%	77,5%	77,6%
Medium Van	74,7%	76,1%	76,3%	76,5%
Large Van	72,7%	74,0%	74,2%	74,4%

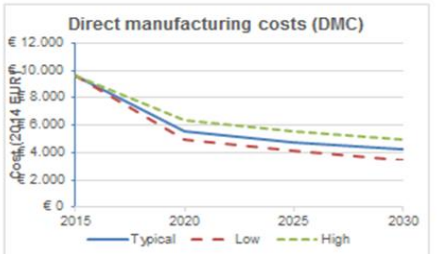


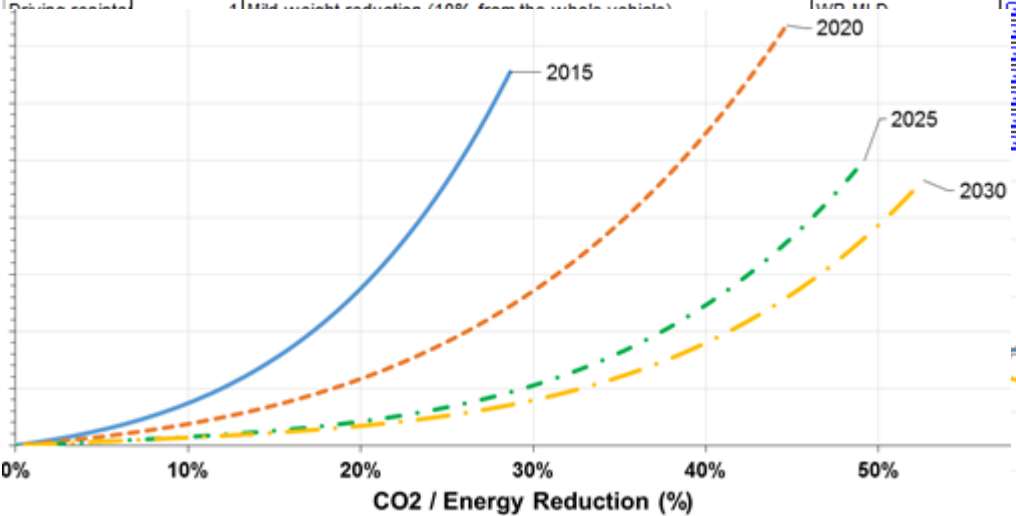
ESTIMATED TECHNOLOGY COSTS — Draft Data

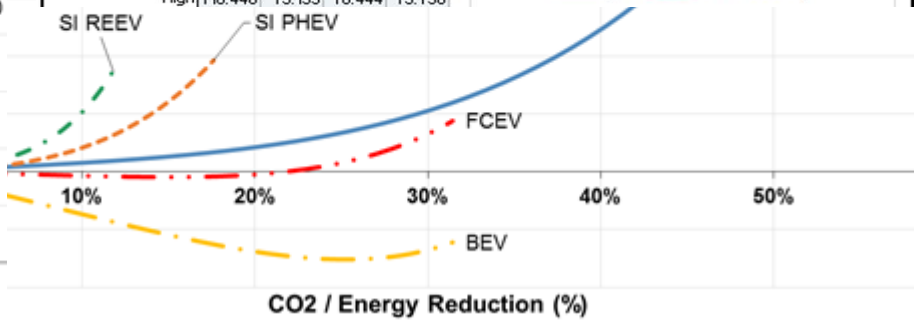
By Segment and Powertrain

Lower Medium Car | SI ICE+HEV | Petrol

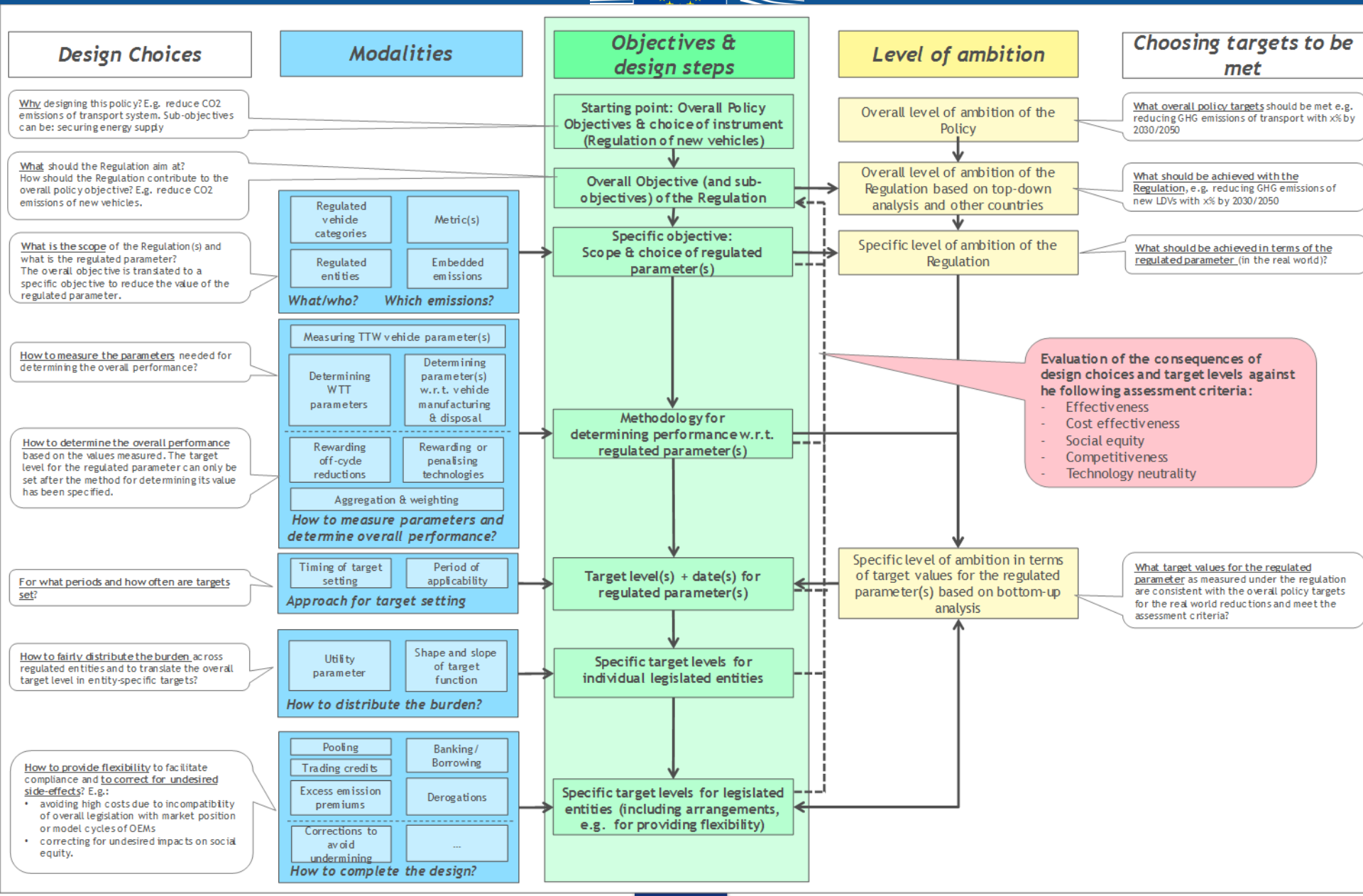
Cost (2014 EUR)	2015	2020	2025	2030
Direct manufacturing costs (DMC)				
Typical	19.568	15.545	14.765	14.264
Low	19.568	14.934	14.146	13.457
High	19.568	16.405	15.536	14.940
Indirect Cost Multiplier (ICM)				
Typical	0,719	0,429	0,164	0,164
Low	0,719	0,429	0,164	0,164
High	0,719	0,429	0,164	0,164
Total cost of manufacturing (TCM)				
Typical	116.448	17.923	15.546	14.963
Low	116.448	17.050	14.826	14.023
High	116.448	19.153	16.444	15.750



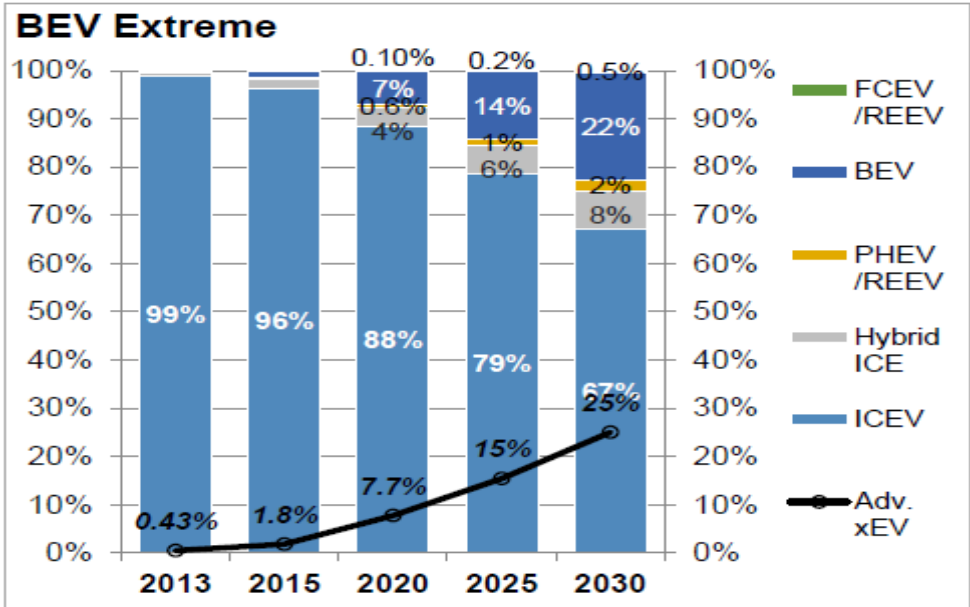


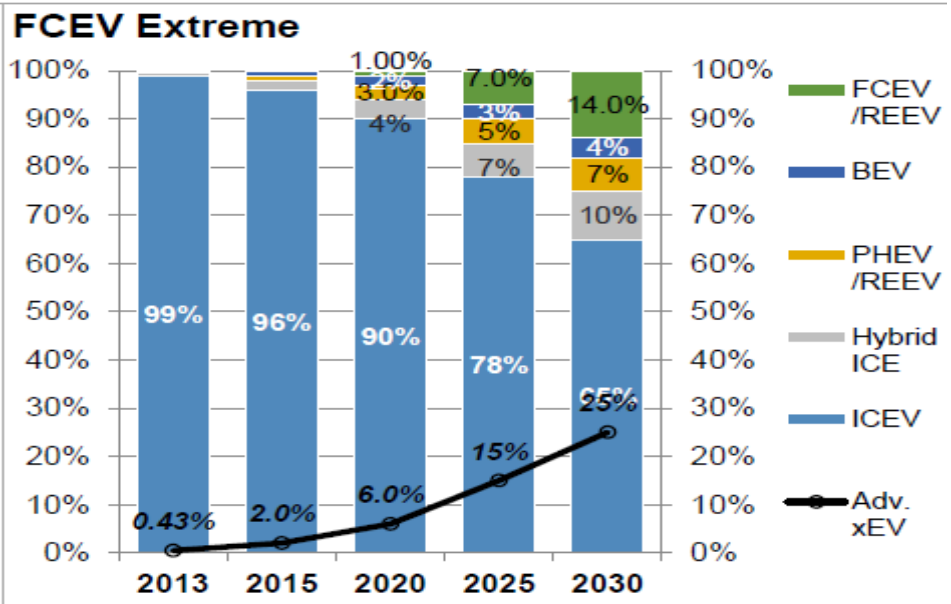


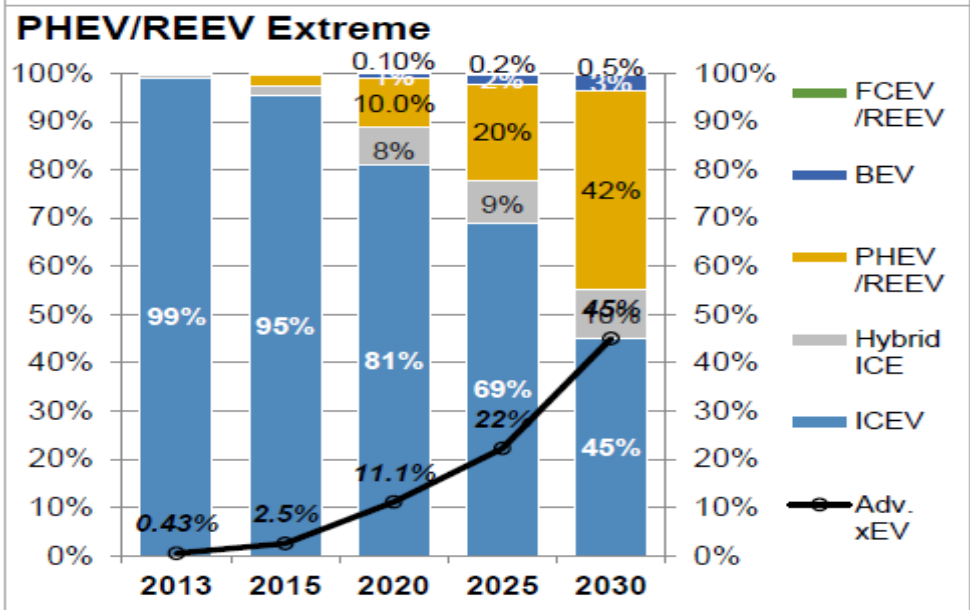
Modalities

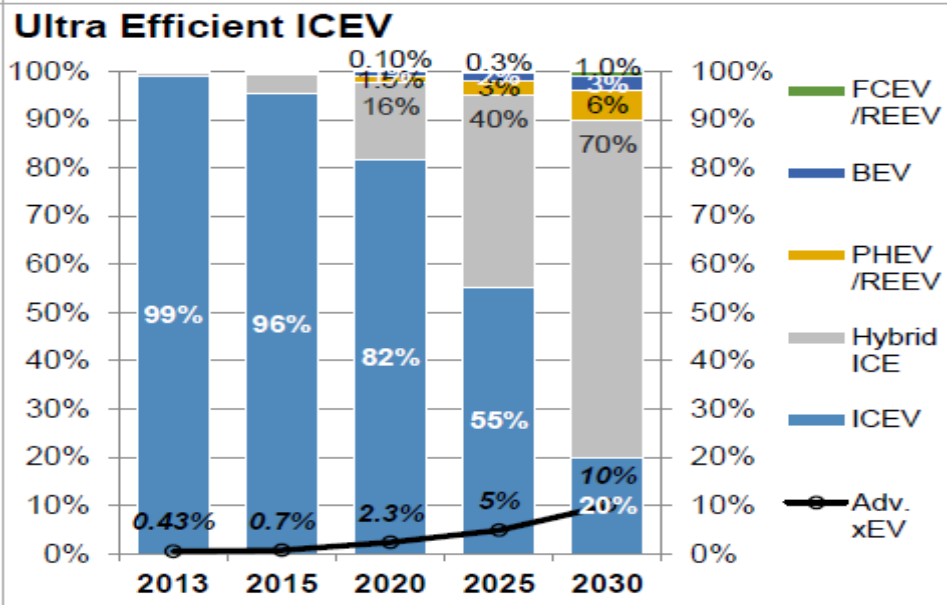

Design Choices
Modalities
Objectives & design steps
Level of ambition
Choosing targets to be met
Why designing this policy? E.g. reduce CO2 emissions of transport system. Sub-objectives can be: securing energy supply
What should the Regulation aim at? How should the Regulation contribute to the overall policy objective? E.g. reduce CO2 emissions of new vehicles.
What is the scope of the Regulation(s) and what is the regulated parameter? The overall objective is translated to a specific objective to reduce the value of the regulated parameter.
How to measure the parameters needed for determining the overall performance?
How to determine the overall performance based on the values measured. The target level for the regulated parameter can only be set after the method for determining its value has been specified.
For what periods and how often are targets set?
How to fairly distribute the burden across regulated entities and to translate the overall target level in entity-specific targets?
How to provide flexibility to facilitate compliance and to correct for undesired side-effects? E.g.:
• avoiding high costs due to incompatibility of overall legislation with market position or model cycles of OEMs
• correcting for undesired impacts on social equity.
Regulated vehicle categories
Metric(s)
Regulated entities
Embedded emissions
What/who?
Which emissions?
Measuring TTW vehicle parameter(s)
Determining WTT parameters
Determining parameter(s) w.r.t. vehicle manufacturing & disposal
Rewarding off-cycle reductions
Rewarding or penalising technologies
Aggregation & weighting
How to measure parameters and determine overall performance?
Timing of target setting
Period of applicability
Approach for target setting
Utility parameter
Shape and slope of target function
How to distribute the burden?
Pooling
Banking/ Borrowing
Trading credits
Excess emission premiums
Derogations
Corrections to avoid undermining
...
How to complete the design?
Starting point: Overall Policy Objectives & choice of instrument (Regulation of new vehicles)
Overall Objective (and sub-objectives) of the Regulation
Specific objective: Scope & choice of regulated parameter(s)
Methodology for determining performance w.r.t. regulated parameter(s)
Target level(s) + date(s) for regulated parameter(s)
Specific target levels for individual legislated entities
Specific target levels for legislated entities (including arrangements, e.g. for providing flexibility)
Overall level of ambition of the Policy
Overall level of ambition of the Regulation based on top-down analysis and other countries
Specific level of ambition of the Regulation
Specific level of ambition in terms of target values for the regulated parameter(s) based on bottom-up analysis
What overall policy targets should be met e.g. reducing GHG emissions of transport with x% by 2030/2050
What should be achieved with the Regulation, e.g. reducing GHG emissions of new LDVs with x% by 2030/2050
What should be achieved in terms of the regulated parameter (in the real world)?
What target values for the regulated parameter as measured under the regulation are consistent with the overall policy targets for the real world reductions and meet the assessment criteria?
Evaluation of the consequences of design choices and target levels against he following assessment criteria:
- Effectiveness
- Cost effectiveness
- Social equity
- Competitiveness
- Technology neutrality

Extreme scenarios exploration









Thank you