



FEDERCHIMICA
AISPEC GAIL
GRUPPO AZIENDE INDUSTRIALI
DELLA LUBRIFICAZIONE

LUBE DAY 2025

Competitività del sistema industriale Europa-Italia e sfide legate alla transizione energetica.



POLITECNICO
MILANO 1863

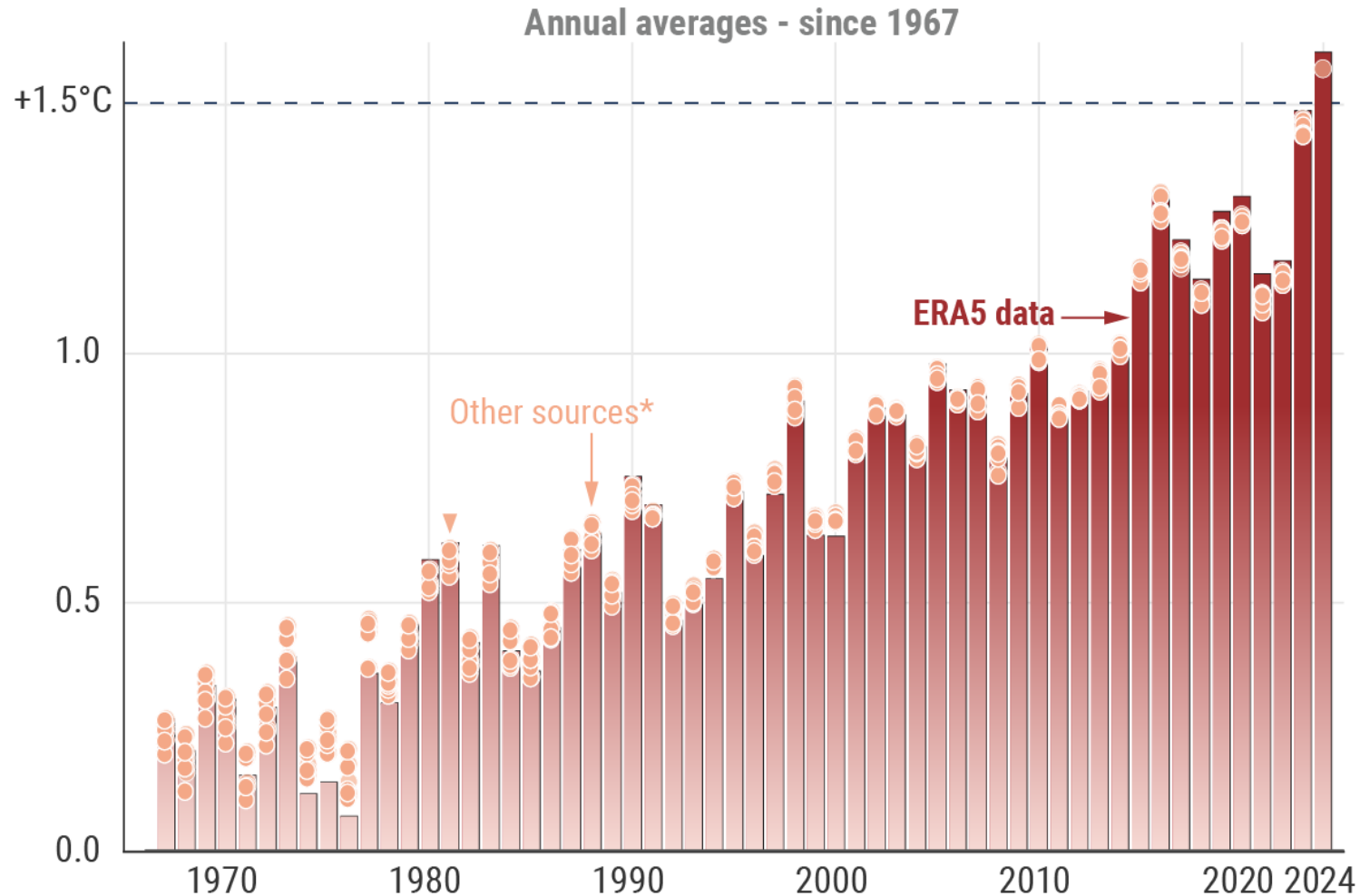
DIPARTIMENTO DI ENERGIA

Neutralità Tecnologica per la defossilizzazione dei trasporti in ottica well-to-wheel: *enigma incomprensibile o concetto imprescindibile?*

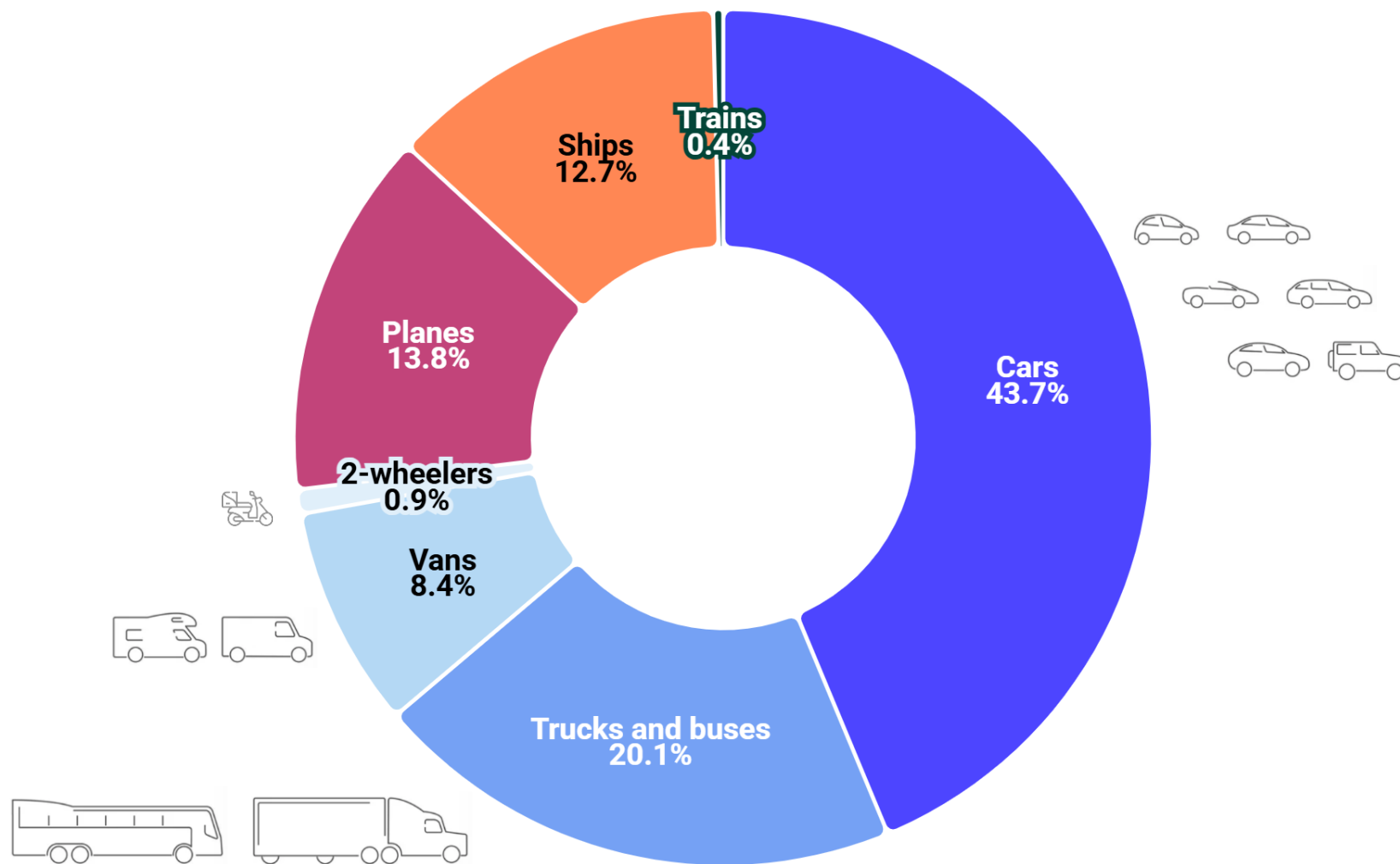
Prof. Carlo Giorgio Visconti

Milano, 15.10.2025

The year 2024 was the first year that the average global temperature exceeded 1.5°C above its pre-industrial (1850-1900) level



In 2024, transport accounted for over 30% of all EU GHG emissions: *cars are the main contributors*



EU asks to reduce CO₂ emission of all road vehicles, in particular LDVs

Annual average emission targets of each manufacturer



Cars and Vans

2020 to 2024 (Regulation (EU) 2019/631):

targets based on the NEDC emission test procedure

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2035+ (Regulation (EU) 2023/851):

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Regulation (EU) 2024/1610:



lorries > 16 t

2025

Reduction wrt 2019

-15%

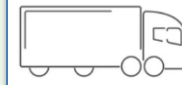


lorries > 5 t

2030

> 16 t: reduction wrt 2019
> 7.5 t: reduction wrt 2021
> 5 t and coaches, trailers:
reduction wrt 2025

-45%



lorries > 7.5 t

2035

-65%



lorries > 16 t
+ trailers

2040

-90%



coaches

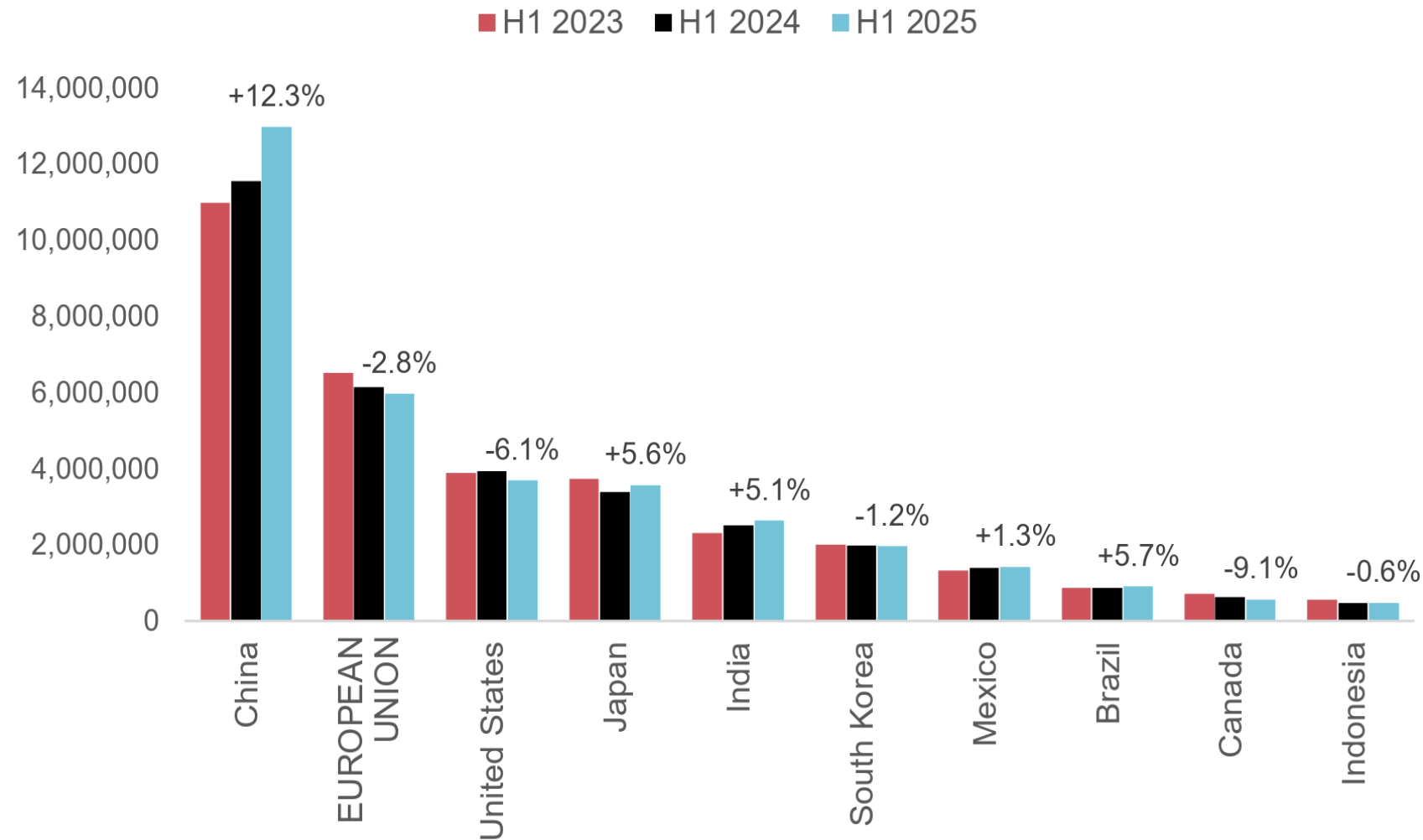
Global automotive industry: new car registrations, H1 2025

	H1 2023	H1 2024	H1 2025 ³	% change	% share
EUROPE	7,678,075	8,338,473	8,136,712	-2.4	21.8
European Union	5,438,888	5,684,279	5,576,568	-1.9	14.9
United Kingdom	949,720	1,006,763	1,042,219	+3.5	2.8
Russia	390,974	696,227	531,382	-23.7	1.4
Türkiye	431,372	462,955	488,003	+5.4	1.3
EFTA	200,566	188,116	196,533	+4.5	0.5
Ukraine	27,712	33,015	30,627	-7.2	0.1
Others (Europe) ⁴	238,843	267,118	271,380	+1.6	0.7
NORTH AMERICA⁵	7,205,078	7,609,807	7,798,379	+2.5	20.9
United States only	6,070,859	6,314,860	6,447,915	+2.1	17.3
SOUTH AMERICA	1,285,074	1,333,244	1,502,455	+12.7	4.0
Brazil only	732,770	848,073	876,303	+3.3	2.3
ASIA	16,505,448	16,461,659	17,906,642	+8.8	47.9
China	9,702,178	9,826,035	11,000,502	+12.0	29.5
India	2,043,885	2,199,524	2,212,970	+0.6	5.9
Japan	2,044,256	1,790,491	1,982,556	+10.7	5.3
South Korea	760,611	692,046	726,546	+5.0	1.9
Others (Asia) ⁶	1,954,518	1,953,563	1,984,068	+1.6	5.3
MIDDLE EAST/AFRICA	1,818,962	1,832,996	2,006,403	+9.5	5.4
WORLD	34,492,637	35,576,179	37,350,591	+5.0	100.0

w.r.t. H1 2024:

- **Worldwide registrations rose 5%**, with almost 50% of the new registration in Asia
- **Asia** led the growth (8.8%), boosted by China (+12%), which benefited from scrappage incentives and “new energy vehicle” policies.
- **North America** recorded modest growth of 2.5%, although concerns remain about weakening demand later in the year.
- **Europe** trailed behind (loosing part of the growth registered from 2023 to 2024), with overall registrations falling by 2.4% and the **EU market down 1.9%**

Global automotive industry: production Countries of global car sales, H1 2025



Global car production: +3.5% (37.7 M)

Market share:

- Asia 60.1%
- Europe 19.7% (**EU 15.9%**)
- North America 15.1 %
- South America 2.7%
- Middle East+Africa 2.4%

China's output continued to surge strongly (nearly 13 M units), driven by:

- government trade-in subsidies
- relaxed auto loan policies
- domestic demand recovery
- increasing exports
- new EV subsidy policies

EU contracted by 2.8% to 7.4 M units

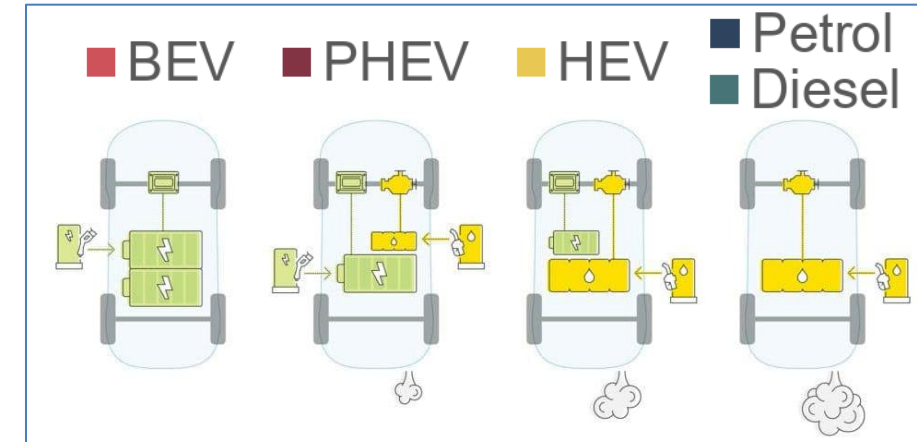
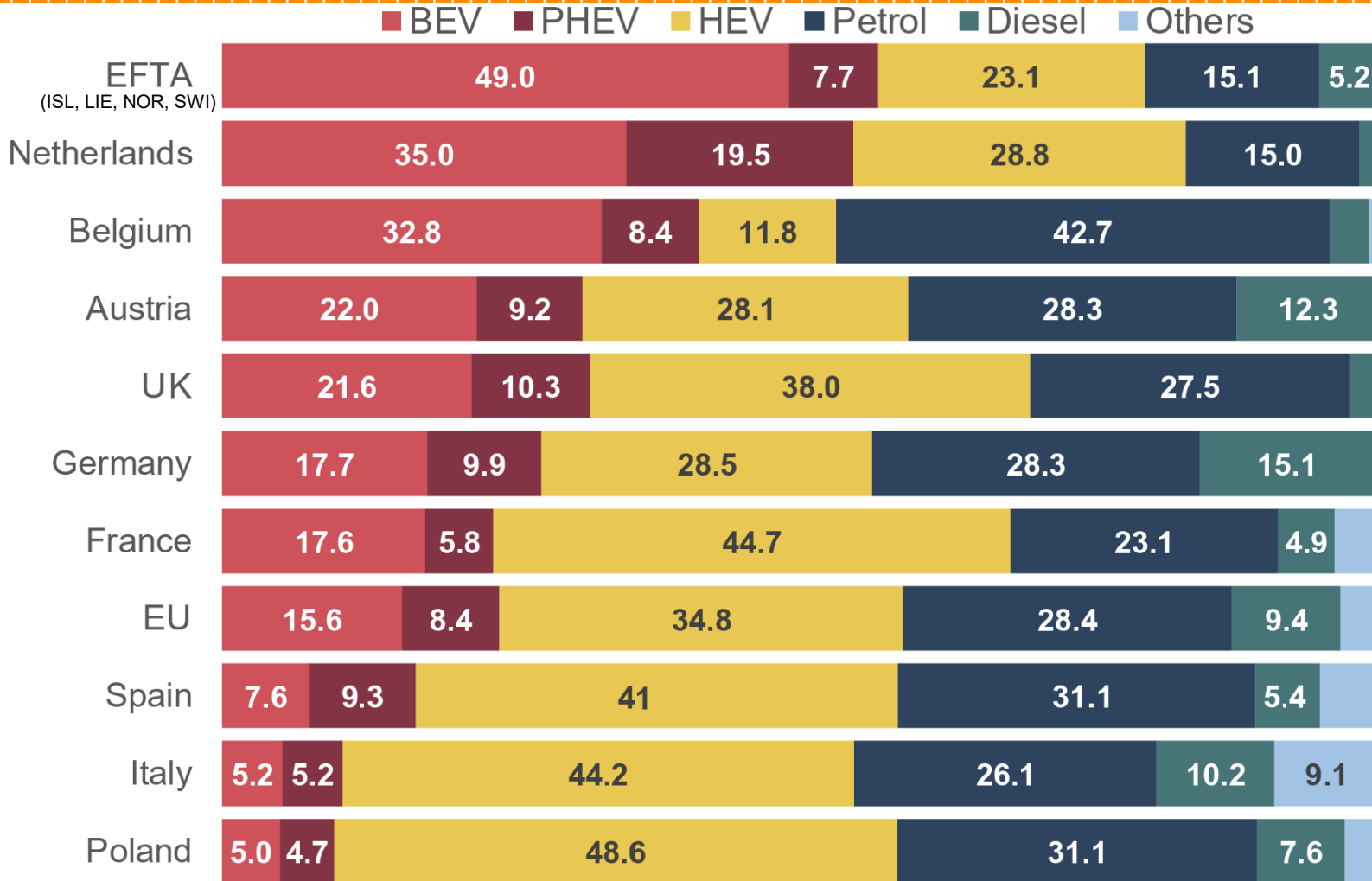
EU automotive industry: new car produced in EU Countries (70%+ EU market)

	H1 2023	H1 2024	H1 2025 ¹⁴	% share
Germany	2,129,027	2,012,026	2,100,757	35.2
Spain	1,007,205	1,062,303	934,414	15.6
Czechia	739,376	773,828	732,633	12.3
Slovakia	570,873	525,223	569,847	9.5
France	529,381	447,348	497,576	8.3
Italy	299,302	204,637	136,229	2.3
Hungary	258,135	235,696	218,823	3.7
Romania	268,965	252,068	235,561	3.9
Belgium	153,999	119,228	99,521	1.7
Sweden	148,003	151,288	135,348	2.3
EUROPEAN UNION	6,514,526	6,145,075	5,971,493	100.0

Production decline mostly due to:

- stricter CO₂ targets
- elevated production costs
- weaker external demand
- slow recovery in key markets
- United States auto tariffs

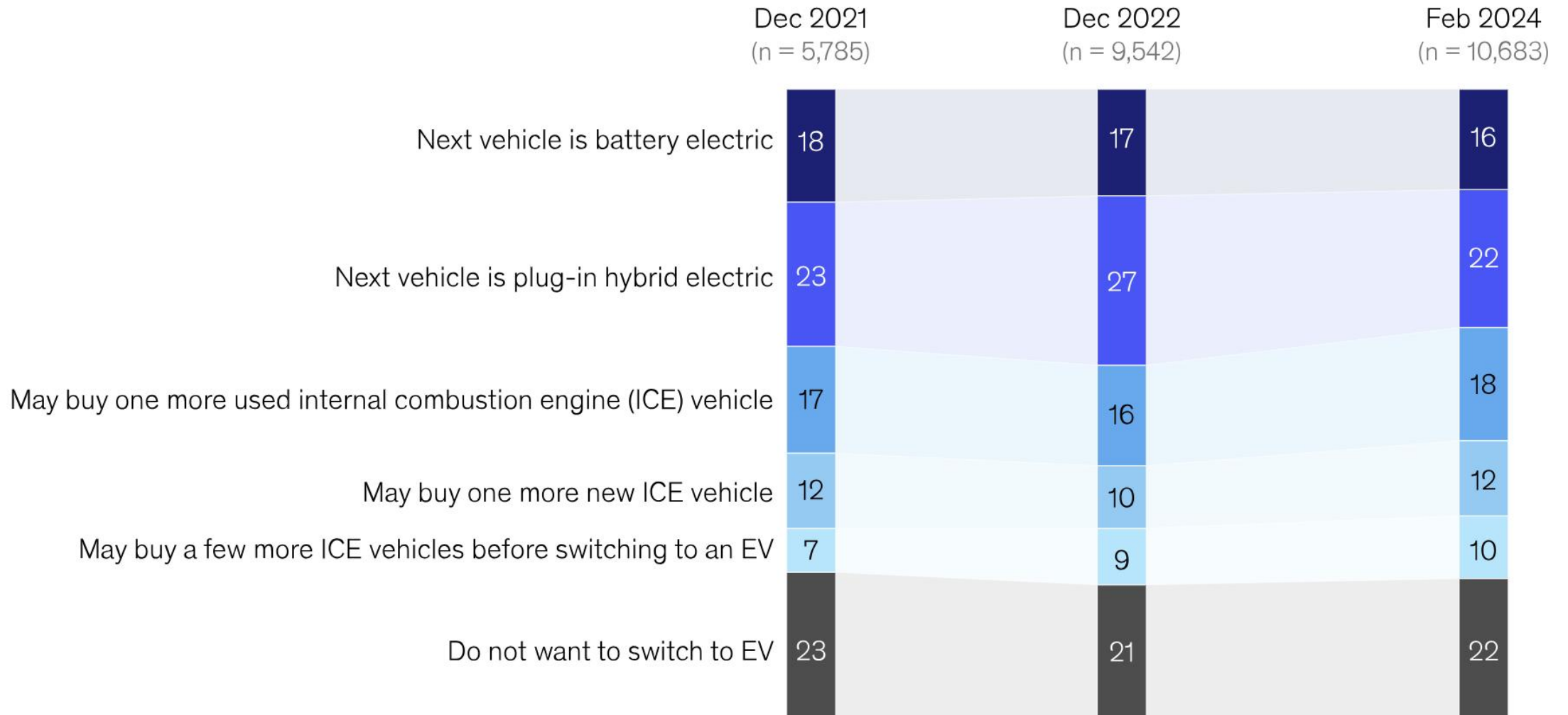
EU automotive industry: new car registrations by power source, H1 2025



Diverse regional trends in power source preferences, **with Italy among the Countries most reluctant to electrification**. In EU:

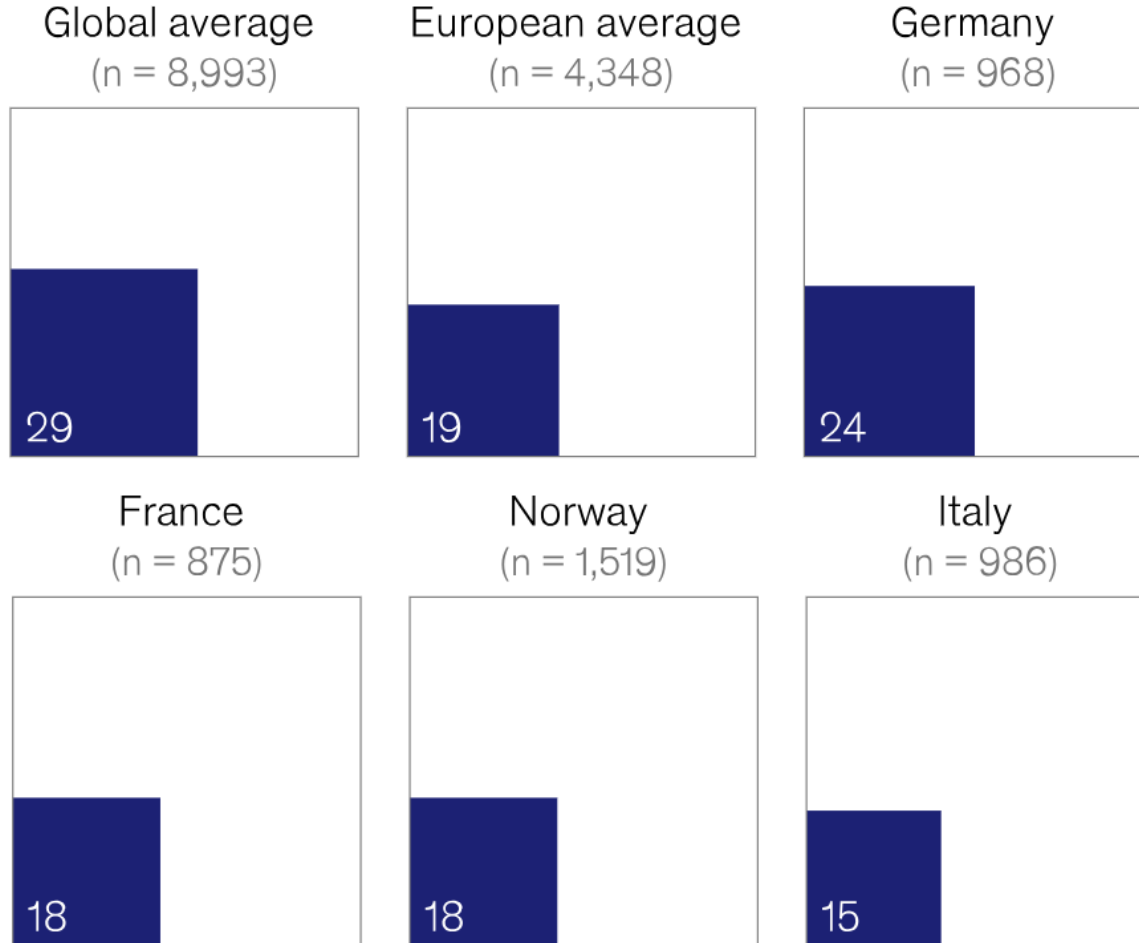
- **BEV** accounted for 15.6% of EU car market share (was 12.5% in H1 2024 and <1% in 2019), led by EFTA countries
- **PHEV** (8.4% of the market) remained marginal
- **HEV** continued to surge (34.8% of the market), remaining the 1° EU choice
- **ICE cars** fell to 37.8% in EU, down from 48.2% over H1 2024.

Powertrain considerations for next vehicle purchase (% of *European non-EV owner respondents*):



Some electric vehicle owners are likely to switch back to ICEs!

(% of *European EV owners*):



Reasons for switching back to an ICE vehicle:

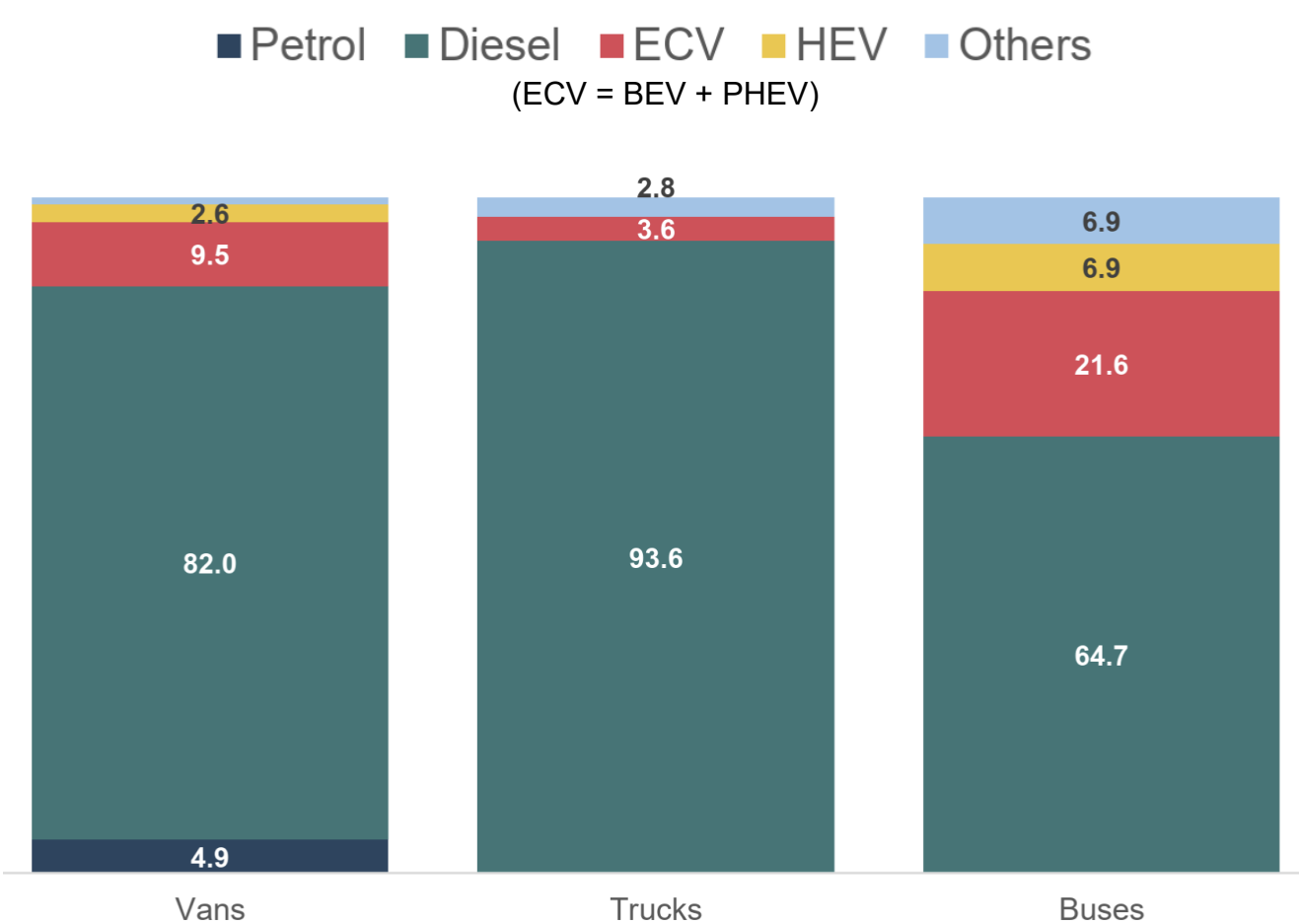
(multiple responses allowed)

- Total cost of ownership (41%)
- Underdeveloped public charging infrastructure (40%)
- Impact on long-distance travel (29%)

ICE cars are considered more practical vehicles, that allow greater independence when planning routes.

EU commercial (LD+HD) vehicles industry: new vans, trucks and bus registrations, H1 2025

	H1 2023	H1 2024	H1 2025 ²⁰	% change
Vans ²¹	731,092	840,384	729,127	-13.2
France	189,949	209,462	184,352	-12.0
Germany	126,603	151,097	128,813	-14.7
Italy	94,609	111,903	98,843	-11.7
Spain	72,214	85,595	95,154	+11.2
Trucks ²²	177,995	183,668	155,367	-15.4
Germany	48,474	52,417	37,994	-27.5
France	26,658	28,530	23,167	-18.8
Italy	15,186	16,766	14,535	-13.3
Spain	13,352	16,248	14,044	-13.6
Buses ²³	15,838	18,964	18,123	-4.4
Germany	2,667	3,141	3,042	-3.2
France	2,979	3,047	2,802	-8.0
Italy	2,408	3,476	2,624	-24.5
Spain	1,741	2,164	1,932	-10.7
TOTAL	924,925	1,024,052	884,494	-13.6



EU asks to reduce CO₂ emission of road vehicles: *can we make it?*



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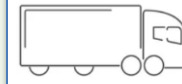


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coaches

0 g_{CO2}/km implies the ban on selling new ICE vehicles from 2035!

What is the consequence?

Oliver Zipse, BMW, 15.10.24:

EU's ban could "*threaten the European automotive industry in its heart*" and "*lead to a massive shrinking of the industry as a whole*"

Jean-Philippe Imparato, Stellantis, 01.07.25:

without a regulatory rethink before the end of the year, the company "*will have to make tough decisions*", hinting at possible factory closures in Europe

Ola Källenius, Mercedes-Benz, 11.08.25:

"*We need a reality check. Otherwise, we are heading at full speed against a wall*"



Cars and Vans

2035+ (Regulation (EU) 2023/851):

Both cars and vans: 0 g_{CO2}/km

**Oliver Zipse,
BMW,
01.09.21**



0 g_{CO2}/km implies the ban on selling new ICE vehicles from 2035!

How is EU reacting to the crisis of EU automotive?

30.01.25: “Strategic dialogue on the future of the automotive industry”
launched by Ursula von der Leyen



Consequence 1: on 19.6.25, with Regulation (EU) 2025/1214, EU adopted the **3-year CO₂ emissions averaging mechanism**. This measure offers manufacturers the possibility to comply with their obligations for the years 2025, 2026 and 2027 by averaging their performance over the three-year period, rather than each individual year. This approach would allow them to balance any excess annual emissions by outperforming the target in subsequent year(s).

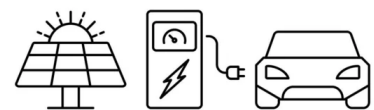
Consequence 2: on 7.7.25, EU Commission launched a “Call for Evidence” (closed on 10.10.25) on the “**Revision of the CO₂ emission standards for cars and vans**” with the aim of “*considering, in particular, all relevant recent technological developments and the importance of an economically viable and socially fair transition to zero-emission mobility*”.

EU Call for Evidence

TOP 3 priorities (IMO)



1. **Real-world CO₂ emissions should be used** instead of WLTP to compare Tank-to-Wheel emissions from vehicles with different power sources.



2. **Total CO₂ impact should be assessed** according to a Life Cycle Assessment approach, or at least a **Well-to-Wheel approach**, instead of the Tank-to-Wheel perspective.



3. **Decarbonization must be replaced by defossilization**, ensuring equal consideration and support for all powertrains including new-generation ICEs powered by biofuels - alongside electric, H₂ and e-fuels technologies, also beyond 2035. Only following a **technology-neutral approach** EU's climate-neutrality goal can be achieved in the future.

Real-world CO₂ emissions for PHEV: “Almost” Zero emission vehicles?



E-HYBRID

FORMENTOR

1.5 e-HYBRID 150 kW (204 CV)

CODICE DI CONFIGURAZIONE [SGPPPZZ6](#)

LA TUA CONFIGURAZIONE

LA VETTURA CHE HAI SELEZIONATO

1.5 E-HYBRID 150 KW (204 CV)

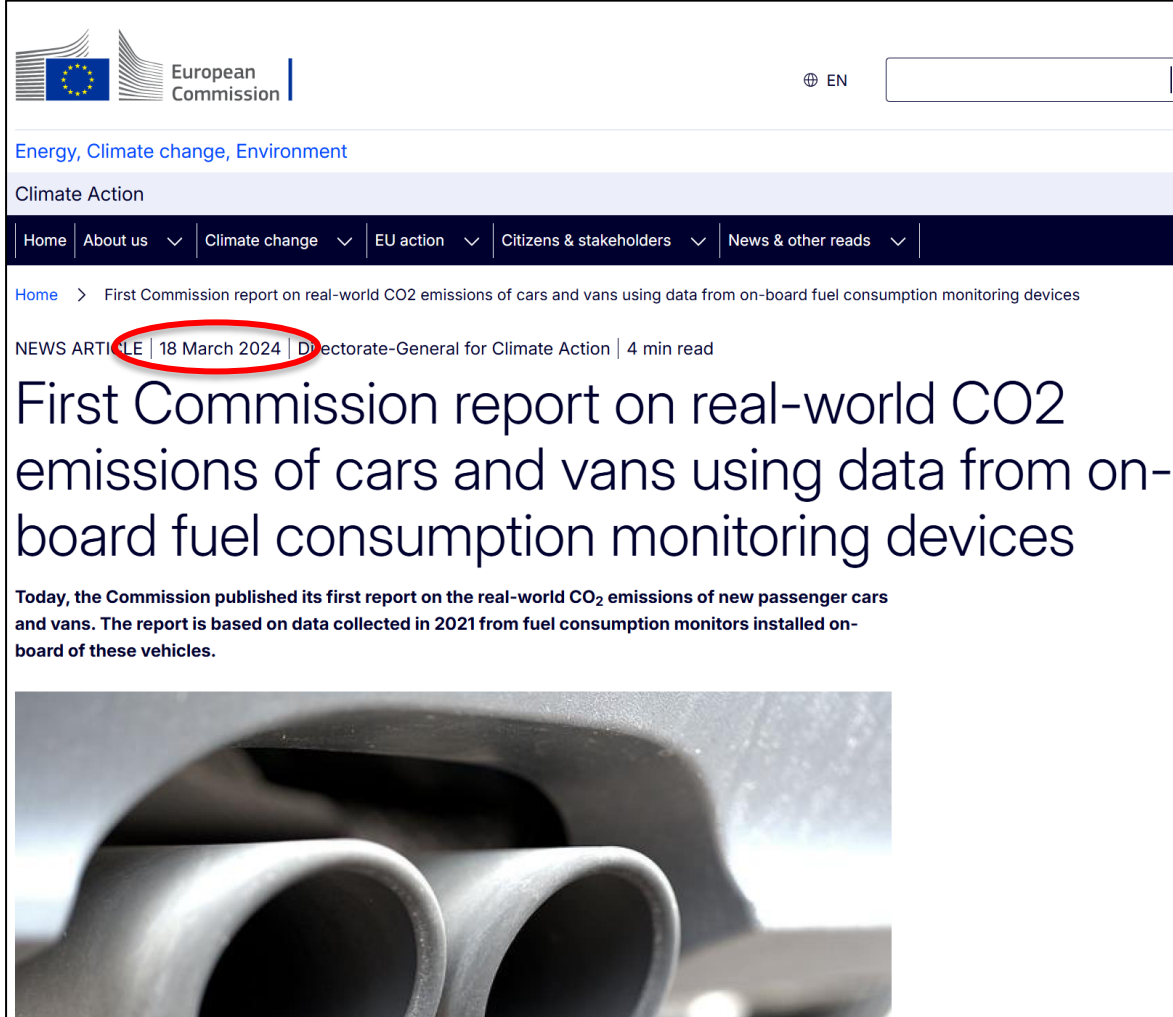
DSG / Automatico

DETTAGLI

Potenza	150 kW (204 CV)
Trasmissione	DSG
Tipo di cambio	Automatico

Emissioni CO ₂ ciclo di prova combinato ¹	10 g/km
Consumo ciclo di prova combinato (Elettrico) ¹	16.8 kWh/100km
Consumo ciclo di prova combinato ¹	0.5 l/100km
Autonomia ¹	119 km
Tempo di ricarica AC ³	2:30 h
Tempo di ricarica DC ³	26 min

Real-world CO₂ emissions for PHEV: WLTP vs real-world CO₂ emissions



European Commission

Energy, Climate change, Environment

Climate Action

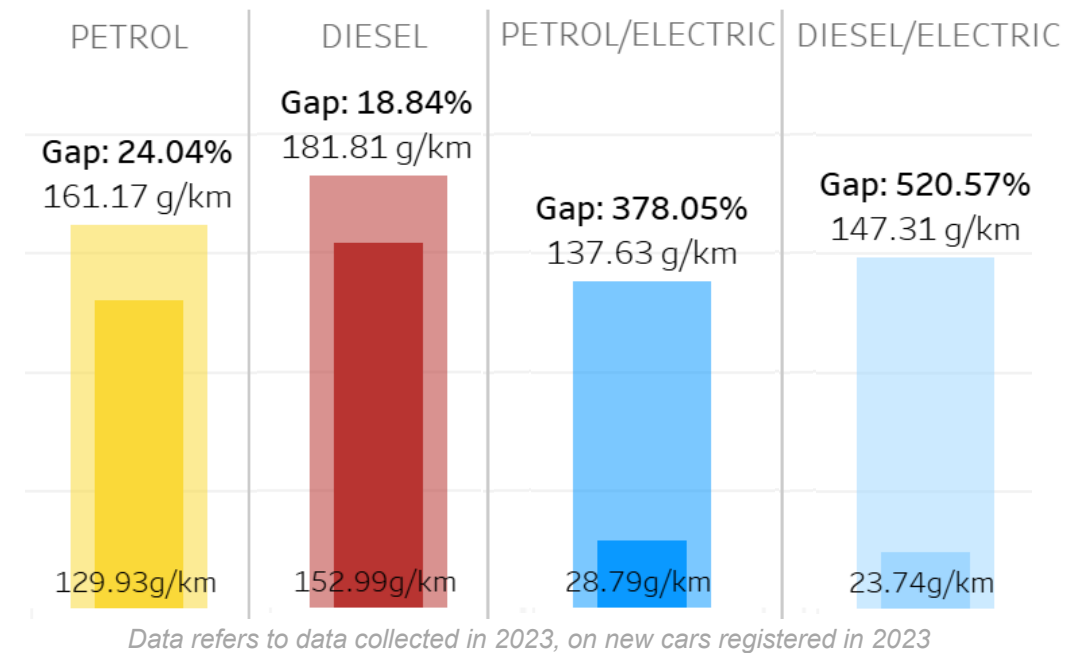
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Home > First Commission report on real-world CO₂ emissions of cars and vans using data from on-board fuel consumption monitoring devices

NEWS ARTICLE | 18 March 2024 | Directorate-General for Climate Action | 4 min read

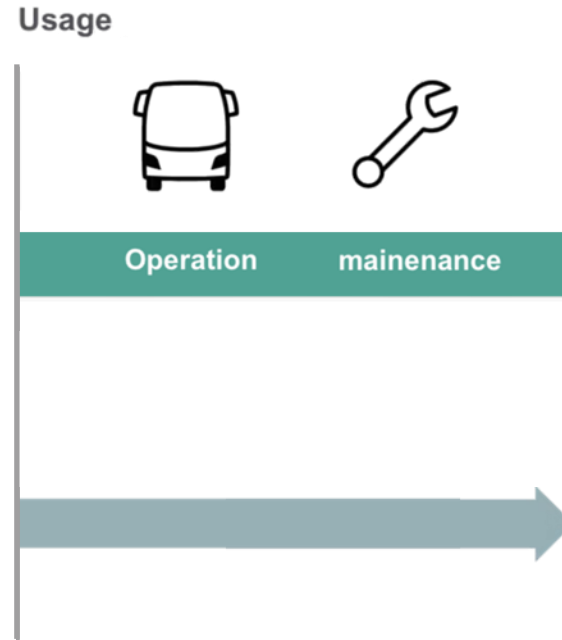
First Commission report on real-world CO₂ emissions of cars and vans using data from on-board fuel consumption monitoring devices

Today, the Commission published its first report on the real-world CO₂ emissions of new passenger cars and vans. The report is based on data collected in 2021 from fuel consumption monitors installed on-board of these vehicles.



Real-world CO₂ emissions from diesel and petrol cars are **around 20% higher** than values from the WLTP ((EU) 2017/1151). For **PHEV**, the **real-world CO₂ emissions were on average 5/6 times higher** than WLTP, which confirms that these vehicles are currently not realising their potential, because **they are not being charged and driven fully electrically as frequently as assumed.**

Tank-to-Wheel (TTW): The approach followed by current EU Regulations



TTW

Tank-To-Wheel

Impact from emissions in operation.

Tank-to-Wheel for BEV: Zero emission vehicles?

TTW

Tank-To-Wheel
Impact from emissions in operation.



Model Y

Ordina ora

Batteria
Standard Range

Autonomia (WLTP)
534 km

Accelerazione
7,2 s 0-100 km/h

Guida
Trazione posteriore

Dimensioni

Peso (massa a vuoto)
1.906 kg

Carico
2.118 litri

Cerchi
18"

Sedili
5 adulti

Display
Touchscreen centrale da 15,4"

Altezza da terra
164 mm

Larghezza totale
Specchietti ripiegati: 1.982 mm
Specchietti aperti: 2.129 mm

Altezza totale
1.621 mm

Lunghezza totale
4.797 mm



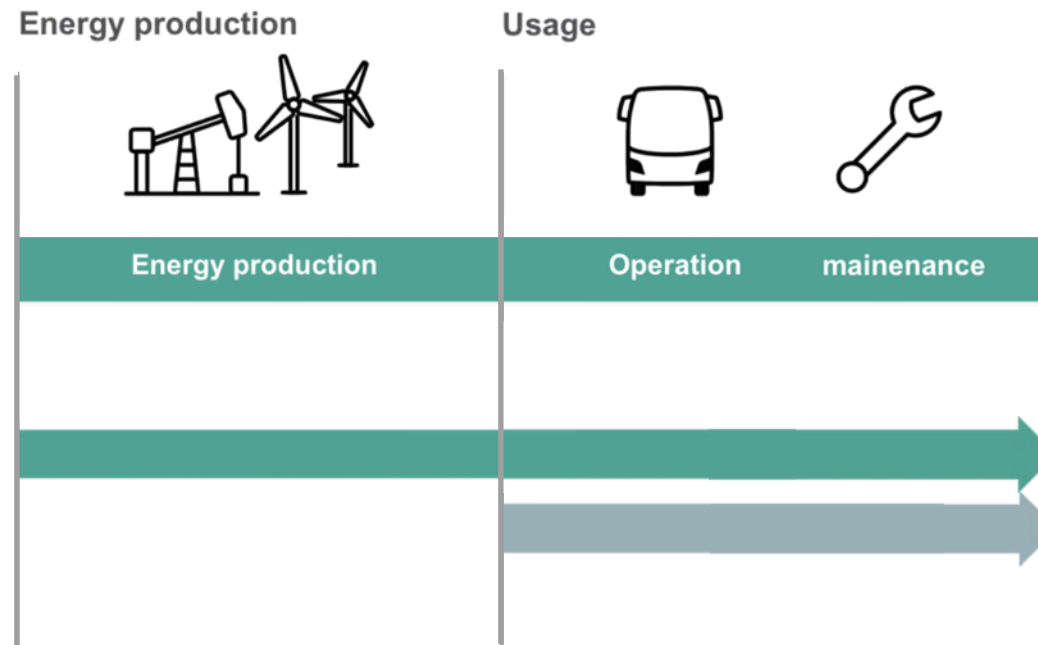
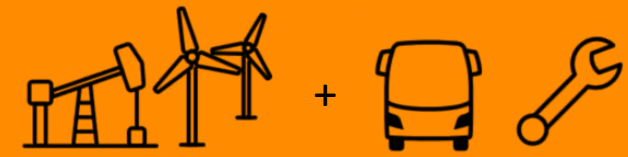
Consumo energetico

Consumo energetico ufficiale
13,1 kWh/100 km

Emissioni di CO2
0 g/km

Classe di efficienza CO2
A

Well-To-Wheel (WTW)



WTW

Well-To-Wheel

Impact from energy production and emissions in operation.

TTW

Tank-To-Wheel

Impact from emissions in operation.

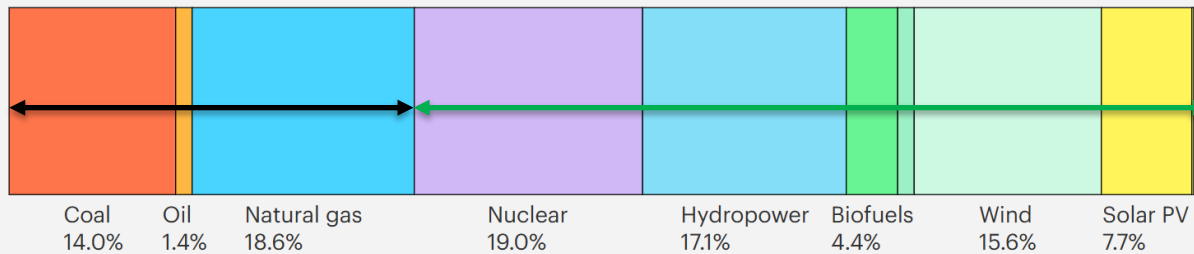
Energy “production”

Electricity as fuel

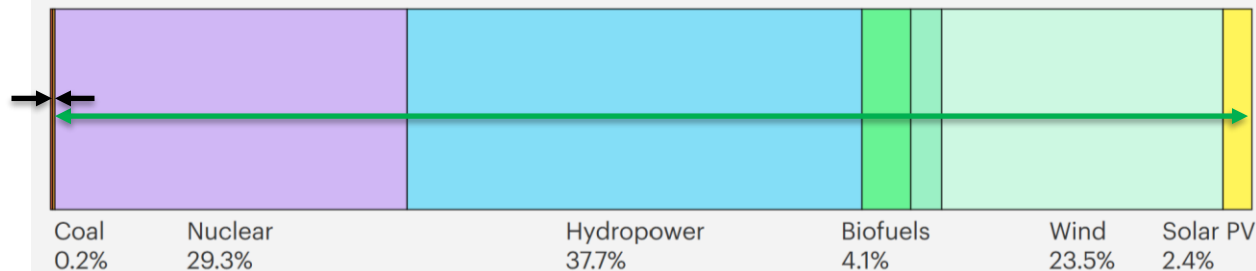
Energy production



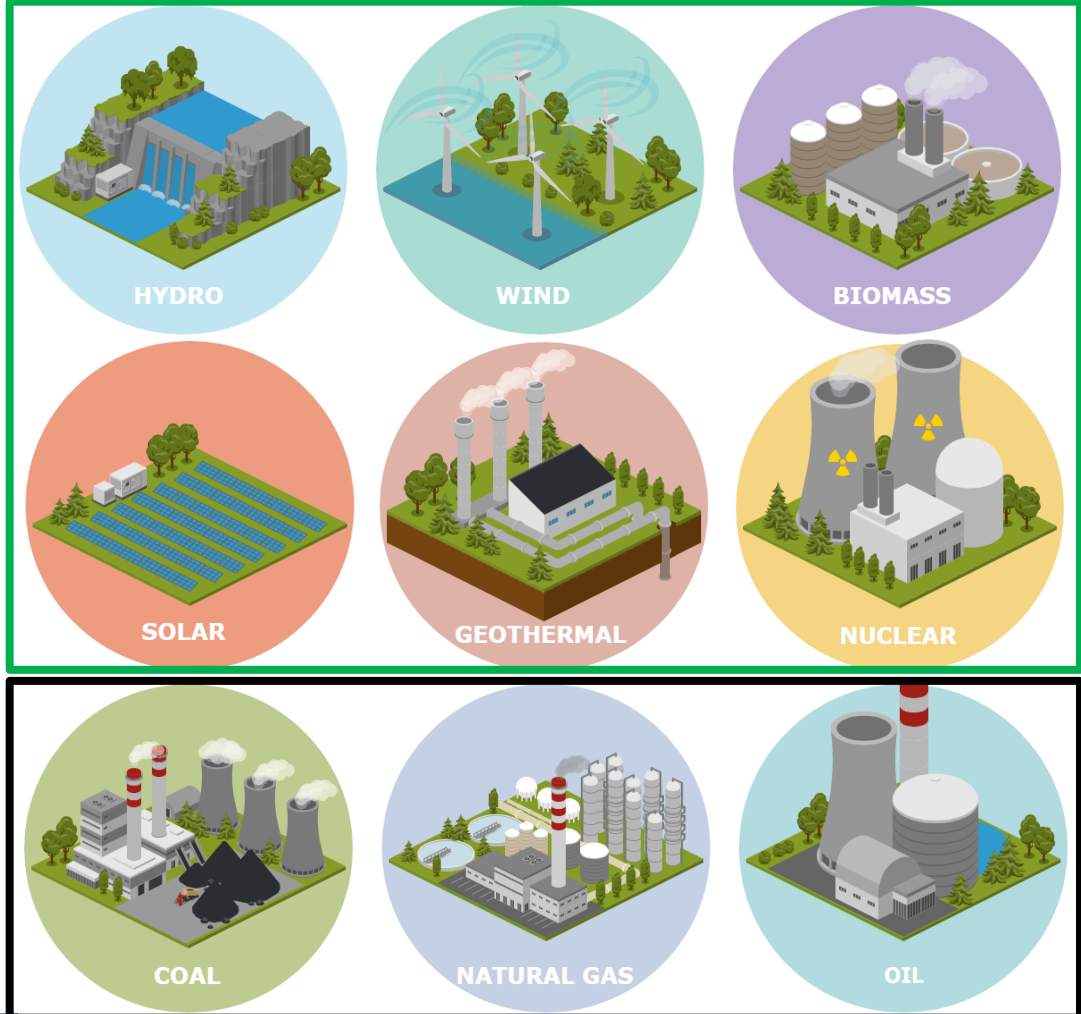
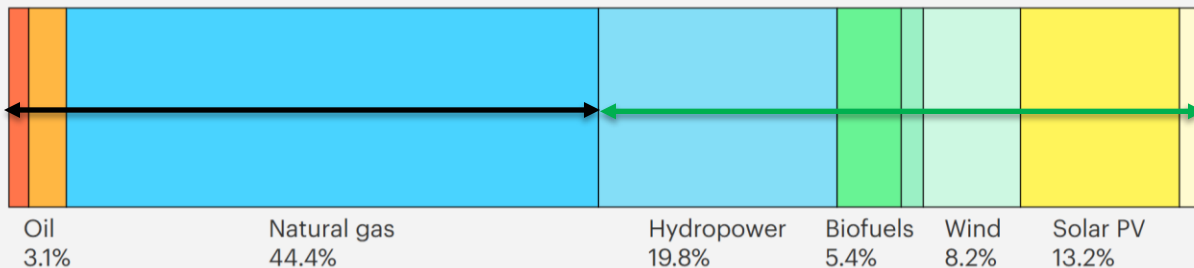
Electricity generation by source, Europe, 2023



Electricity generation, Sweden, 2024



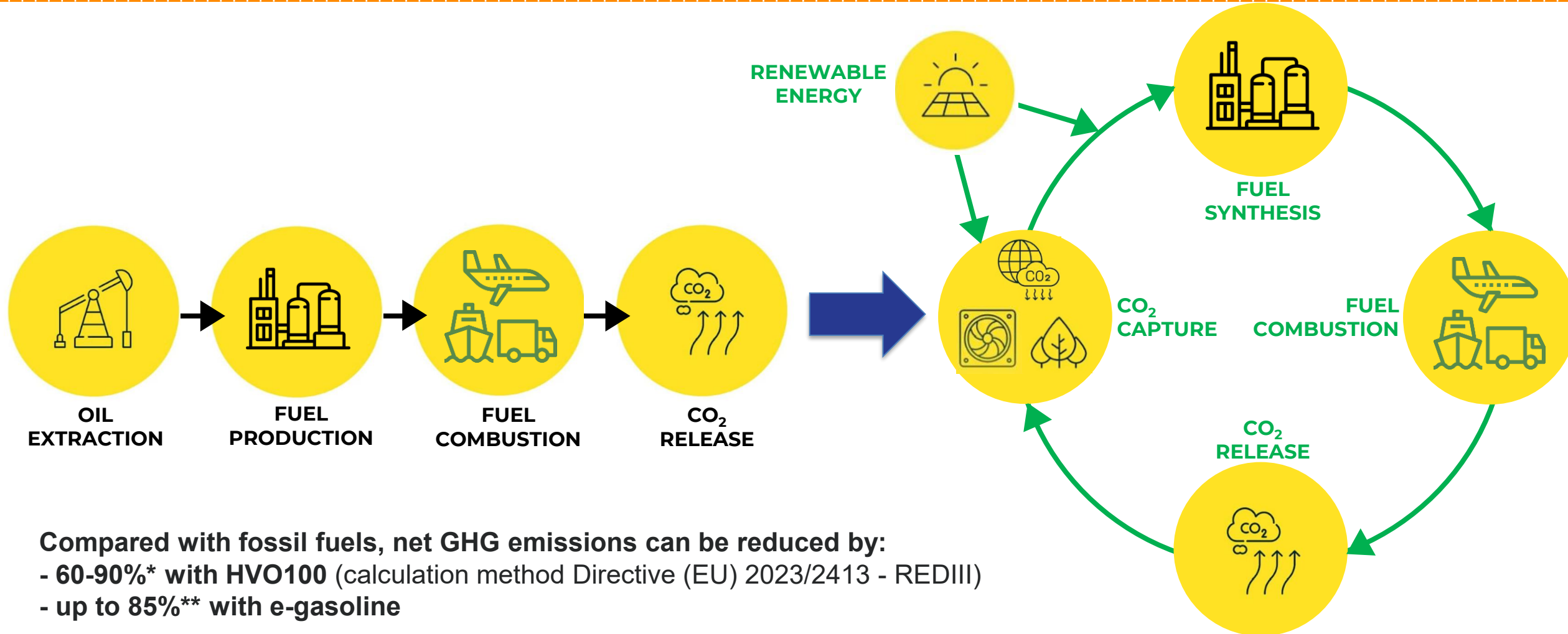
Electricity generation, Italy, 2024



Energy “production”

Fossil fuels vs. bio-fuels and e-fuels

Energy production



Compared with fossil fuels, net GHG emissions can be reduced by:

- 60-90%* with HVO100 (calculation method Directive (EU) 2023/2413 - REDIII)
- up to 85%** with e-gasoline

HVO100 – a key resource for Italy and EU

Energy production



Ecofining™ technology
(ENI/UOP *WO2008058664A1 patent*, 2008)

- 1° IT HVOs producer
- 2° EU HVOs producer (after Neste, FI)
- 3° World HVOs producer (after Neste and Valero + Diamond Green Diesel JV, USA)

Today:

Venice biorefinery (since 2014): 400 kt/y (→ 600 kt/y in 2027)

Gela biorefinery (since 2019): 700 kt/y

1.1 Mt/y HVOs in Italy + 0.55 Mt/y in USA (Chalmette biorefinery since 2023)

Announced for tomorrow:

Livorno biorefinery (under construction, start-up 2026): 500 kt/y

Sannazzaro biorefinery (announced, start-up Dec. 2027): 550 kt/y

Priolo biorefinery (announced, start-up Dec. 2028): 500 kt/y

+ 1.55 Mt/y HVOs in Italy + 1.05 Mt/y HVOs abroad (JVs)

Target: >5 Mt/y HVOs by 2030



LCA - Life Cycle Analysis

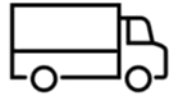


Vehicle production

Energy production

Usage

End of life



Raw materials

Transport

Production

Energy production

Operation

maintenance

Recycling

waste

LCA

Life Cycle Analysis

Total environmental impact,
cradle to grave

WTW

Well-To-Wheel

Impact from energy production
and emissions in operation.

TTW

Tank-To-Wheel

Impact from emissions in
operation.



GRANDEZZE CONSIDERATE	1	2	3	4	5	6		7
	BIOMETANO/BIOLNG	bioGPL	DME rinnovabile	HVO	E-FUELS	IDROGENO		ELETTRICO BEV
						ICE	FC	
ENTE	Assogasmetano	Federchimica-Assogasliq.	Federchimica-Assogasliq.	ENI	PoliMi	H2IT		CLM
POTERE CALORIFICO (kWh/kg)	13	12,8	8,32	12,2	12,2	33,3		1
EMISSIONI CO2 (g/km) (Auto da 1300 kg)	BIOLNG							
WTW	5 [1]	6 [2]	6 [2]	8	13 [3]	11	8 [1]	5 [1]
+ LCA (fabbricazione e demolizione veicolo) [2]	21	21	21	21	21	22	30	30
Totale emissioni a regime	26	27	27	29	34	33	38	35
EMISSIONI CO2 (g/tkm payload [3]) (Camion [4])	BIOLNG							
WTW	6 [5]	--	--	9	--	10	6	7
+ LCA (fabbricazione e demolizione veicolo)	6	--	--	6	--	7	9	10
Totale emissioni a regime	12	--	--	15	--	17	15	17
CONSUMI TRASPORTI ITALIA (MTEP/ANNO)								
ATTUALE	0,6	0,04	---	0,2-0,4	--	--		0,3
PROIEZIONE A TENDERE 2035/2050 (TOTALE 33 MTEP)	4 - 6	1,6 - 2,5	1,2 - 2	6 - 8,5	1 - 4,5	2 - 4		12 - 14
CAPACITÀ PRODUZIONE COMBUSTIBILE ITALIA (MTEP/ANNO)								
ATTUALE	0,5	0,04	--	1,1	--	--		target perseguibile
POTENZIALE 2035	>10	> 2	> 2	> 5	1	3		
COSTO PRODUZIONE (€cent/kWh) [6]								
POTENZIALE 2035/2050	6-6,5	7-7,5	14-15	9-10	16-17	10-15		5-7
IMPIANTI								
DISPONIBILITÀ RETE	disponibile	disponibile	disponibile	disponibile/in espansione	disponibile	in espansione		in espansione

CONTACTS



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MILANO 1863**

DIPARTIMENTO DI ENERGIA

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LCCP
LABORATORY
OF CATALYSIS
AND CATALYTIC
PROCESSES



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