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The impact of alternative energy sources on global oil demand

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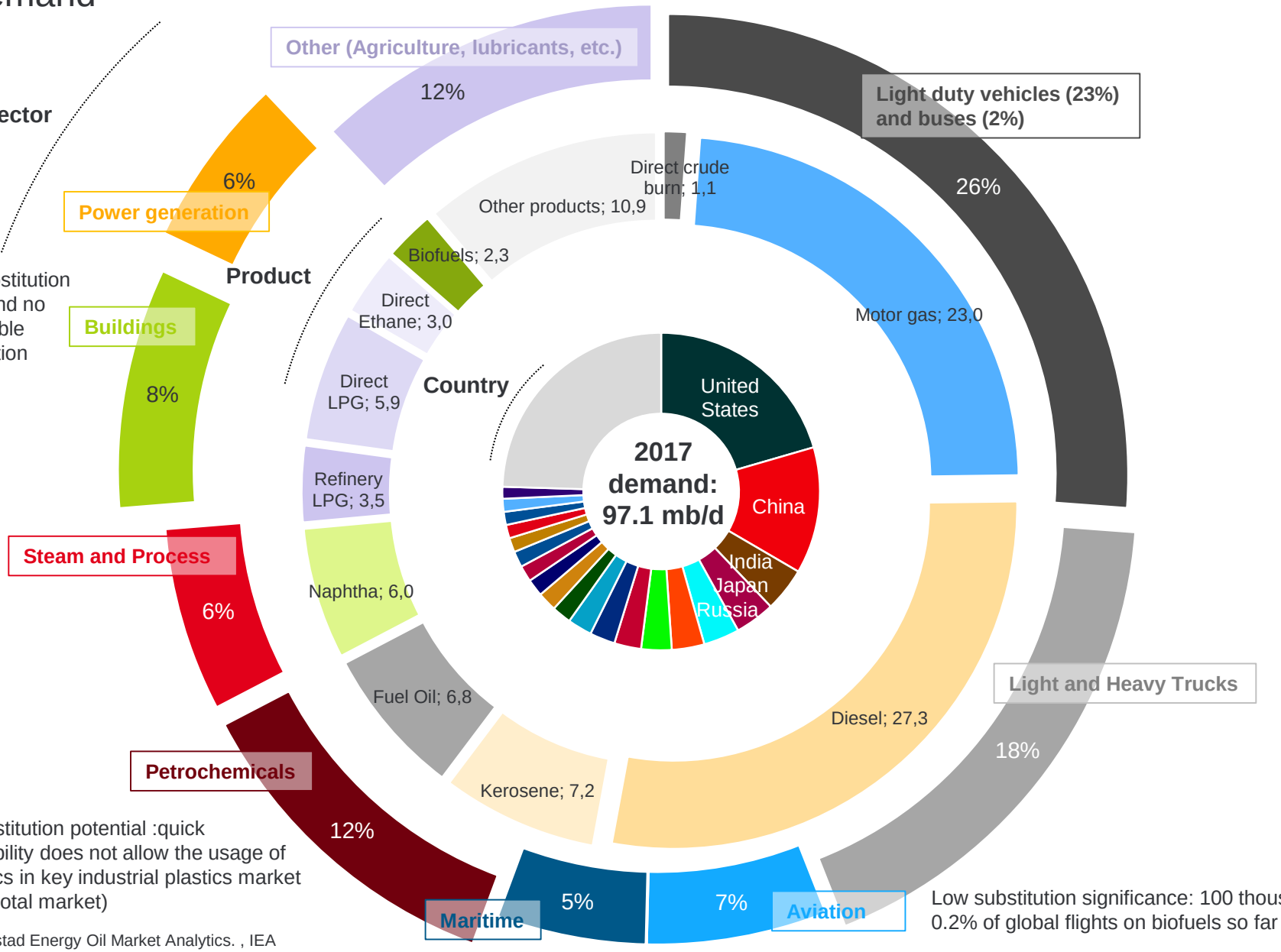
Summary

Global oil demand overview

Electric transportation and effect on global oil demand

New IMO 2020 Sulphur regulations and effect on global oil demand

Geographical and sectorial distribution of oil demand is not favoring fast electric vehicle effect on demand



Main substitution by gas and no foreseeable acceleration

Low substitution potential :quick degradability does not allow the usage of bioplastics in key industrial plastics market (60% of total market)

Low substitution significance: 100 thousand fligths or just 0.2% of global flights on biofuels so far (up to 50/50 blend)

Source: Rystad Energy Oil Market Analytics. , IEA

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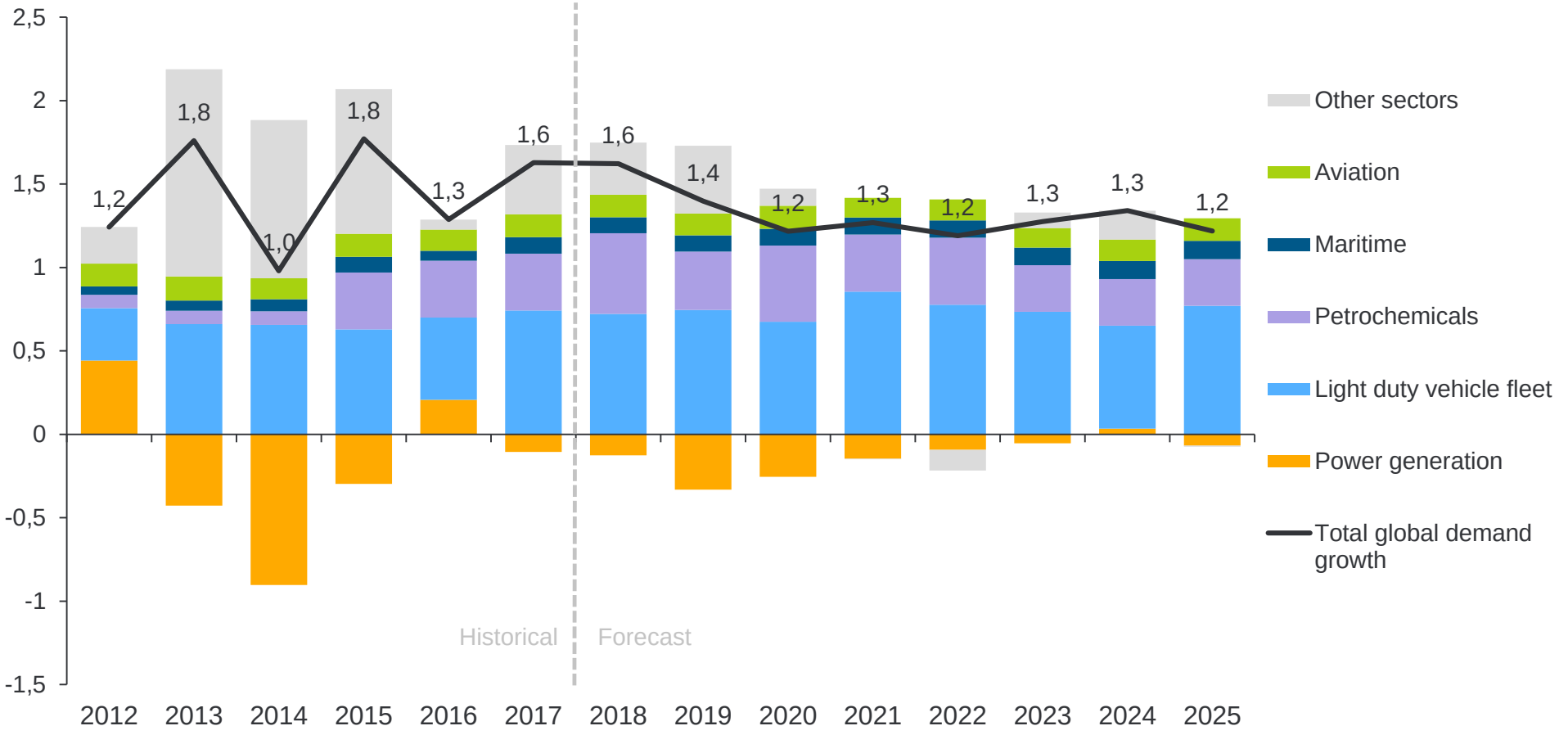
Light duty vehicle fleet to remain the main engine of demand growth in the medium-term

- Light duty vehicles are to remain the main driver of global oil demand growth, providing 60% of total demand growth in 2018-2025
- Petrochemicals add on average around 400 kbbl/d of oil demand per year in 2018-2025, driven by addition of naphtha processing plants in Asia and ethane crackers in the US
- Oil demand in power generation gradually decreases mostly due to ongoing oil-to-gas substitution in the Middle East (Egypt, Iraq and Saudi Arabia)

Global oil products (liquids) demand, year-on-year growth by sector
Million bbl/d



Source: Rystad Energy Oil Market Analytics, company reports

Electric mobility: a key future disruption in oil market?

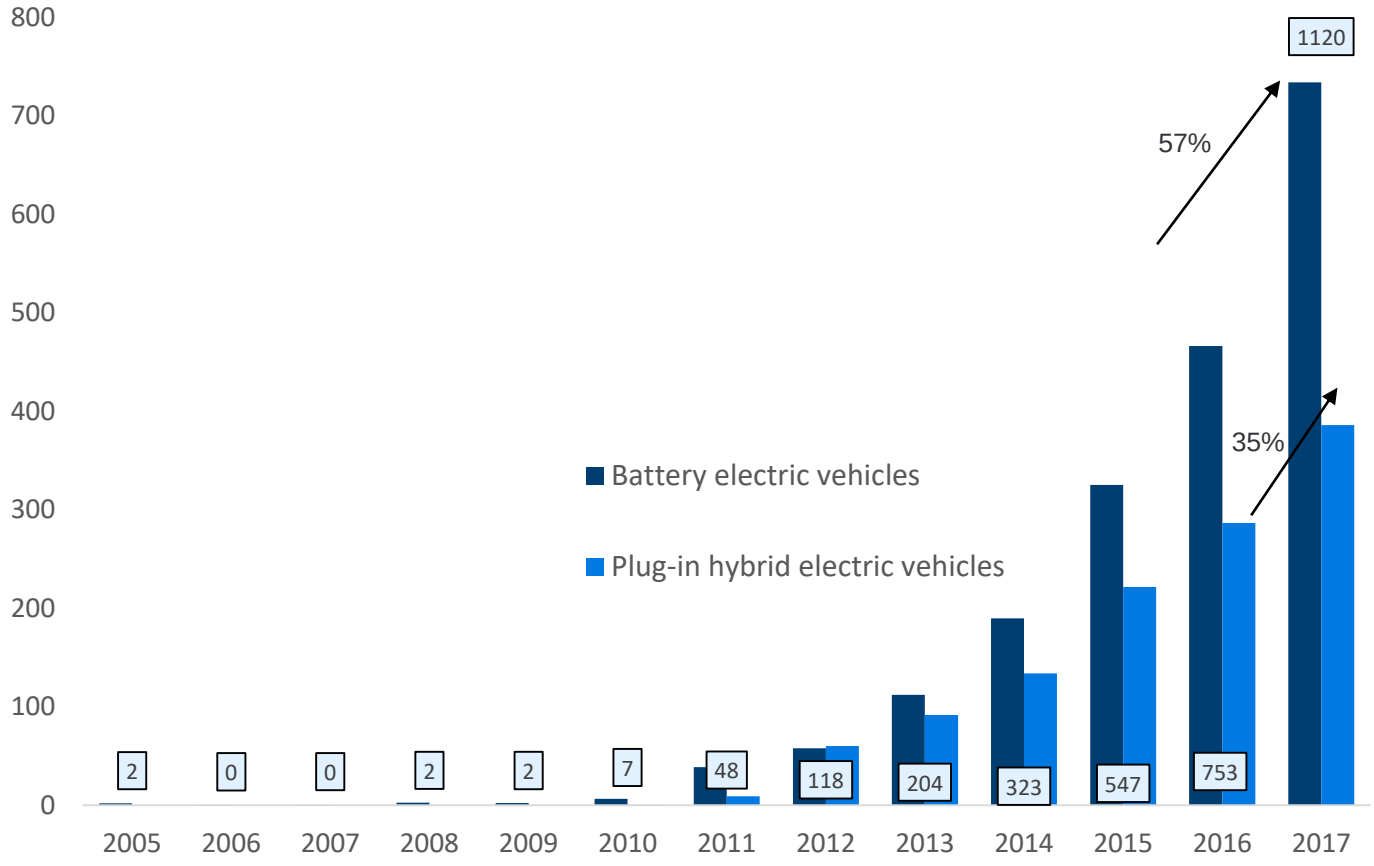
		2016 Sales (000's vehicles)	Main manufacturers	Main models	Technological specifications	Policy support
Battery electric vehicles (BEV)		466	BYD, TESLA	Tesla Model S, BMW i3, Renault ZOE, Nissan Leaf	• Purely electric engine and relatively big battery (30-100 kwh) • 80-100 moving parts • >90% engine efficiency • No oil of liquid fuel	• High policy support level • VAT and purchase tax exemption in Norway • US Federal tax subsidy Exemption from registration restrictions in China
Plug-in Hybrid vehicles (PHEV)		287	LEXUS, VOLVO	Lexus RX Hybrid, Volvo XC90 Hybrid Mitsubishi Outlander PHEV	• ICE* combined with electric motor and medium-sized battery (10 – 15 kwh) • 500+ moving parts • 30-45% engine efficiency • 40-60% economy relative to ICE	Mature technology, decreasing policy support
Hybrid vehicles (HEV)		1400	TOYOTA	Toyota Prius	• ICE combined with small electric motor and small battery (up to 5-6 kwh) • 5-10% fuel economy relative to ICE	• No policy support • Increasing regulatory headwinds, similar to ICE
Fuel cell vehicles (FCEV)		2,3	TOYOTA, HYUNDAI, KIA MOTORS	Hyundai ix35, Toyota Mirai	• Hydrogen as a main source of energy • Very small battery stores only excess energy for use during ignition and acceleration • Range of 450 km • Low production base and charging infrastructure.	• High policy support level

Source: Rystad Energy Oil Market Analytics

Electrical vehicle sales accelerate significantly by average of 50-60% y/y

- Electric vehicle sales increase every year by around 50%-60% since 2014, but absolute numbers are still insignificant

Battery and plug-in hybrid electric vehicle sales
Thousand vehicles



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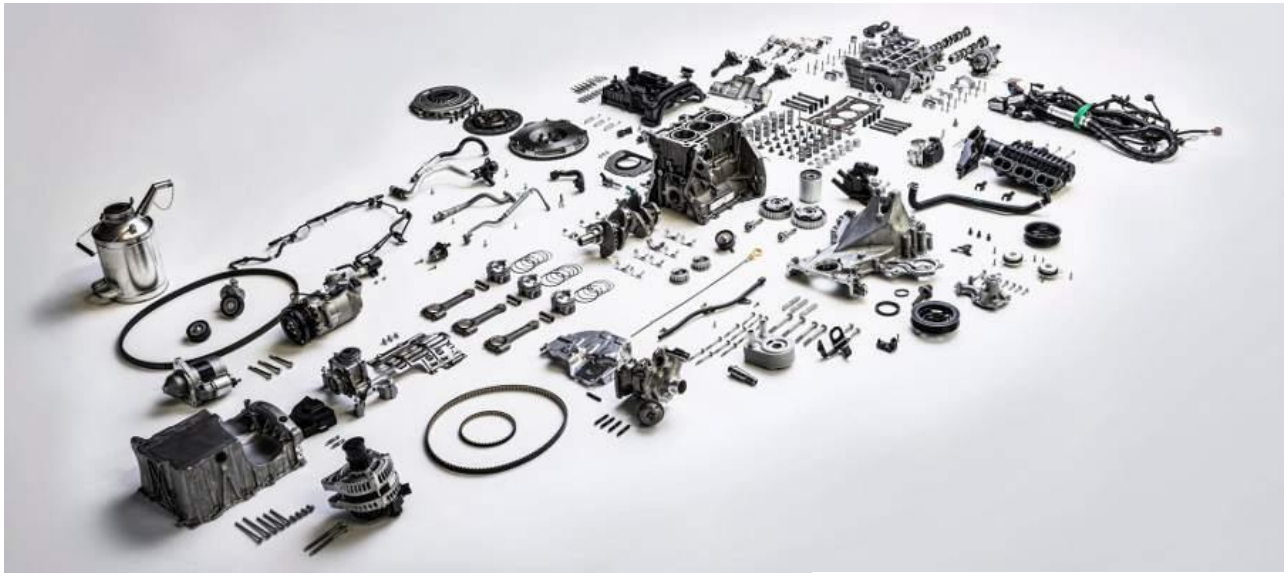
Electric engine technology is superior to conventional combustion engine



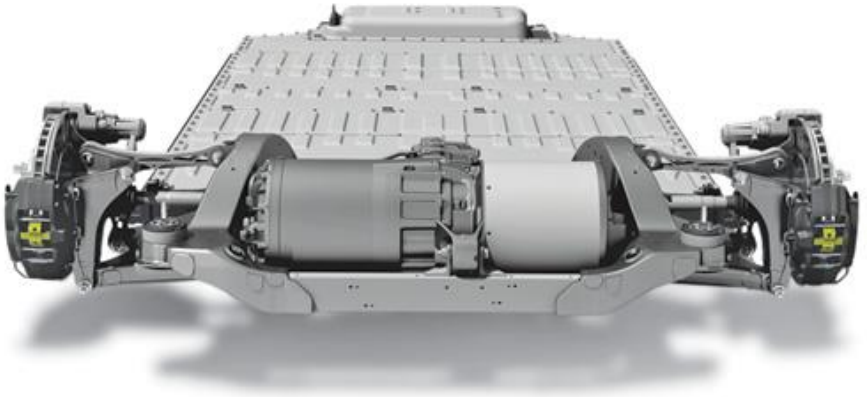
Source: teslaclubsweden.se

ICE vehicle

- Transmission required to use engine effectively
- A lot of moving parts: pistons, connecting rods, valves, oil and water pump, fuel pump, camshaft etc.
- 500+ moving parts, many with direct friction that increase wear out
- Mechanical breaking

Battery Electric Vehicle

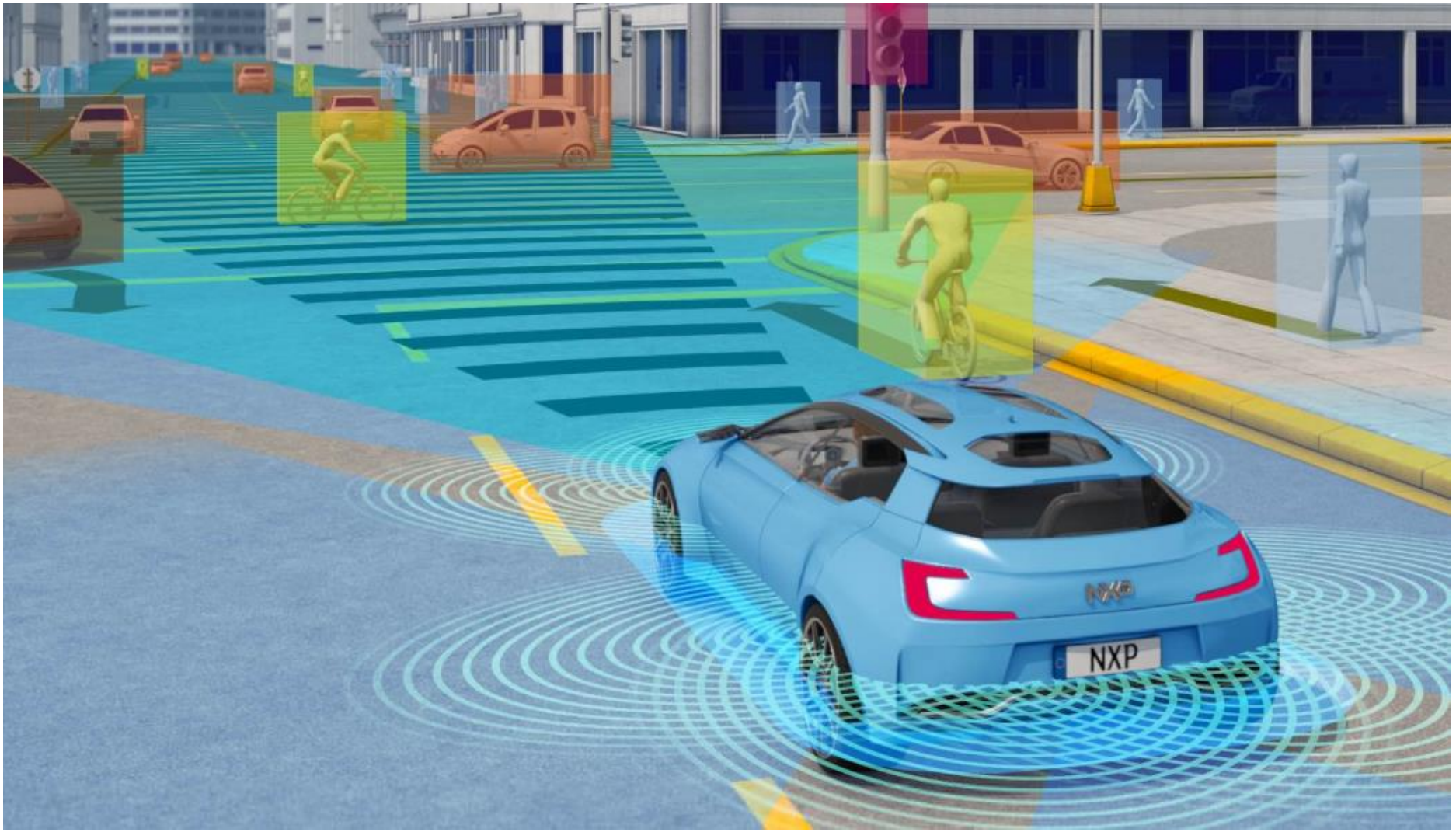
- Transmission parts: motor (rotor and stator), reducer gear (8-10 moving parts), differentials
- 80 - 90 moving parts, electric motor does not require sophisticated gearbox
- Breaking – regenerative breaking using the motor as a generator to pull rotational energy out of the wheels



Source: InsideEV.com

Source: Rystad Energy Oil Market Analytics

Electric vehicle technology is suitable platform for TaaS (Transporation-as-a-Service) and autonomous vehicle technology adoption

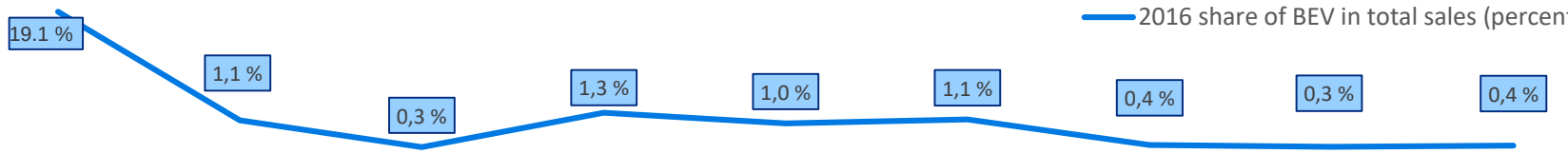


Source: www.electronicsweekly.com

Electric vehicle technology is the long-term solution to city local pollution issues

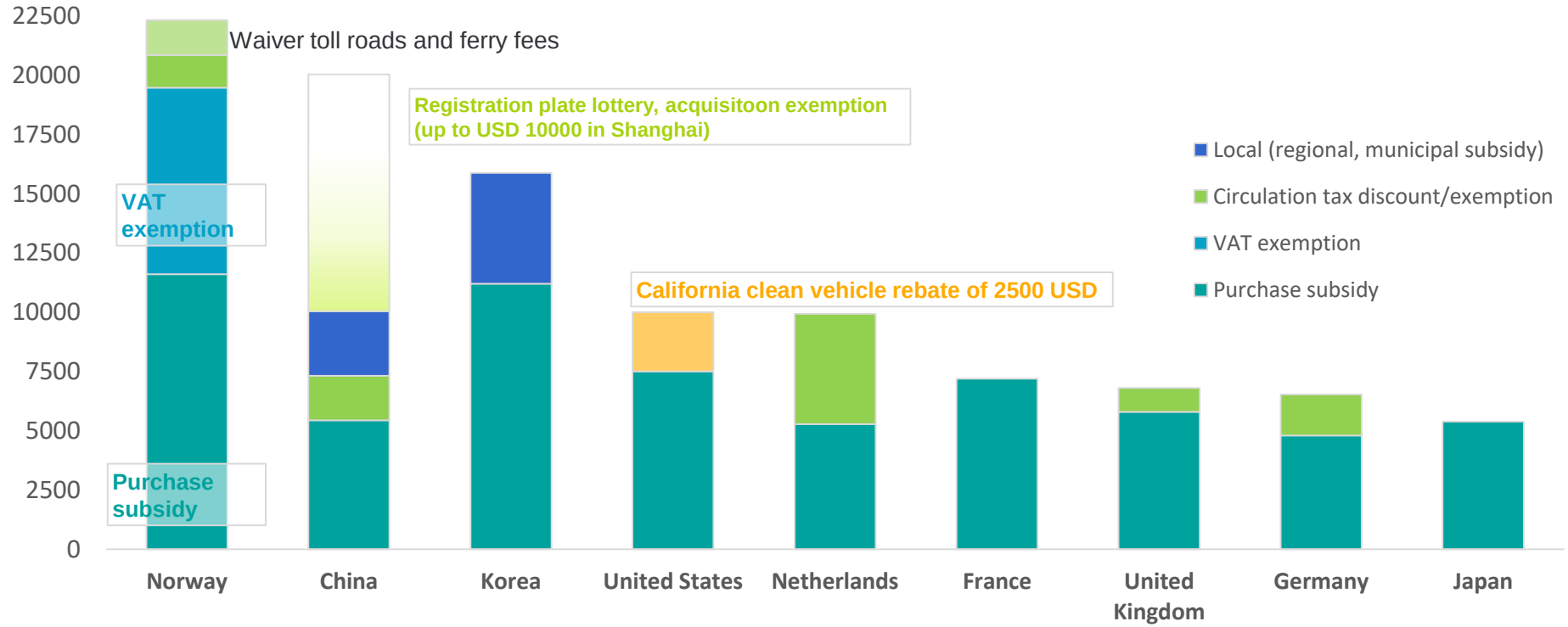
Source : Ufccc

Governments spend billions of USD annually to subsidize electric vehicles



Battery electric vehicle support levels (during 5 year ownership period)

USD



Source: Rystad Energy Oil Market Analytics

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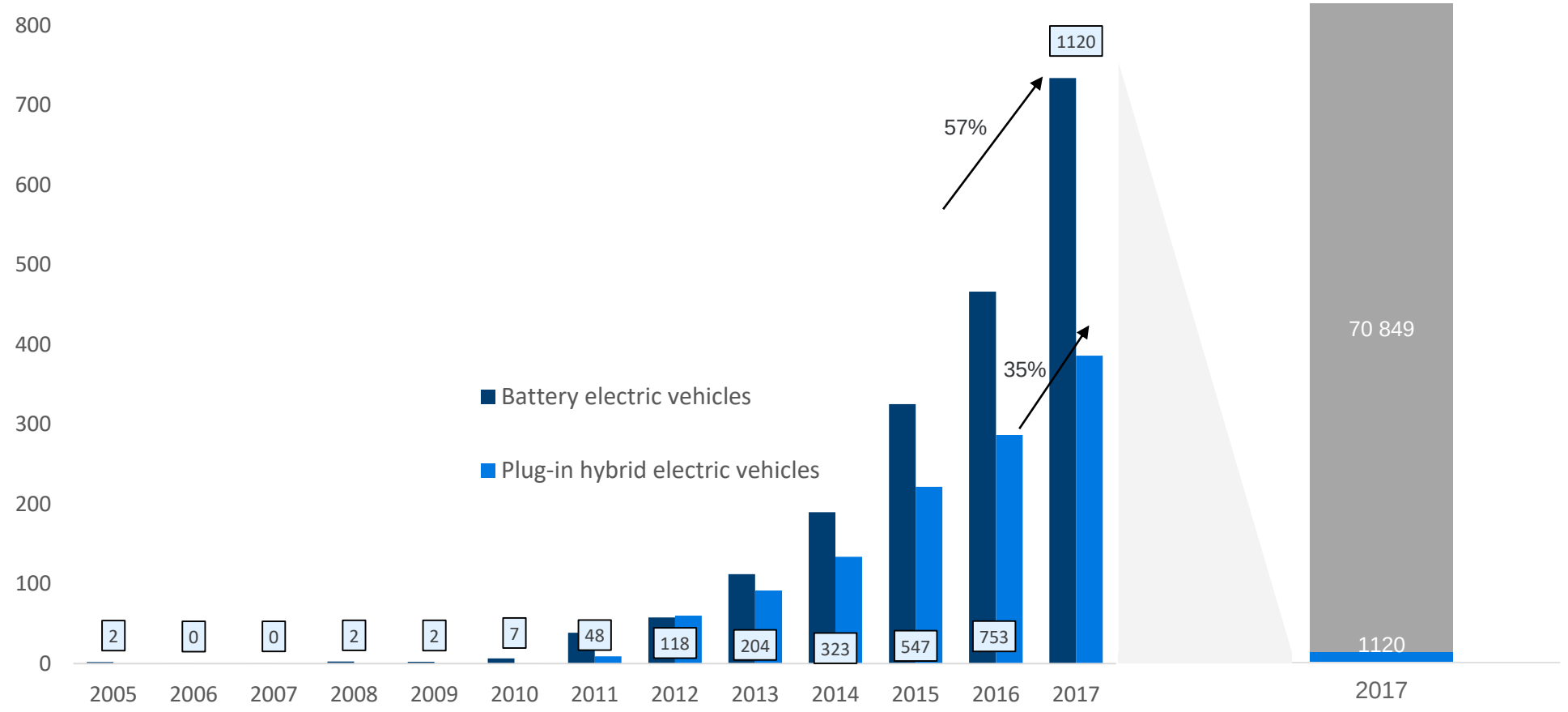
Battery electrical vehicle sales accelerate significantly, but still constitute only 2% of global sales

- Preliminary sales in 2017 of 734 thousand BEVs and 386 PHEVs constutute together 2% of global 71 million vehicle sales
- Electric vehicle sales increase every year by around 50%-60% since 2014, but absolute numbers are still insignificant

Battery and plug-in hybrid electric vehicle sales
Thousand vehicles



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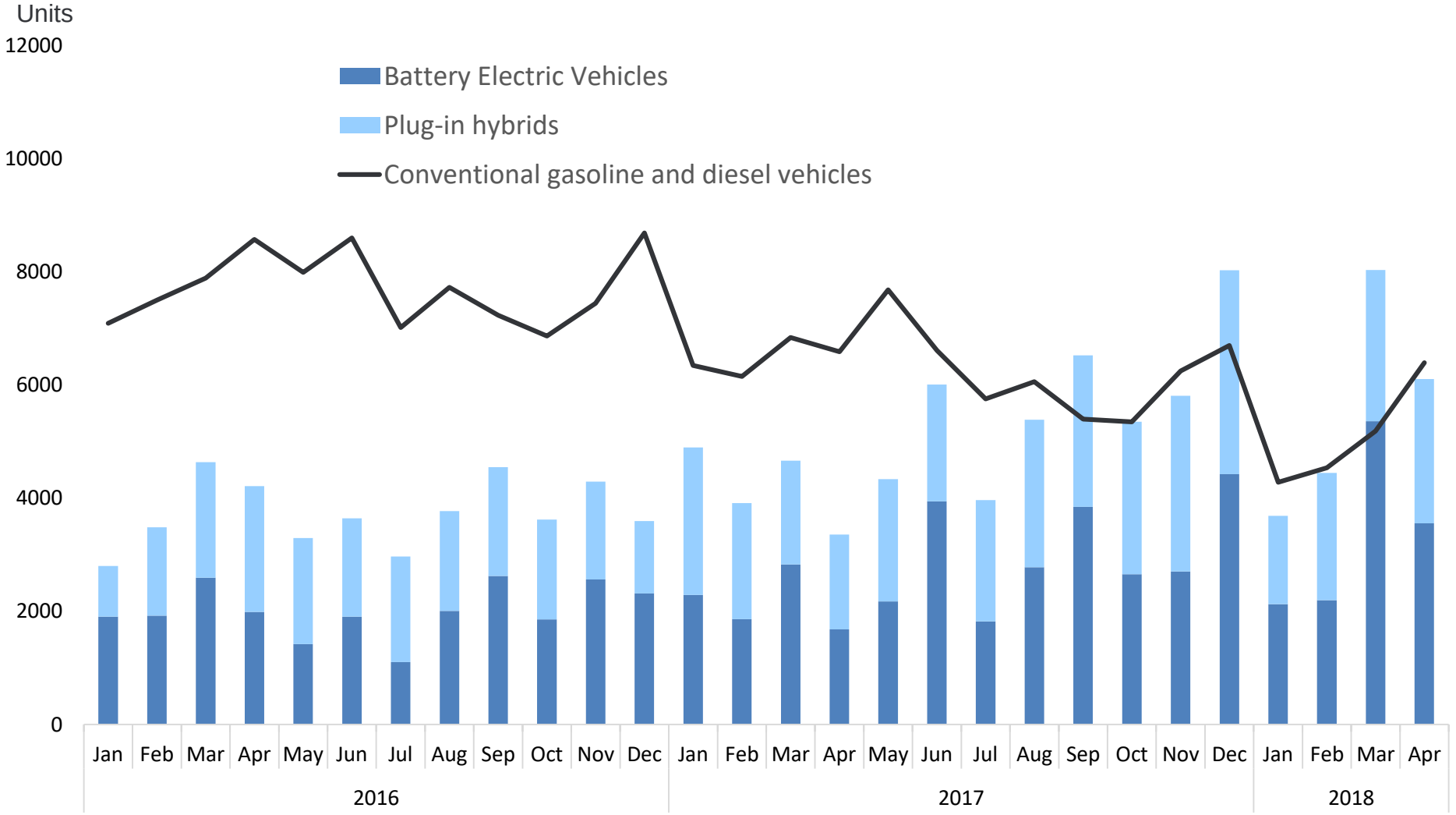
In Norway EV sales rise, propelled by subsidies, but still roughly half of sales are conventional diesel and gasoline vehicles

Vehicle sales in Norway : Battery electric, plug-in hybrid and conventional (diesel and gasoline) vehicles



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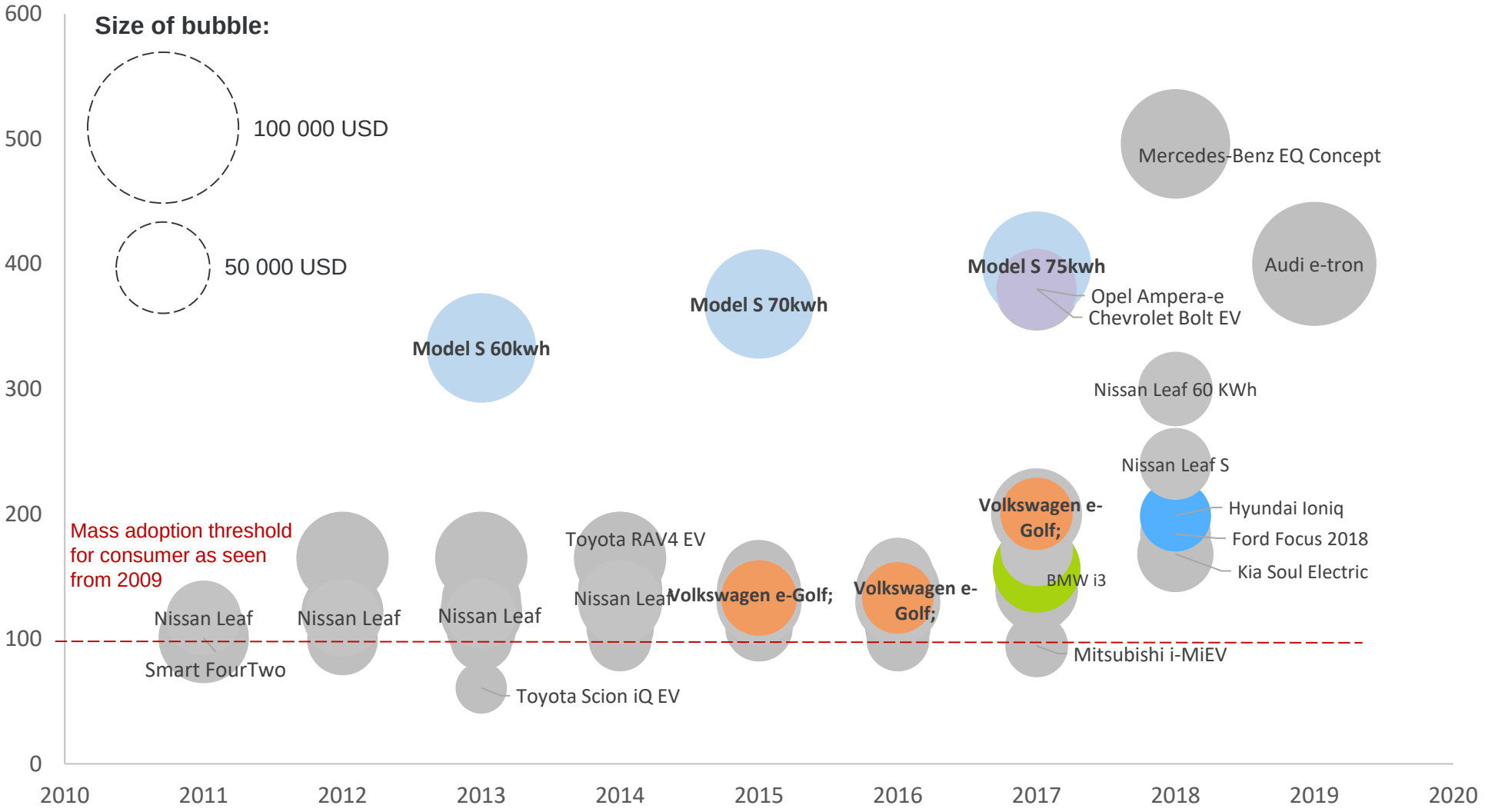
Most of EV models should have been mass-adopted already if consumer was purely range-oriented and range-bound to 100-200 km of travel per charge

Battery electric vehicles by release year (size of bubbles indicate purchasing price before incentives)
Range per charge, kilometers



Source: Source: Rystad Energy Oil Market Analytics, Company reporting

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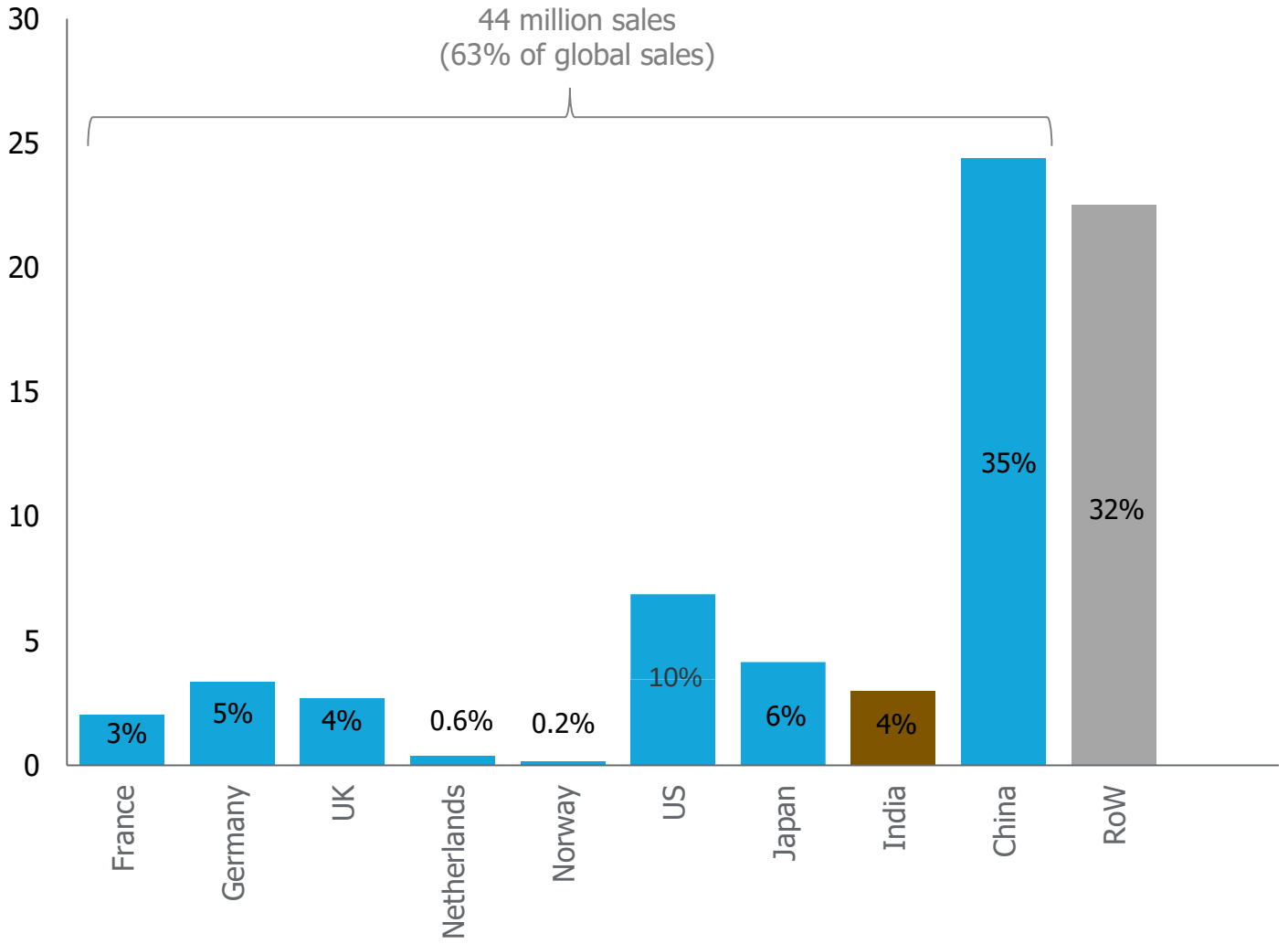
Substitution potential on a country level at 63% of global annual sales is quite significant, BUT…

Private light duty vehicle sales in selected countries and associated EV market share (boxes)
Million vehicles sold in 2016



Source: Rystad Energy Oil Market Analytics

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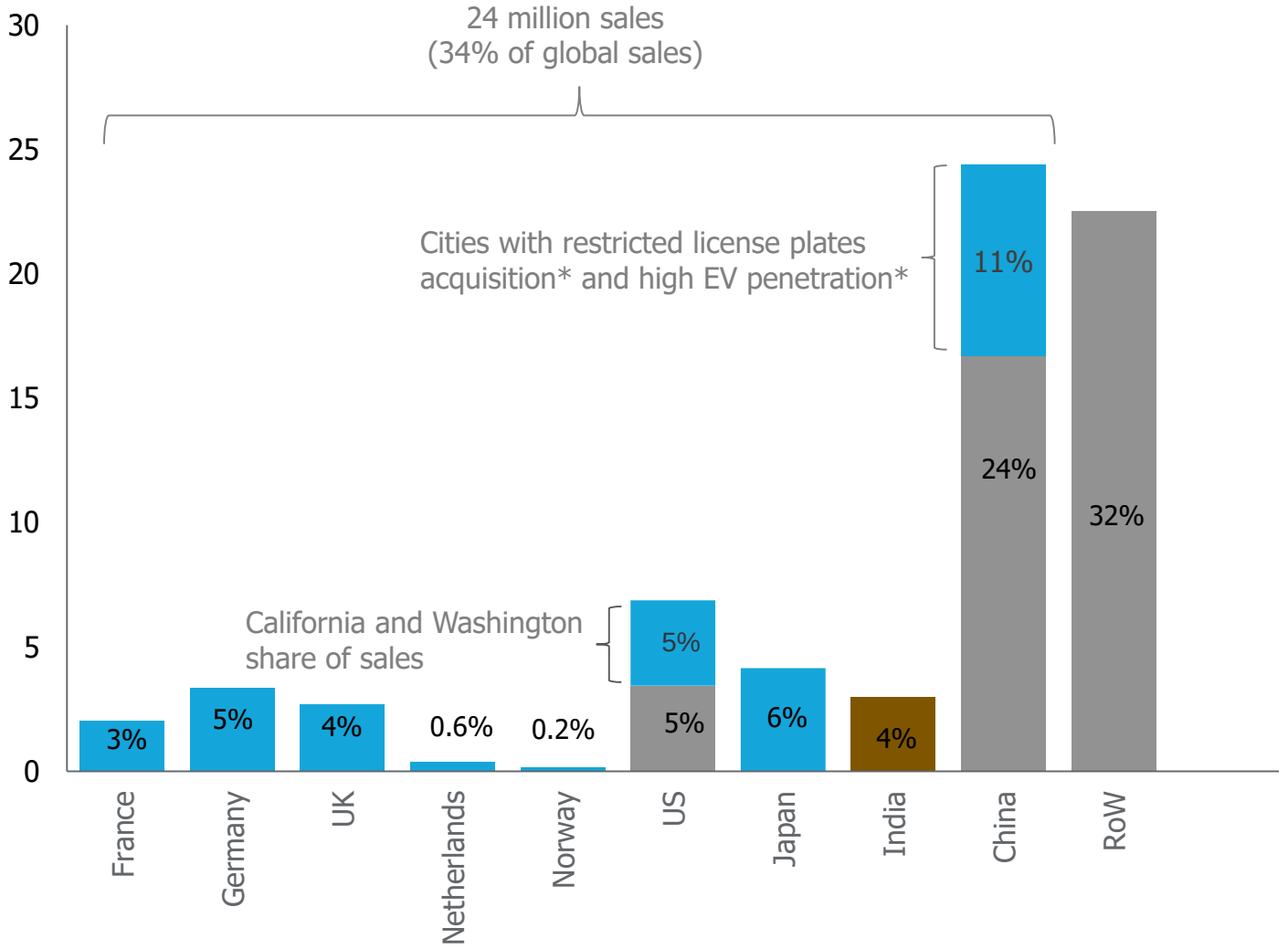
If Chinese and US vehicle markets are assessed realistically, potential impact on global demand is limited

Private light duty vehicle sales in selected countries and associated EV market share (boxes)
Million vehicles sold in 2016



* Beijing, Shanghai, Tianjin, Zhejiang, Guangdong, Shanxi and Shandong provinces
Source: Rystad Energy Oil Market Analytics

1 Key vehicle manufacturers target strong EV sales

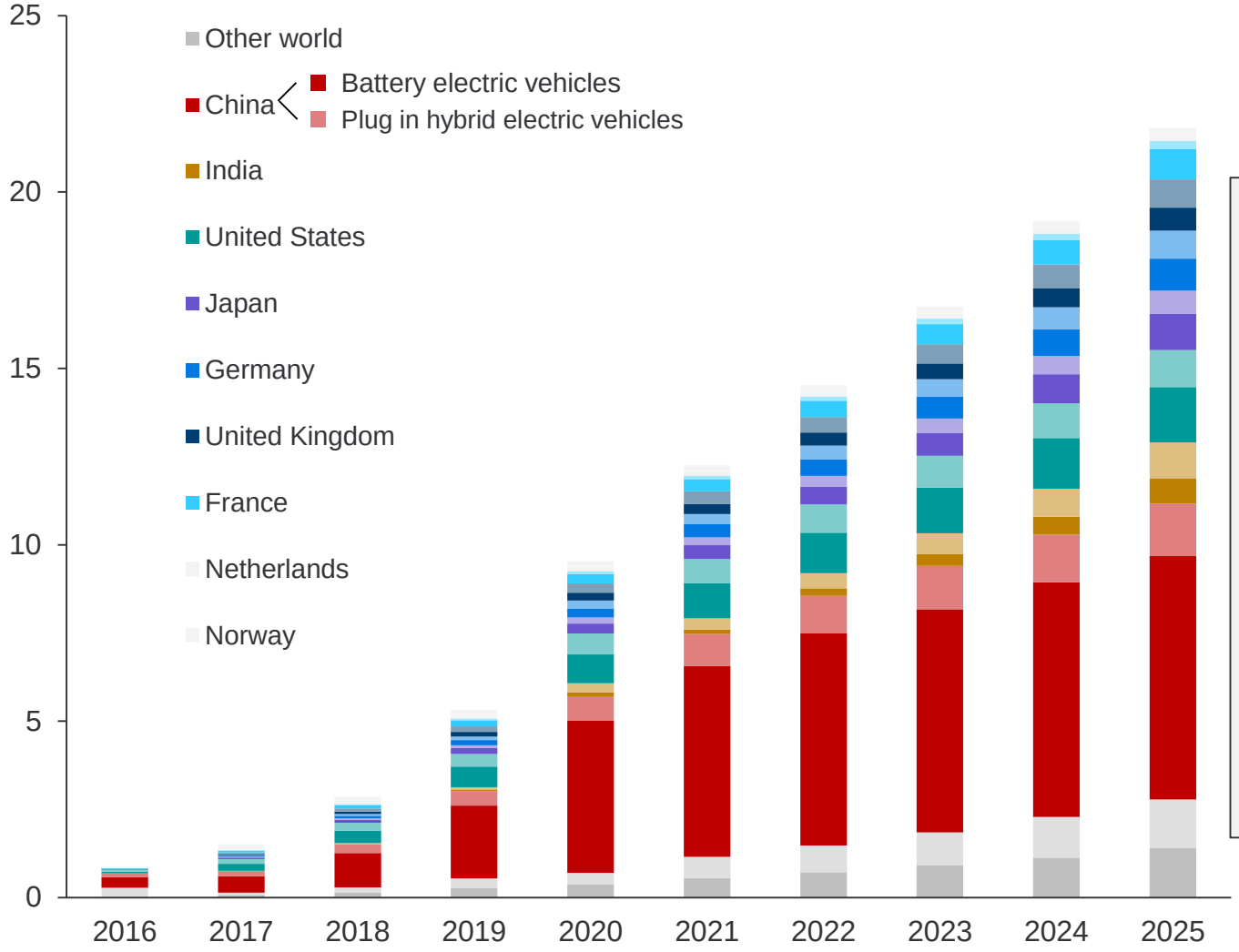
Top ICE vehicle manufacturers 2016

Car manufacturer	Total vehicle sales volume 2016 [million cars]	BEV+PHEV share of 2016 sales [%] (cars)	Target annual sales BEV+PHEV [million cars/ % of sale]	Comments
Volkswagen	10,1	0,6 %	2025: **3 million BEVs/PHEVs**	10 BEV and PHEV models combined announced in year 2018 alone. 2025: 30 different BEV models and an unspecified number of additional PHEV models. Aiming at being the world's leader in electric cars Sell 2-3 million BEVs equivalent to around 20–25% of the Group's expected total unit sales.
TOYOTA	10,0	0,1 %	2030: **3 million PHEV**	Toyota currently has 33 traditional hybrid passenger car models (HEV) and 1 plug-in hybrid (PHEV). Toyota claims conventional engines will have disappeared by 2050. Group recently made a U-turn in favor of Plug in hybrids, traditionally discriminating this power train in favor for simple (non-plug in) hybrids
RENAULT NISSAN	8,5	1,0 %	2020: **1.5 million BEV/PHEV**	The company expects 5% of all the cars will be electric by 2020 and 10% soon after. Intends to launch the first autonomous car by 2020. 20% of its sales in Europe in 2020 to be EVs. Before 2020, Nissan states to be able to reach a range of about 300 miles on a single battery charge
HYUNDAI KIA MOTORS	8,2	0,2 %	2020: **0.3 BEV/PHEV**	H-K plans to launch 31 eco-friendly cars: hybrids 21 (12), plug-ins (6), EVs 8 (2) and fuel-cells 2 (2) vehicles by 2020. Aim to become 2nd largest manufacturer of eco-friendly cars with annual sales of 300 000 (incl. PHEVs and Fuel Cell Vehicles)
GM	8,0	0,4 %	No stated estimate or target	Company missed the target of having 500 000 electric cars on US roads by 2017. The company has high electric car ambitions for the future. Through 2020 GM will announce more than 10 new EV models. To launch 10 electric and hybrid vehicles by 2020 in the Chinese market alone
Ford	6,3	0,4 %	2025: **~1 million BEV/PHEV**	Ford plans USD 4.5 billion investment in 13 New EV models by 2020. Ford estimates that 40% of Ford models will be electrified by 2020.
HONDA	4,9	0,0 %	2030: **BEV/PHEV at 75% of sales**	Honda wants partially or fully electric vehicles to account for two-thirds of global sales by 2030. Plug-ins and hybrids would likely account for about half of sales in 2030, and BEVs will account for 25%. Plans to introduce BEV model in China in 2018

Source: Source: Rystad Energy Oil Market Analytics, Company reporting

China will lead electric vehicles penetration, followed by US and OECD countries

BEV and PHEV sales by country in "Producers targets" scenario
Million units



- Together, global vehicle manufacturers currently guide annual sales at 14 million BEV (13% of global sales) and 7.6 million PHEV (7% of global sales) by 2025.
- Chinese vehicle manufacturers guide aggressive sales numbers of 4 million battery vehicles by 2020
- PHEV sales will be absorbed by current market leaders: U.S. and Japan. Nevertheless, current producers' guiding infers that increasingly more sales will land in developing countries (light grey area in the chart) and in India.
- Manufacturers' targets are aggressive. Meeting these targets requires significant production capacity re-scaling/construction.

Source: Source: Rystad Energy Oil Market Analytics

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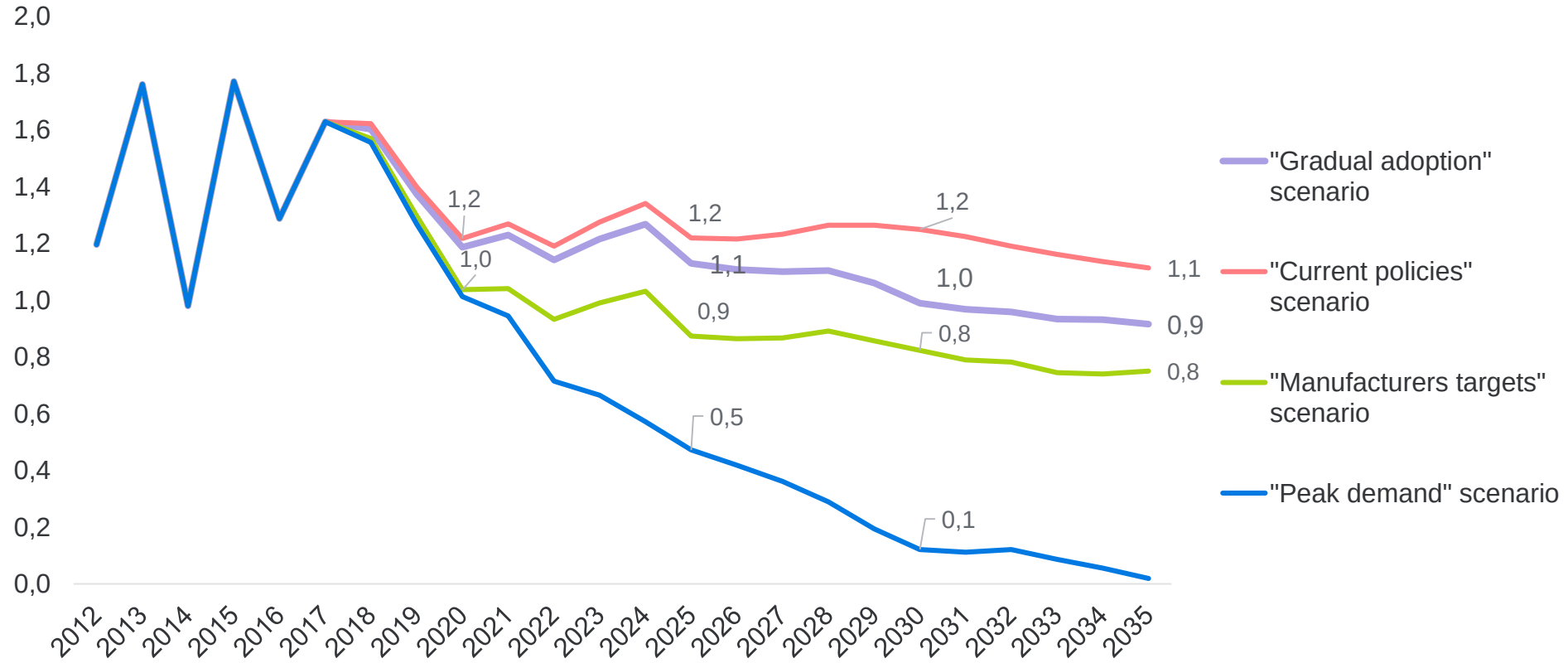
100% BEV penetration in sales in core OECD by 2025 and 50% in India/China cause peak demand only by 2035

- Manufacturers targets scenario: Battery electric vehicle sales at 14 million units by 2025 (13% of global vehicle sales), Plug-in hybrid electric vehicle sales at 7.6 million units by 2025 (8% of global vehicle sales).
- Peak demand scenario: 100% BEV penetration in sales in core OECD by 2025 and 50% in India/China cause peak demand only by 2035. In this scenario BEVs account for all new vehicle sales in OECD Europe by 2025, in the US – by 2030, and by 2040-2050 in India, China and Rest of the World.

Demand growth in Rystad Energy current policies scenario and various EV adoption scenarios
Million bbl/d



Source: Source: Rystad Energy Oil Market Analytics

Summary

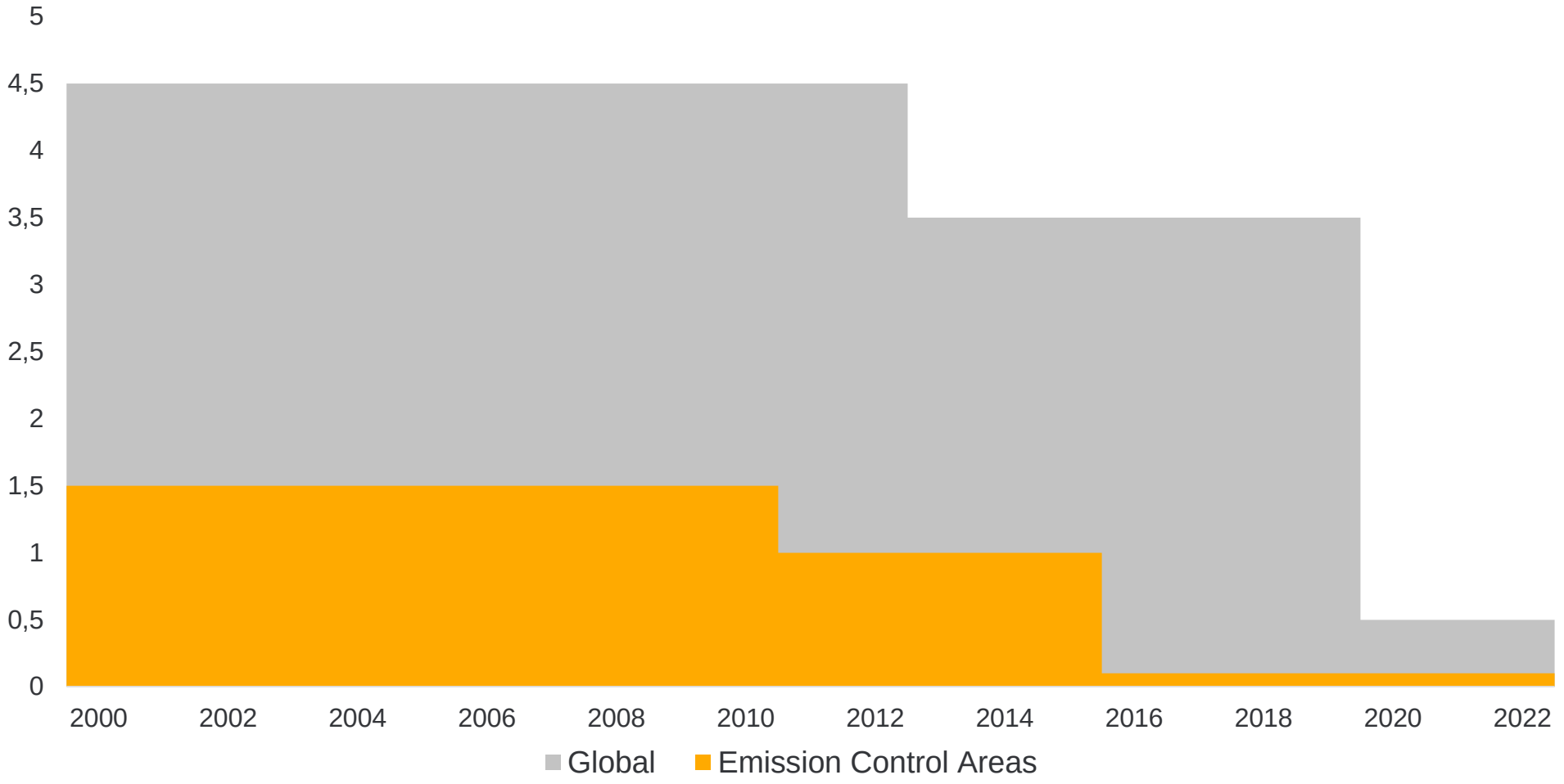
Global oil demand overview

Electric transportation and effect on global oil demand

New IMO 2020 Sulphur regulations and effect on global oil demand

IMO is drastically reshaping future oil demand by introducing new MARPOL sulphur regulations

Bunker Fuel Sulphur Limits
Percent (expressed in terms of % unit mass)



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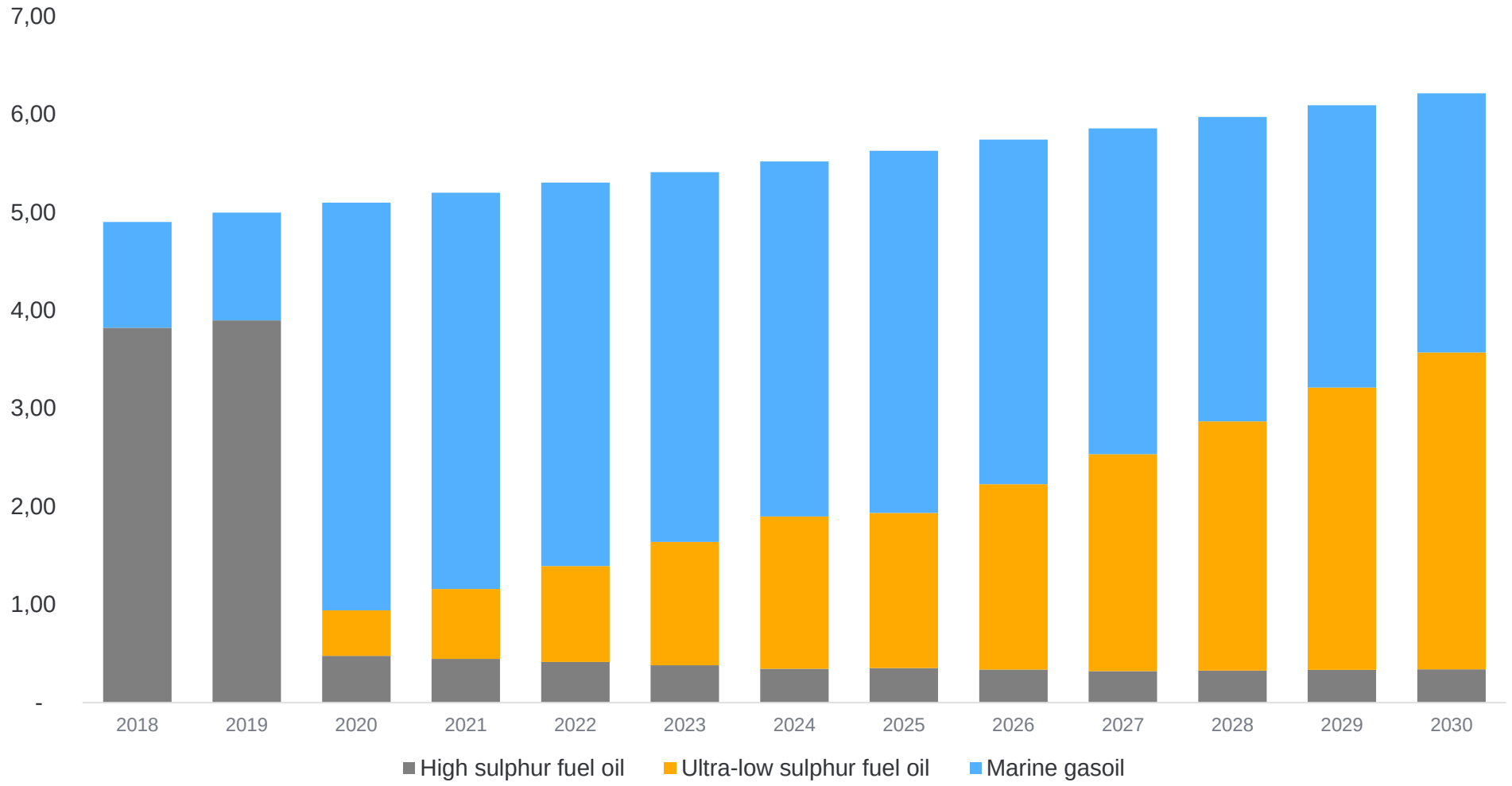
IMO regulations force shipping industry into compliance by increase marine gasoil consumption

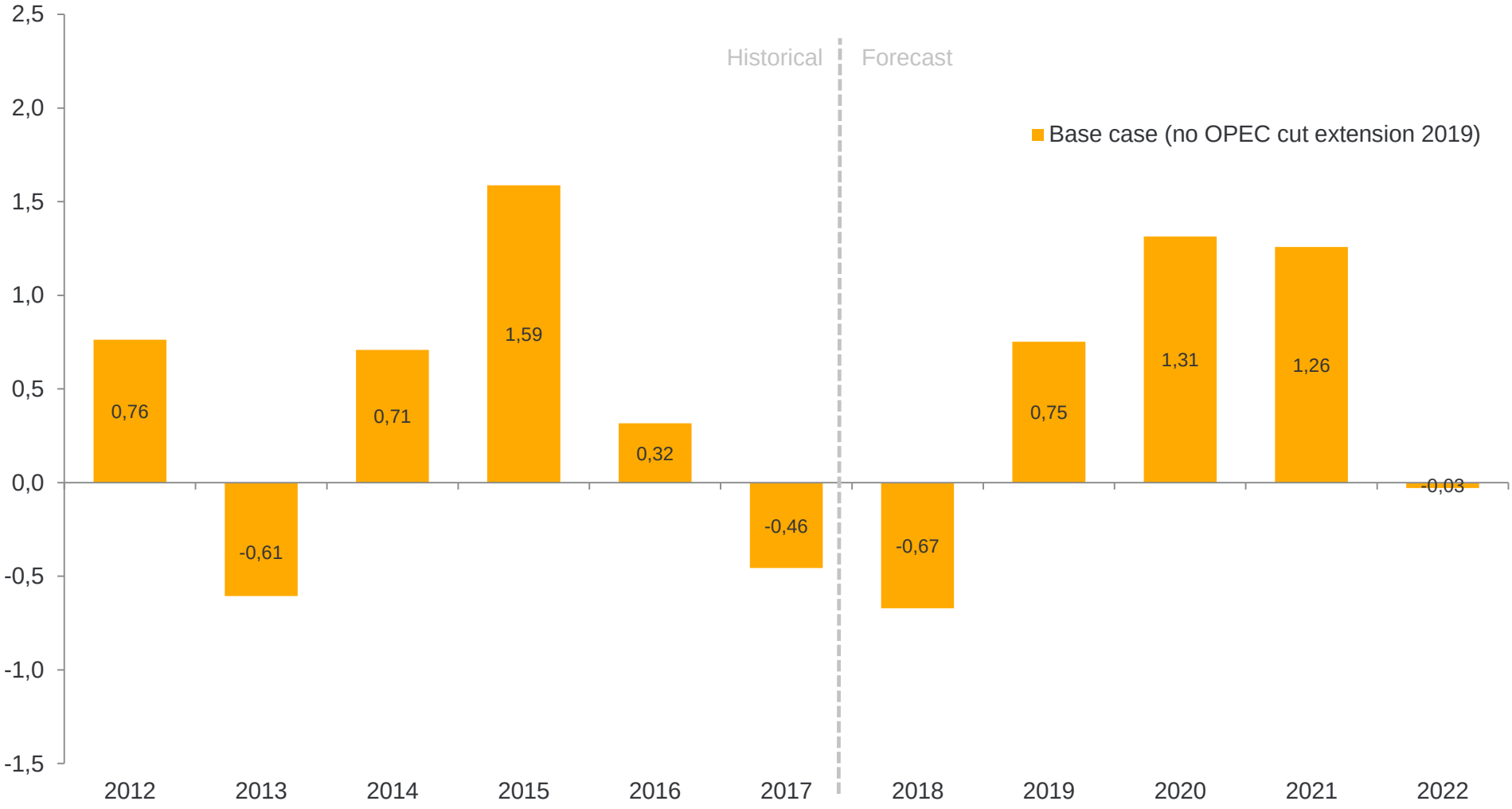
Marine fuel demand by product type
Million bbl/d



* Natural stock build means the amount of inventory build necessary to keep global inventory flat in terms of days of demand (as demand grows).
Source: Rystad Energy research and analysis, OilMarketCube

Substantial imbalance in the market in ‘20-‘21 if effects of IMO Sulphur cap are not accounted for

World liquids supply-demand balance
Million bbl/d



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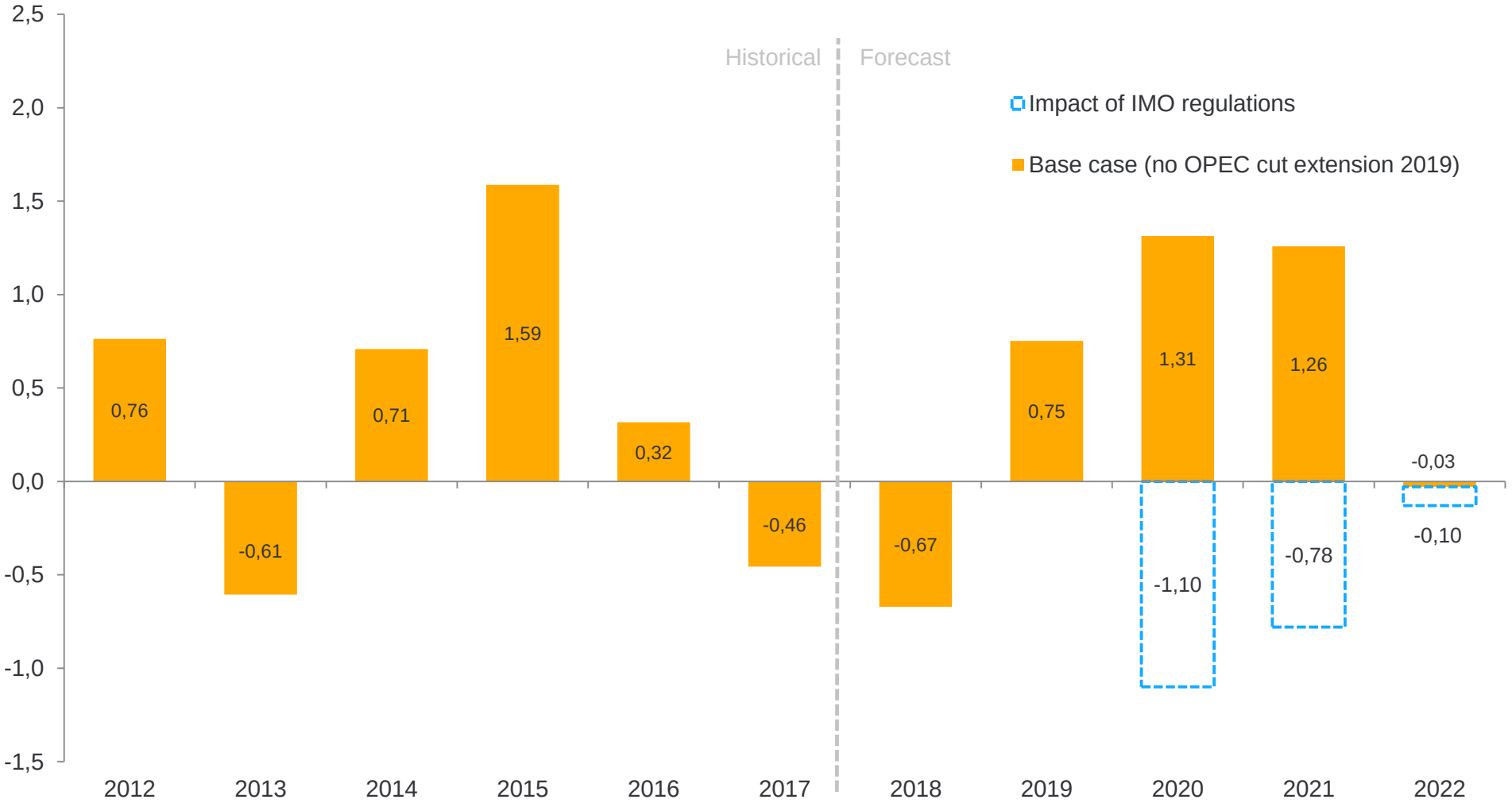
IMO sulphur regulations can result in additional refinery runs and balance the market in ’20-’21

World liquids supply-demand balance
Million bbl/d



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