

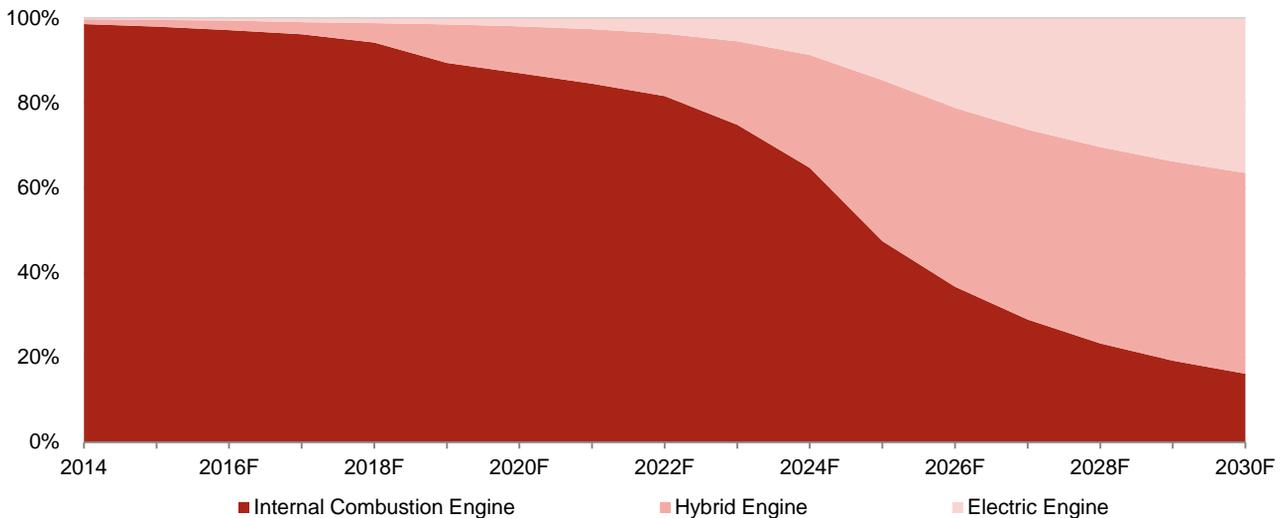
By 2030, every third new registered car in the EU could be an electric car

Current market forecast and scenario outlook

By 2028, more electric vehicles than conventional combustion engines could be delivered to customers within the European Union. New structures, regulatory requirements, and incentives push a reluctant market forward towards mass electrification.

EU: Share of Drive Variant of New Light Vehicle Registrations

2014 – 2030F



Source: Autofacts Analysis

On the road to CO₂ emission-neutral mobility

In December 2015, 195 UN member states agreed on limiting global warming to 2 degrees. In order to achieve that goal, the member states committed to a “climate neutral” economy from 2050 on. This target applies to all emitters in operation, not just the newest ones sold in that year – so by 2050 the entire automotive parc would have to be replaced by GHG-neutral vehicles. Given current average scrapping ages and parc build up, that process could take up to 20 years – making 2030 a logical target year for fully GHG-neutral new car sales. In light of these requirements, PwC Autofacts has developed a long-term scenario analysis on the future development of powertrain mix in the EU. In 2015, 98% of all new light vehicles in the EU were driven by conventional combustion engines. PwC’s calculations suggest

that by 2020, their share will decrease to 87%, by 2025 they will make up less than 50%, and by 2030, conventional combustion engines will only account for a relatively low 16%. On the other hand, electric vehicles, currently at a market share of 0.4%, could potentially surpass the share of conventional combustion engines by 2028 for the first time and are expected to continue to increase to 37% by 2030. Underlying assumptions include a continued pressure from national governments towards the COP21 goals, and the installation of required infrastructure such as public charging points. Mild, full, and plug-in hybrids are regarded as a transitory technology and play an important role for the auto industry to achieve emission targets. By 2030, they are likely to account for a share of 47%.

Mild-Hybrids drive the e-evolution

According to the analysis, the breakthrough of alternative powertrain technologies will likely take place in two stages. For the next few years, smaller technological advancements are foreseeable, such as increasing adoption of 48-Volt electric systems, allowing the use of cost-efficient hybrid technologies without expensive high-voltage engineering. This technology enables the use of electric motors with up to 15 kw performance as mild hybrid. The electric motor is used in two ways: First, it serves as a booster which provides additional torque.

Additionally, it serves as a generator to recuperate energy while braking. In both cases, the electric motor helps to reduce fuel consumption. Currently, approximately one out of every 100 new cars sold in the EU is a mild hybrid. By 2020, however, this share is expected to increase to 8%. Another five years later, the share could peak at 25%, before gradually declining afterwards as the market enters the next stage where fully electric vehicles are assumed to substantially grow in numbers.

Governments push e-mobility

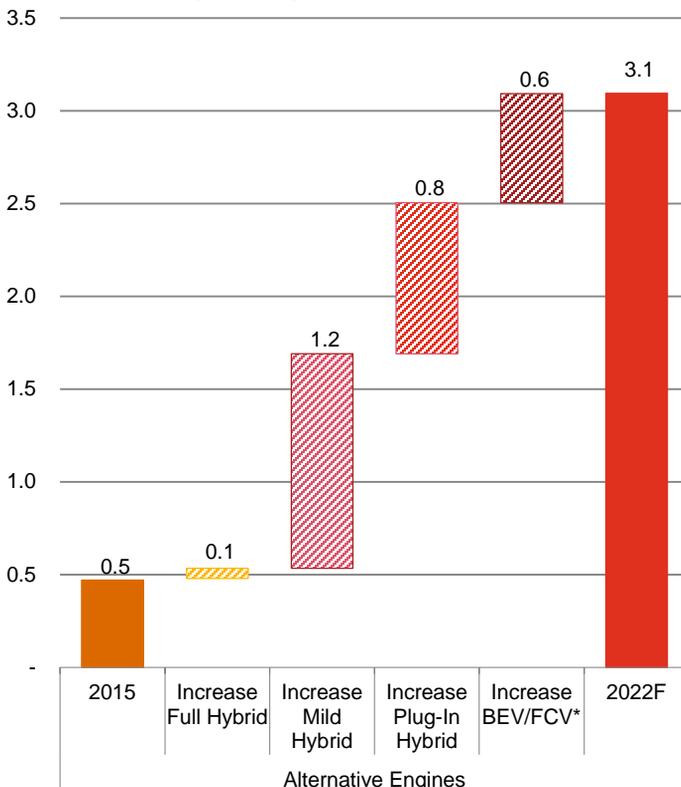
Politics play an important role in the progress of e-mobility. Besides the introduction of the new Worldwide Harmonized Light Vehicle Test Procedures (WLTP,) which will replace the current

New European Driving Cycle (NEDC) test in the EU after 2017, national governments along with regional and local authorities have a great influence on the development of e-mobility. Political measures range from national government subsidies – such as the environmental bonus – to local bans of combustion engines. These measures are motivated by climate issues along with a hope to improve air quality in highly polluted cities and urban areas. Consumers are expected to comply as their mobility needs require, and as alternative technologies become more affordable due to increasing industrialization effects.

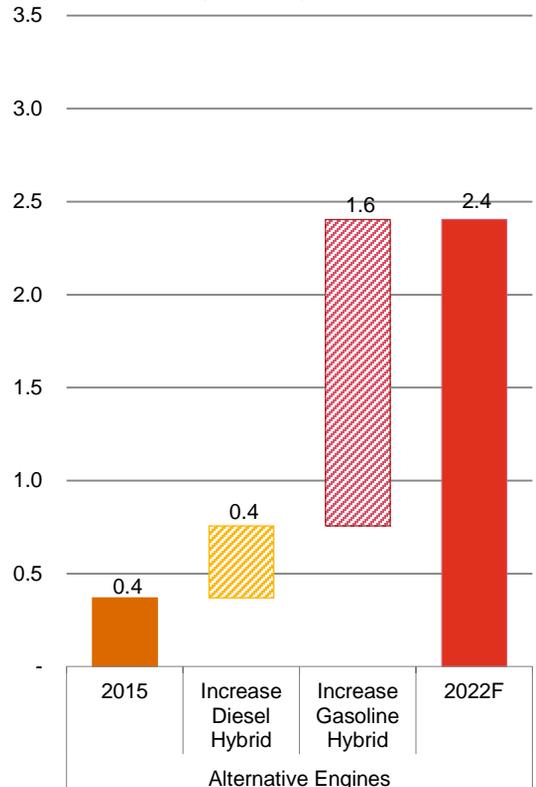
Alternative drivetrains grow short-term

Automakers are continuously expanding their product portfolios, especially with electrified vehicles including mild, full, and plug-in hybrid models. Based on OEM's product announcements and supplier plans, Autofacts forecasts alternative drivetrains to grow five-fold in the EU region, equivalent to 2.61m units, reaching up to more than 3.09m units by 2022. Plug-in hybrids and battery electric engines are forecasted to contribute the most (55.8%) to that particular growth rate. Additionally, gasoline-hybrids are expected to hold the majority (81.3%) of the hybrid market by 2022.

EU: Alternative Engine Type Distribution
2015 vs. 2022F (millions)



EU: Hybrid Distribution**
2015 vs. 2022F (millions)



Source: Autofacts 2016 Q4 Forecast Release, *BEV = Battery Electric Vehicle, FCV = Fuel Cell Vehicle, **excl. BEV/FCV