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How does regulation drive electric vehicle penetration?

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Increasing EV penetration is a key action to help reduce Emissions

Emissions regulation is a global topic which has gained additional support following the Paris Agreement (2015) aimed at achieving net zero GHG emissions by 2050. Globally, transport represents ~16% of total GHG emissions. In the US, the EPA reports that the sector represents an estimated 28% of its emissions, with light-duty vehicles and medium/heavy duty trucks accounting for 59% and 23% of that total, respectively. Estimates for China vary, but they are in the range of 7-10%. In Europe, it is estimated that passenger cars and vans represent ~15% of CO_2 emissions.

Since 2015, China has increased its penetration of BEV's (battery electric vehicles) from 0.6% to 4.6% in 2020, while Europe has raised the level from 0.5% to 5.0% over the same time period (see figure 2). The US percentage remains low arguably because of lack of regulation and infrastructure limitations, though the rate did more than double from 0.4% to 1.2%.

Europe and China also have infrastructure limitations, but they already have clear regulatory frameworks with ambitious reduction targets which should continue drive EV adoption higher, with penetration levels expected to be double digits by 2022. Under Biden's administration in the US, there will be more support. His infrastructure plan should help, though more details and incentives are needed to effect meaningful change.

Below, we discuss some of the key regulation introduced in China and Europe to support EV penetration.

China has been supportive of EV adoption

In order to lower emissions and improve its air quality, especially within cities, China implemented a strict NEV (new energy vehicle) rule. Note that NEVs include both Battery Electric Vehicles (BEV) and Plug in Hybrid Vehicles (PHEV), as well as vehicles powered either by fuel cells or light natural gas. Companies that don't meet these percentage thresholds can buy credits from competitors who over comply.

> "Using a phased approach, China will raise the NEV target 2pts each year to 20% by 2025, with the average fuel economy not exceeding 4 liters per 100km for passenger cars."

In 2019, China's NEV target for an auto manufacturer stood at 10% requirement (to make or import vehicles). China policy dictates annual percentage targets for NEVs, which is calculated by credits and not purely NEV % unit sales. Using a phased approach, China will raise the target 2pts each year to 20% by 2025, with the average fuel economy not exceeding 4 liters per 100km for passenger cars.

Figure 1: NEV credit system in China

NEV credit points = ICE volume x NEV credit point ratio →

2019	2020	2021	2022	2023
10%	12%	14%	16%	18%

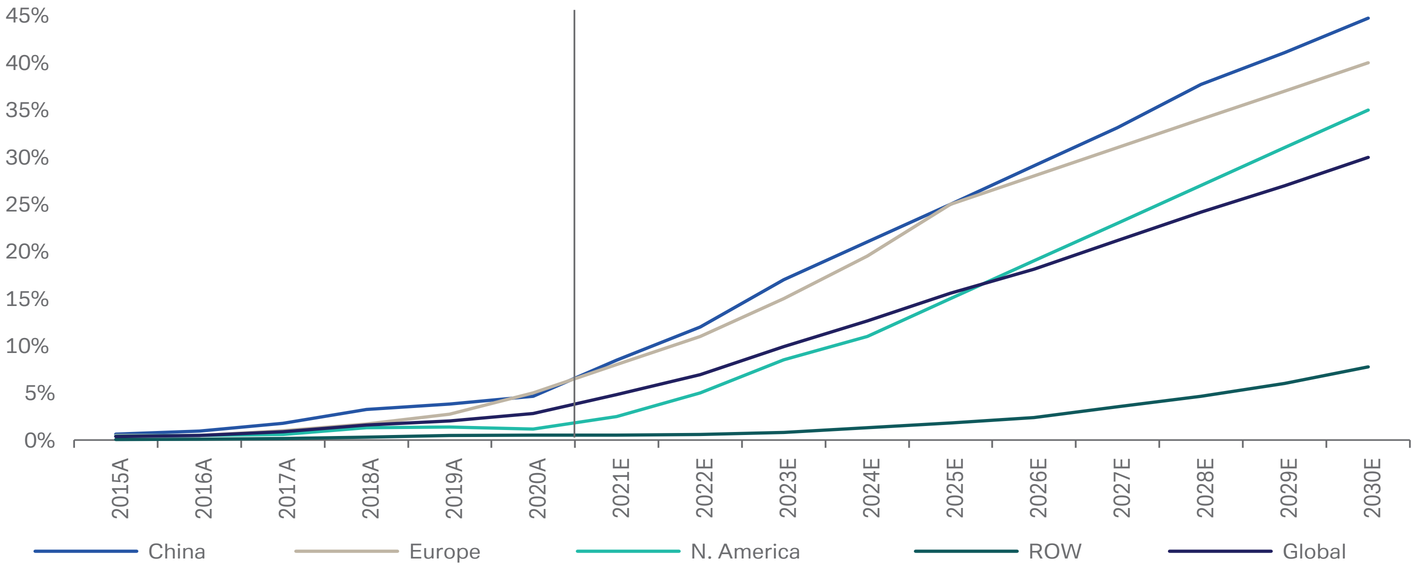
Example: 1m ICEs need 12% quota in 2020 = 120,000 NEV credit points

Assuming 3 NEV credits per NEV would require 40,000 vehicles

Note: New energy vehicles (NEVs): plug-in electric vehicles eligible for public subsidies such as battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs) and fuel cell electric vehicles (FCEV). Source: Deutsche Bank, T&E, CAAM

NEVs are assigned a specific number of credits depending on the range, energy efficiency, ownership type and benchmarking levels. Under this scheme a very efficient BEV can achieve up to 6 NEV credits. Assuming that all OEMs (autos original equipment manufacturer) achieve on average 3 NEV credits per vehicle, the market share of NEVs would be at 4% in 2020 and the industry would still meet the 12% target for this year. For 2021, the NEV target was raised to 14% and will be further increased to 16% in 2022 and 18% in 2023. It is possible to trade NEV credits among OEMs. At the same time, local governments are implementing more restrictive license plate policies (e.g., Shanghai) that greatly favor EVs which we think will be common practice in most Tier-1 cities in the near future. The chart below shows historical electric vehicle penetration level by region and Deutsche Bank's forward looking estimates.

Figure 2: Battery Electric Vehicle (BEV) Penetration (%)



Source: LCM, Deutsche Bank Estimates

Europe has the most ambitious targets

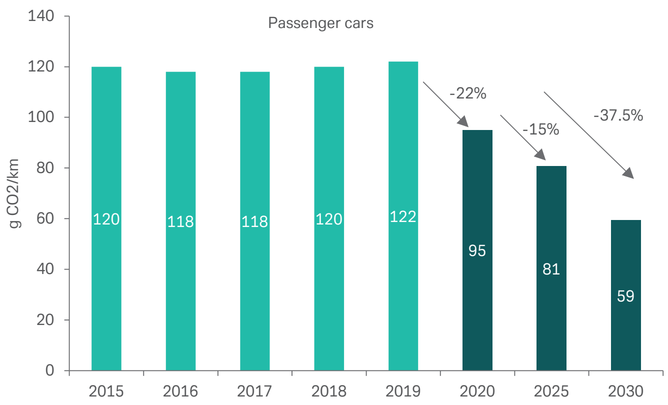
The average level of emissions for new cars registered in 2019 in the EU, Iceland and Norway was 122.4 g/ CO_2/km. Under EU standards for 2021, the average emission target (per OEM fleet) for new passenger cars is 95 g CO_2/km. For context, this level implies fuel consumption of ~4.1 l/100km of petrol or 3.6 l/100 km of diesel. At present, if the average CO_2 emissions of a fleet exceed the stated target, there is a penalty is €95 per extra g/km per vehicle in a given year. Missing these standards can have a meaningful financial impact on producers. For example, in 2020, Volkswagen "narrowly" missed the target resulting in more than E100M in fines. In April 2019, the EU parliament and the Council introduced the first CO_2 emission standards for passenger cars and vans for 2025 and 2030, with a phased in approach. In 2025, the g/km standard will decrease by 15% and then decrease again in 2030 for a 37.5% reduction from 2021 levels.

Note: The specific emission targets for manufacturers to comply with, are based on the EU fleet-wide targets, taking into account the average test mass of a manufacturer's newly registered vehicles.

Supercredits. For passenger cars emitting less than 50 g/km of CO_2, OEMs are getting super credits in order to promote highly efficient vehicles. For 2021, the super-credit weight factor is 1.67 cars. The factor will move to 1.33 cars in 2022 as part of a phased in approach. This means that for every vehicle emitting less that 50 g/km, it will count as 1.67 cars when the fleet average is calculated with a capped benefit of 7.5 g/km per manufacturer over three years.

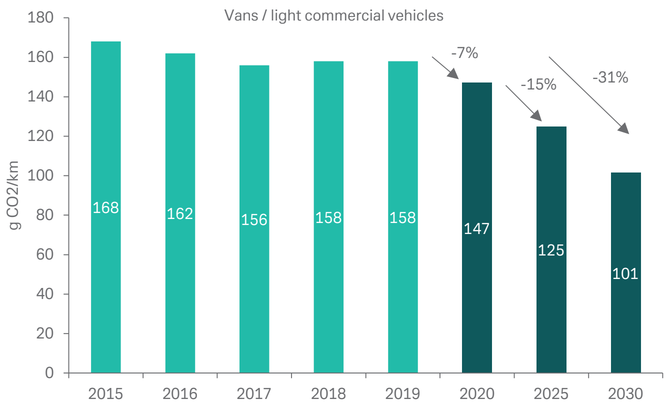
Eco innovations. This refers to technologies that cannot be measured in the National Emissions Ceilings Directive (NEC Directive) test cycle but have a clear CO_2 savings potential (for example, solar roofs, waste heat recovery, etc.). Eco innovations can be offset against the fleet average up to a maximum of 7 g/km of CO_2.

Figure 3: Current CO2 emissions have to decrease by ~30% until 2030 for light commercial vehicles



Source: Deutsche Bank, ICCT

Figure 4: Current CO2 emissions have to decrease by ~40% until 2030 for passenger cars



Source: Deutsche Bank, ICCT

After hitting the speed bump in January, registrations of BEVs and PHEVs are now back to growth on a m/m basis and continues the 10 month streak of consecutive y/y growth albeit still far below 2020 exit run rates. In the top 5 European markets, BEV regs rose by 43% in February, off a rather challenging base, to reach a market share of 6%. This should be still somewhat dampened by incentives that ran out at the end of 2020 and a related pull forward effect. PHEVs have more than doubled again (+141%) in February, after tripling in Feb-20, and reached a market share of 8.5%. With that, electrified vehicles (BEV+PHEV) comfortably keep a double-digit market share in Europe and we expect the market share expansion to continue. Growth rates are likely to accelerate in Q2 reflecting the weak base in 2020 but should normalize in H2.

What else to note? When thinking about growth potential of BEV and PHEV models in Europe there are several things to keep in mind. The number of models available should notably increase in 2021 and hence help the BEV/PHEV adoption. Working against this is the fade out/step down of incentives in certain countries for electrified vehicles as well as the base effect in 2020. While the base was not that easy to beat in Q1, it looks soft in Q2 and becomes incredibly tough to reach in H2. The latter is obviously due to government incentives showing effect as well as OEMs pushing electrified vehicles in order to meet CO2 targets. Ambitions to comply with the regulatory set limits have not diminished and hence there needs to be a sizable uptick in BEV and PHEV registrations, but the question remains when the kicker will hit. We would not rule out seeing overall volumes declining in one or the other months before OEMs start to move strongly again towards year end.

Some US OEMs are becoming more aggressive with their targets

At present, there are not that many compelling EV offerings in the US relative to China/Europe (Tesla had nearly 80% market share in 2020 without any credit help since it already hit the limit, materially outselling other automakers who still have the tax credit). There is also a battery cell shortage in the US which is limiting production and this cannot really be fixed within a year or two. Biden's infrastructure plan calls for $174B of investment focused on helping auto makers secure materials for production/retooling facilities, revamping consumer tax incentives for “American-made” EV purchases, and building a national EV charging network with 500k chargers by 2030. Our autos team believe these proposals will certainly support longer term adoption but the near-term benefit will likely be limited.

In the US, the bulk of high volume EV offerings will be released in 2023-24 and targeted incentives combined with improving charging infrastructure should enable faster penetration. In fact, some US OEMs have just recently announced plans to focus on emissions reductions, which is largely driven by increased EV production. This should in part also be attributable to a shift in tone (and potential policy) from the new administration.

Other Government Incentive Programs

In Europe, almost any country had or still has an incentives program for promoting EVs. One of the most pronounced ones is in Germany including purchase incentives and tax benefits as can be seen in the table below:

Figure 5: Overview of German EV tax benefits

Tax Benefit			Purchase Incentives
Acquisition	Ownership	Company Cars	
Until the end of 2020, temporary VAT reduction from 19% to 16%	10-year exemption for BEVs and FCEVs registered until the end of 2020	Reduction of the taxable amount for BEVs and PHEVs (from 1% to 0.5% of the gross catalogue price per month). Additional reduction of the taxable amount for BEVs with a gross list price of up to €60,000 (from 1% to 0.25% of the gross catalogue price per month). No time limit announced	Until the end of 2025, an 'innovation bonus' temporarily increases the environmental bonus for new and used BEVs, PHEVs and FCEVs. Applies to all eligible vehicles: *Bonus for cars with net list price ≤ €40,000: - €9,000 for BEVs and FCEVs. - €6,750 for PHEVs. *Bonus for cars with net list price > €40,000: - €7,500 for BEVs and FCEVs. - €5,625 for PHEVs.

Source: Deutsche Bank, ICCT

Late last year, the UK announced a 2030 ban on the sale of petrol and diesel cars. While this effort has been applauded by climate activists, there is skepticism that a prudent charging infrastructure can be built to support the policy. A decade ago the UK offered a 5K GBP subsidy for electric car vehicles. The subsidy has come down to 2.5K GBP today, with a 35K cut off. Most car manufacturers have argued that the subsidy isn't supportive of a carbon neutral effort.

CO2 regulation: EU aims for ethically-sourced cobalt, a key battery metal

Cobalt is the battery metal at the highest risk of being exploited in ways that damage the health of people and the environment. Most of the world's supply comes from the Democratic Republic of Congo (producing about three-fifths of the world's cobalt) with as much as a third of that supplied by small-scale miners employing hundreds of thousands of freelancers who often work in dangerous conditions.

Some Chinese companies that sell processed cobalt to Europe mix certified streams of the metal with material sourced from unregulated mines.

“If, as proposed by the European Commission, due diligence on cobalt supply chain will be mandatory for batteries sold in the EU markets in the near future, the demand for responsibly sourced cobalt will increase rapidly,” the study prepared by the EU's Joint Research Centre said.

But those “ambitious requirements might currently be too difficult,” according to an assessment prepared by researchers advising the European Commission. The report, which will be published by Elsevier's Resources Policy journal in June, suggests a tightening market for responsibly-sourced cobalt.

Next to minerals exploration and EV batteries recycling also a reduction in the use of cobalt, driven by substitution efforts, should help bridge the gap between supply and demand.

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