

# Bonus-Malus Vehicle Incentive System in France

## Fact sheet

*for:*

### **Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)**

On behalf of:



of the Federal Republic of Germany



*by:*

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The information and views set out in this study are those of the author(s) and do not necessarily reflect the official opinion of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

This study is based on a policy paper with an overview of greenhouse gas emission reductions and policy instruments in non-ETS sectors across Europe (hereafter referred to as 'Policy Paper'). The Policy Paper can be downloaded from the EUKI website.

## ABBREVIATIONS

BEV	Battery Electric Vehicle
CO <sub>2</sub> e	Carbon dioxide equivalent
ETS	Emissions Trading System
EU	European Union
EUR	Euro
EV	Electric vehicle
GDP	Gross domestic product
GG	Basic Law for the Federal Republic of Germany ('Grundgesetz')
GHG	Greenhouse gas
KraftStG	Motor vehicle tax act (,Kraftfahrsteuergesetz')
NAPE	German National Action Plan on Energy Efficiency
PHEV	Plug-In Hybrid Electric Vehicle
TFEU	Treaty on the Functioning of the European Union
TPES	Total Primary Energy Supply

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## 1 SUMMARY

Under President Emmanuel Macron who became the French President in May 2017, France confirmed its leadership role on climate change issues. In addition to an accelerated coal phase-out, the government announced that it will ban the sale of petrol and diesel vehicles from 2040 onwards. In the near term, emissions from the transport sector shall be reduced further through stricter rules for the Bonus-Malus Vehicle Incentive System and a new 'super malus' for the least efficient vehicles. Diesel taxes are also rising in France to further incentivise diesel drivers to switch to petrol, hybrid, or electric cars. The carbon tax, which mainly covers the transport, industry and buildings sectors, is already among the highest in the world and is scheduled to increase steeply in the coming years.

The Bonus-Malus System is one of the main climate policy instruments in the French transport sector and has successfully contributed to reducing average passenger car emissions since its implementation in 2008. The scheme uses revenues from fees for emission-intensive vehicles to finance bonus payments for electric vehicles (EVs) to incentivise the car purchase decision. Various modifications over the years have helped to ensure the scheme's effectiveness and balance the revenue stream. In 2018, a fee must be paid for vehicles with CO<sub>2</sub> emissions equal to or above 120 g/km. The bonus for EVs is currently at EUR 6,000, whereas hybrid vehicles are no longer eligible for any bonus payments as the market has matured in recent years. However, the French government is currently confronted with the challenge to further decrease average new passenger car emissions and to encourage the sale of more EVs. While average vehicle emissions have decreased by 25% since the launch of the scheme and despite strong growth during the last years, EVs still only had a share of 0.4% in the passenger car stock in 2017.

A success factor of the scheme has been the support by the French automotive industry that welcomes the bonus payments and recognises that the bonus is financed by the malus fees. In contrast, consumers often do not understand how the scheme works and how it relates to air quality measures for passenger vehicles. However, a combination of the Bonus-Malus System with air quality criteria remains challenging, as the scheme is designed to be technology neutral, meaning that it does not differentiate between petrol and diesel vehicles.

The implementation of a similar scheme in Germany could build on the country's existing bonus scheme ('Umweltbonus'). Taking into account the numerous co-benefits, it would be a useful policy tool to reduce emissions in the German transport sector. However, considering that the sector emitted 171 million tonnes CO<sub>2e</sub> (MtCO<sub>2e</sub>) in 2017, the relatively low size of the potential emission savings by such a scheme of around 1.0–2.5 MtCO<sub>2e</sub> in 2030 in the German context implies that it would need to be combined with further measures in the sector to help achieve the effort sharing targets. Nonetheless, implementing a Bonus-Malus System in Germany could send an important signal to German consumers as well as to car manufactures and policy makers across Europe and beyond.

## 2 NATIONAL CONTEXT

### 2.1 National climate policy

France is striving to become ‘the number one green economy’. The country’s greenhouse gas (GHG) emissions per capita are already below the European Union’s (EU) average and more than a third lower than Germany’s (Eurostat, 2017). Since the late 1990s, France has fully decoupled CO<sub>2</sub> emissions and primary energy supply from economic and population growth (Figure 1).

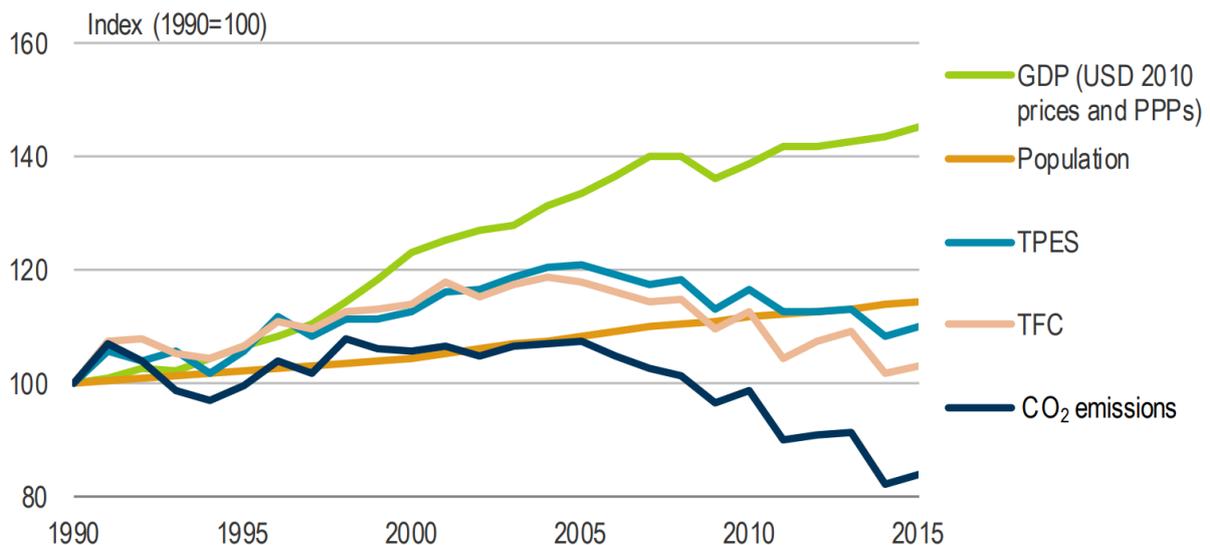


Figure 1: CO<sub>2</sub> emissions, population and GDP in France, 1990–2015 (IEA, 2016); TCF stands for Total Final Consumption and TPES for Total Primary Energy Supply

The carbon intensity of the French economy has been declining rapidly in recent years, largely due to the reduction in industrial demand, greater energy efficiency and the decreasing reliance on fossil fuels. Of particular relevance is that almost three quarters of the generated electricity comes from nuclear power plants (Figure 2) — the highest share in the world. Renewables, dominated by hydro power, currently have a share of 19%, but this share is projected to rise to 40% by 2030 (Légifrance, 2015). The few remaining coal power plants, which currently have a 2% share of electricity generation, will be phased out by 2021 (Independent, 2018). The contribution of nuclear energy to the electricity mix was projected to decline to 50% by 2025, but the government is currently working towards a 2030 to 2035 timeframe to avoid increased GHG emissions and the risk of supply shortages (Reuters, 2017).

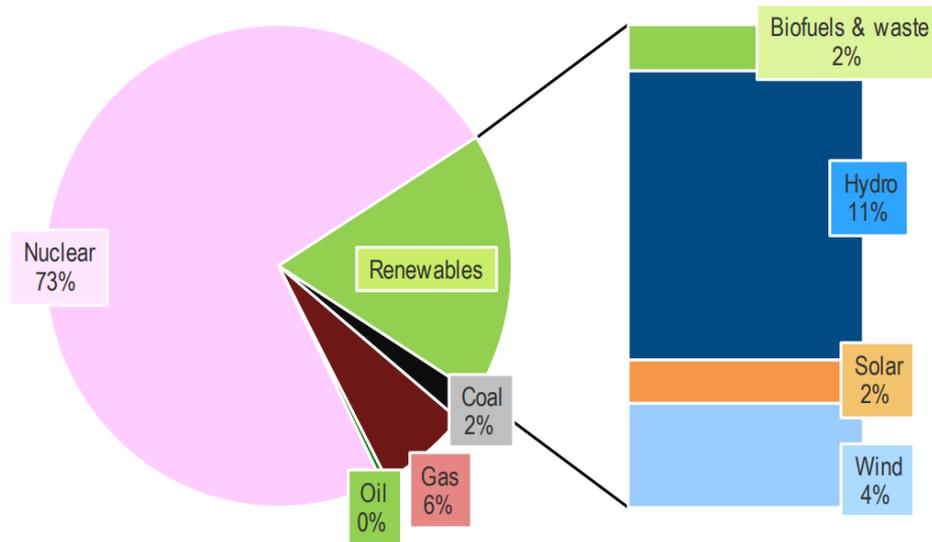


Figure 2: Electricity generation by source, 2015 (IEA, 2017)

In 2015, transport was the largest contributing sector (29%), followed by agriculture and buildings with a share of 17% each in French GHG emissions (Ministry for an ecological and solidary transition, 2017). Manufacturing and construction accounted for 11% of total GHG emissions, the industrial process sector for 10%, energy production for 9% and waste for 4%.

Since Emmanuel Macron became president of France in May 2017, addressing climate change has been high on his agenda. In addition to an accelerated coal phase-out, the government announced that it will ban the sale of petrol and diesel vehicles from 2040 (Ministère de la Transition écologique et solidaire, 2017). In the near term, emissions in the transport sector shall be reduced through stricter rules for the Bonus-Malus System (see section 4.3) and a new ‘super malus’ for the least efficient vehicles (see section 4.4). Diesel taxes are also rising by 2.3 cents per litre every year to bring the levy in line with that of petrol and to further incentivise diesel drivers to switch to petrol, hybrid or electric cars (The Connexion, 2017). In addition, the French government recently announced plans to subsidise the purchase of hydrogen-powered vehicles with a budget of EUR 100 million by 2023 (Bloomberg, 2018)

The carbon tax, which mainly covers the transport, industry and buildings sectors and is already among the highest in the world, increased from EUR 30.5/tCO<sub>2e</sub> in 2017 to EUR 44.6/tCO<sub>2e</sub> in 2018 and is scheduled to reach EUR 86.2/tCO<sub>2e</sub> in 2022 (World Bank and Ecofys, 2018). This increase is occurring at an accelerated rate compared to the initial trajectory outlined in the Act on Energy Transition for Green Growth in 2015.

France is also one of the main countries trying to raise climate ambition on the European level. In March 2018, France called on other Member States to adopt a regional carbon price floor of EUR 25 to EUR 30 per tCO<sub>2</sub> for power generators in the EU Emissions Trading System (ETS) to promote a shift away from coal and towards more climate-friendly fuels (Reuters, 2018). Furthermore, France wants to push the EU to increase ambition of its emission reduction targets under the Paris Agreement (Ministère de la Transition écologique et solidaire, 2017).

## 2.2 Sector context

With a share of 29% in total GHG emissions, the transport sector is the largest emitting sector in France and the level of emissions was higher in 2015 than in 1990 (Ministry for an ecological and solidary transition, 2017). Within the sector, road transport is the dominating source, accounting for 95% of the sectoral emissions. Although GHG emissions from road transport have declined substantially between 2005 and 2008, they have since remained relatively stable (Figure 3).

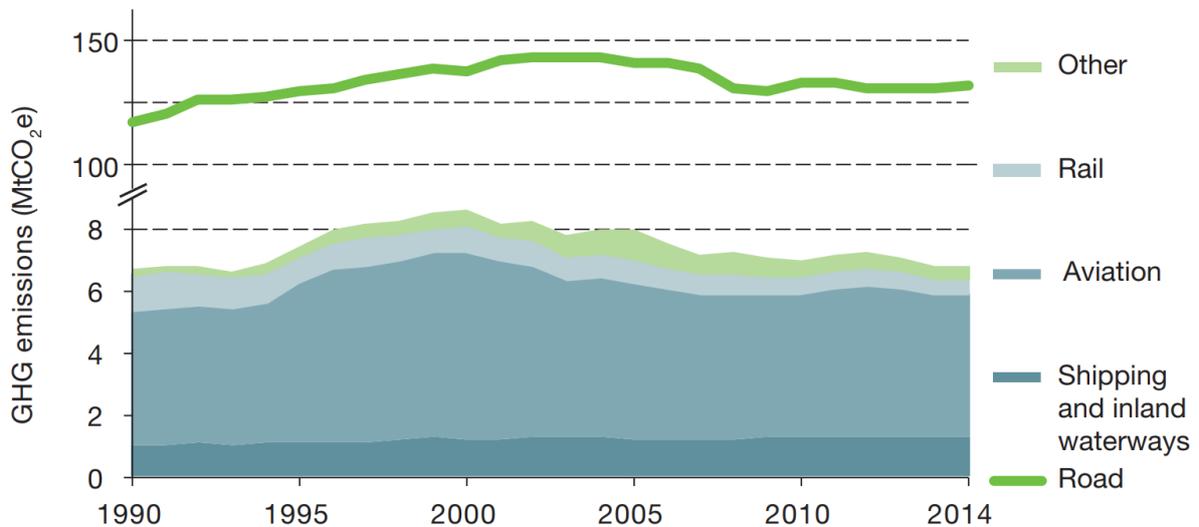


Figure 3: GHG emissions from transport in France; note: 2015 is labelled erroneously as 2014 (Ministry for an ecological and solidary transition, 2017)

France had 479 passenger cars per 1,000 inhabitants in 2016, which is slightly below the EU average of 505 cars/1,000 inhabitants and the German level of 555 cars/1,000 inhabitants (Eurostat, 2017). While petrol cars dominate the passenger car stock in the EU and in Germany, diesel cars account almost for two thirds of the car stock in France (ACEA, 2017). In 2000, diesel cars only had a share of 35% in all new vehicle registrations but increased to 73% in 2012 (IEA, 2016). In recent years, fewer diesel cars were sold, partly due to the ongoing diesel scandals of the automotive industry with regard to test cycles for pollutants, and accounted for 52% of new passenger vehicle registrations in 2016 in contrast to 47% in Germany (Eurostat, 2017). This share could further decrease due to government plans to bring diesel taxes in line with those of petrol (see section 3.1). In the petrol car segment, three out of four passenger cars had small engines (<1,400 cm<sup>3</sup>), whereas in Germany only every second petrol car had a small engine (Eurostat, 2017).

In 2017, electric vehicles (EVs)<sup>1</sup> had a share of 0.4% in the passenger car stock, but sales have been growing quickly in recent years (Ecofys and Navigant Research, 2018). Although there are as many EVs in France as in Germany, there are 50% more publicly accessible charging points in France. Given that France has one of the lowest carbon intensities of electricity in Europe (97 g/kWh of electricity supplied in France compared to 588 g/kWh in Germany), it also implies that French EVs have relatively low lifecycle CO<sub>2</sub> emissions (Moro & Lonza, 2017).

<sup>1</sup> This vehicle category includes Battery Electric Vehicles (BEVs), Plug-in Hybrid Electric Vehicles (PHEVs).

The French car industry is the third largest in Europe, producing almost seven million cars per year, out of which 80% are sold outside France (CCFA, 2017). The two major companies, PSA Group and Renault Group, had a share of 56% in the French vehicle market (CCFA, 2018). French car manufacturers had launched their first electric vehicles and their first rechargeable hybrids in 2012 (IEA HEV, 2013). Currently, the Renault Zoe is the all-time best-selling plug-in electric vehicle in the French market (AVERE, 2018).

Until 2028, GHG emissions in the transport sector are targeted to decline by 29% compared to 2013, according to the National Low Carbon Strategy (Ministère de la Transition écologique et solidaire, 2015). To achieve this target, the energy efficiency of vehicles shall be further improved, the uptake of low-emission vehicles accelerated, and the demand for mobility curbed through urban planning and measures such as carpooling. In addition, alternatives to private vehicles and modal shifts shall be promoted through instruments such as tax incentives for cycling, the development of public transport, and the shift of freight transport from road towards rail and waterways.

### 3 GENERAL DESCRIPTION OF THE POLICY INSTRUMENT

#### 3.1 History

The Bonus-Malus System was introduced on 1 January 2008. During the ‘Grenelle de l’environnement’, an environmental roundtable that took place in Paris in October 2007, it had been discussed as one of the main measures to lower the average CO<sub>2</sub> emissions of passenger vehicles from 176g to 130g CO<sub>2</sub> per kilometre (km) in 2020 (Ministère de l’Écologie et du Développement Durable, 2007). France was among the first countries to apply CO<sub>2</sub>-based fees and rebates for new vehicles simultaneously. Prior to 2008, France imposed vehicle purchase taxes largely based on the engine performance of cars (Federal Reserve Bank of Chicago, 2012).

Since its inception, the French government has adjusted the system multiple times. Figure 4 shows the evolution of the bonus or penalty depending on the vehicle CO<sub>2</sub> emissions per km from 2008 to 2017. Initially, the fee (malus) was charged to new vehicles with CO<sub>2</sub> emissions over 160 g/km, while a rebate (bonus) was provided to vehicles with CO<sub>2</sub> emissions below 130 g/km with discretely changing amounts based on the vehicle’s emissions rate. In the initial phase of the scheme, the bonus threshold was high enough for efficient fossil fuel cars to benefit from the scheme. However, the CO<sub>2</sub> emission levels at which the government starts to impose fees and provide rebates have decreased over the years, as have the CO<sub>2</sub> ‘steps’ between each category. Since 2017 a continuous function has been used to set the fee part of the scheme to provide an uninterrupted incentive to improve vehicle efficiency (ICCT, 2018). Besides, only electric and hybrid vehicles have been eligible for bonus payments as of 2017.

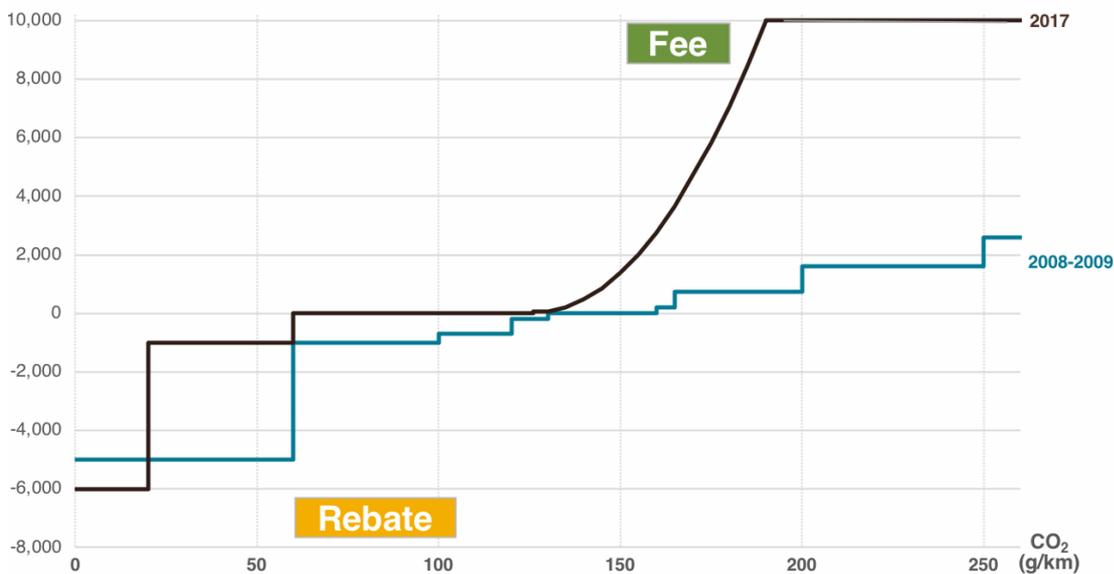


Figure 4: Evolution of the Bonus-Malus System from 2008 to 2017 (ICCT, 2018)<sup>2</sup>

<sup>2</sup> We thank Zifei Yang from the International Council on Clean Transportation (ICCT) for sharing this customised version of the figure with us.

## 3.2 Legal basis

The scheme has been introduced through the Amended Finance Act for 2007 (Law No. 2007-1824, Art. 63) and Decree No. 2007-1873 which came into force on 1 January 2008. In the following years, new decrees were published to strengthen the Bonus-Malus System. On 30 December 2017, Article 1011bis of the General Tax Code was modified by the Finance Act for 2018 (Law No. 2017-1837, Art. 51) to define the new fee levels for 2018. Similarly, the Decree on Aid for the Acquisition or Rental of Low-emission Vehicles (Decree No. 2017-1851) provided new provisions for the bonus payments.

## 3.3 Functioning

The Bonus-Malus System, also known as a feebate scheme, combines both fees and rebates for new vehicle purchases. For the registration of vehicles that have been purchased or rented (with an option to purchase or for a period of at least two years) a fee (malus) applies for vehicles with CO<sub>2</sub> emissions above certain levels. If the vehicle's CO<sub>2</sub> emissions are below certain limits, car buyers are entitled to receive a rebate (bonus). The scheme is designed to be revenue neutral, with malus revenues being used to finance the bonus payments.

In 2018, a fee must be paid for vehicles with CO<sub>2</sub> emissions equal to or above 120 g/km. At the threshold the fee is EUR 50, but the continuous fee function rises steeply to, for example, EUR 1,050 for 140 g/km and EUR 4050 for 160 g/km. For vehicles with CO<sub>2</sub> emissions equal to or above 185 g/km, car buyers must pay EUR 10,500. Vehicles specially equipped to run on E85 super ethanol can benefit from a 40% allowance on carbon dioxide emission levels if their CO<sub>2</sub> emission are below 250 g/km (Service Public, 2018).

As of January 2018, the bonus of up to EUR 6,000 (27% of the acquisition cost) is only granted for electric vehicles emitting less than 20 gCO<sub>2</sub>/km. Vehicles with emissions between 20 and 120 gCO<sub>2</sub>/km are not affected by the Bonus-Malus System, i.e. hybrid vehicles with emissions between 20 and 60 gCO<sub>2</sub>/km are no longer eligible for a EUR 1,000 bonus payment. The bonus is either directly granted to the buyer through a request form or deducted from the price of the vehicle where agreements with car dealers exist (Ministère de l'Environnement, de l'Énergie et de la Mer, 2011).

An additional bonus of EUR 1,000 (EUR 2,000 for non-taxable households) is granted when an old diesel or gasoline powered vehicle<sup>3</sup> is scrapped and a used electric or a more efficient internal combustion engine vehicle<sup>4</sup> is purchased (CEDEF, 2018). For new electric and plug-in hybrid vehicles the bonus is EUR 2,500.

Two- and three-wheelers as well as electric quads are eligible for a bonus of 20% or 27% of their acquisition cost (maximum EUR 100 or EUR 900), depending on their power. Besides, non-taxable households can receive a subsidy of 20% of the cost when purchasing electrically assisted bicycles.

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<sup>3</sup> Gasoline-powered vehicles produced before 1997 and diesel-powered vehicles produced before 2001 are eligible for the additional bonus.

<sup>4</sup> Vehicles must have either the Crit'Air 1 or 2 vignette (equivalent to Euro 5 and 6 standards as well as Euro 4 for petrol cars from 2006–2010) and must emit less than 130 gCO<sub>2</sub>/km.

### 3.4 Interlinkages with other policy instruments

Both fully electric and plug-in hybrid vehicles are eligible for either a 50% discount or are exempt from the license plate tax depending on the region (rEVolution, 2017). EVs are also exempt from the company car tax (ACEA, 2017). Hybrid vehicles emitting less than 110 g/km are exempt during the first two years after registration.

In addition to the existing malus, a 'super malus' was introduced in January 2018 to target luxury cars. Car buyers need to pay EUR 500 per fiscal horsepower<sup>5</sup> for powerful vehicles with more than 35 fiscal horsepower and the tax is capped at EUR 8,000 (CEDEF, 2018). In 2017, more than 1,700 vehicles were sold in this category (L'argus, 2017).

Incentives to buy more environmentally friendly vehicles are further reinforced by Crit'Air scheme that enables local governments to set up restricted zones to reduce local air pollution (Ministère de la Transition écologique et solidaire, 2018).

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<sup>5</sup> Since 1998, the fiscal horsepower is calculated from the sum of a CO<sub>2</sub> emission figure (over 45), and the maximum power output of the engine in kilowatts (over 40) to the power of 1.6.

## 4 IMPACTS OF THE POLICY INSTRUMENT

### 4.1 Effectiveness

The French Bonus-Malus System has been very effective in shifting the vehicle sales distribution towards more environmentally friendly vehicles (Figure 5) and thus decreasing the average emissions of new vehicles. While initially exceeding expectations, progress has slowed down in recent years<sup>6</sup>. In 2017, average emissions reached 111 gCO<sub>2</sub>/km, down from 149 gCO<sub>2</sub>/km in 2007 (ADEME, 2018). The current European target for emission levels from new vehicles sold is set at 95 gCO<sub>2</sub>/km by 2020. In addition, the scrappage bonus is likely to remove around 100,000 old vehicles from French roads according to the plans (Autovista Group, 2017).

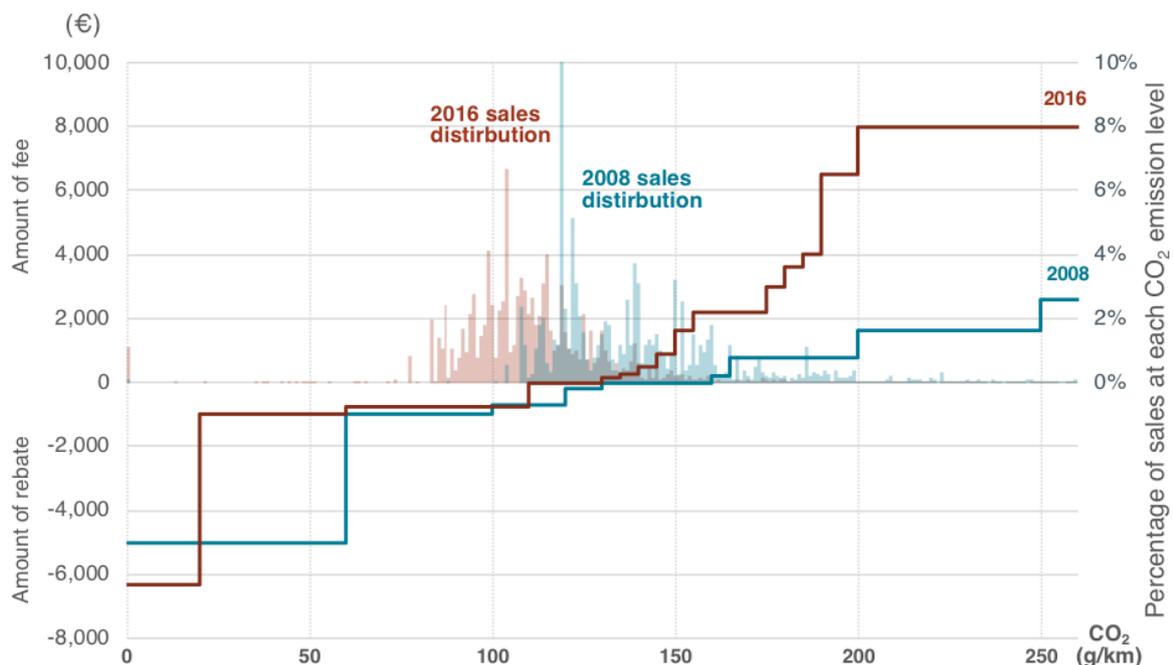


Figure 5: Development of fees and rebates and their impact on sales distribution (ICCT, 2018)

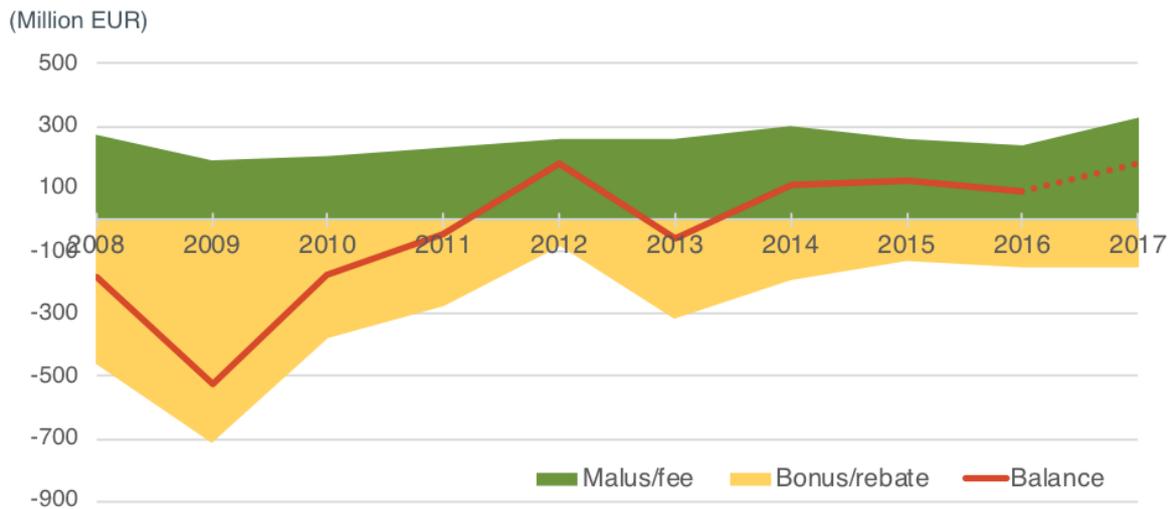
The impact of the policy on GHG emissions is difficult to isolate, also as a consequence of a rebound effect because lower fuel costs for consumers due to more efficient vehicles can increase total vehicle usage and petrol/diesel consumed. Based on projections of average annual km per vehicle and the number of new registrations in France, a study by the French Ministry of Ecology estimates that measures to improve vehicle performance of new passenger cars, including, for example, a CO<sub>2</sub> label for passenger cars, could lead to GHG emission savings of 5.4 million tonnes CO<sub>2</sub>e (MtCO<sub>2</sub>e) in 2020, 8.0 MtCO<sub>2</sub>e in 2025, and 9.8 MtCO<sub>2</sub>e in 2030 (Ministère de l'Écologie, du Développement durable et de l'Énergie, 2015). Compared to private vehicle emissions of around 66 MtCO<sub>2</sub>e in 2015, the impact of the scheme could be substantial considering that the Bonus-Malus System is likely to be the dominant driver of the reductions. However, these numbers also imply that additional measures would be needed to significantly reduce emissions in the transport sector in the future.

<sup>6</sup> We thank Cédric Messier from the French Ministry for an Ecological and Solidary Transition for insights shared during an expert interview on 19 June 2018.

## 4.2 Cost efficiency

Since 2014, the Bonus-Malus System has generated surplus revenues for the French general budget (Figure 6). For 2018, the malus has been set at a level that would cover the costs of the bonus payments (EUR 261 million) and the additional bonus for scrapped vehicles (EUR 127 million) (Sénat, 2018). However, the bonus payments exceeded the fee revenues during the initial phase of the scheme. During the first three years after the implementation of the scheme, the French government on average lost EUR 300 million per year, partly due to the fact that car manufacturers took advantage of the large steps between the bonus payment categories in earlier years (Figure 4 in Section 3.1) (ICCT, 2018).

As a consequence of various adjustments, the income stream has stabilised over time. If the levels and thresholds of the malus fees are adjusted regularly, the scheme can be highly cost efficient, as reducing CO<sub>2</sub> emissions does not create any net costs for the government. Consumers, whereas, are facing higher prices for fossil fuel cars but can benefit from the bonus for electric vehicles. Setting the right thresholds for the bonus and malus is, thus, crucial so that no excessive burden is placed on consumers while still generating sufficient revenues for the bonus. Car manufacturers are incentivised to invest further in developing more efficient vehicles and electric cars. Although this implies increased investment costs, it can increase competitiveness in the long run.



Note: Rough calculation, does not take account of separated bonus for hybrid vehicle from 2008 to 2014. 2017 budget balance is estimated based on 2016 fleet structure.

Figure 6: Revenue balance of the French Bonus-Malus System (ICCT, 2018)

### 4.3 Co-benefits and side-effects

The scheme helps to reduce fuel costs for consumers and dependency on fossil fuel imports. By promoting EVs, the Bonus-Malus System also contributes to improve local air quality in urban areas.

The introduction of the scheme also helped the French car industry to get through the economic crisis and establish a low carbon automotive industry (EY, 2010). However, car sales in general had reached their highest level since 1990 during the initial phase of the scheme as a result of the bonus elements (French Ministry of Ecology and Sustainable Development, 2011).

### 4.4 Success factors and challenges

The French government initially underestimated the incentives for new registrations, which led to an overall increase in car sales and high costs from the bonus payments at the start of the scheme. According to the government, it was also difficult to predict the developments on the demand and supply sides. New thresholds and levels are difficult to calibrate as they have to be negotiated between the Ministry of Ecology, the Ministry of Economy and the Ministry of Industry (Ministère de l'Environnement, de l'Énergie et de la Mer, 2011).

The instrument has been continuously adapted to meet efficiency and effectiveness criteria. Setting a continuous fee rate function as a basis for the malus fees has made it easier to predict market reaction based on elasticity of the purchase cost of vehicles (ICCT, 2018).

However, the French government is currently confronted with the challenges to further decrease average new passenger car emissions and to encourage the sale of more EVs. The government needs to find the right balance between a bonus that is just high enough to influence the purchase decision and a malus that generates sufficient revenues for the bonus, while at the same time avoiding placing an excessive burden on consumers<sup>7</sup>. Eventually, bonus payments could be phased out once the market is mature enough, as has been the case for the plug-in hybrid vehicles as a result of the scheme.

A success factor of the scheme is the support by the French automotive industry that welcomes the bonus payments and recognises that the bonus is financed by the malus fees<sup>8</sup>. In contrast, consumers often do not understand how the scheme works and how it relates to air quality measures for passenger vehicles. However, a combination of the Bonus-Malus System with air quality criteria remains challenging, as the scheme is designed to be technology neutral, meaning that it does not explicitly differentiate between petrol and diesel vehicles. While diesel cars benefit slightly more from the scheme due to their lower average GHG emissions, they cause more particulate matter emissions than petrol cars.

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<sup>7</sup> Insights shared during an expert interview with Cédric Messier from the French Ministry for an Ecological and Solidary Transition on 19 June 2018.

<sup>8</sup> Ibid.

## 5 TRANSFERABILITY

### 5.1 General comparability of the context

Two thirds of the current passenger vehicle fleet in Germany are petrol cars which tend to have larger CO<sub>2</sub> emissions than diesel cars (ACEA, 2017). The fact that Germany has more passenger cars per capita than the EU average further stresses the need for policy measures that transform the vehicle fleet (Eurostat, 2017).

Taking into account the current electricity mix in Germany, EVs already have a better carbon footprint than fossil fuel cars (BMUB, 2017). However, compared to France, the emission intensity of the power sector is six times higher in Germany. Consequently, a shift towards EVs leads to lower GHG savings, but over time the positive environmental impact will improve further as the electricity mix will rely more and more on renewable energy sources.

In general, the German automotive industry has lagged behind in the development of cleaner vehicles but must catch up to maintain international competitiveness. A bonus-malus scheme could provide further incentives for this transition.

### 5.2 Properties of the instrument

The Bonus-Malus System is easily transferable to other national contexts. The scheme is flexible and needs to be adjusted on a regular basis to ensure its effectiveness. The level of bonus payments and malus fees can also be adjusted with a view to revenue neutrality considerations.

The Bonus-Malus System could build on the existing environmental bonus ('Umweltbonus') for the purchase or lease of EVs in Germany that was launched in July 2016 and is administered by the Federal Office for Economic Affairs and Export Control (BAFA) (Bundesregierung, 2017). Car buyers receive a bonus of EUR 4,000 for fully electric vehicles and a bonus of EUR 3,000 for plug-in hybrids (with less than 50 gCO<sub>2</sub>/km). There are two conditions for receiving the bonus: First, since the government and automotive industry each contribute half of the bonus, only cars of participating car manufacturers are eligible. Second, the net basic list price (without additional equipment) of the car must be below EUR 60,000. In addition to private individuals, companies, foundations, corporations and associations are also eligible for funding. The bonus will be granted until the federal funds of EUR 600 million have been exhausted, but no later than July 2019. While the scheme is designed to support the purchase of at least 300,000 new vehicles, only 63,000 applications have been submitted as of June 2018 (BAFA, 2018).

A direct link of bonus and malus elements in Germany could be achieved by requiring a special levy on high-emission vehicles and by using the resulting funds to directly subsidise low-emission vehicles (dena, et al., 2018). Alternatively, the elements of the scheme could be linked indirectly by promoting environmentally friendly vehicles in general and increasing the taxation of environmentally unfriendly vehicles, e.g. by adjusting the limits of the 'Kraftfahrsteuer' in the respective law (§ 9 KraftStG).

The study by dena et al. also concluded that an impairment of the general principle of equality (Art. 3 GG), freedom of action (Art. 2 GG) and occupational freedom (Art. 12 GG) can be justified by environmental and climate action goals. By ensuring that the measure is technology neutral, compatibility with the general principle of equality can be ensured. Furthermore, impairing the free movement of goods (Art. 34 TFEU (Treaty on the Functioning of the European Union)) can also be justified as environmental protection and climate objectives are also recognised as a justification under

EU law. If certain vehicles are privileged, the scheme could potentially be considered as state aid. However, this is not the case as the potential scheme would target private households, which are as such not a suitable object for state aid nor do carmakers have a direct advantage from the scheme. However, as noted by experts, the lack of effective measures to promote the electrification of transport may indeed be a competitive disadvantage.

The Bonus-Malus System can be designed to be revenue neutral or even revenue generating.

### 5.3 Potential impacts

While a bonus-malus scheme can help transform the vehicle fleet, rebound effects must be considered. Emission savings could be partly offset by increased vehicle sales and/or increased vehicle use due to lower fuel consumption and thus lower operating costs.

Nonetheless, a recent study for the Ministry for Economic Affairs and Energy (BMWi) estimated that an extended version of the current bonus system that includes a linked malus element could save 1.0–2.5 MtCO<sub>2e</sub> in/by 2030 (dena, et al., 2018). This estimate is based on a literature review of the impact of financial incentives for the purchase of electric cars, which suggested that new EV registrations increase by 6–10% per EUR 1,000 premium. In addition, it is based on the following parameters building on the French Bonus-Malus System and the assumptions on the German new admission structures in the NAPE 2.0 project:

- Bonus for newly registered electric cars: 2019/2020: EUR 6,000 for Battery Electric Vehicles (BEVs), EUR 1,000 for Plug-In Hybrid Electric Vehicle (PHEVs); From 2021 to 2030: linear reduction to EUR 0.
- Malus for newly registered passenger cars with high CO<sub>2</sub> emissions: 2019/2020: no penalty for new passenger cars ≤ 95 gCO<sub>2</sub>/km; EUR 10,000 penalty for ≥ 250 gCO<sub>2</sub>/km; CO<sub>2</sub> penalty calculation between these thresholds, as in France, in 1-gram increments; from 2021 to 2030: linear decrease of the threshold values from 95 g/km to 68 g/km and 250 g/km to 223 g/km, respectively.

This kind of scheme could lead to additional registrations of 330,000–550,000 EVs in Germany. In addition, efficiency improvements of diesel and petrol cars were based on impact assessments of the French Bonus-Malus System and on a comparison of the developments of CO<sub>2</sub> emissions of new vehicles in France with those in other EU countries.

Table 1: Estimated effects of a potential Bonus-Malus System in 2030 (dena, et al., 2018)

GHG savings	Fuel savings	Direct benefits	Indirect costs
1.0–2.5 MtCO <sub>2e</sub>	15–35 PJ	EUR 3–5 billion	EUR 0–100 million

In terms of costs for the government, direct benefits of the measure are likely to be substantially higher than indirect costs (Table 1). While direct costs, i.e. the bonus payments, would be reduced over time and are estimated at EUR 6–7 billion for the 2019–2030 period, the malus revenues could reach EUR 40–60 billion over the same time horizon. Indirect costs include lower energy tax revenues due to lower fuel use, fuel cost savings, electricity tax revenue increases, and increased corporate tax revenues as companies will benefit from lower fuel costs for their vehicles. In 2030 alone, the bonus-malus scheme could lead to EUR 3–5 billion in additional revenues. In addition, consumers will benefit from lower operating costs both in the case of EVs and more efficient diesel and petrol cars.

While the measure would lead to emission reductions in the transport sector, charging EVs increases electricity demand and the corresponding emissions in the ETS sectors but this impact would be reduced over time as a result of the energy transition. As the EV battery production process continues to be relatively emissions-intensive, increased manufacturing emissions in and outside Europe should also be taken into account. However, considering that the ETS cap is fixed, additional emissions in the ETS sectors should not substantially influence the overall level of ETS emissions (see also section 2.3 in the Policy Paper).

## 5.4 Conclusion

A key advantage of this measure is the fact that it sets incentives in favour of efficient and against inefficient vehicles and that it can be designed to be revenue neutral or even revenue generating, as shown in section 5.3. At the same time, consumers can benefit from lower operating costs. As the vehicle stock becomes more environmentally friendly, urban areas would also benefit from reduced particulate matter pollution which is of particular relevance given the current discussions on both the poor air quality in various German cities and the possibility for German municipalities to enact driving bans for diesel engines, as occurred in Hamburg in May 2018.

If implemented in Germany, the automotive industry would be incentivised to develop more environmentally friendly vehicles and to catch up with foreign car manufacturers that already produce cleaner vehicles on average. Eventually, the German industry could also benefit from increased BEV and PHEV sales.

Furthermore, the implementation of a similar scheme in Germany could build on the country's existing bonus scheme. Also taking into account the numerous co-benefits, it would therefore be a useful policy tool to reduce emissions in the German transport sector. However, considering that the sector emitted 171 MtCO<sub>2e</sub> in 2017 (UBA, 2018), the relatively low size of the emission savings in 2030 implies that a potential Bonus-Malus System needs to be combined with further measures in the sector to help to achieve the 2030 effort sharing targets. Nonetheless, implementing such a scheme in Germany could send an important signal to German consumers as well as to car manufactures and policy makers across Europe and beyond.

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