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Electric Vehicle Incentives in 15 Leading Electric Vehicle Markets

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Electric Vehicle Incentives in 15 Leading Electric Vehicle Markets

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Introduction

This document provides an overview of incentives in 15 leading plug-in electric vehicle (PEV) markets and is an update of the 2019 report [1]. This document presents information on incentives for 2021 incentive values. We added two new countries (Belgium and Italy) due to their PEV market growth. We provide information on incentives for battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs). We do not comment on the effectiveness of each incentive, rather we provide an overview of the different ways in which PEV incentives are administered. The hope is that policymakers can gain insights into different strategies for incentivizing the purchase of PEVs. The document focuses on purchase incentives, it does not take a detailed look into non-financial, indirect, or recurring incentives. The focus is on consumer incentives, not fleet or business incentives.

Each section below outlines how incentives for BEVs and PHEVs are administered in the top 15 PEV markets. Each section presents the value of incentives in local currencies and in U.S. dollars (US\$) and how they are administered to PEV buyers. In addition, PHEV and BEV sales in each country are shown to provide context. Table 1 shows an overview of the countries considered in this document, incentive amounts for BEVs and PHEVs in US\$ (the sections below also show incentives in local currencies) and the type of incentive. Table 1 compares incentive data between 2019 and 2021. In some nations, incentives are not a fixed value for a BEV or PHEV. The values shown in the table serve as an estimate of incentive values, the actual value received can differ. The structure of incentives, actual value, and how they work is outlined in more detail in the sections on each nation.

Incentives for PEVs are applied in several different ways including as income tax credits and post purchase rebates, and they are delivered at the point of sale via grants, purchase-tax or purchase waivers, subsidies, and feebates (or bonus malus). In this document subsidy refers to a sum of money given to or claimed by an organization or company (which may include car dealers) from the participating government that allows the price of the PEV to decrease for the customer, subsidies are also called incentives or grants by issuing governments. Rebates are retrospective discounts given to the consumer after purchasing the PEV. Feebate (or bonus malus) refers to a system where lower emission vehicles receive a rebate (or bonus), and higher emission vehicles pay a fee (or malus). Tax credits are unique to the United States and allow PEV buyers to pay lower tax or receive a tax refund when filling their taxes for the year in which a PEV was purchased.

Overall, from 2019 to 2021 incentives for BEVs increased in value in 5 countries, decreased in value in 6 countries, and remained constant in 1 country. PHEV incentives increased for 6 countries, decreased for 5 countries, and in 4 countries PHEVs receive no incentive. In 2021, 14 of the 15 countries considered have incentives for BEVs, while 12 have incentives for PHEVs. Currently 6 countries have price caps that make higher cost PHEVs or BEVs ineligible for incentives. Nations are also beginning to restrict incentives for PHEVs to vehicles with lower emissions or longer electric ranges.

We also consider whether incentives are delivered at the point of PEV purchase (Figure 1), which reduces the purchase price for consumers, or whether they are received post purchase. In 13 nations incentives are delivered at the point of PEV purchase, in Germany half is received at purchase and half is received after, in the USA they are delivered after PEV purchase. In 2 countries (France and Sweden) incentives are feebates (or bonus malus) where PEVs are subsidized at the point of sale, these incentives are funded through fees applied to less efficient vehicles at the point of purchase. These incentive structures can create a revenue-neutral mechanism to fund PEV incentives.

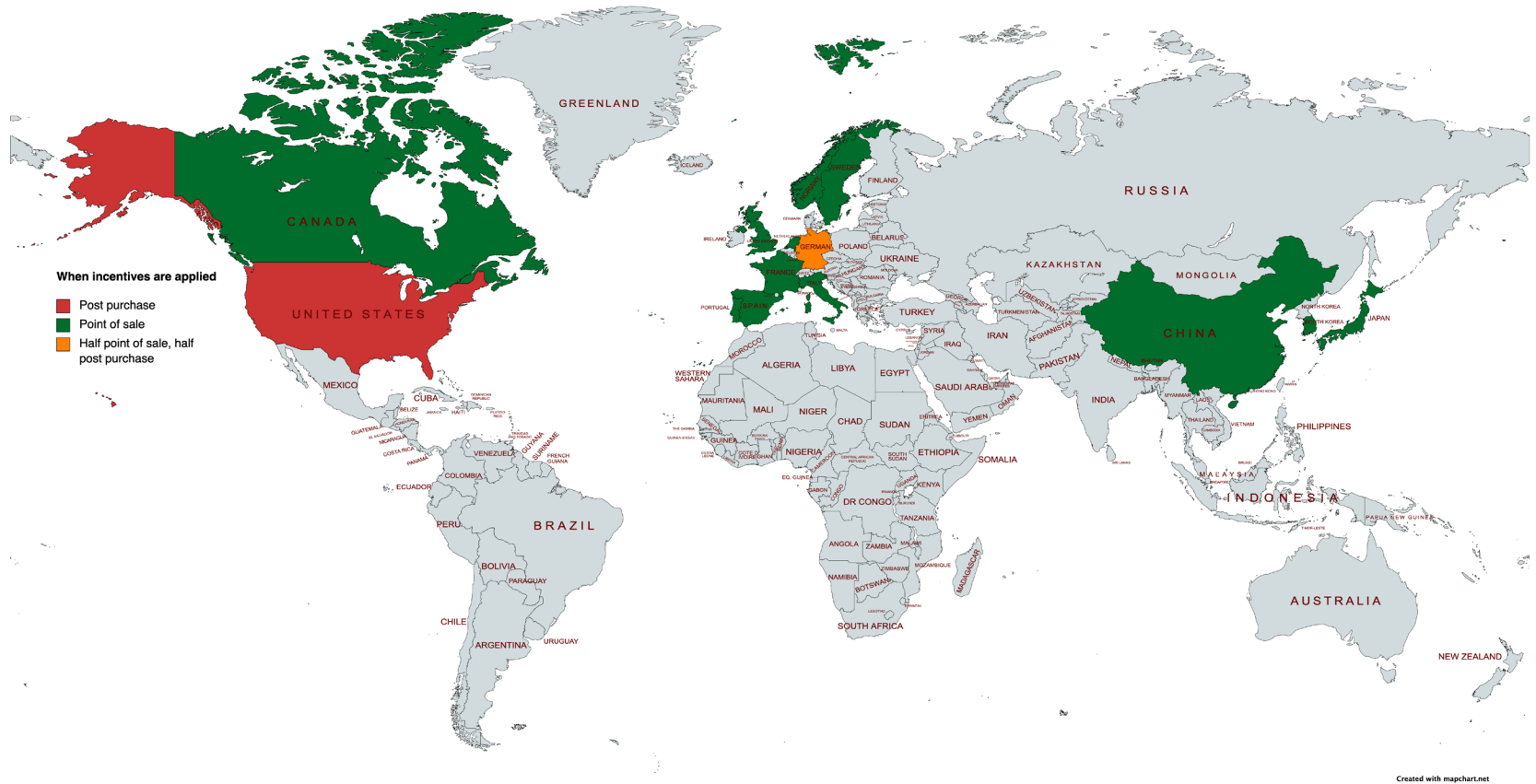


Figure 1: Whether incentives are received at the point of PEV purchase or after PEV purchase in the 15 markets considered in this report.

Table 1: Overview of incentive values and incentive type for BEVs and PHEVs in 2019 and 2021 for the nations considered in this study.

Country	2019 Incentives		2021 Incentives		
	BEV (US\$)	PHEV (US\$)	BEV (US\$)	PHEV (US\$)	Incentive Type
Belgium	Varying	Tax reduction	0	0	Tax Benefit
Canada	3,800	1,900	4,000	4,000	Point of sale subsidy
China	3,700	1,500	2,400	1,000	Point of sale subsidy
France	9,100	1,000	7,000	1,200	Bonus-malus or Feebate
Germany	4,600	3,400	10,600	7,950	Point of sale subsidy and rebate (50% at point of sale, 50% after)
Italy	4700	1800	4,700	1,800	Point of sale subsidy
Japan	3,500	1,700	7,710	3,850	Point of sale subsidy
Netherlands	8,000	3,800	4,700	0	Registration Tax Incentive and point of sale subsidy
Norway	11,600	10,000	10,700	9,200	VAT and Purchase Tax Exemption
Portugal	3,400	1,300	2,650	1,325	Point of sale subsidy
South Korea	13,200	6,700	7,200	7,200	Point of sale subsidy
Spain	6,400	0	6,500	3,200	Point of sale subsidy
Sweden	6,500	2,400	6,900	2,400	Bonus-malus or Feebate
United Kingdom	4,500	0	2,040		Point of sale subsidy
United States	7,500	7,500	7,500	7,500	Post purchase income tax credit

Belgium

BEV Incentives: none
 PHEV Incentives: none
 Incentive Type: n/a

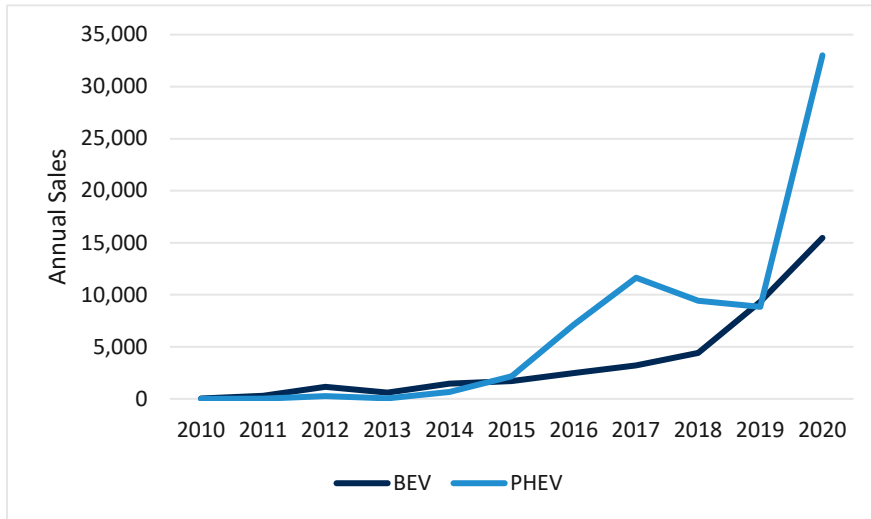


Figure 2: BEV and PHEV Sales in Belgium

Belgium had provided subsidies of up to €4,000 (US\$4,831) for BEVs, these were discontinued in 2020. Table 2 provides past incentive rates ending in 2020 [2]. BEVs pay a minimum registration tax of €61.50 and minimum ownership tax of €83.56 (US\$103) in Brussels and Wallonia. Flanders residents who own a BEV are permanently exempt from registration tax whereas PHEV owners were exempt till 2020.

Table 2: BEV subsidies in Beligin prior to their removal in 2020.

Subsidy, €(US\$)	Vehicle cost, €(US\$)
4,000 (4,831)	<31,000 (37,443)
3,500 (4,227)	31,000–41,000 (37,443–49,522)
2,500 (3,020)	41,000–61,000 (49,522–73,679)
2,000 (2,416)	>61,000 (73,679)

Canada

BEV Incentives: US\$4,000

PHEV Incentives: US\$4,000

Incentive Type: Point of sale subsidy

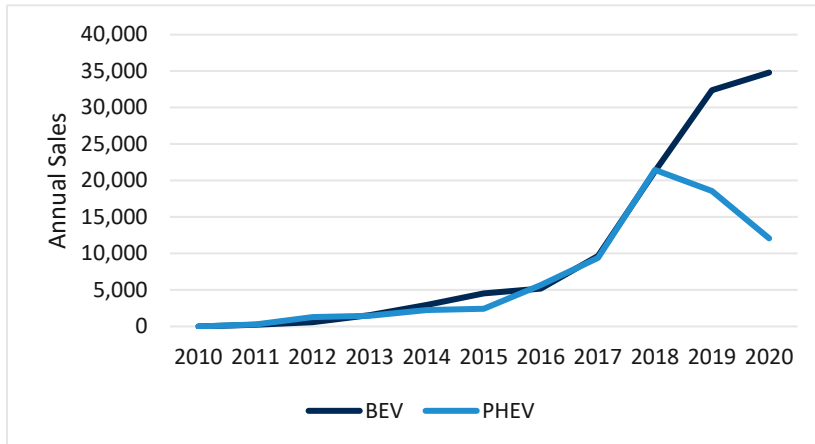


Figure 3: BEV and PHEV Sales in Canada

Through the *Incentives for Zero-Emission Vehicles* program, Canada offers a national incentive of Can\$5,000 (US\$4,000) for BEVs and long-range PHEVs (battery size ≥ 15 kWh). Short range PHEVs (battery size < 15 kWh) are eligible for up to Can\$2,500 (US\$2,000)[3]. The incentive is received directly at the point of vehicle purchase. Vehicles with fewer than 6 seats must have a base price under Can\$45,000 (36,300 US\$), though higher priced trims are also eligible up to Can\$55,000 (44,400 US\$). Vehicles with 7 seats may have a base price up to Can\$55,000 (44,400 US\$), and Can\$60,000 (48,400 US\$) for higher trim levels [4]. The incentive went into effect in May 2019 and will provide 100% of these incentive values for the purchase of a BEV or PHEV until 2023. After this, the incentive drops to 75% for 2024-2025, then 55% for 2026-2027.

On a provincial level, Ontario had the highest incentive of Can\$14,000 (10,500 US\$). However, the program ended on September 10, 2018 [5]. British Columbia has the next highest incentive which is Can\$3,000 (3,700 US\$) as a subsidy for Clean Energy Vehicles and an additional Can\$6,000 (4,500 US\$) for replacing an old vehicle with a lower-emitting one under Can\$55,000. Quebec offers a Can\$8000 subsidy for buying a new BEV or PHEV if the vehicle price remains under Can\$75,000.

China

BEV Incentives: US\$2,250

PHEV Incentives: US\$1,250

Incentive Type: Point of sale subsidy

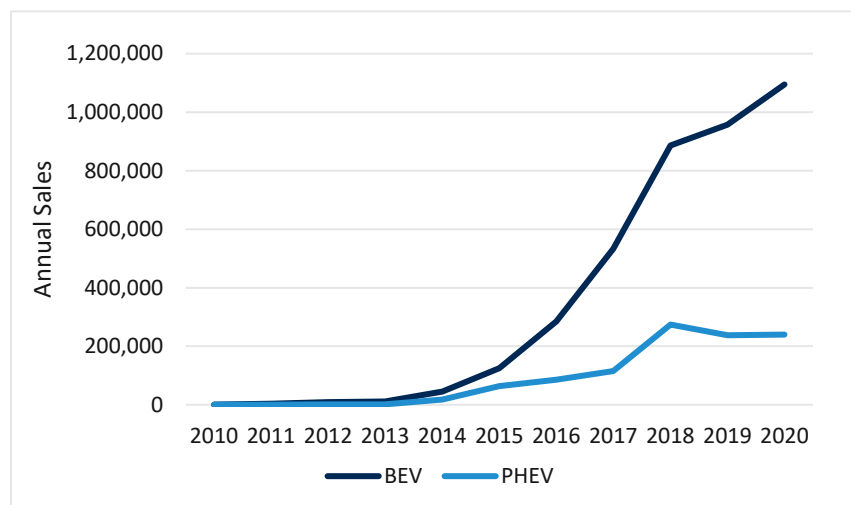


Figure 4: BEV and PHEV Sales in China

China has an electric vehicle purchase subsidy that reduces in value by 10%, 20%, and 30% for 2020, 2021, and 2022. In 2020, subsidy for private PEVs sets requirements for the price of passenger vehicles to be less than CN¥300,000 (US\$47,000).

The subsidy for a PEVs is calculated with the following equation and the information in Table 3, Table 4, and Table 5. The tables contain values necessary to calculate the point-of-sale purchase subsidy for the customer [7].

$$\text{PEV Subsidy} = \{\text{subsidy based on range} \times \text{CN¥550 (US\$86)}\} \times \text{Battery energy density adjustment coefficient} \times \text{Vehicle energy consumption adjustment coefficient}$$

Incentive values depend on range, battery energy density, and fuel consumption. In 2021 BEVs with a range between 300 and 400km receive an incentive of CN¥14,400 (US\$2,250) plus or minus any adjustments. PHEVs receive CN¥8,000 (US\$1,250) plus or minus any adjustments. The adjustments for BEV and PHEV battery energy density and energy consumption can reduce the incentive by up to 70% or increase it by up to 32%.

Table 3: Subsidies values for 2019-2022 based on electric driving range.

Electric driving range (km)		Subsidy by year (CN¥1,000)			
		2019	2020	2021	2022
BEV	300≤R<400	18	16.2	14.4	12.6
	R≥400	25	22.5	20	17.5
PHEV	R≥50	10	9	8	7

Table 4. Battery energy density adjustment coefficients*

Energy density (Wh/kg)	Coefficient
[105–120)	0.6
[120–140)	1
[140–160)	1.1
[160–160+)	1.2

*Vehicles with batteries that have an energy density less than 105 Wh/kg do not qualify for the subsidy.

Table 5. Vehicle energy consumption (in kWh/100km) adjustment coefficients

Relationship of the fuel economy (in kWh/100km) to the <i>Requirement</i> *	Coefficient
Less than the <i>Requirement</i> by [0–5)%	0.5
Less than the <i>Requirement</i> by [5–25)%	1
Less than the <i>Requirement</i> by $\geq 25\%$	1.1

*The *Requirement* is based on the weight (m , in kg) of the vehicle:
If $m < 1000$ kg, then $Requirement = 0.0126 \times m + 0.45$
If $1000 \leq m < 1600$ kg, then $Requirement = 0.0108 \times m + 2.25$
If $m \geq 1600$ kg, then $Requirement = 0.0045 \times m + 12.33$

France

BEV Incentives: US\$7,000

PHEV Incentives: US\$1,200

Incentive Type: Feebate/Bonus-malus

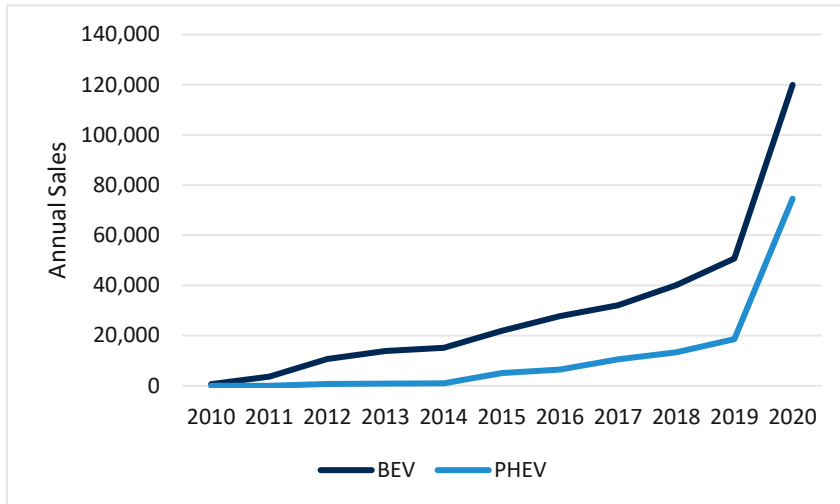


Figure 5: BEV and PHEV Sales in France

France has a federal bonus-malus scheme (also known as a feebate), which provides incentives for vehicles with lower CO₂ emissions (including BEVs and PHEVs) and charges fees to vehicles with higher emissions [8]. A vehicle emitting 20 gCO₂/km or less (which includes BEVs) receives a reward of €6,000 (US\$7,000), a vehicle emitting 21–60 gCO₂/km (the emissions of some PHEVs) receives €1,000 (US\$1,200) with a vehicle price cap of €45,000. Vehicles emitting 60–131 gCO₂/km receive no incentive and pay no fee. Vehicles emitting more than 132 g/km CO₂ pay a fee based on the amount of CO₂ emissions per kilometer [9]. Table 6 and Figure 6 show how the feebate system is structured. In 2021 the fees for higher emitting gasoline vehicles are higher, maxing out at €30,000 compared to €10,500 in 2019. France has additional purchase subsidies for trading in an old diesel vehicle and for buying a second-hand electric vehicle of €2,000 (US\$2,350) and €1,000 (US\$1,200), respectively [10].

Table 6: Overview of France’s bonus-malus system.

Vehicle Emissions (gCO ₂ /km)	Subsidy Amount € (US\$)
<20	6000 (7000)
21–60	1000 (1200)
60–120	0 (0)
>120	CO ₂ emissions-based fee, see figure 6.

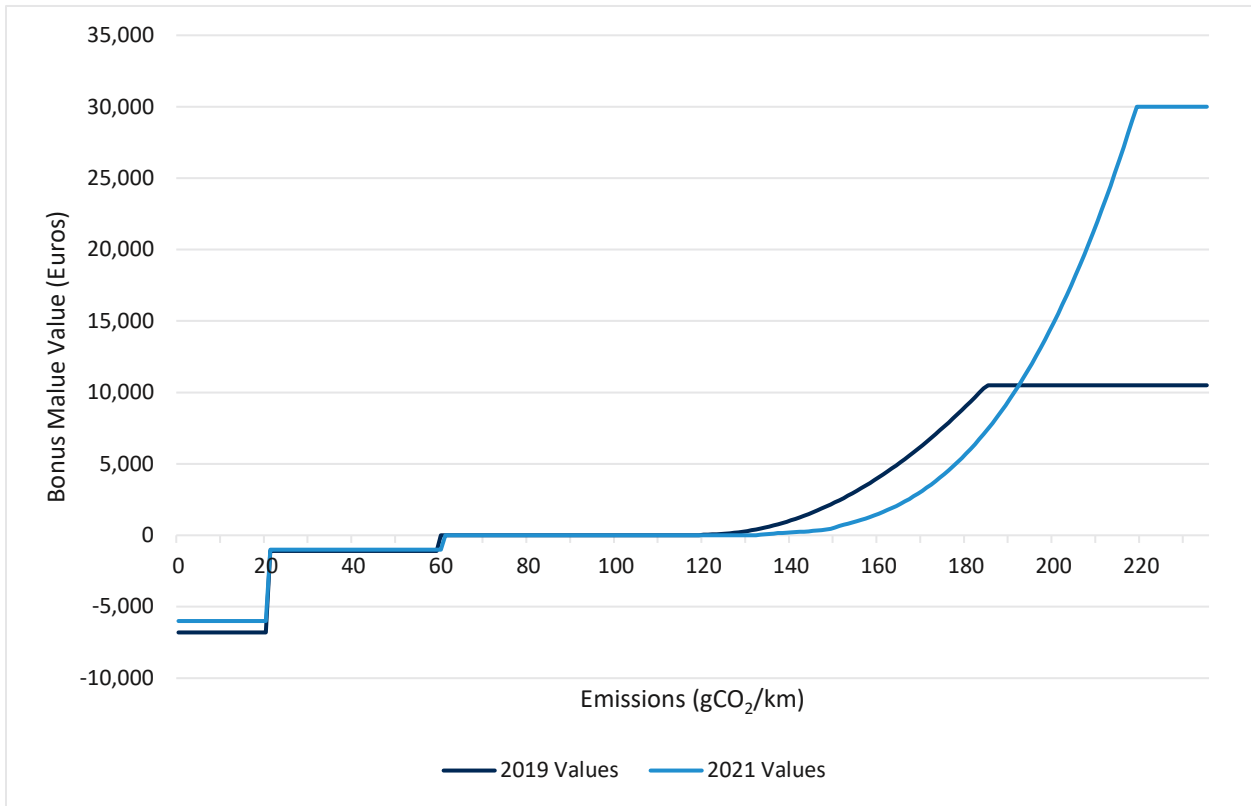


Figure 6: France bonus-malus values. Values less than 0 indicate that buyers receive an incentive (bonus), values higher than 0 indicate the fee (malus) buyers must pay [10].

Germany

BEV Incentives: US\$10,600

PHEV Incentives: US\$7,950

Incentive Type: Point of sale subsidy and rebate (50% at point of sale, 50% after)

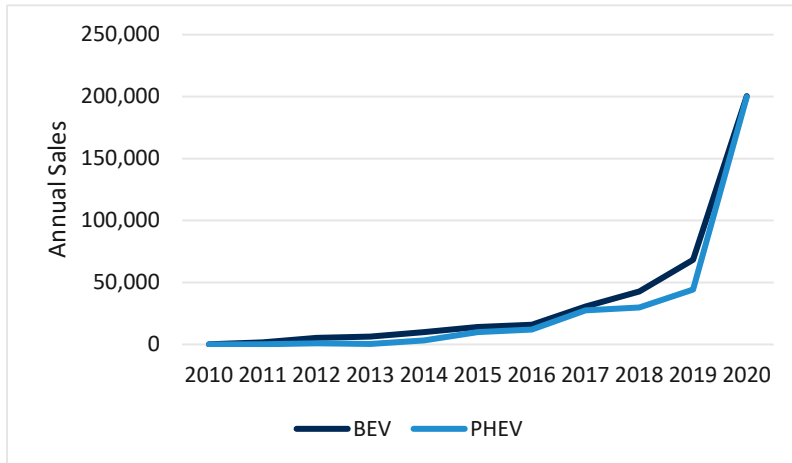


Figure 7: BEV and PHEV Sales in Germany

Germany has a national purchase subsidy of €9,000 (US\$10,600) for BEVs, and €6,750 (US\$8,130) for PHEVs. The full incentive is available for PEVs priced under €40,000 [11]. For vehicles priced between €40,000 and €65,000, the BEV subsidy is €7,500 (US\$8,731) and the PHEV subsidy €5,625. PHEVs are required to have emissions of less than 50 gCO₂/km or an electrical range of at least 40 km, which will increase to 60 km by 2022. Used electric vehicles that are less than 12 months old and have less than 150,000 km mileage also qualify for €5,000 subsidies for BEVs and €3,750 for PHEVs. The incentive is received half at the point of purchase and half after purchase. The dealership provides a discount equating to half the incentive amount while the government or state bank provides a rebate for the rest of the amount which is received after purchase.

Annual vehicle tax exemptions are given for initial vehicle registration for up to 10 years. BEVs are also given benefits such as free parking spaces, reserved parking spots, and access to bus lanes.

Italy

BEV Incentives: US\$4,700

PHEV Incentives: US\$1,800

Incentive Type: Point of sale subsidy

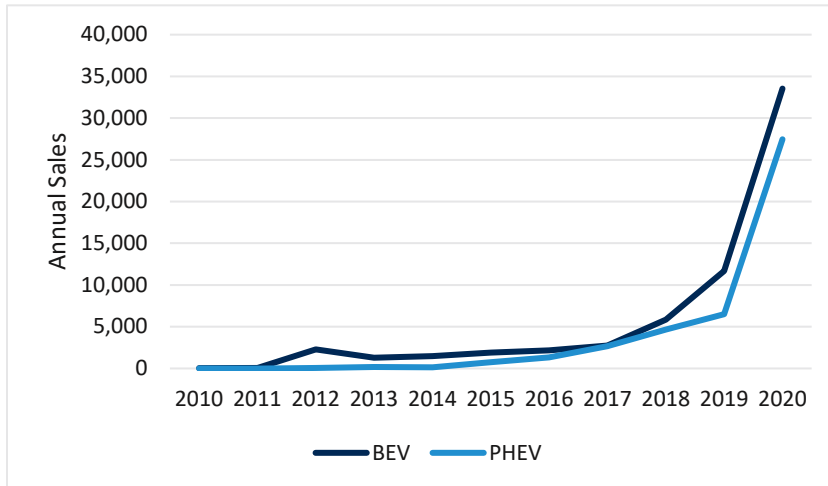


Figure 8: BEV and PHEV Sales in Italy

Vehicles emitting less than 20 gCO₂/km (typically BEVs) receive a €4,000 (US\$4,831) subsidy and vehicles emitting between 20–60g CO₂/km (typically PHEVs) receive a €1,500 (US\$1,812) subsidy. Additional incentives are provided if a gasoline powered vehicle is scrapped when purchasing an electric vehicle. When purchasing a vehicle with less than 20 gCO₂/km, an additional €2,000 (US\$2,416) is available, for vehicles emitting between 20–60 gCO₂/km an additional €1,000 (US\$1,208) is available [12]. Electric vehicles are exempt from ownership tax for 5 years and receive a 75% reduction after that 5-year period.

Japan

BEV Incentives: US\$7,710

PHEV Incentives: US\$3,850

Incentive Type: Point of sale subsidy

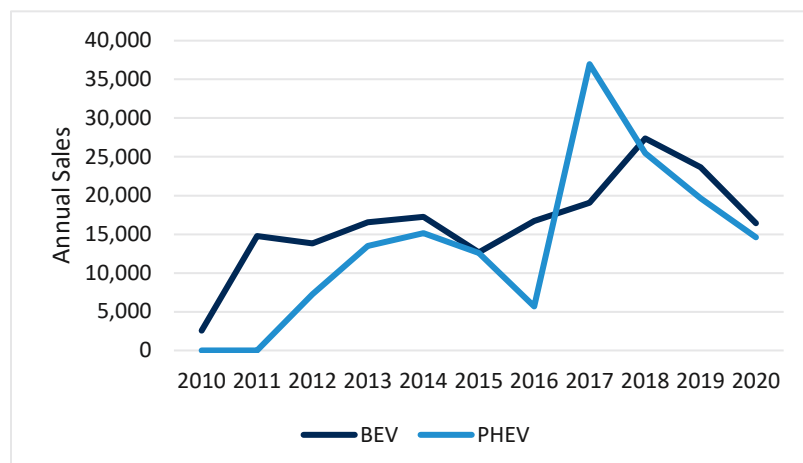


Figure 9: BEV and PHEV Sales in Japan

Japan's purchase subsidy increased from JP¥400,000 (US\$3,679) in 2019 to JP¥800,000 (US\$7,358) in 2021 for BEVs and from JP¥200,000 (US\$1,840) in 2019 to JP¥400,000 (US\$3,679) in 2021 for PHEVs [13]. The conditions for the maximum incentive states that all electricity generated in the user's home or office must be from renewable sources. Japan's Ministry of the Environment cabinet allocated JP¥8 billion for all related expenses. Local governments can also incentivize EV purchases [14]. For example, Tokyo gives an additional JP¥300,000 to PEV buyers (US\$2,891).

A PEV gains JP¥1,000 for each kilometer of electric driving range. That number is then multiplied by different values based upon the vehicle type [15]. BEVs have a multiplier of 1, PHEVs = 1, fuel cell electric vehicles = $\frac{2}{3}$, and clean diesel vehicles = $\frac{1}{12}$ (Table 7). PHEV subsidies are only given to vehicles that have an electric driving range of over 30 km. The equation below shows how to calculate subsidy amounts for each vehicle type; the main variable is the subsidy multiplier. The subsidy for each vehicle will not be paid if the value is under JP¥15,000 (US\$138). Table 7 illustrates how to calculate the subsidy amount for BEVs and PHEVs and other eligible vehicles.

Table 7: Monetary Incentive Calculations for Japan

Vehicle Type	Subsidy Amount JP¥ (US\$)	Subsidy Multiplier	Upper Limit JP¥ (US\$)
PHEV	400,000 (3,679)	1	400,000 (3,679)
BEV	1,000 JP¥ per km of range	1	800,000 (7,358)
Clean Diesel	Vehicle Price – Comparable Gas Vehicle Price	1/12	Was 150,000 (1,380)
Fuel Cell	Vehicle Price – Comparable Gas Vehicle Price	2/3	None

Netherlands

BEV Incentives: US\$4,700

PHEV Incentives: US\$0

Incentive Type: Registration Tax Incentive and Point of sale subsidy

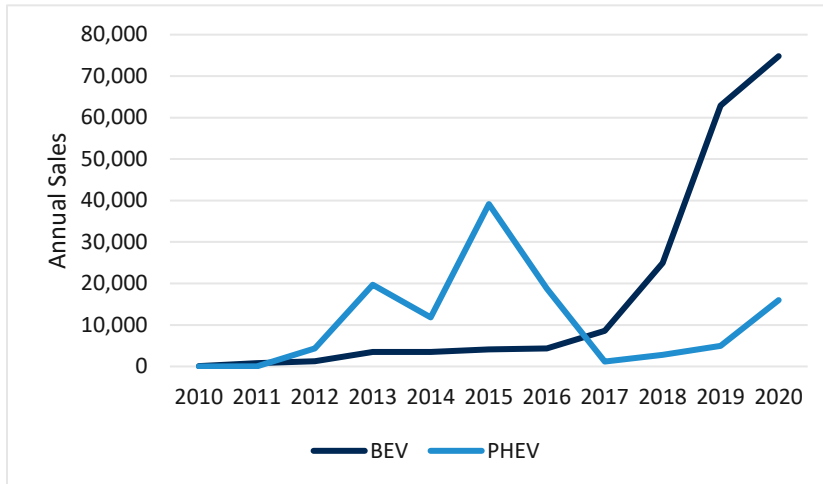


Figure 10: BEV and PHEV Sales in Netherlands

In the Netherlands buyers receive a purchase subsidy of up to €4,000 (US\$4,831) for new BEVs and €2,000 for used BEVs. According to the Dutch government the new BEV purchase subsidy will be €3,350 (US\$3,900) in 2022, €2,950 (US\$3,435) in 2023, €2,550 (US\$2,969) in 2024 and €0 in 2025, while the subsidy for used BEVs will stay constant. BEVs are required to have a range of at least 120 km, a price between €12,000 (US\$14,573) and €45,000 (US\$54,648) and be purchased through a specialized dealer to receive a subsidy.

BEVs are also exempt from registration tax until 2025, while PHEVs and conventional vehicles pay different amounts of registration tax based on CO₂ emissions (see **Figure 12**). The values in **Figure 12** are calculated according to the equation and coefficients shown in Table 8 and Table 9.

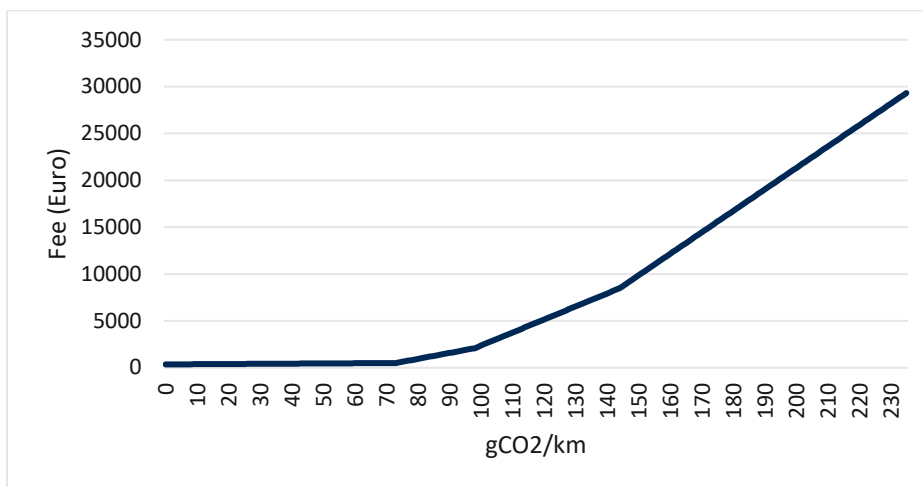


Figure 11: BEV Registration Tax for 2021.

Table 8: Calculation of BEV Passenger Car Registration Tax.

$$\text{Tax} = [(\text{Emissions in gCO}_2/\text{km} - \text{Col. I}) \times \text{Col. II}] + \text{Col. III.}$$

Select the row to use based on the range (left column) that the vehicle emissions fall in.

Emissions (gCO ₂ /km)	(I)	(II)	(III)
[0–73)	0	2	356
[73–98)	73	63	502
[98–144)	98	139	2077
[144–162)	144	229	8471
> 162	162	458	12593

Table 9: Calculation of tax for PHEV for Calendar Year of 2020 [19].

$$\text{Tax} = [(\text{Emissions in gCO}_2/\text{km} - \text{Col. I}) \times \text{Col. II}] + \text{Col. III.}$$

Select the row to use based on the range (left column) that the vehicle emissions fall in.

Emissions (gCO ₂ /km)	(I)	(II)	(III)
[0–34)	0	24	0
[34–60)	34	84	816
≥ 60	60	202	3

The Netherlands also has company car tax incentives. If drivers use a company car for private use, a percentage of the vehicle's value is added to their income before taxes. Drivers of PEVs pay a lower tax rate on this income. In 2021 it is 12% below €40,000 (US\$46,570) and in 2022 it will be 16% below €35,000 (US\$40,749). In 2020 this increased from 4% to 8% for BEVs priced under €45,000 (US\$54,648) and 22% for all PHEVs and gas vehicles[16]. For BEVs listed above €45,000 (US\$54,648), 22% is applied to amounts above €45,000 (US\$54,648) [17].

Norway

BEV Incentives: US\$14,000

PHEV Incentives: US\$3,000

Incentive Type: VAT and Purchase Tax Exemption

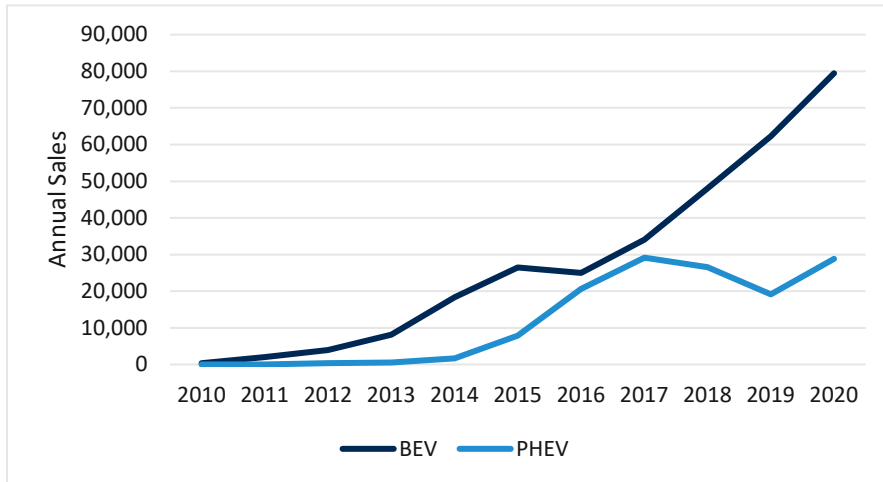


Figure 12: BEV and PHEV Sales in Norway

PEVs in Norway are not directly given incentives, though they do not pay any new vehicle tax. Since vehicle taxes for conventional vehicles are substantial, we consider this to be an incentive. The incentive values for Norway are calculated based on the purchase taxes a buyer of a PEV does not pay, compared to that of a conventional vehicle (in this case the tax of a VW Golf gas car compared to a VW ID3 BEV or VW Golf PHEV).

New vehicles in Norway pay VAT (value added tax) and an emission and weight-based purchase tax [18]. VAT is 25% of the purchase price. The rates for the payable purchase taxes are shown in Table 10. The calculation considers CO₂ emissions, NO_x emissions, and the vehicle curb weight. The tax on NO_x emissions is calculated by multiplying 71.17 NOK (US\$8.5) per milligram of NO_x per km above 0 mg (see Figure 15). Tax payable from CO₂ and weight is accumulated for each range of CO₂ emissions greater than zero (see Figure 14 and Figure 16 for values based on information in (Table 10). The amount of total tax cannot be negative, vehicles with negative values are taxed 0 NOK. BEVs are exempt from both VAT and emissions taxes. Table 11 shows some example vehicles sold in Norway and tax payable at the point of purchase. To calculate the incentive values for BEVs and PHEVs, we use the difference between the typical tax payable for gasoline vehicles by the tax a BEV or PHEV would pay. This gives an approximate incentive for BEVs of US\$14,000, and for PHEVs US\$3,000.

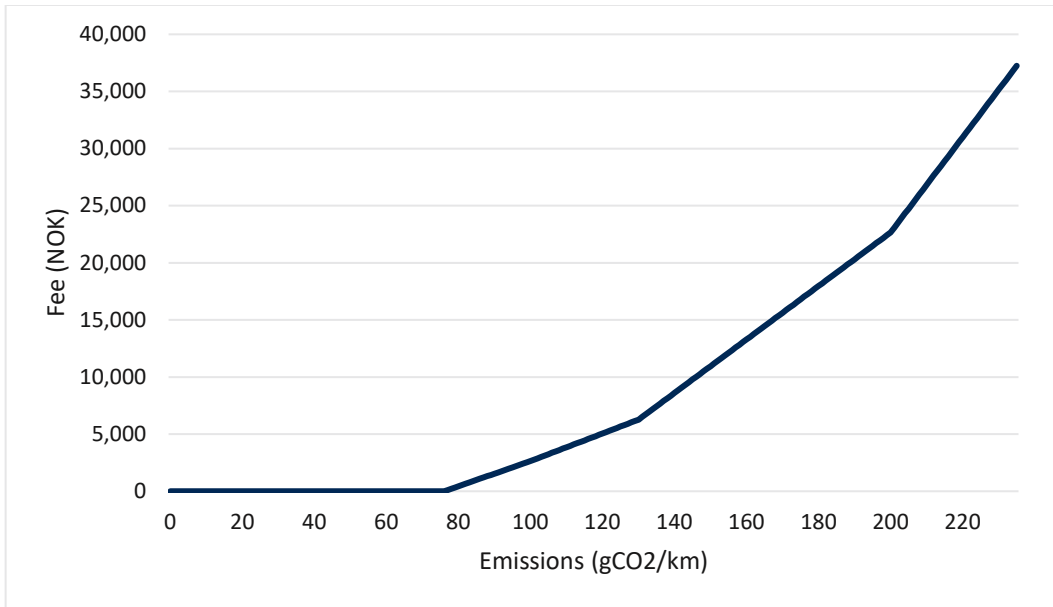


Figure 13: Tailpipe CO₂ emissions tax for Norway vehicles excluding BEVs in 2021.

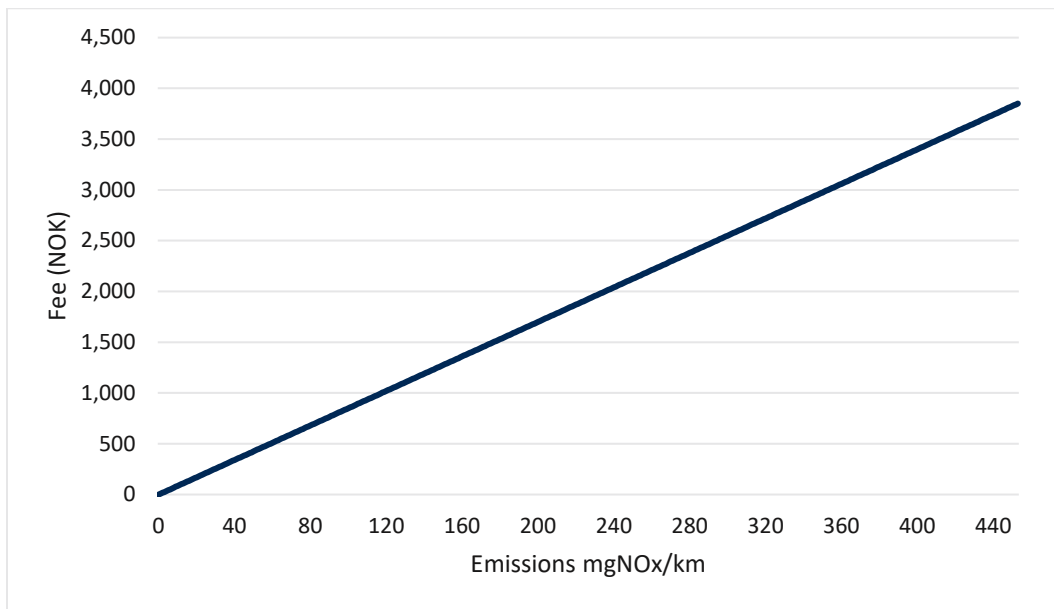


Figure 14: Tailpipe NO_x emissions tax for Netherland vehicles excluding BEVs in 2021.

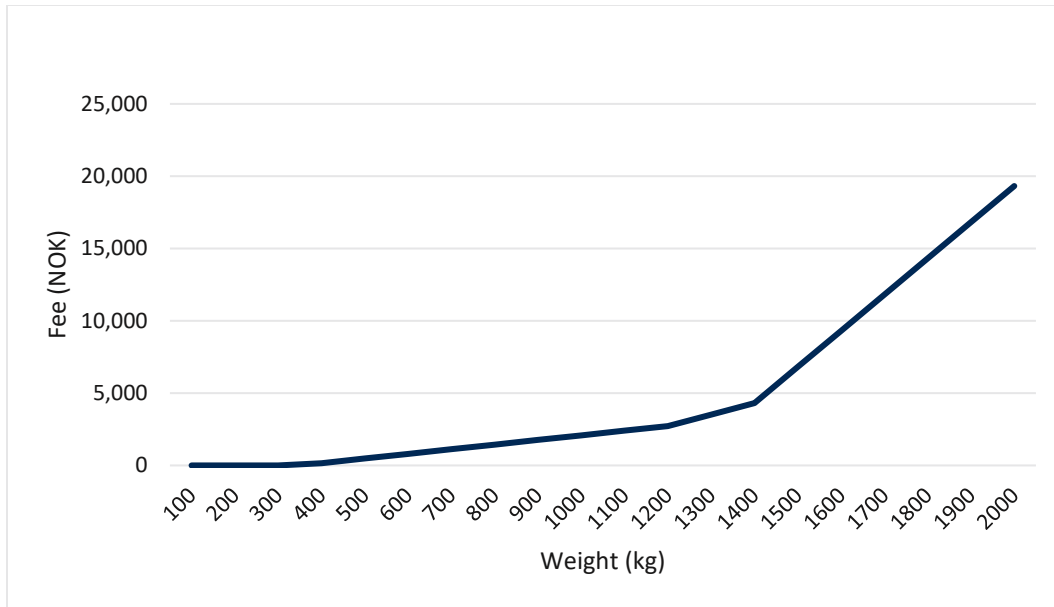


Figure 15: Curb weight tax for Netherland vehicles excluding BEVs in 2021.

Table 10: Emissions and weight based registration taxes in Norway [23].

CO ₂ (g/km)	NOK (US\$) per g/km CO ₂	NOx (mg/km)	NOK (US\$) per mg NOx /km	Curb Weight (kg)	NOK (US\$) per kg Curb Weight
0–40	-1007 (133)	>0	71 (8.5)	0–350	0 (0)
40–74	-936 (113)			351–1200	27 (3)
75	0 (0)			1201–1400	66 (8)
76–100	918 (110)			1401–1500	207 (25)
101–130	999 (121)			>1500	241 (29)
131–200	2698 (324)				
>200	3463 (417)				

Table 11: Example Vehicles in Norway and their Registration Taxes (with VAT) [24].

Vehicle	Propulsion	Taxes Payable NOK (US\$)
Volvo V90	Gas	369,363 (44,475)
Volkswagen Golf	Gas	118,406 (14,257)
Volkswagen ID3	BEV	0 (0)
Volkswagen Golf eHybrid	PHEV	95,973 (11,556)
Toyota RAV4 Hybrid	HEV	187,688 (22,600)

Portugal

BEV Incentives: US\$2,650

PHEV Incentives: US\$1,325

Incentive Type: Point of sale subsidy

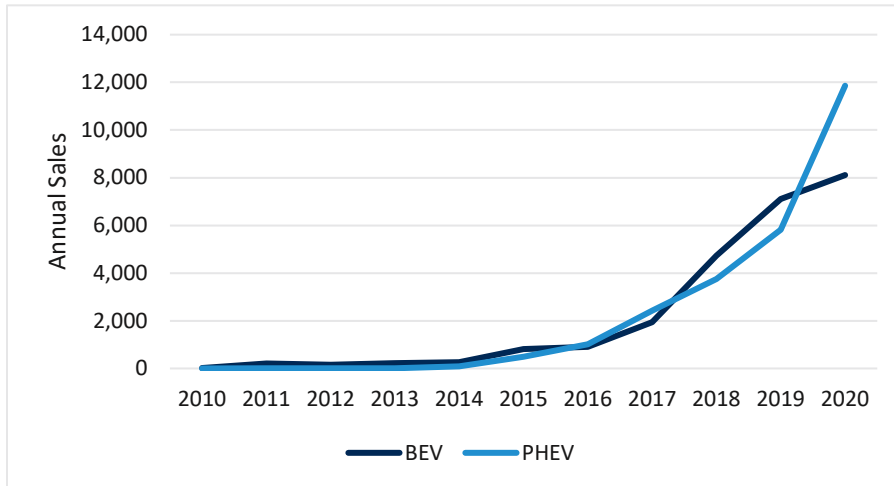


Figure 16: BEV and PHEV Sales in Portugal

Portugal has a national subsidy of €2,250 (US\$2,650) for BEVs and €1,125 (US\$1,325) for PHEVs [19]. The incentive has a purchase price cap of €62,500 (US\$73,600) for both PHEVs and BEVs [20]. Vehicles in Portugal also receive tax exemptions on registration tax and ownership tax based upon CO₂ emissions. BEVs are exempt from the registration and ownership tax [19], PHEVs with an all-electric mode of up to 25 kilometers receive a 25% reduction from taxes [19].

Other incentives include those for motorcycles, which have a €400 (US\$470) incentive, and electric scooters, which have a €250 (US\$300) incentive. Local incentives include free parking and one year of discounted electricity [21].

South Korea

BEV Incentives: US\$7,200

PHEV Incentives: 0

Incentive Type: Point of sale subsidy

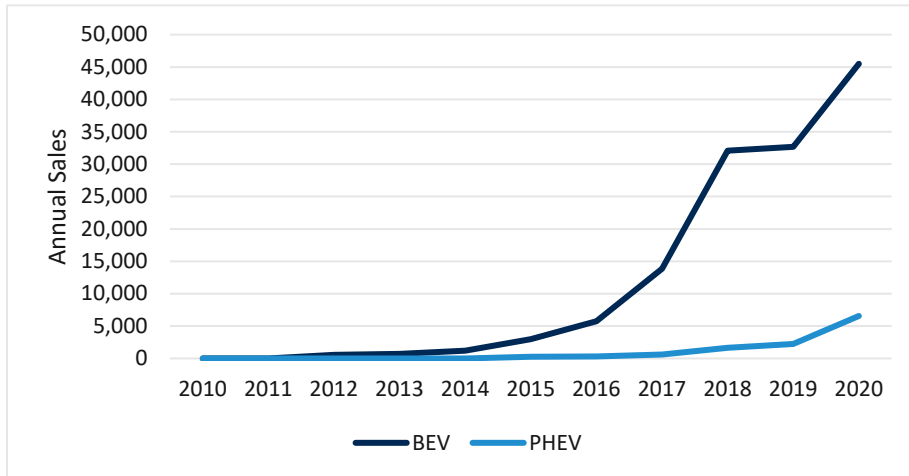


Figure 17: BEV and PHEV Sales in South Korea

South Korea has both national and local government incentives for PEV purchase. PHEV incentives were discontinued in 2021. The incentive program for BEVs (and fuel cell electric vehicles) has been extended to 2025 to support domestic EV car manufacturers such as Hyundai and Kia and to bolster purchases of electric or hybrid drivetrain buses and trucks [22].

The incentive value is dependent on manufacturer and car model. The maximum national incentive for BEVs is ₩8 million (US\$7063) while the maximum for an electric trucks is ₩21 million (US\$18,540) [23]. The maximum incentive for PEVs only applies to those with a purchase price under ₩60 million (US\$52,973). There is a 50% reduction in subsidy if the purchase price is in between ₩60 (US\$52,973) and ₩90 million (US\$79,549). Any PEV over ₩90 million does not receive any incentive.

Local incentives, such as in Seoul, include incentives of ₩4 million (US\$3,531) for BEVs. National taxation rates can be reduced by ₩3.9 million (US\$3,443) and local taxation can be reduced by ₩1.4 million (US\$1,236) [23] as shown in Table 13. In addition, public parking fees are exempted for one hour and charged 50% of the usual fee after one hour [24].

Table 12: Example BEV vehicles and subsidy amount South Korea [30].

Vehicle	Propulsion	Subsidy Amount ₩ (US\$)
Kia Niro EV (HP, Prestige)	BEV	8,000,000 (7,063)
Renault Samsung SM3 ZOE ZEN	BEV	7,020,000 (6,198)
Soul (Basic type, Prestige)	BEV	7,500,000 (6,622)
Tesla Model S	BEV	-
Peugeot e-208 Allure	BEV	6,490,000 (5,739)

Table 13: Levy rates and reduction amounts in amounts South Korea [30].

Tax	Charge Rate	BEV Reduction Limit ₩ (US\$)
Individual Consumption (National)	5% of the vehicle price	3,000,000 (2,700)
Education (National)	30% of individual consumption tax	900,000 (800)
Acquisition (Local)	7% of vehicle price (small car, 4%)	1,400,000 (1,236)

Spain

BEV Incentives: US\$4,857

PHEV Incentives: US\$2,300

Incentive Type: Point of sale subsidy

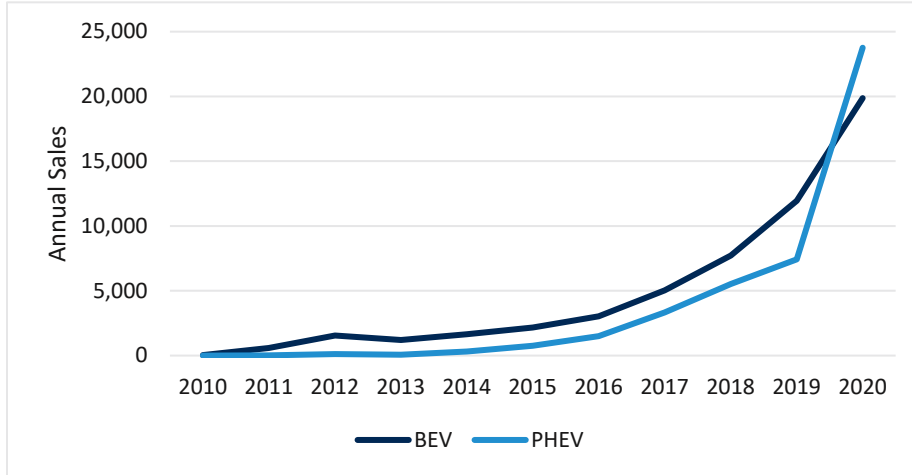


Figure 18: BEV and PHEV Sales in Spain

Spain had a national subsidy of up to €4,000 (US\$4,857) for BEVs with a range over 90 km [25]. An additional €1,500 (US\$1,821) is available when scrapping a gasoline vehicle. For electric vehicles with a range of 30–90 km, a €1,900 (US\$2,307) subsidy with an additional €700 (US\$850) for scrapping is awarded [26]. BEVs are also exempt from registration taxes. Registration tax for non-BEVs is based on CO₂ emissions and range between 4.75% and 14.75%. PHEVs can receive a subsidy of up to €1,900 (US\$2,300) and an additional €700 (US\$855) for scrapping their old vehicle [27]. Spain provides subsidies for private and public charging points [27]. Local incentives include road tax exemptions, free parking, and toll exemptions on some highways [27].

Sweden

BEV Incentives: US\$6,900

PHEV Incentives: US\$2,400

Incentive Type: Bonus-Malus or Feebate

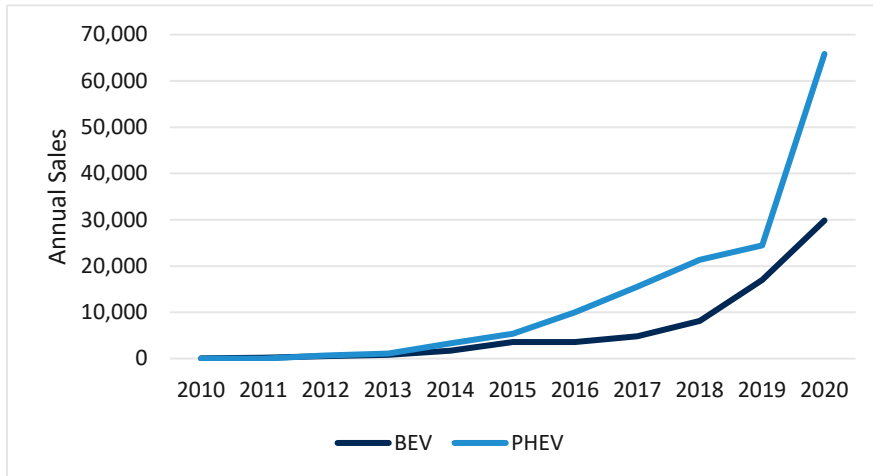


Figure 19: BEV and PHEV Sales in Sweden

Sweden's main incentive until June 2018 was a purchase rebate called the "Super Green Vehicle Rebate," that rewarded buyers 60,000 SEK (US\$4,300) for BEVs and 10,020 SEK (US\$2,200) for PHEVs [28]. For a BEV, the buyer was rewarded up to 35% of the difference in the new car price between a comparable internal combustion engine vehicle, but no more than 40,000 SEK (US\$4,300). For a PHEV, the owner was rewarded 17.5% of a comparable car with an upper limit of 20,000 SEK (US\$2,200). New vehicles also received a five-year tax exemption from the annual circulation tax, on average 1,760 SEK (US\$190) [28].

In June 2018, the purchase rebate system was replaced by a bonus-malus (or feebate) system [28]. As of April 2021, the system required vehicles to emit less than 70 gCO₂/km to receive reward and penalized vehicles (malus system) that emit more than 90 gCO₂/km (see Figure 21). A PHEV purchased after 2021 is rewarded 45,000 SEK (US\$5,223) minus 583 SEK (US\$68) for each gCO₂/km over 0. PHEVs purchased before April 2021 have a cap of 60,000 SEK (US\$6,500) and a malus of 714 SEK (US\$83) per gCO₂/km. The following equations summarize the bonus system:

$$\text{Purchased after April 2021: } 45,000 - (\text{g CO}_2/\text{km} \times 583) = \text{Bonus}$$

$$\text{Purchased prior to April 2021: } 60,000 - (\text{g CO}_2/\text{km} \times 714) = \text{Bonus}$$

BEVs receive the highest possible bonus of 70,000 SEK (US\$8,125) if purchased after April 2021 and 60,000 SEK (US\$6,500) if purchased before April 2021, though the bonus cannot exceed 25% of the car's new price. Vehicles that can use alternative fuels receive a minimum of 10,000 SEK (US\$1,100) regardless of CO₂ emissions [29]. The malus system increases the vehicle tax for the first three years after purchase. All vehicles pay a flat rate of 360 SEK, and the remainder of the tax is calculated based on the emissions of the vehicle. Figure 21 shows the bonus and malus amounts for different emission levels; Table 14 and Table 15 show the more detailed method of calculating the malus.

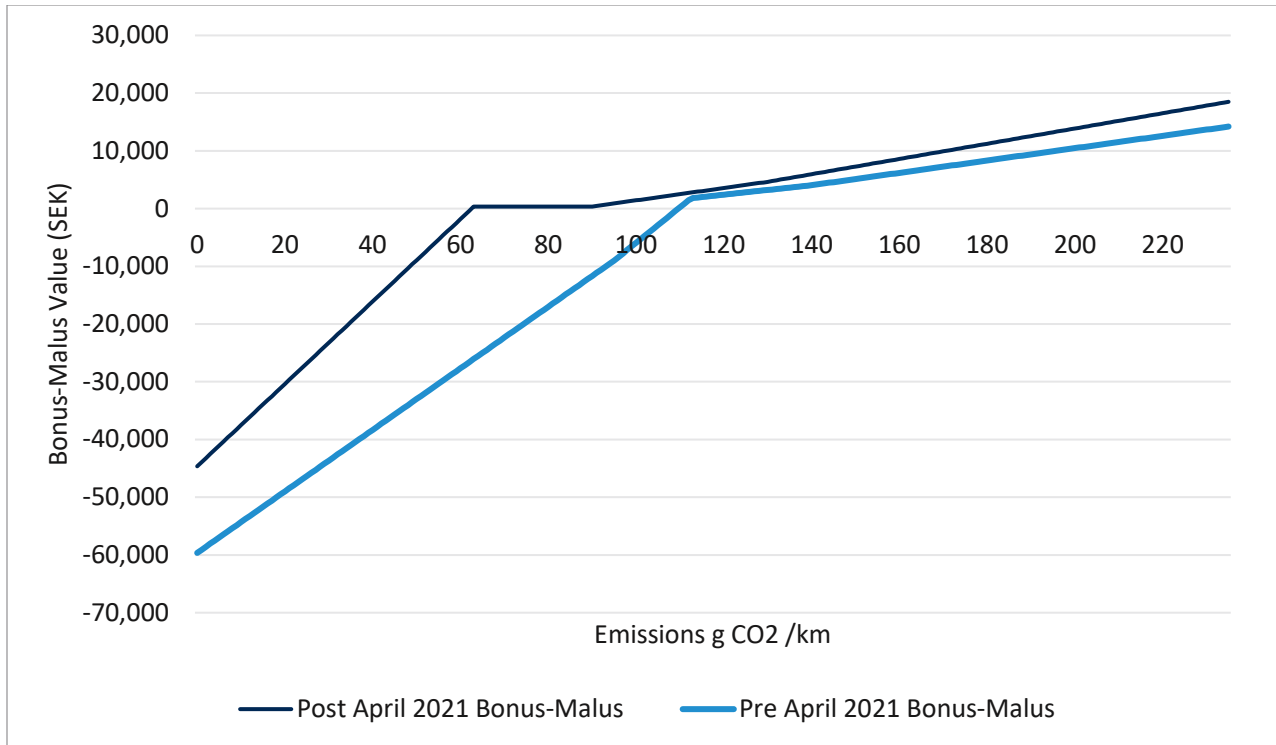


Figure 20: Bonus and Malus rates per g CO2 emitted pre and post April 2021, negative values include a bonus (incentive) and positive indicate a malus (fee).

Table 14: Malus System SEK (effective end of June 2018).

$$\text{Malus} = [(\text{Emissions gCO}_2/\text{km} - \text{Col. I}) \times \text{Col. II}] + 360$$

Emissions (gCO ₂ /km)	I	II
[0–95)	0	0
[95–140)	95	82
≥ 140	140	107

Table 15: Malus System SEK (effective April 2021). Malus = [(Emissions gCO₂/km – Col. I) × Col. II] + 360

Emissions (gCO ₂ /km)	(I)	(II)
[0–95)	0	0
[95–140)	90	107
≥ 140	130	132

Table 16: Example Vehicles in Sweden and Incentive Amounts SEK (US\$). Negative values indicate a fee (malus).

Vehicle	Propulsion	Emissions g/km CO ₂	Incentive SEK (US\$)
Volkswagen ID.3	BEV	0	70,000 (\$7,738)
Volkswagen Golf	Gas	92	-10,204 (\$1,184)
Volvo V90 PHEV	PHEV	46	17,822(\$2,069)
Toyota RAV4	Gas	126	-16,992 (\$1,972)

Diesel powered vehicles have an environmental surcharge of 250 SEK /year and have a one-time malus of 13.52 SEK per g/km CO₂ emitted [30].

United Kingdom

BEV incentive: US\$2,040

PHEV incentive: none

Incentive Type: Point of sale subsidy

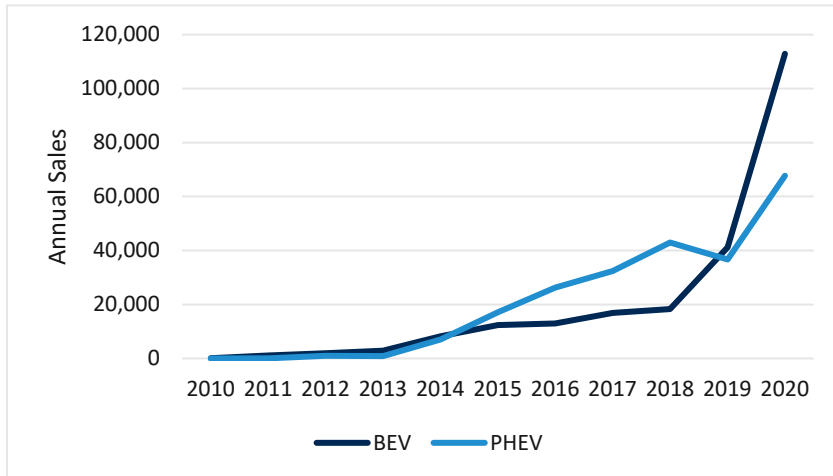


Figure 21: BEV and PHEV Sales in the UK

The PEV purchase incentive in the United Kingdom is known as the plug-in car grant. The value of incentives has been falling since 2018. The program was most recently updated in March 2021. Zero emission vehicles with greater than 70 miles of range receive up to 35% of their purchase price, with a maximum of GBP£1,500 (US\$2,040) [31]. The incentive is given to car dealerships or manufactures and is passed on to the consumer at the point of PEV purchase via a reduction in vehicle purchase price. PHEVs no longer receive any incentive [31].

In the UK, income tax exemptions are available for drivers of company cars. The income tax exemption provides a substantial yearly incentive for drivers of BEVs. The incentive is not tied to the point of purchase. Company car drivers pay benefit in kind (BIK) tax which is calculated based on the value of the vehicles, the company car driver's annual income tax, and the emissions of the vehicle. The emissions of the vehicle are used to determine the BIK tax band for the vehicles. BIK rates for 2021 and 2022 go from 1% (for vehicles <50g CO₂/km) with a range of at least 130 miles to 37% (for petrol vehicles >170g CO₂/km). PHEVs will pay between 7% and 21% depending on their electric range and CO₂ emissions.

The following calculation is used:

$$\text{Vehicle MSRP} \times \text{BIK rate} \times \text{Income tax band} = \text{BIK tax liability}$$

Assuming a 40% income tax rate a Golf GTE PHEV owners would pay £1584, a Volkswagen ID3 owner would pay £123, a diesel VW Golf owner would pay £3637, and a petrol golf would pay £3032 owner in BIK tax annually. BEVs receive the largest reduction in tax liability paying substantially lower tax, PHEVs pay around half the BIK tax of a conventional vehicle.

United States

BEV Incentives: US\$7,500

PHEV Incentives: US\$7,500

Incentive Type: Post Purchase Tax Credit

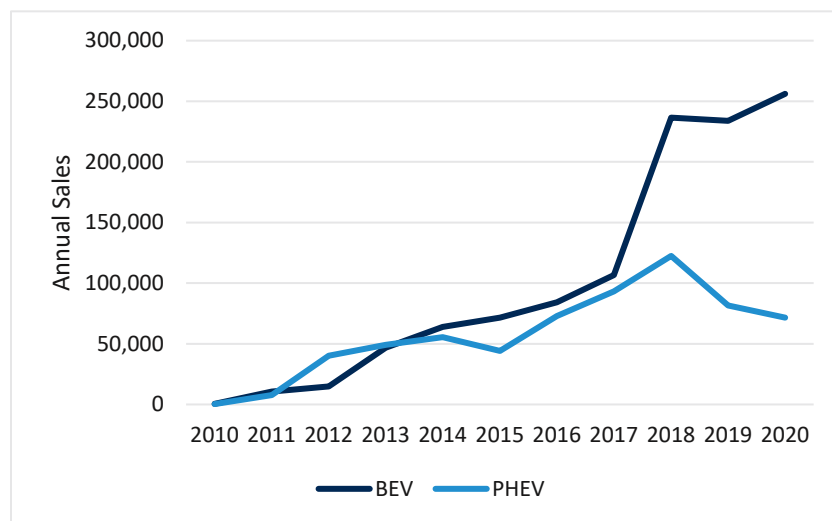


Figure 22: BEV and PHEV Sales in the US

The United States has a national (federal) tax credit that consumers receive once, when filing their income taxes for the year in which they purchased their PEV. The incentive ranges from US\$2,500 to US\$7,500, based on the PEVs battery capacity [32,33]. The vehicle must draw propulsion energy from a battery with at least 5 kWh of capacity, with a gains of US\$417 for each kWh after 5 kWh to a maximum of US\$7,500 [33]. Table 18 shows the value of the federal tax credit for several PEVs. The maximum federal tax credit is applicable to vehicles sold by each automaker until they sell 200,000 PEVs. For the two quarters after they sell 200,000, the maximum tax credit value falls by 50% (US\$3,750). For the third and fourth quarter after 200,000 PEVs are sold, the incentive is reduced to 25% of its original value (US\$1,875). After the fourth quarter, no incentive is available for that vehicle [33]. Tesla and General Motors buyers no longer qualify for the US\$7500 rebate because these manufacturers already produced 200,000 electric vehicles. The newly proposed GREEN Act could bring back an incentive of up to US\$7000 for Tesla and GM buyers [34].

Multiple states also provide incentives for PEVs, these differ in amount given and how they are provided by state.

Table 17: Example of Tax Credits in the US.

Vehicle	Propulsion	Battery Capacity (kWh)	Tax Credits Earned (US\$)
Nissan Leaf	BEV	40	7,500
Honda Clarity	PHEV	17	7,500
Toyota Prius Prime	PHEV	8.8	4,502

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