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Driving the Market for Plug-in Vehicles: Understanding Financial Purchase Incentives

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Key Takeaways

Purchase incentives can be used to promote plug-in electric vehicle (PEVs) market growth. A well-designed incentive will:

1. Be delivered as a grant, value-added tax, or purchase tax exemption.
2. Be combined with high taxes or disincentives, for high CO₂-emitting internal combustion engine vehicles.
3. Offer larger incentives for battery electric vehicles and plug-in hybrids with long driving ranges.
4. Offer smaller incentives for plug-in hybrids with low electric ranges.
5. Not be applicable to high-end luxury battery electric vehicles or to persons of very high income.
6. Be promoted to consumers through education and outreach campaigns that would also build awareness of PEVs in general. Education and outreach is explored in another policy brief.
7. Not be removed too early in the market introduction of PEVs until PEVs gain a stable foothold in the market.
8. Financial purchase incentives should be used in combination with other incentives available after PEV purchase (provision of charging stations, free parking, HOV lane access, toll waivers etc.).

Introduction

Plug-in electric vehicles (PEVs) are more efficient and less polluting than internal combustion engine vehicles (ICEVs). For PEVs to have the most significant impact on urban air pollution, energy consumption, and climate change, they need to be deployed in large numbers. For this to happen consumers may need to be incentivized to purchase them. This policy brief explores financial purchase

incentives for plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs). Financial purchase incentives are monetary instruments used to attract buyers to PHEVs or BEVs.

PHEVs and BEVs are currently more expensive than ICEVs. Purchase incentives are used to make PHEVs and BEVs more affordable for consumers. Meanwhile, costs are reduced through learning and economies of scale, eventually leading to BEV and PHEVs achieving price parity with ICEVs.

This policy brief describes the effectiveness of incentives in increasing PHEV and BEV sales. This

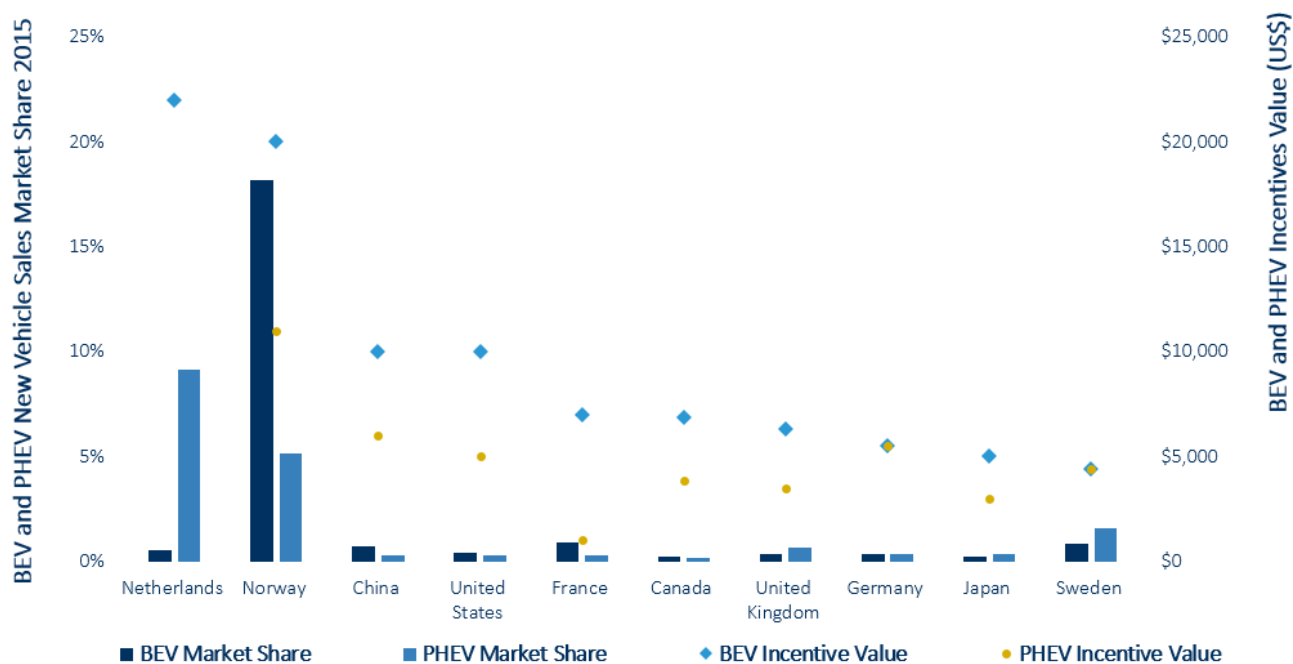


Figure 1: Chart showing the relationship between incentive value for BEVs and PHEVs and the market share of the vehicles [2]. The higher the value of incentives offered, the higher the market for PEVs will be.

brief explores how these incentives should be designed so that they are the most effective. The evidence presented in this policy brief is taken from a systematic literature review [1].

Lessons from Academic Research and Empirical Data

More than 30 studies show that purchase incentives are effective in increasing PEV sales. Research using statistical analysis has found that purchase incentives increase PEV market shares.

Purchase incentives reduce the overall cost of buying a BEV or PHEV and are delivered in multiple ways including grants, value-added taxes (VAT) or tax exemptions, and rebates or income tax credits.

Purchase Incentive Delivery

Some incentives are provided upfront while others

come after consumers buy PEVs. Incentives that come upfront, not afterwards, are more effective.

The following types of incentives are currently in use:

- *Point-of-Sale Grant Incentives:* These are in the form of a government grants that reduce the upfront purchase price of a BEV or PHEV. The plug-in car grant in the UK offers £4,500 off the purchase price of a BEV and £2,500 off a PHEV.
- *Value Added Tax (VAT) and Purchase Tax Exemptions:* In some markets BEVs do not pay VAT or purchase tax (which ICEVs must pay). This reduces the upfront purchase price. In Norway BEVs pay neither VAT, which is 25%, nor purchase tax, which can be an additional 100% of the vehicle value.
- *Post-Purchase Rebates:* Consumers receive a check or 'cash back' after they have purchased a PEV. This does not reduce the point-of-sale price of a PEV. In California, buyers of BEVs receive a US\$2,500 rebate.
- *Income Tax Credits:* Consumers receive an income tax reduction at the end of the year. This does not reduce the upfront purchase price of the vehicle. In

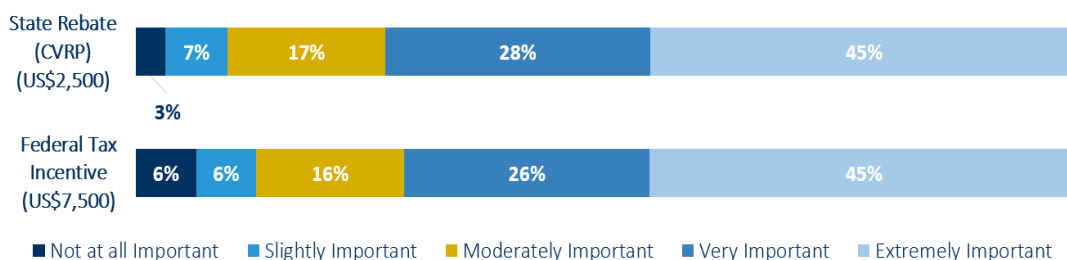


Figure 2: Despite the US Federal Income Tax being worth three times more than the California Vehicle Rebate Program (CVRP), consumers value the incentives equally because they receive the CVRP sooner than the tax credit.

the US, buyers of some PHEVs and all BEVs receive a federal income tax credit of up to US\$7,500.

Of these incentives, grants, VAT or tax exemptions and rebates are the most effective. Income tax credits are effective but are inefficient.

Purchase incentives for BEVs and PHEVs

BEVs offer the greatest environmental benefits and should receive the highest level of incentive. PHEVs with long electric ranges (>30 miles) can achieve the same number of electric miles as BEVs and should receive a similar incentive. PHEVs with lower electric ranges should receive diminishing incentives based on their range. This is due to them having a poor ratio of electric miles to gasoline miles driven [4,5].

Income and Vehicle Price Caps

Purchase incentives are less important for buyers of high-end luxury BEVs or for people with very high incomes [7] (See Figure 3). Purchase incentives should have a price eligibility cap (as applied in Germany) or an income eligibility cap.

Education and Awareness

Studies have found that knowledge of PEV incentives and PEVs is low and therefore the impact of the incentives is smaller than it should be [8].

Incentive Phase-Outs

At present, incentives are very important; around 50% of BEV sales may not occur without the purchase incentives. The removal of purchase incentives too early in the introduction of PEVs will have a negative effect on market growth.

Rebates and grants may be susceptible to budgetary constraints. In some regions, tax and VAT exemptions for BEVs are paired with high taxes or VAT for high CO₂ emitting ICEVs effectively create a revenue source to fund PEV subsidies. This may result in policies that last longer. This is applied in France with the feebate (bonus-malus) system [9].

Other Policy Considerations

They should be used in combination with other incentives such as free parking, car pool lane access, free tolls and the development of PEV infrastructure. These are explored in additional policy guides (see Further Reading for full list).

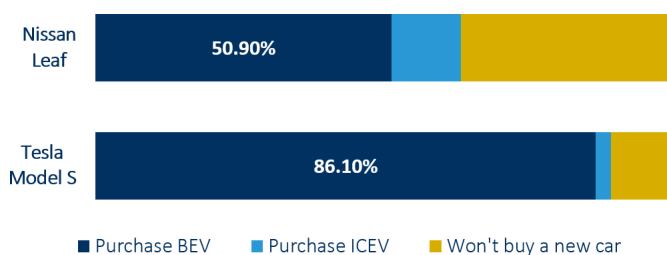


Figure 3: The chart shows consumer behavior if the US federal income tax credit was not available. Most buyers of high-end BEVs (Tesla Model S) would still purchase their vehicle without the incentive [6]. Tesla buyers are less price sensitive, reflecting their higher incomes.

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Further Reading

This policy brief is part of a series of briefs. Each brief concentrates on a specific aspect of PEVs.

The following briefs are available:

1. Regulatory Mechanisms and Implementation
2. Financial Purchase Incentives
3. Non- financial and in use incentives
4. Information, Education and Outreach
5. Electricity Grids and PEV Infrastructure

Briefs are available at: <https://phev.ucdavis.edu/international-ev-policy-council-policy-briefs/>

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