

INTERNATIONAL EV POLICY COUNCIL

Driving the Market for Plug-in Vehicles - Understanding Reoccurring Incentives

Scott Hardman, Tom Turrentine, Nicolo Daina, Erik Figenbaum, Dahlia Garas,
Patrick Jochem, Sten Karlsson, Denis Naberezhnykh, Jose Pontes,
Nazir Refa, Benjamin Sovacool, Francis Sprei, Gil Tal

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. To achieve this consumers will need to be incentivized for them to purchase them.

This policy guide explores reoccurring incentives for PEVs. It compliments another guide that explores financial purchase incentives [1]. Reoccurring incentives are received by consumers during vehicle ownership opposed to financial purchase incentives which are received at point of sale. Reoccurring incentives can be received at any increment, during any timeframe, and not all consumers use these incentives when they are in place. This policy guide outlines the effectiveness of reoccurring incentives in promoting PEV sales. It describes how these incentives should be utilised to have the greatest impact on PEV sales.

Lessons from Academic Research & Empirical Data

Academics have undertaken research to analyze whether different reoccurring incentives are effective in promoting PEV sales. The findings of these studies

are explored below and are presented in detail in [2].

PEV Charging Infrastructure

The development of charging infrastructure may be the most important consideration for policy makers. Developing public, work place, and corridor charging has been found to increase rates of PEV adoption [1,2]. A lack of infrastructure will deter consumers from purchasing a PEV.

In locations with long dwell times slow charge infrastructure can be installed. In locations with short dwell times DC fast charging infrastructure should be installed. Policy makers should provide funds that allow the construction of both public and private charging infrastructure. This should be in urban areas, at work places, on travel corridors, and travel destinations. Infrastructure development is explored in [5].

HOV, Bus & Transit Lanes

Allowing PEVs to access HOV, transit, or bus lanes is effective in encouraging consumers to purchase a PEV, though this incentive may encourage consumers to purchase low range PHEVs over BEVs [3]. This incentive is more effective in more congested regions, and may have little impact in uncongested regions.

HOV, transit, and bus lane access for PEVs should be introduced in locations where congestion exists and should promote the use of PEVs. This is done

by allowing PEVs to drive in traditionally limited-access lanes without restriction. Lanes are usually in operation during peak travel times, some are in operation 24 hours per day. Allowing PEVs to drive in these lanes may only be a short-term measure as after PEVs have gained a significant market share the lanes could become congested, though it continues to be a successful intervention in regions with high PEV sales, notably California (HOV lanes) and Norway (bus lanes).

Parking Incentives

Allowing BEVs and PHEVs to park for free, at discounted rates, or at preferential locations is effective in encouraging consumers to purchase the vehicles [4,5].

Free and discounted parking allows drivers of PEVs to have reduced expenditure on parking fees. Preferential parking allocates favourable parking spaces for PEVs. Parking incentives are most effective when paired with charging infrastructure. Free parking may be a short-term intervention due to lost revenue. However, surcharges for highly polluting ICEVs could account for the lost revenue. Preferential parking does not negatively impact revenue.

Toll Waivers

Toll waivers have been introduced in few regions globally. Research shows that they are effective in increasing PEV sales [6,7]. These waivers have been applied to bridge, road, tunnel, and ferry tolls. Policy makers can seek to implement toll fee waivers in regions where toll roads are in operation. This may be a short-term policy due to reduced revenue. Higher fees for ICEVs could help to maintain revenue though. Additionally, PEVs could receive discounts rather than full waivers after PEVs have begun to be purchased in significant numbers.

Congestion Charge Zones

Introducing zones in urban areas where ICEVs are required to pay to enter has been introduced

in a small number of locations (e.g London and Madrid). These locations allow PEVs to enter the zones for free. This has been found to be effective in encouraging PEV adoption [8,9]. It also alleviates congestion, and improves air quality. Congestion charge zones should be implemented in urban areas. They should require ICEVs to pay to enter the zone. PEVs should be allowed to enter for free.

Annual Vehicle Tax Discounts

Providing discounts or exemptions to annual vehicle tax or licensing fees is effective in encouraging PEV adoption [6]. In some nations vehicles are required to pay an annual road tax or an annual licence fee. Exempting PEVs from these fees will encourage consumers to purchase the vehicles. It is most effective when tax for ICEVs is high. An increasing tax on ICEVs can be used to fund the exemptions for PEVs.

Petroleum Price

The price of petroleum has been found to be related to PEV sales. High petroleum prices are correlated to increased sales of PEVs. An incrementally increasing tax on petroleum can be used to increase fuel prices. This will encourage consumers to purchase more efficient vehicles, including PEVs.

Number of Incentives

Studies have found that the number of incentives in place is related to PEV market growth. Introducing more incentives will have a greater impact on PEV sales. Infrastructure investments are a must have policy measure. HOV, transit and bus lanes, parking incentives, toll waivers, congestion charge zones, annual tax waivers, and petrol price increases are all effective means in promoting PEV sales. The combined impacts of these incentives will be greater than their individual impacts. Consumers are motivated by different incentives and sometimes desire many incentives. Many of these incentives are effective in encouraging new and used PEV sales. Any incentive that reduces the cost or increases the convenience of owning a PEV in comparison to

an ICEV will be effective in promoting PEV market growth.

Education and Awareness

Any policy measure cannot achieve its full efficacy without consumers being aware of it. Policy makers should seek to initiate education and awareness campaigns to promote the available incentives. Education and awareness is explored in full in [13].

Interactions with Public Transit

Some regions have high levels of public transit use and are working towards increasing the use of public transit. In these regions policy makers, should consider the impact incentivising PEV use will have on rates of public transit use. Policy makers should seek to maintain transit use whilst increasing PEV adoption. Policy makers should introduce specific policy measures that work towards making it easier and cheaper to access public transit hubs. For example, introducing parking and charging incentives for PEVs at public transit hubs. Areas where commuters travel to (e.g urban areas) should have fewer incentives than transit hubs. The aim of this would be to encourage consumers to drive to transit hubs and not urban areas.

BEVs and PHEVs

Reoccurring incentives should be targeted so that BEVs and long range PHEVs (>30 miles electric range) receive similar incentives. These vehicle types achieve a similar number of electric miles, meaning they have similar energy, climate, and air pollution benefits. Short range PHEVs should have fewer incentives available to them. PHEVs with ranges of <30 miles do not achieve many electric vehicle miles therefore have lower efficiencies and worse environmental performance [10].

value of PEVs to consumers and have been shown to have a positive impact on the market. Policy makers should introduce as many incentives as possible to ensure PEVs achieve market growth. Policy makers should use HOV, transit and bus lanes, parking incentives, toll waivers, congestion charge zones, annual tax waivers, and petrol price increased to promote PEVs. Incentives should be introduced in as many regions as possible to have the greatest impact. Incentives should also be transparent and consumers should be aware of how long incentives will be in place. Reoccurring incentives should be paired with financial purchase incentives, and all incentives should be clearly communicated to consumers through education and awareness campaigns. It may not be possible to have these incentives in place permanently, therefore policy makers may need to remove them. Incentives should not be removed suddenly without notice; a gradual phase out of incentives once PEVs have gained a stable foothold on the market will be the least disruptive. Finally to ensure that incentives are having the desired impact policy makers should continually monitor their impact on PEV sales.

Summary

Reoccurring incentives continually reinforce the

Acknowledgements

The International Electric Vehicle Policy Council is coordinated by the Plug-in Hybrid & Electric Vehicle Research Center at UC Davis, and is funded by ClimateWorks Foundation.

Contact Information

Lead Authors

Scott Hardman, University of California Davis, USA, shardman@ucdavis.edu

Tom Turrentine, University of California Davis, USA, tturrentine@ucdavis.edu

Contributing Authors

Nicolo Daina, Imperial College London, UK, n.daina@imperial.ac.uk

Erik Figenbaum, TOI (Institute of Transport Economics), Norway, Erik.Figenbaum@toi.no

Dahlia Garas, University of California Davis, USA, dmgaras@ucdavis.edu

Patrick Jochem, Karlsruhe Institute of Technology, Germany, patrick.jochem@kit.edu

Sten Karlsson, Chalmers University of Technology, Sweden, sten.karlsson@chalmers.se

Denis Naberezhnykh, TRL, UK, dnaberezhnykh@trl.co.uk

Jose Pontes, EV-Sales Blog, Spain, efeelblog@gmail.com

Nazir Rafa, Elaadnl, Netherlands, Nazir.Refa@elaad.nl

Benjamin Sovacool, University of Sussex, UK,

B.Sovacool@sussex.ac.uk

Frances Sprei, Chalmers University of Technology, Sweden, fsprei@chalmers.se

Gil Tal, University of California Davis, USA gtal@ucdavis.edu

Further Reading

This policy guide is part of a series of guides. Each guide concentrates on a specific aspect of PEVs.

The following guides are available:

Introduction to PEV Policy Guides

1. Regulatory Mechanisms and Implementation

2. Government and Industry

3. Financial Purchase Incentives

4. Non-financial and in use incentives

5. Information, Education and Outreach

6. Electricity Grids and PEV Infrastructure

Selected References

[1] Hardman S, Turrentine T, Axsen J, Garas D, Goldberg S, Jochem P, et al. Driving the Market for Plug-in Vehicles - Understanding Financial Purchase Incentives 2017.

[2] Hardman S. Reoccurring and Indirect Incentives for Plug-in Electric Vehicles – A Review of the Evidence. Transp Res Part A Policy Pract (UNDER Rev 2017).

[3] Nicholas M a, Tal G. Charging for Charging : The Paradox of Free Charging and Its Detrimental Effect on the Use of Electric Vehicles. 2013.

[4] Caperello N, Tyreehageman J, Davies J. I am not an environmental wacko! Getting from early plug-in vehicle owners to potential later buyers. Transp Res Board 2015 Annu Meet 2015.

[5] Hardman S, Turrentine T, Tal G. Driving the Market for Plug-in Vehicles - Developing PEV

Charging Infrastructure. Inst Transp Stud 2017.

[6] Tal G, Nicholas MA. Exploring the Impact of High Occupancy Vehicle (HOV) Lane Access on Plug-in Vehicle Sales and Usage in California. 2014.

[7] Mersky AC, Sprei F, Samaras C, Qian Z (Sean). Effectiveness of incentives on electric vehicle adoption in Norway. Transp Res Part D Transp Environ 2016;46:56–68. doi:10.1016/j.trd.2016.03.011.

[8] Bjerkan KY, Nørbech TE, Nordtømme ME. Incentives for promoting Battery Electric Vehicle (BEV) adoption in Norway. Transp Res Part D Transp Environ 2016;43:169–80. doi:10.1016/j.trd.2015.12.002.

[9] Figenbaum E, Kolbenstvedt M. Learning from Norwegian Battery Electric and Plug-in Hybrid Vehicle Users. 2016.

[10] Zhang Y, Qian Z (Sean), Sprei F, Li B. The impact of car specifications, prices and incentives for battery electric vehicles in Norway: Choices of heterogeneous consumers. Transp Res Part C Emerg Technol 2016;69:386–401. doi:10.1016/j.trc.2016.06.014.

[11] Percoco M. The effect of road pricing on traffic composition: Evidence from a natural experiment in Milan, Italy. Transp Policy 2014;31:55–60. doi:10.1016/j.tranpol.2013.12.001.

[12] Ozaki R, Sevastyanova K. Going hybrid: An analysis of consumer purchase motivations. Energy Policy 2011;39:2217–27. doi:10.1016/j.enpol.2010.04.024.

[13] Hardman S, Turrentine T, Tal G, Kurani K. Driving the Market for Plug-in Vehicles - Information, Education, and Outreach. Inst Transp Stud 2017.

[14] Nicholas MA, Tal G, Turrentine TS. Advanced Plug-in Electric Vehicle Travel and Charging Behavior Interim Report Advanced Plug in Electric Vehicle Travel and Charging Behavior Interim Report. Inst Transp Stud 2016.