EVALUATION OF STATE PLUG-IN ELECTRIC VEHICLE PURCHASE INCENTIVE PROGRAMS: WHAT DRIVES VEHICLE UPTAKE?

by
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Abstract

This objective of this paper was to identify common program components of state-level financial purchase incentives for plug-in electric vehicles (PEVs) that are most closely linked with "success," which is determined by referring to the number of PEVs registered in the state, normalized based on population (per 1,000 people) in 2017. While there is no single factor that drives PEV uptake for non-fleet retail customers, financial purchase incentives are a key component. We evaluated PEV financial purchase incentive program components to offer recommendations to states on successful program elements. Through a review of active state PEV purchase incentives in California, Colorado, Connecticut, Massachusetts, New York, and Washington, this project developed a list of recommendations for key components of incentive programs to support PEVs. We offered six recommendations to consider when designing PEV incentive programs. These recommendations may inform states developing PEV financial purchase incentive programs to expand the PEV market. This project is significant as many PEVs provide a promising pathway to reduce petroleum consumption, GHG emissions, and air pollution. Further, an evaluation of state-level incentive programs is critical as more weight is placed on states' efforts address these challenges.

Table of Contents

List of Tables

Introduction

About one-third of the United States greenhouse gas (GHG) emissions are produced by the transportation sector. Approximately 62% of the total transportation GHG emissions are produced by light-duty vehicles. Light-duty vehicles also consume more than half of the petroleum-based fuels consumed in United States transportation. A promising pathway to reduce petroleum consumption, GHG emissions, and local air pollution is through plug-in electric vehicles (PEVs), which includes all-electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs) (Zhou et al., 2015). However, there are several barriers to the adoption of PEVs, including high retail prices, the limited range of batteries, and the lack of PEV charging stations (Hidrue et al., 2011). Notably, purchase price is consistently described as the most significant barrier to PEV adoption (Dagsvik, 2002; Newbery and Strbac, 2016; Silvia and Krause, 2016). Reducing this barrier warrants governmental intervention because PEVs mitigate negative externalities from conventional vehicles and produce positive externalities (Graham et al., 2014). At the local, state, and national level, governments promote the ownership of PEVs to reduce petroleum consumption, GHG emissions, as well as improve local air quality (Lutsey et al., 2015).

California enacted a state regulation that original equipment manufacturer (OEM) with annual sales greater than 60,000 vehicles sell a percentage of zero emission vehicles (ZEVs). The requirement rises over time to 22% of new vehicles sold to be ZEVs by 2025 (Clark-Sutton et al., 2016). Nine other states have adopted California's ZEV regulations, including Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont (Clark-Sutton et al., 2016; U.S. Energy Information Administration, 2017).[1] "PEV sales are

[1] On April 3, 3018, Governor Murphy, New Jersey, announced that New Jersey will join other states in signing the State Zero-Emission Vehicles Programs Memorandum of Understanding (http://www.nj.gov/governor/news/news/562018/approved/20180403b_emissions_standards.shtml).

assumed to be largely driven by regulations in the 10 states that have adopted Title 13 of the California Code of Regulations (CCR), Sections 1962.1 and 1962.2" (U.S. Energy Information Administration, 2017).

On October 24, 2013, the governors of eight ZEV states signed the State ZEV Programs as part of a multi-objective strategy to reduce transportation-related criteria air pollutants and GHG emissions, enhance energy diversity, save consumers money, and promote economic growth (Clark-Sutton et al., 2016; State ZEV Programs Memorandum of Understanding (MOU), 2013). Specifically, California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island, and Vermont joined together on this MOU to support the deployment of ZEVs (PEVs and hydrogen fuel cell electric vehicles (FCEVs)) by coordinating actions through involvement in a ZEV Program Implementation Task Force (State ZEV Programs MOU, 2013). The states agreed to meet a collective target of having at least 3.3 million ZEVs on the road within the signatory states and adequate fueling infrastructure by 2025. Collectively, the eight ZEV program signatory states constitute approximately a quarter of the total U.S. vehicle market and can therefore play a substantial role in shifting the market toward ZEVs throughout the United States (State ZEV Programs MOU, 2013).

In May 2014, the ZEV Program Implementation Task Force published a multi-state ZEV action plan identifying 11 key actions to accomplish the goals in the MOU (ZEV Program Implementation Task Force, 2014). The action plan is designed to guide coordination among states and inform state action (ZEV Program Implementation Task Force, 2014). In particular, action two advises that ZEV states provide consumer incentives to enhance the ZEV ownership experience (ZEV Program Implementation Task Force, 2014). All ZEV states have subsequently created financial and or non-financial consumer purchase incentives for PEVs.

As discussed below, a number of recent studies indicate that policy incentives have a positive effect on PEV adoption. However, it is important to acknowledge that vehicle incentives are only part of the picture. In addition to providing incentives to reduce the purchase price of PEVs, overcoming PEV deployment barriers, such as lack of available charging infrastructure, require governments to "support research to develop advanced batteries and innovative technologies to enable reliable electrification, invest in large-scale infrastructure deployment, and offer a range of major financial and nonfinancial incentives (Zhou et al. 2015)." Various policies may also be offered by utilities, OEMs, or private companies. Examples of policies to incentivize the adoption of PEVs include purchase incentives for electric vehicle charging stations, lower electricity rates for PEV charging, preferential parking or free parking, emission inspection exemptions, and HOV lane access (Clark-Sutton et al., 2016; U.S. Energy Information Administration, 2017). In addition, federal policies and incentives also contribute to PEV promotion actions. For example, the federal government offers a tax credit worth up to $7,500 for the purchase or lease of a new PEV.

To develop the PEV market, governments and private entities offer incentives to spur PEV sales, reducing negative externalities from conventional vehicles. We seek to understand the underpinnings of successful state-level PEV financial purchase incentives to help states expand PEV adoption. This project identifies program components of state-level financial purchase incentives for PEVs that are most closely linked with "success," which is determined by referring to the number of PEVs registered in the state, normalized based on population (per 1,000 people) in 2017. We review PEV purchase incentives in California, Colorado, Connecticut, Massachusetts, New York, and Washington. The purchase incentives examined include point-of-sale incentives, rebates, tax credits, and tax exemptions. Recommendations and

suggestions for PEV incentive program components that are closely aligned with success are offered. As state governments develop incentive programs, they may refer to these recommendations, which are intended to capture PEV purchasers beyond early adopters. Policies and programs that support PEVs are critical as PEVs offer a promising pathway to reduce petroleum consumption, GHG emissions, and local air pollution.

This paper only evaluates state financial purchase incentives for PEVs; non-financial incentives or financial incentives that are not offered by a state government directly are not evaluated. All purchase incentives aim to reduce the price consumers pay for a PEV, however purchase incentives can be grouped into four types of incentives (Hardman et al., 2017). One incentive reviewed in this project is a point-of-sale incentive, which is applied immediately at the time a consumer purchases a vehicle. Next, a sales tax exemption allows a PEV purchaser to pay lower or no sales and use taxes, which may also be applied at the point of purchase. Alternatively, a tax credit allows a PEV purchaser to pay a reduced tax on his or her annual state income tax. The final incentive type is a rebate, which reimburses a PEV purchaser that applies for the rebate a set amount following the purchase of a PEV.

While this project reviews multiple state incentive programs, it did not set out to necessarily compare one program against another. To accurately compare programs, extensive statistical analysis would need to have been applied, which was not the approach of this assessment. Instead, we set out to deepen understanding of the attributes of successful programs that spur the adoption of PEVs. This was done by applying a mixed-methods approach to review and assess state-level PEV incentive programs. Data on each state program was gathered for review and program parameters were characterized to identify best practices.

The following table is a breakdown of the type of purchase incentives for the six states examined in this project as well as the incentive value. The incentive value varies depending on the technology, purchase price, or income level of the consumer. More detail on each program is provided in the Results section.

Table 1: State PEV Financial Purchase Incentive Programs

State	Incentive type	Incentive Value
California	Rebate	$1,500-$4,500
Colorado	Point-of-sale tax credit	$2,500-$5,000
Connecticut	Point-of-sale rebate	$500-$3000
Massachusetts	Rebate	$1,000-$2,500
New York	Point-of-sale rebate	$500-$2,000
Washington	Point-of-sale sales/use tax exemption	$3,000*

* A high-end estimate based on the vehicle sales tax in Washington, which applies to the first $32,000 of the PEV price (Banse, 2018; Gordon-Bloomfield, 2016).

We hypothesize that the success of PEV incentive programs is not solely dependent upon the value of the incentive offered. We postulate that other incentive program elements will be closely linked with PEV deployment success.

Literature Review

The objective of this paper is to identify which state-level financial incentive purchase program elements are closely linked with PEV uptake. This work builds upon a growing body of literature that investigates policy actions that may spur PEV adoption. Previous studies, using diverse methodologies, have found that consumer financial incentives are correlated with an increase in PEV sales (Hardman et al., 2017; Jin et al., 2017; Sierzchula et al. 2014; Slowik and Lutsey, 2017; Zhou et al. 2015). In particular, through an examination of PEV market trends and government policies, Zhou et al. 2015 found that national and regional PEV-related incentives can play an important role in jump-starting the PEV market (Zhou et al. 2015). As such, “policy makers wishing to reduce transportation-related emissions can use purchase incentives to increase PEV sales” (Hardman et al., 2017). These findings, and the ones discussed below,

provided a foundation of knowledge to support our evaluation of state-level PEV financial purchase incentive programs for non-fleet retail customers.

Academic research regarding the effectiveness of state PEV purchase incentives to increase vehicle adoption has not been extensive. Few have provided lessons learned from state PEV incentive programs or have covered multiple-state incentive programs for the specific technology evaluated in this project. Instead, researchers have explored federal regulatory and incentive programs to spur fuel-efficient vehicles or hybrid electric vehicles (HEVs), looked at the effectiveness of single-state incentive programs or local incentive programs for HEVs or PEVs, deciphered consumer motivations and preferences for HEVs or PEVs, and examined the effectiveness of HEVs and PEVs to reduce emissions.

Previously, researchers have focused on the effectiveness of specific federal vehicle-related legislation based on economic, social, and environmental criteria, such as the federal Consumer Assistance to Recycle and Save Act of 2009 (Cash for Clunkers program) (Huang, 2010; Tyrrell and Dernbach, 2011). Researchers have also examined a variety of federal incentives to spur consumer adoption of HEVs (Gallagher and Muehlegger, 2011).

Literature has also covered state or community-level examinations of incentive programs for HEVs or PEVs (Musti and Kockelman, 2011). In an evaluation of local policy measures to stimulate the uptake and use of PEVs, researchers discussed the effectiveness, efficiency, and feasibility of supportive policies for PEVs (Bakker and Trip, 2013). Researchers also evaluated the effectiveness of specific state incentive programs or local programs for HEVs or PEVs (DeShazo et al., 2017). In addition, there have been reviews of the effectiveness of foreign market policy instruments to drive PEV adoption (Gass et al., 2014; Jiménez et al., 2016; Mersky et al., 2016).

Researchers have examined the efficacy of various incentive types, including state sales tax waivers, income tax credits, and non-tax incentives, for HEVs and found that the type of tax incentive offered (e.g., credit, exemption) is as important as the fiscal amount of the incentive (Gallagher and Muehlegger, 2011). Additionally, researchers reported on a case study of consumer adoption of HEVs to discern what drives consumers to adopt energy-sustainable innovations some explored consumers' willingness to pay for PEV attributes and overall preferences for PEVs (Hidrue and Parsons, 2015; Musti and Kockelman, 2011; Ozaki and Sevastyanova, 2011). Another study reviewed external factors, attempting to ascertain whether reductions in fuel costs, vehicle registration tax, or GHG emissions would encourage consumers to purchase a HEV or an alternative fuel vehicle (AFV) (Caulfield et al., 2010). Other researchers have examined consumer motivations and preferences for HEVs or PEVs and identified socio-economic factors that are expected to be influential in determining PEV adoption rates (Egbue and Long, 2012; Helveston et al., 2015; Sierzchula et al., 2014; Vergis and Chen, 2015).

Although a relatively small number of papers in comparison to the entire body of literature, there have been research findings that conclude that incentives are not effective at driving the PEV market and are costly. For example, some researchers proposed an elimination of mainstream consumer incentives that are replaced with targeted niche market incentives (Green et al., 2014; Skerlos and Winebrake, 2010). In addition, researchers have developed a modeling framework to optimize the design of PEV incentive policies (Nie et al., 2016). Based on model outputs, researchers found that in comparison to investment in building charging stations, providing purchase incentives for PEVs is less effective at shifting the PEV market (Nie et al., 2016).

Additionally, researchers have assessed the performance of rebate designs that vary in terms of technologies, consumer income eligibility, and caps on the price of eligible vehicles (DeShazo et al., 2017). Their conclusions suggest that the most effective rebates are progressive and suggest redesigning existing rebate programs to give consumers in lower-income classes relatively higher rebates to expand the market from early adopters (DeShazo et al., 2017). Further, publications from International Council on Clean Transportation, Center for Climate and Energy Solutions, and Center for Sustainable Energy (CSE), have assessed the impact of various state incentives on PEV uptake and provided recommendations on the most compelling approaches to promoting PEV deployment (Jin et al., 2014; Lutsey et al., 2015; Slowik and Lutsey, 2017; Welch, 2017).

Researchers find that state PEV incentives play a significant early role in reducing the cost of ownership and are driving PEV sales (Slowik and Lutsey, 2017). In a review of HEVs, it was reported that indirect or nonfinancial incentives, such as HOV lane access or free parking for PEVs, have not typically had a significant impact on vehicle uptake (Potoglou and Kanaroglou, 2007; Gallagher and Muehlegger, 2011). However, researchers have found that financial incentives for the purchase of advanced or AFVs correlates with increased adoption (Huang, 2010; Ozaki and Sevastyanova, 2011; Sallee, 2011). A paper from U.S. Energy Information Administration (EIA) evaluated PEV sales and incentives over time and found that incentives, particularly rebates and tax credits, have a direct impact on sales (U.S. Energy Information Administration, 2017). Similarly, researchers used statistical models to review the effectiveness of financial and non-financial PEV promotion activities in U.S cities. The analysis of 25 major U.S. metropolitan areas found that consumer incentives are linked with higher PEV sales (Lutsey et al., 2015).

Other research finds that multiple policy actions are the most effective at driving PEV uptake. Researchers developed models to simulate the introduction of four policy scenarios aimed at promoting PEV adoption in an urban community and compared them against a baseline (Silvia and Krause, 2016). The different scenarios included subsidies for the purchase of a vehicle, development of local public charging, increasing the visibility of EVs on the road through government fleet purchases, and a hybrid approach of all actions. The results found that there are tiers of policy effectiveness. Specifically, charging network expansion had virtually no impact on PEV sales, increasing PEV visibility through the purchase of government fleets and providing incentives to reduce purchase price have similar moderate impacts on PEV sales, and the hybrid policy approach led to the greatest number of PEVs on the roadways (Silvia and Krause, 2016). Another study sought to determine the relationship of consumer financial incentives to increase PEV adoption (Sierzchula et al., 2014). By referring to existing literature and using multiple linear regression analysis, results showed that financial incentives, charging infrastructure, and local presence of production facilities to be significant and positively correlated to a country's PEV market share (Sierzchula et al., 2014).

Few previous attempts have been made to evaluate multiple state PEV incentive programs or review how successful PEV incentive programs are designed. To the best of our knowledge, this study is among the early attempts to assess the effect of different state-level consumer financial purchase incentives for PEVs to identify common characteristics of successful PEV incentive programs. This research contributes to the existing body of literature. It provides a particularly helpful review as "one of the most important issues concerning the deployment of PEVs is determining what incentives are needed to promote deployment" (Committee on Overcoming Barriers to Electric-Vehicle Deployment Board on Energy and

Environmental Systems, 2015). However, little is yet known about the effectiveness of PEV incentive programs (Committee on Overcoming Barriers to Electric-Vehicle Deployment Board on Energy and Environmental Systems, 2015).

Methodology and Assumptions

This project uses a mixed-methods approach to review and assess state-level PEV financial purchase incentive programs. First, we collected data from the literature as well as informational resources specific to each of the six PEV financial purchase incentives. Then, we developed interview questions (included in Appendix A) to survey state program representative for each incentive program on additional program details, including development, implementation, and results to date. Data was collected and synthesized for common program components and cross-referenced with findings from literature. Data on the number of PEVs deployed in a state was obtained for each year the incentive program has been in place. We then determined the number of PEVs registered in the state, normalized based on population (per 1,000 people) in 2017 using a simple calculation. The assumptions and methodologies applied in this review of state-level PEV financial purchase incentives are covered in greater detail below.

Methodology for State Incentive Program Selection

A suite of policies exists at the federal, state, local, and private levels to spur PEV deployment. For the purposes of this project, private or local incentives, as well as the contribution of research and development are not reviewed or discussed at length. The aim of this project is to understand what program parameters of state-level financial purchase incentives are closely aligned with success so that other states may develop effective PEV financial purchase incentives.

To determine which state-level financial incentive programs would be evaluated we considered a number of factors. Previous research found that the “25 most-populous U.S.

metropolitan areas represent more than 42% of the population, 46% of auto sales, and 67% of new PEV registrations," (Lutsey et al., 2015). In our assessment, we prioritized states with major metropolitan areas as it was found that states with high population densities offer more imminent opportunity for PEV market penetration (Lutsey et al., 2015). One explanation for this is that cities tend to have commuting distances that most currently available PEVs can cover on battery power alone (Lutsey et al., 2015).

Then we identified which ZEV MOU states have active financial incentives for the purchase of PEVs, using the U.S. Department of Energy's (DOE) Laws and Incentives database. The reasoning for this is that collectively, the eight ZEV MOU program signatory states constitute approximately a quarter of the total U.S. passenger vehicle market and can therefore play a substantial role in shifting the market toward ZEVs throughout the United States (State ZEV Programs MOU, 2013). Additionally, it has been noted that states that have joined the ZEV program will be more accommodating to PEVs than states that have not (Clark-Sutton et al., 2016). The following search filters were applied using DOE's Laws and Incentives search function to generate a list of purchase incentives programs in the ZEV MOU states.

> **Jurisdiction**: California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island, and Vermont
> **Technology/Fuel**: EVs, PHEVs
> **Incentive/Regulation**: Tax Incentives, Loans and Leases, Rebates, Other Incentives, Acquisition / Fuel Use, Climate Change / Energy Initiatives
> **User**: Vehicle Owner/Driver

Next, the incentive programs were reviewed based on two criteria: whether the program start date would provide at least a year's worth of data for analysis and whether the PEV purchase incentive is available for non-fleet customers. The ZEV MOU states that meet these criteria are California, Connecticut, Massachusetts, and New York. Maryland, Oregon, Rhode Island, and Vermont are MOU states that are excluded from review as they do not meet the

above criteria. First, Maryland and Oregon's incentives program started in July 2017 and January 2018, respectively; as such, data on program impact on PEV uptake would be limited. Additionally, Vermont did not yet have a state-level financial purchase incentive for PEVs. Lastly, Rhode Island's Charge Up! Program was not open to non-fleet customers.

Based on knowledge of strong markets for PEVs from literature review and data from the Auto Alliance's Advanced Technology Vehicle (ATV) Sales Dashboard, an additional search was conducted to identify incentive programs in non-MOU states. State-level sales and market share data for light-duty PEVs from 2011 to 2017 is provided in the ATV Sales Dashboard, sourced from IHS Markit data. IHS Markit collects vehicle sales and registration data from state departments of motor vehicles. Referring to the ATV Sales Dashboard data, the states with the highest number of PEVs registered are: California, New York, Georgia, Washington, Florida, Texas, New Jersey, Oregon, Michigan, Massachusetts, Colorado, and Pennsylvania. A second DOE Laws and Incentives search was conducted for states not already identified in the previous search result. Specifically, the applied filters were:

> **Jurisdiction**: Colorado, Florida, Georgia, Michigan, New Jersey, Oregon, Pennsylvania, Texas, Washington
> **Technology/Fuel**: EVs, PHEVs
> **Incentive/Regulation**: Tax Incentives, Loans and Leases, Other Incentives, Acquisition / Fuel Use, Climate Change / Energy Initiatives
> **User**: Vehicle Owner/Driver

Based on the above filters, results were again reviewed for state-offered incentives for non-fleet retail customers that have been effective for at least one year. Lastly, it was considered whether different types of financial purchase incentives were captured in the states selected, such as point-of-sale incentives, rebates, and tax credits. Based on these considerations, the states that were selected for evaluation were California, Colorado, Connecticut, Massachusetts, New York, and Washington.

Data Collection

After it was determined which states would be included in analysis, data on program background and development, implementation, and program statistics were collected. After preliminary data on programs were collected, interview questions for incentive program representatives were then drafted to elicit additional program design details (interview questions are included in Appendix A). An informal interview was requested with a program representative or someone knowledgeable of a range of program aspects, including development, implementation, and results to identify general trends of successful programs. Follow-up outreach was conducted as necessary. Based on response rates and schedules of program representatives, only two interviews were conducted. The interviews were with a representative of Colorado's Innovative Motor Vehicle Tax Credit and a representative of New York Drive Clean Rebate. Due to this low response rate, analysis was limited to publicly available data for the remaining incentive programs.

Data on the number of vehicles deployed per 1,000 people in each state was determined using data from the corresponding incentive program (as available), the ATV Sales Dashboard, and the U.S. Census Bureau.

Data Sources and Assumptions

The following table summarizes data sources utilized in this project to assess PEV incentive programs.

Table 2: Data Sources and Assumptions

Data	Data Source	Description and Assumptions
Incentive program availability and descriptions	U.S. Department of Energy's Laws and Incentives database (https://www.afdc.energy.gov/laws)	This database tracks federal and state laws and incentives for alternative fuels and vehicles, air quality, fuel efficiency, and other transportation-related topics.
Incentive program details	State program websites and program	Incentive program information and available data were collected from state program websites.

	representative interviews	Interviews collected additional information and data on program development, operation, and results.
PEV sales and registration	Auto Alliance's Advanced Technology Vehicle (ATV) Sales Dashboard (https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard/)	The ATV Sales Dashboard allows users to view state-level vehicle registration data. This interactive mapping feature sources data from IHS Markit, which works with motor vehicle departments to gather vehicle sales data. Data is available from January 2011 through December 2017. Users may filter data by ATV Category (EV and PHEV were selected) and registration type (retail was selected). Based on the effective status dates of the programs included in assessment, 2017 sales data was reviewed.
Population	U.S. Census Bureau (2017; https://www.census.gov/data/tables/2017/demo/popest/state-total.html)	Population data was collected for each assessed state to determine the number of PEVs per 1,000 people.

Assessment and Assumptions

It was determined that a purely quantitative analysis of data would insufficiently capture trends of successful PEV incentive programs as there are a number of exogenous factors that contribute to PEV market development. As such, the assessment is primarily a qualitative review that combines program data, general notes and observations regarding the program, and findings from the literature review.

In order to determine the number of PEVs per 1,000 people, a simple calculation was completed. Specifically, the total number of PEVs registered in 2017 was collected. Then the population estimate, as of July 1, 2017, was collected for each state. The number of PEVs registered in a state in 2017 was divided by the same state's total population in 2017 and then multiplied by 1,000 to estimate the number of PEVs per 1,000 inhabitants.

To determine the number of PEVs registered in 2017, we obtained data from two sources. First, as available, we obtained data from each program on the number of PEVs the incentive program was responsible for deploying. Program level data was not available for Colorado and

New York. Therefore, to obtain data for each state, we referred to a second source of data, the ATV Sales Dashboard. We did not want to ignore the best-available data from the corresponding incentive program, but supplementing incentive program data for states that it was not available (i.e., Colorado and New York) would inaccurately inflate PEV registration data in these states, compared to the other states. This is because incentive programs typically do not capture all new PEV registrations.

There are a number of reasons why state programs do not capture all new PEV registration data. One explanation is that there is lack of information about the incentive when purchasing the PEV. Another possible explanation is that program eligibility requirements may restrict certain non-fleet retail customers or vehicles. For example, California's incentive program excludes customers with income over a certain range and Connecticut's program excludes vehicles that cost over $60,000. As such, it is preferable to refer to data on PEV registration that is available from the incentive program directly. However, state programs may not track this data, such as Colorado, or do not currently make it publicly available, such as New York.

Therefore, we calculated the number of PEVs registered per 1,000 people using both data sources, as available (see Table 3 for a review of the two PEV registration data sources).

Table 3: A Review of Vehicle Registration Data Sources

	Pros	Cons
ATV Sales Dashboard	Provides a consistent data source on the number of PEVs registered for all states.	Data is not specific to the impact of PEV incentive programs; can't attribute all registered PEVs to incentive program.
Incentive program data	Captures the direct impact of an incentive program on the number of PEVs registered.	Incomplete data set; not available for Colorado (CO) or New York (NY). Supplementing missing state data would inflate CO and NY data, compare to other program data.

Results

This section provides an overview of each state's PEV purchase incentive program and highlights notable program details and components. A full review of all program components is available in Appendix B. As only PEV technologies are evaluated in this project, details on other technologies that may be included in the incentive program are not listed. Additionally, we only list the current, or near-future, incentive values for each program and do not detail previous incentive values, if applicable. For each state, data on the number of PEVs deployed per 1,000 people is provided in a table at the end of each description. Data is presented in two separate tables on the number of PEVs deployed per 1,000 people available, if two data sources are available. This is applicable for California, Connecticut, Massachusetts, and Washington. For each of these states, program-specific data is presented in the first table and the second table displays the number of PEVs registered per 1,000 people based on ATV Sales Dashboard data. As necessary, additional assumptions are listed below tables. The section ends with a chart comparing the number of PEVs deployed per 1,000 people in each state, sourcing data from both the program-specific resources and the ATV Sales Dashboard, to the maximum EV incentive value offered.

California

The California Clean Vehicle Rebate Project (CVRP), which began March 18, 2010, offers rebates for the purchase or lease of a new qualified light-duty ZEVs and PHEVs that the California Air Resources Board (CARB) has approved or certified. Rebates are available to individuals, business owners, and government entities on a first-come, first-served basis. Charge Ahead California (Senate Bill 1275, 2014), which took effect on March 29, 2016, required the CVRP to implement eligibility criteria based on income. Generally, rebates for low- and moderate-income households increased and an income cap was implemented for higher-income

consumers. The rebate amounts starting November 1, 2016, to the present are shown in the following table (CSE, 2016a; California Climate Investments and CARB, 2017):

Table 4: California CVRP Rebate Amount

	Filing Status	Gross Annual Income Level	EV	PHEV
Increased Amount for Low/Moderate Income	Gross annual household income ≤ 300% of the federal poverty level* (FPL)		$4,500	$3,500
	Individual	300% of FPL to $150K	$2,500	$1,500
	Head-of-Household	300% of FPL to $204K	$2,500	$1,500
	Joint	300% of FPL to $300K	$2,500	$1,500

OEMs must apply to CARB to have their ZEVs be eligible for the rebate. Based on program eligibility requirements, 20 EVs and 17 PHEVs were eligible for the CVRP rebate, as of 2017 (CSE, 2018b). Vehicles that qualify for a rebate under the CVRP may be purchased out-of-state, but applicants must be California residents at the time of purchase and retain ownership of the vehicle for 30 consecutive months. As long as funds are available, rebates are distributed within 90 calendars days of the application approval. A purchaser or lessee may combine the CVRP rebate with other incentive opportunities. Beginning on January 1, 2015, entities were limited to no more than two rebates. To receive the rebate, the purchaser or lessee must submit a rebate application within 18 months of the date of vehicle transaction (California Climate Investments and California Air Resources Board, 2017).

In addition to providing rebates for the purchase or lease of new, eligible vehicles, the CVRP provides information on the ZEV market to consumers and stakeholders. The program provides a website with project information and online application capabilities, state-wide technology outreach and education and various other market facilitation activities. The car shopper education and outreach resources provide an overview of PEV benefits, technology, and incentives, and includes stories from current PEV drivers. The dealer hub provides information

on how to process rebates and preapproved rebates and offers tips, tools, and trainings to facilitate the sale of PEVs. A number of guides and publications are available for download. Upcoming local education and outreach events are also featured (CSE, 2018b).

The CVRP is administered and implemented through a partnership between CARB and the CSE. Since its inception, the CVRP has received funding from the Air Quality Improvement Program (AQIP). AQIP was created under the California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (Assembly Bill (AB) 118, 2007) and was reauthorized by AB 8, 2013, which extended the fees that support AQIP through 2023. Funding is also provided from the California Energy Commission and Low-Carbon Transportation Investments. Funding for the CVRP is expected to be available through 2023 (CSE, 2016a).

The CVRP's Data and Reporting tab on the program website includes details on the status of funding, rebate statistics, a consumer survey dashboard, and program reports. In 2017, the CVRP distributed $71,537,368 and $30,025,067 to individuals for the purchase of EVs and PHEVs, respectively. Since the project inception in March 2010, through January 2018, the CVRP issued or reserved 227,989 rebates for PEVs to individuals totaling over $514 million. Based on 2017 data, the number of PEVs deployed per 1,000 people in California are shown in Tables 5 and 6 (CSE, 2018a).

Table 5: California PEVs Registered per 1,000 People, 2017, CVRP Data

2017 Data	Vehicles	Funding	PEVs per 1,000 People
EV	26,599	$71,537,368	
PHEV	17,664	$30,025,067	
Total	44,263	$101,562,435	

Table 6: California PEVs Registered per 1,000 People, 2017, ATV Sales Dashboard Data

2017 Data	Vehicles	PEVs per 1,000 People

EV	48,326	2.34
PHEV	44,059	
Total	92,385	

Colorado

The Innovative Motor Vehicle Credit is a legislatively-mandated tax credit (Colorado Revised Statutes 39-22-516.7 and 39-22-516.8) that took effect in 2012 and expires in 2022.[2] From January 1, 2015, to December 31, 2016, a tax credit was available for the purchase, lease, and conversion of light-, medium-, and heavy-duty alternative fueled vehicles, including EVs, PHEVs, compressed or liquefied natural gas, propane, and hydrogen. Credits were claimed for the purchase, lease, or conversion of new and used light-duty vehicles with at least four kilowatt-hours (kWh) of battery capacity. There was no limit to the number of qualifying vehicles for which a taxpayer could claim a credit (Colorado Department of Revenue, 2016; Colorado Legislative Council Staff, 2017).

The credit amount for each vehicle was determined through a calculation, which is shown in Appendix C, with the maximum credit amount set at $6,000 (Colorado Department of Revenue, 2016). This credit calculation formula was reported as being cumbersome and problematic. In addition, it was reported that guidance on the credit from Colorado Department of Revenue was difficult to access, requiring individuals to download numerous guidance documents and forms, which needed information from the dealer to complete. This resulted in a high percentage of residents completing the forms incorrectly or incompletely (Eisemann, 2018).

Due to these issues, a broad cross-section of alternative fuel and advanced vehicle technology stakeholders in Colorado collaborated to update the tax credit (Eisemann, 2018). A coalition of

[2] Program information for tax years 2012-2015 was not available at the time of review.

stakeholders worked to pass legislation (House Bill 16-1332, 2016) that simplified the credit calculation and made the Innovative Motor Vehicle Tax Credit available at the point-of-sale. The updates, which took effect on January 1, 2017, also restricted the tax credit to the purchase or lease of a new PEV (Colorado Department of Revenue, 2016). The amount of the credit now varies depending upon the weight classification of the vehicle and the tax year during which the vehicle is purchased or leased (Eisemann, 2018). Light-duty PEVs purchased or leased between January 1, 2017, and January 1, 2022, are eligible for a tax credit equal to the amounts shown in Table 7 (Colorado Department of Revenue, 2016; Colorado Legislative Council Staff, 2017):

Table 7: Colorado Tax Credit Amount

Vehicle Type	Description	Value		
		1/1/2017-/1/2020	1/1/2020-1/1/2021	1/1/2021-1/1/2022
Purchased PEV	Battery capacity of at least 4 kWh	$5,000	$4,000	$2,500
Leased PEV	Battery capacity of at least 4 kWh	$2,500	$2,000	$1,500

There is no cap to the number of tax credits that may be claimed, but it phases out starting in 2020 and then sunsets on December 31, 2021 (Colorado Legislative Council Staff, 2017). The value of the credit is fully refundable in the year it is claimed and may not be carried forward to offset taxes in subsequent years (Colorado Department of Revenue, 2016; Eisemann, 2018). Vehicles must have a lease term of at least 24 consecutive months to qualify. When an individual acquires the vehicle, he or she may assign the tax credit at the point-of-sale to a financing entity, which allows the individual to realize the full value of the tax credit immediately. The financing entity may collect an administrative fee up to $150 (Colorado Department of Revenue, 2016).

The AFV tax credit webpage provides information available for download on the tax credits for 2015 to 2016, 2016 to 2017, and 2017 to 2021. The webpage also provides guidance

to dealers and finance companies on how to submit an Innovative Motor Vehicle Tax Credit form. In 2017, there were program-specific education and outreach materials developed. The Colorado Energy Office (CEO) collaborated with Refuel Colorado coaches throughout the state and alternative fuel stakeholders to disseminate tax credit information to each entity's local community and fleets. The coaches, CEO, and Colorado Department of Revenue, answered questions from the general public, fleets, and dealers and attended events to provide information on the tax credit. The CEO representative noted in an interview CEO has plans to allocate funds to conduct outreach and update the program webpage (Colorado Department of Revenue, 2016; Eisemann, 2018).

CEO does not track the number of credits that have been claimed, but refers to data on PEVs sold from IHS Markit data provided through the ATV Sales Dashboard, which is summarized in the following table (Eisemann, 2018):

Table 8: Colorado PEVs Registered per 1,000 People, 2017, ATV Sales Dashboard Data

2017 Data	Vehicles	Funding*	PEVs per 1,000 People
EV	2,640	$13,200,000	
PHEV	1,458	$7,290,000	
Total	4,098	$20,490,000	

** Funding is estimated by multiplying the tax credit amount for the purchase of a PEV by the number of new vehicle sales for retail customers from the ATV Sales Dashboard from January 2017 through December 2017. This assumes that tax credits were claimed for all new PEV sales in 2017.*

Connecticut

The Connecticut Hydrogen and Electric Automobile Purchase Rebate Program (CHEAPR) offers rebates to in-state residents, municipalities or businesses who purchase or lease a FCEV, EV, or PHEV (The State of Connecticut, 2016; The State of Connecticut, 2018). Rebates are offered on a first-come, first-served basis until funds expire. Eligible vehicles must have a manufacturer's suggested retail price (MSRP) that does not exceed $60,000 and be

highway capable. The rebate amounts are based on battery range in the following amounts (The State of Connecticut, 2018):

Table 9: Connecticut CHEAPR Rebate Amount

Vehicle Type	Description	Amount
EV	175 miles or greater	$3,000
EV	100-174 miles	$2,000
EV	Less than 100 miles	$500
PHEV	40 miles or greater	$2,000
PHEV	Less than 40 miles	$500

Based on program eligibility requirements, 20 EV models and 21 PHEV models were eligible for the CHEAPR rebate, as of 2017 (The State of Connecticut, 2018).

CHEAPR, designed in consultation with the Connecticut Automotive Retailers Association (CARA), provides consumers the option to transfer their rebate to the dealership and receive a reduction in the price of their vehicle at the point-of-sale through the "dealer assignment" feature, rather than waiting for the rebate. In either case, the dealer handles the application and is reimbursed within 10 days. Approximately 81% of consumers have transferred their rebate to the dealer at the point-of-sale. The dealership receives an incentive of $300 per qualifying vehicle sold. Because of this program parameter, all new vehicles must be purchased at a licensed franchised Connecticut new automobile dealer and also registered in Connecticut, or from an OEM that does not have licensed franchised new automobile dealers in Connecticut. Participants must complete a survey at the time of purchase or lease and retain the vehicle for at least 24 consecutive months (CSE, 2017).

CHEAPR is administered by CSE on behalf of Eversource Energy, through the EVConnecticut program, which is a partnership between the Connecticut Department of Energy and Environmental Protection and the Connecticut Department of Transportation (The State of Connecticut, 2018). The original $1 million funding for the program, came through an agreement

that allowed for the merger of Northeast Utilities and NSTAR, now Eversource Energy, in April 2012; another $1 million was provided in 2016 from this merger agreement. Additionally, $1 million in funding was made available as a result of revenues the state received from its participation in the Regional Greenhouse Gas Initiative. In 2017, the state provided $2.7 million in funding to CHEAPR (The State of Connecticut, 2016).

The CHEAPR website provides an eligible vehicle list, available funding and program statistics, frequently asked questions, resources available for download, and a dealer application portal. CHEAPR's Program Statistics tab on the program website includes details on the status of funding and rebate statistics. The number of registered PEVs per 1,000 people are summarized in Tables 10 and 11 (The State of Connecticut, 2018).

Table 10: Connecticut PEVs Registered per 1,000 People, 2017, CHEAPR Data

2017 Data	Vehicles	Funding	PEVs per 1,000 People
EV	475	$1,151,000	
PHEV	808	$1,347,000	
Total	1,283	$2,498,000	

Table 11: Connecticut PEVs Registered per 1,000 People, 2017, ATV Sales Dashboard Data

2017 Data	Vehicles	PEVs per 1,000 People
EV	976	
PHEV	1,281	
Total	2,257	

Massachusetts

Massachusetts Offers Rebates for Electric Vehicles (MOR-EV) launched in June 2014. The program provides state residents rebates of varying levels for different ZEVs, as outlined in Table 12 (CSE, 2018c).

Table 12: Massachusetts MOR-EV Rebate Value

Vehicle Type	Description	Value*
EV	EV	$1,000-$2,500
PHEV+	PHEV with battery capacity ≥ 10 kWh	$1,000-$2,500

PHEV	PHEV with battery capacity < 10 kWh	$1,000-$2,500

** The lower dollar amount is for vehicles with a base MSRP greater than or equal to $60,000.*

Based on program eligibility requirements, 13 EV models and 25 PHEV models were eligible for the MOR-EV rebate, as of 2017. Rebates are only available to Massachusetts residents and residents must submit applications within three months of the vehicle purchase or lease date. Applicants must retain ownership of the vehicle for a minimum of 36 consecutive months.

The MOR-EV program is funded by the Executive Office of Energy and Environmental Affairs and Department of Energy Resources and administered statewide by CSE (CSE, 2016b). The MOR-EV website provides guidance on applying for a rebate, lists frequently asked questions, and links to related PEV resources. MOR-EV's Program Statistics webpage includes details on the status of funding and rebate statistics. Data on PEVs registered in 2017 are summarized in Tables 13 and 14 (CSE, 2018c).

Table 13: Massachusetts PEVs Registered per 1,000 People, 2017, MOR-EV Data

2017 Data	Vehicles	Funding	PEVs per 1,000 People
EV	1,447	$2,804,500	
PHEV	1,584	$2,930,500	
Total	3,031	$5,741,000	

Table 14: Massachusetts PEVs Registered per 1,000 People, 2017, ATV Dashboard Data

2017 Data	Vehicles	PEVs per 1,000 People
EV	1,871	
PHEV	2,690	
Total	4,561	

New York

In April 2016, enacted legislation in New York directed the New York State Energy Research and Development Authority (NYSERDA) to implement a rebate program. The Drive Clean Rebate launched on March 21, 2017, and is part of ChargeNY, New York State's overall clean transportation strategy to reduce GHG emissions (Bolton, 2018). The initiative also

includes efforts to increase New York State's PEV readiness by educating consumers and policymakers about the benefits of PEVs, reforming regulations at the State and local level to facilitate PEV charging, and testing advanced PEV technologies and demonstrating their benefits to the public through the state fleet (Bolton, 2018). This initiative provides rebates of up to $2,000, based on battery range, for the purchase or lease of a new eligible PEV, as shown in Table 15 (NYSERDA, 2018).

Table 15: New York Drive Clean Rebate Value

Vehicle Type	Description	Amount
PEV	> 120 miles	$2,000
PEV	40-119 miles	$1,700
PHEV	20-39 miles	$1,100
PHEV	<20 miles	$500
PEV MSRP >$60,000	N/A	$500

Based on program eligibility requirements, 15 EV models and 28 PHEV models qualify for the rebate, as of 2017 (NYSERDA, 2018).

The Drive Clean Rebate is a point-of-sale rebate program that reduces the cost of purchasing or leasing an eligible zero or low emission vehicle for New York State residents, businesses, and government entities. Participating dealers reduce the vehicle price by the full amount of the rebate at the point-of-sale, which immediately passes the full savings of the rebate to the consumer. Dealers then have 60 calendar days to submit a rebate application. When the application is approved, NYSERDA issues the rebate directly to the participating dealer. The vehicle owner or lessee must retain ownership for at least 36 consecutive months from the date of purchase. Additionally, owners or lessees are requested to participate in online surveys and other research efforts (NYSERDA, 2018). The following table summarizes 2017 vehicle registration data.

Table 16: New York PEVs Registered per 1,000 People, 2017, ATV Sales Dashboard Data

2017 Data*	Vehicles	Funding	PEVs per 1,000 People
EV	3,327		
PHEV	6,160		
Total	9,487	$6,471,600	

**The number of vehicle is sourced from the ATV Sales Dashboard from January 2017 through December 2017 as the program only provides an estimate that 10,000 PEVs were sold in 2017 (New York State, 2018). Additionally, the program only provides data on the total reserved amount and does not provide the breakdown by EV and PHEV. Funding data, however, is available from the program. The first full year of program funding is listed in the table above.*

The Drive Clean Rebate website provides information on how the rebate works for consumers and dealers, an eligible vehicle list, available funding, resources available for download, and additional details on the Charge NY initiative.

Since the program launch, NYSERDA has approved more than $7.5 million in rebates for New Yorkers. Most consumers received a rebate of approximately $1,100 and more than 10,000 PEVs sold in the program's first year, a 67% increase over 2016 (New York State, 2018). Program data reveals that approximately 70% of PEV purchases were captured under the program (Bolton, 2018).

Washington

The AFV Tax Exemption began on July 1, 2009 (Revised Code of Washington 82.08.809). New passenger vehicles, light-duty trucks, and medium-duty passenger vehicles that are dedicated AFVs (including EVs) or are PHEVs that can travel at least 30 miles on battery power alone are exempt from state motor vehicle sales and use taxes. Qualified vehicles must meet the California motor vehicle emissions standards in Title 13 of the California Code of Regulations (Washington State Department of Licensing).

For vehicles that are purchased from a Washington dealer, the transaction will be processed without collecting the exempt taxes. Vehicles purchased outside of Washington, require purchasers to bring the vehicle paperwork to a vehicle licensing office to process the exemption (Washington State Department of Licensing).

From July 15, 2015, to July 1, 2016, vehicles sold or leased that exceed an MSRP of $35,000 were not exempt from the sales tax. Beginning July 1, 2016, the MSRP cap for qualifying vehicles was raised to $42,500. The sales tax exemption applies to up to $32,000 of a vehicle's selling price or the total amount of lease payments made (Washington State Department of Licensing). It is estimated that the value of the tax exemption is approximately $3,000 (Banse, 2018; Gordon-Bloomfield, 2016).

Based on program eligibility requirements, 13 EV models and 25 PHEV models qualify for the AFV exemption, as of 2017 (Washington State Department of Licensing). Information from the Department of Commerce provides an estimated cost to implement program changes at $20,000 (Moulton, 2016).

The law requires this exemption to expire when the total number of qualifying vehicles titled in Washington on or after July 15, 2015, reaches 7,500 vehicles, or on July 1, 2019, whichever happens first. The tax exemption then ends one month after the Department of Licensing notifies the Department of Revenue that this number was reached (Washington State Department of Licensing). Legislation was proposed in 2018 to extend the tax exemption to 2021, but it did not pass. On April 18, 2018, the Department of Revenue released a Special Notice explaining that the AFV tax exemption expires June 1, 2018, therefore the last day to use the exemption is May 31, 2018, as the total number of qualifying vehicles titled in the state since July 15, 2015, reached 7,500 vehicles (Department of Revenue Washington State, 2018). Entities in the state therefore must acquire a PEV by May 31, 2018, to claim the exemption (Department of Revenue Washington State, 2018).

Washington State Department of Licensing provides raw registration data to Washington State Department of Transportation (WSDOT) twice per year (WSDOT, 2018). The data

captures PEV registration data through the end of June and through the end of the calendar year. WSDOT offers analysis of registration data and includes trends on year-over-year growth as well as growth by county and vehicle model. Qualifying clean AFV and PHEV data is provided by the Department of Licensing, but there is no further breakdown within the AFV category. Therefore, PHEV and EV data can't be isolated. Table 17 provides a total count for AFV and PHEV data registered in 2017 and the estimated number of PEVs per 1,000 people in Washington. Table 18 provides a count of EV and PHEV registrations in 2017 and the estimated number of PEVs per 1,000 people in Washington (Department of Licensing, 2018; WSDOT, 2018).

Table 17: Washington PEVs Registered per 1,000 People, 2017, Tax Exemption Data

2017 Data	Vehicles	Funding*	PEVs per 1,000 People
EV			
PHEV			
Total	3,999	$11,997,000	

** Funding is estimated by multiplying an approximate tax exemption amount ($3,000) for the purchase of a PEV by the number of new vehicle sales for retail customers from Washington State Department of Licensing.*

Table 18: Washington PEVs Registered per 1,000 People, 2017, ATV Dashboard Data

2017 Data	Vehicles	PEVs per 1,000 People
EV	4,442	
PHEV	2,360	
Total	6,802	

Results Summary

The number of PEVs per 1,000 people for each evaluated state's incentive type is summarized in the following figure on the primary axis (bars), using the 2017 data sources referenced above. The minimum and maximum incentive value that corresponds with each state incentive program is shown in the secondary axis (lines).

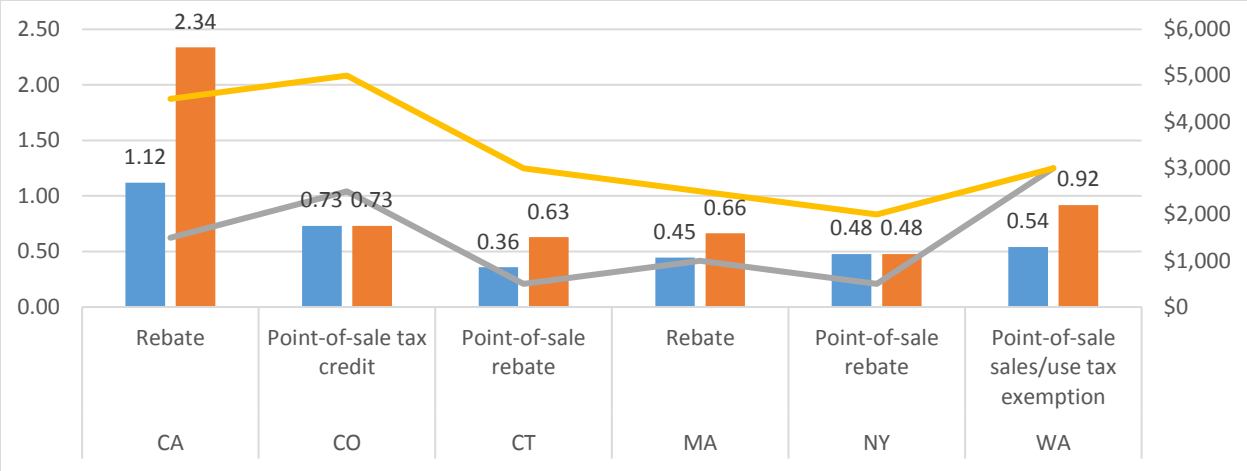

Figure 1: PEVs Registered per 1,000 people by State and Incentive Program Value. The primary axis shows the number of PEVs per 1,000 people by state (bars). Blue bars source data from program resources on the number of PEVs registered in 2017 that received or claimed the program incentive, as available. Orange bars source data from the ATV Sales Dashboard. Where PEVs per 1,000 people are the same for both sources of data, ATV Sales Dashboard data was used as default, as program data was not available. The secondary axis (lines) shows the minimum (silver line) and maximum (yellow line) incentive value that corresponds with each state incentive program. As noted previously, the incentive value for Washington is estimated and therefore there is no difference between the minimum or maximum incentive values offered.

Discussion

The program results confirm our hypothesis. While the value of the incentive offered may be an important parameter of PEV incentive programs, the success of PEV incentive programs is not solely dependent upon the value of the incentive offered. It was found that other incentive program elements, which are provided as recommendations below, are closely linked with PEV deployment success.

First, it is important to note that PEV registrations within a state are influenced by many factors, including state and local incentive programs, charging infrastructure availability, and fuel pricing (U.S. Department of Energy, 2017). It is the combination and interaction of program elements, as well as many other program features, and the regional market that spurs PEV uptake. It has been shown that policy incentives for PEVs in general have a positive effect on PEV adoption (Zhang et al., 2011). Policy incentives can be considered to be effective if they

increase the probability of a consumer buying a PEV. This project defines successful PEV purchase incentives by the impact on the uptake of PEVs. This project does not explore the efficiency, which is the costs that are involved compared to the impact.

Given the size of the dataset, statistical analyses were not conducted. However, a mixed-methods assessment was applied to determine recommendations and best practices of successful PEV incentive programs by combining empirical observations with literature. These recommendations may be particularly useful for state governments to reference as they develop incentive programs and as the PEV market grows. In particular, the recommendations below look to capture PEV purchasers beyond early adopters. We have found the program elements discussed in this section to be tied to successful PEV incentive programs. Of course, these are only a few elements that contribute to PEV uptake.

Due to the size of the data set, the inherent differences between program metrics and components, as well as the complexity of PEV market drivers, we did not conduct statistical analyses to evaluate these programs as methodologies would not accurately assess the success of each PEV incentive program. The intention of this project is not to rate or rank these programs based on success of PEV uptake. The programs evaluated were preferentially selected as among the top incentive programs in the nation. Further, it was determined that there are many exogenous factors that drive PEV uptake. In addition, we excluded an evaluation of cost-effectiveness of programs from the review, which would likely be a critical metric to assess the effectiveness and efficiency of any PEV purchase incentive program. Next, it is difficult to compare programs with different program start dates, as programs implemented earlier than others would have a “leg-up” on consumer awareness of the incentive and may have had a chance to implement program changes after data on performance was collected. In addition, the

results of data collection were not comprehensive or consistent across programs. In order to conduct statistical analysis, more complete or detailed program data would need to be available. From a review of program elements, no one element appeared to be correlated with the highest number of PEVs deployed. For these reasons, this project instead sought to evaluate trends among successful programs to make general recommendations on what program components may be linked to success.

Recommendation: Formalize Data Collection into Program Design

Because the PEV market is relatively new and effective methods for promoting market sustainability are still emerging, integrating data collection into program design to identify trends and relationships between consumers and purchasing habits (CSE, 2017). Tracking the distribution of an incentive can help program administrators assess the success of the program. Specifically, it is recommended that states formalize data collection and tracking into the program design for adequate assessment. An analysis from EIA shows that "measurement of the significance of an incentive on sales requires data granularity on at least a monthly basis" (U.S. Energy Information Administration, 2017).

Data collection can inform all program elements. Programs may track performance of the incentive through consumer surveys, such as California, Connecticut, Massachusetts, and New York have done. Incentive recipient data, such as demographic data or what vehicles were purchased, can be "contextualized with information about the larger clean-vehicle market and comparable light-duty vehicle markets" (CSE, 2016a). For example, as a result of program data and consumer survey responses, Massachusetts gained a "better understanding of ZEV adoption rates, the driver population and their motivations to adopt cleaner vehicles" (CSE, 2016b). Additionally, states may track participation rates by vehicle model to provide insight on dealer

engagement. Further, making program data publicly available via an interactive dashboard and mapping tools on the program website supports program transparency and inform stakeholders.

Massachusetts experienced several changes during program year two, which was informed by data collection. Building data collection into the program facilitates examination into the success and effectiveness of the incentive at achieving its goals (CSE 2016b). For example, to inform program updates, CSE conducted a study to understand how the CHEAPR dealer incentive is distributed and used by dealerships, and to explore its effectiveness in promoting the development of the PEV market (CSE, 2017). Programs may also decide to conduct research to identify barriers to PEV sales at dealerships to structure incentive programs.

Data collection can inform internal processes as well. For example, in the second year of the MOR-EV program, the program administrators improved rebate processing to better manage increased application volume. CSE applied an understanding of the processes to identify issues. The internal updates made to processing applications allowed staff to handle a 24% increase in the number of rebates issued and reserved from one year to the next (CSE, 2016b).

Recommendation: Incorporate Consumer and Dealer Education and Information Campaigns

"Consumer education is an integral part of increasing PEV awareness and adoption." Studies have shown that while incentives can drive the adoption of PEVs, familiarity and experience with the technology can also drive adoption (Hardman et al., 2017). Previous examinations of incentive programs have revealed that many consumers are not aware that purchase incentives exist for PEVs, which lowers the impact the incentive has on spurring the PEV market (Krause et al., 2013). As expected, "low levels of awareness of financial purchase incentives for PEVs will result in lower rates of PEV adoption" (Hardman et al., 2017). Incentivizing purchasers to select PEVs over conventional vehicles can only happen if the purchaser is aware of the incentive. As such, it is recommended that education and outreach

campaigns be incorporated into PEV purchase incentive programs to lead to the greatest PEV adoption. The educational campaigns can be geared toward consumers and dealers and can cover incentive availability, program guidelines, or the PEV technology.

Starting in 2014, California increased its consumer outreach and education events, compared to former years. The CVRP incorporates a range of events to reach a wider audience of consumers, including community events, environmental events, PEV test drives, home improvement shows, and trade shows. In addition, the CVRP administrators conduct dealer outreach and education (CSE, 2016a). “Educated and engaged dealers are crucial to the success of PEV adoption and MOR-EV program objectives” (CSE, 2016b). Connecticut emphasizes dealer marketing and outreach. As “dealers play a crucial role in the CHEAPR rebate process, most outreach has been targeted toward dealerships” (CSE, 2017). By collecting data from participants on CHEAPR program features, administrators noted that increasing dealer outreach could improve program awareness and familiarity (CSE, 2017). Similarly, Massachusetts found that education and outreach events, such as test drive events, improve consumer’s perceptions of ZEVs and increase the likelihood that an individual will acquire a PEV (CSE, 2016b).

Recommendation: Design Incentive Schemes to be Inclusive

Research has also found that financial purchase incentives are particularly important for mainstream PEVs, but not as important for luxury PEVs (Hardman et al., 2017). Specifically, study results showed that 70% of Tesla adopters would still have purchased their vehicles without financial incentives, suggesting that the “underlying reason was related to these people’s exceptionally high incomes” (Hardman et al., 2017). As such, it is suggested that financial purchase incentive amounts could be a way to expand the PEV market beyond high-income purchasers (Hardman et al., 2017). Expanding the PEV market beyond early innovators is key for PEV market penetration.

Financial purchase incentive programs could be designed to "give consumers in lower-income classes relatively higher rebates" (DeShazo et al., 2017). In November 2016, California's CVRP precluded high-income earners from qualifying for the rebate and offered low-income earners an additional $2,000 (California Climate Investments and CARB, 2017). Incentive programs with income caps are considered more progressive as it "reduces the number of consumers who receive rebates, but would have purchased a PEV anyways" (CSE, 2016a). This allows programs to target "lower-income consumers who have a higher marginal value for the rebate and who are less likely to purchase a PEV except in the presence of higher rebate levels" (CSE, 2016a).

The incentive type also influences the inclusivity of the PEV purchase incentive. In particular, rebates are seen as less inclusive than a point-of-sale incentive as it requires consumers to have the financial ability to purchase the vehicle upfront. Rebates are viewed as more effective in promoting PEV markets for higher income households. For states that select the rebate model, it is recommended that incentive schemes distinguish between mainstream and luxury PEVs" (Hardman et al., 2017). Four states, Connecticut, Massachusetts, New York, and Washington, have vehicle price caps that are designed to limit the incentive to the purchase of mainstream vehicles. In Fiscal Year 2010-2011, the Tesla Model S was the most rebated vehicle overall under Massachusetts's MOR-EV (CSE, 2016b). After reviewing program data, MOR-EV administrators lowered the rebate amount for PEVs that have an MSRP over $60,000 (CSE, 2016b). New York's Drive Clean Rebate also offers a rebate at a reduced amount for PEVs over $60,000, whereas PEV over $60,000 in Connecticut are excluded from the program altogether (NYSERDA, 2018; The State of Connecticut, 2018). In 2016, the Washington State Legislature raised the vehicle eligibility cap from $35,000 to $42,500 (House Bill 2778, 2016). While this

continues to preclude luxury PEVs, it allows consumers to purchase long-range, mid-market or mainstream PEVs.

Another way to address inclusivity is through education and outreach. California Legislature passed SB 1275, 2014, which "mandated that an equity component be established within the CVRP, with the goal of improving access to resources by all communities, and in particular, disadvantaged communities" (CSE, 2016a). CSE "hired additional staff with experience in outreach to disadvantaged populations and developed a set of outreach and education activities to meet the needs of this population" (CSE, 2016a). CSE also made all educational materials specific to the program and incentive, including the program website, available in Spanish.

Colorado's tax credit is inclusive as it is fully refundable in the year it is claimed (Colorado Department of Revenue, 2016). That is, taxpayers can receive the full tax credit amount even if they do not accrue tax liability of equal amount. In comparison, to receive the full federal tax credit amount for the purchase of an eligible PEV, individuals must accrue enough tax liability, which is regressive for individuals that do not accrue enough tax liability.

Recommendation: Facilitate Access to the Incentive

Ease of access regarding incentive programs is reviewed in two ways in this project, 1) incentive processing rates and 2) when the incentive is received, both of these parameters are related to the type of incentive offered. One way to improve ease of access is through efficient application processing techniques, if applicable. CSE notes that "processing rebates accurately, efficiently and transparently is central to the success of the CVRP" (CSE, 2016a).

Previous assessments of PEV incentive programs concluded that incentives applied at the point-of-sale, such as a tax exemption, are more effective at driving PEV uptake than a rebate or tax credit (DeShazo et al., 2017). While Colorado's incentive is a tax credit, legislative updates

reduced the complexity of calculating the tax credit value (Eisemann, 2018). Researchers also determined that of the incentives that are applied at or close to the point-of-sale, rebates may be the least preferable (Hardman et al., 2017). This is because rebates provide consumers with a payment after the vehicle has been purchased. Comparatively, "tax exemptions can assist consumers purchase a PEV by reducing the vehicle price upfront, rather than providing 'cash back' after the purchase" (Bolton, 2018). Point-of-sale incentives, such as Washington's sales tax exemption or New York's Drive Clean Rebate, incentivizes purchasers by offering "cash on the hood," reducing the vehicle price immediately (Bolton, 2018). Through a program participant survey, Connecticut found that respondents preferred a point-of-sale rebate in comparison to all other incentive designs, particularly in comparison to rebates applied for by consumers after the sale" (CSE, 2017). Through the "dealer assignment," consumers receive the rebate as a direct discount on the vehicle price, rather than waiting for a check to arrive in the mail (CSE, 2017). New York's incentive program also makes it easier for the consumer as the dealer handles the paperwork and applies for the reimbursement (Bolton, 2018). "The intent of the Drive Clean Rebate is to be as effective as possible at influencing consumers' decisions" and removes as much hassle around purchasing a PEV as possible (Bolton, 2018).

Recommendation: Involve Numerous Entities in Program Development

Statewide support of the PEV program from differing entities is another critical element of program success, as "growth in the PEV market requires many actions by many players (Slowik and Lutsey, 2017). As discussed previously, a significant feature of Connecticut's program is the support from dealers. The CHEAPR program partnered with CARA to offer a dealership incentive that encourages dealers to join CHEAPR and promote PEVs and motivate salespeople to make the extra effort to sell PEVs." (CSE, 2017). The CHEAPR program was modeled after a pilot rebate program offered by auto manufacturers. Making the program work

in a way the dealers understand and support creates buy-in (CSE, 2017). New York's Drive Clean Rebate also has strong dealer support from the Greater New York Auto Dealers Association and its 425 members. Similarly, Massachusetts has found that dealer outreach and education is an important program feature "as dealerships are the primary channel through which consumers learn about the rebates." (CSE, 2016b).

A CEO representative notes that collaboration from alternative fuel stakeholders was critical to developing and updating the tax credit. The legislation that set the tax credit requirements came to fruition because of broad stakeholder support as many alternative fuel types are included in the tax credit (Eisemann, 2018).

Recommendation: Develop Other Financial and Non-Financial State and Private Incentives

Finally, while this review focused on financial purchase incentives, it is still important for policy makers to consider other incentives. No one or two policy actions are sufficient to grow PEV markets (Silvia and Krause, 2016; Slowik and Lutsey, 2017). Research suggests that for incentive programs to have the greatest impact on PEV sales they should be "introduced alongside non-monetary and non-purchase incentives" (Hardman et al., 2017). As such, it is recommended that state-level financial purchase incentives for PEVs are offered in combination with other financial and non-financial state and private incentives. In the United States, incentives for PEVs are diverse, "with state and local governments, civil society, and companies promoting awareness and sales of PEVs, as well as campaigning for policy, charging infrastructure, and financial support" (Lutsey et al., 2015). A comprehensive approach of policy, incentives, and awareness campaigns are linked with PEV uptake across the United States (Slowik and Lutsey, 2017). Each state reviewed in this paper offer other incentives that promote the deployment of PEVs, detailed in Appendix D.

PEV purchase incentives may increase the market penetration of PEVs, however, "do not address a number of other barriers to PEV adoption for mainstream consumers, such as lack of charging infrastructure" (Clark-Sutton et al., 2016). As such, a suite of regulations and policies are needed to address all aspects of the PEV adoption (Silvia and Krause, 2016). Both emission-related regulations and user-related regulations have positive impacts on PEV sales (Center for Sustainable Energy 2014). Previous studies have shown that the most effective policy option is a hybrid approach, which incorporates financial and non-financial policy and promotion actions for PEVs at the state, local, utility, and private stakeholders, and indirect incentives (Lutsey et al., 2015; Silvia and Krause, 2016). For example, the availability of public and workplace charging is linked with PEV market uptake (U.S. Energy Information Administration, 2017). The leading PEV markets have at least 275 public charge points per million people (Slowik and Lutsey, 2017).

Conclusion

The objective of this paper was to identify the program components of state-level financial purchase incentives for PEVs that are most closely linked with "success," which is determined by referring to the number of PEVs registered per 1,000 people in 2017. We evaluated PEV purchase incentive program parameters to offer recommendations to states on how to design, implement, and administer successful PEV purchase incentive programs. Through a review of active state PEV purchase incentives in California, Colorado, Connecticut, Massachusetts, New York, and Washington, this project developed a list of recommendations for developing and implementing effective programs to support PEVs. We offered six recommendations to consider when designing PEV incentive programs. The results of this paper may inform states developing PEV financial purchase incentive programs to expand the PEV market. Future investigations of PEV incentive programs may attempt to assess the statistical

significance of incentive program parameters, calculate the cost-effectiveness of each incentive program, evaluate consumer preferences, or compare the effectiveness and impact of various financial and non-financial incentives.

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Appendix

Appendix A

Plug-In Electric Vehicle Incentive Program Interview Questions

Please answer the questions below based on available data/information, and to the best of your knowledge. If data is not available for a specific question, you may note "N/A."

First, the interview questions cover plug-in electric vehicle (PEV) incentive program design, then incentive program implementation and operation, followed by program data and results. Background information regarding the purpose of and use of the information is also provided below.

Note that your participation is voluntary. You can choose to complete as much or as little as you would like. However, completeness of information will provide the most accurate assessment.

Should you have any questions regarding this project, you may contact Amy Snelling (asnelli2@jhu.edu; 617-218-3458) or Stacy Noblet (stacy.noblet@icf.com).

Thank you for your time and assistance.

Incentive Program Background and Development

Please respond to the following questions regarding the development and design of the purchase incentive.

1. To what extent was research on program design conducted prior to program development?
2. What entities were involved in the program development?
3. How was the specific incentive-type (e.g., point-of-sale, rebate, or tax credit) selected?
4. How was it determined which technologies or advanced vehicles would be included?
5. Briefly summarize how the incentive amount(s) was set.

Incentive Program Implementation and Operation

6. Education and Outreach
    a. Consumer education and outreach
        i. How was the incentive program promoted? Which promotional activities seem to be the most effective?
        ii. Which audience did outreach efforts target?
        iii. What were the topics of focus for the outreach efforts? (e.g., PEV technology, PEV benefits, model availability)

iv. Are there plans to change future consumer education and outreach goals? How would efforts change?

b. Dealership outreach and education

i. What did dealer education and outreach cover?

ii. Are there plans to change dealer education and outreach approach? How would efforts change?

7. Application Processing

a. What percentage of application forms were accepted, rejected, or not completed?

b. What were the common reasons for rejection?

c. What was the average processing time from the time documents were received to approval of an application?

8. Incentive Program Updates

a. Has the program changed since its inception? If yes, please list the ways the program has changed (e.g., changes to the incentive amount offered).

b. Following the abovementioned updates, did consumer or dealer participation in the program change? If so, how?

Incentive Program Data

9. Distribution

a. How many incentives have been issued and how much funding has been distributed?

b. What is the incentive distribution for each eligible vehicle category?

c. What percentage of registered eligible vehicles received an incentive?

d. How much funding remains?

e. Has there been any funding extension?

10. Recipients

a. How is information regarding incentive availability provided to consumers? How often are updates provided?

a. Is research or data collected from the participant following distribution? If yes, what information is requested?

b. Has this data been applied to inform program planning?

11. Please include any additional thoughts you would like to note about the incentive program

Background

The intent of these interview questions is to gather data on state-level financial purchase incentives for plug-in electric vehicles (PEVs) for a master's thesis project at Johns Hopkins University. The project is investigating PEV financial purchase incentives for public retail customers in California, Colorado, Connecticut, Massachusetts, New York, and Washington. The project researchers acknowledge that while there is no single factor that drives PEV uptake, purchase incentives are a key component. The above questions are intended to identify general trends of successful PEV purchase incentives to potentially assist states develop incentive programs.

This project will solicit input from representatives of each incentive program. As such, your input will contribute to the assessment of PEV financial purchase incentives for states more broadly.

The final paper will be posted to the Johns Hopkins University Sheridan Libraries database.

Appendix B

	California	**Colorado**	**Connecticut**	**Massachusetts**	**New York**	**Washington**
Incentive Program	Clean Vehicle Rebate Project	Innovative Motor Vehicle Tax Credit	Connecticut Hydrogen and Electric Automobile Purchase Rebate	Massachusetts Offers Rebates for Electric Vehicles	Drive Clean Rebate	Alternative Fuel Vehicles and Plug-In Hybrids Tax Exemptions
ZEV State	Yes	No	Yes	Yes	Yes	No
Incentive Type	Rebate	Point-of-sale tax credit	Point-of-sale rebate	Rebate	Point-of-sale rebate	Point-of-sale sales/use tax exemption
Effective Status Dates	March 18, 2010	January 1, 2012	May 19, 2015	June 18, 2014	March 21, 2017	July 1, 2009
Eligible Vehicle Technologies	EV, PHEV, FCEV	EV, PHEV, CNG, LNG, LPG	EV, PHEV, FCEV	EV, PHEV, FCEV, ZEM	EV, PHEV	EV, PHEV, FCEV, CNG, LNG, LPG
Legislation	Assembly Bill 615, 2017, and California Health and Safety Code 44274 and 44258	Colorado Revised Statutes 39-22-516.7 and 39-22-516.8	N/A	N/A	2016	Revised Code of Washington 82.08.809 and 82.12.809
Vehicle Price Cap	N/A	N/A	$60,000	$60,000	$60,000	$42,500
Income Cap	Yes	No	No	No	No	No
Number of Eligible PEVs	20 EVs 17 PHEVs (37)	Unknown	20 EVs 21 PHEVs (41)	13 EVs 25 PHEVs (38)	15 EVs 28 PHEVs (43)	15 EVs 3 PHEVs (18)
Length of Ownership	30 consecutive months	24 consecutive months	24 consecutive months	36 consecutive months	36 consecutive months	N/A
Funding Sources (2017)	Government; Grants (Air Quality Improvement	Government Agencies	Government; Utility	Government Agencies	Government (Environmental Protecti	Government Agencies

	Program; Low Carbon Transportation Investments; Cap-and-Trade auction proceeds; CARB)				on Fund)	
EV Amount (2017 Maximum)	$4,500	$5,000	$3,000	$2,500	$2,000	$3,000
PHEV Amount (2017 Maximum)	$3,500	$5,000	$2,000	$2,500	$2,000	$3,000
Total Budget	$514,430,030	81,090,000+	$6,182,000	$16,867,163	$70,000,000	N/A
EV Incentives, 2017	26,599	2,640	475	1,447	3,327	4,442
PHEV Incentives, 2017	17,664	1,458	808	1,584	6,160	2,360
2017 PEV Number of Incentives Distributed	44,263	4,098	1,283	3,031	9,487	6,802
2017 EV Funds Awarded	$71,537,368	$13,200,000	$1,151,000	$2,804,500	NA	$13,326,000
2017 PHEV Funds Awarded	$30,025,067	$7,290,000	$1,347,000	$2,930,500	NA	$7,080,000
2017 PEV Funds Awarded	$101,562,435	$20,490,000	$2,498,000	$5,741,000	$6,471,600	$20,406,000
Funds Remaining	N/A	N/A	$846,500	$4,166,163	$48,528,400	N/A
PEVs per 1,000 People (2017	1.119543427	0.730852051	0.357562488	0.446221686	0.47794898	0.539986332

Program Data)						
ATV Dashboard Registered EVs	48,326	2,640	976	1,871	3,327	4,442
ATV Dashboard Registered PHEVs	44,059	1,458	1,281	2,690	6,160	2,360
ATV Dashboard Registered PEVs	92,385	4,098	2257	4,561	9,487	6,802
PEVs per 1,000 People (2017 ATV Dashboard)	2.336692486	0.730852051	0.629008992	0.664886348	0.47794898	0.918476377
Outsourced Administrator	Yes	No	Yes	Yes	Yes	No
Entities Involved	California Air Resources Board; Center for Sustainable Energy	Colorado Energy Office; Colorado Department of Revenue; Diverse group of stakeholders	Connecticut Department of Energy and Environmental Protection and the Connecticut Department of Transportation; Avangrid; Center for Sustainable Energy; Eversource; Connecticut Automotive Retailers Association	Massachusetts Department of Energy Resources; Massachusetts Clean Cities; Center for Sustainable Energy	New York State Energy Research and Development Authority; Center for Sustainable Energy	Washington State Department of Licensing - Department of Revenue ; Department of Commerce; Washington State Department of Transportation
Dealer Incentive	N/A	N/A	$300	N/A	N/A	N/A

Who Handles the Application/ Incentive Processing	Vehicle Owner	Dealer or Vehicle Owner	Dealer	Vehicle Owner	Dealer	Vehicle Owner
Processing Time	20 days	0 days	0 days (10 days)	75 days	0 days (90 days)	0 days
Publicly Available Data on Availability	Yes	N/A	Yes	Yes	Yes	Yes
Dedicated Consumer Education and Outreach	Yes	No	Yes	Yes	Yes	No
Dealer Education and Outreach	Yes	No	Yes	Yes	Yes	No
Participant Survey	Yes	No	Yes	Yes	Yes	No
Program Website	Yes	No	Yes	Yes	Yes	No
Program Updates	Yes	Yes	No	Yes	No	Yes
PEV Incentives and Regulations	17	3	3	3	5	3

Appendix C

Colorado Innovative Motor Vehicle Credit for Tax Years 2015-2016, Credit Calculation Formula

1. New vehicle MSRP, used vehicle purchase price, leased value (see below), or conversion cost _____

2. Any available federal credit* _____

3. Any other grants, credits, or rebates available _____

4. Line 2 plus line 3 _____

5. Net cost incurred, line 1 minus line 4 _____

6. Enter battery capacity (for vehicle purchases or leases) or 75 (for vehicle conversions) _____

7. Line 6 divided by 100 _____

8. Tentative tax credit, line 5 multiplied by line 7 _____

9. Maximum credit ___$6,000__

10. Allowable credit, lesser of lines 8 or 9 _____

* See www.irs.gov/businesses/plug-in-electric-vehicle-credit-irc-30-andirc-30d and http://www.fueleconomy.gov/feg/taxcenter.shtml for information about federal tax credits

Appendix D

Additional incentives and regulations aimed at accelerating PEV uptake in the evaluated states, sourced from the DOE Laws and Incentives database.

State	**Title**	**Type**	**Technology Categories**	**Incentive or Regulation Categories**	**User Categories**
CA	High Occupancy Vehicle (HOV) and High Occupancy Toll (HOT) Lane Exemption	State Incentives	NG|HY|ELEC|PHEV	EXEM	IND|FLEET
CA	Low Emission Vehicle Incentives and Technical Training - San Joaquin Valley	State Incentives	BIOD|ETH|NG|LPG|HY|ELEC|HEV|PHEV	GNT|OTHER	IND|FLEET|OTHER
CA	Alternative Fuel and Vehicle Incentives	State Incentives	BIOD|ETH|NG|LPG|HY|ELEC|HEV|AFTMKTCONV|PHEV	GNT|LOANS	IND|FLEET|PURCH|MAN|OTHER
CA	Alternative Fuel and Advanced Vehicle Rebate - San Joaquin Valley	State Incentives	NG|HY|ELEC|PHEV	RBATE	IND|FLEET
CA	Voluntary Vehicle Retirement Incentives - San Joaquin Valley and South Coast	State Incentives	EFFEC|ELEC|HEV|OTHER|PHEV	GNT	IND|FLEET
CA	Electric Vehicle Supply Equipment (EVSE) Loan and Rebate Program	State Incentives	ELEC|PHEV	LOANS|RBATE	IND|FLEET|STATION
CA	Alternative Fuel Vehicle (AFV) and Hybrid Electric Vehicle (HEV) Insurance Discount	Utility/Private Incentives	NG|LPG|HY|ELEC|HEV|PHEV	OTHER	IND
CA	Plug-In Electric Vehicle (PEV) Charging Rate Reduction - LADWP	Utility/Private Incentives	ELEC|PHEV	OTHER	IND|FLEET|PURCH
CA	Plug-In Electric Vehicle (PEV) Charging Rate Reduction - SCE	Utility/Private Incentives	ELEC|PHEV	OTHER	IND|FLEET|PURCH
CA	Clean Vehicle Electricity and Natural Gas Rate Reduction - PG&E	Utility/Private Incentives	NG|ELEC|PHEV	OTHER	IND|PURCH
CA	Plug-In Electric Vehicle (PEV) and Natural Gas	Utility/Private Incentives	NG|ELEC|PHEV	OTHER	IND|FLEET|PURCH

	Infrastructure Charging Rate Reduction - SDG&E				
CA	Electric Vehicle Supply Equipment (EVSE) Rebate - LADWP	Utility/Private Incentives	ELEC|PHEV	RBATE	IND|STATION|OTHER
CA	Electric Vehicle Supply Equipment (EVSE) and Charging Incentives - Sonoma Clean Power	Utility/Private Incentives	ELEC|PHEV	RBATE|OTHER	IND
CA	Plug-In Electric Vehicle (PEV) Rebate - PG&E	Utility/Private Incentives	ELEC|PHEV	RBATE	IND
CA	Electric Vehicle Supply Equipment and Charging Incentives - SMUD	Utility/Private Incentives	ELEC|PHEV	RBATE	IND
CA	Plug-In Electric Vehicle (PEV) Credit - SDG&E	Utility/Private Incentives	ELEC|PHEV	GNT|RBATE	IND
CA	Plug-In Electric Vehicle (PEV) Rebate - SCE	Utility/Private Incentives	ELEC|PHEV	RBATE	IND
CO	High Occupancy Vehicle (HOV) Lane Exemption	State Incentives	HEV|PHEV	EXEM	IND|FLEET
CO	Plug-In Electric Vehicle (PEV) and Electric Vehicle Supply Equipment (EVSE) Grants	State Incentives	ELEC|PHEV	GNT	IND|FLEET|STATION
CO	Electric Vehicle Emissions Inspection Exemption	State Incentives	ELEC	EXEM	IND|FLEET
CT	Electric Vehicle Supply Equipment (EVSE) Grants	State Incentives	ELEC|PHEV	GNT	IND|FLEET|STATION
CT	Reduced Registration Fee for Electric Vehicles	State Incentives	ELEC|PHEV	OTHER	IND
CT	Electric Vehicle Emissions Inspection Exemption	State Incentives	ELEC	EXEM	IND|FLEET
MA	Plug-In Electric Vehicle (PEV) and Electric Vehicle Supply Equipment (EVSE) Grants	State Incentives	ELEC	GNT	IND|FLEET|STATION
MA	Electric Vehicle Emissions Inspection Exemption	State Incentives	ELEC	EXEM	IND|FLEET
MA	Plug-In Electric Vehicle (PEV) Discounts - Mass Energy	Utility/Private Incentives	ELEC|PHEV	GNT|RBATE	IND|FLEET
NY	High Occupancy Vehicle (HOV) Lane Exemption	State Incentives	ELEC|HEV|PHEV	EXEM	IND|FLEET

NY	Electric Vehicle Emissions Inspection Exemption	State Incentives	ELEC	EXEM	IND|FLEET
NY	Plug-in Electric Vehicle (PEV) Toll Discount Program	State Incentives	ELEC|HEV|PHEV	EXEM	IND
NY	Plug-In Electric Vehicle (PEV) Voluntary Time of Use (TOU) Rate Price Guarantee - Con Edison	Utility/Private Incentives	ELEC|PHEV	EXEM|OTHER	IND
NY	Plug-in Electric Vehicles (PEVs) Discount - EZ-EV	Utility/Private Incentives	ELEC|PHEV	OTHER	IND
WA	Plug-In Electric Vehicle (PEV) Charging Infrastructure Availability	Laws and Regulations	ELEC|PHEV	REQ	IND|OTHER
WA	Plug-In Electric Vehicle (PEV) Charging Signage and Parking Regulations	Laws and Regulations	ELEC|PHEV	REGIS	IND|STATION
WA	Alternative Fuel Vehicle (AFV) and Hybrid Electric Vehicle (HEV) Emissions Inspection Exemption	State Incentives	NG|LPG|ELEC|HEV	EXEM	IND|FLEET