Massachusetts Transportation Pollution Reduction Incentive Program Design (TPRIP)

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1. Background

In New England and Eastern Canada, the transportation sector is the largest and fastest growing sector of their respective economies, in terms of its energy consumption and greenhouse gas (GHG) emissions\(^1\). Passenger vehicles, consisting of cars and light-duty trucks, are responsible for nearly two-thirds of the GHG emissions from transportation, and these emissions are growing at an average rate of 1.9 percent annually (Energy Information Administration).

Climate change, although it could benefit some regions, could ultimately cause extensive physical and economic damage to in other regions. That damage, while uncertain, could include higher sea levels; wider ranges for tropical diseases; disruptions to farming, forestry, and natural ecosystems; and greater variability and extremes of regional weather.\(^2\) Accordingly, the New England Governors and Eastern Canadian Premiers (with an endorsement by the State of Massachusetts) have established ambitious GHG reduction targets – reduce 1990 levels by 10 percent by 2020.\(^3\)

In order to meet these GHG reduction targets, the industrial and building sectors should be included, but considered as a longer-term emission reduction strategy, due to the very long lifetimes of their existing stocks of power plants, industrial equipment, and buildings. In the short-term, state policymakers must rely on strategies aimed at the transportation sector. The passenger vehicle fleet is comprised primarily of 220 million cars and light duty trucks nationally (about 4.5 million in Massachusetts), of which about 10 percent turn over every year as new cars and trucks are purchased.\(^4\) Moreover, new vehicles are driven twice as much as older vehicles – a two-year old SUV is driven an average of 19,800 miles annually while a 10-year-old SUV is driven only 9,200 miles annually.\(^5\) The more miles a car or truck is driven, the greater its GHG emissions and energy consumption.

The passenger transportation sector is necessarily complex as it involves a very large number of individual actors each with their own behaviors involving the manufacture, sale, purchase and use of cars and trucks. Likewise, these vehicles are comprised of an array of complex technologies. As such, reducing emissions from passenger cars and trucks will rely on both technological and behavioral policies. Therefore, policymakers need to consider both how vehicles are designed (such as energy efficiency and type of fuel consumed) as well as how they are used (such behavior as purchase decisions, miles driven, and driving conditions) in order to achieve their GHG emission reduction goals.

In their quest to control emissions from motor vehicles, policymakers have historically taken a regulatory approach. Specifically, the federal government (U.S. Environmental Protection Agency) has the primary regulatory authority for setting tailpipe emissions

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\(^1\) New England Governors/Eastern Canadian Premiers Climate Change Action Plan. August 2001
\(^3\) New England Governors/Eastern Canadian Premiers Climate Change Action Plan. August 2001
\(^4\) Oak Ridge National Laboratory, Transportation Energy Data Book, Edition 23, 2003 (national data). Note: 330 million new cars and light trucks were purchased in Massachusetts in 2002.
\(^5\) Ibid.
standards, which currently does not include standards for carbon dioxide or other GHG emissions. Additionally, the federal government (U.S. Department of Transportation along with the U.S. Congress) has sole authority to enact a statutory corporate average fuel economy standard (CAFE standard) applicable to passenger vehicles. In the cases of both tailpipe emissions (with the exception of California) and fuel economy, the states do not have regulatory authority and are specifically preempted from setting standards.

Tailpipe emission standards have been strengthened and expanded over the years, due in part to California’s sanctioned involvement. However, CAFE standards, which were initially established in 1975 when Congress enacted the Energy Policy and Conservation Act following the oil embargo a year earlier, have been stalled and even caused over time to erode. Years of auto industry gaming with “truck” specifications (which are merely substitutes for cars but are subject to lower CAFE standards), among other things, caused a real reduction in the new vehicle fleet fuel economy. In 1974, the only “trucks” that existed were pickups, used primarily in rural farming areas, for hauling cargo. Children were driven around in station wagons, which are technically “cars”. SUVs and minivans did not exist. Today consumers are more likely to buy a light truck (51 percent) than a car (49 percent), despite its significantly higher GHG emissions. Their new trucks will tend to be four-wheel drive (46 percent) and 29 percent will be over 6,000 pounds. And compared to new cars, these new light trucks, minivans, and SUVs will be driven an average of 4,000-5,000 more miles each year. Each of these trends serve to further increase energy consumption and GHG emissions over time.

With the power to regulate GHG emissions and fuel economy removed from their purview, state policymakers have two strategies remaining to control motor vehicle GHG emissions – implementing market-based policies (financial incentives) and/or undertaking public outreach and education. In our competitive economy, the sure way to affect consumers’ behavior is to employ money. Information, while important, is a less powerful stimulus to bring about social change.

2. Policy Concept

One promising option for state policymakers to consider in achieving their GHG emission reduction targets is a Transportation Pollution Reduction Incentive Program (TPRIP). This policy employs a system of rebates and fees that reward and induce consumers to purchase vehicles with lower energy consumption and GHG emissions. Termed “feebates,” this market instrument has been employed elsewhere to encourage purchasers of cars and light duty trucks to take account of the energy and environmental characteristics of the vehicles they buy. Consumers who choose vehicles with high energy consumption or high emissions pay a fee (a surcharge to the vehicles’ purchase price), whereas those who choose fuel-sipping, cleaner cars would be rewarded with a rebate. The rebate or surcharge is calculated on a sliding scale, depending on how far a vehicle’s lifetime energy consumption diverges from a pre-determined target. The system

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6 Ibid.
7 Ibid.
8 Ibid.
can be designed to be revenue-neutral.\footnote{That is, all revenues generated in fees would be distributed back in the form of rebates. In practice, this can only be done approximately since it is impossible to predict the precise composition of vehicle purchases in a given year. An annual or bi-annual review of the actual design may be necessary to ensure rough revenue neutrality in subsequent years.} Moreover, if states choose to, this policy can be designed to be responsive to future changes in federal fuel economy and tailpipe emissions standards.

Such energy saving incentive programs have been enacted internationally, for example in Austria, Canada, Denmark, Germany and Sweden. Domestically, several states – California, Massachusetts, Maryland, Arizona, Maine, South Dakota, Rhode Island and Iowa – have designed and tried to implement a energy saving and/or emission reducing feebate programs. (See Appendix A). Congress has also considered feebates that take vehicle fuel economy and auto safety into account. A national-level policy would ensure maximum impact because it would induce improvements in the average fuel economy of the nationwide vehicle fleet. But state-level plans can succeed in motivating different buying patterns that decrease regional energy consumption and GHG emissions, as well as informing consumers\footnote{Note that any labeling relating to CAFÉ standards is expressly pre-empted from state governments to implement. Therefore, public outreach and education relating to a Fuel Saving Incentive Program cannot include labeling on new vehicles. Other means of outreach and education, state websites, etc. will be required.} about the characteristics of different vehicles and their pollution consequences.\footnote{US Department of Energy, Office of Policy. \textit{Effects of Feebates on Vehicle Fuel Economy, Carbon Dioxide Emissions, and Consumer Surplus.} February 1995.} Also, if enough states adopt such plans, it could provide an impetus to car manufacturers to develop cleaner, more energy-efficient vehicles nationwide.\footnote{This has been the case with lower California tailpipe emission standards as CA certified vehicles are sold in other states.}

In theory, such programs improve vehicle energy efficiency in two ways. The first, shorter-term mechanism is triggered by affecting consumer choice, through rewards and surcharges, thereby increasing the number of energy-saving vehicles on the road. The second, longer-term mechanism is prompted by influencing manufacturers, through changes in consumer preference, to increase the production of more energy-efficient, lower GHG vehicles.\footnote{Perrin, Thorau, and Associates Ltd. \textit{Options to Reduce Light Duty Vehicle Emissions.} October, 2001}

It is easiest to motivate manufacturers to change their design, production, and marketing behavior when consumer preferences are in flux. Political controversy, safety concerns, and declining sales of the giant SUV, are just now beginning to change the vehicle market. A new lineup of smaller sport trucks, station wagons, and mini cars\footnote{Jonathan Welsh, “Small-Car Envy,” \textit{Wall Street Journal Online}, December 26, 2003.} are being developed to address this changing market, especially by domestic manufacturers.\footnote{Steve Parker, “Think Small,” \textit{Alaska Airlines Magazine}, November 2003.} Energy sipping, hybrid-electric vehicles have entered the market and several new hybrid-electric cars and trucks are slated for introduction by Ford, GM, Daimler-Chrysler,
Toyota, and others in the next several years.\textsuperscript{16} And these new energy-efficient cars are proving to be popular as evidenced by Toyota Prius hybrid that just won Motor Trend’s Car of the Year award.\textsuperscript{17}

No doubt the current market for cars and light trucks offers a dizzying array of choices, comprising vehicles of different sizes, degrees of “luxury”, and performance characteristics. Even after a consumer has fixed on a certain model, there are still choices that determine their vehicle’s energy consumption. These can include: transmissions – manual vs. automatic vs. continuously variable transmission; engine size; power – V-4 vs. V-6 vs. V-8; drivetrains – FWD vs. 4WD vs. AWD; fuel type – hybrid-electric vs. gasoline vs. diesel vs. alternative fuels; and so on.

Basically there are too many choices for most consumers to act rationally when it comes to simply optimizing GHG emissions. An energy saving incentive program would help consumers choose between vehicles with similar functional attributes but different technological characteristics that relate directly to energy consumption and GHG emissions. By offering a monetary inducement, consumers would be rewarded to purchase the cleaner options. If enough consumers respond, car dealers and manufacturers would eventually follow suit by shifting inventories and manufacturing these vehicles in larger numbers.

### 3. Policy Design Elements

There are a variety of ways to design vehicle incentive programs. These policies can be tailored to specific needs and goals. Some of the design elements include:

- Vehicles Included (new or used vehicles sold, across size classes or within size classes, commercial vehicles)
- Metrics used (fuel economy, fuel consumption, carbon emissions, weight, engine size, vehicle footprint, or a combination thereof)
- Magnitude of rebates and surcharges (location of zero-point, revenue neutral or revenue positive, linear or non-linear, with or without a cap, with or without a “deadband”)

Each of these policy design options is discussed below. Many of them merit deliberation before advancing the optimal design to deliver the goal of GHG emission reduction. In addition to the program’s overarching emission goal, careful consideration should be given to simplicity and fairness of program design, compatibility and coordination with other local vehicle and tax-related programs, and the likelihood of “leakage” across state borders. Several alternative designs are discussed below in the context of the Massachusetts’ light-duty vehicle fleet.


\textsuperscript{17} Sholnn Freeman, “Toyota’s Prius Hybrid Named Motor Trend’s ‘Car of the Year,’ ” \textit{Wall Street Journal}, November 26, 2003.
A. Vehicles Covered by the Program

Two-axle, four-tire vehicles under 10,000 pounds Gross Vehicle Weight Rating (GVRW) are defined as “light-duty, passenger vehicles.” Light-duty, passenger vehicles have been further distinguished between vehicles primarily designed for the transport of passengers and those designed for the transport of cargo. This distinction is meant to sort between personal transportation and commercial, agricultural or recreational transportation, which unfortunately is not very clear-cut. Both cars and trucks are included in the light-duty passenger vehicle category. Passenger light-duty trucks (LDTs) are further classified by weight: Class 1 (6,000 pounds and under); Class 2a (6,001 – 8,500 pounds); and Class 2b (8,501-10,000 pounds).

In more common terms, the LDT Class 1 category includes small pickup trucks (e.g., Toyota Tacoma and Chevrolet S-10), minivans, and compact SUVs (e.g., Ford Explorer and Chrysler PT Cruiser). The LDT Class 2a category includes larger SUVs (e.g., Cadillac Escalade, Ford Expedition, and Chevrolet Suburban) and mid-size pickup trucks (e.g., Ford F-150 and Toyota Tundra). The LDT Class 2b category includes large pickup trucks and SUVs (e.g., GMC Yukon, GMC Sierra 250, Ford Excursion). And there is a final category, which is not even specified under current CAFE standards, for those vehicles over 10,000 pounds GVWR. These include, for example, Hummer H1 (10,300 lbs.), GMC Sierra 3500 crew cab (11,400 lbs.), Ford F350 (11,200 lbs.), and the Dodge Ram Quad Cab (11,500 lbs.).

Fuel economy is not reported in the Fuel Economy Guide for vehicles over 8,500 pounds GVRW. Therefore, LDT Class 2b and heavier vehicles may require outreach to inform consumers about the fact that they consume excessive energy consumption and why they could be levied high fees under TPRIP. Moreover, the energy consumption data or carbon dioxide emissions for these vehicles will have to be obtained separately each year from either the U.S. Environmental Protection Agency or the vehicle manufacturers.

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19 There are different vehicle categories for Tier 2 tailpipe emissions standards and fuel economy standards. This report categorizes vehicles as the CAFÉ standards do since GHG emissions relate to fuel economy rather than tailpipe emissions. EPA classifies trucks in different tiers. See: EPA Proposed Rules: Control of Emissions of Air Pollution From 2004 and Later Model Year Heavy-Duty Highway Engines and Vehicles; Revision of Light-Duty Truck Definition, Federal Register, October 29, 1999 (Volume 64, Number 209), Page 58471-58566.
Within or Across Vehicle Size Classes (Number of Tiers)?

Vehicles are separated into different size classes and new classes are created as vehicles morph and change. For cars the size classes currently include: two-seater, mini-compact; subcompact; compact; midsize; large; small station wagons; midsize station wagons; luxury small; and luxury large. For light trucks, they include: minivans; passenger vans; small SUVs; large SUVs; small pickup trucks; standard pickup trucks; large pickup trucks.22

If environmental considerations are the sole criteria for evaluation, an energy saving incentive program should be designed to operate across all vehicle classes (single-tier) so there is a clear and consistent inducement to choose the vehicle with the lowest GHG emissions. Such a single-tier system, inclusive of all cars and light trucks, is preferable if it can withstand political opposition. In receiving comments on future reforms to the CAFE standard, the National Academy of Science noted that all public interest groups and individuals who commented in workshops believe that separate standards for cars and light trucks do not have any practical value under the CAFE standards.23 If the federal government eventually sets a single CAFE standards for LDVs, then a single-tier program would be entirely defensible. In the meantime, it may be up to states to treat cars and light trucks as unified passenger vehicles if they are going to make progress in this area.

This single-tier program design is further supported by the trend of SUVs bearing down on car sales. Today’s buyers are fluid as they freely move between cars and light trucks. For example, only about 37 percent of the people who previously bought a premium mid-sized car like a Toyota Camry, Honda Accord, or Ford Taurus bought another one in 2003. The number that switched from a mid-sized car to a midsize SUV jumped from 9 percent in 2000 to 13 percent in 2003, while 2 percent of purchasers switched to luxury SUVs.24

Figure 1 shows the distribution of car and light truck sales in Massachusetts in 2002, by rated fuel economy. These vehicles essentially non-distinguishable from a GHG emissions and energy consumption perspective. Note that the fuel economy of light trucks tends to be clustered at the low end of the range, and that there are a few cars with very high fuel economy but most tend to be below 30 miles per gallon.

22 Ibid.
Figure 1. Distribution of Retail Vehicle Sales in 2002 in Massachusetts by Rated Fuel Economy (City).

Source: R.L. Polk

If a single-tier program design is not feasible, it might be necessary to implement a program designed with multiple tiers. For example, a two-tier system could comprise a car class and a light truck class, possibly distinguished by weight (over and under 6,000 lbs. GVWR). This would counter opposition on the basis that a one-tier system unfairly penalizes those who choose (or need) larger (heavier) vehicles. In addition to trucks, heavier station wagons could be included with light trucks to “level the playing field” so that vehicles with comparable cargo space and weight are grouped together.

A two-tier system, however, has its drawbacks in that it is more complex to design and implement. It will also contain perverse incentives, in that consumers purchasing certain car models would end up paying a fee while others purchasing certain light truck models would receive a rebate, even though the car uses less fuel than the truck. Indeed, some would argue that a two-tier system that separates cars and trucks is unfair on the grounds that it rewards gas-guzzling vehicles that should actually be penalized. This issue deserves special attention in public discourse before the program is adopted.
New vs. Used Vehicles?

While both new and used vehicles could be included in an energy saving incentive program, there are distinct advantages to restricting the program to new vehicles. These include, overall program effectiveness, administrative cost savings, program feasibility, and a simplified program design. Most importantly, an incentive program that includes the sale of used and new vehicles would encompass a much larger number of vehicles and force rebates to be relatively low. Therefore, it would be more challenging to design an effective program that includes used vehicle purchases.

Treatment of Commercial Vehicles

Since passenger vehicles are currently rated up to 12,000 pounds GVWR, the line between private use and commercial use can be blurry. To avoid penalizing the use of larger vehicles for legitimate business purposes (e.g., delivery vans and trucks), some or all commercial vehicles could be made exempt from the program. However, a basis for identifying these vehicles would have to be agreed upon. From a pure externality viewpoint, it can be argued that there should be no exclusions, that is, individuals and businesses should factor in the true costs of having larger vehicles while making vehicle purchase decisions. However, from a practical viewpoint that considers policy feasibility, it might be wise to exclude commercial vehicles at this time. If exclusions are extended to commercial vehicles, the program could require that special application for variance. These applications would have to demonstrate how the vehicles were being used for commercial purposes. Program funds could be allotted to cover these administrative costs of evaluating commercial vehicle exemptions.

B. Societal Criteria for the Program

The program could be designed to address both criteria air pollutants and GHG (equivalent carbon dioxide) emissions. Other societal criteria, such as vehicle safety, have also been included in prior vehicle incentive program designs. However, for simplicity and since criteria pollutant emissions and vehicle safety are already addressed by existing standards that have routinely been tightened, it might be more appropriate to focus only on GHG emissions.

There are several ways to design an incentive program to reduce GHG emissions. It could be based on lifetime fuel consumption; gallons per mile (or liters per hundred kilometers, as used in many European programs); equivalent carbon dioxide (CO$_2$) per mile, equivalent lifetime CO$_2$, or miles per gallon (mpg).  

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25 A vehicle’s lifetime gallons would need to be calculated using the reported fuel economy, combining city and highway figures, adjusted using EPA factors, and lifetime miles driven updated annually based by U.S. DOE Transportation DataBook. (Note that the cumulative average lifetime miles in 2000 was 184,800 miles for cars and 205,000 miles for light trucks.) See Oak Ridge National Laboratory, Op. Cit., 2003. The lifetime CO$_2$ (in tons) can be computed simply on the basis that 9.78 tons of CO$_2$ are generated from the combustion of 1000 gallons of gasoline.
An energy saving incentive program might be most accessible to consumers if it is based on the vehicle’s fuel economy (mpg) because it is posted on the sticker on new vehicle windows. However it is probably wise to steer clear of this regulated metric. If used, it is likely that an mpg-based fee or rebate could face legal challenges as states are expressly preempted by statute from establishing or changing CAFE standards.\textsuperscript{26}

Other possible proxies for fuel economy, including vehicle curb weight, area footprint, and engine displacement, could be used as the basis for fees and rebates. (See Figure 2 for correlation between fuel consumption and engine displacement, with an $r^2$ of 0.68.)\textsuperscript{27} Measures such as engine displacement can help the program avoid difficulties relating to federal preemption. However, the farther the program diverges from fuel consumption (or GHG emissions), the more potential for gaming exists, as dealers and manufacturers might configure vehicles just to qualify them for rebates even though they do not actually reduce GHG emissions.

Alternatively, California has established a Efficient Vehicle Incentive Program that provides rebates to vehicles that employ specific energy-saving technologies.\textsuperscript{28} For example, hybrid-electric vehicles were given rebates until the state’s funding dried up. The current program did not establish a fee to fund the rebates for reasons of political expediency. Instead rebates were funded by general revenues, which explains the short-term nature of the program as California is currently in a severe budget deficit.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{fig2.png}
\caption{Correlation between engine displacement and fuel consumption ($R^2 = 0.6807$).}
\end{figure}

\textsuperscript{26} In Maryland, the U.S. Department of Transportation challenged the feebate program on the basis of federal preemption of fuel economy regulations. See the section below on legal concerns.

\textsuperscript{27} The correlation between fuel consumption and carbon dioxide emissions is 0.999, essentially a perfect fit. Therefore fuel consumption is the best measure of GHG emissions. The reason is that when fuel is combusted the result is primarily carbon dioxide and trace amounts of criteria pollutants.

**Figure 2. Relationship between Engine Displacement and Fuel Consumption**

*Source: Tellus Institute based on Massachusetts new vehicle sales data, 2002.*

*Single or Multiple “Zero Points”?*

A zero point is the trigger selected or computed that determines the value of each vehicle’s fee or rebate. The greater the distance a vehicle is from the zero point, the greater its fee or rebate is. For example, if the criteria selected is lifetime tons of CO$_2$, the (weighted) fleet mean CO$_2$ emissions could be calculated as the zero point. The program can be designed to include a deadband on either side of the zero point so that neither a fee or a rebate is triggered in this deadband.$^{29}$

Assuming a single social criteria is selected for the program, one “zero point” would be set below which consumers would get a rebate and above which they would pay a fee. Multiple program criterion either require multiple zero points a composite metric from which to set a single zero point.

**C. Fee/Rebate Structure**

The determination of the zero-point in an energy saving incentive program is central to establishing the structure and magnitude of fees and rebates. The position of the zero point will determine, among other things, whether or not a revenue neutrality results. For revenue neutral programs, the zero-point is at the weighted average of the control measure used (see below).

The fee or rebate can be fixed (linear) or variable (non-linear). It could increase or decrease linearly or nonlinearly with the measure about the zero point, change only after a threshold level is crossed (that is, beyond a deadband), and be capped at the ends. The simplest way to estimate the fee or rebate using a metric of lifetime fuel consumption and a linear structure with no deadband is shown below:

\[
\text{Fee or Rebate} = (V_m) \times (F_x - F_0),
\]

Where:

- $F_0$ is the zero point, which in the revenue neutral case is the projected, sales-weighted, average lifetime fuel consumption of the new vehicle fleet.

$^{29}$ Note that if miles per gallon are selected as the metric to determine fees and rebates, the harmonic must always be used when calculating differences. Using fuel economy (mpg) requires a more complicated procedure than using lifetime gallons.
$F_x$ is the estimated lifetime fuel consumption of vehicle, $x$, and

$V_m$ is the fee or rebate expressed in $/$gallon.\(^{30}\)

A benefit of this metric (lifetime fuel consumption) is that $V_m$ can be compared to the price of gasoline to test for program cost effectiveness. In order to conserve a gallon of gasoline, policymakers should be willing to spend at least as much as the price of a gallon of gasoline, and possibly more if externalities are being taken into account.

**Program Financing – Should the Program Designed to be Revenue Neutral?**

The question of revenue neutrality can be quite important in determining public opinion about energy saving incentive programs. Programs designed to generate revenues (where fees exceed rebates) could be perceived negatively as yet another rise in taxes. Yet, in tough economic times, state legislatures are often interested in fresh sources of income, so carefully developed revenue-positive proposals may be received positively.\(^{31}\) Moreover, there is evidence of some public sentiment in support of “polluter pays” taxes that are targeted to specified worthy ends. If a part of the revenues can be diverted to worthy programs (such as public outreach efforts to increase environmental awareness), the effect of a fee/rebate system could be further enhanced.

Programs designed to deliver more rebates than fees collected require ample, ongoing public budgets to implement. These programs are likely to be less sustainable than revenue neural (or revenue generating) designs, as the state’s revenues and priorities change from year to year.

Regardless of the program design selected, a main goal will be balancing inflows and outlays of any program. Normal market fluctuations will make it hard to keep a fee/rebate program completely revenue-neutral from year to year. Moreover, a program’s administrative costs (see below) should be managed and contained within the program’s budget. The need for a contingency fund is likely to arise and should be deliberated at the outset.

**Should there be caps on fees/rebates?**

A few vehicles in the market are extremely efficient and also fairly low priced (e.g., Honda Insight with a composite, adjusted fuel economy of 54 mpg priced at around $19,500), implying that the rebates on select models could end up being a significant fraction of their total costs. In general the less fuel a vehicle consumes, the lower its

\(^{30}\) Note again, if the metric selected is mpg, then this formula must be modified to take into account the harmonic nature of fuel economy. The reciprocals of mpg must be subtracted instead of mpg itself.

\(^{31}\) In at least one recent case legislation was unsuccessful because it was revenue-neutral during a period when the state was actively looking for revenue-enhancing measures. (Based on personal communication with an environmental advocacy group. Given the politically sensitive nature of the case, the identities of the organization and the state involved are kept confidential.)
The ten most fuel-efficient cars have an average retail price of $20,000 while the ten least fuel-efficient cars have an average retail price of $50,000. Therefore, rebates will generally be a higher percentage of their price than fees. This is helpful from a political viewpoint. However, the more politically sensitive issue relates to the absolute value of fees associated with the highest gas guzzlers. For example, it merits discussion as to whether a 12 mpg pickup that generates approximately 167 tons of CO₂ over its lifetime can be assessed a $13,000 fee without gathering too much opposition. A cap on both the fee and rebate that excludes outliers may provide a sensible way to address this problem.

**Cross-State Boundary Effects**

Unless a nationwide incentive program is implemented, there would always exist the potential problem of boundary effects. This could facilitate gaming whereby consumers can travel to a neighboring state without an incentive program in place to avoid the fee when purchasing a gas guzzling vehicle and then register this vehicle in Massachusetts. Or out-of-state consumers can travel into Massachusetts to benefit from its incentive program. A system can and should be designed to minimize this gaming. Additional measures, similar to those associated with vehicle registration regulations, should be put in place to reduce the potential for cross-state boundary effects.

**D. Administrative and Legality Issues**

The level of administrative ease will depend on program design. A simple way to collect fees and issue rebates would be to establish a new, separate state account for TPRIP. Alternatively, the program could be merged into existing financial operating systems such as the collection of vehicle sales taxes, registration fees, or excise taxes. The transaction could take place at either the point of sale or registration of all new vehicles. The primary disadvantage with this system is that of cross-state boundary effects: without adequate protections, vehicles could be purchased and registered out of state and then brought into the state and not be qualified as “new” vehicles upon change of registration.

The administration of the program will require funds, which is expected to be greater at the program start-up. In an ongoing program, administrative costs could be paid out of contingency funds accumulated by designing cumulative fees to exceed rebates (up to 10 to 20% higher). There are also creative ways to cover funds and ease administration of this program. In California, for example, the program was designed to borrow start-up funds for a fee/rebate program from the revenue-generating “vanity license plate” program. These funds could be paid back over time as the program stabilized.

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Incidence of Rebates and Fees

The incentive of the program could be integrated into the new vehicle sales tax assessment and collection (expressed as a percentage of vehicle price) or be designed as a separate surcharge or rebate that is independent of the price. The latter has the advantage of being consistent with the main driver for the program, that it is a carbon-based incentive, not a “luxury” tax on vehicles that happen to consume greater amounts of fuel over their lifetimes.

State Preemption and the Legality of an Energy Saving Incentive Program

The biggest concern for any vehicle-based incentive program dealing with GHG or fuel consumption is appearing to interfere with CAFE standards. In no way can states refer to or manipulate the labels on new vehicles that specify the vehicles’ CAFE rating. The more the program steers clear of designing around mpg, the less likely it will be preempted.

Much of the debate around the legality of vehicle efficiency incentive programs centers on the Maryland feebate legislation that was called into question under federal preemption by the National Highway Traffic Safety Administration (NHTSA) in 1992. In response, the Maryland Attorney General issued an opinion saying that while the consumer notice requirement (labeling provision) of the legislation would be subject to preemption, the tax surcharge-tax credit aspect of it need not be.\(^{34}\) While the challenge never went to court, the legislation itself was withdrawn. Although consideration was given to submitting a reworked bill that would be implementable, Maryland policymakers chose not to for fear of defeat the second time around.

In a separate but related issue, there is currently a legal challenge to California’s ZEV Program by General Motors, Daimler-Chrysler and several California car dealers alleging the new Zero Emission Vehicle (ZEV) rules violate a federal law barring states from interfering with fuel economy in any way. If this challenge is successful in removing ZEV rules, it may mean that any metric for fuel consumption is off limits to states. If this is the case, the State may want to consider challenging the federal government for interfering with regional GHG emission targets in place, since carbon dioxide and fuel economy are inextricably linked.

Periodic Program Calibration

Any vehicle incentive program will be subject to the whims of the marketplace and gaming by consumers, dealers, and manufacturers. Therefore, updating and recalibrating the program is essential. These changes would address the changing pattern

\(^{34}\) Again, the state’s utilization of vehicle labeling relating in any way to CAFÉ standards, mpg, is expressly preempted by federal law.
of vehicle purchases, the level of the contingency funds needed, and possible future changes to the federal CAFE standard. Updating does impose an administrative burden on the program, as technical resources would be needed to perform these computations. A small amount of the revenues from the contingency funds should be set-aside for this purpose, which at a minimum, would happen on an annual basis. While the maximum fees and rebates could be adjusted over time to take account of external factors, it is important that the public not perceive this as an unpredictable program or a “tax” without a ceiling.

Public Outreach

Public outreach and education is a crucial element for the success of an energy saving incentive program. However, the state must be very careful in how it disseminates information to safeguard against federal preemption. Today, information dissemination is probably most effective when delivered over the world wide web. California’s state website is a good model for providing public outreach on vehicle energy efficiency choices and incentive policies in effect.35 As mentioned previously, while labeling could serve an important educational role, any label would have to be carefully designed so as not to run afoul of federal preemption challenges. It is advisable to seek public input as proposed legislation is under development. An early attempt to get a clear, test-marketed message across can improve the chances that the public will understand the goals of the energy saving incentive program and perceive it favorably.

Spending less than the cost of a gallon of gasoline to save a gallon of gasoline is a win-win situation. Where else can you buy a gallon of gasoline for say $1.00 per gallon? Keeping an energy saving incentive program bounded by the prevailing price of gasoline from year to year is one way that the state can justify collecting and spending the money to help consumers conserve gasoline and reduce GHG emissions.

35 The website posted by the California Energy Commission can be found at: http://www.consumerenergycenter.org
4. Examples of Alternative Program Designs

The following are examples of Program Designs based on 2002 sales data in Massachusetts.

a. A linear schedule around a zero point of 95 lifetime tons of CO₂ generated, reaching plateaus of -$5,000 (fee) at 191 tons CO₂ and $4,500 (rebate) at 38 tons CO₂.

Notes:

1. Zero point is at 95 lifetime tons CO₂.
2. About 12% of new vehicle fleet are at zero-point, i.e., are unaffected by fee/rebate.
3. Based on 2002 sales, under this schedule, fees would amount to about $158 million and rebates would amount to $129 million, leaving about $29 million for contingency funds.
4. Less than 0.5% of fleet on each side will either pay the cap amount of $5,000 or receive the cap amount of $4,500.
5. Fee payers would pay the equivalent of $0.51 per gallon of gasoline saved.
b. A linear schedule around a deadband from about 91 to 100 lifetime tons of CO₂ generated, reaching plateaus of -$5,000 (fee) at 191 tons CO₂ and $5,000 (rebate) at 38 tons CO₂.

Notes:

1. Zero point is at 95 lifetime tons CO₂.
2. Deadband covers about 38% of new vehicle fleet.
3. Based on 2002 sales, under this schedule, fees would amount to about $141 million and rebates would amount to $114 million, leaving about $27 million for contingency funds.
4. Less than 0.5% of fleet on each side will either pay or receive the cap amount of $5,000.
5. Fee payers would pay the equivalent of $0.51 per gallon of gasoline saved.
c. A linear schedule for cars (excluding medium and large station wagons), around a zero point of 79 lifetime tons of CO\textsubscript{2} generated, reaching plateaus of -$5,000 (fee) at 151 lifetime tons of CO\textsubscript{2} and $4,000 (rebate) at 34 lifetime tons of CO\textsubscript{2}.

Design for Cars Only, with No Deadband, Linear Schedule and -$5,000/$+$4,000 Cap

<table>
<thead>
<tr>
<th>Lifetime CO\textsubscript{2} Emissions (tons)</th>
<th>Fees/Rebates ($)</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>25</td>
<td>-5000</td>
</tr>
<tr>
<td>50</td>
<td>-4000</td>
</tr>
<tr>
<td>75</td>
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<td>100</td>
<td>-2000</td>
</tr>
<tr>
<td>125</td>
<td>-1000</td>
</tr>
<tr>
<td>150</td>
<td>0</td>
</tr>
<tr>
<td>175</td>
<td>+4000</td>
</tr>
<tr>
<td>200</td>
<td>+5000</td>
</tr>
<tr>
<td>225</td>
<td>+6000</td>
</tr>
<tr>
<td>250</td>
<td>+7000</td>
</tr>
</tbody>
</table>

Notes:

1. Zero point is at around 79 lifetime tons CO\textsubscript{2}.
2. About 2% of new car fleet are at zero-point, i.e., are unaffected by fee/rebate.
3. Based on 2002 sales, under this schedule, fees would amount to about $78 million and rebates would amount to $66 million, leaving about $12 million for contingency funds.
4. Less than 0.5% of fleet on each side will either pay the cap amount of $5000 or receive the cap amount of $4,000.
5. Fee payers would pay the equivalent of $0.68 per gallon of gasoline saved.
d. A linear schedule for light trucks and medium and large station wagons around a zero point of 118 lifetime tons of CO$_2$ generated, reaching plateaus of -$5,000 (fee) at 182 lifetime tons of CO$_2$ and $3,500 (rebate) at 69 lifetime tons of CO$_2$. 

![Design for Light Trucks (and Medium and Large Station Wagons) Only, with No Deadband, Linear Schedule and -$5,000/$3,500 Cap](image)

**Notes:**

1. Zero point is at 118 lifetime tons of CO$_2$.

2. About 17% of the new light truck fleet is at zero-point, i.e., is unaffected by fee/rebate.

3. Based on 2002 sales, under this schedule, fees would amount to about $91 million and rebates would amount to $76 million, leaving about $15 million for contingency funds.

4. Less than 0.1% of fleet on each side will pay the cap amount of $5,000 or receive the cap amount of $3,500.

5. Fee payers would pay the equivalent of $0.76 per gallon of gasoline saved.
e. A Non-linear schedule with no cap.

Notes:

1. Zero point is at 95 lifetime tons CO₂.
2. About 12% of the new vehicles are at zero-point, i.e., are unaffected by fee/rebate.
3. Based on 2002 sales, under this schedule, fees would amount to about $81 million and rebates would amount to $65 million, leaving about $16 million for contingency funds.
4. Fee payers would pay the equivalent of $0.20-60 per gallon of gasoline saved, depending on whether they were in the shallow (lower) or steep (higher) part of the curve.
## Appendix A: Summary of Programs Elsewhere (actual and proposed)

<table>
<thead>
<tr>
<th>Features</th>
<th>Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Austria</td>
</tr>
<tr>
<td>Status</td>
<td>Implemented</td>
</tr>
<tr>
<td>Administrating Authority</td>
<td>German Federal Govt and States</td>
</tr>
<tr>
<td>Updates</td>
<td>Yes</td>
</tr>
<tr>
<td>Across/within class</td>
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</tr>
<tr>
<td>Revenue Neutrality</td>
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<tr>
<td>Incentives for AFVs</td>
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<tr>
<td>Treatment of SUVSs</td>
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<tr>
<td>Treatment of other light trucks</td>
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</tr>
<tr>
<td>Linear/nonlinear</td>
<td>Nonlinear: Zero-point</td>
</tr>
<tr>
<td></td>
<td>for 29 mpg vehicles varying with price and mpg</td>
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<tr>
<td>-----------------------------------</td>
<td>-----------------------------------------------</td>
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<tr>
<td>Education/Outreach</td>
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</tr>
<tr>
<td>Labeling</td>
<td>No</td>
</tr>
<tr>
<td>Periodic review of rate structure</td>
<td>Yes</td>
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</tbody>
</table>

*Source: Tellus Institute, 2003*