REPORT FROM

OFFICE OF THE CITY ADMINISTRATIVE OFFICER

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Council District:

To: The Council

From: Miguel A. Santana, City Administrative Officer

Reference: Adoption of the 2014-15 Budget – City Council Instruction – R30

Subject: **GAS TAX REVENUE – IMPACT OF HYBRID AND ELECTRIC VEHICLES**

SUMMARY

Upon adoption of the 2014-15 Budget, the Council instructed this Office to report to the Budget and Finance Committee regarding the use of hybrid and electric vehicles and the impact on Gas Tax revenue. The implementation of vehicles that are more efficient in the consumption of gasoline, or simply do not use gasoline, has a negative impact on Gas Tax revenues. The United States Department of Transportation Federal Highway Administration Publication Number FHWA-HRT-09-001 (Attached) describes the impact that the efficiency of vehicles has on Gas Tax revenue.

The Gas Tax is assessed per gallon and is not tied directly to the price of gasoline. Therefore, Gas Tax revenues are impacted as overall usage changes. Factors that impact gasoline usage are:

- The Price of Gasoline –
  - The price of gasoline and the revenue from Gas Taxes are inversely related. As gasoline prices rise, usage declines and Gas Tax revenue declines. Inversely, as gasoline prices decline, usage increases and Gas Tax revenue increases.
- The Condition of the Economy –
  - When consumers are struggling, Gas Tax revenues tend to either stay flat or trend downward.
- The Efficiency of Vehicles –
  - With hybrid and electric vehicles selling well in California, increases in overall vehicle efficiency have reduced the volume of gasoline sales per vehicle per mile.
- Demographic Trends –
  - As the demographics of permitted drivers and vehicles on the roads change, the overall use of gasoline tends to change.
- Availability of Alternatives –
  - As usage of public transportation or bicycling increases, gasoline usage tends to decrease.

These factors tend to work together and can, at times, have offsetting impacts. Therefore, the actual impact of one factor can be difficult to accurately isolate.

U.S. Department of Transportation
Federal Highway Administration

Publication Number: FHWA-HRT-09-001

Higher Gas Efficiency Equals Lower Fuel Revenues

by Ron Hagquist

A Texas study shows that drastically higher motor fuel taxes—or something else—will be needed soon to compensate for revenue losses from increasing vehicle fuel efficiency.

Photo: General Motors Corporation

Plug-in vehicles such as this one are slated to enter the marketplace in 2010.

It would be difficult to miss all the recent articles surrounding the current status of the Federal Highway Trust Fund. A main source of financial support for the transportation community, the fund is based on an old model of high gas consumption. Today, automobiles are more efficient, and consumers are cutting back.

But fuel tax rates have not been adjusted to meet growing needs for highway investment. The last increase in Federal fuel taxes was in 1993. Since then, highway construction costs have risen substantially. Recent spikes in fuel prices have reduced travel and hence fuel tax revenues, and voters have been reluctant to increase fuel tax rates.

Inflation in both construction and maintenance also have contributed to the highway revenue needs gap. At a time when fuel costs are continuing to increase, consumer demand is decreasing, and the institutional environment is staying the same, a long-term solution could take a while. Where does that leave the transportation community?

State departments of transportation (DOTs) are beginning to implement innovative financing strategies such as tolling and public-private partnerships (PPPs), but the bulk of their funding still comes from motor fuel taxes. Using even conservative estimates for market acceptance of technological improvements, such as hybrid and plug-in electric vehicles, the prognosis indicates a dramatic increase in motor fleet efficiency (cars and trucks) in the United States over the coming quarter century.

For State DOTs, which rely on motor fuel taxes for most of their funding, the years ahead pose a major financial challenge as motor vehicles become increasingly fuel efficient, motorists purchase less fuel, and fuel tax revenues decline. The Federal and State governments need to plan for this significant change when estimating future funds from the motor fuels tax.

As a basis for long-range strategic planning and policy evaluation, the Texas Department of Transportation (TxDOT) recently engaged a transportation consulting firm to produce a long-term forecast of the fuel efficiency of motor vehicles in the State. The study found that the fuel tax might have to be increased nearly eightfold to meet the expected mobility needs and to compensate for much wider use of more fuel-efficient motor vehicles. These findings indicate that policymakers need to start looking at expanded use of innovative financing and technological solutions such as a vehicle miles traveled (VMT) tax as alternatives to fuel taxes for transportation-related funding.

Fuel Efficiency on the Rise

In his 2007 State of the Union speech, President George W. Bush laid out a comprehensive plan to improve U.S. energy security by reducing the Nation's gasoline consumption by 20 percent over the next 10 years. Increasing Corporate Average Fuel Economy (CAFE) standards for the new car fleet is a primary means of meeting that goal.

The 2007 CAFE standard for the fuel efficiency of new vehicles is 11.7 kilometers per liter, km/l (27.5 miles per gallon, mi/gal) for cars and 9.4 km/l (22.2 mi/gal) for light trucks. Some commercial hybrid vehicles already on the road attain double those figures.

Gas Tax Rates and the Highway Trust Fund

States impose their own gas taxes, in addition to the Federal taxes per gallon of gas. These taxes vary from State to State. Alaska has by far the lowest tax rate at 8 cents per gallon, while Pennsylvania has the highest tax rate at 38.1 cents per gallon. The tax rates for diesel also vary substantially by State.

The largest contributor of revenues to the Highway Trust Fund is the Federal tax of 18.4 cents per gallon on gasoline and gasohol (a fuel consisting of a blend of ethyl alcohol and unleaded gasoline). Under current Federal law, such taxes are scheduled to expire in 2011. The gas and gasohol tax currently produces about two-thirds of the fund's total revenues. Almost 2.9 cents per gallon is dedicated to the mass transit account. The second-largest source is the levy of 24.3 cents per gallon on diesel, which accounts for about one-quarter of the revenues.

Thus, taxes on motor fuels generate about 90 percent of the trust fund's total revenues. The rest come from a 12 percent tax on the first retail sale of a truck or trailer above a certain weight, taxes on truck tires for highway use, and an annual use tax on heavy trucks. The Congressional Budget Office projects all five of those revenue sources separately, along with refunds on amounts paid by certain taxpayers, such as State and local governments, which are exempt from the taxes.

Revenues from taxes on gasoline and diesel fuel are credited to the trust fund, and then the highway and mass transit accounts receive shares. Revenues from the three different taxes on trucks are credited entirely to the Highway Account. Currently, more than 85 percent of the revenues in the Highway Trust

Fund go to the Highway Account.

Source: API.

The second generation of hybrids (plug-in vehicles), coming to market around 2010, will have a fuel efficiency of 42.5 km/l (100.0 mi/gal). The third generation will be lighter and even more fuel-efficient. Already, a Volkswagen prototype car made of high-strength carbon composite material attains 101.6 km/l (239.0 mi/gal).

A perfect storm of political, technological, and market factors are converging to drive this change. Politically, financial incentives (subsidies such as tax credits) for purchasing hybrid vehicles have been used. In addition, more ambitious CAFE standards might become a reality.

Technological and market factors, and actions by automakers and buyers, could outpace government action. According to a 2007 survey of motor industry experts by technology-futures forecasting firm TechCast, the consensus is that 2012 is the most likely year for hybrids to attain 30 percent of the U.S. new car market. By 2025, the hybrid market share could be as high as 75 percent, the firm says.

In addition, automakers are introducing other fuel-saving technologies, such as state-of-the-art transmissions. The benefits generally are additive. As more new technologies are incorporated into a vehicle, the fuel efficiency increases. Motivated by fuel prices, auto manufacturers could replace standard spark-ignition engines with diesel engines in light trucks, increasing fuel economy by 30 percent.

In addition, according to the U.S. Department of Energy, although hybrid vehicles accounted for just 2.2 percent of all new vehicle registrations for 2007, hybrid vehicle registrations rose 38 percent for a total of 350,289. Of the top 10 States for new hybrid vehicle registrations, California had by far the most, accounting for a quarter of all new hybrid vehicles, while the remaining top 9 States—Florida, Illinois, Massachusetts, New Jersey, New York, Pennsylvania, Texas, Virginia, and Washington—each had about 3 to 5 percent of new hybrid registrations. Although the State of Washington had only 3.7 percent of new hybrid registrations for 2007, it was second only to California on a per capita basis.

Hybrid vehicles have been sold in the United States since the Honda Insight went on the market in 1999. Total hybrid sales were about 350,000 in 2007, which is an increase of about 40 percent over total 2006 sales. Sales of hybrids also have increased at the national level from 1.4 to 2.6 percent. Diesels, however, experienced a slight decline in 2007, bringing their total sales figures closer to that of hybrid vehicles.

The Texas Study

In developing its long-range plans, TxDOT sought to account for these market trends in fuel efficiency. Using a scenario-based approach, the consultant's study, *Accounting for Fuel Efficiency in Texas Fuel Tax*

Revenue Estimations, found that the average fleet mileage, currently 7.6 km/l (17.9 mi/gal), will likely increase to 24.7 km/l (58.0 mi/gal) by 2030—and quite possibly as high as 36.6 km/l (86.0 mi/gal).

Fuel-Saving Technology	
New Technology	**Efficiency Increase**
Variable valve timing and lift	5.0%
Cylinder inactivation	7.5%
Turbochargers/superchargers	7.5%
Integrated starter/generator systems	8.0%
Direct fuel injection	12.0%
Continuously variable transmissions	6.0%
Automated manual transmissions	7.0%

Source: www.fueleconomy.gov/feg/tech_adv.shtml.

In other terms, Texas's average total fleet (all cars and trucks on the road in the State) efficiency most likely will triple by 2030 and could increase nearly five times. This rate of increased efficiency greatly outstrips the expected growth in Texas's population, resulting in a large net decrease in fuel tax revenues.

The second part of the analysis used the consultant's efficiency projections to determine how much higher the State motor fuels tax would have to be to cover the estimated $86 billion gap in mobility needs expected to accrue in Texas by 2030—that is, the shortfall that was expected in fuel tax revenues before considering higher vehicle fuel efficiency. Using a set of fleet efficiency scenarios, the consultant determined that the tax, currently 20 cents per 3.8 liters (1.0 gallon), necessary to close the gap is between $1.33 and $1.79, most likely $1.51 per gallon. Thus, the State would need to increase the current tax by a factor of nearly eight to compensate for the greater fuel efficiency anticipated in Texas.

The Texas Scenarios

The next 25 years will look very different than the last 25 in terms of two critical factors affecting fuel consumption: the dawn of high fuel-efficiency technology and the dusk of cheap oil. Even a cursory assessment of these factors finds a wide range of possible outcomes. Since simple extrapolation of historical trends is not appropriate due to likely major changes in these fundamental factors, the consultant used a scenario approach to forecast fuel consumption in Texas. According to the study, the two parameters critical to the future of motor fleet fuel efficiency are technological progress and market acceptance.

Why Scenarios?

According to an old military adage, "the first casualty of any battle is the battle plan." Recognizing this, major military planning is based on multiple scenarios that explicitly recognize the uncontrollable. Likewise, a long-term forecast usually contains multiple uncertainties that make a single-number prediction of limited value to a decisionmaker. Of greater value is a range of predicted values along with a statement of the likelihood that the actual outcome will be within that range.

Forecasting fuel tax revenues out to 2030 involves compounding two critical but uncertain factors: technological fuel-efficiency progress and rate of adoption in the marketplace (fleet turnover). Therefore, a high technological possibility paired with a high rate of incorporation into the fleet results in high fuel efficiency, whereas the combination of low progress and low market acceptance has a low efficiency outcome.

For this reason, the Texas researchers used a scenario approach to provide a fuller picture in their long-term forecast of motor vehicle fuel efficiency. They used three scenarios of technology and three of market penetration as inputs, resulting in nine combinations of the underlying variables. The researchers went another step by taking a risk analysis approach, assigning likelihoods (probabilities) to the input scenarios and producing joint likelihoods for the nine resulting forecasts. So in 2030, the fleet efficiency will almost certainly be between 13.0 kilometers/liter, km/l (30.5 miles per gallon, mi/gal) and 36.8 km/l (86.5 mi/gal), with about a 60 percent probability of being between 14.9 km/l (35.0 mi/gal) and 24.7 km/l (58.0 mi/gal).

The consultant combined scenarios of motor-industry market forecasts with scenarios of technological fuel-efficiency improvements. The consultant also estimated the associated probabilities for these individual scenarios, allowing calculation of the likelihoods of the final combined scenarios. Since wider adoption of hybrids is only one of the expected fleet changes that will increase fuel efficiency over the coming decades, the analysis factored in other changes, including greater use of diesel engines and technologies such as continuously variable transmissions and cylinder idling.

Low, medium, and high scenarios for both market and technology resulted in nine scenarios of fleet fuel efficiency, each with an estimated probability, in turn allowing determination of confidence intervals for future fuel efficiency.

The consultant's study found that the overall fleet fuel efficiency in Texas will likely range between 10.4 km/l (24.5 mi/gal) and 17.0 km/l (40.0 mi/gal) in 2020 (averaging out at 13.7 km/l, 32.2 mi/gal), and range between 13.0 km/l (30.5 mi/gal) and 36.8 km/l (86.5 mi/gal) in 2030 (averaging out at 24.7 km/l, 58.0 mi/gal).

Alternative Scenarios

Scenario	Probability	Cumulative Probability
Low market penetration and low km/l (mi/gal)	6.25%	6.25%
Low market penetration and high km/l (mi/gal)	6.25%	12.50%
Low market penetration and average km/l (mi/gal)	12.50%	25.00%
Average market penetration and low km/l (mi/gal)	12.50%	37.50%
Average market penetration and high km/l (mi/gal)	12.50%	50.00%
Average market penetration and average km/l (mi/gal)	25.00%	75.00%
High market penetration and low km/l (mi/gal)	6.25%	81.25%
High market penetration and high km/l (mi/gal)	6.25%	87.50%
High market penetration and average km/l (mi/gal)	12.50%	100.00%

Source: TxDOT.

"Rather than simply come up with a point estimate of the revenue shortfall due to increased vehicle efficiency, the consultant came up with a range of plausible outcomes on two dimensions of uncertainty to

give decisionmakers a look at the real future, which is always more complex than our expectations allow," says Peter Bishop, coordinator of the Future Studies program at the University of Houston.

Financial Ramifications

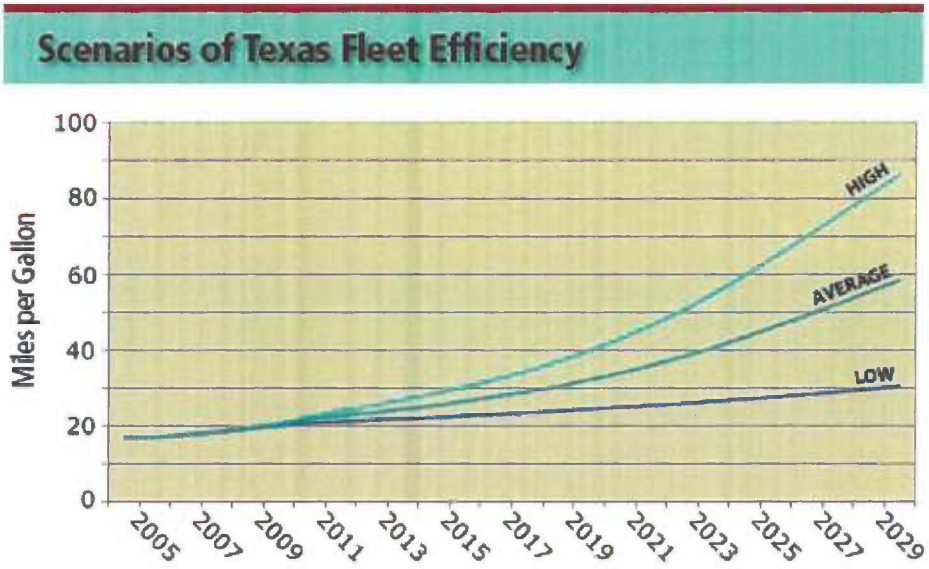
The second part of the analysis consisted of determining the necessary tax increase that would be required to meet an $86 billion gap in mobility needs through 2030. This analysis goes to the issue of the feasibility of funding mobility needs in Texas entirely from increasing fuel taxes as opposed to tolling roads or using other forms of revenue generation. This computation involved adding to the fuel efficiency scenarios two additional low and high scenarios for annual traffic growth over the 25-year timeframe (1.7 percent and 3.2 percent, respectively).

The "average tax value" is the average annual Texas State tax that would have to be imposed over the entire 25 years to close the entire $86 billion gap over that period. The range of scenario results shows that the "expected value" (the probability-weighted average) is $1.51, with a 75 percent probability that the tax will have to be within a range of $1.33 to $1.79.

Trends and Solutions

Even in growth States such as Texas, the outlook for fuel tax revenues over the coming decades is for dramatic declines. Increases in fuel efficiency can easily exceed long-term growth in driving, resulting in lower fuel use and therefore lower tax revenues.

Many factors will continue to drive the popularity of hybrids and other fuel-saving technology: the rising price of oil, the push to reduce foreign imports of oil, and the desire to reduce greenhouse gas emissions and smog-causing pollutants from tailpipes. The common-denominator solution is reducing fuel use, and the technology is already doing just that.



Source: TxDOT

This graph depicts the projected future of vehicle fuel efficiency in Texas, with low, high, and average scenarios. Cumulative effects of high-efficiency vehicles on fuel consumption will likely become significant within the next 10 years and have an even greater impact in the subsequent decade.

The study findings—that a considerable increase in funding would be required to meet mobility needs over the next quarter century—argue forcefully for the need for policymakers to consider innovative and road user-based financing. "Future vehicle design and fuel efficiencies are going to profoundly change the financial landscape for highways," says Robert Harrison, deputy director of the Center for Transportation Research at The University of Texas at Austin.

Next Steps

Departments of transportation across the Nation face a similar situation: changing fuel efficiency, aging infrastructure, and the demand-dampening impact of higher fuel prices. In Texas and elsewhere, increasing mobility needs due to continuing population and economic growth add to the challenge.

Alternative Scenarios Results				
Market Penetration Of Alternative Technologies	Km/l (mi/gal) Improvement For All Technologies	Average Tax Value	Probability	Cumulative Probability
Low	Low	$1.26	6.25%	6.25%
Medium	Low	$1.32	12.50%	18.75%
Low	Medium	$1.33	12.50%	31.25%
High	Low	$1.38	6.25%	37.50%
Low	High	$1.44	6.25%	43.75%
Medium	Medium	$1.51	25.00%	68.75%
High	Medium	$1.68	12.50%	81.25%
Medium	High	$1.79	12.50%	93.75%
High	High	$2.14	6.25%	100.00%

In response, TxDOT established a high-level 2030 Committee composed of transportation officials, stakeholders, and researchers with the mission to direct a major assessment of the State's transportation needs through 2030. Two university transportation research organizations will complete the study in time for the convening of the Texas Legislature in January 2009.

Spurring Innovation

With encouragement from Federal agencies, the X PRIZE Foundation and Progressive® insurance company are offering $10 million in prizes to teams who can design vehicles that achieve the energy equivalent of 42.5 kilometers per liter (100.0 miles per gallon) and are safe, environmentally friendly, and appealing to car buyers.

"This competition will result in more choices of more fuel-efficient vehicles for drivers and will be a catalyst for moving this technology forward, faster," said Progressive CEO Glenn Renwick at the prize's announcement at the New York International Auto Show in March 2008.

The X PRIZE Foundation achieved a primary goal in 2004, when its $10 million Ansari X PRIZE spurred pilot Burt Rutan to take the world's first private vehicle into suborbital space flight. The Progressive Automotive X PRIZE has received support and encouragement from Government agencies that will help the privately funded organization conduct the competition and test vehicle compliance. These agencies include the following: the U.S. Department of Energy (DOE), Argonne National Laboratory, the U.S. Department of Transportation's Federal Highway Administration and National Highway Traffic Safety Administration, the U.S. Environmental Protection Agency, and the California Air Resources Board.

As of July 2008, 90 teams from 12 countries said they plan to enter the competition. The goal is "to inspire a new generation of viable, super fuel-efficient vehicles that offer more consumer choices," with emphasis placed on affordability, safety, and the environment. "It is about developing real,