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Costs and Benefits of Standards for Vehicle Emissions and Fuel Carbon-Content in Texas **POLICY SUMMARY**

By James Fine¹ and Chris Mihm²

We forecast the Texas passenger car and light truck fleets in two scenarios:

- (1) business-as-usual vehicle fuel efficiency mandated by Federal Corporate Average Fuel Efficiency standards, and;
- (2) efficiency spurred by implementing greenhouse gas emissions standards like those adopted in California and several other states, combined with a low-carbon fuel standard (LCFS).³

We find that considerable opportunity exists for all Texans to drive more while spending less on fuel. We find that by implementing both the Clean Car and LCFS standards, Texas can reduce vehicle-related emissions by over 10%. By 2030, vehicle efficiency improvements can save drivers over \$8.8 billion at the pumps and avoid about 3.6 billion gallons of fuel use annually while driving more miles.⁴ Furthermore, Texas can avoid about 15 million metric tons of greenhouse gas emissions per year by 2030 from cars and light trucks, or cumulatively avoid nearly 440 million tons of emissions from 2010 through 2030.

The Texas Department of Transportation counts over 17 million motor vehicles that consumed about 9.2 billion gallons annually, which was 8.5% of total U.S. fuel use in 2008. We input the 2008 Texas automobile fleet into the VISION model developed by Argonne National Laboratory to forecast emissions and fuel use impacts of improved fuel efficiency and lower fuel carbon content.⁵ The business as usual scenario has fuel efficiency equal to Federal CAFE standards, whereas an opportunistic scenario has higher fuel efficiency as needed to meet greenhouse gas emissions standards (i.e., Clean Cars standards) and a low-carbon fuel standard (i.e., LCFS).

Tables A and B summarize findings for cars and light trucks in 2020 and 2030, respectively, for the two scenarios, with Table B showing aggregate benefits for the 20-year study period, 2010 through 2030. The Clean Car and LCFS standards will combine to reduce emissions significantly while saving drivers money from avoided fuel costs. Texas drivers will save on average \$420 and \$620 per year in 2030 in avoided fuel costs. Subtracting the capital costs of improvements from the fuel cost savings provides a general estimate of net savings. The California Air Resources Board estimates that annualized costs of vehicle modifications to meet the Clean Car standards will average \$158 per car or \$43 per truck.⁶ We gauge the net benefits to consumers by subtracting CARB's cost estimate from our estimate of avoided fuel costs. This calculation yields a net benefit to drivers of 2030 model cars of approximately \$262 annually and to drivers of average light duty trucks of \$597 annually.

Statewide, the fleet will avoid consumption of 3.6 billion gallons of fuel in 2030, which translates into 37 tons of avoided global warming pollution and nearly \$8.8 billion in avoided fuel costs. Aggregated for the 20-year study period from 2010 thru 2030, avoided greenhouse emissions exceed 440 MMTCO₂E, as shown in Figure 1 as the area under the "cars + trucks" line.

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³ States adopting the California GHG emissions standards include Arizona, Connecticut, Maine, Maryland, Massachusetts, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Rhode Island, Vermont and Washington. California recently adopted a low-carbon fuel standard that sets a goal of reducing the carbon content of gasoline and diesel transportation fuels 10% by 2020.

⁴ Texans will drive more because the cost of each trip will be reduced. The average car or light truck will be driven over 500 more miles each year in the Clean Cars and LCFS standards scenario.

⁵ The full VISION model can be found at www.transportation.anl.gov/modeling_simulation/VISION/index.htm

⁶ See Tables 10.2-1 and 11.4-1 of California Environmental Protection Agency, California Air Resources Board, Addendum Presenting And Describing Revisions To: Initial Statement Of Reasons For Proposed Rulemaking, Public Hearing To Consider Adoption Of Regulations To Control Greenhouse Gas Emissions From Motor Vehicles, September 10, 2004.

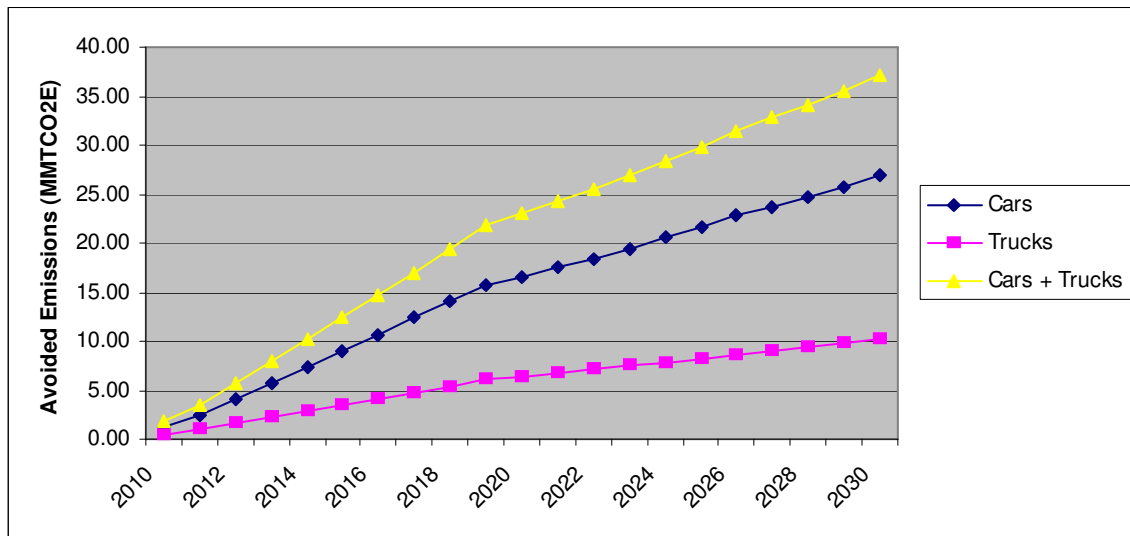
Table A: Summary of Findings for 2020 from Clean Cars and LCFS Standards

| | Cars | Light Trucks | Cars + Trucks |
|--|-------------|---------------------|----------------------|
| Avoided Fuel Use Bills (Millions of Gallons/Year) | 937 | 469 | 1,406 |
| Avoided Fuel Use Bills (Gallons/Day) | 0 | 0 | 0 |
| Avoided Fuel Costs (All Cars & Light Trucks, \$2005 Millions) | \$2,237 | \$1,119 | \$3,356 |
| Additional VMTs (All Cars & Light Trucks, Millions) | 2,382 | 682 | 3,064 |
| Avoided Fuel Costs (\$2005 Per Vehicle) | \$280 | \$400 | - |
| Additional VMTs (Miles Per Vehicle) | 177 | 149 | - |
| Avoided GHG Emissions (All Cars & Light Trucks, MMTC Eq, 2020) | 4.525 | 1.747 | 6.3 |
| Avoided GHG Emissions (All Cars & Light Trucks, MMTCO2 Eq, 2020) | 16.591 | 6.404 | 23.0 |

Table B: Summary of Findings for 2030 from Clean Cars and LCFS Standards

| | Cars | Light Trucks | Cars + Trucks |
|---|-------------|---------------------|----------------------|
| Avoided Fuel Use (Millions of Gallons/Year) | 2,114 | 1,470 | 3,584 |
| Avoided Fuel Use (Millions of Gallons/Day) | 5.79 | 4.03 | 9.82 |
| Avoided Fuel Costs (All Cars & Light Trucks, \$2005 Millions) | \$5,218 | \$3,628 | \$8,846 |
| Additional VMTs (All Cars & Light Trucks, Millions) | 5,918 | 1,886 | 7,804 |
| Avoided Fuel Costs (\$2005 Per Vehicle) | \$420 | \$620 | - |
| Additional VMTs (Miles Per Vehicle) | 513 | 527 | - |
| Avoided GHG Emissions (All Cars & Light Trucks, MMTC Eq, 2030) | 7.3 | 2.8 | 10.1 |
| Avoided GHG Emissions (All Cars & Light Trucks, MMTCO2 Eq, 2030) | 26.8 | 10.2 | 37.1 |
| Avoided GHG Emissions (All Cars & Light Trucks, MMTC Eq, 2010-2030) | 87.4 | 33.4 | 120.8 |
| Avoided GHG Emissions (All Cars & Light Trucks, MMTCO2 Eq, 2010-2030) | 320.4 | 122.5 | 442.8 |

Figure 1: Federal CAFE and Clean Car Standards for Cars, SUVs and Light Trucks



Methods

The three dimensions of a complete solution for transportation-related emissions will address transportation demand management, transportation fuel carbon content, and vehicle fuel efficiency. Our modeling examines both fuel carbon content and vehicle efficiency for Texas cars and light trucks from the present through 2030.

We utilized the VISION AEO 2008 Expanded Model to quantify emissions and economic impacts. VISION is built with default national fleet data that we adapted by inserting the Texas vehicle fleet based on registered vehicles data provided by the Texas Department of Transportation. We also adjusted parameters to more accurately represent Texas, such as current fleet-wide fuel efficiency and the forecasted proportion of light-duty trucks and passenger cars. We set the Texas market share of light duty trucks at 40% from 2000 to 2030 based on the existing fleet composition. We used default values for the market penetration of new technologies like electric vehicles and plug in electric vehicles.

As shown in Figure 1, we used two sets of new vehicle fuel efficiency forecasts to represent the two scenarios: business-as-usual prevailing Federal Corporate Average Fuel Efficiency standards, and the Clean Cars standards. Fuel efficiencies for the full Texas fleet and individual new cars and trucks differ as shown in Table C. We input new car fuel efficiency assumptions, whereas the model calculated fleet average fuel efficiency weighted by vehicle miles travelled.

Whereas the California Air Resources Board predicts that the LCFS will not translate into higher costs for drivers, to be conservative we assume that fuel prices will increase slightly as a result of the policy.⁷ For example, in 2030, the reference case fuel price for gasoline is \$2.47, but we assume the LCFS will increase the price to \$2.60 per gallon.⁸

There are several compliance pathways for both the Clean Cars standards and the LCFS.⁹ For simplicity, transparency and a coarse estimate of benefits, adjusting fuel efficiency and fuel carbon content serves as an adequate analog in the modeling construct. In the Reference Case, we adjusted the passenger car and light truck fuel efficiencies to represent the current Corporate Average Fuel Economy (CAFE) standards. In the Investment Case, we enhanced the fuel economy for passenger car and light-duty trucks to represent the emissions standards like those being promulgated by California and more than a dozen other states. In addition, we reduced the model parameters for carbon content by 10% based on the adoption of a low carbon fuel standard with goals similar to California's of reducing carbon content by 10% by 2020.

Fuel price assumptions in 2020 and 2030 are \$2.38 and \$2.47 per gallon, respectively, based on forecasts by the Federal Energy Information Administration. We consider these to be very conservative since fuel prices approached \$4 per gallon in some parts of the U.S. in 2008.

⁷ See CARB, 2009, Proposed Regulation to Implement the Low Carbon Fuel Standard Volume I. Staff Report: Initial Statement of Reasons. Chapter VIII: Economic Impacts. March 5.

⁸ For consistency with internal modeling assumptions, we use the default value of \$2.47 to calculate personal and fleet-wide avoided fuel costs. Using the higher price per gallon will only increase the estimated benefits of the Clean Car and LCFS standards.

⁹ There are several ways to forecast strategies used to comply with the Clean Car standards:

- Vehicle fuel efficiency
- Fuel switching
- Vehicle switching
- Vehicle technologies that improve air conditioning efficiencies and reduce leakage, and that reduce emissions of non-CO2 greenhouse gases, notably nitrous oxide and methane.
- Combinations of the above

Like the Clean Car standards, there are several compliance pathways for the LCFS:

- Providing only fuels that meet the standard
- Providing a mix of higher and lower carbon fuels that on average meet the standard
- Using previously banked credits in an amount that equals the credit deficit
- Acquiring credits from other parties who earned credits by exceeding the standard.
- Combinations of the above.

For example, a producer may choose to meet the LCFS by a combination of selling low carbon fuels (e.g. ethanol derived from waste resources), and by buying credits from other regulated parties. The LCFS should spark research in alternatives to petroleum-based fuels, leading to GHG emission reductions over the long term.

Figure 1: Federal CAFE and Clean Car Standards for Cars, SUVs and Light Trucks

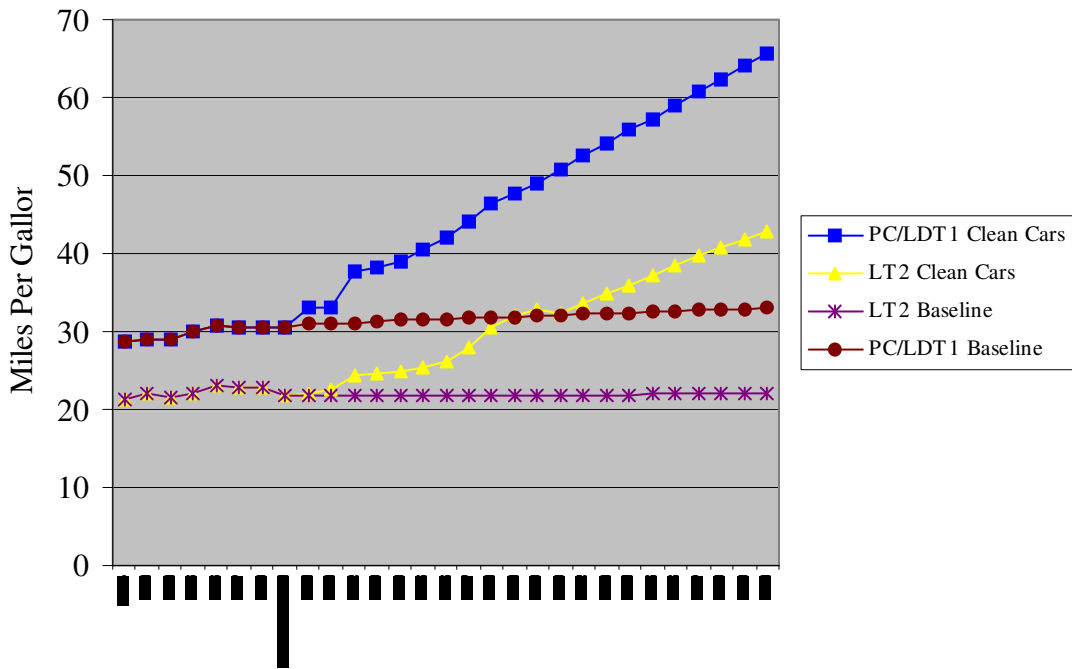


Table C: New Car and Fleet Average Fuel Efficiency

| Year | New Car – Federal CAFE | New Car – Clean Car Standards | VMT-weighted Texas Car Fleet – Federal CAFE | VMT-weighted Texas Car Fleet – Clean Car Standards |
|------|--------------------------------|---------------------------------------|---|--|
| 2020 | 32.0 | 49.1 | 24.4 | 28.6 |
| 2030 | 33.0 | 65.6 | 25.7 | 40.0 |
| | New Light Truck - Federal CAFE | New Light Truck - Clean Car Standards | VMT-weighted Texas Light Truck Fleet - Federal CAFE | VMT-weighted Texas Light Truck Fleet - Clean Car Standards |
| 2020 | 21.9 | 32.7 | 17.3 | 19.4 |
| 2030 | 22.0 | 42.7 | 17.5 | 26.0 |