Driving Progress, Fueling Savings Fact Sheet Methodology and Assumptions

Summary

The Union of Concerned Scientists (UCS) produced analysis to estimate the average cost of ownership savings California's cleaner fuels and vehicle policies will provide over the lifetime of an average new vehicle purchased in 2015, 2020, and 2025, and over the remaining lifetime of an average 10-year-old used vehicle purchased in 2025. A California driver who purchases an average new model year 2015 car can expect to save $3.90 each week over the life of the vehicle compared with our baseline scenario; a driver who purchased a new vehicle in 2008 prior to the implementation of cleaner fuels and vehicle polices. The comparative savings grow to $5.22 per week for the owner of a new vehicle in 2020 and $8.98 per week for someone buying a new vehicle in 2025. In addition, a 10-year-old used car in 2025 will save its driver $7.46 a week, or $388 a year, over the remaining lifetime of the vehicle compared with a 10-year-old used car purchased in 2015.

The policies considered in this analysis include California's cap and trade program, the low carbon fuel standard (LCFS), and California's vehicle standards including model year 2009-2016 greenhouse gas standards and the advanced clean cars regulations affecting model years 2017 through 2025. Net savings were estimated by calculating the fuel cost savings from more efficient vehicles minus the fuel economy technology, cap and trade, and LCFS costs (see Table 1). Fuel cost savings were quantified by estimating total fuel consumed, using vehicle miles traveled (VMT) and fuel economy for both the policy case and baseline scenario. All of these savings and costs were calculated annually over a 15 year lifetime for new vehicles and 5 year remaining lifetime for used vehicles and then converted to an average savings per week basis.

TABLE 1: New Vehicle Costs and Savings (Costs converted to 2013 dollars)

Year	On-Road Fuel Economy (mpg)	Incremental Technology Cost	Cap and Trade ($/ton)	LCFS ($/ton)	Net Lifetime Savings (15 Year Life)	Average Annual Savings	Average Weekly Savings
2008 (baseline)	21.2						
2015	26.4	$ 1,379	$ 11.91	$ 50	$ 3,040	$ 203	$ 3.90
2020	30.4	$ 2,467	$ 15.20	$ 100	$ 4,074	$ 272	$ 5.22
2025	38.0	$ 3,247	$ 19.40	$ 150	$ 7,007	$ 467	$ 8.98

TABLE 2: Used Vehicle Costs and Savings (Costs converted to 2013 dollars)

Year	On-Road Fuel Economy (mpg)	Incremental Technology Cost (2009 $)	Cap and Trade ($/ton)	LCFS ($/ton)	Net Lifetime Savings (5 Year Remaining Life, 2013 $)	Average Annual Savings	Average Weekly Savings
2015 (MY 2005 Vehicle)	19.8						
2025 (MY 2015 Vehicle)	26.4	$ 317	$ 19.40	$ 150	$ 1,940	$ 388	$ 7.46

CAP AND TRADE PROGRAM

Assumed carbon costs of $11.90 per metric ton (MT) of carbon dioxide equivalent (CO_2e) for 2015. The 2015 value is based on the California Air Resources Board's Annual Auction Reserve Prices in 2014 and costs were assumed to increase 5 percent per year plus inflation through 2025 and beyond (CARB 2014a). The per vehicle costs of California's cap and trade program were based on California Air Resources Board (CARB) values for tailpipe emissions of 72.91 g CO2e/MJ and energy of 119.5 MJ per gallon of gasoline. Using these assumptions, a value of 0.0087 MT CO2e per gallon of gasoline was estimated (CARB 2014a). This was multiplied by the cost per MT to estimate the cost per gallon of gasoline.

LOW CARBON FUEL STANDARD (LCFS)

The price of LCFS carbon credits in 2015 was assumed to be $50 per MT for 2015 based on recently reported credit prices (CARB 2014b). CARB is currently considering implementing a maximum price of carbon credits in the LCFS to ensure that costs remain below a maximum threshold (CARB 2014c). To reflect this potential cost containment mechanism, the maximum price of carbon credits in the LCFS was set to $150 per MT in 2025 and beyond, and the values between 2015 and 2025 were linearly interpolated**.** For this analysis, the following levels of stringency were assumed for the percent reduction in carbon intensity under the LCFS: 1 percent in 2015, 3.5 percent in 2016, 5 percent in 2017, 6.5 percent in 2018, 8 percent in 2019 and 10 percent from 2020 to 2025 (CARB 2014d). For each year, lifecycle- emissions for California reformulated gasoline were assumed to be 99.18 g CO2e/MJ with an energy content of 119.5 MJ per gallon of gasoline. This was converted to 0.012 MT CO2e per gallon of gasoline. Finally, per-gallon LCFS costs were calculated by multiplying the 0.012 MT CO2e per gallon of gasoline by the stringency and cost of LCFS credits.

VEHICLE STANDARDS

Vehicle standards in this analysis include the fleet-average greenhouse gas standards for model years 2009-2016, and the advanced clean cars standards which include the zero emissions vehicle (ZEV) and the low emission vehicle (LEV III) programs. The ZEV program requires auto companies to produce a certain percentage of zero emission vehicles, defined as hydrogen fuel cell, battery electric, and plug-in hybrid vehicles, for sale in California, while the LEV III program requires both criteria pollutant reductions and an average fleet-wide reduction in global warming emissions for new vehicles.

As a result of these policies, average new vehicles between 2009 and 2025 will see significantly improved fuel economy. Table 1 shows the fuel economy estimates and incremental vehicle costs based on CARB rulemaking documents (CARB 2014e, CARB 2014f).

ADDITIONAL VEHICLE ASSUMPTIONS

For model year (MY) vehicles 2015 through MY 2025, annual VMT estimates were based on the CARB Initial Statement of Reason (ISOR) payback calculator (CARB 2014e). A weighted average of projected VMT for passenger cars and light-trucks is used to represent the average light–duty vehicle. For MY 2008, the baseline vehicle, VMT was estimated using the CARB EMFAC Emissions Database, a model which gives detailed information about air pollutant emissions and vehicle use, including VMT and amount of fuel consumed (CARB 2014g).

For the used vehicle comparison, a 10 year old used vehicle in 2025 has a remaining lifetime of 5 years. The baseline of comparison is an average 10-year old used vehicle in 2015 (i.e. a MY 2005 vehicle). Fuel economy and VMT estimates for the MY 2005 vehicle were estimated by running the CARB EMFAC model.

Technology and insurance costs were based on values in the ISOR payback calculator and converted to 2013 dollars. These assumptions include sales tax of 7.25 percent and insurance of 6.6 percent, both of which were applied to the incremental technology cost. For new vehicles, a loan life of 5 years with a 7 percent interest rate was applied. For used vehicles, the loan life was assumed to be 3 years with an interest rate of 10 percent. The 10-year old vehicle in 2015 (MY 2005) was assumed to have no incremental technology costs while the 10-year old vehicle in 2025 (MY 2015) was assumed to have an incremental technology costs equal to 23 percent of a new MY 2015 vehicle’s incremental technology cost to account for depreciation. A discount rate of 5 percent was applied to future costs and savings. A baseline gasoline price of $4 per gallon was assumed over the life of the vehicles for all scenarios.

[REFERENCES]

California Air Resources Board (CARB). 2014a. Annual Auction Reserve Price, September 19, 2014. Sacramento, CA. Online at *http://www.arb.ca.gov/cc/capandtrade/auction/2014_annual_reserve_price_notice_joint_auction_update.pdf*.

California Air Resources Board (CARB). 2014b. Monthly LCFS Credit Trading Activity Report for August 2014. Sacramento, CA. Online at *http://www.arb.ca.gov/fuels/lcfs/credit/20140909_augcreditreport.pdf*.

California Air Resources Board (CARB). 2014c. LCFS Public Workshop, April 4, 2014. Sacramento, CA. Online at *http://www.arb.ca.gov/fuels/lcfs/lcfs_meetings/040414_cost_containment_presentation_color.pdf*.

California Air Resources Board (CARB). 2014d. LCFS Final Regulation Order. Sacramento, CA. Online at *http://www.arb.ca.gov/fuels/lcfs/CleanFinalRegOrder112612.pdf*.

California Air Resources Board (CARB). 2014e. Initial State of Reasoning (ISOR) Payback Calculator. Sacramento, CA. Online at *http://www.arb.ca.gov/msprog/clean_cars/clean_cars_ab1085/payback%20for%20isor%20final.xlsx*.

California Air Resources Board (CARB). 2014f. Compliance Cost for ZEV and LEV III Programs. Sacramento, CA. Online at *http://www.arb.ca.gov/msprog/clean_cars/clean_cars_ab1085/isor%20ghg%20zev%2008nov2011.xlsx*.

California Air Resources Board (CARB). 2014g. EMFAC Emissions Database. Sacramento, CA. Online at *http://www.arb.ca.gov/emfac*.

ADDITIONAL INFOGRAPHIC REFERENCES

California Energy Commission (CEC). 2010. The Impacts of Sea-Level Rise on the California Coast. Sacramento, CA. Online at *http://www.energy.ca.gov/publications/displayOneReport.php?pubNum=CEC-500-2009-024-F*.

Howitt, R., J. Medellín-Azuara, D. MacEwan, J. Lund, and D. Sumner. 2014. Economic analysis of the 2014 drought for California agriculture. Davis, CA: UC–Davis Center for Watershed Sciences. Online at *https://watershed.ucdavis.edu/files/biblio/DroughtReport_23July2014_0.pdf*.

State of California. 2014. California State Budget 2014-15. Sacramento, CA. Online at *http://www.ebudget.ca.gov/2014-15/pdf/Enacted/BudgetSummary/FullBudgetSummary.pdf.*

Union of Concerned Scientists (UCS). 2014. Playing with fire: How climate change and development patterns are contributing to the soaring costs of western wildfires. Cambridge, MA. Online at *http://www.ucsusa.org/assets/documents/global_warming/playing-with-fire-report.pdf.*