Anti-Corporate Average Fuel Economy standard political rhetoric goes something like this: by 2025, those few of us left financially able to buy brand-new cars will be forced into subcompact electric vehicles. Oh, and, we’ll be forced into strict diets of tofu and arugula so we’re not too big for the soybean-based seats of those tiny cars.

For the record, I’ve never been a big fan of CAFE. The alternative is a fuel tax, of course, and not the 18.4 cents per gallon for gasoline and 24.4 cents per gallon for diesel that the federal government currently charges, but instead a level more akin to what Western European nations charge, driving prices there to $6, $7, $8 per gallon and more. “Tax” is a four-letter word in the U.S., even if politicians and industry leaders of all political stripes tend to prefer a higher federal tax to CAFE, especially as our reduced oil consumption reduces federal tax revenues.

Even with high fuel taxes, the European Union’s CO2 standards are growing more and more strict. CO2 levels are just another way of measuring fuel economy, and the EU standards are more or less in line with the 2016 and 2025 U.S. CAFE standards.

If not for CAFE, global automakers would have to respond to EU CO2 standards, anyway. At the same time, global automakers are responding to ever more strict safety standards, which are the enemy of greater fuel efficiency. Between stiffening safety standards both here and in the EU and the demand for more content such as so-called infotainment systems, automakers are resorting to more expensive body and component materials like high-tensile steel, aluminum and even carbon-fiber just to keep a new car or truck from growing heavier.

Most mainstream automakers doing business in the U.S. have officially supported the 2025 CAFE standard of 54.5 mpg. Why?

First, 54.5 doesn’t quite mean 54.5. The University of Michigan published a study of the “footprint” rule in Energy Policy more than a year ago. The CAFE standard, this university said, could create an incentive for automakers to build larger cars and trucks, because they would be on the lower end of the 35.5 mpg and 54.5 mpg averages.

The other part of that “loophole” is the S-Curve. The graph I have here is for the model year 2011 standard, but it shows how the S-Curve works for various sizes in the new, future standards. The height of the ess determines which size car or truck crosses the line from being required to get fuel mileage above the corporate average to the point where it’s below the corporate average. It uses the vehicle’s “footprint,”
which is track width times wheelbase. For 2016 and '25, this curve favors larger cars and pickup trucks. Large cars tend to be only low-volume luxury models in Europe, like the Mercedes-Benz S-Class and the BMW 7 Series, while large cars like the Dodge Charger and Ford Taurus are still fairly common here. The S-Curve also favors the full-size pickup truck, moneymakers for the Detroit Three.

Porsche already has taken advantage of the CAFE footprint equation. Its new, 2013 911 has a wheelbase that’s a full four-inches longer than the old model’s. With all due respect, fears expressed in the University of Michigan study may be exaggerated. “Will cars get bigger? Very possibly,” one author of the study said. “Will that lead to more pollution? Yes.”

The previous Porsche 911, known internally as the 997, was rated 19/27 mpg with the PDK, or automated manual transmission and the six-speed manual was rated 18/25 mpg.

The current Porsche 911, or 993 internally, is rated 20/28 mpg with the PDK and stop/start technology, and 19/27 mpg with the manual, now with seven forward gears. That's only one mile per gallon more in every measurement except the manual’s highway number, which is up by two.

Again, this is with a four-inch increase in wheelbase. Porsche will continue to develop the 993’s engine and transmission prior to another all-new redesign, and may replace some body panels with a weight-saving material like carbon-fiber.

The Porsche 911’s progress is a clear indication of where we’re headed as automakers fret over the 2016 and '25 CAFE requirements. This is nothing new. When Cadillac and Oldsmobile pioneered the overhead-valve V-8 in the postwar period, they produced some of the first mass-market cars with 0-60 mph times that were substantially quicker than their quarter-mile times. Yet these engines achieved substantially better fuel efficiency.

Engineering is not a perfect science, and there probably will be some substandard performers on the way to 2025. Jim Hall of 2953 Analytics predicts the next dozen years will be like the mid-1970s to the ’80s, when performance, engine smoothness and reliability suffered at the hand of the first CAFE standards and tightening emissions standards. In those days, five- to six-liter engines made about the same horsepower as today’s 2.5-liter four-cylinder engines. Or, put it this way; today’s 2.5-liter fours make about the same horsepower as the “high-performance” V-8s of 35 years ago.

Analyst Hall further predicts that most cars will have some form of electrical assistance in 12 years, though for many cars and trucks, that will mean systems that regenerate power from brakes and other components, and may do away with the alternator/generator completely. He believes that every automotive segment will offer at least one highly efficient hybrid or electrified model.
What about electric vehicles, extended-range electrics and full hybrids? Nissan-Renault’s Carlos Ghosn has famously predicted that electric vehicles will make up no more than 10 percent of new car sales by 2020. Most analysts find that figure optimistic.

The problem is this. Full hybrids like the Toyota Prius line, plug-in hybrids and extended-range electrics like the Prius Plug-in, Ford C-Max Energi and Chevrolet Volt, and full electrics like the Tesla Model S and its more quotidian California-mandated competitors do their best work in the city and on short commutes. Hybrids typically match or top their highway mpg numbers with their city mpg numbers.

As production of high-tech vehicles goes up, the automakers’ cost of the technology comes down. Many of the cars I’ve just described are good, or very good all-around cars. Anything beyond a Prius-type full hybrid will cost you $30,000 to $100,000 or more. They would be great cars for about $20,000, as a second car you’d drive to work five days a week.

By then, they’ll compete with, I hope, better public transportation, including light rail, and bicycles. They’ll do better in Northern cities like Detroit than in warmer climates.

Mercedes-Benz, Nissan and Ford recently announced a joint program to develop hydrogen-powered fuel-cell vehicles with the goal of putting production models on the street by 2017. This is laudable goal, to be sure, though with scant infrastructure and high cost, they’ll be sold or leased in miniscule numbers for years to come. Honda and Mercedes already market fuel-cell models in California. Last year, Mercedes sold 49 B-Class fuel-cell cars there.

For the next 12 years, internal combustion engines will power the bulk of cars and trucks sold in North America, Europe and Asia. That’s good news for enthusiasts like me, and not terribly bad news for you unless you believe that climate change is already beyond the point of saving. And yes, for the record, I do believe humans are causing climate change.

How will automakers meet the 2016 and ’25 CAFE standards? They won’t change much of what they’ve been doing for the last decade. Some prognostications:

**Large, rear-wheel-drive:** Cars like the Chrysler 300, Mercedes-Benz E-Class and Cadillac CTS will be around. In fact, General Motors and Chrysler-Fiat will expand their rear-wheel-drive lineups in the years leading to the ’16 CAFE regs.

**Eight- and nine-speed transmissions:** While Nissan, Honda and others continue to develop CVTs and Ford and VW rely on dual-clutch automated manual transmissions, the future is in eight- and nine-speed automatics. Consider the fact
that the Chrysler 300 and Dodge Charger, two large rear-drive cars, achieve a 31 mpg highway rating when equipped with a 3.6-liter V-6 and eight-speed automatic. That equals to the compact, front-wheel-drive Buick Verano’s highway number, a car with a 2.4-liter four-cylinder engine and six-speed automatic.

**Further development of existing technologies:** All modern engines will have gas direct injection instead of port injection in a few short years. Cylinder shutoff, which turns a V-8 into a four or a V-6 into a three-cylinder engine at highway cruising speeds, will be a must. Stop/start technology, which shuts off a warm engine at stop signs and stoplights are becoming common in Europe, and will start to catch on here.

**Midsize sedans:** The compact car and compact crossover/utility shares of the overall market rose last year, though the midsize market rose more. Thanks to better aerodynamics and more modern engines, compact cars can match or even beat the fuel efficiency of most subcompacts and even a-segment cars like the Fiat 500. Midsize cars aren’t far behind, and may catch up with engine downsizing, diesels and more gears in their automatics. This is the car segment Americans will continue to favor for years to come.

**Pickup trucks:** Diesels are common in heavy-duty pickup trucks now. We’ll start to see them in half-ton trucks and their sport/utility counterparts in a few years. GM’s new pickups will have cylinder shutoff and gas direct injection, which may prove to be more effective in this segment than Ford’s EcoBoost V-6. Trucks will use more lightweight materials, though I’m skeptical they’ll become aluminum-intensive.

**Engine downsizing:** The V-8 has become an exotic, small-volume engine for luxury and performance cars – the new V-12. The new Mercedes E-Class isn’t available with a V-8 unless you choose the $100,000 E63 AMG hot rod. Benz has just added a four-cylinder diesel to its E-Class lineup in the U.S. BMW is known for its inline six, but the turbo four is becoming the mainstream engine in its popular, iconic 3 Series. The size of our cars won’t change, much, but the engines will: one-and-a-half liter fours, some with turbocharging for midsize cars; about two liters for full-size cars. BMW also is developing a three-cylinder engine from its inline six, for its Minis and smaller, front-drive BMW models.

**Diesel engines:** They’re finally on the way, especially if GM can revive its diesel reputation with the European 2.0-liter four available in the Chevy Cruze later this year. GM expects that car to reach at least 42 mpg, highway, with a six-speed automatic, and the engine has adequate torque for larger models, including the new Chevy Impala and the Buick LaCrosse, as well as compact crossovers. Diesels are expensive to clean up, however. Even with fuel at $4 per gallon, it takes a few years for the average driver to recover his or her cost of ordering a diesel.

These are the trends I see extending 12 years out. Alternative power sources always cost the manufacturer, and usually the consumer, far more than the status quo when
that status quo has been around for more than a century. It was easier to get the automobile business off the ground when the alternative was the horse than it is to develop hydrogen fuel cells when oil is so cheap.

The bigger change to the auto industry, and one that is the bane of auto enthusiasts, is the autonomous vehicle. The basics for autonomy are on the market now, and in a few years, luxury cars will be available with autopilot systems that will let you drop your hands off the steering wheel for long stretches of highway or freeway.

The good news for our ecology, and our supply of fossil fuels, is that the technology will develop quickly. It will be just a decade or two from that first fully autonomous Mercedes or Volvo sedan to get to a car that doesn’t need any bumpers, airbags or other heavy safety equipment and runs nose-to-tail in “car trains” running at the speed limit. Better for the ecology, yes; but a less-appealing alternative for those of us who love to drive, compared with an electrified compact sedan.

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