TRANSPORTATION:

Can the U.S. trucking sector cut emissions 80% by midcentury?

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The governmental objective to cut carbon emissions 80 percent by 2050 is not rare.

In downtown Los Angeles on Wednesday, California Gov. Jerry Brown (D) announced an executive order that would lower emissions 40 percent by 2030 -- the first half of a plan to lower emissions 80 percent by midcentury from 1990 levels.

The Obama administration announced an emissions reduction plan in March to stay on the 80-percent-reduction-by-2050 path, and New York City has a long-term target to lower its emissions 80 percent below 2005 levels by 2050.

With that common climate benchmark in mind, Lew Fulton and Marshall Miller, researchers at the Sustainable Transportation Energy Pathways Program (STEPS) at the University of California, Davis, have been trying to figure out what it would take for the trucking sectors in California and nationwide to meet that target.

"The 80-in-50 concept is pretty prevalent," said Fulton, predicting that government policies and incentives will play a strong role in expanding alternative fuel within the trucking business.

The most pressing question, he said, concerns the speed at which the market adopts fuels other than gasoline or diesel and how local and federal lawmakers facilitate that shift.

In 2010, the California trucking sector was responsible for about 4.75 billion gallons of diesel fuel -- or its equivalent -- and the nationwide market consumed more than 50 billion gallons while shipping freight from town to town and across the country.

Fulton and Miller, in a conference call yesterday organized by the National Center for Sustainable Transportation, explained what would have to happen to meet the objectives.

The pair chose two hypothetical options to test how to reach an 80 percent cut by 2050: a scenario in which zero-emission vehicles (ZEVs) are prioritized and are expensive initially but lead to emission cuts, and an option with a mix of biofuel adoption and ZEV deployment that would place significantly less importance on new, greener vehicles, since fuels could be used immediately.

The first option, Fulton and Miller found, would lead to complete fuel-cell adoption within the trucking industry by 2050, while the mixed scenario would split the market in 2050 between fuel cells and diesel models with cutting-edge biofuels.
Fuel-cell trucks in a decade?

The vast majority of the trucking market nationally runs on diesel. Only a sliver of trucks run on biofuels or natural gas. And the fuel-cell penetration, part of a "nascent" market to Fulton, has scant infrastructure to support its development.

"Can we move in that direction fast enough and soon enough?" Fulton asked, thinking aloud. "It's going to take very strong policies to make that happen."

The authors' report, to be released next month, is a "high level" view of the technology and fuels available within the sector and the challenges and barriers to achieving "low-carbon trucking" by 2050.

According to the U.S. Energy Information Administration's latest annual energy forecast, energy consumption from trucks and buses will rise in the coming decades -- from about 6 quadrillion British thermal units in 2012 to about 8 quadrillion Btu in 2040. Over the same period, light-duty vehicles will consume less -- about 15 quadrillion Btu in 2012 to 12 quadrillion Btu in 2040 -- largely due to more stringent fuel-economy standards.

"It's clearly where the growth is expected to happen," Lew said, referring to EIA's upward prediction. Of trucks, he added, "They are growing more rapidly than light-duty vehicles."

Vehicle type and fuel efficiency differ widely within the American trucking landscape.

Long-haul trucks -- vehicles that travel cross-country and, according to the duo's research, average 100,000 miles a year -- go through plenty of fuel but spend less time idling than short-haul trucks, like furniture moving vans or city buses.

"The trucking sector is fairly complex," Miller said, noting that miles-per-gallon performance could stretch from 3 mpg (with dump trucks) and 5 mpg (in the case of big-rig sleeper cabs) to about 15 mpg (for heavy-duty vans and pickups). "The variation in fuel economy is really quite large."

Diesel and gasoline fuels dominate the market, Miller said. The barriers for other fuel sources to penetrate the market are significant, the researchers said yesterday, but some options are gaining toeholds.

Natural gas as a fuel, whether compressed (CNG) or liquefied (LNG), is deployed on a commercial scale in almost all truck types and has a significant presence in buses, according to the research.

And fuel cells have been "extensively tested" in buses and cars, the research team found, but the timeline for the broad market in other truck models is a decade or two out, and they would likely wear out faster than diesel alternatives.

Battery-powered trucks face obstacles

Toyota unveiled the Mirai, a fuel-cell-powered car, last year. The Japanese automaker has said the vehicle will be available in California in the fall -- a situation that could lay the foundation for hydrogen pumping stations that trucking companies could use to fill up years from now.

"We have very little hydrogen in use today," Fulton said. When making investments, he added, "Truck companies look for relatively low payback times."

Policymakers must be centrally involved to meet long-term emission goals, Fulton said. "I think it would take a long time," he said, for energy efficiency standards to push hydrogen fuel cells into broad market adoption.
Meanwhile, battery electric options are expensive and a possible drag on trucks' range due to their weight. Yet they could boost efficiency. Batteries also may not last for a truck's complete lifetime, presenting another red flag, according to the researchers.

"There are trade-offs between fuel-cell and battery electric trucks," said Miller, explaining that, to make long-distance, battery-powered trucks work, the batteries would have to be massive.

Last February, during a speech in which he announced tougher fuel standards for heavy-duty trucks, President Obama said such trucks make up 4 percent of vehicles on the country's highways but emit 20 percent of the transportation sector's pollution.

According to U.S. EPA, the transportation sector, the second-most carbon-intensive slice of the economy, is responsible for 27 percent of domestic emissions. The biggest emitter is the power-generation sector, which accounted for 31 percent of greenhouse gas releases in 2013.