

Captain Hybrid

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54.5 MPG Comes With Trade-Offs

The cost of electrified powertrains, new materials, and better engines could trickle down to consumers.

By CHARLES J. MURRAY, Senior Technical Editor, Electronics & Test

THE WHITE HOUSE'S new 54.5mpg average fuel economy rule could inspire innovation, but it could also lead to cost trade-offs, industry experts warn.

"Putting the 54.5mpg target out there is good," said Sandy Munro, CEO of Munro & Associates Inc. and a consultant who did cost studies on the subject for the Environmental Protection Agency prior to the finalization of the rule. "Engineers always need a challenge. But the question is, what are you willing to give up to get there?"

Munro and other experts cite a multitude of ways to boost America's corporate average fuel economy. Big ticket items include hybrid vehicles and pure electric cars, but Munro says lawmakers and auto manufacturers are talking about many other possibilities, too. Those include lightweight materials, such as carbon fibers, magnesium, and titanium. Also under consideration are engine enhancements, such as variable valve timing, reduced displacement, and turbochargers. Transmissions will continue to increase the number of gears — with automakers offering eight-, nine-, and even 10-speed models — and some transmissions may start using different case materials in order to reduce weight.

Munro cites vehicle interiors as a place for innovation and weight reduction. He says the amount of wires and wiring harnesses need to be reduced. Heavy components, such as seats and instrument panels, must be substantially redesigned to employ lighter materials.

"People are always looking at the powertrain and body," he said. "But we've got to look at the whole picture,

and that includes the interior."

The simplest way to reach 54.5mpg, however, might just be size reduction. Smaller, lighter vehicles offer a fuel efficiency boost that is roughly proportional to the reduction in mass.

"A mid-size car won't have the same volume that it has today," Munro said. "You'll get your groceries in there, and you might get your golf clubs in there, but it's not going to have the same amount of volume it has today."

Innovative new materials will also raise costs. Munro says that aluminum and steel skins for today's conventional vehicles cost about \$0.30 and \$0.55 per pound, respectively. In contrast, magnesium runs \$2.20, titanium is about \$35, and carbon fiber composites are roughly \$40 to \$50 per pound. While titanium and carbon fibers offer the opportunity to use less material by weight because of their lower density, the cost differences would be significant, Munro said.

It's still unclear how those costs would affect consumers. Government officials have cited a figure of \$2,800 per car, but those estimates pertain to the years between 2017 and 2025, and don't include the costs incurred between 2012 and 2016. In separate studies, Scenaria Inc. and The Center for Automotive Research have said the actual price to consumers would minimally reach between \$5,000 and \$8,000 per vehicle, and possibly as much as \$11,000.

"Hitting 54.5 miles per gallon is possible, but it comes at a price," Munro said. "It goes back to whether the general buying public is willing to put up the cash." **DN**