

Opportunity Assessment Clean Diesels in the North American Light Duty Market

***13th DEER Conference
US Department of Energy***

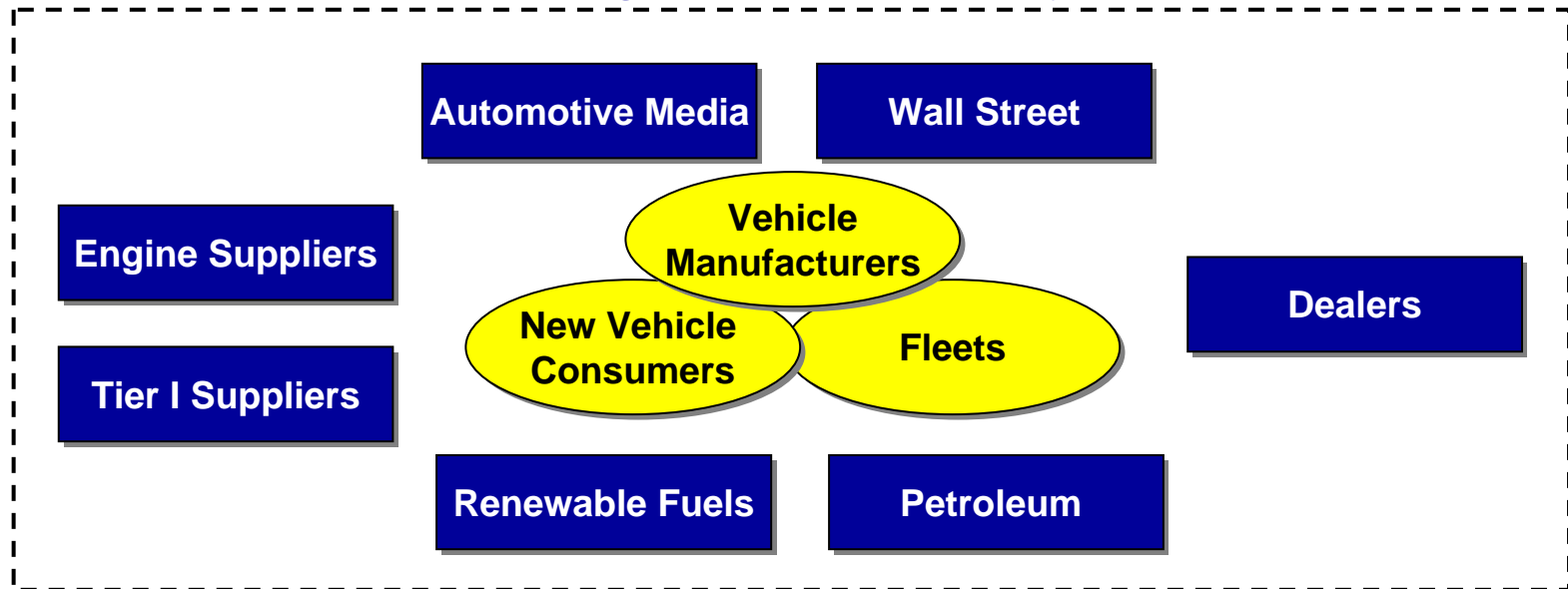
August 14, 2007



MARTEC[®]

Martec has completed a comprehensive analysis of the opportunity for clean diesels in the North American light duty market.

10 Stakeholder Groups Shaping the LDD Opportunity - > 2,000 Respondents



Created in partnership with HART Energy Consulting, the study synthesizes the voice of each stakeholder group on critical issues:

- Consumer perceptions and consideration for LDD vs. HEV powertrains
- Urea SCR service intervals and compliance
- Residual value performance
- Variable cost comparison of LDD vs. full HEV by segment
- Fit with national energy and CO2 policy development
- Demand forecast

Agenda

① **Performance: it's all about torque**

② **Consumer awareness and impressions**

③ **Voice of dealers, Wall Street and the automotive media**

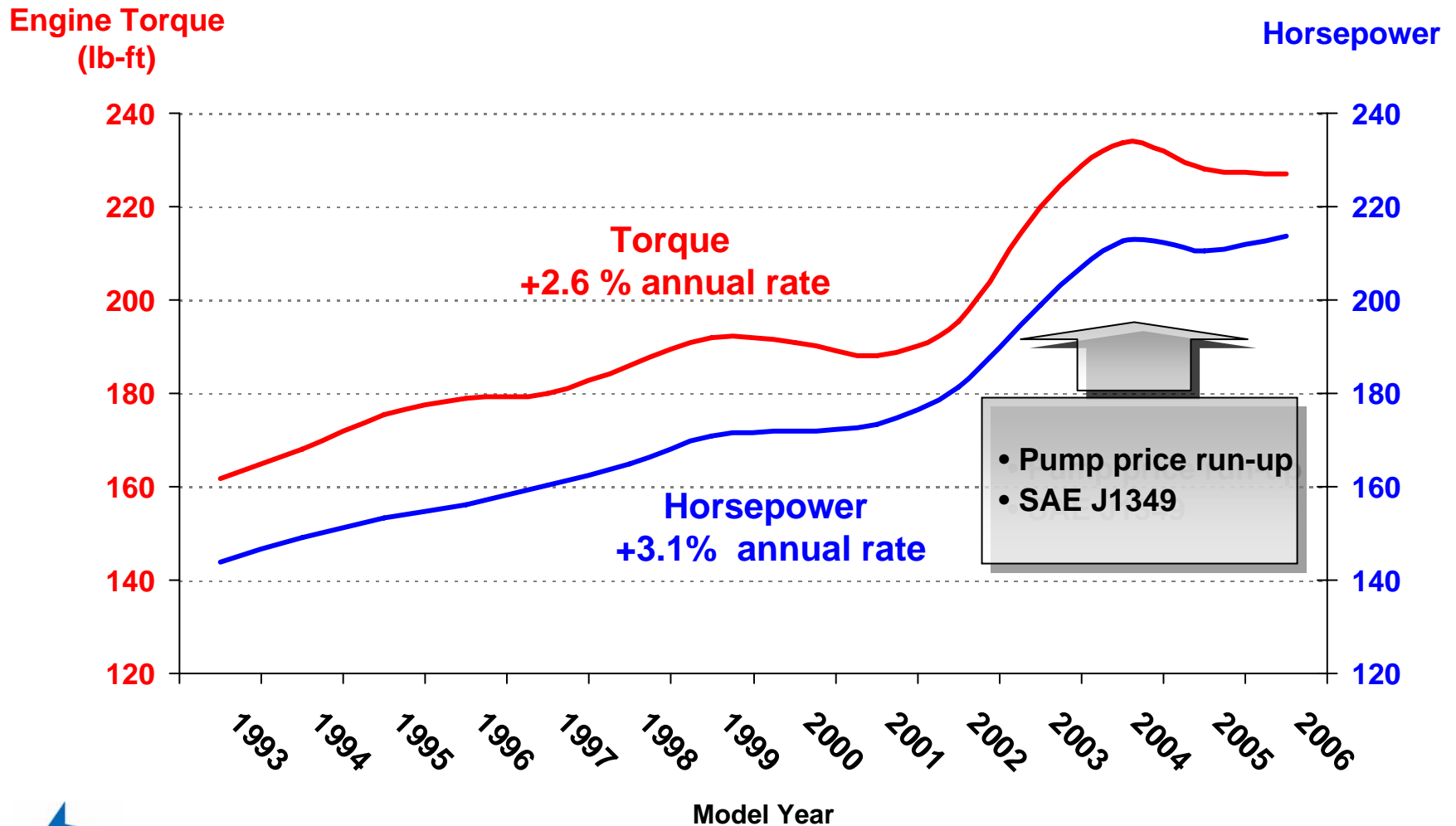
④ **Public policy impact**

⑤ **Forecast and conclusions**

US consumer demand for torque has been climbing at a 2.6% annual rate.

Market Demand

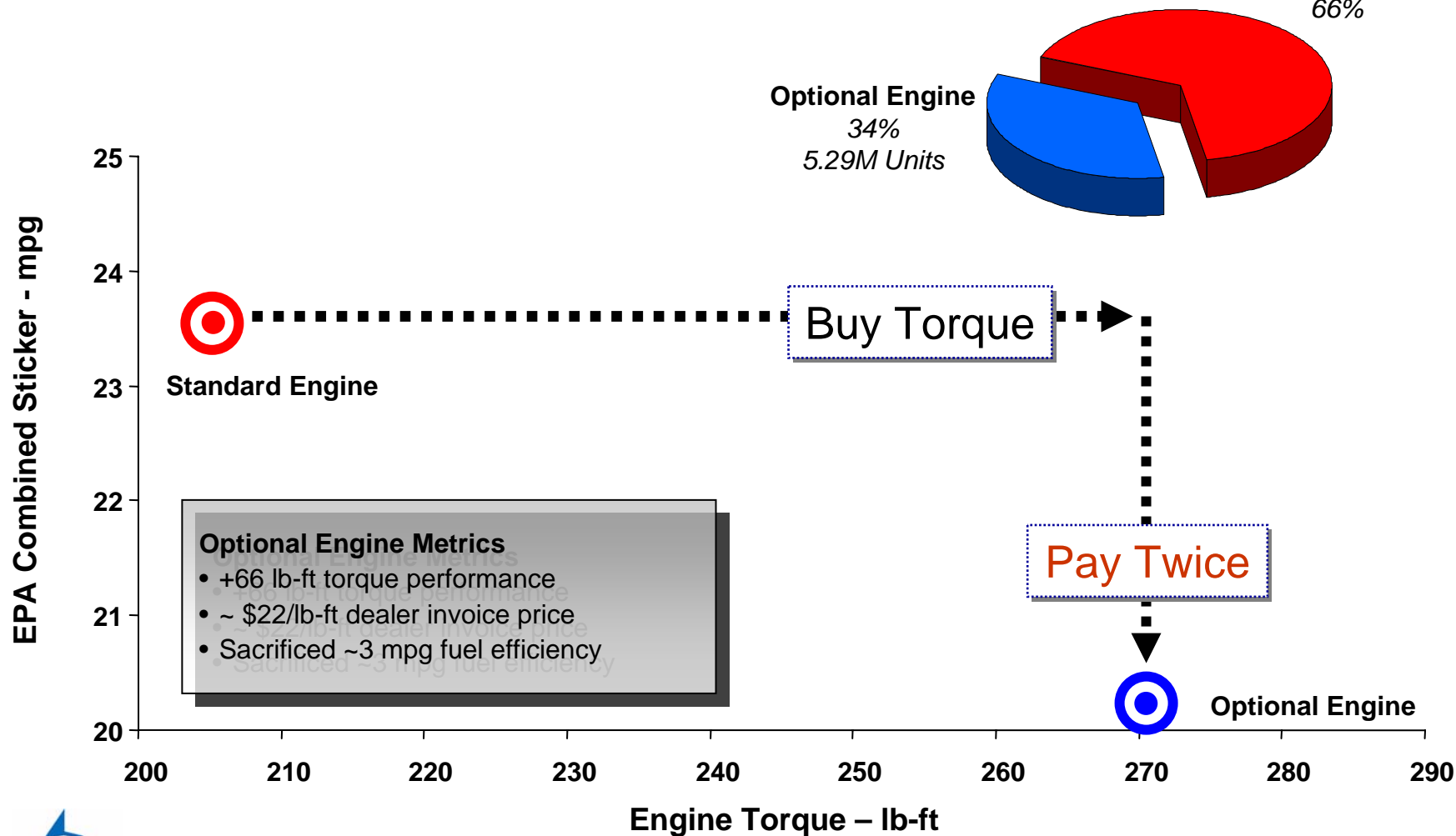
US Fleet Torque and Hp Development – Fleet



5.3M premium engine buyers drive > \$7.5B in incremental industry revenue *and* sacrifice fuel economy.

Market Demand

2006 US Fleet Torque vs. Fuel Efficiency

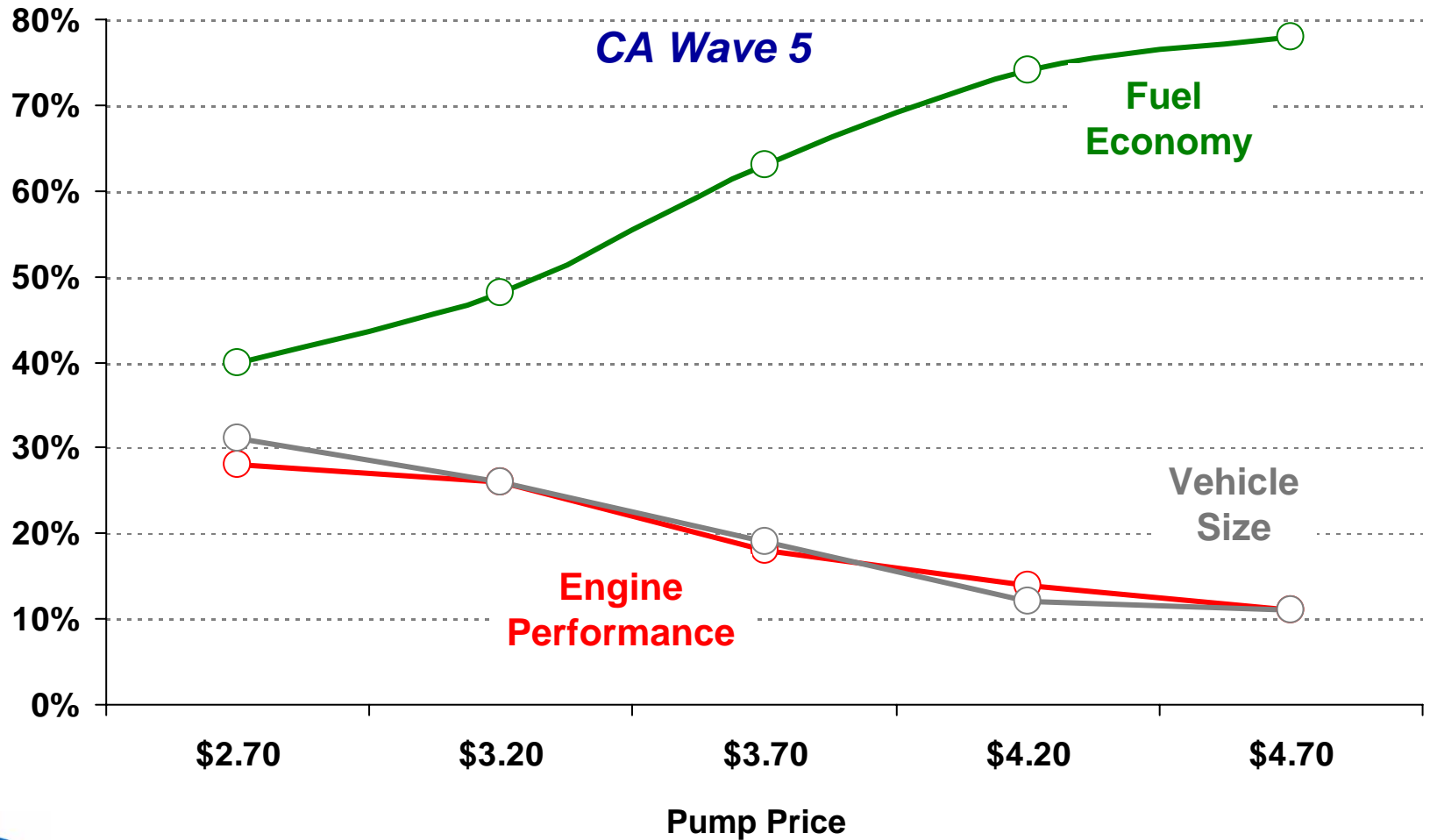


Source: Martec analysis

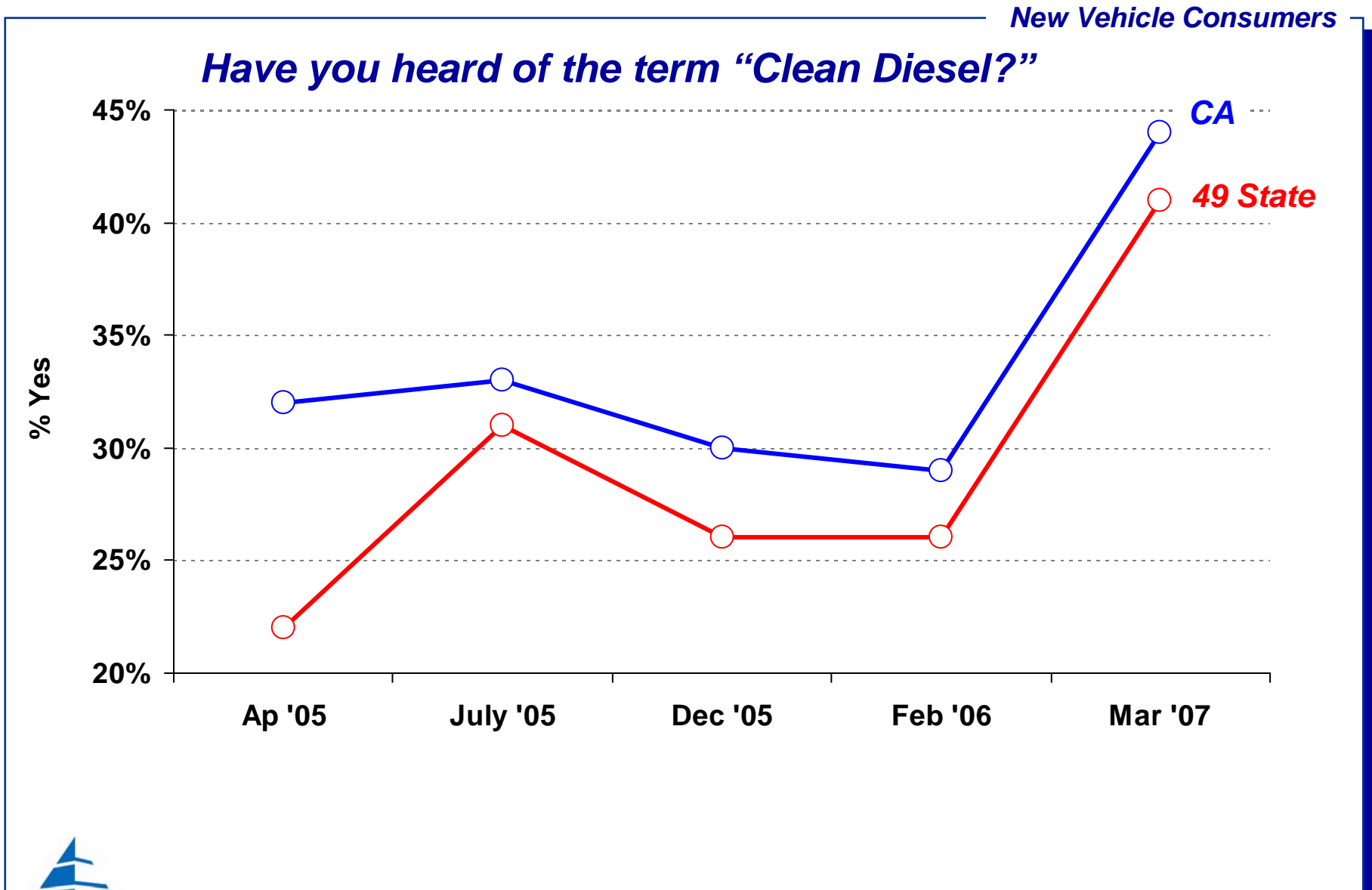
Even at escalating fuel prices, a significant share of consumers want to maintain engine performance and vehicle attributes.

New Vehicle Consumers

Rank as No. 1 Purchase Decision Factor at Increasing Fuel Prices



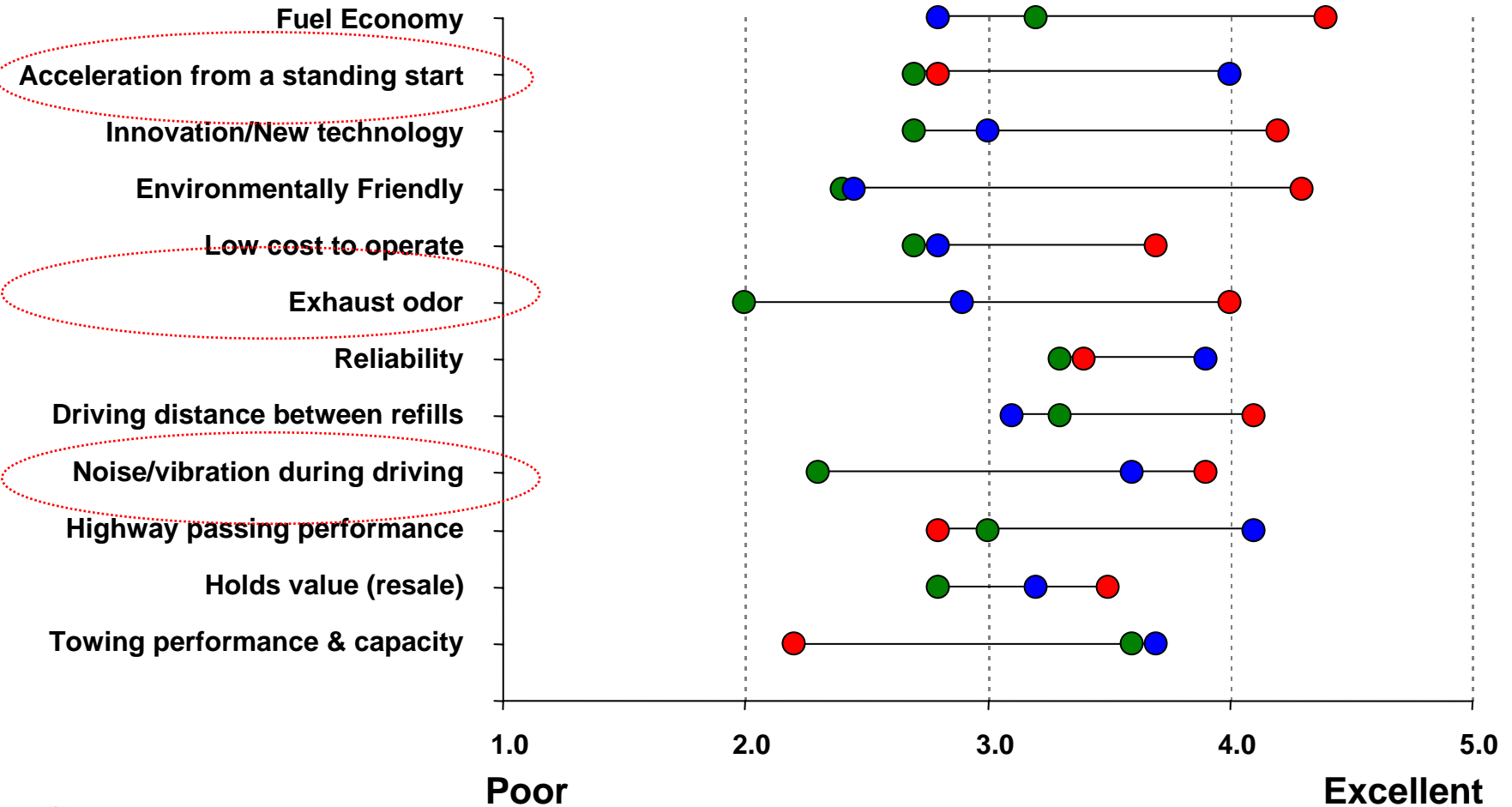
There has been a significant increase in consumer familiarity with Clean Diesel.



But consumer perceptions are not yet aligned with state-of-the-art diesel positioning.

New Vehicle Consumers

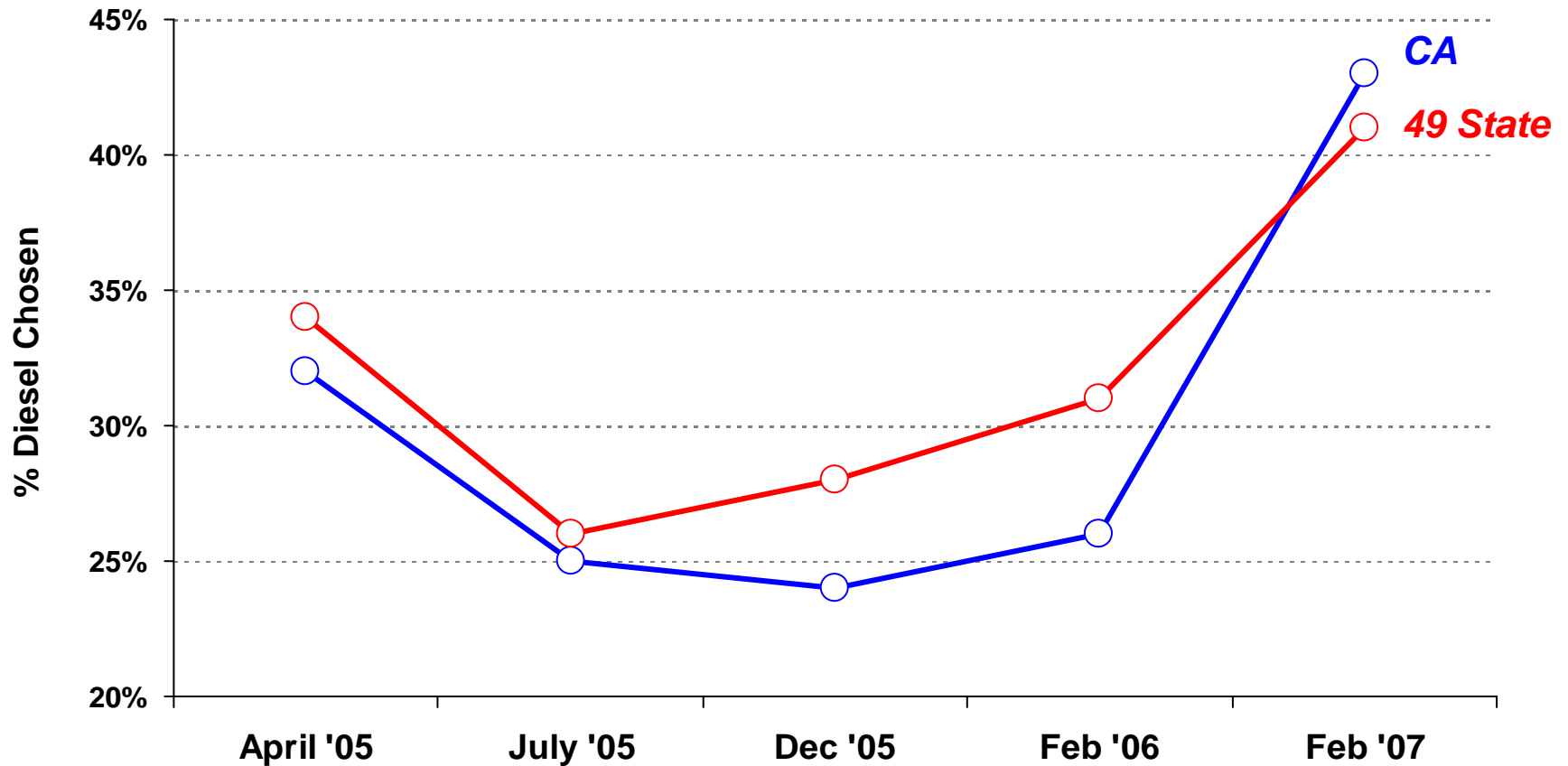
CA Wave 5



These perceptions are not deeply held.

New Vehicle Consumers

After Education: *Percent Selecting Clean Diesel*



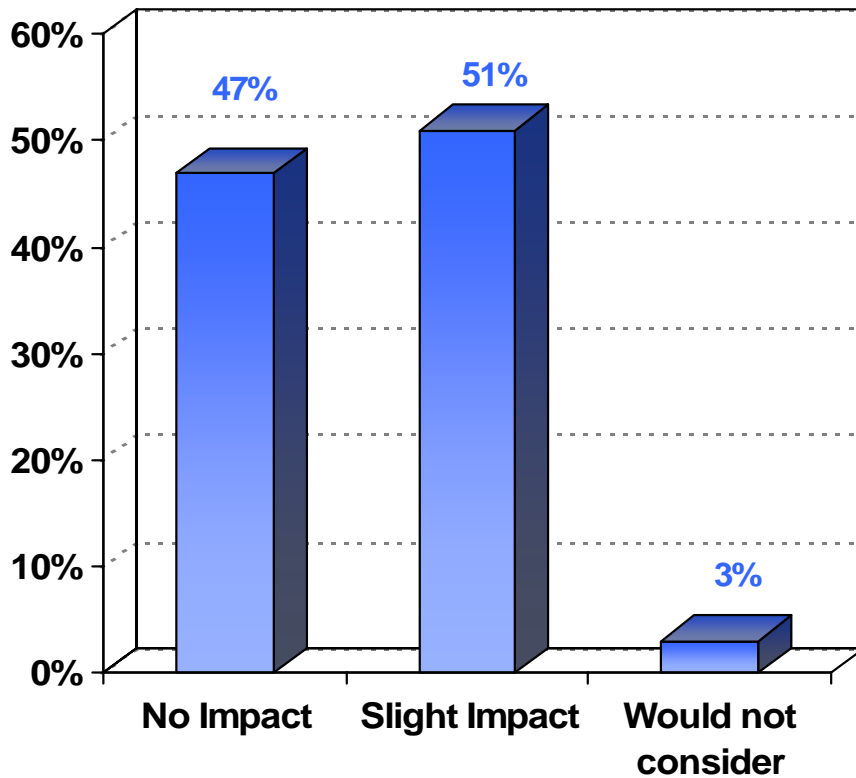
Urea SCR compliance is not a deal breaker.

New Vehicle Consumers

2-part Urea SCR Question

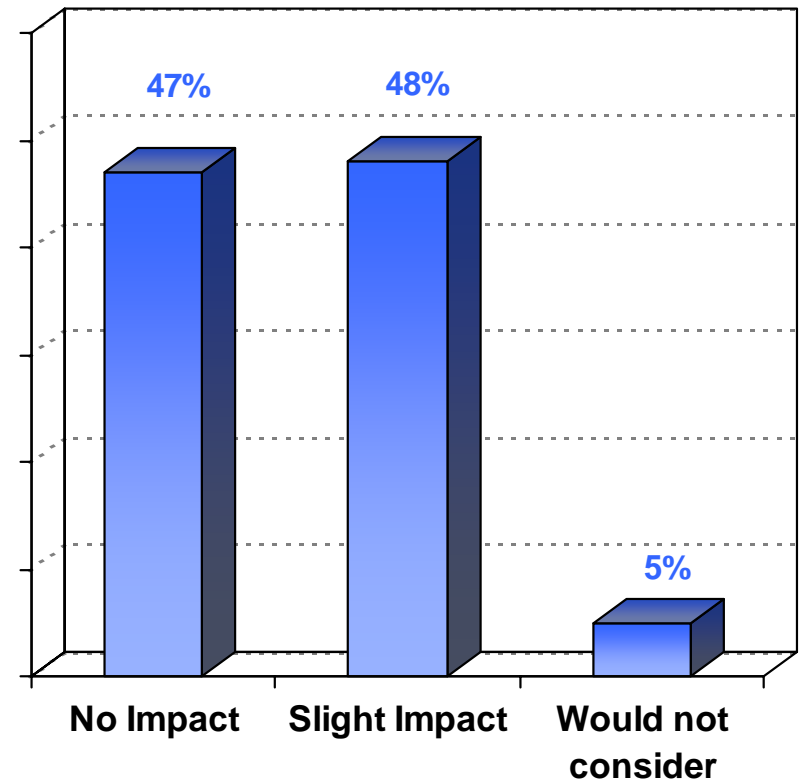
Part 1:

On-board reservoir with oil change interval range



Part 2:

In-use compliance warnings with no-restart countdown



■ CA Wave 5

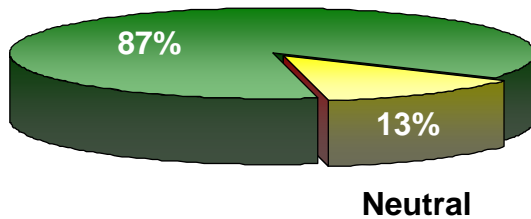
European badge dealers have the most favorable impressions of diesel engines.

Dealers

Dealers: Overall Impression of Diesel Engines/Technology

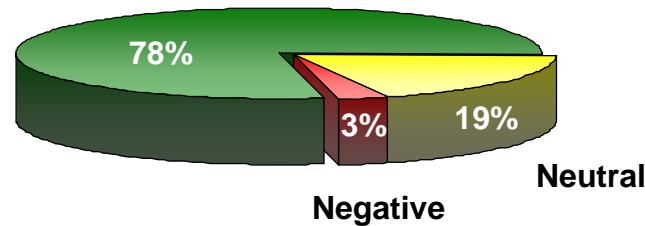
Europe

Positive



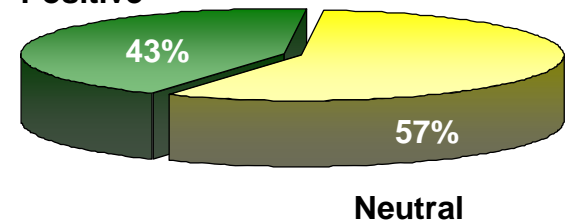
US

Positive



Asia

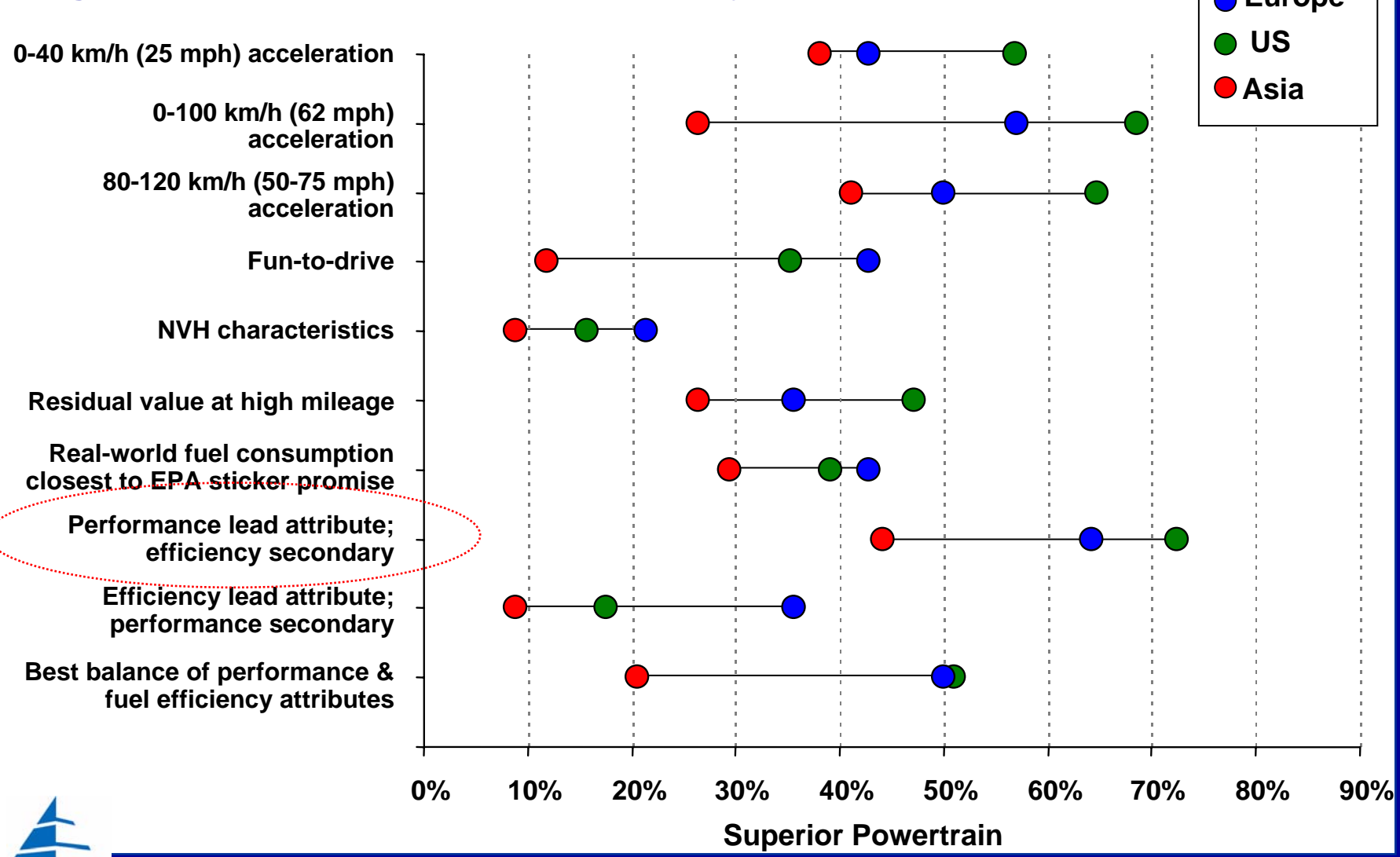
Positive



Most dealers see performance as the lead diesel attribute.

Dealers

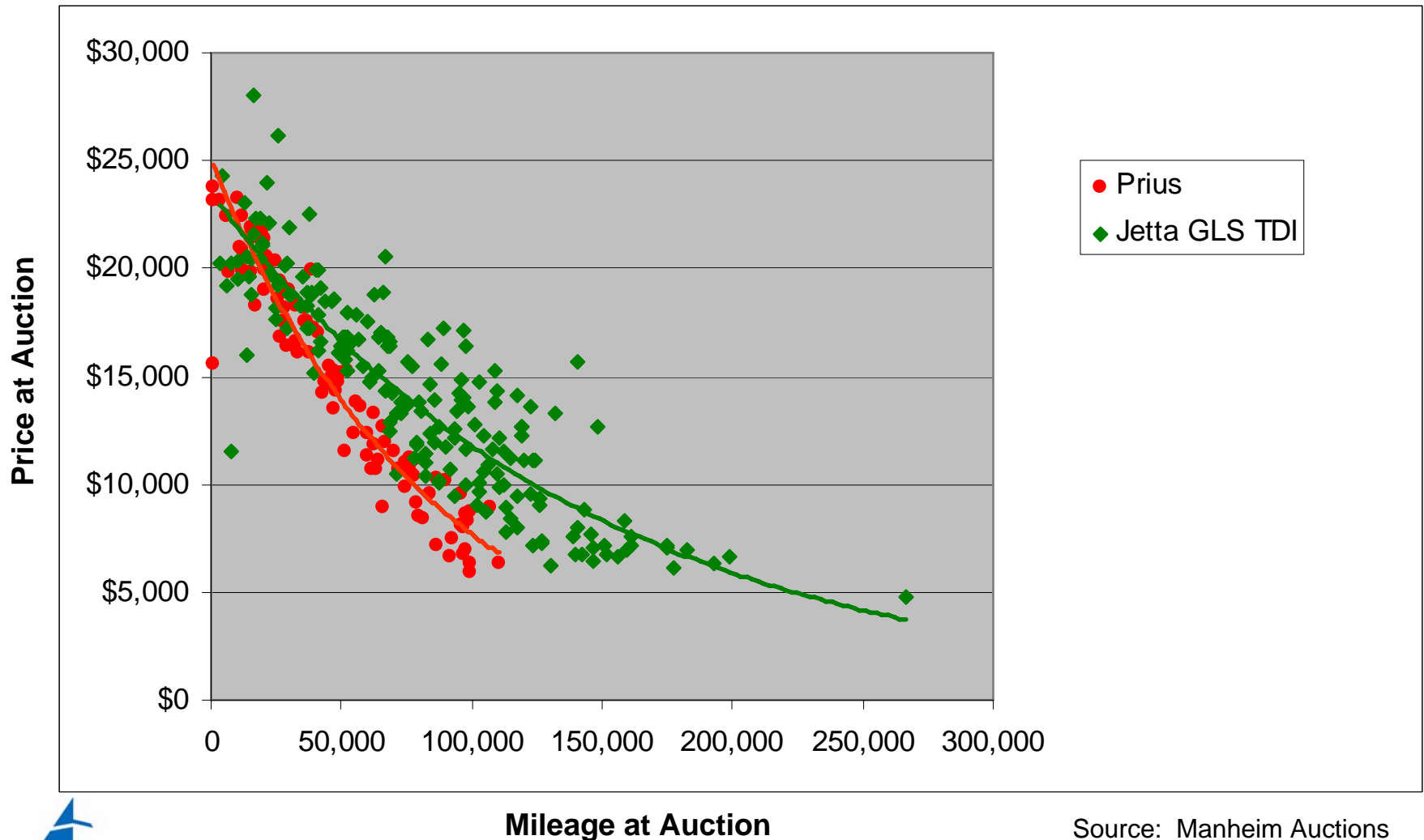
Large Sedans & CUV: Superior Powertrain by Attribute (Diesel)



The Prius depreciates at a faster rate than Jetta GLS TDI . . . during a period of higher diesel fuel prices.

Residual Value

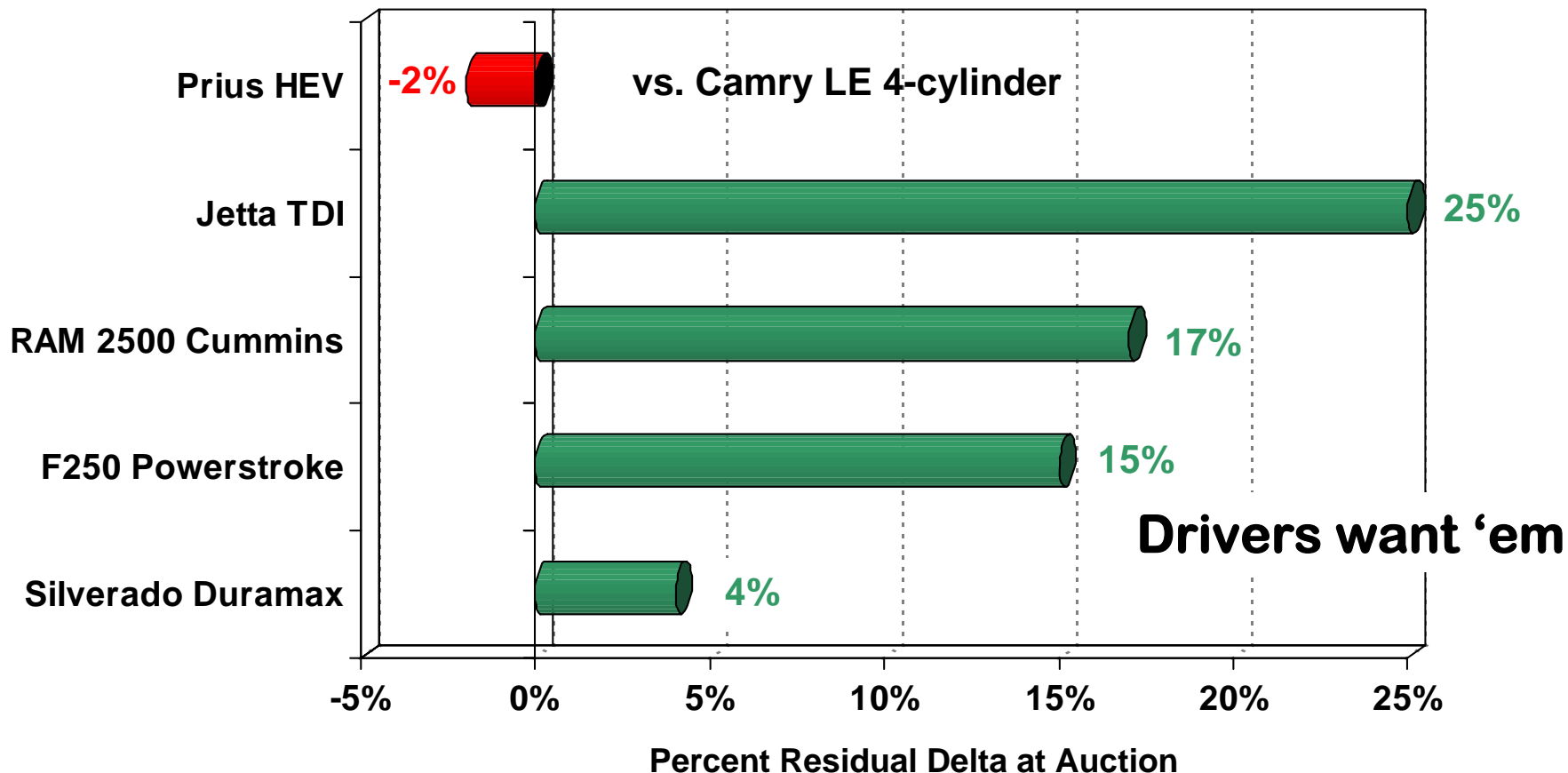
Prius vs. Jetta Diesel



Diesels pay the owner back with superior residual value retention over standard engines.

Residual Value

Vehicle Residual Value: Points Over/Under Standard Powertrain at High Mileage



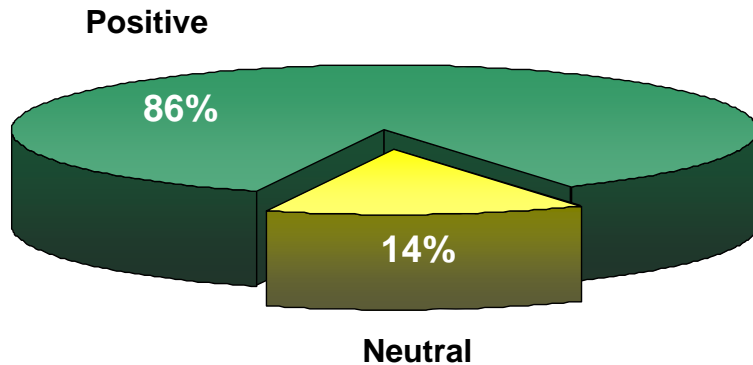
Cars at 100K miles; trucks at 150K miles

Source: Manheim Auctions

Wall Street is bullish on light duty diesel.

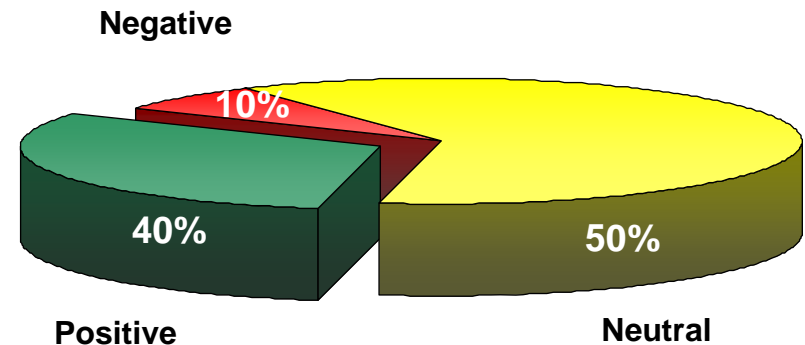
Wall Street

How would you characterize your overall impression of diesel engine technology/diesel-powered vehicles today?



No respondents answered "Negative"

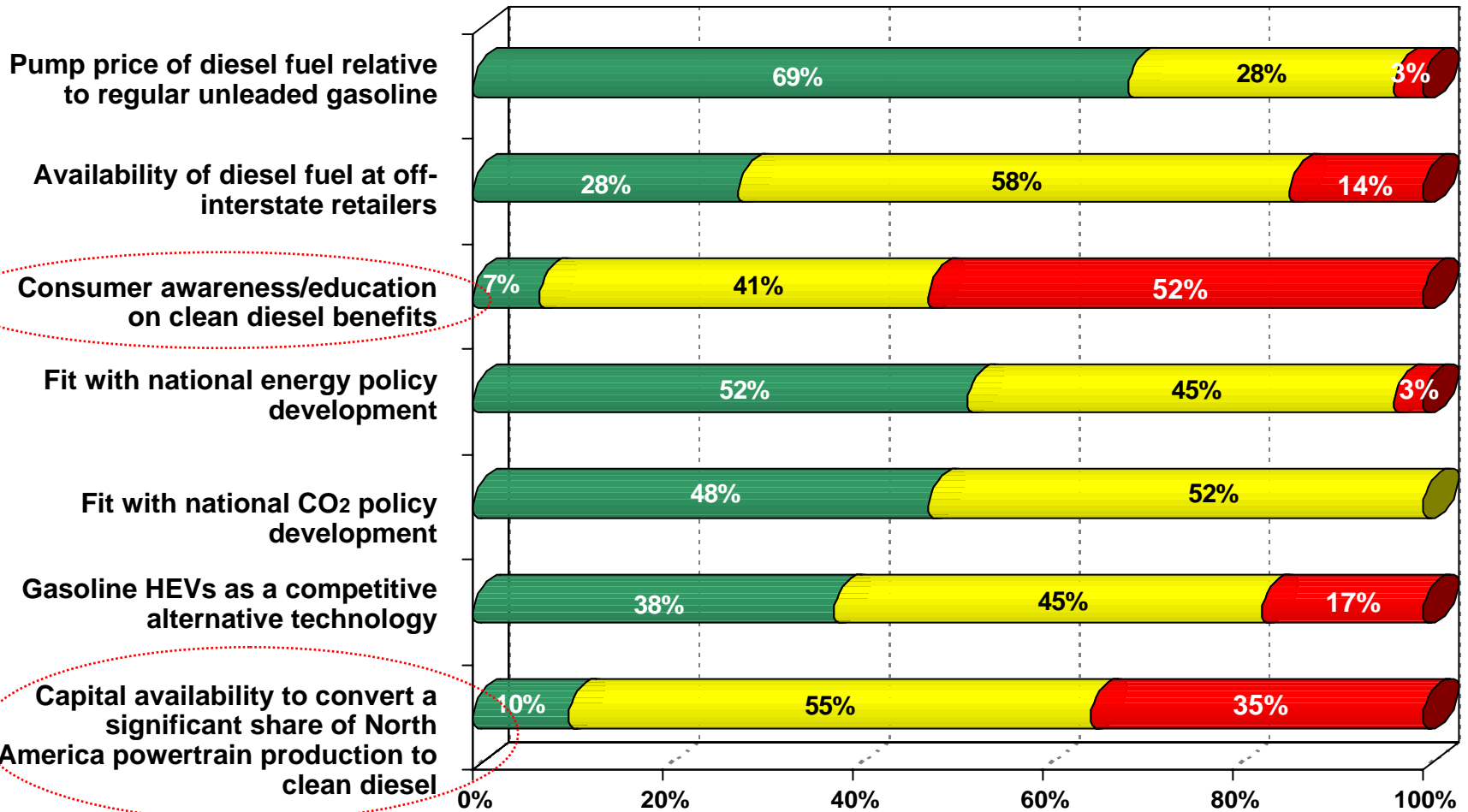
How would you characterize your overall impression of hybrid gasoline powertrains/vehicles today?



Wall Street sees consumer education and capital as the biggest threats to the LDD business case.

Wall Street

Light Duty Diesel Business Case: Identification of Barriers

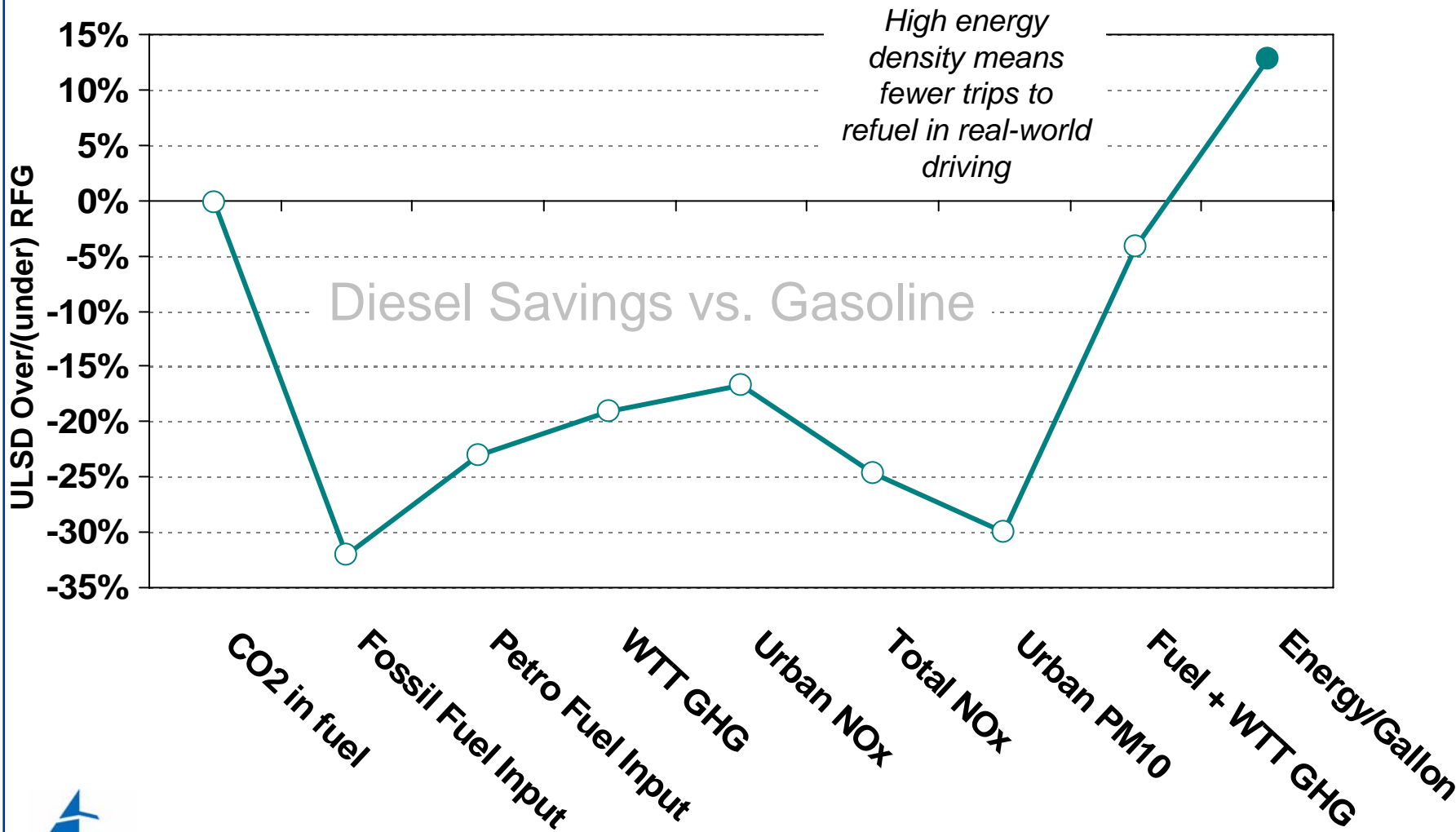


Green: Not a barrier to LDD business case
Yellow: In transition, but moving toward green status (not a barrier)
Red: At this time, appears unfavorable to LDD business case

The California Energy Commission finds diesel fuel is significantly advantaged on well-to-tank emissions and energy efficiency.

Policy

CA WTT ULSD/RFG for Each Million Btu of Fuel Available in Vehicle Tank



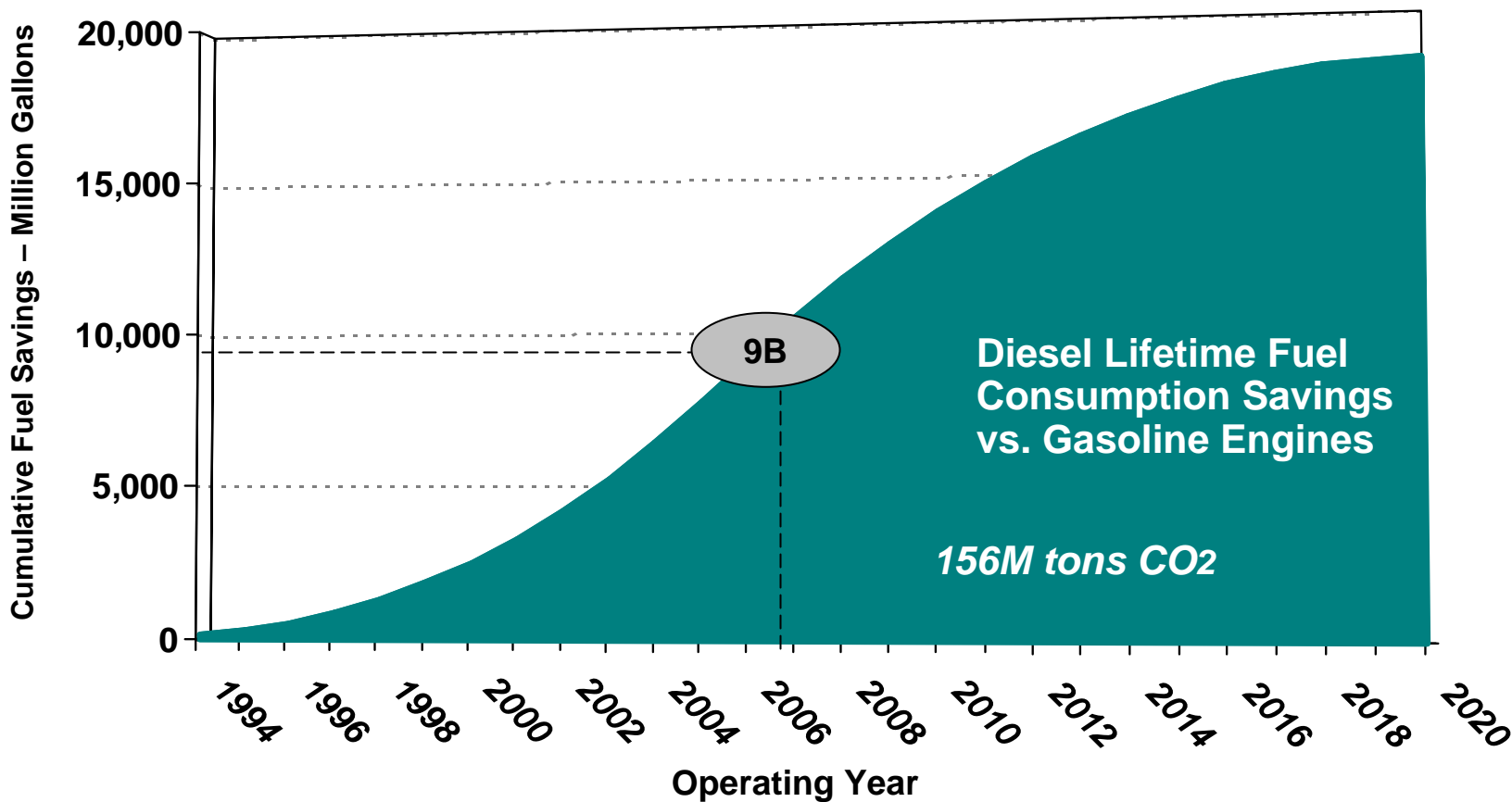
MARTEC

Source: California Energy Commission, June 2007

HDPU diesels produced from 1994-2006 will save the US 18B gallons of fuel over their useful lives.

Policy

US HD Pickup Truck Diesel Performance



Based on 1994-2006 HDPU vehicle sales. Assumes diesels did not exist and were replaced by standard (71%) and optional gas engines (29%), US EPA Mobil 6 VMT and 15 year useful life. Martec analysis of real world fuel economy for all engines in this segment.

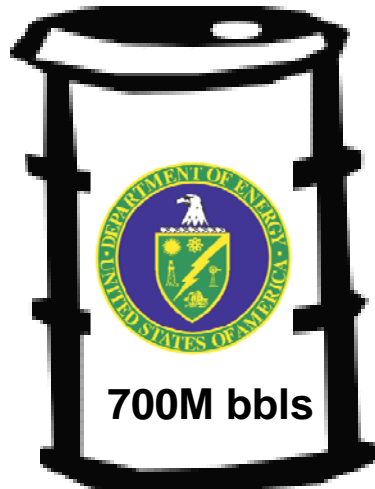
Source: Martec analysis

How important is an 18B gallon savings?

Policy

Energy Security

Strategic Petroleum Reserve

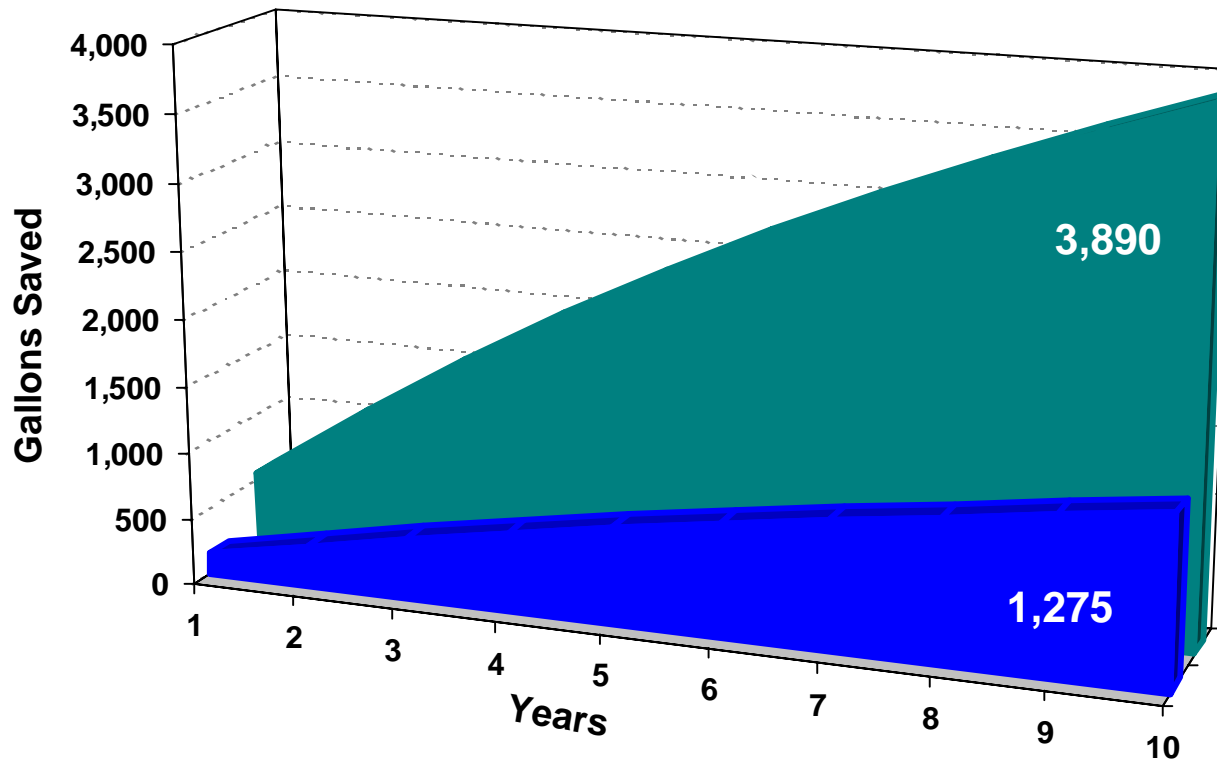


- ✓ 914MM barrels of crude
- ✓ 20 months Venezuelan imports
- ✓ Enough gasoline to support California's demand for 425 days
- ✓ More than \$36B in economic savings to vehicle owners

1 new light duty diesel pickup truck will save the nation more fuel than 3 midsize hybrids.

Policy

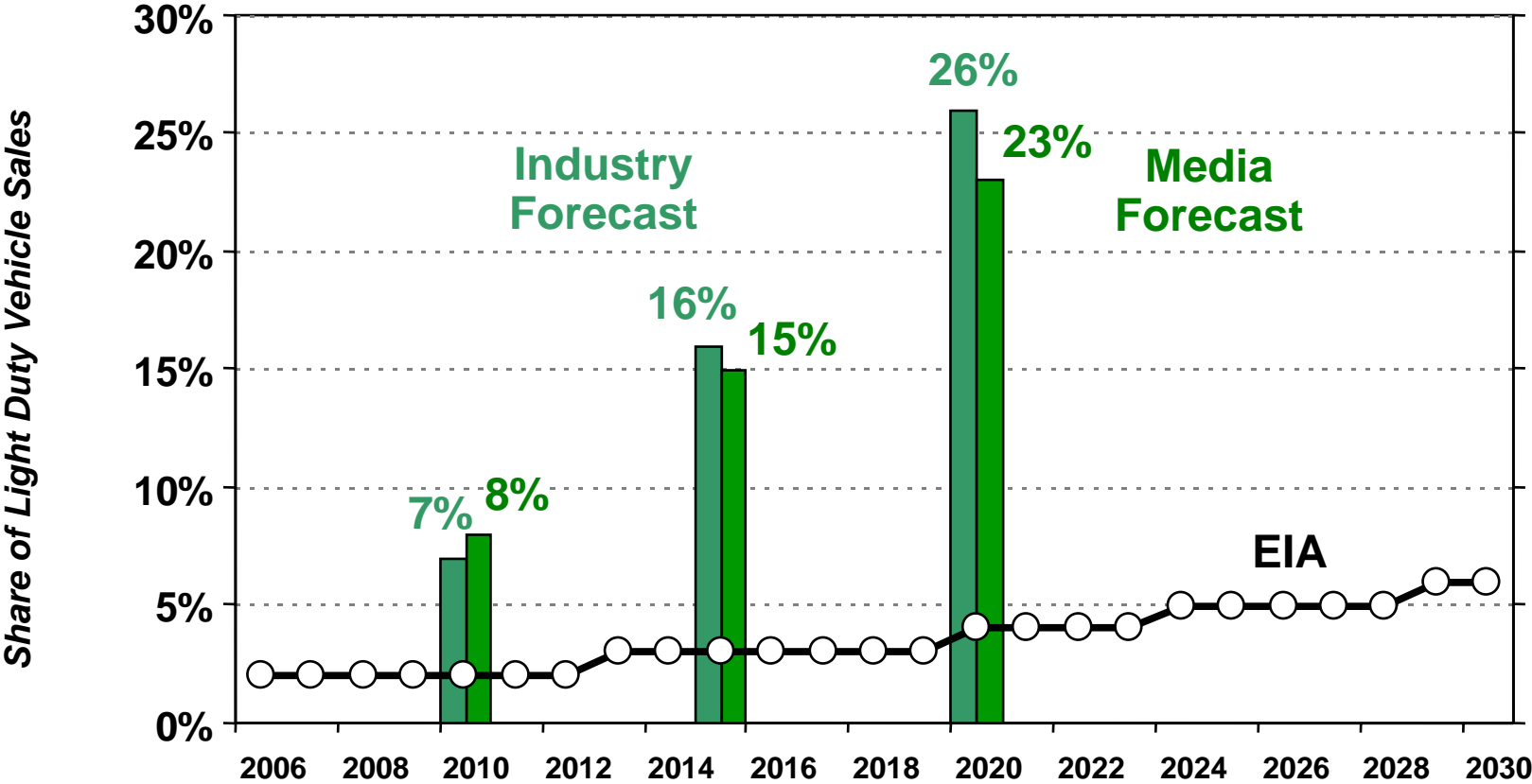
Light Duty Diesel Pickup vs. Midsize Hybrid – Gallons Saved



Both the industry and automotive media forecast light duty diesel penetration significantly higher than EIA.

Forecast

Energy Information Administration Long Range Forecast vs. Industry and Media - Fleet



Both consumers and the nation win with diesel.

Summary

- ❶ Diesel-powered vehicles deliver the kind of performance US consumers want ... and pay a premium to acquire.

Diesels pay the consumer back through:

- Exceptional real-world fuel economy and range
- High residual values

- ❷ Consumer education is the biggest gap identified across all voice modules included in the study.

- ❸ Light duty diesels are positioned to make major contributions to the nation's fuel consumption and CO₂ emissions reduction objectives.



The complete study is available by subscription from Martec or HART Energy Consulting.

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