
Energy Use and Trends in the U.S. Heavy-Duty Vehicle Sector



Resources for the Future

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Transportation Energy Consumption and Efficiency Analysis

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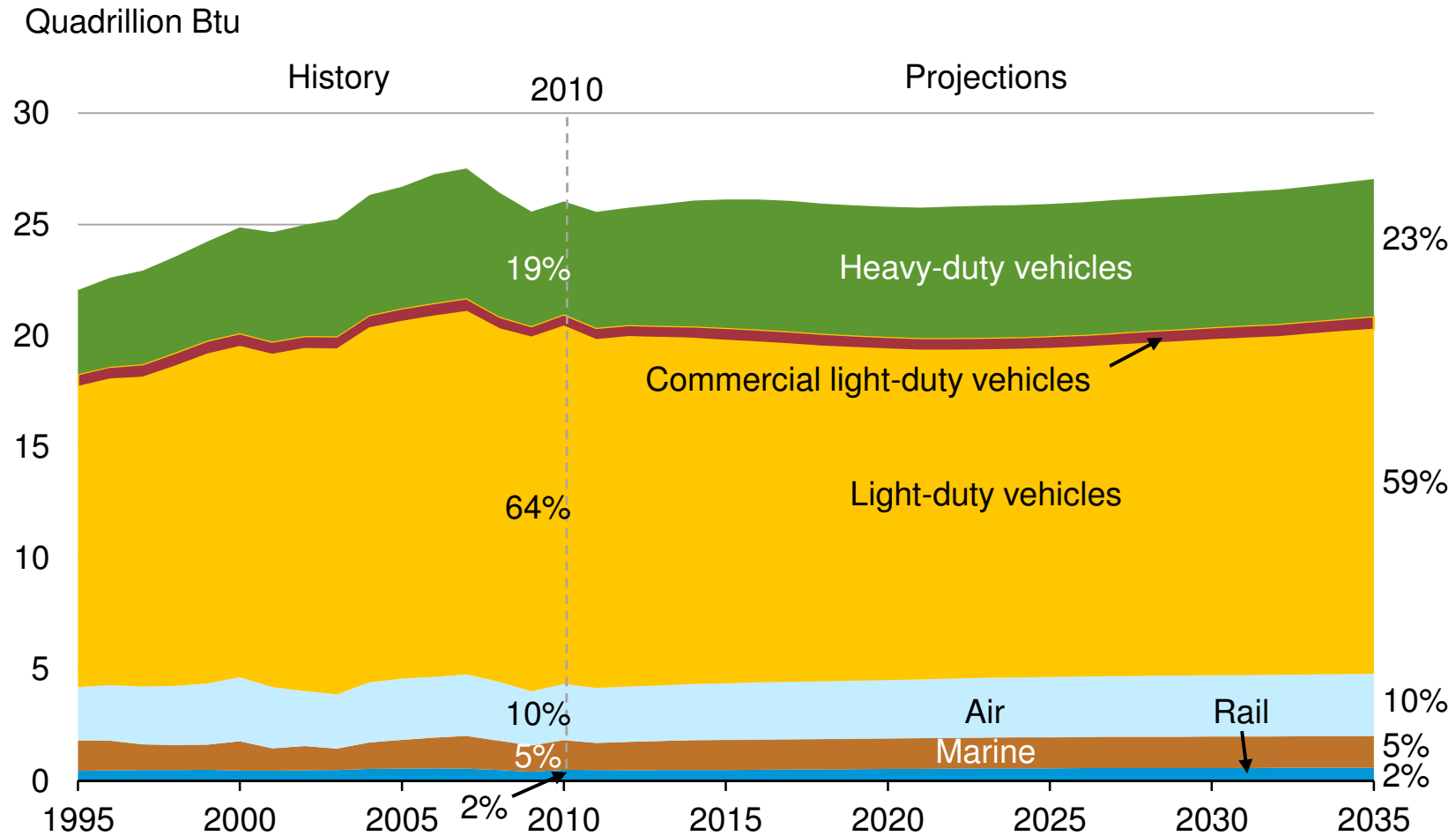
Overview

- Heavy-duty energy demand in the *Annual Energy Outlook 2012*
- Drivers of energy demand
- Heavy-duty natural gas vehicles

Annual Energy Outlook 2012 Reference case

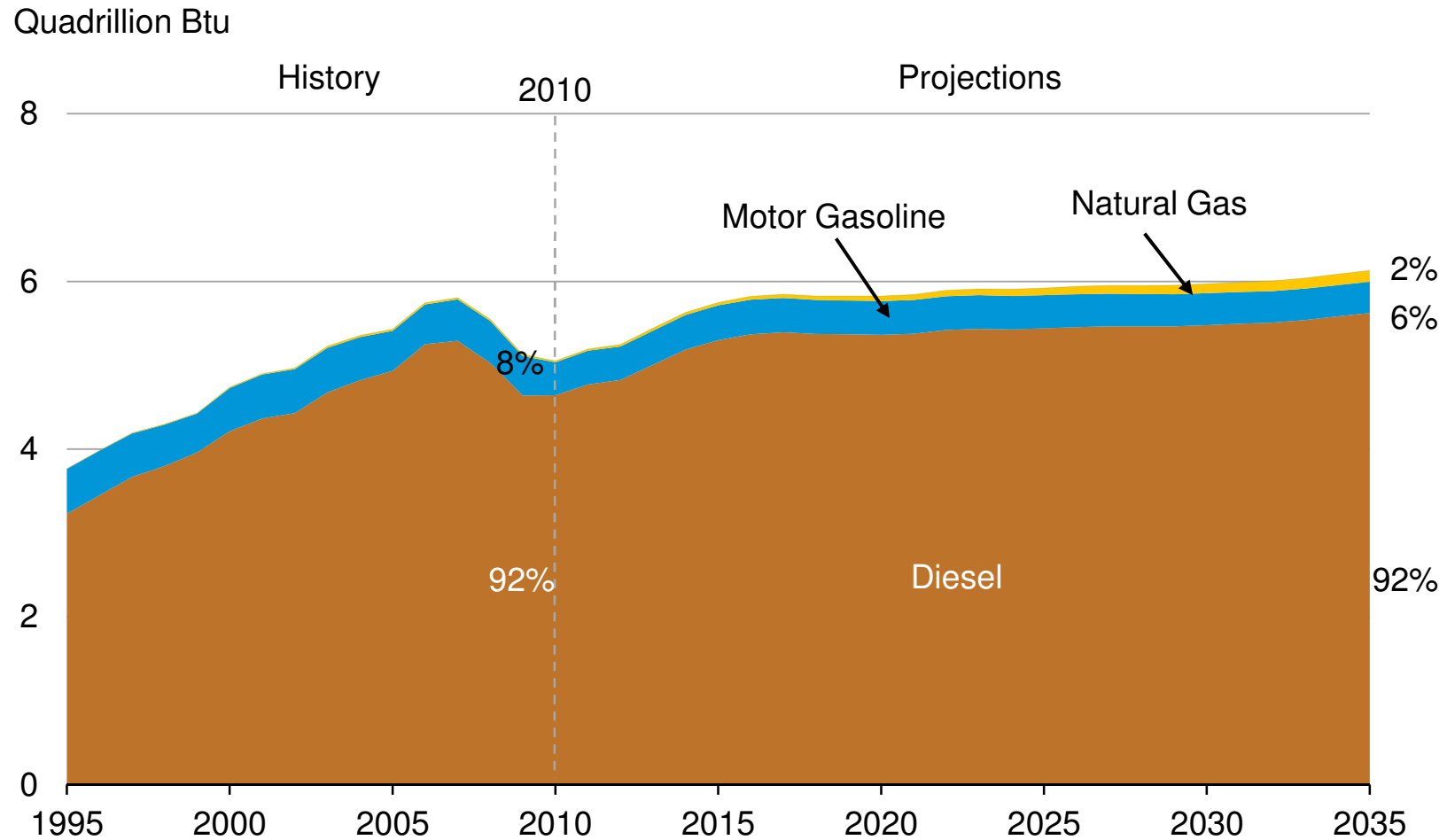
- Projects energy demand by heavy-duty vehicles by the determinants of energy demand
 - Vehicle miles travelled (industrial output)
 - Fuel economy
 - Fuel type
- Model structure:
 - Three size classes (class 3, classes 4 through 6, classes 7 and 8)
 - Four vehicle fuel types (diesel, gasoline, CNG, LPG)
 - Fleet and non-fleet vehicles
 - Vintages up to 34+
- For vehicle technology, application of HD National Program, and fuel economy determination, model expands to 13 size classes

Heavy-duty vehicle energy use represents the second largest and fastest growing share of transportation energy demand



Source: EIA, Annual Energy Outlook 2012 Reference case
Excludes pipeline, lubricants, and military

Heavy-duty vehicle energy consumption is met almost entirely by diesel fuel



Source: EIA, Annual Energy Outlook 2012 Reference case

Key drivers of heavy-duty vehicle energy demand

Heavy-duty vehicles*	2010	2035	Growth (2010-2035)
Energy consumption (quadrillion Btu)	4.8	5.8	21 %
Manufacturing output (billion 2005 dollars)	4,260	6,285	48 %
Vehicle miles travelled (billion miles)	233.8	345.2	48 %
Efficiency of vehicle stock (mpg)	7.1	8.6	21 %
Number of vehicles in stock (million)	8.9	12.5	40 %
Heavy heavy-duty vehicles (class 7-8)			
Energy consumption (quadrillion Btu)	4.0	4.7	18 %
Vehicle miles travelled (billion miles)	174.7	253.3	45 %
Efficiency of new vehicles (mpg)	5.8	7.5	29 %
Efficiency of vehicle stock (mpg)	6.1	7.5	23 %
Number of vehicles in stock (millions)	5.0	6.6	32 %

Source: EIA, Annual Energy Outlook 2012 Reference case

*Excludes buses

Key drivers of heavy-duty vehicle energy demand (continued)

	2010	2035	Growth (2010-2035)
Medium heavy-duty vehicles (class 4-6)			
Energy consumption (quadrillion Btu)	0.5	0.8	60 %
Vehicle miles travelled (billion miles)	28.9	53.9	87 %
Efficiency of new vehicles (mpg)	8.4	9.3	11 %
Efficiency of vehicle stock (mpg)	8.2	9.2	12 %
Number of vehicles (million)	1.9	3.3	74 %
Light medium heavy-duty vehicles (class 3)			
Energy consumption (quadrillion Btu)	0.3	0.3	---
Vehicle miles travelled (billion miles)	30.2	38.1	26 %
Efficiency of new vehicles (mpg)	11.7	15.3	31%
Efficiency of vehicle stock (mpg)	12.0	15.2	27 %
Number of vehicles in stock (millions)	2.0	2.6	30 %

Source: EIA, Annual Energy Outlook 2012 Reference case

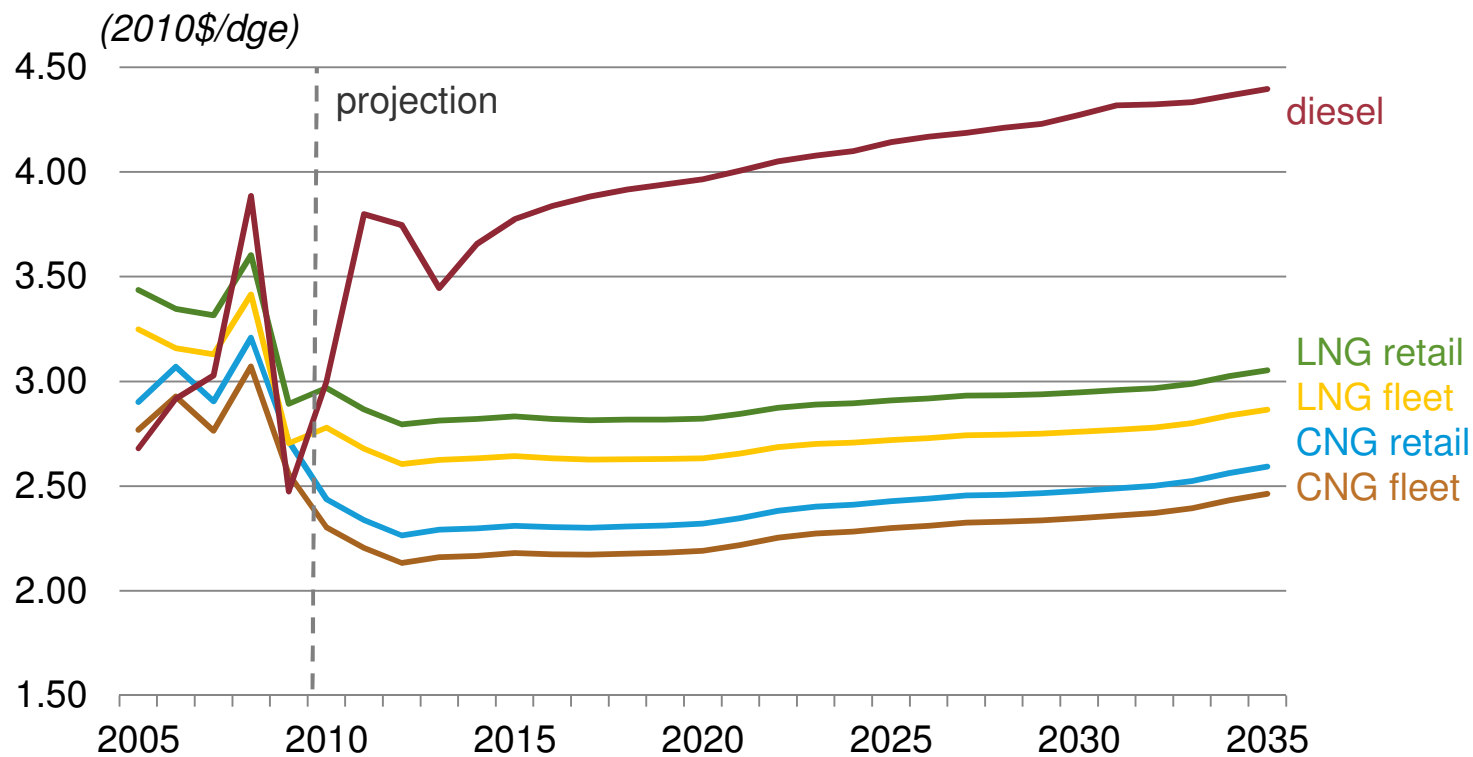
Key drivers of heavy-duty vehicle energy demand—the case of the 2Bs

	2010	2035	Growth (2010-2035)
Commercial light-duty vehicles (class 2b)			
Energy consumption (quadrillion Btu)	0.5	0.6	11 %
Vehicle miles travelled (billion miles)	64	92	44 %
Efficiency of new vehicles (mpg)	15.7	19.1	22%
Efficiency of vehicle stock (mpg)	14.4	19.0	32 %
Number of vehicles (million)	7.3	8.5	16 %

Source: EIA, Annual Energy Outlook 2012 Reference case

Difference in diesel and natural gas fuel prices offer opportunities for HDVs

- Natural gas fuel price for in both liquefied and compressed form, by retail or fleet operation



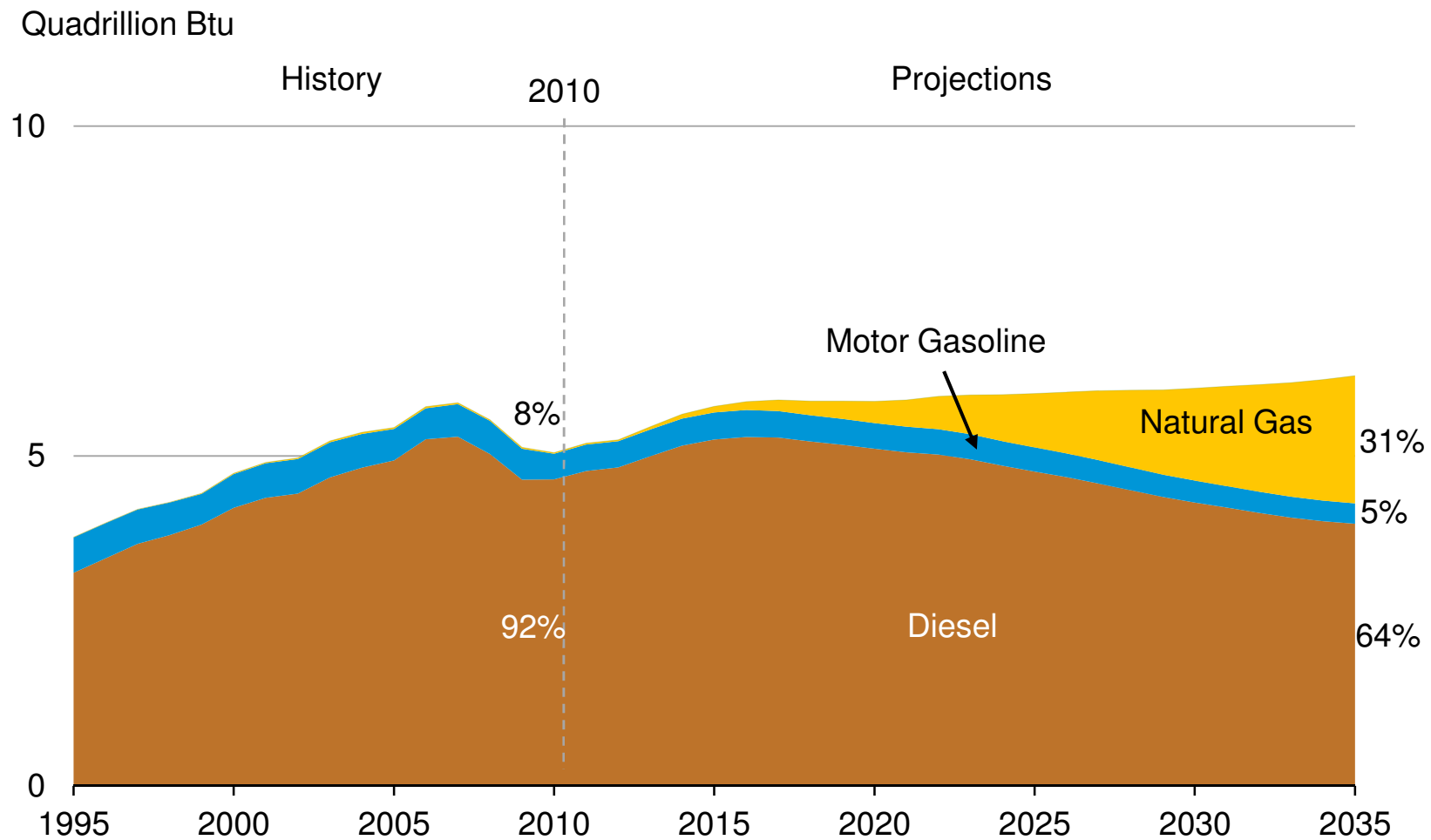
Source: AEO2012, HDV Reference case

AEO2012 HD NGV Potential case

- Natural gas vehicle tank sized according to vehicle miles travelled
- Natural gas vehicle incremental cost consists of engine + tank cost:
 - Class 3: \$9,750 to \$37,555
 - Class 4 to 6: \$34,150 to \$69,250
 - Class 7 to 8: \$49,075 to \$86,125

VMT Group	Annual miles	Incremental Cost (\$)		
		Class 3	Class 4-6	Class 7-8
1	12,554	9,750	34,150	49,075
2	27,855	9,750	34,150	49,075
3	46,021	9,750	40,000	55,250
4	62,276	12,008	44,500	60,000
5	85,000	15,872	54,400	70,450
6	110,000	20,124	60,250	76,625
7	125,000	22,675	69,250	86,125
8	147,500	26,501	69,250	86,125
9	167,500	29,902	69,250	86,125
10	187,500	33,303	69,250	86,125
11	212,500	37,555	69,250	86,125

Heavy-duty vehicle natural gas consumption grows substantially in the HD NGV case



Source: EIA, Annual Energy Outlook 2012 HD NGV case

Major takeaways

- Heavy-duty vehicle energy demand is the second largest in the transportation sector
- Heavy-duty vehicle energy demand is the fastest growing mode in transportation
- HD National Program Phase I projected to increase fuel efficiency of vehicles but vehicle miles travelled grows more rapidly
- Future HD National Program Phase II would further reduce energy demand
- Natural gas vehicles have favorable fuel economics but infrastructure is a major uncertainty

For more information

U.S. Energy Information Administration home page | www.eia.gov

Annual Energy Outlook | www.eia.gov/forecasts/aeo

Short-Term Energy Outlook | www.eia.gov/forecasts/steo

International Energy Outlook | www.eia.gov/forecasts/ieo

Monthly Energy Review | www.eia.gov/totalenergy/data/monthly

Annual Energy Review | www.eia.gov/totalenergy/data/annual