

# Extending NHTS to Produce Energy-Related Transportation Statistics



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*National Household Travel Survey Data: A Workshop*

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# EIA's Mission and Goals

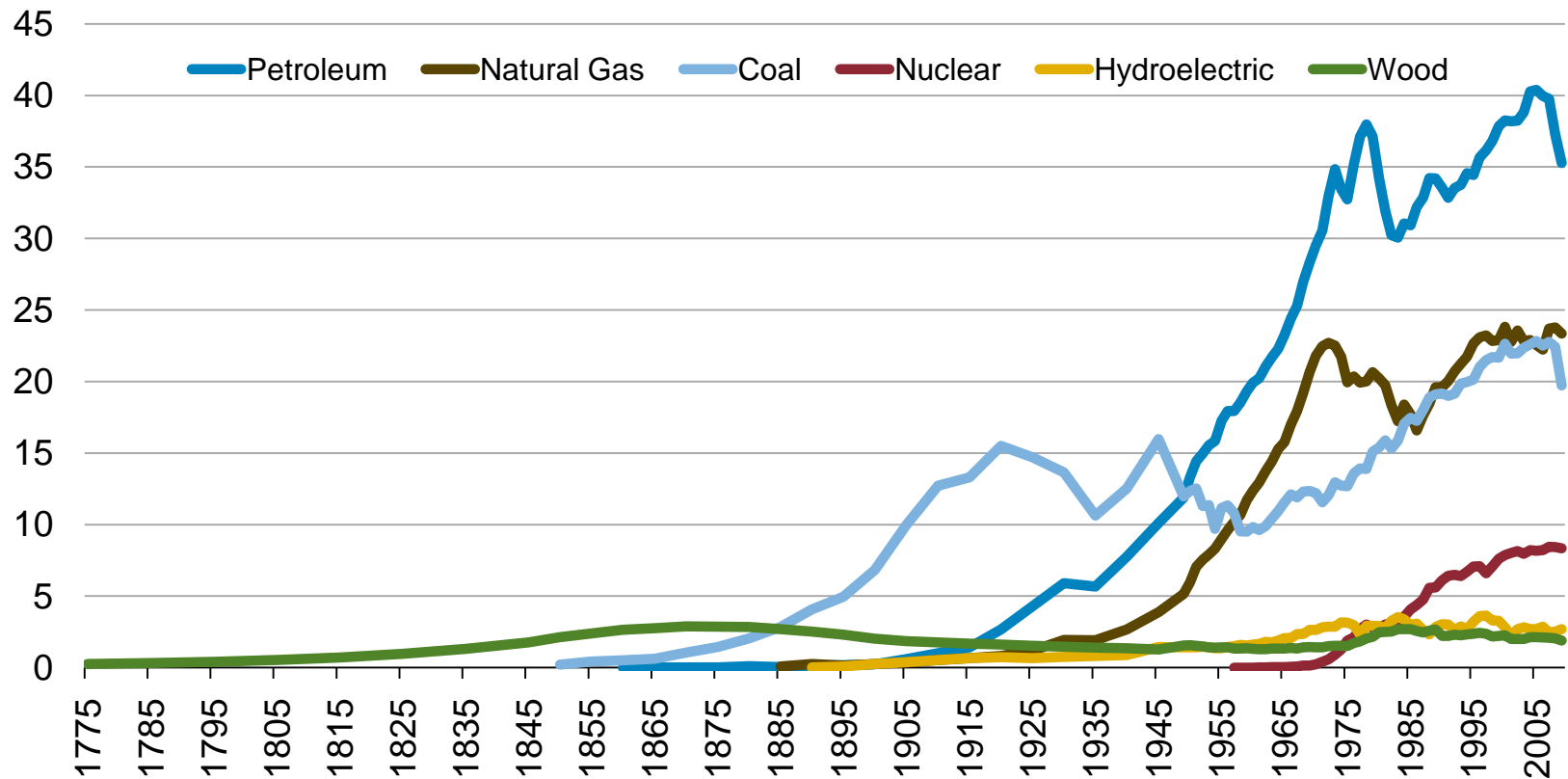
- The U.S. Energy Information Administration (EIA) is the statistical and analytical agency within the U.S. Department of Energy.
- EIA collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding of energy and its interaction with the economy and the environment.
- EIA is the Nation's premier source of energy information and, by law, its data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government.

# How does enhancing the NHTS database with energy characteristics achieve EIA's mission?

- Capitalizes on EIA's expertise. Responsible for demand-side (versus supply-side) of the energy equation covering
  - Residential (including **personal transport**) and commercial buildings
  - Manufacturing plants
- Fills data gap. RTECS provided information on how energy is used by households for personal transportation and was conducted in 1983, 1985, 1988, 1991, and 1994 then discontinued due to resource constraints
- Continues successful partnership started with the 2001 NHTS program and expanded for 2009 to include add-on samples

# EIA takes a long view of energy use in the United States

quadrillion British Thermal Units (Btu)



Energy consumption patterns have changed over the history of our country as we developed new energy sources and as our uses of energy changed. **In 2009, over 50 percent of petroleum use is finished motor gasoline.**

Source: EIA, Annual Energy Review 2009

# EIA is responsible for projecting current energy and market conditions

*Million metric tons of carbon dioxide equivalent by sector and source, 2008 and 2035*

	Residential		Commercial		Industrial		Transport	
	2008	2035	2008	2035	2008	2035	2008	2035
Petroleum	85	58	46	37	376	405	1,896	2,023
Natural Gas	266	260	171	208	407	493	37	44
Coal	1	0	7	6	173	249	-	-
Electricity	878	909	850	1,063	642	542	4	12
Total	1,229	1,228	1,074	1,314	1,598	1,689	1,937	2,080

Source: EIA, *Annual Energy Outlook 2011*.

# EIA used a Team Approach on this project

- Federal Highway Administration (FHWA)
- National Highway Traffic Safety Administration (NHTSA)
- Oak Ridge National Laboratory, Center for Transportation Analysis (ORNL), U.S. Department of Energy
- U.S. Environmental Protection Agency (EPA)
- Dr. Richard Newell, EIA's Administrator, who determined that this work benefits users of EIA data

# Purposes of NHTS converge with EIA's mission, but with user precautions

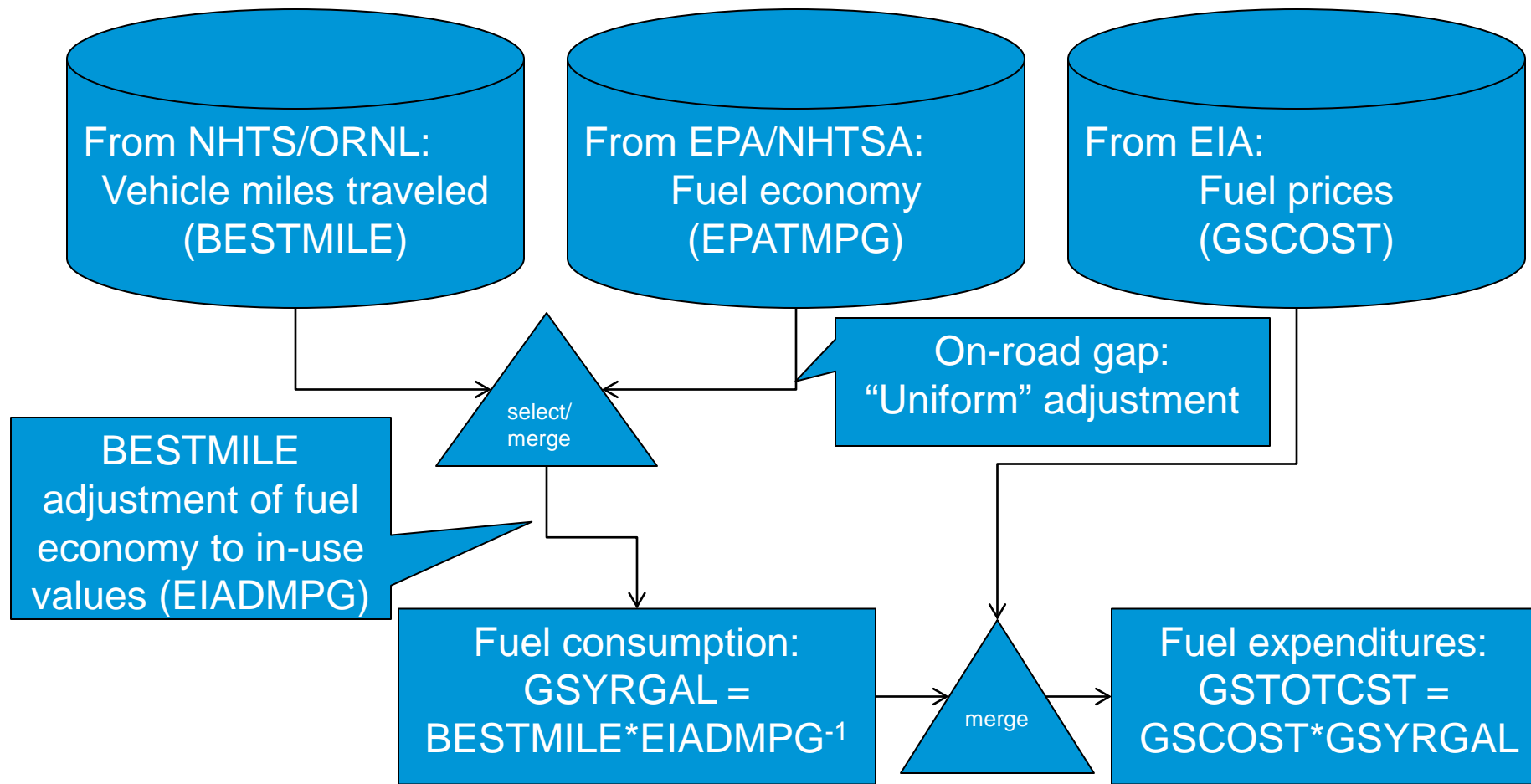
- Primary purpose of the NHTS is its first stage analytics of producing population totals, averages, and counts of residential housing and their travel demands on the Nation's roadways from respondent data.
- Energy consumption is important but not a core consideration of NHTS; hence, EIA's work represents a second stage of analytics that integrates information from multiple data sources (e.g., EIA, EPA, NHTSA, and ORNL).
- Energy modeling is a second stage in the analytics of survey sampling, in that model-based estimates (totals, averages, and counts) represent those that were **not collected** directly from survey respondents.

# Focus is on modeling key energy-related transportation statistics

- Unadjusted composite fuel economy (**EPATMPG**) from EPA and NHTSA; Derived fuel economy value (**EIADMPG**) to reflect on-road, in-use values
- Fuel type (**FUELTYPE**) and vehicle class (**VEHCLASS**)
- Energy consumption (**GSYRGAL**) in gasoline-equivalent gallons units
- Energy expenditure (**GSTOTCST**) which represents annual energy expenditures in nominal U.S. dollars
- Energy cost (**GSCOST**) which represents annual fuel cost in nominal U.S. dollars per gasoline-equivalent gallon



# How does EIA model light-duty vehicle energy demand?



# Energy-related transportation statistics enhance the story about light-duty vehicles

	Year					Annual Percent Change	
	1988	1991	1994	2001	2009	88-09	01-09
Population (million)	244.5	252.2	260.3	285.1	307.0	1.1	0.9
Households (million)	91.6	94.6	97.3	107.4	113.6	1.0	0.7
Vehicles (million)	147.5	151.2	156.8	191.0	202.9	1.5	0.8
Number of vehicles per 1000 capita	603	600	602	670	661	0.4	-0.2
Real disposable personal income per capita (chained \$2005)	22,997	23,453	24,517	29,299	32,847	1.7	1.4
VMT (trillion)	1.5	1.6	1.8	2.3	2.3	2.1	0
Energy (billion gallons)	82.4	82.8	90.6	113.1	111.1	1.4	-0.2
Intensity (gallons per 1000 miles)	54.6	51.8	50.5	49.5	48.5	-0.6	-0.3

Sources: EIA, *Residential Transportation Energy Consumption Survey*; FHWA, *National Household Travel Survey*. U.S. Bureau of Economic Analysis, Table 2.1, *Survey of Current Business*; U.S. Census Bureau, *Population Estimates Program*.

# Sensitivity analysis is important

- Accuracy of adjustments, while tested and approved for use in prior RTECS studies, is not quantifiable because we lack fuel type, fuel purchase and mileage diaries for computing a vehicle's **actual** on-road, in-use fuel economy.
  - Impact from excessive idling or congestion is not considered
  - Note that EIA's RTECS used fuel purchase diaries, which contributed to its respondent burden and expense in sampling 3,000-5,000 U.S. households
  - Modeling can result in endogeneity issues with subsequent analyses
- Uncertainty associated with the procedures used to link fuel economy may be assessed by constraining assignments of fuel economy to a pre-determined subset of extreme values
  - Applying sales-weighted fuel economy values for each light-duty vehicle yields an energy consumption total which is 1 percent less than the published total, and 8 percent for extreme values

# An augmented NHTS is well-situated to address policy-relevant considerations

- Understand the travel and energy consumption patterns underlying the supply-based statistics produced by EIA
- Decompose transportation energy use into vehicle use and energy intensity
- Future fuel prices, the rate of economic recovery, and the ways consumers choose to cope with these circumstances will provide the evidence of changes in behavior.
  - NHTS could prove useful in comparing, between the 2001 and 2009 data sets, travel and vehicle use patterns by vehicle fuel economy (or some other efficiency metric) at the household level to see if a measurable response to fuel price/economic condition occurred.
  - Wide variations in fuel prices during 2009 survey period also permit useful analysis using 2009 data

# Suggestions for fine-tuning future programs, and location of EIA's documentation

- Additional vehicle characteristics and usage data
  - Multiple odometer readings taken throughout the survey period (e.g., beginning, middle, and end of year readings)
  - Fuel purchase and travel diaries for a sub-sample of households
  - Vehicle Identification Numbers (VINs), at a minimum obtain fuel type info
  - Duration of household's possession of a vehicle (i.e., dispositions of vehicles during the survey period)
- EIA's documentation for the 2009 NHTS may be found at <http://nhts.ornl.gov/2009/pub/EIA.pdf>
- EIA's report using the 2001 NHTS may be found at [http://www.eia.gov/emeu/rtecs/nhts\\_survey/2001/index.html](http://www.eia.gov/emeu/rtecs/nhts_survey/2001/index.html)

Thank you for your time and attention

# For more information

U.S. Energy Information Administration home page | [www.eia.gov](http://www.eia.gov)

Short-Term Energy Outlook | [www.eia.gov/steo](http://www.eia.gov/steo)

Annual Energy Outlook | [www.eia.gov/aeo](http://www.eia.gov/aeo)

International Energy Outlook | [www.eia.gov/ieo](http://www.eia.gov/ieo)

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