



# Alternative Fuels and Public Transportation

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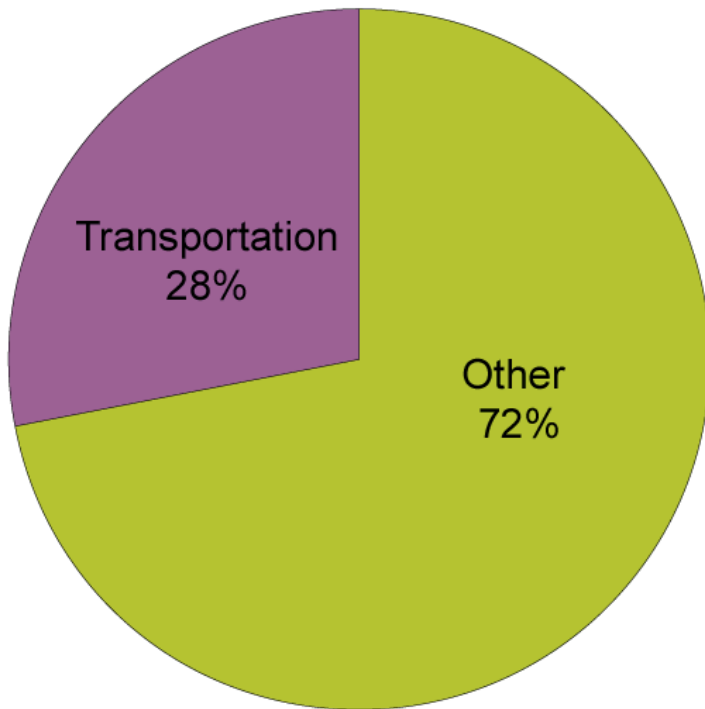


# PRESENTATION OUTLINE

- Why are alternative fuels important?
- What factors should be considered?
- How can I compare the potential costs?

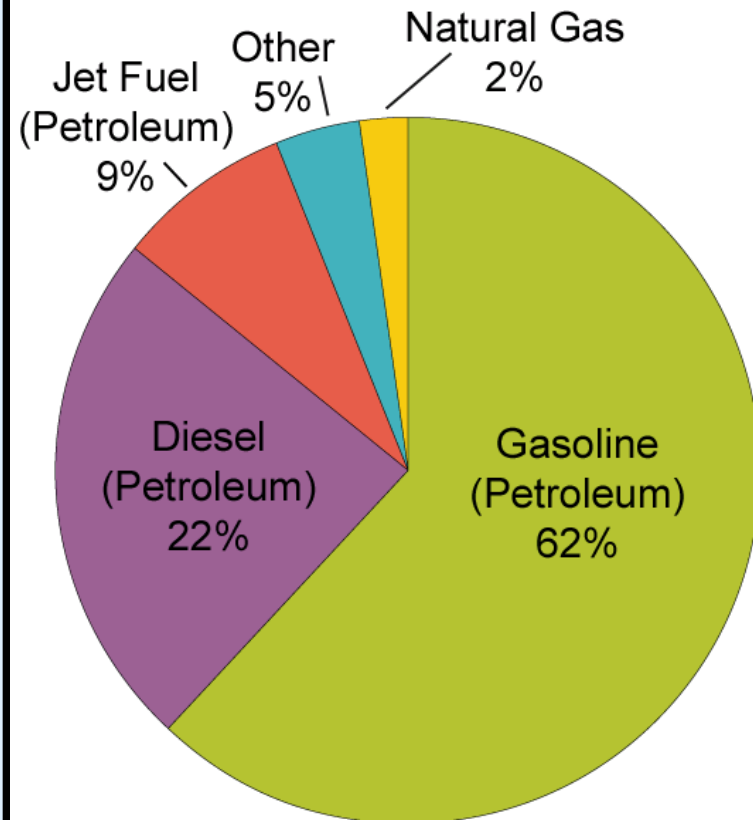
# U.S. ENERGY USE

## Share of Energy Used for Transportation, 2008

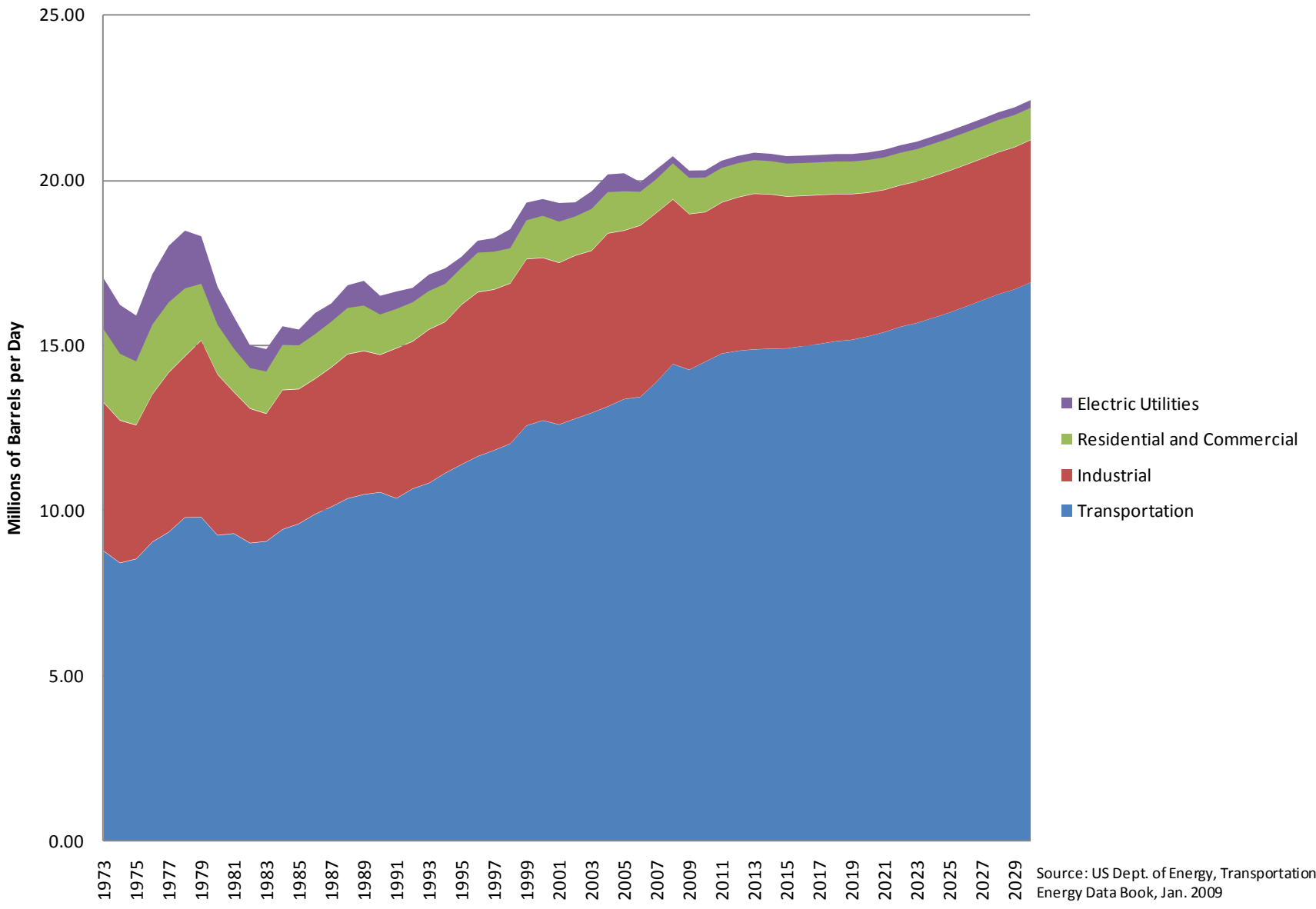


Source: Energy Information Administration, *Annual Energy Review 2008*.

## Fuel Used for Transportation, 2007

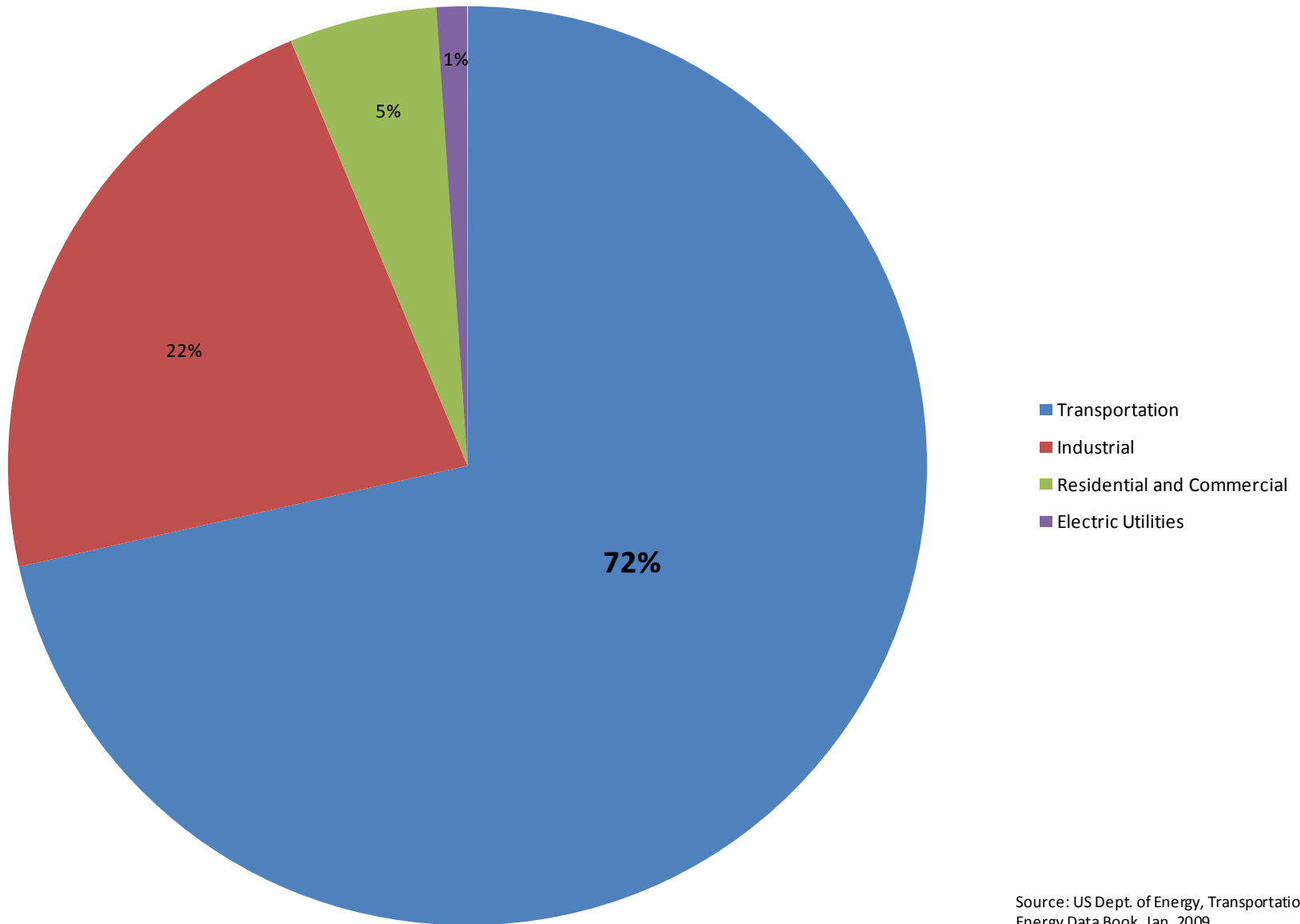


# United States Petroleum Consumption - All Sectors, 1973-2030



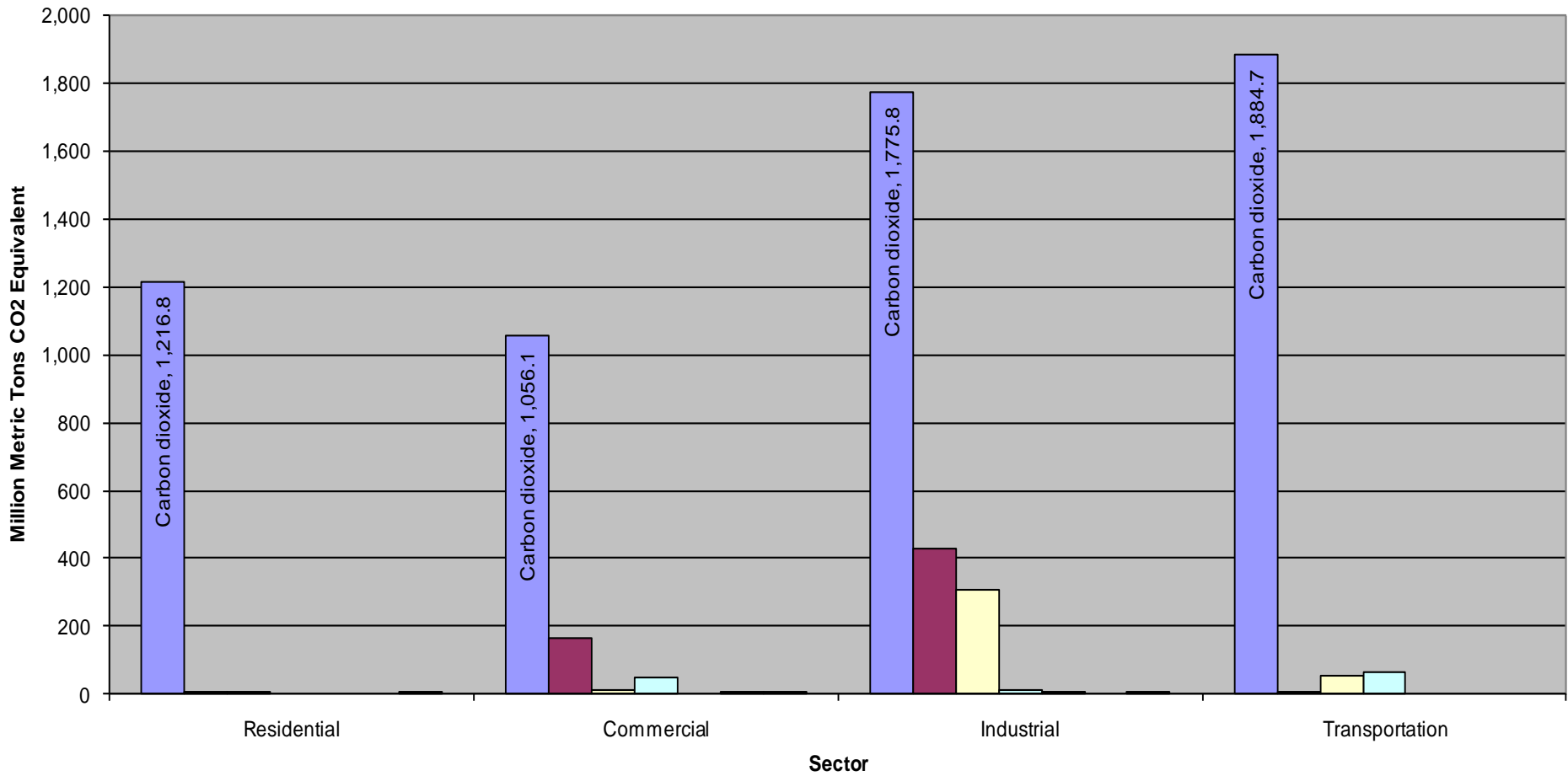
Source: US Dept. of Energy, Transportation Energy Data Book, Jan. 2009

# U.S. Petroleum Consumption -2010



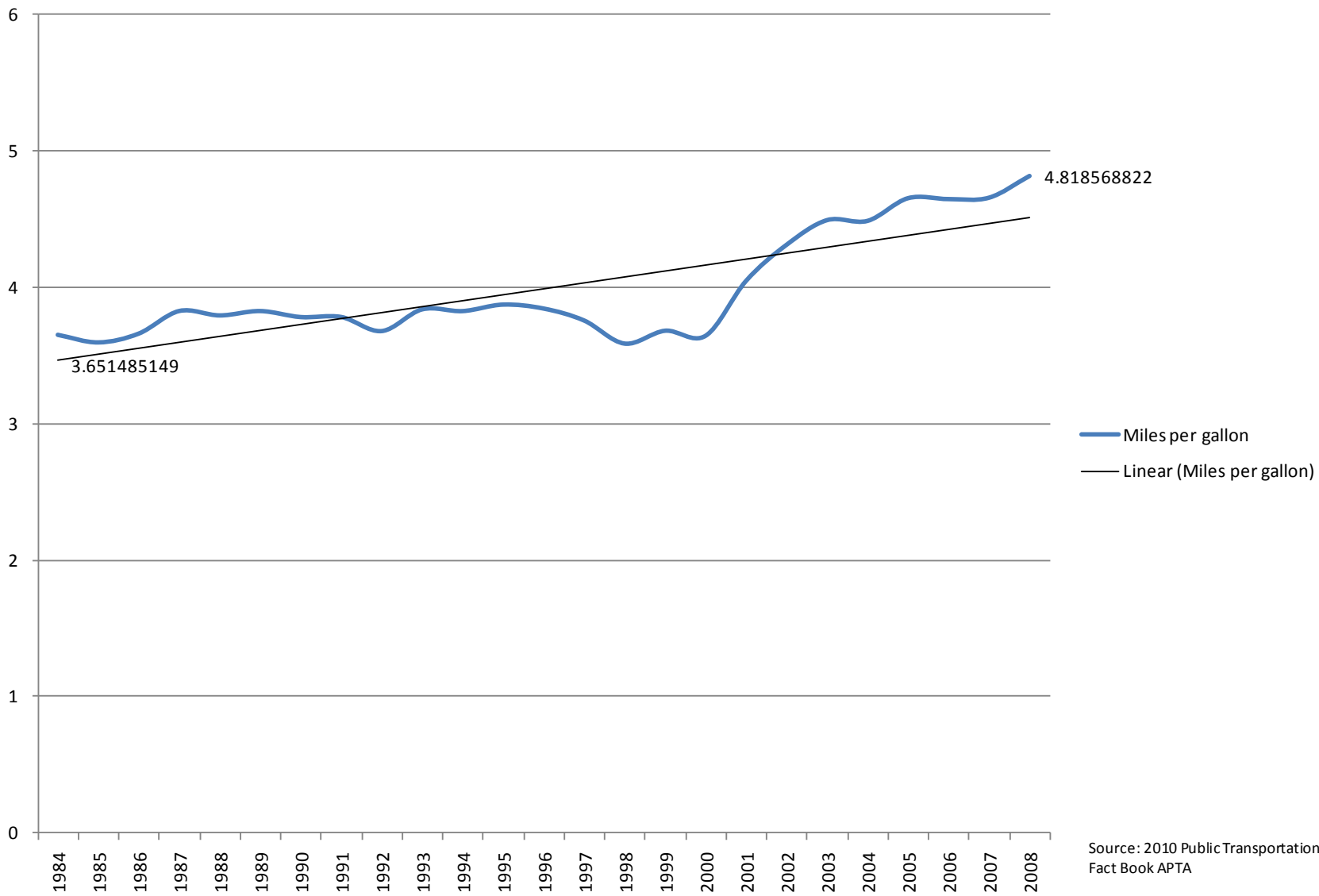
Source: US Dept. of Energy, Transportation Energy Data Book, Jan. 2009

# Total Greenhouse Emissions by Sector 2006



■ Carbon dioxide 
 ■ Methane 
 ■ Nitrous oxide 
 ■ Hydrofluorocarbons 
 ■ Perfluorocarbons 
 ■ Other hydrofluorocarbons, perfluorocarbons/perfluoropolyether 
 ■ Sulfur hexafluoride

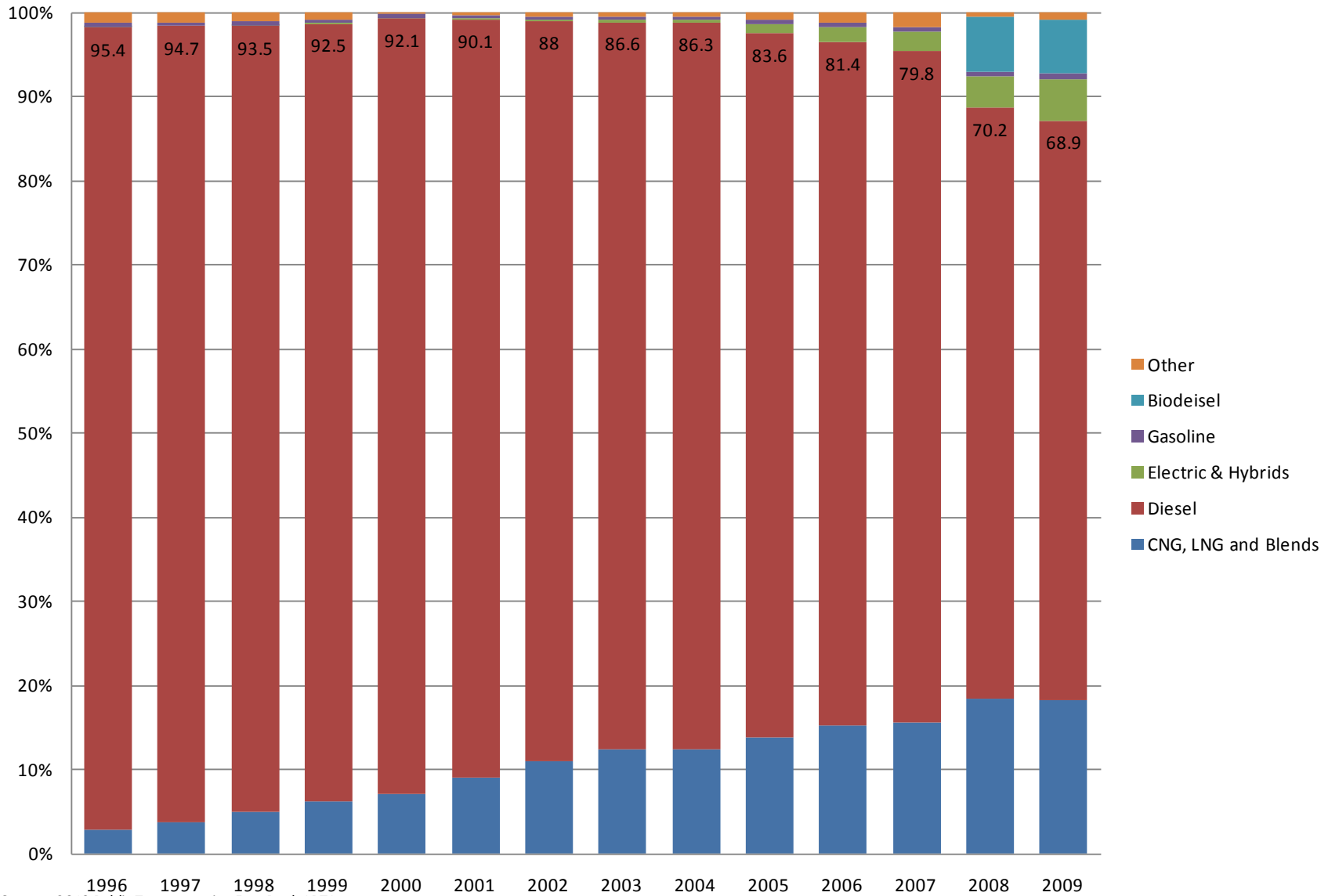
# US Bus Vehicle Miles per Gallon Fossil Fuel



Source: 2010 Public Transportation Fact Book APTA



# US Bus Power Sources 1996-2009 (percent)



Source: 2010 Public Transportation Fact Book APTA





# Alternative Fuel Considerations

- Motivation – air quality, noise...
- Fuel availability
- Access to maintenance expertise
- Climate
- Fueling time
- Vehicle range and duty cycle
- Facility modifications
- Cost

# Life-Cycle Cost Analysis

The cost comparison is conducted on a total and per-mile basis, summarized by two measures:

- **Total Annualized Cost (\$/mile)** – Represents the sum of vehicle replacement, facility modification (spread out over the bus life), annual maintenance and fueling costs.

Total Annualized Cost – Local Share – Same as Total Annualized Cost, but reduced by the share capital acquisition costs covered at the Federal level

- **Total Social Annualized Cost (\$/mile)** – This value includes the contribution of alternative fuels in reducing pollution emission. The impact of emission reduction is summarized in the Results worksheet. This value is also reported on a per-mile basis.

# COST INFORMATION

## Capital costs:

Bus acquisition cost per vehicle

Date each bus entered service (model year, length, seating capacity for each bus)

## Operating costs:

Life-to-date mileage per bus

Fuel economy (average miles per gallon or equivalent sales unit)

Fuel price per gallon or per equivalent sales unit

Fuel cost per mile

Life-to-date labor costs per bus

Life-to-date parts costs per bus

Life-to-date other costs per bus (if any/if reported)

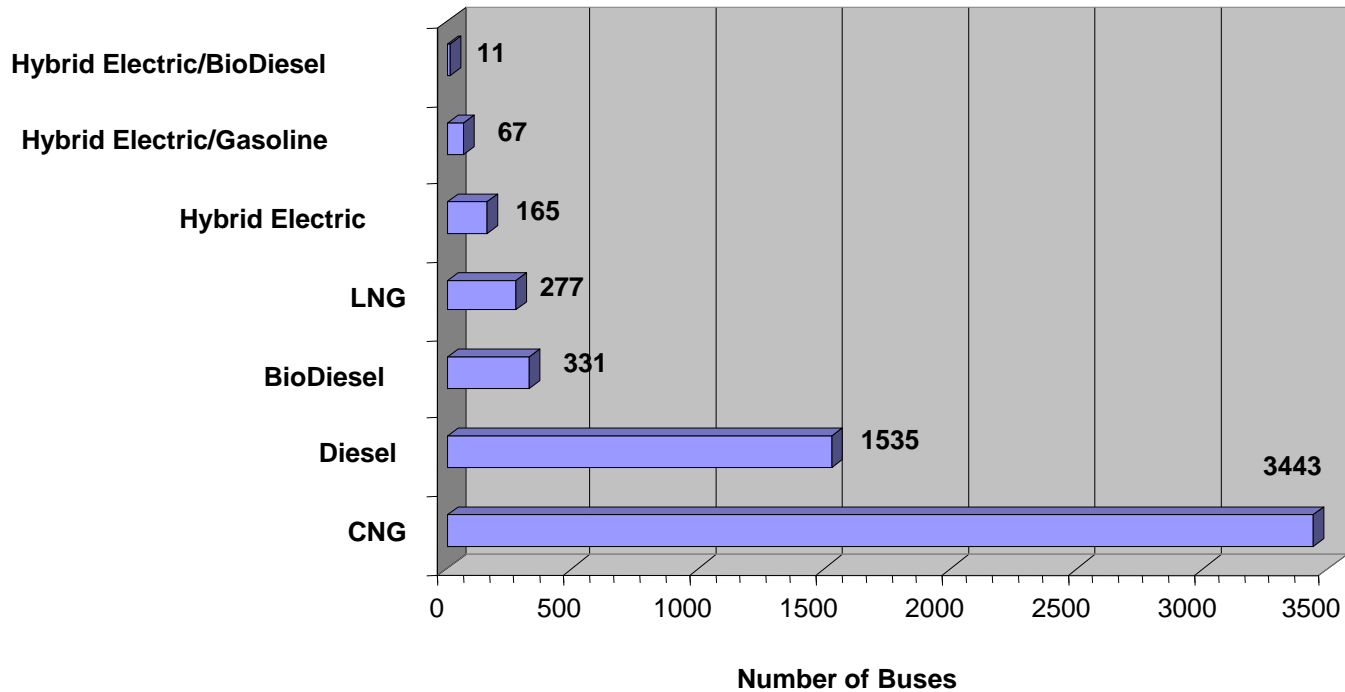
# Data Source:

## Survey of Transit Agencies

|  |                                     |
|--|-------------------------------------|
| <b>ABQRide / Albuquerque, NM</b>       | <b>DART / Dallas, TX</b>            |
| <b>LBT / Long Beach, CA</b>            | <b>LYNX / Orlando, FL</b>           |
| <b>MBTA / Boston, MA</b>               | <b>NJT / New Jersey Transit</b>     |
| <b>OCTA / Orange County, CA</b>        | <b>OmniTrans / San Ber'dino, CA</b> |
| <b>Palm Tran / West Palm Beach, FL</b> | <b>PSTA / Pinellas, FL</b>          |
| <b>RFTA / Aspen, CO</b>                | <b>RTA / Riverside, CA</b>          |
| <b>RTD / Denver, CO</b>                | <b>RTS / Gainesville, FL</b>        |
| <b>SDMTS / San Diego, CA</b>           | <b>MTA / Los Angeles, CA</b>        |
| <b>SEPTA / Philadelphia, PA</b>        | <b>SunTran / Tucson, AZ</b>         |
| <b>HART / Tampa, FL</b>                | <b>AC Transit / Oakland, CA</b>     |
| <b>BJCTA / Birmingham, AL</b>          | <b>CNYCentro / Syracuse, NY</b>     |
| <b>GCRTA / Cleveland, OH</b>           | <b>GET / Bakersfield, CA</b>        |
| <b>NCTD / Oceanside, CA</b>            | <b>SunLine / Thousand Oaks, CA</b>  |
| <b>The Bus / Honolulu, HI</b>          | <b>Valley Metro / Phoenix, AZ</b>   |
| <b>JTA / Jacksonville, FL</b>          | <b>Sound Transit / Tacoma, WA</b>   |

# TOTAL FLEET REPORTED

Composite Fleet Summary: Total Buses by Fuel Type



# Using the BuFFeT© Model

# MODEL STRUCTURE

Inputs → default or custom

- Fleet size: current and projected

- Capital and operating costs

- Fuel costs

Output

- Annualized agency cost (\$/mile)

- Annualized societal cost (\$/mile)

- Emission table

Sensitivity Analysis

- Monte Carlo simulation



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