

# Transport in Transition:

Market Drivers Prompt Fleets to Transition to Alternative Fuels and Advanced Vehicle Technologies



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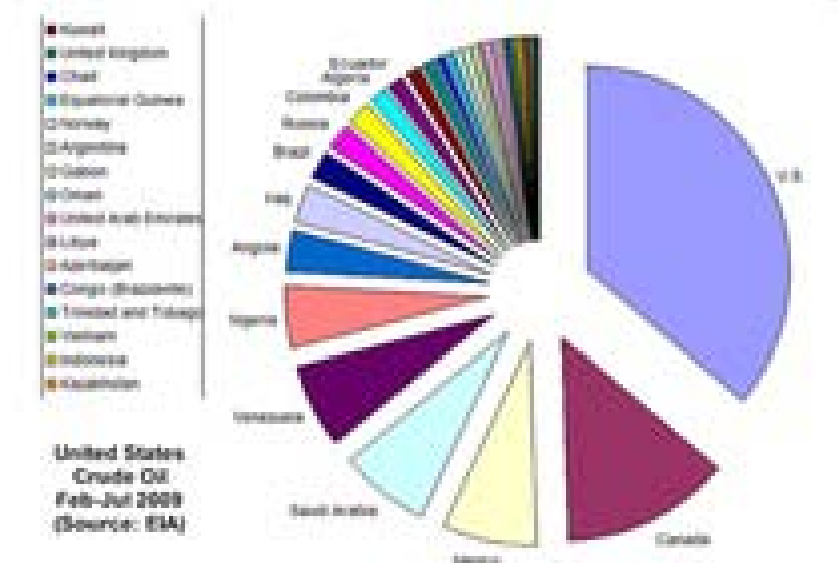
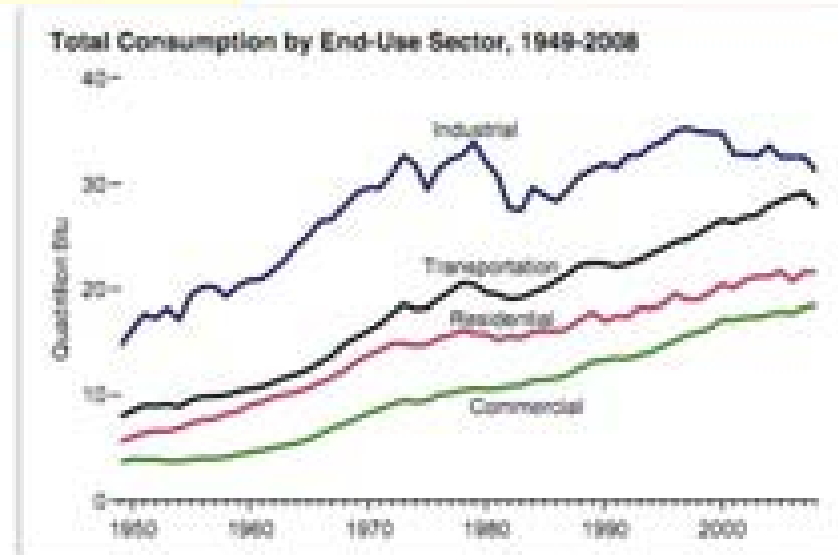
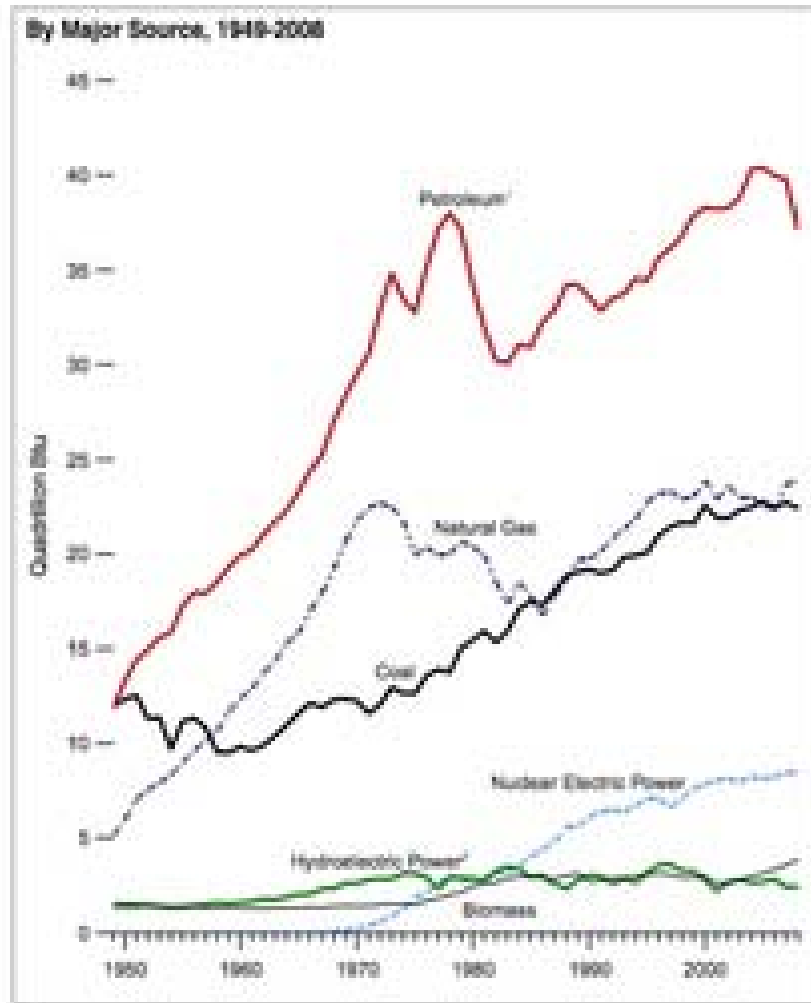
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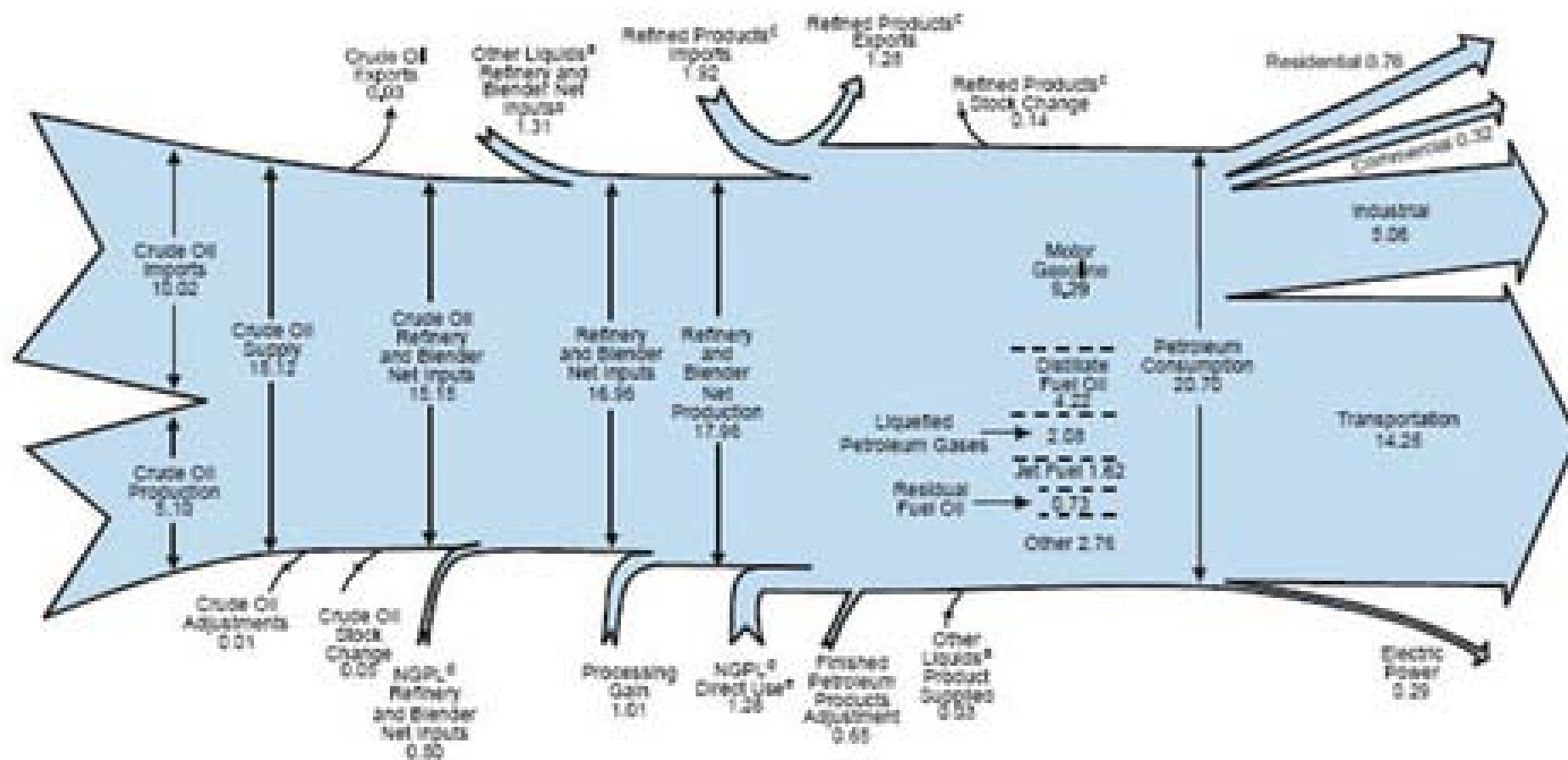
# Market Drivers Prompting the Transition

- Energy consumption is up across all sectors, especially in transportation, despite fuel efficiency gains, b/c VMT has increased even more so
- US reliance on foreign oil, including from unfriendly and potentially unstable regimes, continues to increase – now about two-thirds of total US crude oil imports
- Transportation now accounts for about 70% of all petroleum fuel use in the US



Source: Annual Energy Outlook 2009. Energy Information Administration.

# U.S. Petroleum Flow



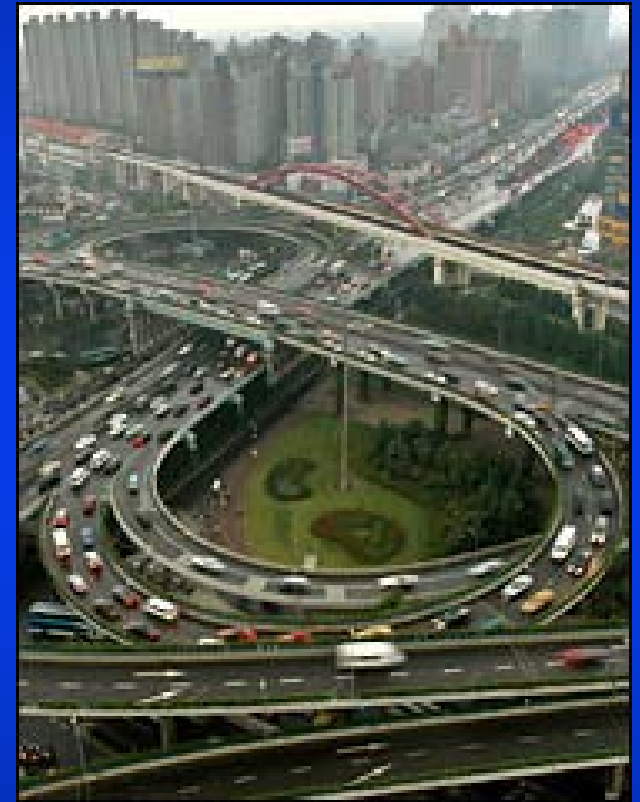
Source: Annual Energy Outlook 2009. Energy Information Administration.

# Market Drivers Prompting the Transition

- US only accounts for less than 5% of the world's population but consumes 25% of oil
- Global oil supply-demand imbalance getting worse, which pushes fuel prices up

# Market Drivers Prompting the Transition

- Emerging Asian economies compete for oil supply, putting additional upward pressure on price. New demand is outpacing new supply (“peak oil”)
- Addition of new refining capacity is a lengthy process – system is already stressed
- Barrel of oil topped \$145 in late spring 2008! Slump in world economy pushed prices down but higher prices will return. Fleets are looking for alternatives.



Traffic in Shanghai China:  
Chinese vehicle ownership per capita is equal to where US was in 1919!

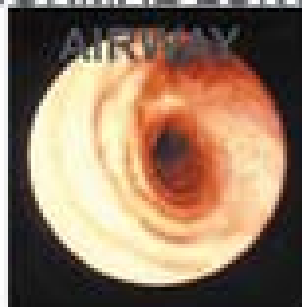
# Market Drivers Prompting the Transition

- Transportation sector has tremendous impact on local/regional AQ
- Approximately 149 million people live in areas with air quality that is less than satisfactory (~1/2 US population).
  - Asthma / other respiratory illnesses becoming more prevalent
  - Increased healthcare costs
  - Absenteeism and decreased productivity
  - Diminished agricultural output and economic costs
- Texas has 27 counties that are either out of compliance or in maintenance status with NAAQS

# Why Does This Matter?

- 2007 economic costs of oil dependence estimated to exceed \$350B
- Households spending \$3,000/year on fuel + 60% is imported = \$1,800 transfer of individual wealth to oil exporting countries
- Strong links between anthropogenic emissions and climate response
- Strong policy actions following shocks of 1973-74 and 1979-80 helped cut

**NORMAL LUNG**



**INFLAMMED LUNG AIRWAY**



QuickTime™ and a  
decompression  
plugin are needed to see this picture.

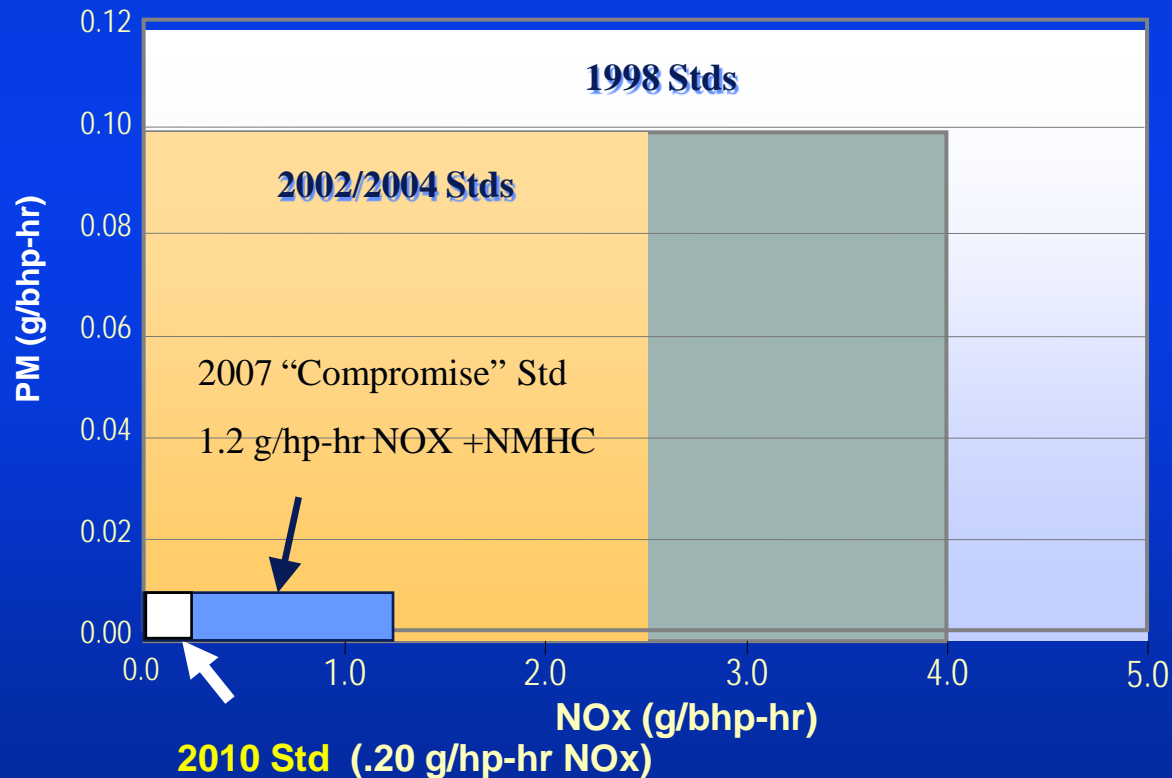


Sources: Top R: Greene, David, Facing the Challenge of Oil Dependence and Climate Change: What Will it Take. [http://www-cta.oml.gov/cta/staff\\_GreeneDL.shtml](http://www.cta.oml.gov/cta/staff_GreeneDL.shtml)

Bottom L: EPA, [http://www.epa.gov/epaospp/efm2/efm2mainpage\\_health\\_page1](http://www.epa.gov/epaospp/efm2/efm2mainpage_health_page1) | Bottom R: Photo courtesy NARA, [photoshop.com](http://photoshop.com) Green, David et al. U.S. EPA

# Market Drivers Prompting the Transition

- AQ Goals, NAAQS and EPA Vehicle Emissions Requirements
  - CAAA drive local/regional govts to reduce criteria emissions (NO<sub>x</sub>, PM)
  - EPA and CARB vehicle/engine emissions requirements and their impact on OEMs' product offerings, vehicle performance and fuel economy



- To achieve 2004 and 2007 emissions benchmarks, fuel economy and performance took a hit.
- Diesel exhaust after-treatment technologies have increased truck purchase and O&M costs
- 2010 NO<sub>x</sub> requirement: SCR or EGR strategies – add'l complexity and cost (and weight)

# Market Drivers Prompting Transition

- The Environmental, Economic and Political Realities of Global Warming and Greenhouse Gases
  - Issue is fairly high priority internationally and gaining traction here in US
  - States/regions adopting Low-Carbon Fuel Standards (LCFS) which promote market for lower carbon fuels and renewable fuels
  - Obama Administration has signaled willingness to tackle GHG, if not this session then next Congress
- **Alternative fuels and AFVs typically reduce GHG on “wells to wheels” or “field to wheels” basis**
  - Ex: Natural gas vehicles reduce GHGs between 20-23% compared with diesel HDVs and between 26-29% compared with gasoline vehicles. GHG reductions are even more dramatic when biomethane is used

# Diversifying the Transportation Fuel Portfolio

- Multiple Alt Fuels and AFV Technologies Available
  - Electricity
    - EVs, Hybrid EVs, PHEVs
  - Bio-diesel (B100) and blends
  - Ethanol
    - E85 (majority is in midwest market)
    - Oxidant additive to gasoline (e.g. E10 gasoline – perhaps to be increased)
  - Propane
  - Natural Gas
    - CNG and LNG
  - Hydrogen
    - Internal combustion engines (H/CNG blends like Hythane)
    - Fuel cells (eventually)

Achieving the goal of reduced petroleum use and improved air quality will take more than implementation of alt fuel/AFV programs....

A more comprehensive approach is needed...one that intertwines changes in behavior and technology

# Behavioral Changes and the Technologies That Facilitate Them

- Supply chain integration and management
- Trip planning and duty-cycle optimization
  - Route optimization, GPS and real-time tracking
  - Applying the right vehicle to the job  
Ex: Fed Ex re-allocated vehicles based on duty-cycle, saving millions in fuel costs
  - Innovative policies  
Ex: UPS' no left turn policy is designed to eliminate or greatly reduce left hand turns. This reduces drivers wait time and traffic lights, thus reducing fuel consumption and reducing risk



# Behavioral Changes and the Technologies That Facilitate Them



- Anti-idling policies and technologies. Idling school bus consumes .75 diesel gallons/hr and a Class 8 tractor can consume as much as 1+ gallons/hr. Much of the time, idling is unnecessary habit but when power is legitimately needed, other options are more fuel efficient and cost effective
  - Idle limiters
  - APUs
  - Batteries
  - Auto start-stop systems



# Behavioral Changes and the Technologies That Facilitate Them

- Vehicle Preventative Maintenance

Numerous studies show that well maintained vehicles run better, pollute less, get better fuel economy and last longer.....duhh!

# Behavioral Changes and the Technologies That Facilitate Them

- Vehicle Telematics

Telematics provides fleets managers with tools to mine data real time to learn about vehicle and driver performance. Typically uses GPS tracking and information transfer from multiple onboard data points such as location, speed, fuel consumption, tire pressure, etc.

Data also can provide insights into driver behavior that is fuel inefficient (and potentially dangerous)...such as speeding, fast starts/hard stops, frequent alternation between acceleration and braking, etc.

# Examples of Other Vehicle Technology Developments Driven by Economics

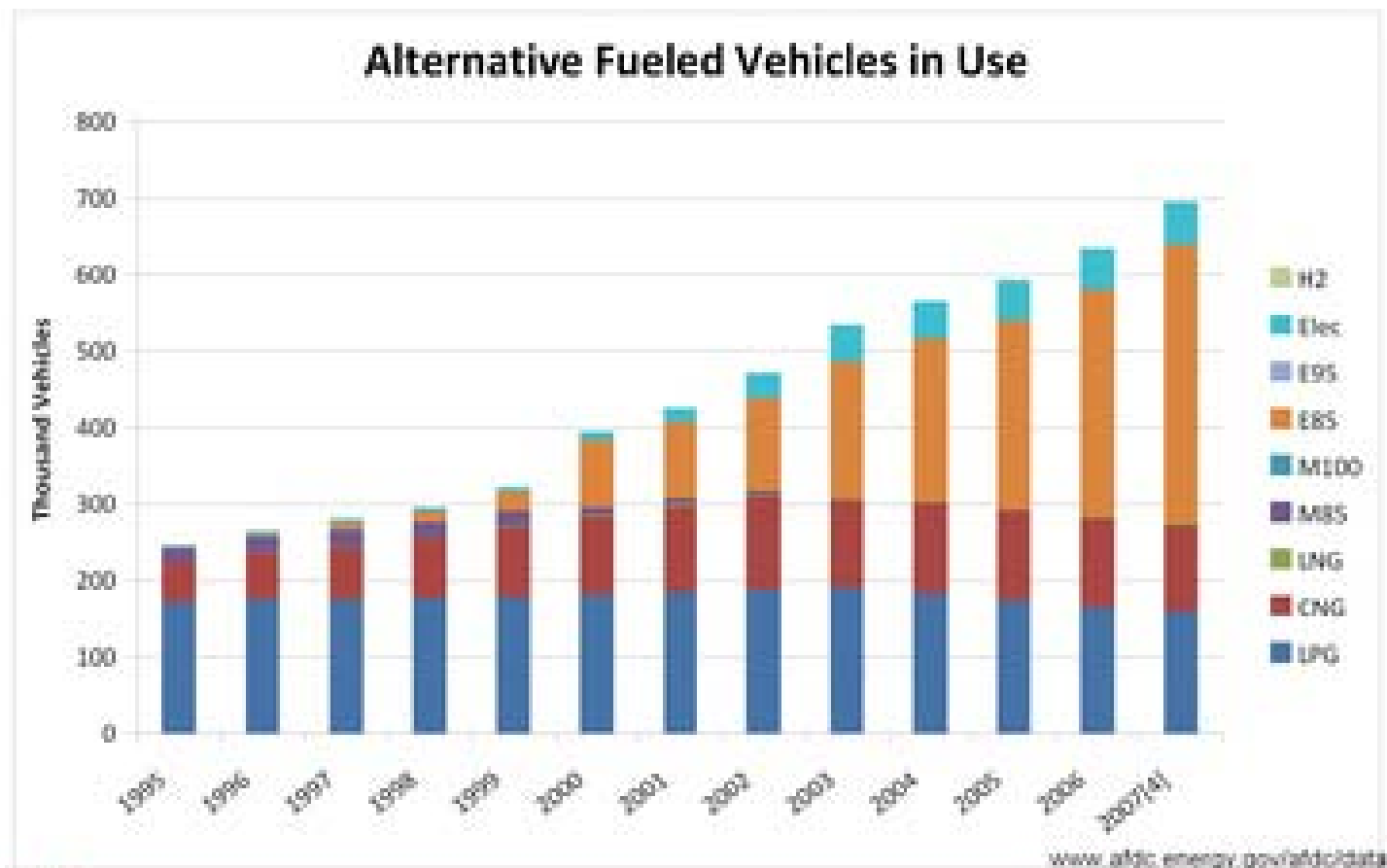
- A variety of advances have been /are being developed comprising materials, design and engineering
  - Adaptive learn engine-transmission integration technology
  - Use of composites and other lightweight materials in frame and body to reduce fuel consumption
  - Advanced low-resistance/low-friction tires
  - Aerodynamic analysis for reduced drag
  - Many others



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- 250 million LD cars on road today.... ALL AFVs = ~ 0.28%
- We need to do more, and there are HUGE opportunities



# Selection of Alt Fuel Vehicles is Growing

- More NGV models available than ever before
  - Many major MDV/HDV OEMs offering factory-built units
  - List of EPA-/CARB-certified engines and retrofit systems from SVMs is growing too
  - Detroit OEMs are re-engaging
- Propane on-road vehicle selection is expanding significantly with OEM and QVM/Tier 1 supplier relationships
  - Blue Bird Corp, Collins, Rousch, AAF/Prins, Clean Fuels USA, others
- OEMs offering more E85 Flex Fuel LDVs than ever before
- LDV hybrid selection is expanding
- Battery-electric vehicles finding acceptance and success in niche markets
- Many MD/HDV hybrid technology developments/field tests/deployments underway (Diesel-Electric, CNG-electric, Diesel-Hydraulic, CNG-hydraulic)
- Non-road developments – port yard hostlers, rail yard hostlers, power gen

# Federal/State/Regional Government Policies and Program Initiatives

- Federal Tax credits for AFVs and fueling infrastructure are helping move the market forward but expiration of fuel credits has hurt
- Mood on Capitol Hill is generally favorable although election year makes it difficult to get anything passed
- Many states offering incentives and setting pro-alt fuel policies
  - Income tax credits, grants, set-asides, deployment mandates and inducements
  - TCEQ, TERP programs are good example of proactive engagement
- Ports initiative in CA may lead to similar efforts in other states
  - Trucks, yard hostlers, ship cold-ironing, rail yard hostlers,
- Airports increasingly taking a more active role in alt fuels/AFVs
  - Consolidation of rental car facilities, terminal buses, policies that require/incent private fleets to implement AFV programs

# Summary

- Transport is in transition but there's so much more to be done to build momentum needed to "tip the scale" – economic downturn has slowed progress but when the economy recovers, fleets must be prepared for fuel price spike as fundamentals of supply-demand have not changed
- Fleets can achieve significant fuel efficiency gains by implementing sound fleet management practices aided by growing selection of advanced technologies
- Alt fuels and AFVs will ultimately help nation diversify transportation fuel mix; lessons learned today will facilitate faster market adoption later
- Texas, which has always been a leader in alt fuel and AFV market development, will be a critical player in that process

## **Thank you for this opportunity**

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