

# Propane Autogas

A Safe, Economic, and Environmentally Friendly  
Option for Fleet Vehicles

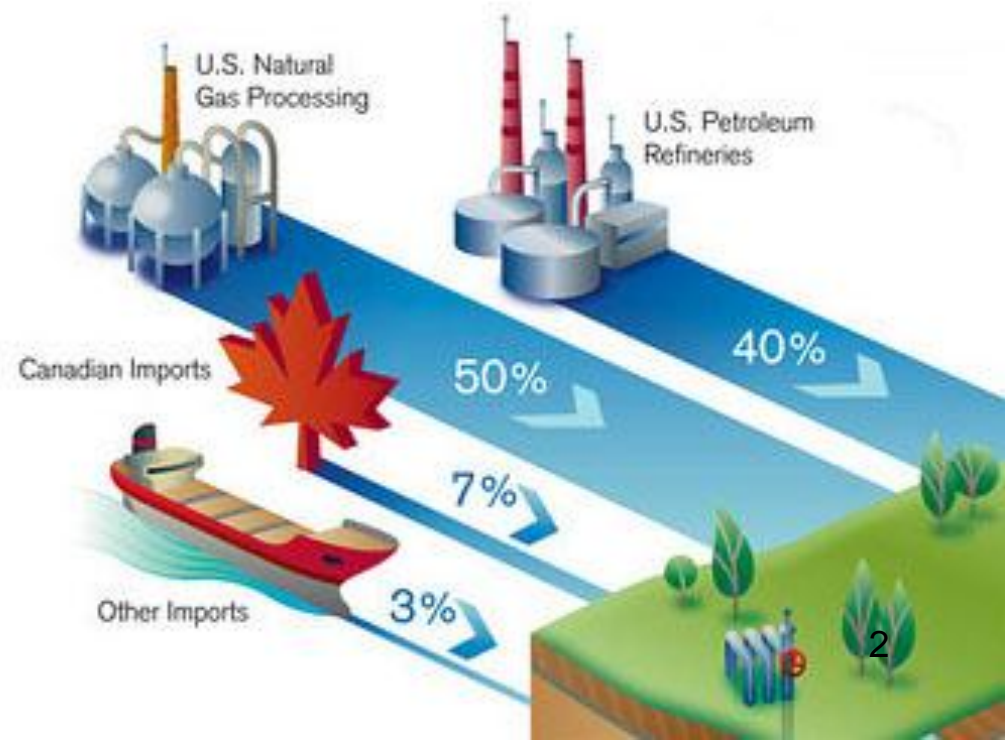
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# Domestically Produced

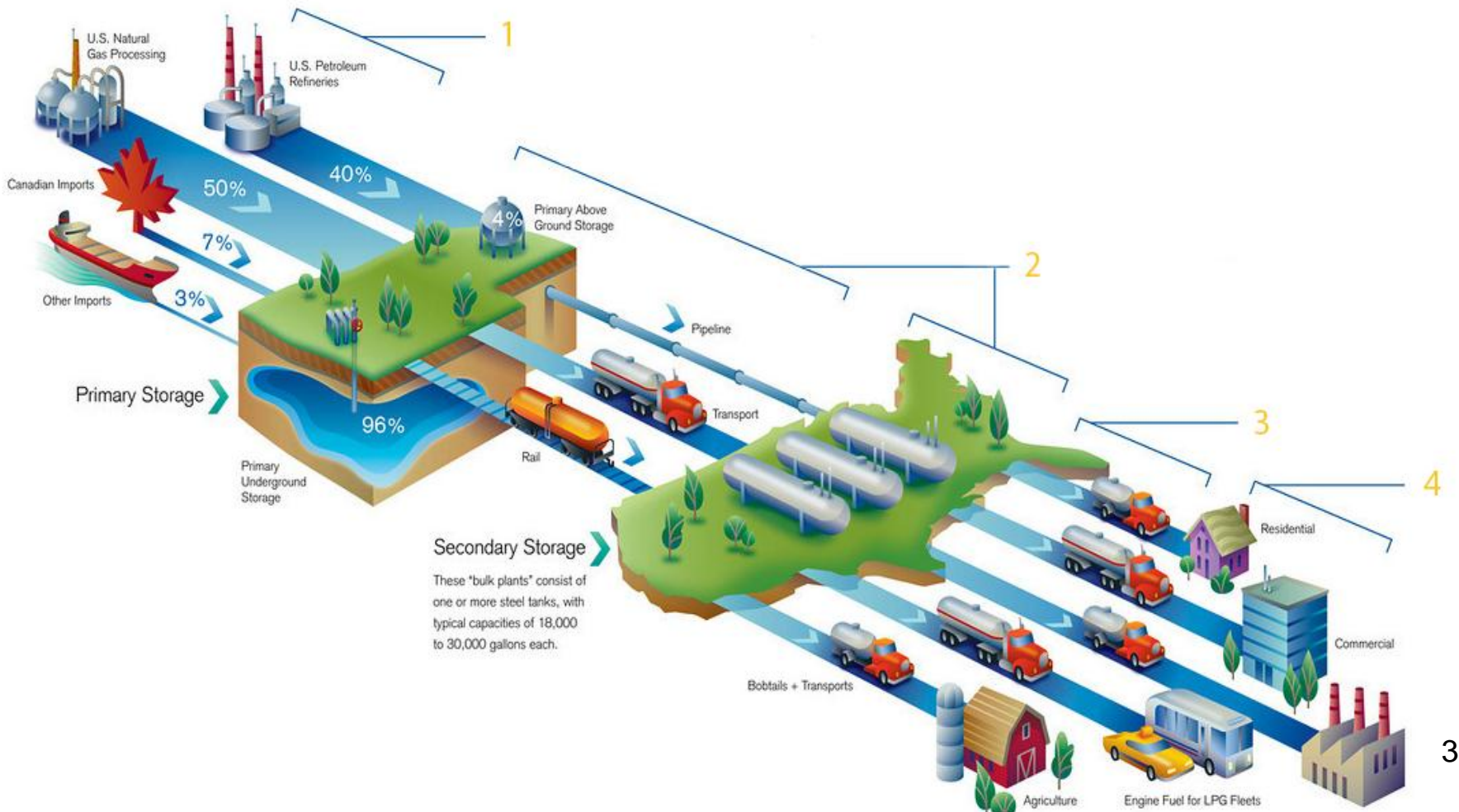
- Approximately 90 percent of propane consumed in the U.S. is produced domestically
- An additional 7 percent is produced in Canada



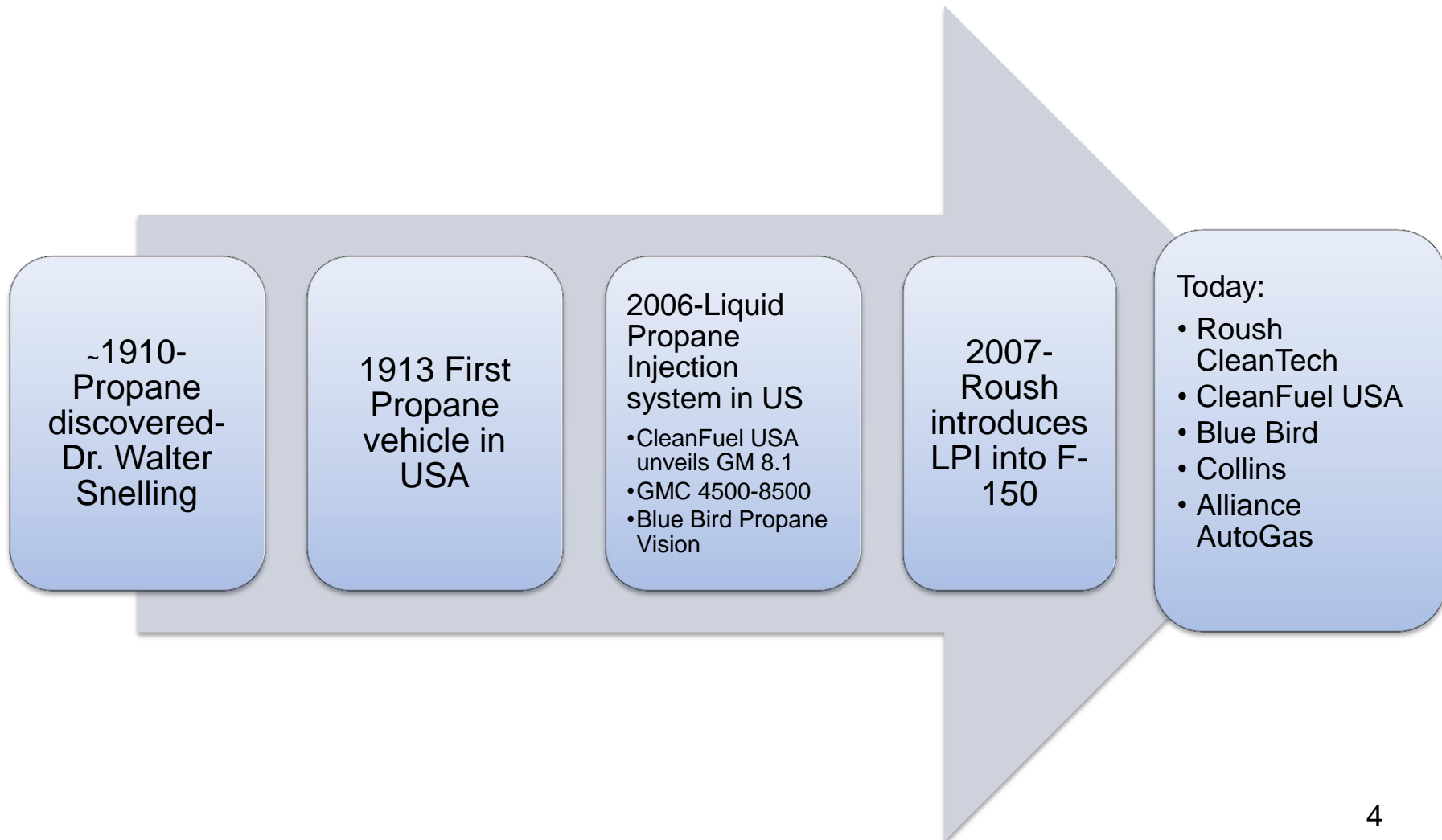


# Domestically Produced

## Propane Distribution Network



# History of propane autogas



# Propane Autogas as an Alternative Motor Fuel

~270,000 propane vehicles in US

~15M propane vehicles worldwide

Referred to as “Autogas”

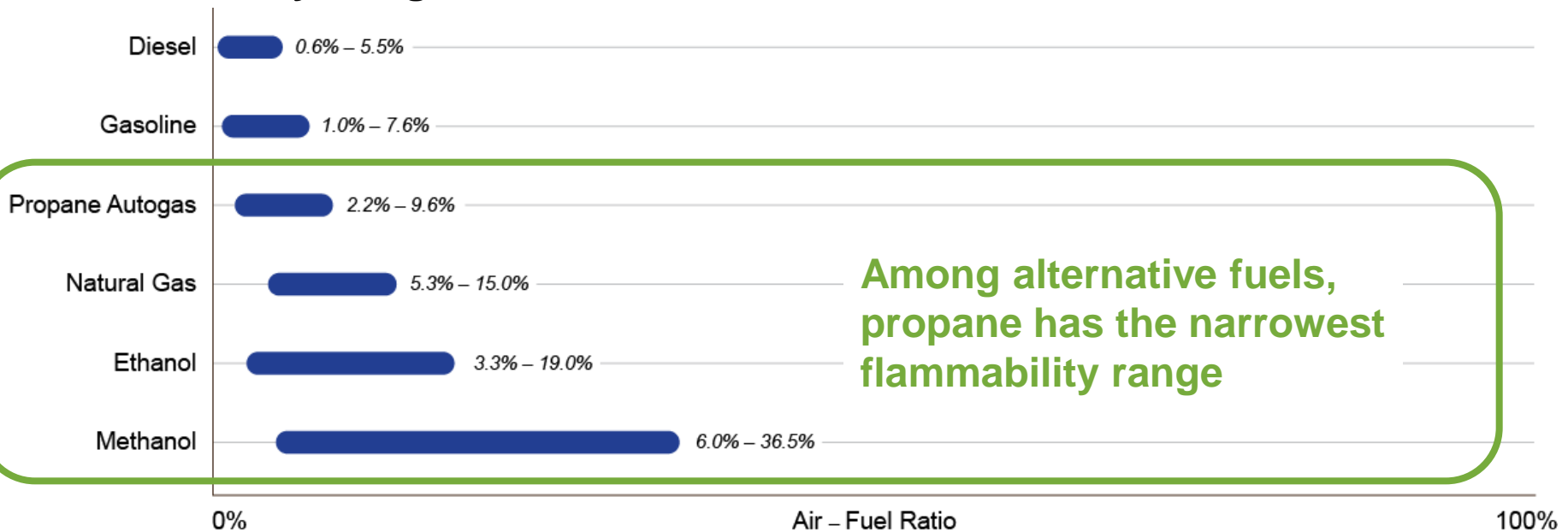
Move in US to use propane autogas for propane used in on-road applications.





# Safety Advantages of Propane Autogas

## Flammability Range







# Safety Advantages of Propane Autogas



- Built-in safety devices and shut-off valves
- Propane tanks are 20 times more puncture-resistant than gasoline tanks

# Propane-Autogas-Fueled Vehicles Meet Strict Set of Rules and Requirements



- The Department of Transportation
- National Highway Traffic Safety Administration
- Environmental Protection Agency





# Propane-Autogas-Fueled Vehicles Meet Strict Set of Rules and Requirements



- American Society of Mechanical Engineers



- National Fire Protection Association



- Underwriters' Laboratory



# Propane Properties



- Tasteless, colorless, and naturally odorless
- Propane manufacturers add odorant (ethyl mercaptan)
- Capable of being either liquid or gas; in ambient conditions, it is a gas
- Flammability range of 2.2 percent to 9.6 percent
- Approximate ignition temperature of 920 degrees Fahrenheit
- If liquid propane leaks, it will vaporize and dissipate into the air (will not puddle)

# Propane Properties



- Stored and transported as a liquid (under pressure) and can vaporize under the proper conditions
- Vaporizes at approximately -44 degrees Fahrenheit
- One cubic foot of propane will boil off (expand) into 270 feet of vapor
- If liquid propane contacts skin, immediate frostbite results

# Vehicle Identification



- Propane identification decals are mounted on the lower right rear of the vehicle (above the bumper)
- Decal is black, diamond shaped with a luminous light silver or white border, and with the word “PROPANE”

# Vehicle Components

- Fuel tank
- Fuel tank mounting and bracket system
- Fuel system and line



- Built in several shapes and sizes
- Installed in a variety of locations (depending on the type of vehicle)
- Vehicles may have more than one tank
- Tanks rated for 312 psig
- Pressure-relief valves vent to outside of vehicle
- 20 times more puncture-resistant than a gas tank
- Equipped with manual shutoff, excess flow, and automatic closure features



# Fuel Tanks

- The location of manual shutoff valves are typically marked on many vehicles

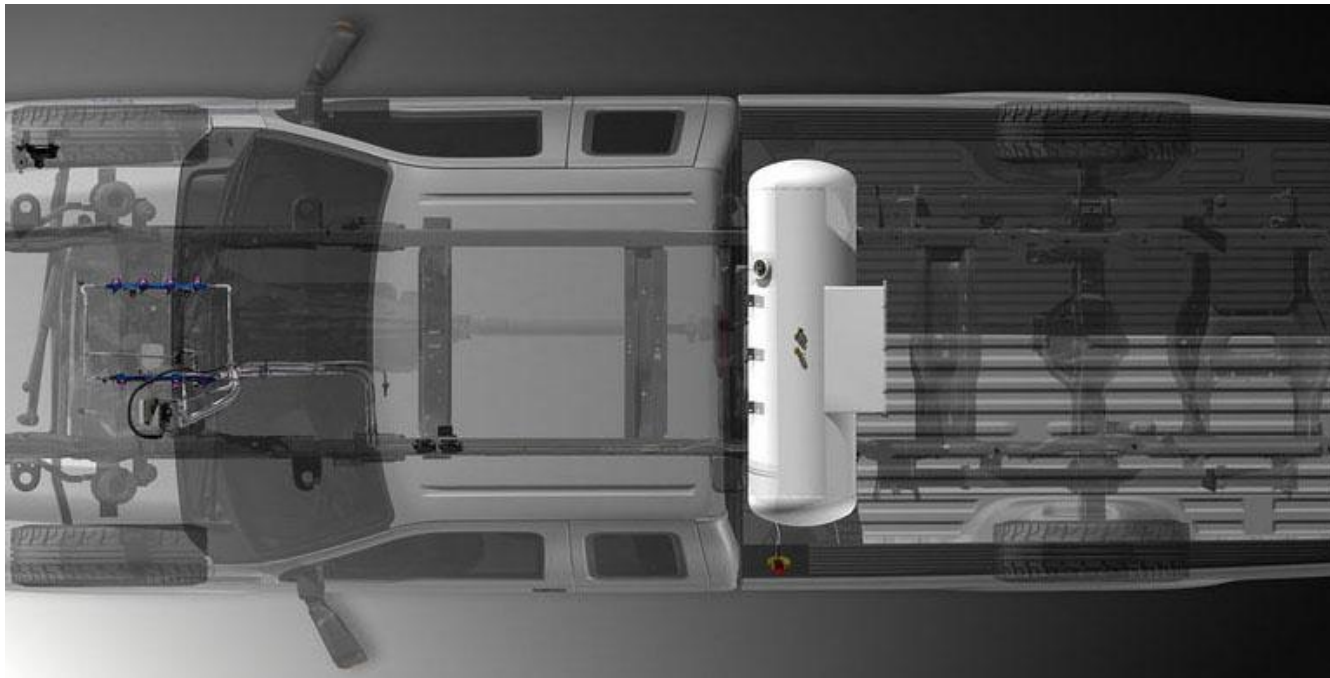


# Fuel Tank Mounting & Bracket Systems



- Fuel tanks can be mounted inside or outside of a vehicle
  - › Typical exterior mounts include:
    - Pickup truck bed
    - Under a flat or stake bed of a truck
    - Along the frame rails of a truck or bus
  - › Typical interior mounts include:
    - Trunk of a passenger car (e.g., taxi and police car)
    - Rear of a van, minivan, or SUV
    - Must be installed with protective enclosure to prevent leaks to passenger compartment
- All tanks must be protected to prevent damage from objects encountered on roadways

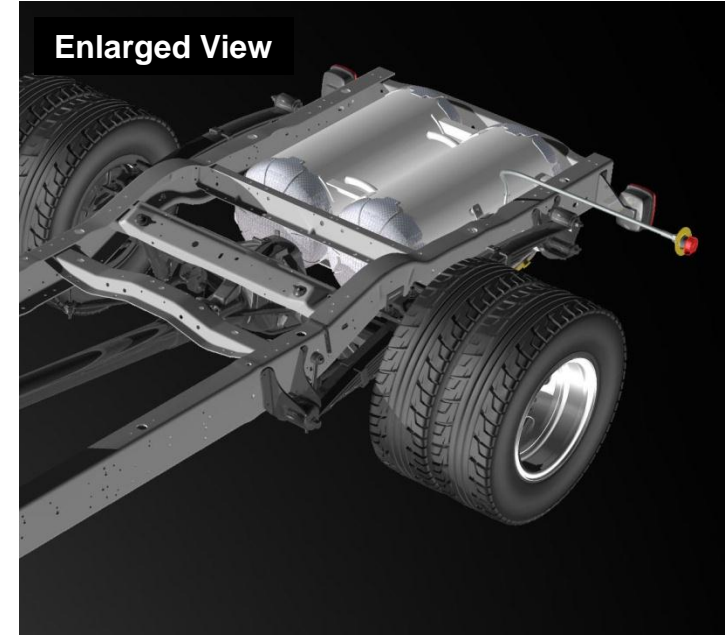
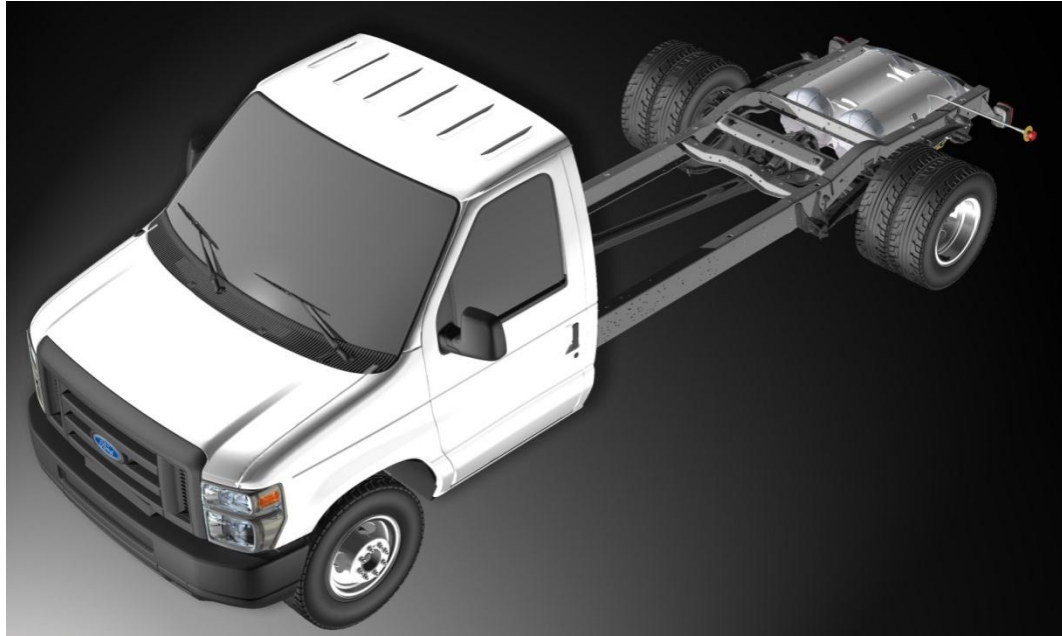
# Fuel Tank Mounting & Bracket Systems



Images courtesy of Roush CleanTech

- Exterior mount on pickup truck bed

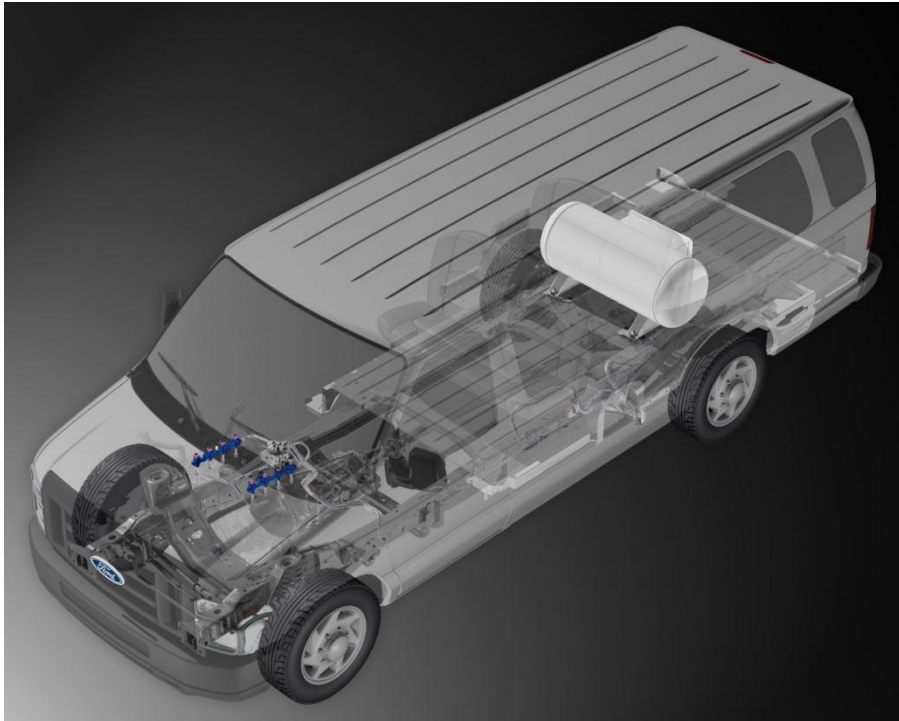
# Fuel Tank Mounting & Bracket Systems



Images courtesy of Roush CleanTech

- Exterior mount on DRW cabin chassis

# Fuel Tank Mounting & Bracket Systems



Images courtesy of Roush CleanTech

- Interior mount in van

# Fuel Tank Mounting & Bracket Systems

- Larger vehicles and buses may have bracket systems
  - › Buses utilize a bracket system that provides added protection
  - › Tanks located between bus frame rails





- Two types of fuel systems
  1. Vapor fuel injection system
    - Stored in tank in liquid form at low pressure
    - Passes through fuel line to engine, converted to vapor by a regulator
    - Vapor mixes with air and enters combustion chamber
    - Similar to a traditional vehicle carburetor system

# Fuel Systems and Lines

2. Liquid fuel injection system
  - New and popular technology
  - Liquid propane is directly injected into the combustion chamber
  - Improves engine durability and power output

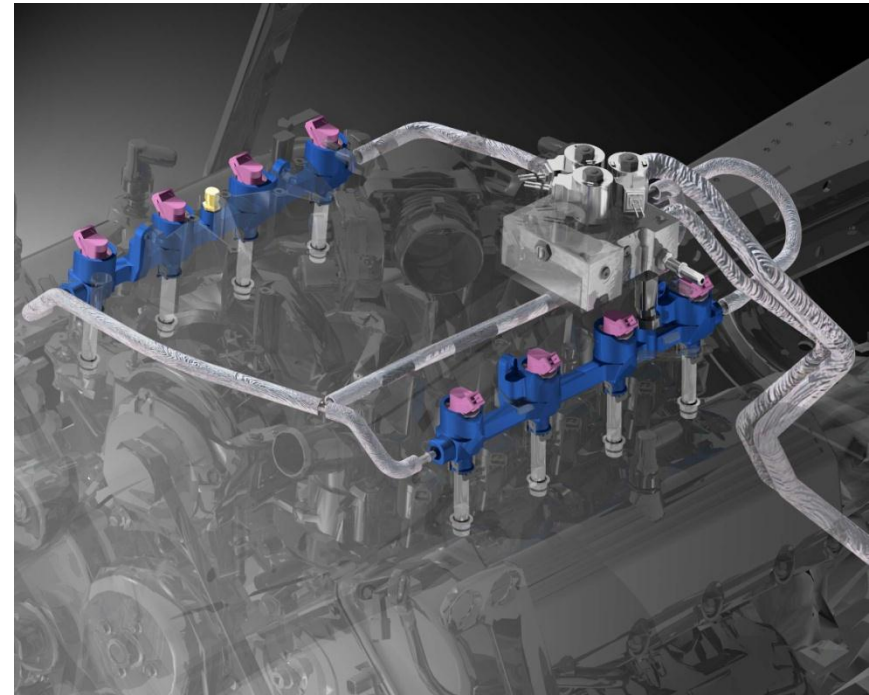


Image courtesy of Roush CleanTech

- Propane autogas fuel lines are typically routed through the vehicle in the same location as the original factory fuel lines
- Fuel lines are typically made of stainless steel to handle the varying temperatures and pressures of liquid propane
- An automatic shutoff valve prevents the flow of fuel to the engine when it is not running, even if the ignition switch is in the “on” position

# Vehicle Refueling

- Distinct differences in propane autogas dispensing systems
  - › Sealed systems
  - › Operate under higher pressure
- Above-ground storage
- Tanks filled to 80% to allow expansion



**PROPANE**

*EXCEPTIONAL ENERGY®*