In 1998, Ford Motor Company introduced its first propane*/gasoline-powered bi-fuel F-series pickup with a 5.4L engine (previous propane models featured the 4.9L engine). A bi-fuel vehicle has two separate fuel systems that enable the engine to operate on either propane or gasoline, but not at the same time. For this project, we tested the improved 1999 model year, an F-250 with a 5.4L V8 Triton bi-fuel propane/gasoline engine. The propane tank, which holds 26.8 gallons of propane, is installed in the bed of the pickup. The gasoline tank holds 30 gallons, for a combined total of nearly 57 gallons of fuel. Based on the fuel economy tests we performed, this results in a range of 225–300 miles on propane plus 340–490 miles on gasoline.

The engine in this vehicle is designed to start on propane. When the propane level in the tank falls below a set limit, the engine automatically switches to gasoline. Improvements for the 1999 model year include modifications for better fuel flow, which increases engine power. Emissions certification levels were also improved, from the low-emission vehicle (LEV) standard in 1998 to the ultra low-emission vehicle (ULEV) standard for 1999. The F-series truck comes in a variety of options to meet individual fleet needs, such as 2- or 4-wheel drive, and regular or SuperCab.

*Or liquefied petroleum gas (LPG).

**General Description**

**Engine:**
- Displacement: 5.4 liter
- Configuration: V8
- Transmission: 4-speed automatic overdrive
- Fuel System: Sequential electronic fuel injection
- Engine Family Code: XFMXA05.4JGC
- Compression Ratio: 9.0:1

**Capacities:**
- Fuel: 26.8 gal LPG/30 gal gasoline
- Passengers: 3 front/2 rear
- Cargo (cu ft): 46.7

**Dimensions:**
- Length: 224.2 in.
- Width: 65.2 in.
- GVWR*: 6800 lb

**Other Options:**
- Rear wheel drive, 4X2, SuperCab truck equipped with air conditioning, power steering, power brakes, tilt wheel, antilock brake system (ABS), and cruise control. This vehicle was also equipped with front and rear disk brakes.

*Soak time allows the vehicle to stabilize at a given temperature.
Evaluation results for the bi-fuel F-250 pickup show very little difference in braking, driveability, or handling when tested on either gasoline or LPG. Fuel economy for the F-250 operating on LPG was 26% to 28% less than that measured when operating on gasoline. This is expected because LPG has about 27% less energy per gallon than gasoline. Acceleration tests showed slightly lower results when the pickup was operating on LPG. Differences ranged between 1.5% and 7% quicker for the gasoline acceleration tests. Evaluators for the driveability and handling test gave good overall marks to the F-250 pickup. Ratings were similar when tested on either fuel, with one exception. Although the acceleration times were close, evaluators noticed slower acceleration when operating on LPG. During the cold start tests, the F-250 started at -20°F on gasoline. According to the Owners Guide Supplement for the LPG F-250, the system is designed to start on gasoline if the ambient temperature falls below 20°F. To confirm this, we tested the bi-fuel at -20° F with the LPG tank full, and the gasoline tank empty. As expected, the engine attempted to start on gasoline, but was unsuccessful. A subsequent test at 20°F on LPG proved successful. Emissions results for the F-250 were below the ULEV certification standard for both fuels. Non-methane hydrocarbon and carbon dioxide emissions were lower for the LPG tests; carbon monoxide and oxides of nitrogen emissions were higher. The biggest emissions benefit of LPG shows up in the results for total potency weighted toxics (including benzene, 1,3-butadiene, formaldehyde, and acetaldehyde)*. Potency weighted toxics emissions for the LPG test were 98% lower than those from the gasoline test.

For more information on the calculation of potency weighted toxic emissions, see the section on emissions on the Web site (http://www.ott.doe.gov/otu/field_ops/nve).