## Alternative Fuels Data Center
### Fuel Properties Comparison

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<table>
<thead>
<tr>
<th>Physical State</th>
<th>Gasoline/E10</th>
<th>Low Sulfur Diesel</th>
<th>Biodiesel</th>
<th>Propane (LPG)</th>
<th>Compressed Natural Gas (CNG)</th>
<th>Liquefied Natural Gas (LNG)</th>
<th>Ethanol/E100</th>
<th>Methanol</th>
<th>Hydrogen</th>
<th>Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid</td>
<td>Liquid</td>
<td>Liquid</td>
<td>Liquid</td>
<td>Compressed Gas (lighter than air)</td>
<td>Cryogenic Liquid (lighter than air as a gas)</td>
<td>Liquid</td>
<td>Liquid</td>
<td>Compressed Gas (lighter than air) or Liquid</td>
<td>Electricity</td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td>40–55 (d)</td>
<td>N/A</td>
<td>48–65 (d)</td>
<td>N/A</td>
<td>N/A</td>
<td>0–54 (e)</td>
<td>N/A</td>
<td>130+ (g)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>84–93 (f)</td>
<td>N/A</td>
<td>105 (g)</td>
<td>120+ (h)</td>
<td>120+ (h)</td>
<td>110 (i)</td>
<td>55°F (j)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Cetane Number

- Gasoline/E10: N/A
- Low Sulfur Diesel: 40–55 (d)
- Biodiesel: N/A
- Propane (LPG): N/A
- Compressed Natural Gas (CNG): 120+ (h)
- Liquefied Natural Gas (LNG): N/A
- Ethanol/E100: 55°F (j)
- Methanol: N/A
- Hydrogen: 120+ (h)
- Electricity: N/A

### Pump Octane Number

- Gasoline/E10: 84–93 (f)
- Low Sulfur Diesel: N/A
- Biodiesel: N/A
- Propane (LPG): 105 (g)
- Compressed Natural Gas (CNG): 120+ (h)
- Liquefied Natural Gas (LNG): 120+ (h)
- Ethanol/E100: 110 (i)
- Methanol: N/A
- Hydrogen: 120+ (h)
- Electricity: N/A

### Flash Point

- Gasoline/E10: -45°F (j)
- Low Sulfur Diesel: 165°F (j)
- Biodiesel: 212° to 338°F (d)
- Propane (LPG): -100° to -150°F (j)
- Compressed Natural Gas (CNG): -300°F (j)
- Liquefied Natural Gas (LNG): 1,004°F (k)
- Ethanol/E100: 793°F (j)
- Methanol: 897°F (j)
- Hydrogen: 1,050° to 1,080°F (j)
- Electricity: N/A

### Autoignition Temperature

- Gasoline/E10: 495°F (j)
- Low Sulfur Diesel: ~600°F (j)
- Biodiesel: 850° to 950°F (j)
- Propane (LPG): 1,004°F (j)
- Compressed Natural Gas (CNG): 1,004°F (k)
- Liquefied Natural Gas (LNG): 793°F (j)
- Ethanol/E100: 897°F (j)
- Methanol: 1,050° to 1,080°F (j)
- Hydrogen: 1,050° to 1,080°F (j)
- Electricity: N/A

### Maintenance Issues

- Gasoline/E10: Lubricity is improved over that of conventional low sulfur diesel fuel. For more maintenance information see the Biodiesel Handling and Use Guidelines—Fifth Edition. (d)
- Low Sulfur Diesel: High-pressure tanks require periodic inspection and certification.
- Biodiesel: LNG is stored in cryogenic tanks with a specific hold time before the pressure build is relieved, the vehicle should be operated on a schedule to maintain a lower pressure in the tank.
- Propane (LPG): Special lubricants may be required. Practices are very similar, if not identical, to those for conventionally fueled operations.
- Compressed Natural Gas (CNG): Special lubricants must be used as directed by the supplier as well as M-85-compatible replacement parts. Can cause serious damage to organs in the body if a person swallows it, breathes it in, or gets it on their skin.
- Liquefied Natural Gas (LNG): When hydrogen is used in fuel cell applications, maintenance should be very minimal. High-pressure tanks require periodic inspection and certification.
- Ethanol/E100: Manufacturing and transportation accounts for approximately 30% of total U.S. energy needs and 70% of petroleum consumption. (l)
- Methanol: Biodiesel is domestically produced, renewable, and reduces petroleum use 95% throughout its lifecycle (m).
- Hydrogen: Manufactured using oil. Transportation accounts for approximately 30% of total U.S. energy needs and 70% of petroleum consumption. (l).
- Electricity: Electricity is produced domestically from a wide range of sources, including through coal fired power plants and renewable sources, making it a versatile fuel.

### Energy Security Impacts

- Gasoline/E10: Manufactured using oil. Transportation accounts for approximately 30% of total U.S. energy needs and 70% of petroleum consumption. (l).
- Low Sulfur Diesel: Manufactured using oil. Transportation accounts for approximately 30% of total U.S. energy needs and 70% of petroleum consumption. (l).
- Biodiesel: Biodiesel is domestically produced, renewable, and reduces petroleum use 95% throughout its lifecycle (m).
- Propane (LPG): Approximately half of U.S. LPG is derived from oil, but no oil is imported specifically for LPG production.
- Compressed Natural Gas (CNG): CNG is domestically produced from natural gas and renewable biogas. The United States has vast natural gas reserves.
- Liquefied Natural Gas (LNG): LNG is domestically produced from natural gas and renewable biogas. The United States has vast natural gas reserves.
- Ethanol/E100: Ethanol is produced domestically and can be produced from renewable sources.
- Methanol: Methanol is produced domestically, and can be produced from renewable sources.
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Notes
[1] Standard Chemical Formulas represent idealized fuels. Some table values are expressed in ranges to represent typical fuel variations that are encountered in the field.
[2] GGE table values reflect BTU range for common gasoline baseline references (E0, E10, and indolene certification fuel).
[3] The type of meter or dispensing equipment being used to fuel vehicles must be taken into consideration. For fast-fill stations that dispense CNG with Coriolis flow meters, which measure fuel mass and report fuel dispensed on a “gallon of gasoline-equivalent” (GGE) basis, the lbs./GGE factor should be used. For time-fill stations or other applications that use traditional residential and commercial gas meters that measure/record in units of cubic feet, the CF/GGE factor should be used.
[5] E85 is a high-level gasoline-ethanol blend containing 51% to 83% ethanol, depending on geography and season. Ethanol content is lower in the winter months in cold climates to ensure a vehicle starts. Based on composition, E85’s lower heating value varies from 83,950 to 95,450 Btu/gal.
[7] Lithium Ion energy densities increased by a factor of 3.4, when used for transportation, to account for the increased efficiencies of electric vehicle drivetrains relative to the internal combustion engine.

Sources
(e) American Petroleum Institute [API], Alcohols and Ethers, Publication No. 4261, 3rd ed. (Washington, DC, June 2001), Table 2.
(g) American Petroleum Institute [API], Alcohols and Ethers, Publication No. 4261, 3rd ed. (Washington, DC, June 2001), Table B-1.