

refuel



San Diego Regional Alternative Fuel
Coordinating Council

Overview of Alternative Fuels

Electricity

Plug-in Electric Vehicles (PEVs) use energy stored in a battery for vehicle propulsion. Plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs) are two types of electric vehicles powered by a source of electricity external to the vehicle, such as the electricity grid or a distributed energy source. PHEVs are powered by an internal combustion engine (ICE) and a rechargeable battery, which displaces some or all of the need for ICE power and gasoline consumption. BEVs run on electric motors powered entirely by rechargeable battery packs. In both BEV and PHEV technologies the batteries must be charged externally (i.e. plugged-in). Light duty passenger vehicles make up the majority of PEVs, however some medium and heavy duty models are available.

Biodiesel

Biodiesel is a renewable, domestically produced, non-petroleum-based fuel for diesel engines. The fuel is manufactured from vegetable oils, animal fats, or recycled restaurant greases. Biodiesel is simple to use, biodegradable, nontoxic, and essentially free of sulfur and aromatics.

Pure biodiesel (B100) contains no petroleum, but it can be blended at any level with petroleum diesel to create a biodiesel blend. Typical biodiesel blends range from 5 to 99 percent, with B5 (5% biodiesel, 95% petroleum diesel) and B20 (20%/80%) the most common fleet choices. Biodiesel can be legally blended with petroleum diesel in any percentage. Unmodified diesel engines can potentially run on any blend of biodiesel. Blends greater than B20 are not typically recommended for use without at least some engine modifications, and may void the engine warranty. Biodiesel blends below B5 are considered diesel fuel and can be used in all diesel vehicles.

Ethanol

Ethanol is a renewable, domestically produced alcohol-based fuel derived from various plant materials including corn, sugar cane, and grasses. Ethanol is produced by fermenting and distilling starch crops that have been converted into simple sugars.

More than 95 percent of the gasoline in California contains a low-level blend of ethanol (6-10%) to oxygenate the fuel and reduce air pollution. E85 (85% ethanol, 15% gasoline) is considered an alternative fuel that can be used in flexible fuel vehicles (FFVs). FFVs are capable of operating interchangeable on gasoline and E85. American-made light-duty trucks, vans and sport utility vehicles are commonly available in flex-fuel models, however most never utilize E85.

Natural Gas

Natural gas is a mixture of hydrocarbons, primarily made up of methane (CH₄). Natural gas is a clean-burning, domestically produced fuel that generates significantly fewer emissions than conventional gasoline or diesel when used to power vehicles. The majority of natural gas for fuel use in the United States is a non-renewable fossil fuel extracted from gas and oil wells. Smaller amounts are derived from supplemental sources such as synthetic gas, landfill gas, and other biogas resources. Because of the gaseous nature of this fuel, it must be stored onboard a vehicle in either a compressed gaseous (compressed natural gas) or liquefied (liquefied natural gas) state.

In Compressed natural gas (CNG) the natural gas is compressed at pressures of up to 3,600 pounds per square inch, stored on-board a vehicle in specially designed and constructed cylinders. Vehicles that run on natural gas have engines and fuel systems that are optimized for gaseous fuel use. To store more energy onboard a vehicle in a smaller volume, natural gas can be liquefied. Liquefied natural gas (LNG) is clear, colorless, and odorless. To produce LNG, natural gas is purified and condensed into liquid by cooling to -260°F (-162°C). Because it must be kept at such cold temperatures, LNG is stored in double-wall, vacuum-insulated pressure vessels. LNG fuel systems typically are used only with heavy-duty vehicles. Various classes of natural gas vehicles are available from sedans to heavy-duty trucks.

Propane

Propane, also known as liquefied petroleum gas (LPG) or autogas is produced from both natural gas processing and crude oil refining. Compared to gasoline or diesel, natural gas produces lower carbon dioxide, carbon monoxide and nonmethane hydrocarbon emissions. Propane can be turned into a liquid at a moderate pressure (160 pounds per square inch [psi]) and is stored in pressure tanks at about 200 psi at 100° F. When propane is drawn from a tank, it changes to a gas before it is burned in the engine. Propane is commonly used to fuel, light and medium-duty trucks, vans, and shuttle buses.

Hydrogen

Hydrogen can be produced for use as a transportation fuel in fuel-cell vehicles (FCVs). Fuel cells generate electricity through an electrochemical process, turning hydrogen and oxygen into electricity to power an electric motor which drives the vehicle. FCVs are zero-emission vehicles that emit only water vapor and warm air from the tailpipe. Hydrogen can be produced through reforming hydrocarbon fuels like natural gas or electrolyzing water. Hydrogen can be produced by reformation or electrolysis at the fueling station itself or produced elsewhere and delivered by truck or pumped through a pipeline. Hydrogen is stored onboard the vehicle in very high pressure tanks (10,000 psi).

Today, little hydrogen is produced for use as a vehicle fuel, and hydrogen for industrial purposes is produced through the reformation of natural gas. Hydrogen has the potential to be produced from low-carbon renewable resources, providing significant GHG benefits from well to wheels when used in a fuel cell vehicle.