




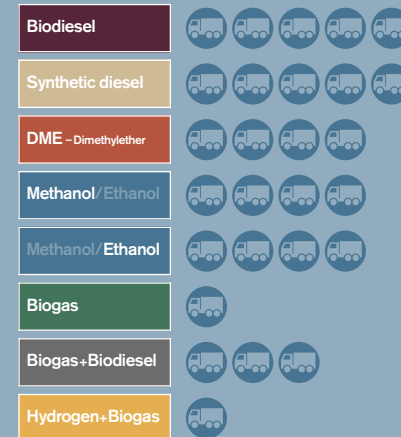


The following is an overall assessment of the technical complexity of adapting vehicles to use the new fuels.

Assessment includes the effects of various parameters – such as maximum engine performance, increased weight and range between refuelling – on vehicle efficiency. The last of these, for example, may affect vehicle payload.

The complexity of adaptation includes factors that necessitate additional fuel storage capacity, and require new and more expensive components, as well as the technology needed to meet future emission standards. As an example, some fuels require more advanced emission control systems than others.

-  **Suitable for all heavy applications; no special vehicle adaptation required.**
-  **Suitable for most applications; no expensive or extensive vehicle adaptation required.**
-  **Suitable for most applications; expensive and extensive vehicle adaptation required.**
-  **Suitable for up to half of all applications; complex, expensive and extensive vehicle adaptation required.**
-  **Suitable for only a limited number of applications; major, expensive and extensive vehicle adaptation required.**



Biodiesel and synthetic diesel receive the highest rating. Vehicles powered by these fuels are essentially comparable with conventional diesels. However, biodiesel necessitates more service and generates higher nitrogen oxide emissions.

Although the lower energy content of DME reduces vehicle range by 50 percent, the fuel can still be used for long-haul transport. While it requires a unique and advanced fuel system, DME also offers savings in terms of the cost and weight of exhaust silencing and post-treatment systems.

The lower energy content of ethanol reduces the range of the vehicle by 30 percent per tank of fuel.

Although biogas+biodiesel offers maximum engine performance, vehicle range is cut by half if the gas is in liquid form. In addition, two separate fuel systems are required.

Biogas and hydrogen+biogas require an Otto engine, which limits power output. The low energy density of the compressed gas limits the range of the vehicle to approximately 20 percent of that of a diesel. Cost and weight are increased by a complex fuel tank system.