Fuel Cell Emission and Fuel Economy Compliance

EPA
Office of Air and Radiation
Office of Transportation and Air Quality

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Background

Fuel Cell Vehicle Classifications

Direct Hydrogen - fueled directly with gaseous or liquid hydrogen.

Reformer - fueled with hydrogen reformed from gasoline, methanol or other sources.

APU - Auxiliary Power Unit, used to provide accessory power. Can be either direct hydrogen or reformer.

Legal Review

FCVs must certify compliance with emission standards.

Fuel economy must be calculated for all fuel cell vehicles.

No defeat devices are allowed.

Direct Hydrogen FCVs

Testing Requirements

- Automatically classified as a ZEV
- No tailpipe emission testing is required.
- Fuel economy testing is required.
- Defeat device evaluation.

Reformer FCVs

Manufacturers must demonstrate emissions compliance.

- Reformer emissions must be measured. These emissions will be included on FTP/SFTP/EVAP testing as appropriate. This will be determined on a case by case basis.
- Fuel economy testing is required.
- Unregulated pollutant evaluation.
- Defeat device evaluation.

Fuel Cell APU Equipped Vehicles

Federal Emission Certification and Confirmatory Test Requirements

- Must meet the same requirements as a conventional vehicle with the exception that the emissions and fuel consumption of the APU must be accounted for in the test results.
- Since the use of APUs is very limited and each has unique operating parameters that must be evaluated individually, how the emissions and fuel consumption are accounted for is determined on an individual basis before the application for certification has been submitted.

Certification Confirmatory Test Requirements

For vehicles with on board energy storage devices such as batteries or capacitors:

- All energy used by the vehicle must be accounted for in the fuel economy calculation.
- One way to accomplish this is to have the state of charge at the end of a test greater to or equal to the beginning value.
- Other methods will be evaluated on a case by case basis.

Certification Confirmatory Test Requirements

For Direct Hydrogen FCVs:

For now, fuel consumption will be reported in miles/kg until more information is available on how hydrogen will be marketed.

Fuel consumption testing will follow the draft SAE J2527 test procedure.

Certification Confirmatory Test Requirements

For Direct Hydrogen FCVs:

Three methodologies are being developed:

Gravametric - An off-board hydrogen tank is used to supply fuel. The mass of the tank is determined before and after each test phase. The mass of fuel used can be directly calculated.

Pressure/Temperature - The stabilized pressure and temperature of a hydrogen source of known volume is measured before and after each test phase and the mass of fuel can be calculated.

Mass flow meter - Direct flow measurement

Certification Confirmatory Test Requirements

Examples of cases requiring individual evaluation:

- Hybrid FCVs that operate off a battery until the fuel cell is at operating temperature.
- Reformers that do not operate continuously or in a non-homogeneous cycle.
- APUs that are only operated under specific conditions or only when commanded by the operator.