Text proposal to incorporate Fuel Cell Vehicles under GTR21

Prepared by China
EVE-87

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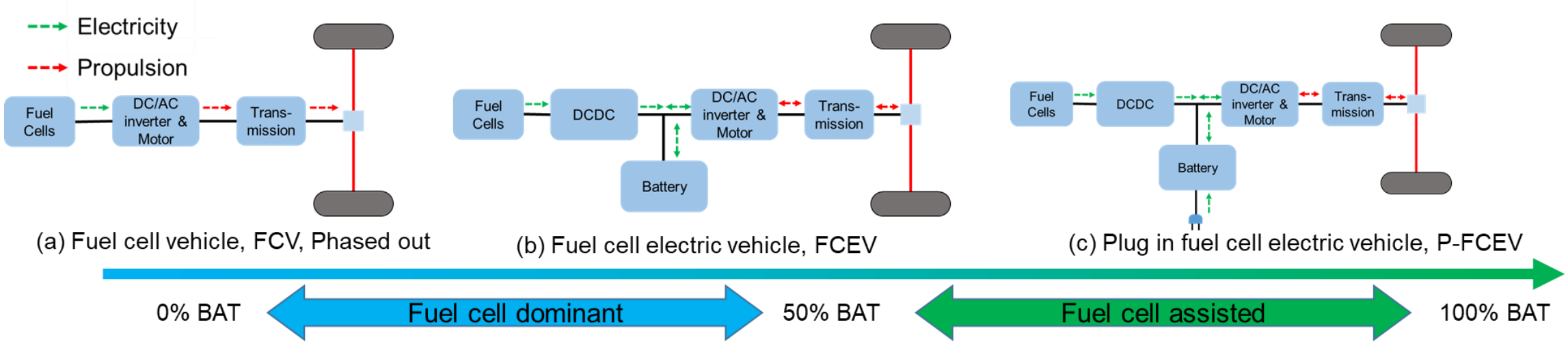
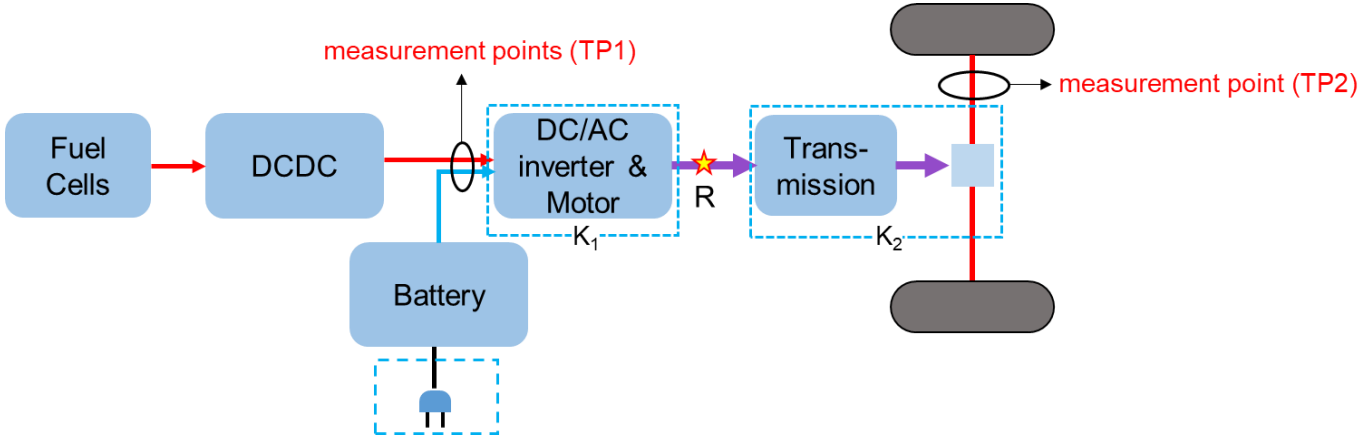
GTR21: To incorporate fuel cell vehicles under GTR21

- Powertrain configurations for fuel cell vehicle



- Fuel cells generate electrical energy rather than mechanical energy, similar to battery. According to the definition of power determination reference point, the reference point of fuel cell vehicles should be situated at the output of the motor, **both TP1 and TP2 are applicable to FCVs.**



- Here TP1 may be performed by measuring current and voltage at the input of DC/AC inverter and motor (corrected by K_1) to determine the power at R.
- TP2 may be performed by measuring the torque and speed at the drive wheels or axle hubs (corrected by K_2) to determine R.

Proposed contents of text revision on GTR21

● Original

2. Scope and application

2.1. This UN GTR applies to vehicles that meet all of the following criteria (a) through (c):
(a) Are hybrid electric vehicles, or are pure electric vehicles that have more than one propulsion energy converter;

2.2. This UN GTR does not apply to fuel cell vehicles.

4. Abbreviations

6.3. Preparation of vehicle

The vehicle shall be presented in good technical condition and shall be run-in in accordance with the manufacturer's recommendations.

OVC-HEVs and NOVC-HEVs shall have been run-in and driven between 3,000 and 15,000 km before the test. The engine, transmission and vehicle shall be run-in in accordance with the manufacturer's recommendations.

PEVs shall have been run-in at least 300 km or one full charge distance, whichever is longer.

…

Fuel shall be the same fuel that was used for certification of the ICE, if equipped. For example, the fuel specified in UN ECE Regulation No. 85 shall be used for vehicles equipped with an ICE certified under that regulation.

The Hydrogen refueling quantity does not affect the fuel cell output power and only needs to satisfy the vehicle manufacturer's requirements.

● Proposal

2. Scope and application

2.1. This UN GTR applies to vehicles that meet all of the following criteria (a) through (c):
(a) Are hybrid electric vehicles, are pure electric vehicles that have more than one propulsion energy converter, or are fuel cell vehicles;

2.2. ~~This UN GTR does not apply to fuel cell vehicles.~~

4. Abbreviations

FCV Fuel cell vehicle

6.3. Preparation of vehicle

The vehicle shall be presented in good technical condition and shall be run-in in accordance with the manufacturer's recommendations.

OVC-HEVs and NOVC-HEVs shall have been run-in and driven between 3,000 and 15,000 km before the test. The engine, transmission and vehicle shall be run-in in accordance with the manufacturer's recommendations.

PEVs shall have been run-in at least 300 km or one full charge distance, whichever is longer.

FCVs shall have been run-in in accordance with the manufacture's recommendations. The fuel cell shall be run-in at least 300 km.

…

Fuel shall be the same fuel that was used for certification of the ICE, if equipped. For example, the fuel specified in UN ECE Regulation No. 85 shall be used for vehicles equipped with an ICE certified under that regulation.

Hydrogen shall be refueled in accordance with the manufacturer's recommendations.

Proposed contents of text revision on GTR21

● Original

6.5. Initial charge of REESS

For PEVs and OVC-HEVs, prior to or during vehicle soak (6.6), the REESS shall be charged to an initial SOC at which maximum system power is obtained. The manufacturer may specify the initial SOC at which maximum system power is obtained.

6.8. Test sequence

6.8.1. General

The test shall be carried out in accordance with 6.8.3. to 6.8.8., and 6.9. to 6.10. (see Figure 23). The test shall be stopped immediately if warning indicator(s) with regard to the powertrain turns on.

Note: Warnings are coolant temperature and engine check lamp, for example.

The following operational metrics, if present, shall be monitored and recorded throughout the test: (a) engine coolant temperature, (b) battery temperature (as indicated by temperature of battery cells, modules, or pack, as available), (c) transmission or gearbox oil temperature, (d) battery SOC, (e) electric machine temperature (as Indicated by temperature of stator, rotor, or cooling fluid, as available). The manufacturer shall specify the normal operating range for each operational metric.

● Proposal

6.5. Initial charge of REESS

For PEVs, OVC-HEVs and FCVs, prior to or during vehicle soak (6.6), the REESS shall be charged to an initial SOC at which maximum system power is obtained. The manufacturer may specify the initial SOC at which maximum system power is obtained.

6.8. Test sequence

6.8.1. General

The test shall be carried out in accordance with 6.8.3. to 6.8.8., and 6.9. to 6.10. (see Figure 23). The test shall be stopped immediately if warning indicator(s) with regard to the powertrain turns on.

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The following operational metrics, if present, shall be monitored and recorded throughout the test: (a) engine coolant temperature, (b) battery temperature (as indicated by temperature of battery cells, modules, or pack, as available), (c) transmission or gearbox oil temperature, (d) battery SOC, (e) electric machine temperature (as Indicated by temperature of stator, rotor, or cooling fluid, as available), (f) fuel cell temperature. The manufacturer shall specify the normal operating range for each operational metric.

Temperature heavily influences the output power of the fuel cell, relatively high temperature or relatively low temperature would yield a decrease in the output power.

Proposed contents of text revision on GTR21

● Original

Annex 1

2.5.3.	TP2 may be performed by measuring the torque and speed at the right-side axle (corrected by K2(l)) to determine the sum of RI and R2, and measuring the torque and speed at the left-side axle (corrected by K2(2)) to determine R3.
2.6.	Other architectures
2.6.1	Reference points for other architectures not listed in this Annex, or for variations in the listed architectures, shall be selected in conformity with the definition of power determination reference point in 3.5. and in a manner consistent with the principles and guidelines discussed herein. Selection of power determination reference points is subject to approval by the responsible authority.

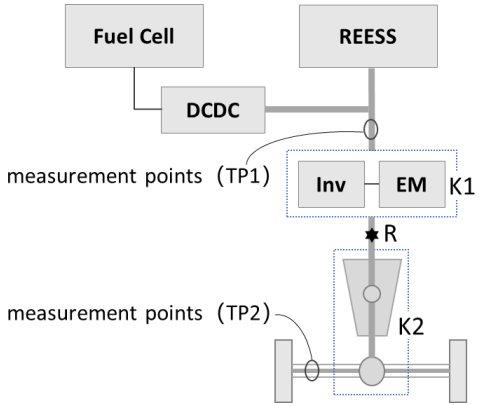
Fuel cell architectures exhibit distinct differences compared to other architectures. They exhibit different power flow path and they impose specific requirements regarding vehicle readiness and monitoring metrics, thus necessitating their classification as a distinct architecture.

● Proposal

Annex 1

2.5.3.	TP2 may be performed by measuring the torque and speed at the right-side axle (corrected by K2(l)) to determine the sum of RI and R2, and measuring the torque and speed at the left-side axle (corrected by K2(2)) to determine R3.
2.6.	Fuel cell architectures
2.6.1	The power determination reference points for Fuel cell architectures (example in Figure 29) are generally the mechanical power output shaft(s) of any electric machines that provide mechanical power to the road.

Figure 29
Example of power determination reference point for a Fuel cell architecture



Note: measurement point for TP2 represents both axle shafts.

2.6.2	Here TP1 may be performed by measuring current and voltage at the input of DC/AC inverter and motor (corrected by K1) to determine the power at R.
2.6.3	TP2 may be performed by measuring the torque and speed at the drive wheels or axle hubs (corrected by K2) to determine R.
2.7	Other architectures