Comparison of Heavy Duty Hybrid Test Procedures Drafted in GTR n°4
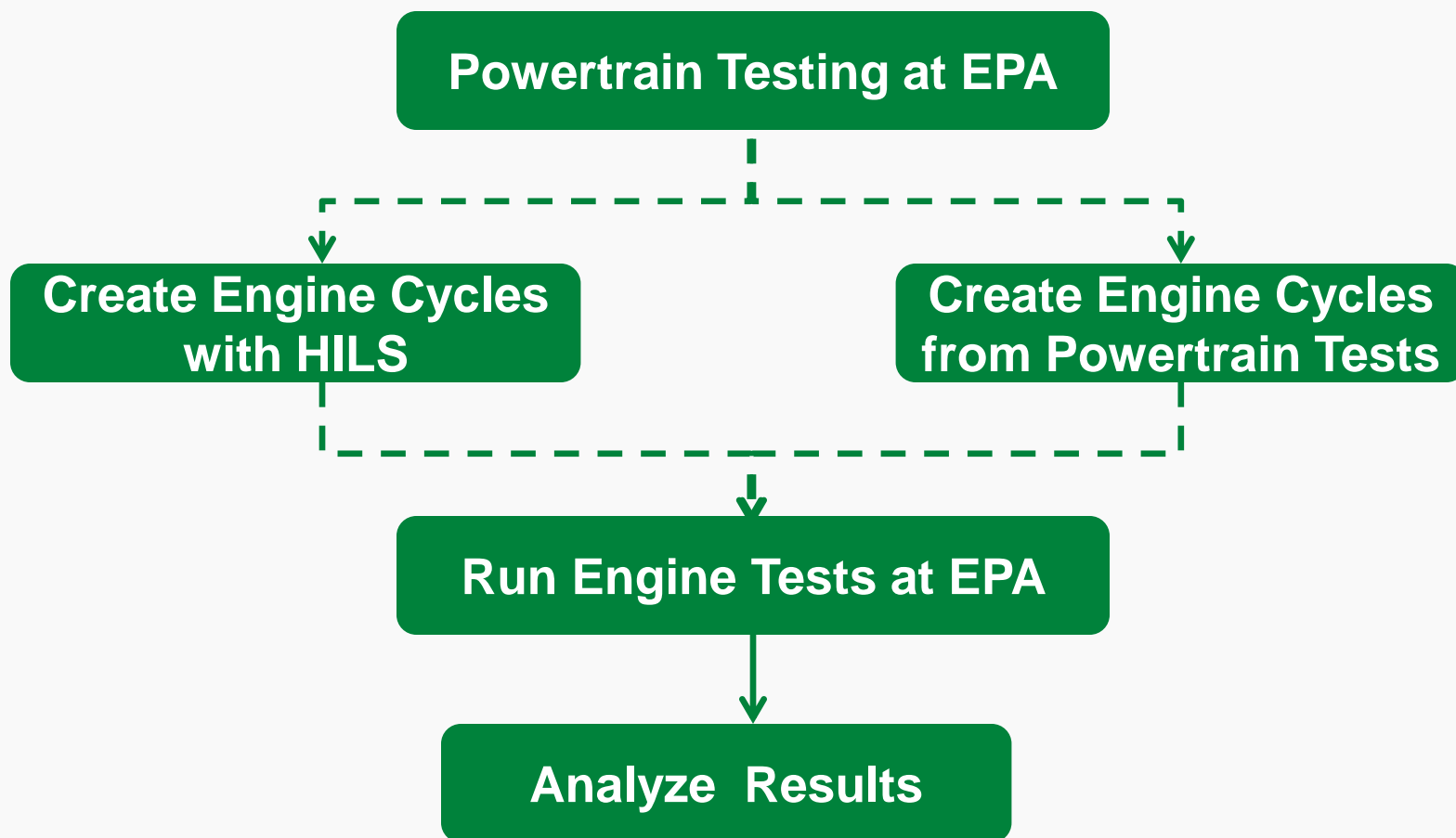
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1/13/15

Goals of the Comparison

- Compare emission results from the two methods

- Evaluate the repeatability of the two procedures

- Get hands-on experience with the two procedures

- Complete work by end of February to inform WP.29 vote in March

Overview of the Comparison

Creating Cycles Using HILS

Integrate the HCM from powertrain tested at EPA with FPT's HILS bench

- Update CAN messages for the hybrid control module (HCM) that is part of the powertrain (need support from hybrid manufacturer)

- Generate engine model parameters according to A.9.8.3

- Run HILS and check that the engine cycle passes validation criteria in A.9.5.8

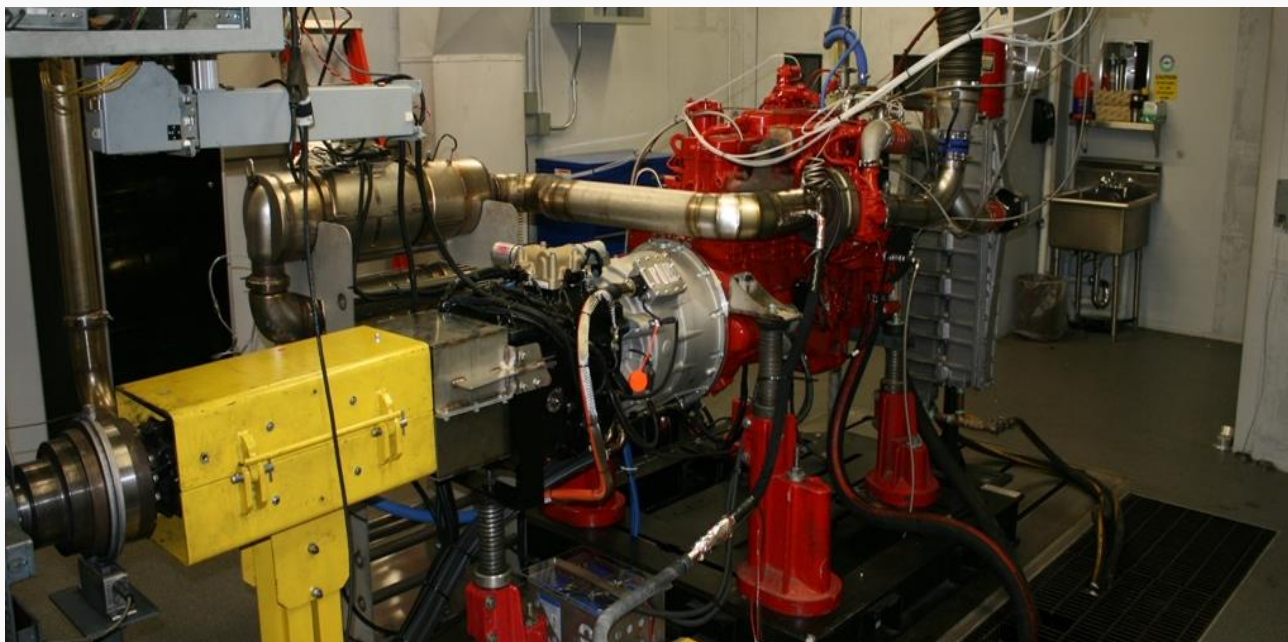- Rerun HILS if validation criteria is not met

Creating Cycle from Powertrain Test

Use CAN data to extract engine speed/load operation from powertrain tests

- Create engine cycle by modifying engine speed/load cycle while staying within the criteria of A.9.5.8

Test Article

- Eaton parallel hybrid transmission with 6 speed AMT
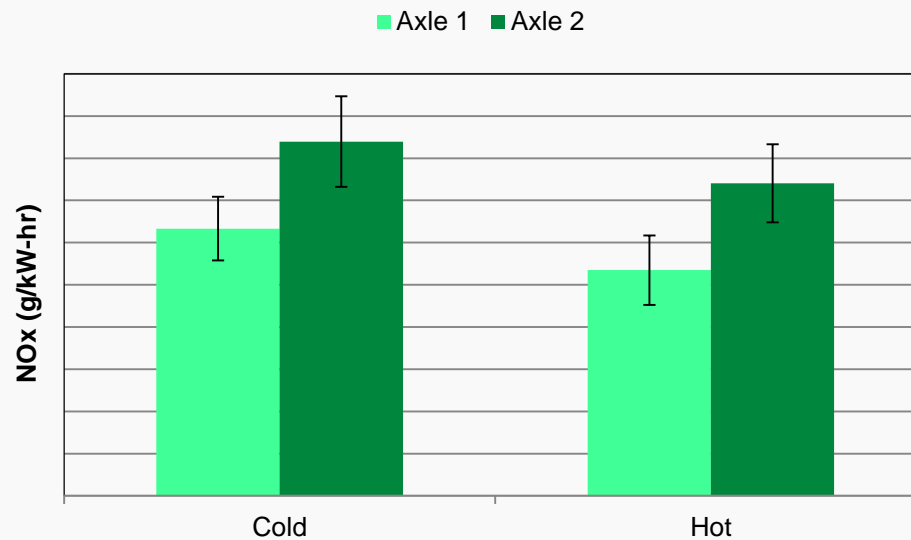- 2010 Cummins ISB 200hp

Vehicle Parameters

Vehicle parameters were calculated following subparagraphs of A.9.5.4.2.2 using hybrid powertrain rated power of 156.7 kW

m (kg)	11315
A (m^2)	6.669
Cr	0.00669
Cd	0.6235

PowertrainTesting

- Cold and hot start WHVC tests
  - 3 repeats
  - 2 axle ratios
- Run rated power test

Engine Testing

- Cycles

  – Option 1: Engine cycles created using HILS

  – Option 2: Engine cycles taken from powertrain tests

- Cold and Hot Start Tests

  – 3 repeats

  – 2 engine cycles

Status of the Comparison

- Powertrain testing with both axles has been completed
- Rated power tests have been completed with powertrain
- Integration of EPA's HCM with FPT's HILS bench is in progress
  - Verified that the 2 HCMs (from the Iveco vehicle and EPA powertrain) are wired the same.
  - CAN communication with the HCM as been established
  - There are currently multiple error codes triggered due to some of the CAN messages not defined
  - Will need to work with Eaton to define all CAN channels. Timing to this is not certain due to the proprietary nature of the information needed.
- Engine testing will start once engine cycles are determined. Testing will take approximately 2 weeks to complete.