

EVE-74-XYe

&lt;updated EVE-69-04e&gt;

# PROPOSALS to allow “SYSTEM BENCH” for all vehicle type on GTR#21

prepared by Japan

@EVE74

18<sup>th</sup> & 19<sup>th</sup> Sep. 2024

## ■ Action Items

Item	Contents	Details
(1) Ensure Accuracy	-1. Develop robust logic	List up potential loophole risks, then develop the logic to eliminate loophole
	-2. Verify the equivalency	Compare measurement results between the other methods and the system bench, then demonstrate the same level of accuracy
(2) Technical Appeal	-1. Demonstration of system bench equipment	Invite EVE members to demonstrate the system bench testing

## ■ GTR21 Revision Schedule(Phase3)

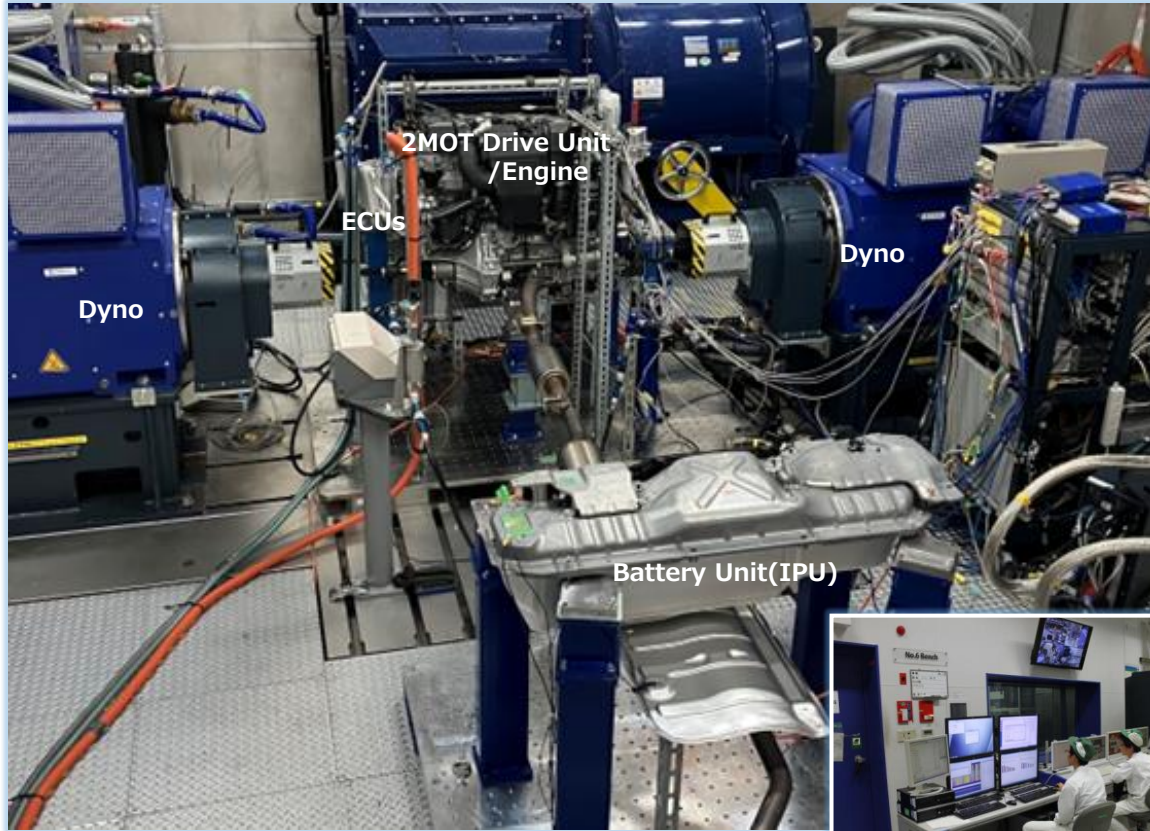
Year	2024											2025			
Month	3	4	5	6	7	8	9	10		11	12	1	2	3	4
EVE IF-WG		★ 16					★ 18,19					★ 9			
(1) Ensure Accuracy	-1. Develop robust logic: Loophole Item Extraction (Mar) → Risk Avoidance Concept Arrangement (Apr-May) → Summary (Aug)														
	-2. Verify the equivlency: Bench/Model selection (Sep) → Test preparation (Oct) → Test implementation (Jan-Feb) → Summary (Apr)														
(2) Technical Appeal	-1. Demonstration of system bench: Bench/Model selection (Mar) → Demo contents Review (Apr) → Test preparation (Jul) → ★17 (Sep)														
	By building assurance logic Certification in verification, actual vehicle														

major item	middle item	sub-item	Loophole Risk	concept of risk aversion	
System bench specifications	Powertrain	Powertrain specifications	Hardware specifications different from those of the actual vehicle are installed.	All powertrain components are basically the same as in the vehicle. Simulation and/or alternative can be used only when equivalency is confirmed.	
		Auxiliary load	Auxiliary loads are set lower than in the actual vehicle.	Follows the same approach defined in the GTR21, means that "The default value shall be 1kW, or the results of actual vehicle measurements. (measured input current and voltage to the DC/DC converter onboard the vehicle) shall be reflected."	
		ECU software	ECU data is modified for bench use.	Disclose any changes for measurement related to powertrain.	
	Cooling system	Engine	Surpass in-vehicle performance by over-cooling.	Follow same temperature conditions specified in UNR85.	
		Motor	Surpass in-vehicle performance by over-cooling.	Follow same temperature conditions specified in UNR85.	
		Battery	Surpass in-vehicle performance by over-cooling with temperature conditions that deviate from the actual vehicle.	Demonstrate the equivalent range of the battery temperature during system bench testing and normal vehicle operating	
	Equipment requirements	Dyno accuracy	Using inaccurate dynamometers, resulting inaccurate measurement.	Vehicle speed accuracy requirements shall be the same as Chassis Dyno. (For Hub Dyno, same as UNR85 requirements)	
	Test condition	Fuel	–	Use non-recommended fuel to manipulate performance. 1): Possible to increase the system power in systems that the battery output can increase if engine power decrease by intentionally using lower octane value fuel. 2): As opposed to pattern (1), Possible to achieve lower system power by intentionally using higher octane value fuel	Follow the fuel requirement defined in UNR85 ->Use the fuel with octane value corresponding to the recommended fuel.
		Test method	–	Control system power with partial throttle of acceleration pedal.	Provide the evidence of wide-open-throttle acceleration pedal.

**Completed the loophole risk study to ensure the system bench logic.**

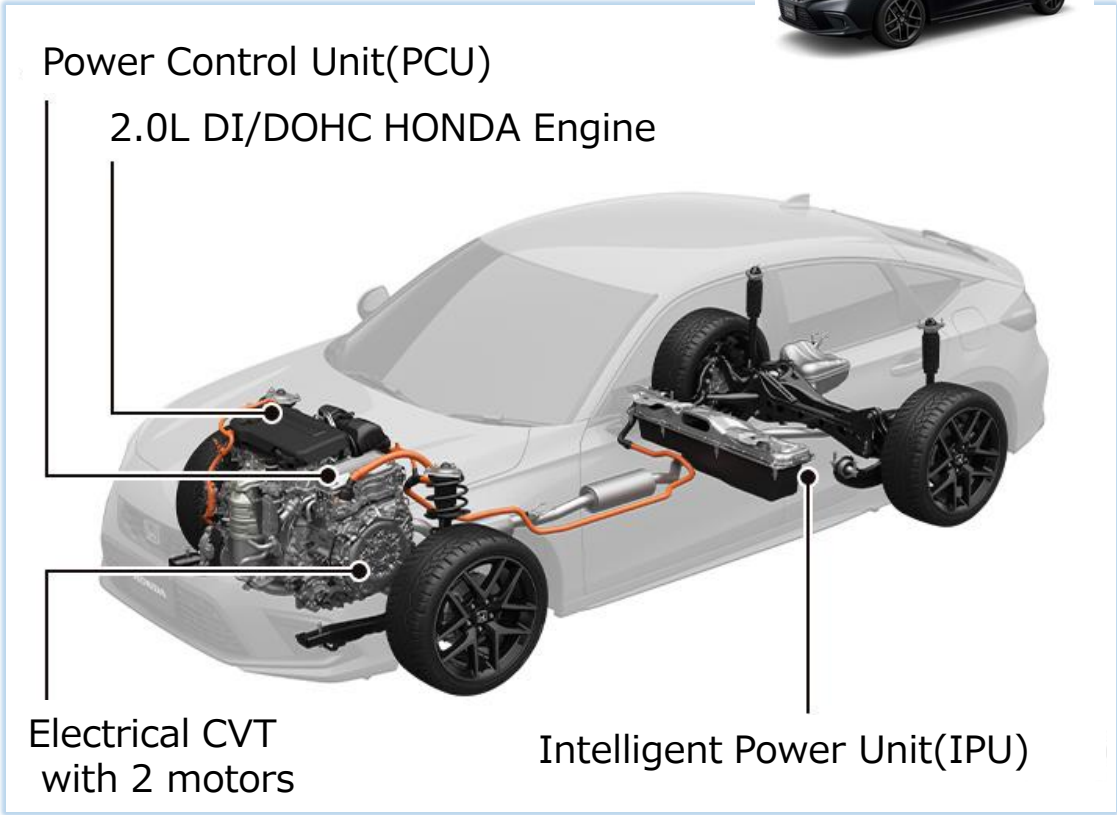
## Powertrain Testbed for Hybrid Models

Power units to run the vehicle is installed on the bench.

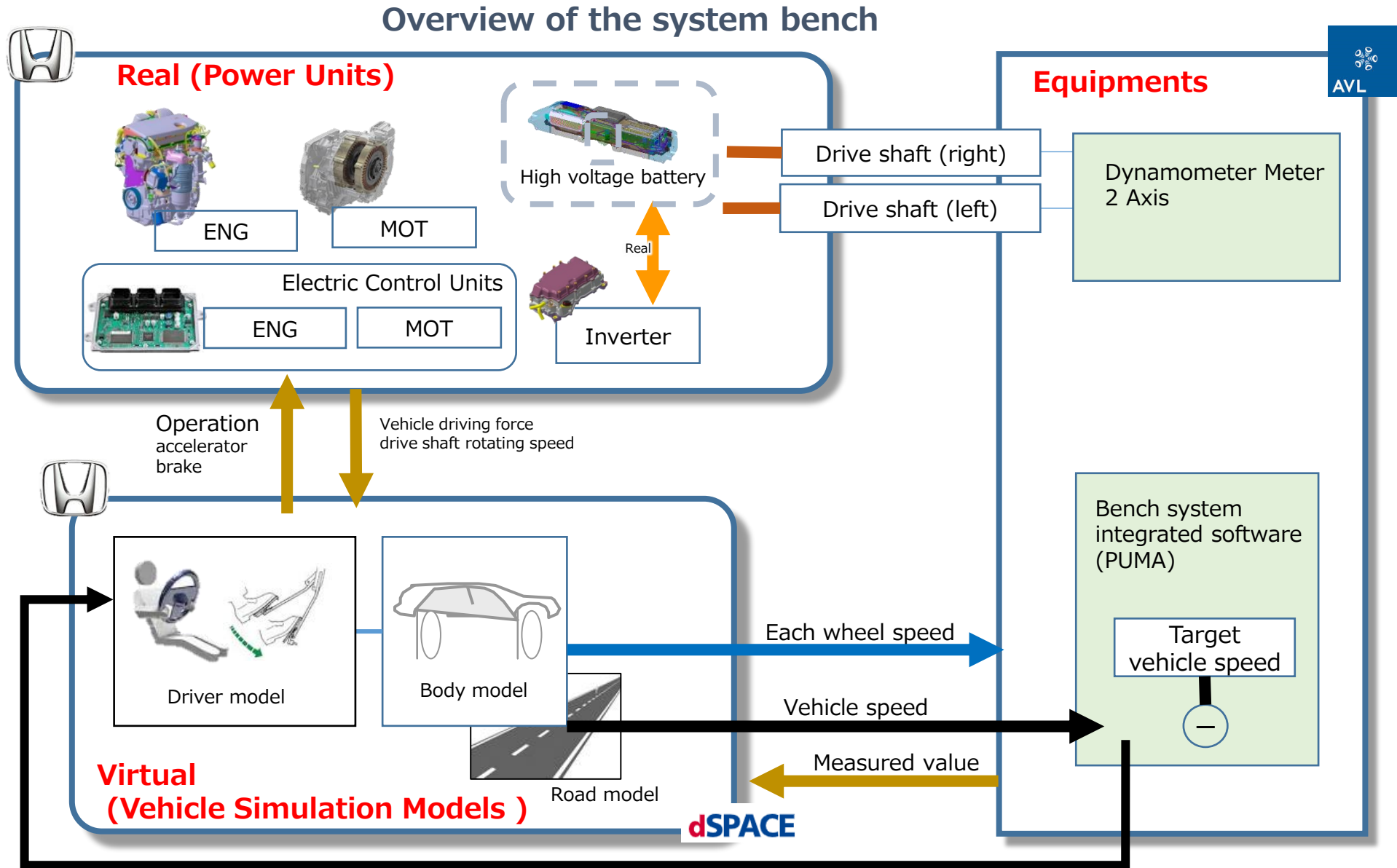


System Bench for HEV

21MY Honda CIVIC



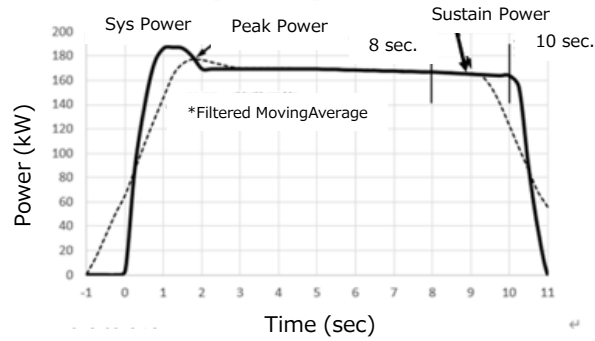
The system bench is a core technology for future power unit development without actual vehicle.



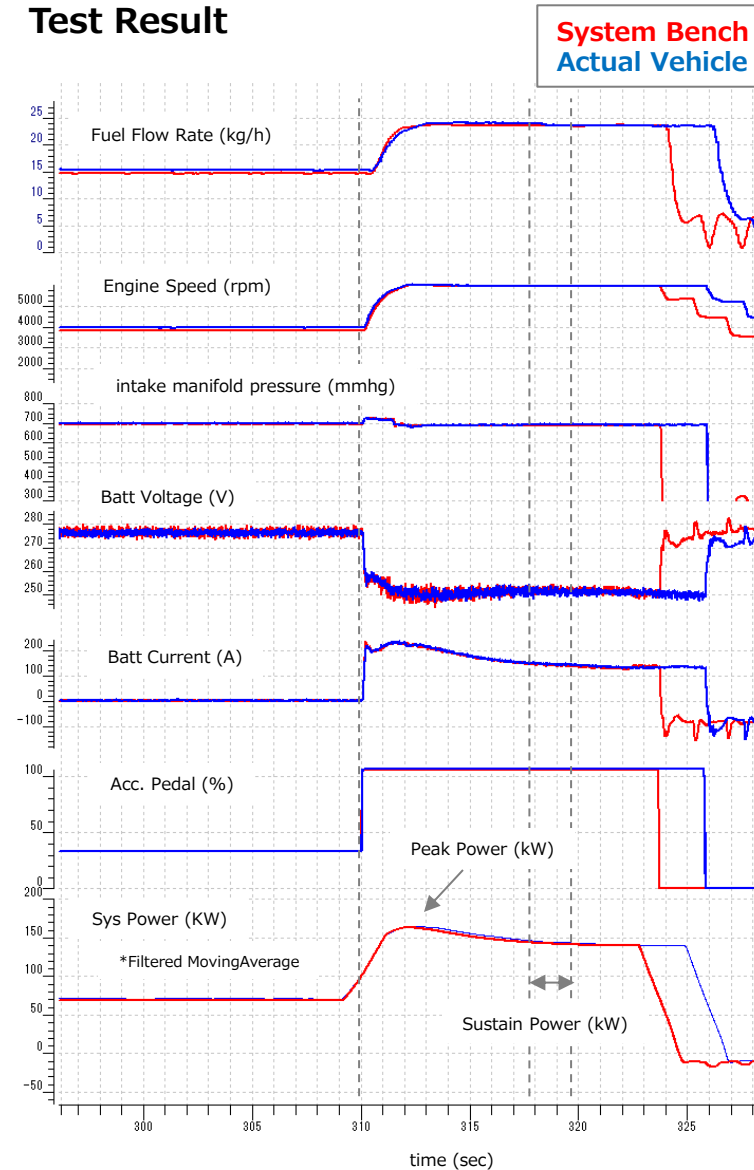
By connecting the power units and simulation models with equipments, Vehicle behavior can be replaced on the bench.

# (2)-1. System bench tour

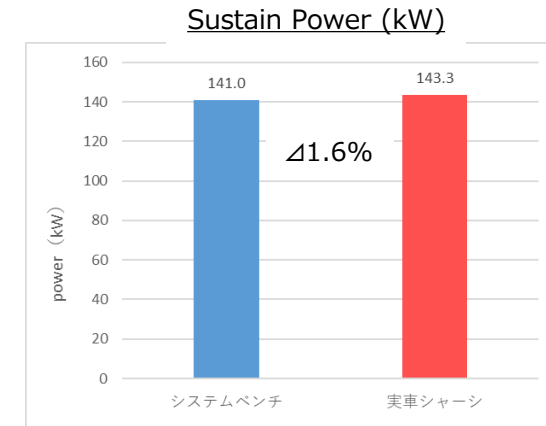
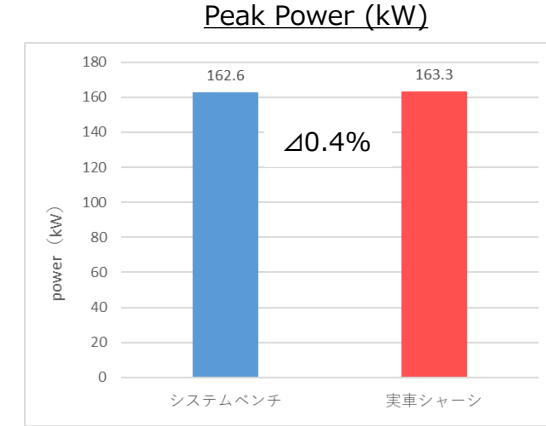
## Test method: HEV System power Measurement



## Test Result



System Bench  
Actual Vehicle



	System Bench	Actual Vehicle
Measurement point		
Test piece	21MY Civic eHEV P/U	21MY Civic eHEV
Fuel Flow rate	Fuel Flow meter	Fuel Flow meter
Engine speed	Pick-up sensor	Pick-up sensor
Intake manifold pressure	Electric Control Unit value	Electric Control Unit value
Battery Voltage	Electric Voltage meter	Electric Voltage meter
Battery Current	Electric Current meter	Electric Current meter
Acceleration Pedal Angle	Electric Control Unit value	Electric Control Unit value

Equivalent system power can be measured between chassis dyno and System Bench.

- ✓ Completed the loophole risk study among the requirements to guarantee the utilization of the system bench.
- ✓ Demonstrated the same level of accuracy when using the System Bench compared with the other methods.
- ✓ Expect to achieve same level of accuracy for other HEV systems, as long as “robust logic” is confirmed.