

Development of the Third Generation 100% Electric Drive Hybrid Powertrain for Large Minivan

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Nissan's proprietary hybrid system, e-POWER, is a series hybrid system in which the vehicle is driven solely by electric motors using electricity generated by an engine. Leveraging the advantages of 100% motor-driven propulsion, e-POWER delivers superior quietness, smooth and powerful acceleration, and excellent fuel economy. The system has been deployed globally, primarily in compact cars, middle minivans, and SUVs.

In 2025, Nissan developed the third-generation e-POWER system, covering vehicle applications ranging from C-segment SUVs for global markets to large minivans primarily targeted at the Japanese market. The third-generation e-POWER system achieves improved fuel economy and quietness through the adoption of a dedicated 1.5-Liter turbocharged engine for power generation and a 5-in-1 unit integrating five functions: motor, generator, inverter, reduction gear, and speed-increasing gear.

This paper describes the hardware specification development and energy management technologies applied to a new large minivan, the largest vehicle equipped with the third-generation e-POWER system.

(1) The engine, front unit, and rear motor were adopted as commonized components with the C-segment SUV, while a newly developed high-output lithium-ion battery with 15% higher output and a rear gear ratio lowered by 28% compared with the previous specification were adopted as modifications, thereby achieving the output and driving force required for the large minivan(Fig. 1, Fig. 2).

(2) The output at the best fuel-efficiency operating point was increased by 9% compared with the second-generation system through the adoption of a dedicated power-generation engine. In addition, expansion of the engine operating area enabled by the improved quietness performance realized an energy management strategy capable of maintaining battery state of charge (SOC) even in the heavier large minivan(Fig. 3).

(3) A new high-speed operating point for highway driving, providing 44% higher output than the best fuel-efficiency operating point was introduced. By generating electric power exceeding the road-load demand during high-speed cruising, the battery SOC was maintained at a higher level. As a result, the high-speed operating point could be maintained more robustly against load fluctuations during high-speed driving, resulting in improved fuel economy and quietness(Fig. 4).

(4) These technologies achieved a high level of balance between the superior responsiveness, smoothness, and powerful acceleration characteristic of 100% motor-driven propulsion and the comfortable, refined mobility experience required for a large minivan.

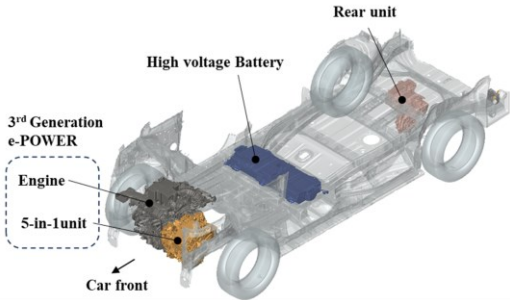


Fig. 1 System configuration of the new large minivan

	Previous C segment SUV	New developed C segment SUV	New developed large Minivan
Drive	2WD/4WD	2WD	4WD
Vehicle weight	1750/1850kg	1617kg	2430kg
Destination	JPN	Global	Japan
Front	2 nd generation	3 rd generation	
Engine Type	Gasoline L3 1.5L turbo	Gasoline L3 1.5L turbo e-POWER Dedicated	
	106kW RON91	116kW RON95	103kW RON91
Motor	150kW/330Nm	151kW/330Nm	
Gear ratio	8.284	8.800	
Rear Motor	100kW/195Nm	N/A	100kW/195Nm
Gear ratio	7.283	N/A	9.338
High voltage Battery	Li-ion	Li-ion	Li-ion High output

Fig. 2 Specifications of the new large minivan

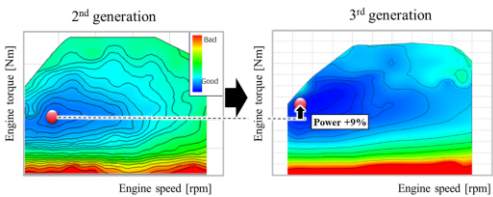


Fig. 3 Engine efficiency map

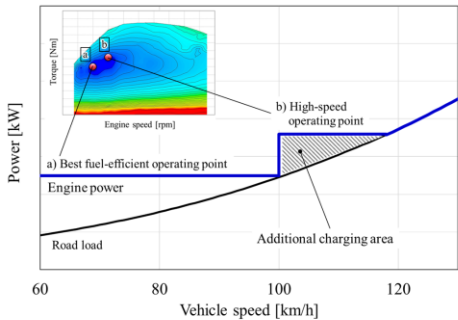


Fig. 4 High-speed operating point