

UNDER THE HOOD OF THE 2008 CHEVROLET TAHOE DUAL-MODE HYBRID

The dual-mode system used in the 2008 Chevrolet Tahoe and GMC Yukon hybrids represents the first fruits of the combined efforts of General Motors, Daimler-Chrysler and BMW to develop a hybrid drive system. In addition to improved effi-

ciency that all hybrids provide in city driving, the two-mode system targets improved highway fuel economy as well. A conventional four-speed automatic transmission combined with two electrically variable modes of operation optimizes power and torque for various driving conditions. Two 60 kW motors and a 300 V battery pack provide the electric power. At low speed and light loads (the first mode), the vehicle operates on electric power only, engine power only, or a combination of engine and

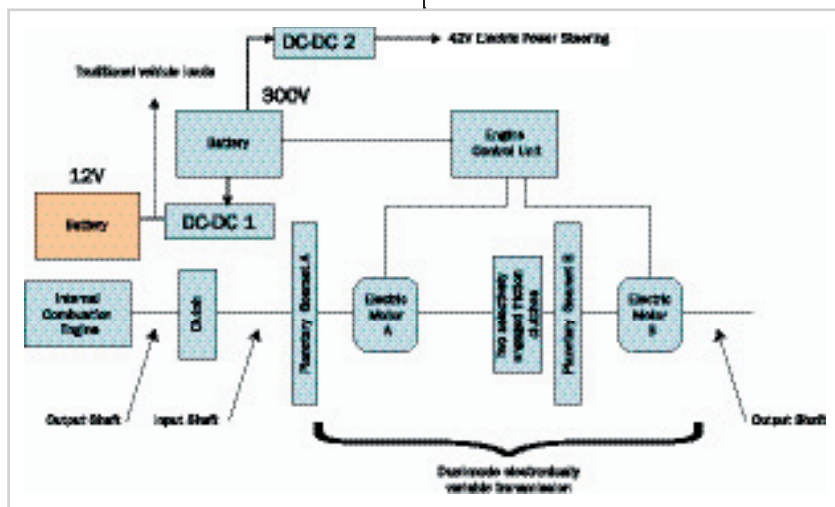


Figure 1. The architecture of the dual-mode hybrid includes a power conversion for electric power steering and traditional vehicle loads in addition to the 300 V for powering the two inverters.

ciency that all hybrids provide in city driving, the two-mode system targets improved highway fuel economy as well.

A conventional four-speed automatic transmission combined with two electrically variable modes of operation optimizes power and torque for various driving conditions. Two 60 kW motors and a 300 V battery pack provide the electric power. At low speed and light loads (the first mode), the vehicle operates on electric power only, engine power only, or a combination of engine and

POWER CONVERSION

The 300 V battery directly powers the inverters of the 60 kW motors and is converted to 12 V and 42 V for the rest of the vehicle's loads. In addition to traditional 12 V loads, the Tahoe hybrid's 300 V to 12 V dc-dc converter and 12 V battery combination handle the latest electrical/electronic systems such as the power-release fold-and-tumble second-row seat, remote vehicle starting system and first- and second-row heated seats. New electronic systems powered from 12 V include the ultrasonic rear parking assist, rear-view camera system, touch-screen navigation system, and DVD rear-seat entertain-

ment system. For hybrid operation, an electric coolant pump operating at 12 V circulates coolant through the electronics and through the passenger compartment when the engine is off.



Figure 2. Unlike the 300 V battery, the dual-mode hybrid's power electronics mount under the hood.

A separate 300 V to 42 V dc-dc converter controls the electric power steering (EPS). "We did not find a good system solution with a 12 V EPS in that size vehicle," said Pete Savagian, engineering director for Hybrid Powertrains at General Motors.

The 12 V unit is a bidirectional converter but the 42 V unit is not. Both the 12 V and the 42 V converters are about 2.2 kW each. The bidirectional converter allows a jump charge to the hybrid under some service conditions. If the high-voltage battery is below its serviceable state of charge, it can be charged through the 12 V side from another battery or a 12 V charger.

Power conversion is performed by a hard-switched converter. "It is fairly conventional as far as converters go in topology, but the specific application demands fairly high package density and great durability over the driving range and the environment of being under the hood," said Savagian.

The two dc-dc converters as well as the inverters for the motors are housed in a single assembly. The inverter and the accessory power module or APM, which is the dc-dc converter are liquid cooled. The two-mode hybrid system has a separate cooling loop for the power electronics. ■