

Bosch Parallel-Hybrid vor der Serieneinführung

Bosch Parallel Hybrid before Start of Production

Dr.-Ing. Matthias **Küsell**
Robert Bosch GmbH, Stuttgart



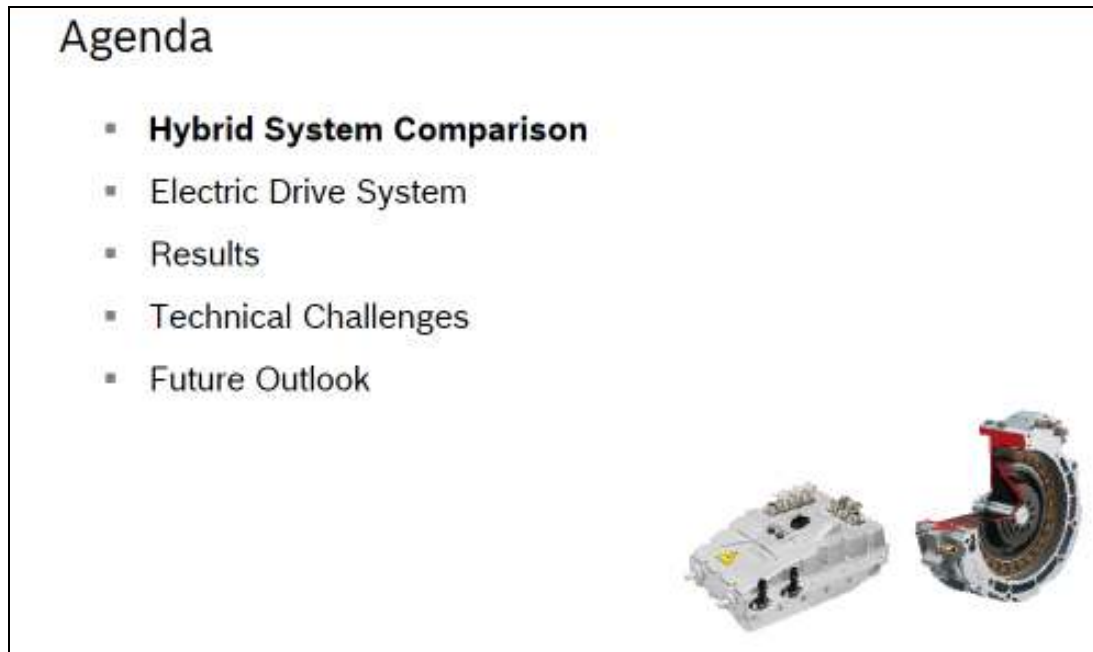


Fig. 1: Agenda

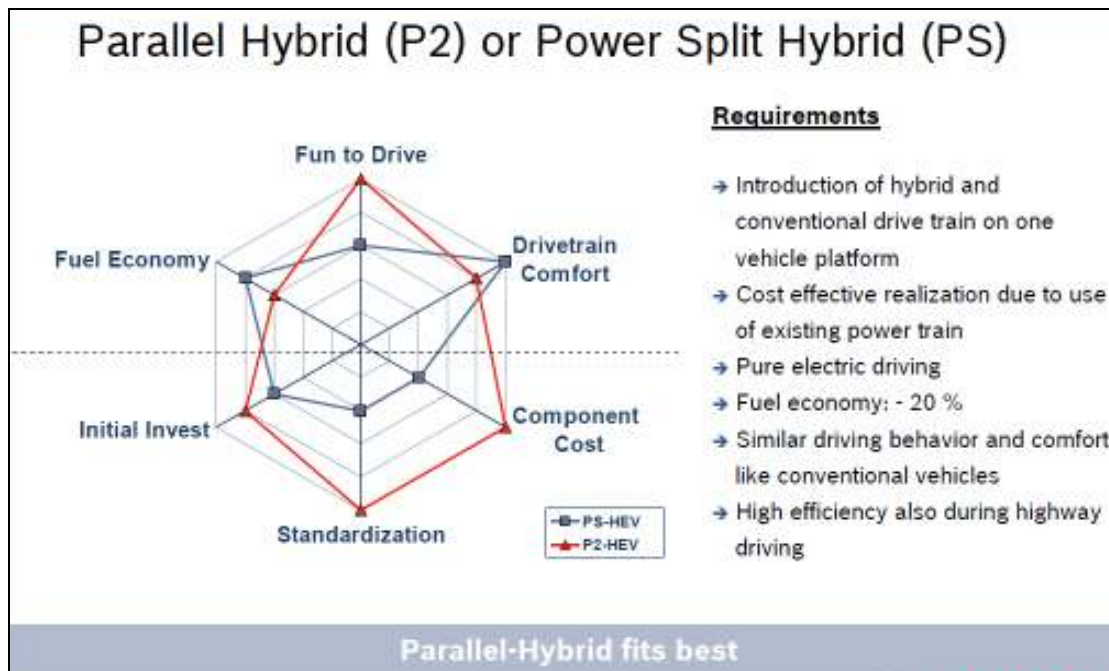


Fig. 2: Parallel Hybrid (P2) or Power Split Hybrid (PS)

Agenda

- Hybrid System Comparison
- **Electric Drive System**
- Results
- Technical Challenges
- Future Outlook


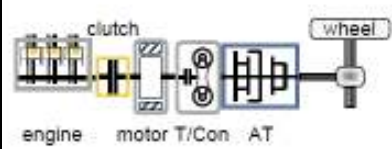



Fig. 3: Agenda

Parallel Strong Hybrid System



clutch
engine motor T/Con AT wheel

Vehicle data
 Parallel Hybrid
 V6 3,0l TFSI engine, 245kW / 440Nm
 E-Machine 38kW / 300Nm
 Battery 288V NiMH 1,7kWh
 8 Gear Automatic Transmission



Bosch components
 DI-Motronic: MED17, SW for engine and hybrid management
 SW for clutch control
 E-Drive: E-Machine, Inverter, DC/DC converter, clutch, clutch actuation

→ HV cable




Fig. 4: Parallel Strong Hybrid System

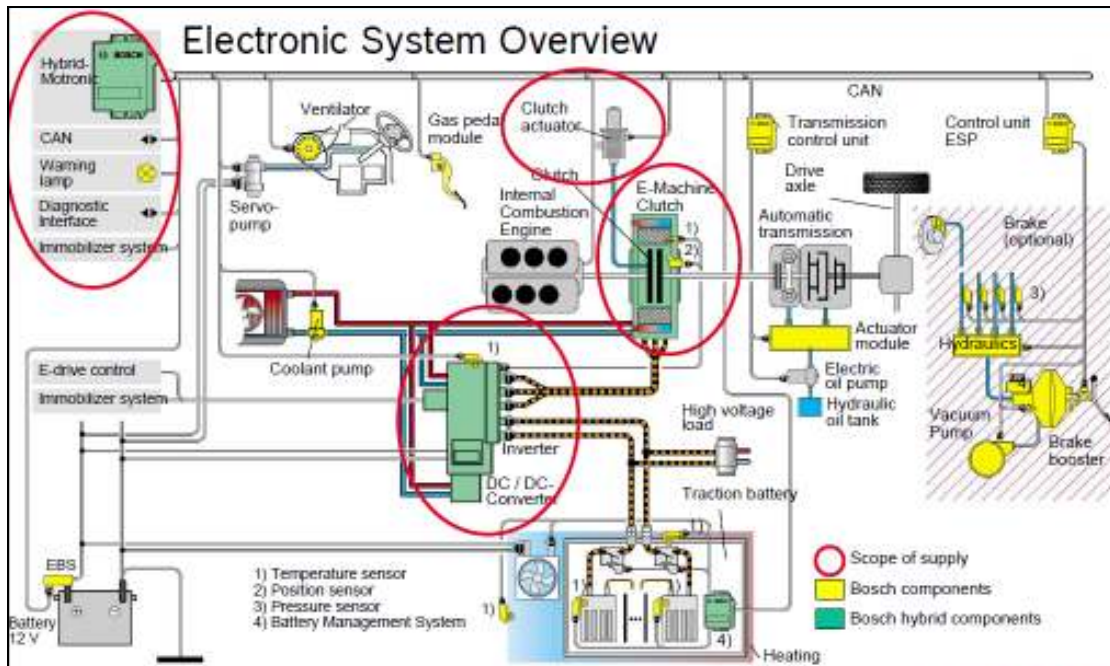


Fig. 5: Electronic System Overview

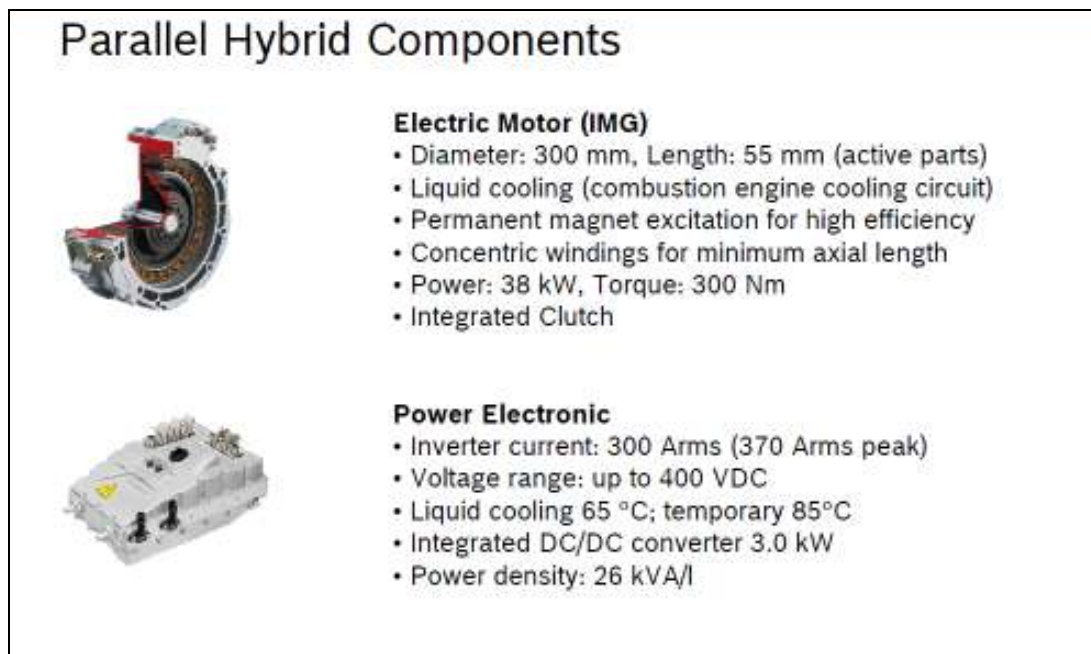


Fig. 6: Parallel Hybrid Components

Agenda

- Hybrid System Comparison
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Fig. 7: Agenda

Driving Performance

- 1. Comfort**
High comfort of re-start due to central coordination of e-machine and clutch torque.
Different gear shift maps for hybrid and electric driving.
- 2. Electric Driving**
Pure electric driving up to 70km/h
Typical 30 to 50 km/h
- 3. Special**
ICE disconnection up to 156km/h feasible (Gliding)
- 4. Fuel consumption**
Measurements cover simulation results an will meet customer expectations.

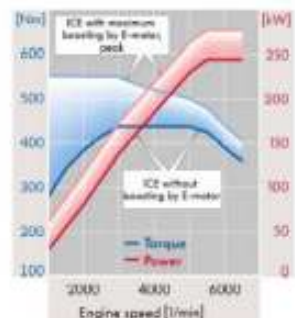


Fig. 8: Driving Performance

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- Hybrid System Comparison
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- **Technical Challenges**
- Future Outlook




Fig. 9: *Technical Challenges*

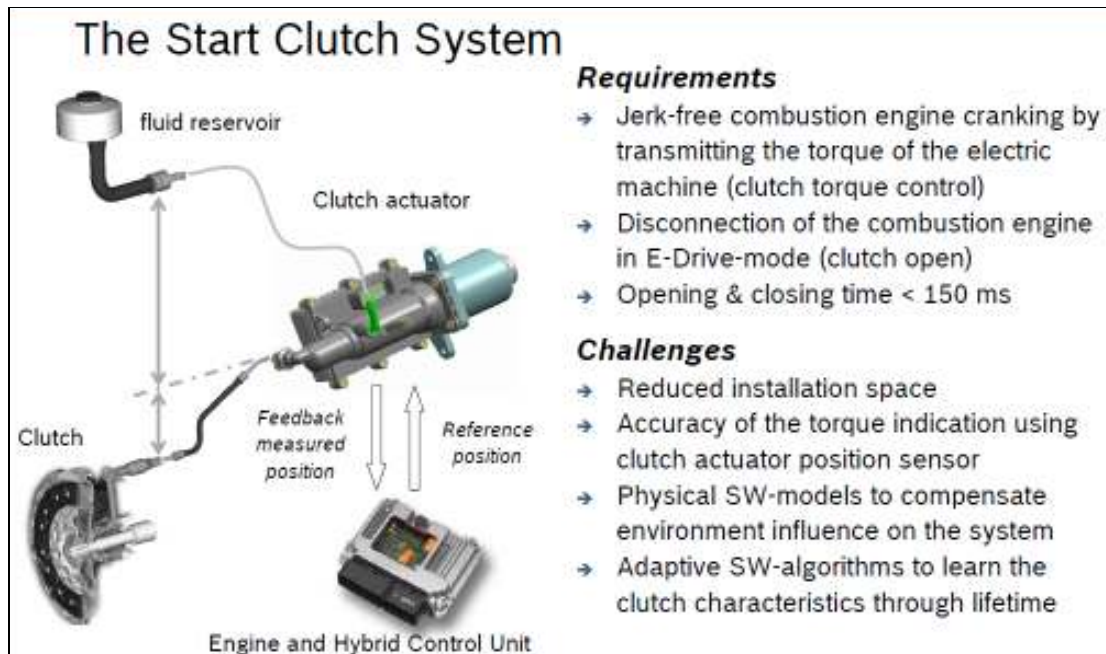


Fig. 10: *The Start Clutch System*

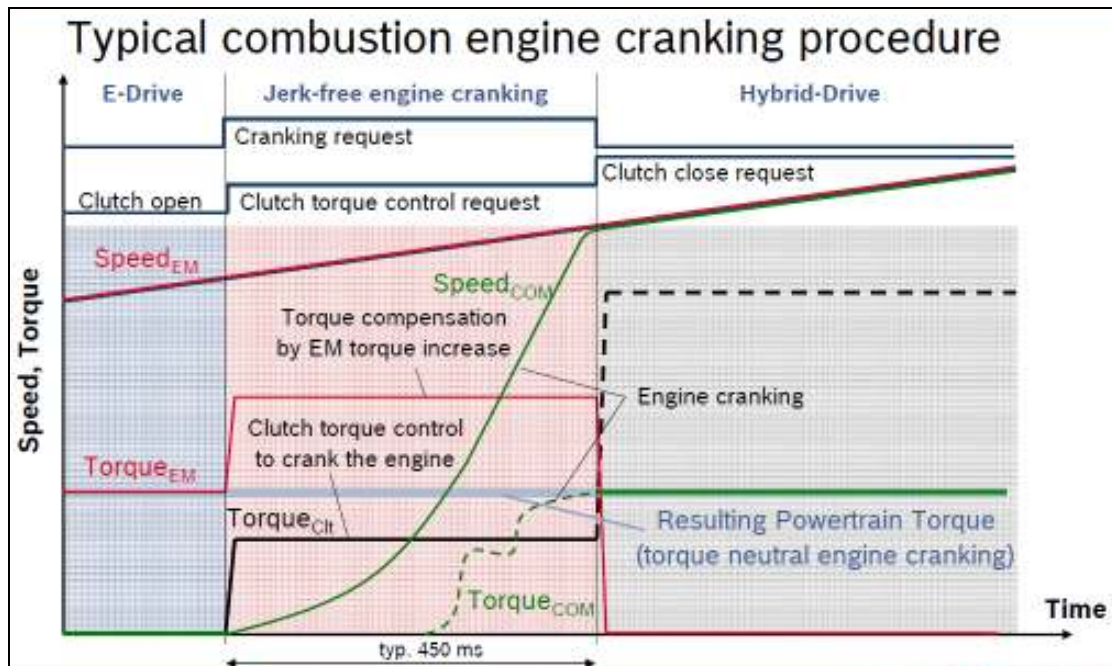


Fig. 11: Typical combustion engine cranking procedure

The Rotor Position Challenge

- Purpose of the rotor position sensor
 - torque control quality
 - rotor speed determination
- Challenges for the development of the sensor concept
 - few available space (axial & radial)
 - signal distortion by magnetic fields
 - need for diagnostic and monitoring functions with high integrity
 - need for damping of torsional vibrations in the drive train

Fig. 12: The Rotor Position Challenge

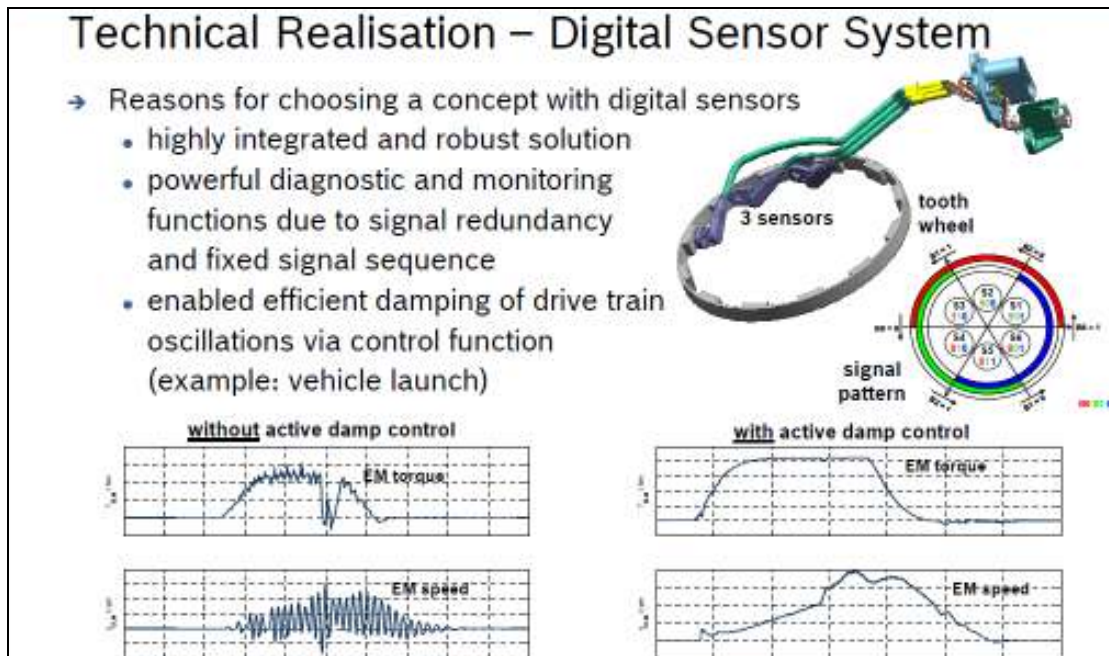


Fig. 13: Technical Realisation – Digital Sensor System

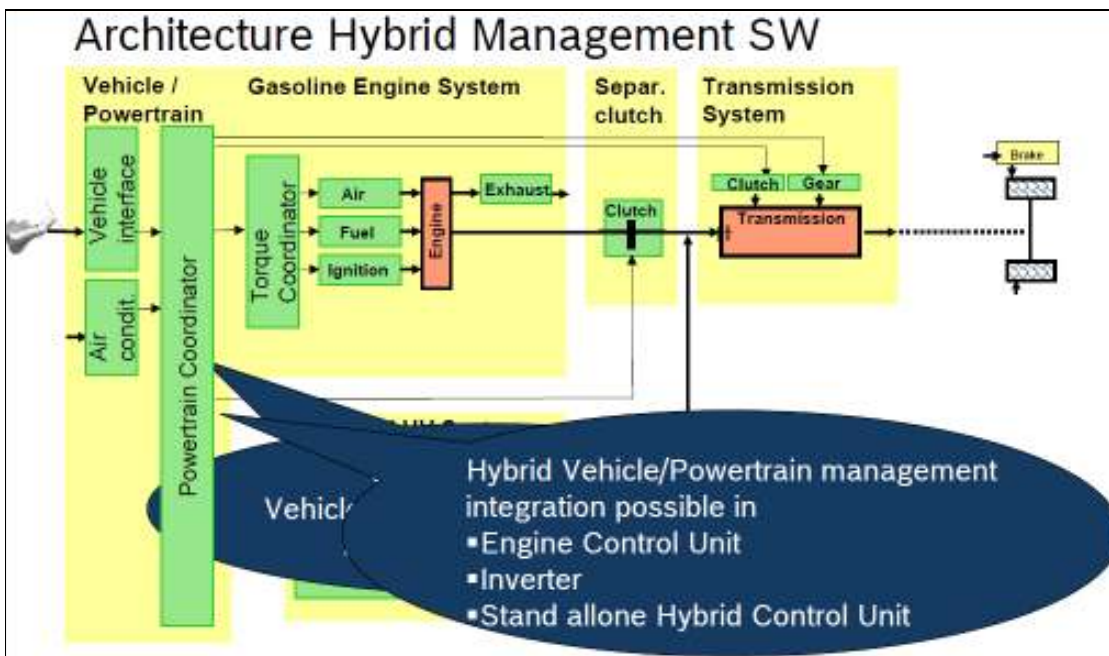


Fig. 14: Architecture Hybrid Management SW

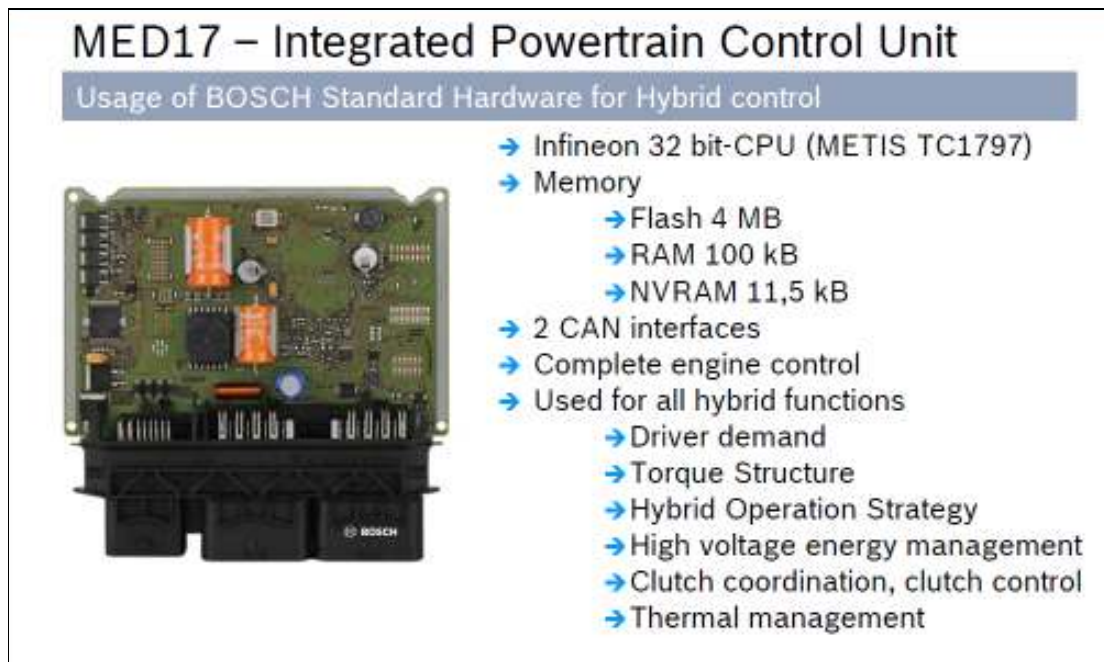


Fig. 15: MED17 – Integrated Powertrain Control Unit

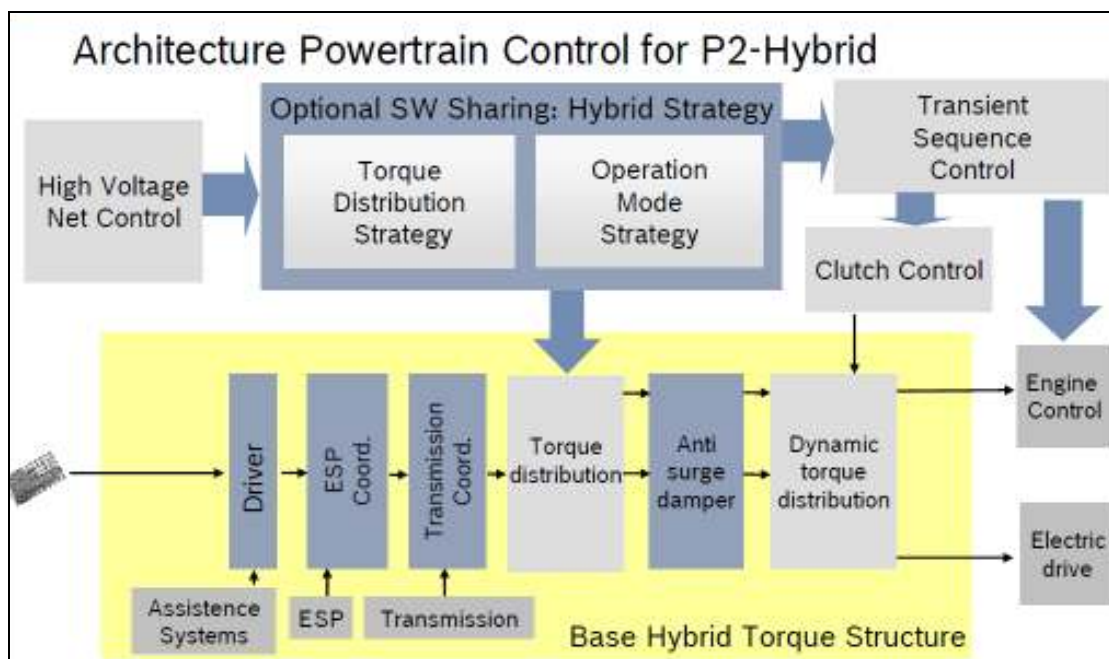


Fig. 16: Architecture Powertrain Control for P2-Hybrid



Fig. 17: Agenda

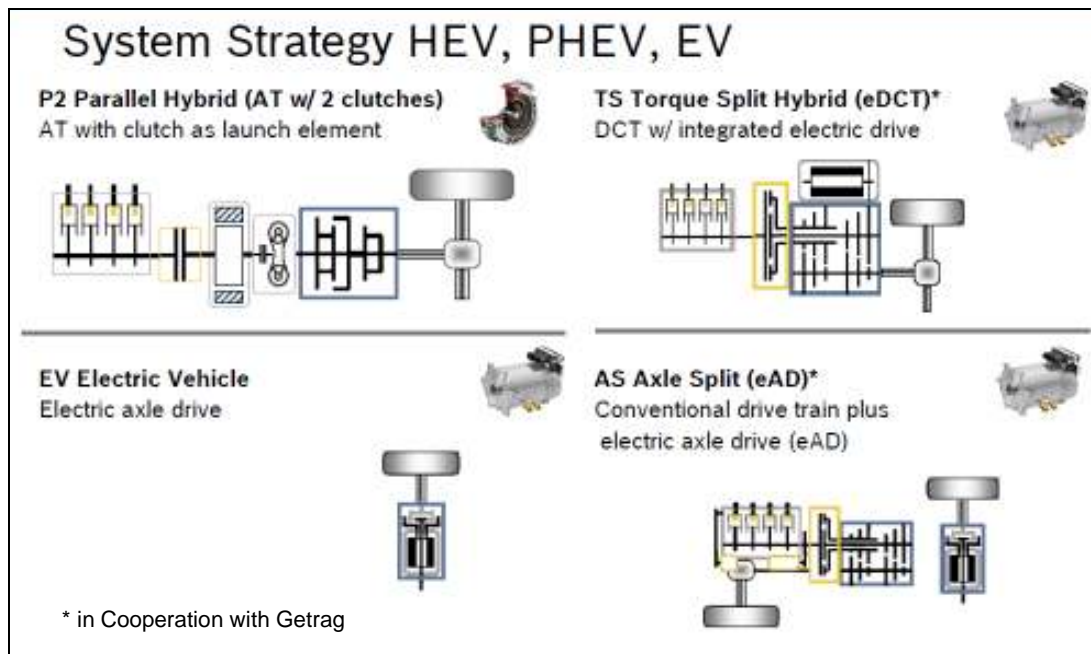


Fig. 18: System Strategy HEV, PHEV, EV

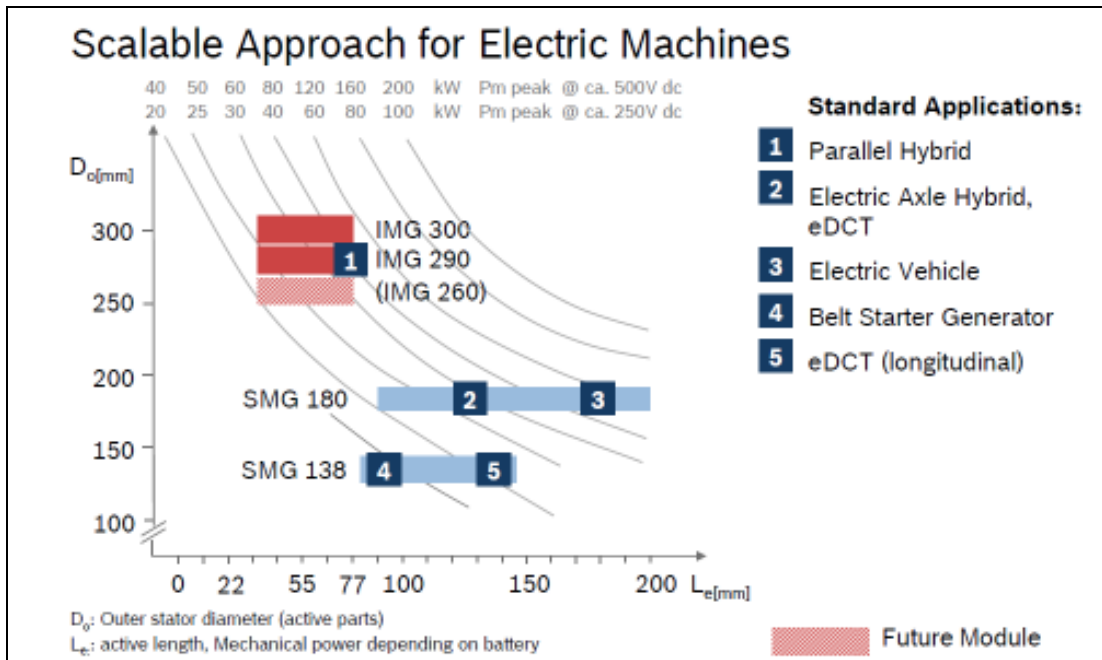


Fig. 19: Scalable Approach for Electric Machines

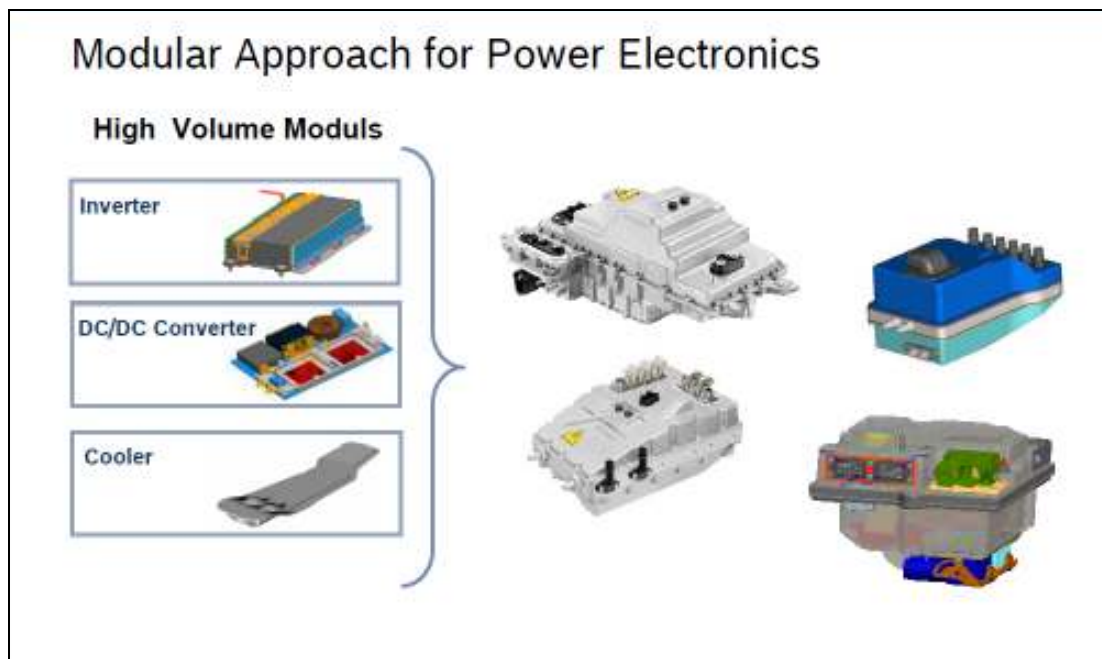


Fig. 20: Modular Approach for Power Electronics

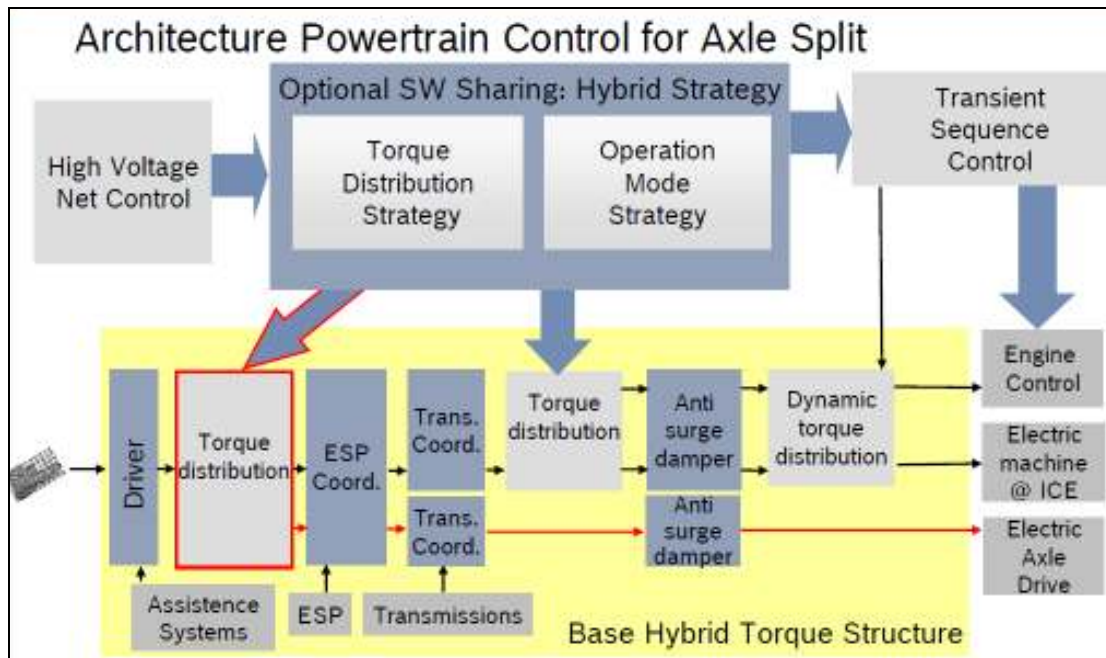


Fig. 21: Architecture Powertrain Control for Axle Split