FEV propulsion

The future of sustainable propulsion systems is now – but we won't stop here

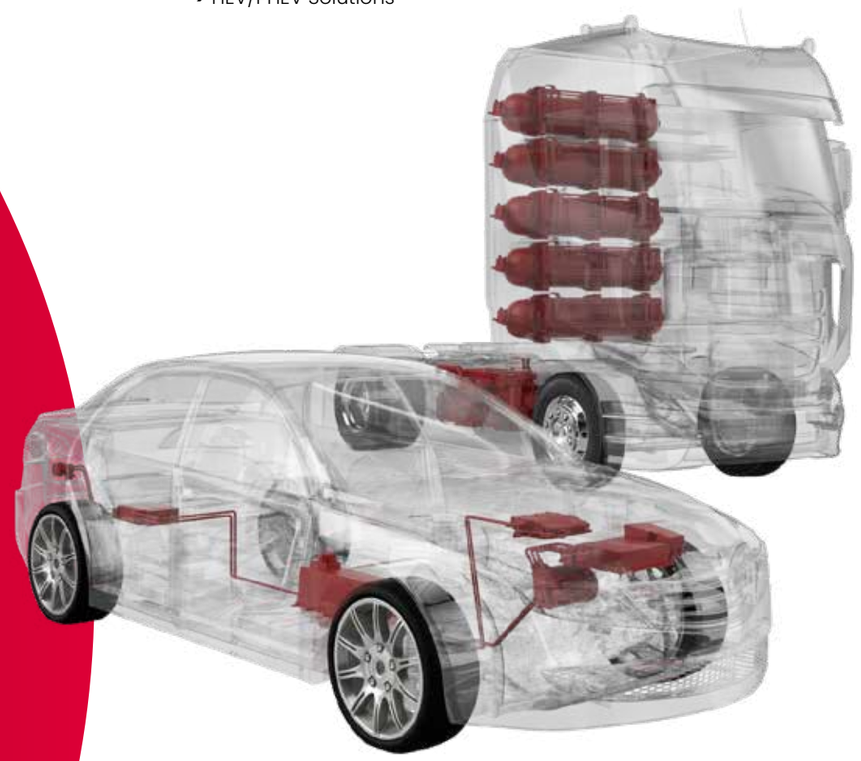
feel evolution

ICE Powertrains

- **Benchmarking**
- **Powertrain concepts and technology demonstrators**
- **Design and simulations**
- **Powertrain calibration**
- **Application software development**
- **Testing and validation**
- **Catalyst aging**

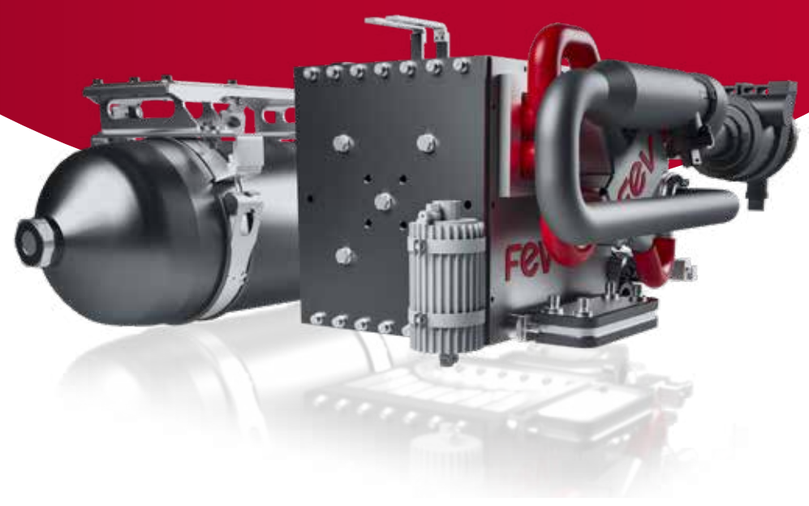
Energy carriers supported

- Green carriers
  - Hydrogen
  - Methanol
  - Ammonia
  - Compressed biogas
- Designed fuels
- Conventional carriers
  - Gasoline/Diesel
  - CNG/LNG
  - Ethanol
- HEV/PHEV Solutions



Fuel cell powertrains

- **Benchmarking**
  Market analysis, vehicle, powertrain, component
- **Design and Simulations**
  Concept development, system engineering, balance of parts
- **Fuel cell development**
  Stack development, system development, fuel cell degradation
- **Fuel cell controls**
- **H2 tank control**
- **Calibration**
- **Testing and validation**



Verification and validation

- Fuel cell and stack testing
- System testing
- Degradation assessment
- Environmental testing
- Mechanical testing
- Durability
- Vehicle testing

Power electronics

Your local engineering partner with global know-how for hardware and control development specifically for power electronics applications

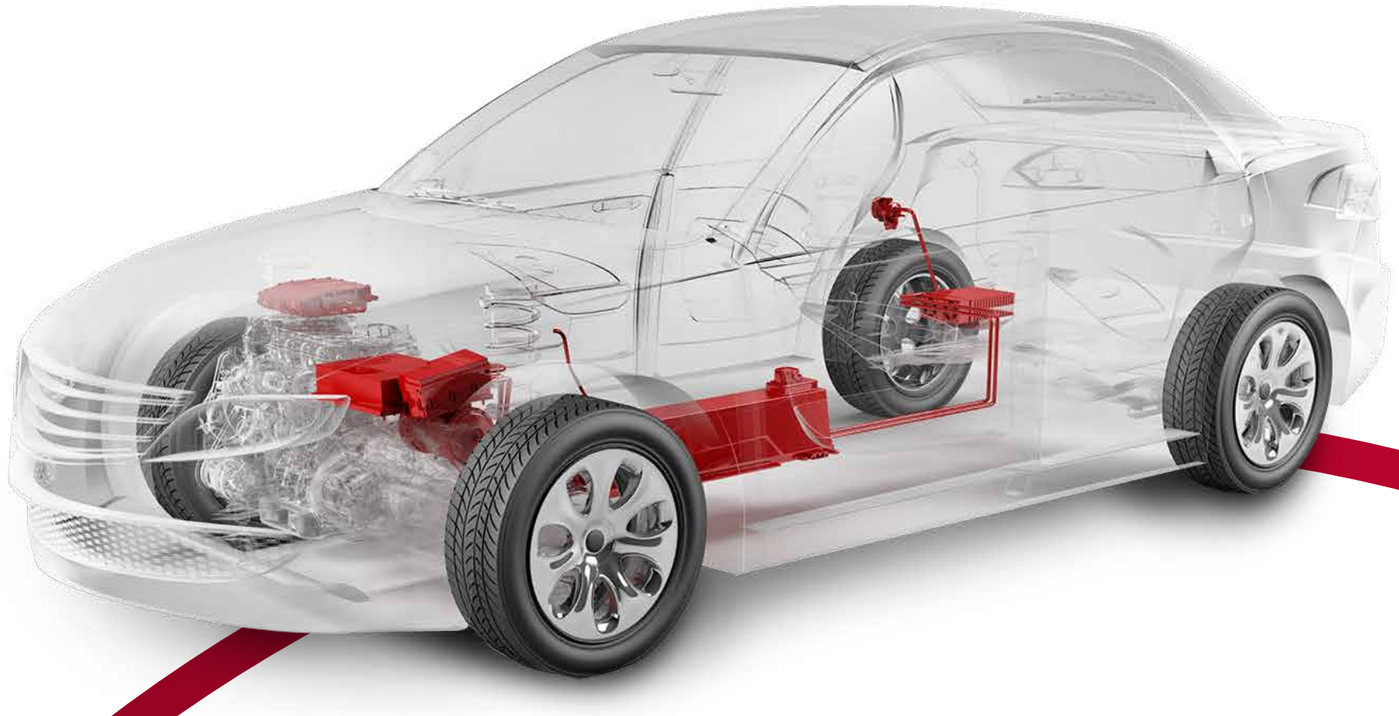
Strong and proven background in developing complex power electronic converters viz. Chargers, DC-DC and motor control unit (MCU) for EV applications

Our customers can leverage an entire portfolio of our services which include

- Power electronics hardware development as per automotive standards (ISO26262, ISO7637, ISO16750, CISPR25 etc.)
- Magnetics design and optimization to meet state of the art power density
- FEM analysis to simulate EMC behavior of power converters.
- Control software development specifically tailored for power converters such as DC-DC, chargers and MCU

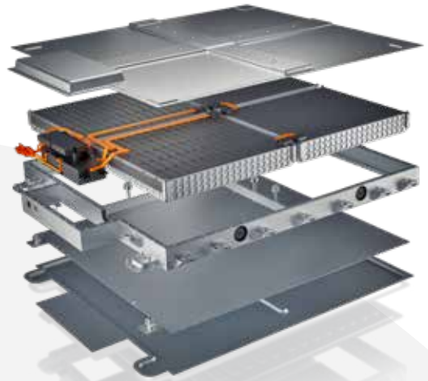
xCU control functions

- End to end powertrain controls development with FEV's own IP and offers white box solutions for hardware and software for vehicle controls, motor controls, battery controls, fuel cell controls and e-transmission controls.
- Full system development for new ground up projects including independent legislation analysis, energy optimization, benchmarking, charging infrastructure, calibration for mass production
- Capabilities in systems & controls following standardized approach, milestone plan, proven tool chain and methodologies, large team of experts, coordination of activities all over the world, familiarity with local market requirements



Battery

- Turn-key battery pack development from concept to series production
- Address the mechanical, electrical, thermal and software systems within your complex battery development programs and meet the challenges of time-to-market, homologation requirements for different markets, safety, durability and any special customer needs
- Concept preparation, system and requirements engineering, design and development cycle, thermal and structural simulations, cell modeling, testing and validation, and project management



HIL validation

Real-time simulation with HIL testing (hardware-in-loop): automation in HIL testing using tools like VT system, dSPACE, ETAS, generating automated reports that pinpoint errors, guiding necessary improvements.

System engineering

- Entire vehicle systems engineering and system engineering at sub system level. Example: EPT, body, ADAS and infotainment domains
- SysEng gap analysis and roadmap definition
- Holistic verification and validation of concepts incl. automation
- Golden sample development – tailoring SysEng practices for your company
- Artifact creation and operationalization of design methods
- Process, methods and tools consultation and training
- Bringing engineering disciplines together in one framework

One stop solution for current and future testing needs

- State of the art engine test benches including H2
  - Supports green carriers like Hydrogen and Methanol
  - Supports all conventional energy carriers
  - Friction test bench
  - PESO certified H2 storage
  - Emission measurement
- Catalyst aging bench
- Chassis Dynamometer
- NVH test bench
- Cold chamber
- HIL test bench
- Battery development test bench
- Motor test bench
- EDU test bench

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