FEV Signature Solutions

Fuel cell control unit (FCCU) software

Operate your fuel cell system in mobile applications efficiently and reliably

FEV offers

- Modular fuel cell control software including wide range of diagnostic & monitoring functionalities
- Customization services for prototypes or series applications
- Additional services as modification/extension, integration, commissioning and calibration
- Control approach for maximizing remaining useful life (RUL)

Why FEV

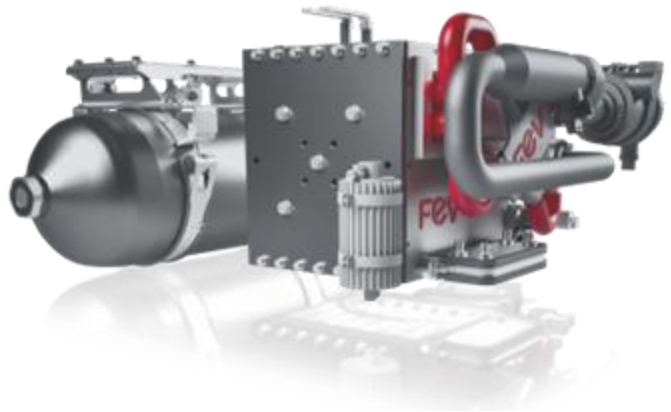
- Fuel cell control software developed with extensive fuel cell and control system know-how
- We provide a tested and flexible solution that will be adapted to your specific needs (e.g. P&ID configuration)
- White box option enables you to use FEV's solution for your own development
- This software can be combined with FEV's control software for H_2-tank controls and VCU/HCU (vehicle control unit / hybrid control unit) for supervisory control

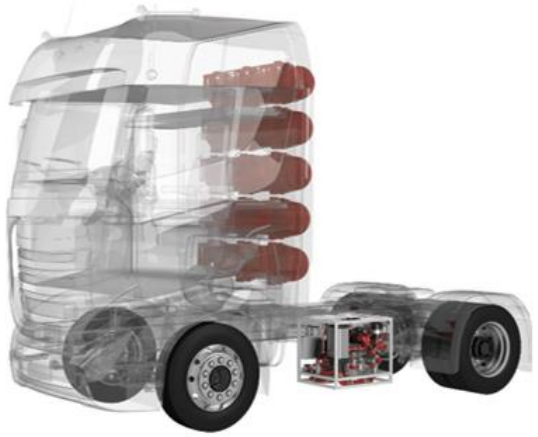
FEV reference projects

SELECTED BY TIER-1 FOR COMPLETE FC DEVELOPMENT FOR SERIES APPLICATION

French Tier 1 supplier - FEV responsibility:

- System layout and P&ID
- Support in supplier selection (EU and CN)
- Mechanical design according to STASHH* requirements
- E/E (LV and HV) and fuel cell PDU
- Functional safety
- Controls & SW development
- Calibration
- Validation





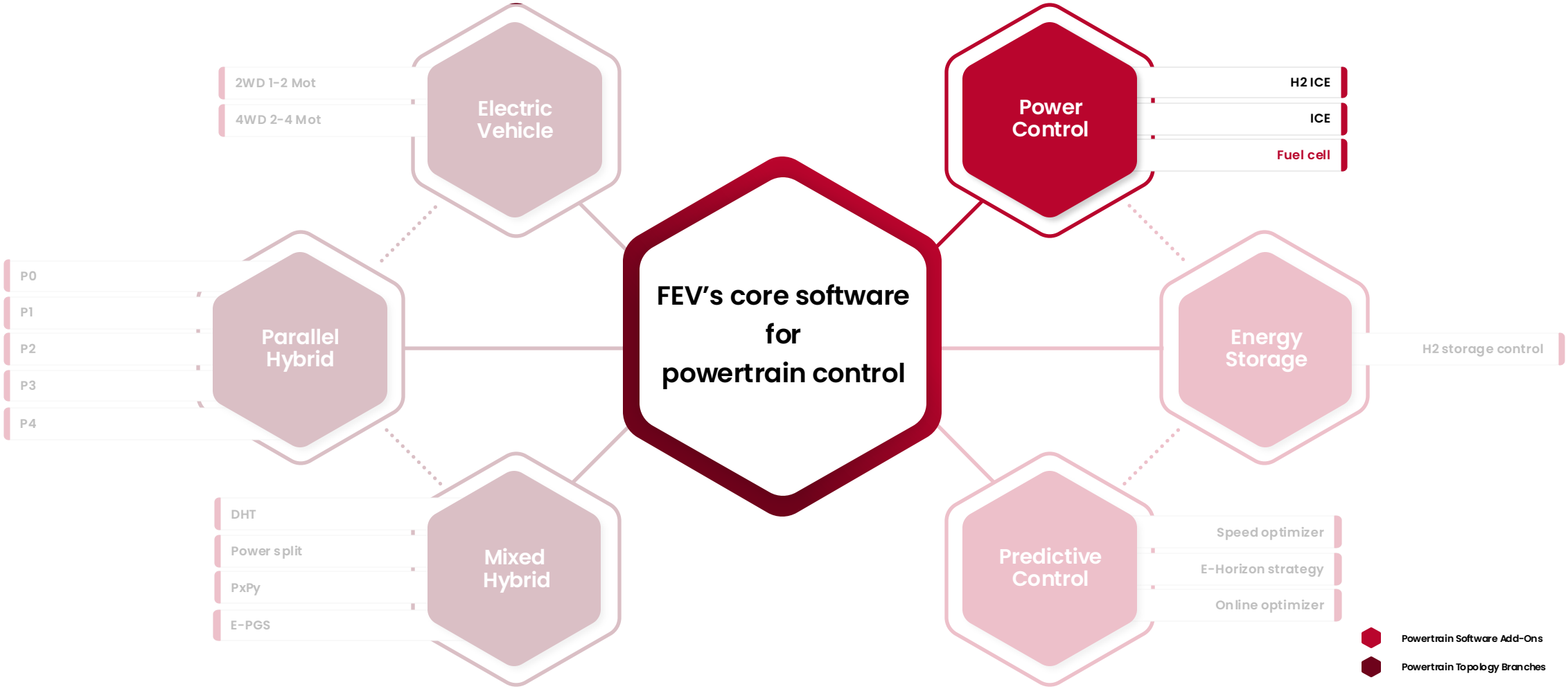
German Tier 1 supplier - FEV responsibility:

- Diagnostic control software development
  - Incl. state of health and remaining stack life estimation
  - Incl. development of real-time capable component models
- Series production calibration on test bench and in vehicle
- Support after SOP

*STASHH = **Standard Sized FC module for Heavy Duty applications** (https://stashh.eu/)

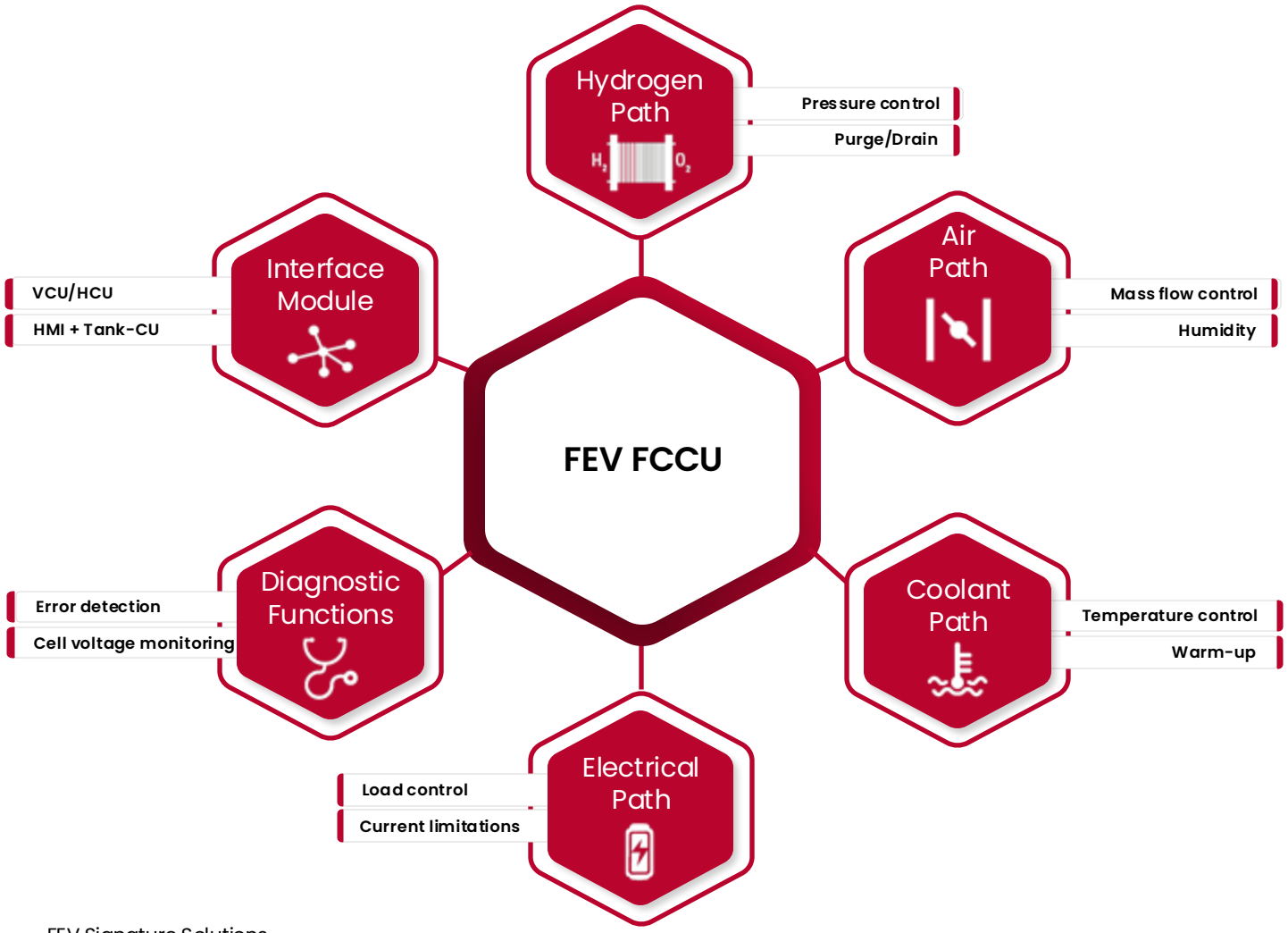
FEV's control functions
Developed, defined and approved in FEV's software landscape

FCCU SOFTWARE AS PART OF FEV'S POWERTRAIN CONTROL SOFTWARE



FEV's fuel cell control functions

FEATURES OF FEV'S FUEL CELL CONTROL UNIT

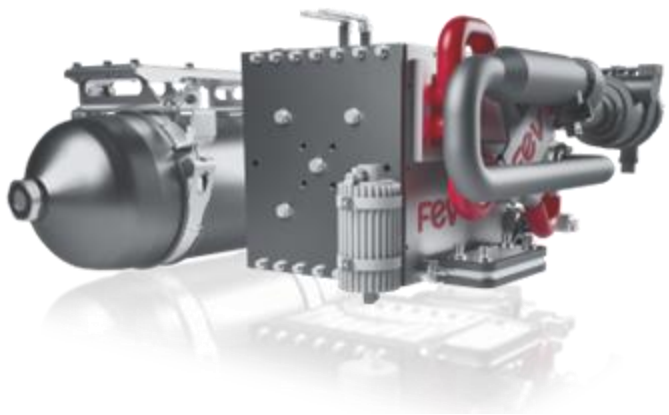


Special features:

- Modular approach
  - Air, hydrogen, coolant and electrical path
  - Easy to adapt interface module for VCU, HCU, tank-CU and HMI
  - Wide range of diagnostics and monitoring incl. cell voltage analysis, state of health (SoH) models etc. for series applications
- SW-extensions available
  - Hybrid/REX-strategy
  - Maintenance manager
  - Tank control unit
- Highlight
  - Start-up/power down procedure including freeze start capability

FEV‘s fuel cell control functions

FEV‘S FCCU HIGHLIGHTS & FUNCTION DEVELOPMENT COMPETENCE



Start-up & shut down

FEV’s start-up and shut-down procedure has been coordinated with various fuel cell stack manufacturers, which allows you a wide range of diagnostics to be performed to check various subsystems.

Mass flow & pressure control

Depending on the system complexity, the modular FEV FCCU SW takes into account different approaches to mass flow and pressure control, e.g. using throttles and bypasses.

Humidity control

In both internal and external humidification, FEV has experience with the details of humidity control. Besides control of stoichiometry, pressure and temperature, a special focus is the optimization of the purge/drain strategy.

Closed loop power control

To account for component deviation or aging in power control, FEV uses a closed loop power control. This ensures that the vehicle power request can be reached as quickly as possible at any given time.

Get in touch with us for further information

www.fev.com/en/signature-solutions