

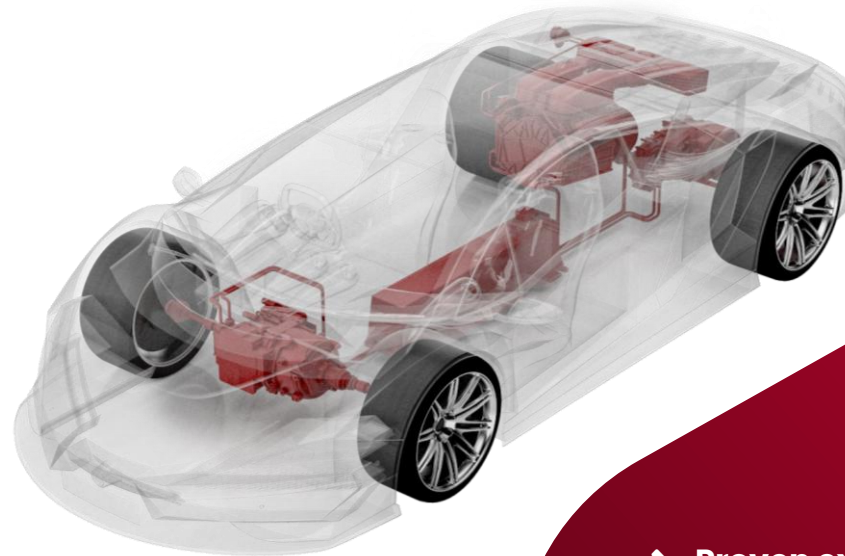
FEV Add-on Range Extender System Controls

FEV SIGNATURE SOLUTIONS

Quickly enter the REX/REEV market with your BEVs or conventional ICE powertrains

FEV offers

- ▶ Range Extender Controls for your powertrain development program as an add-on to your existing software, including integration services
- ▶ High readiness-level to speed up your program straight from the start, based on our comprehensive library of control functions in series level maturity
- ▶ Tailored process from prototype to production to balance your needs of maturity and project timeline
- ▶ X-in-1 controller: our REX Add-on Controls can be upgraded to extend to and take over engine management controls and BEV vehicle controls
- ▶ Cost effective implementation solutions as a standalone or X-in-1 controller with reduced complexity of your E/E system and controls interfaces



Why FEV

- ▶ **Proven expertise:** 45+ years of automotive engineering excellence, trusted by global OEMs and Tier-X suppliers to deliver innovative, production-ready solutions with deep domain expertise
- ▶ **Customer-centric solutions:** Transparent and customizable, enabling you to extend, integrate, and scale your own development
- ▶ **Ready to go:** Available control functions ready for customization in high maturity

Selected reference REEV projects

HYBRID RANGE EXTENDED ELECTRIC VEHICLES

North American OEM

Range Extended Electric Class 8 Truck with CNG combustion engine

- › Buildup, controls and hardware design of a A-Sample and B-Sample Fleet for series production range extender vehicles.
- › Completion in 2022

FEV responsibility

- › **Propulsion system controls**, calibration, and certification
- › Vehicle integration for OEM ADAS features, controls and driver interfaces
- › Advanced product quality planning (APQP)

Japanese OEM

Predictive Range Extender Functions and Fuel Economy Evaluation

- › Support in the development of a concept system for a fuel cell powered railroad application
- › Completion in 2019

FEV responsibility

- › Development of **E-horizon reconstructor model**
- › Development of **AI based prediction algorithm** to determine the speed profile (short, medium and long-horizon)
- › Development of FEV patented algorithm to optimize **decision on hybrid or electric driving mode** based on road-preview data.

German Premium OEM

2x Hybrid BEV demonstrator concept with range extender topology

- › Concept development, controls, hardware design, integration and testing of 2 range extender vehicle concepts
- › Completion in 2022

FEV responsibility

- › Complete REX E/E integration **without modifying electric vehicle control system**.
- › **Autarkic Add-On** implementation of controls for REEV system
- › Establishing a control structure with both main optimization targets: fuel consumption and NVH optimized operation.

Reference project FEV propulsion

Courtesy of Hyliion

Electric Range Extender (ERX) for Class 8 tractor-trailer applications

FEV involvement

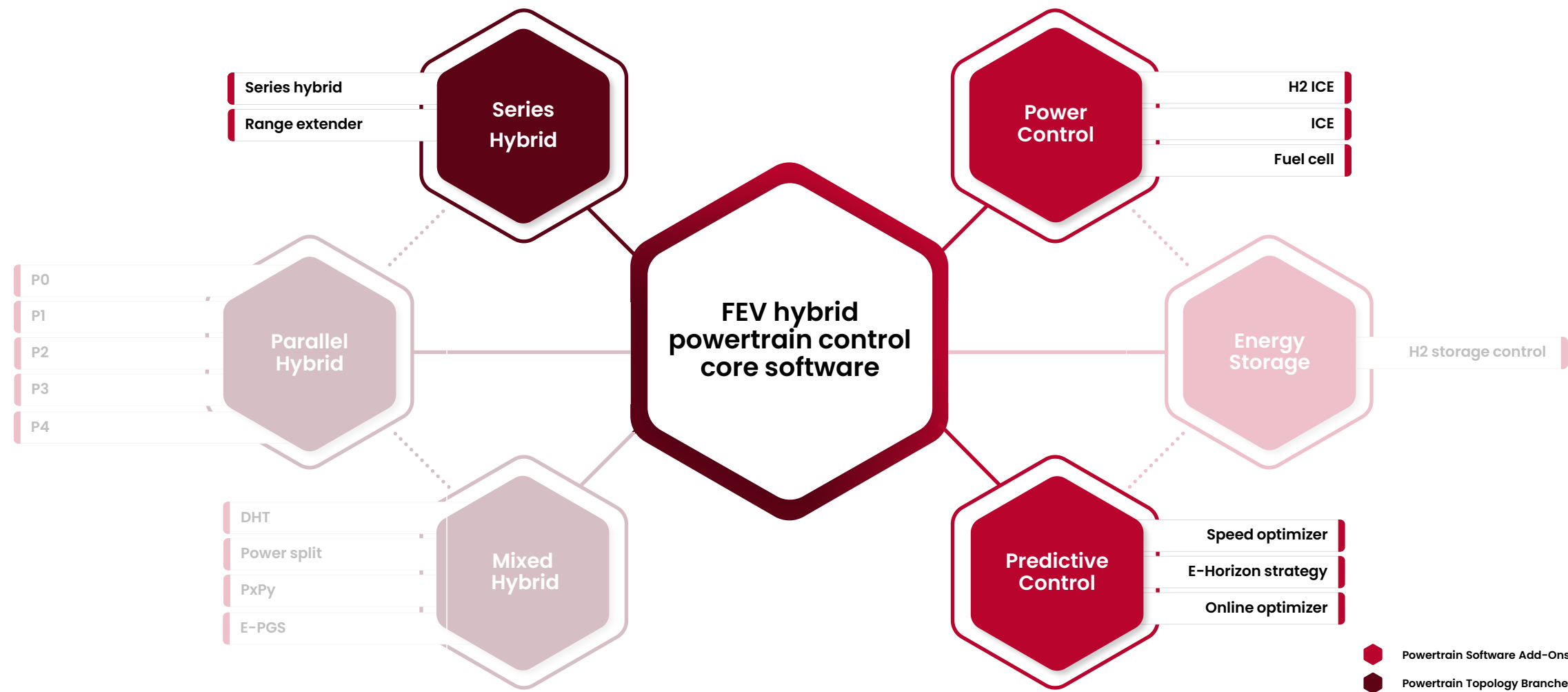
- Powertrain
 - Design
 - Development
 - Integration
 - Validation
- **Propulsion system controls**, calibration, and certification
- Vehicle integration for OEM ADAS features, controls and driver interfaces
- Advanced product quality planning (APQP)

Technology benefits

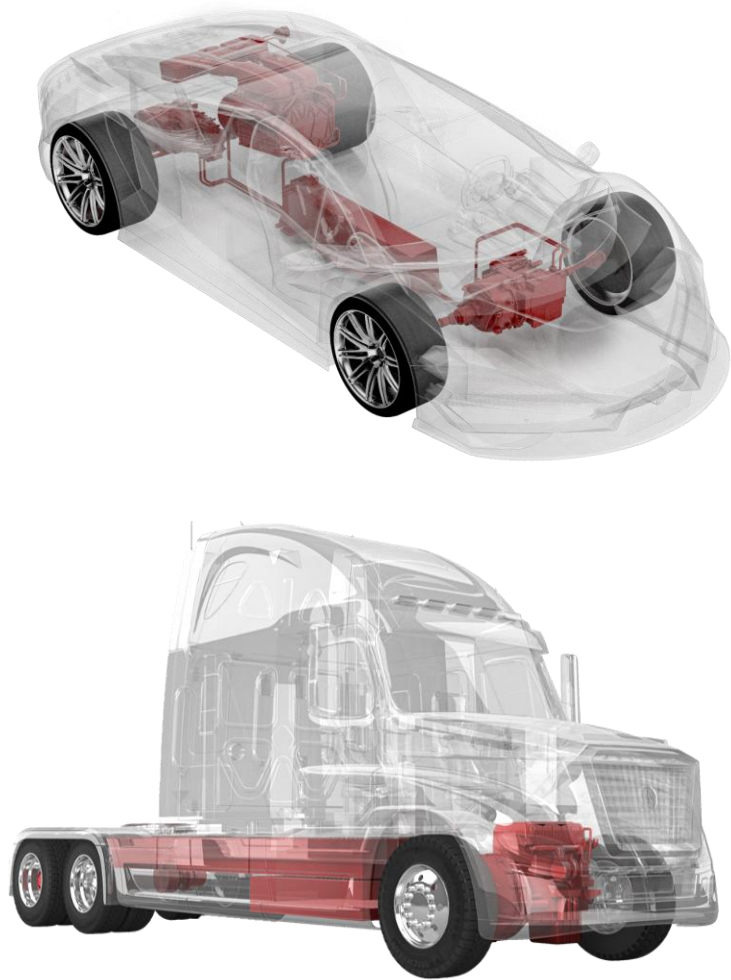
- BEV operation with range extension
- Better acceleration
- Lower total cost of ownership



Series REEV software as part of FEV's powertrain control software



Find out which core REEV control functions can support your development



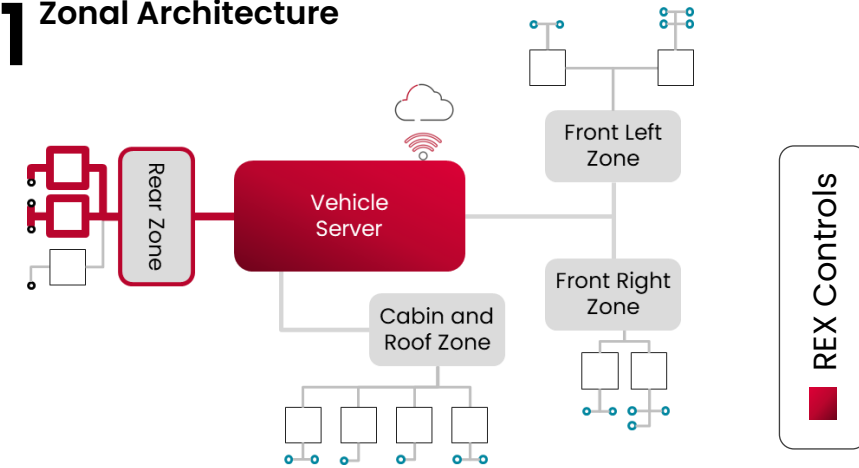
NVH Optimization	NVH control ensures the REX operates within the desired NVH character, remaining imperceptible to the driver. Intelligent speed and load management harmonize NVH behavior in full compliance with performance and emission.
Vehicle coordination	Coordination of vehicle sub-systems and states, such as the low voltage, high voltage and powertrain activation states.
Predictive energy management	Predictive energy management, and power distribution for the electric powertrain system – considering minimization of fuel consumption, emissions and NVH.
Torque management	Determination and arbitration of driver and AD system torque requests. Drivability filtering and torque distribution for enhanced performance, efficiency and comfort.
Diagnostics	Monitoring of the system state and detection of possible faults. Coordination of the system reaction for maximum system availability.

Adaptable to your E/E architecture

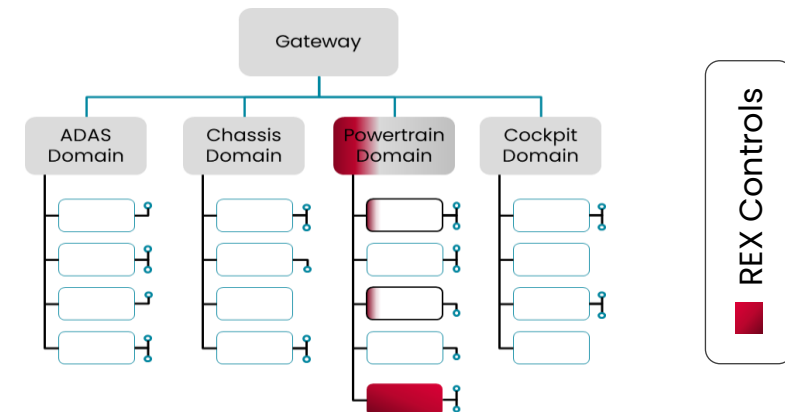
No matter the base vehicle E/E topology, FEV can integrate existing AUTOSAR control software onto **existing or new hardware**.

Thanks to the extensive inhouse software library landscape, **X-in-1** controller integration methods are also applicable where hybrid controls and e.g. engine management system share the same platform

01 Zonal Architecture



02 Classical Domain Architectures



(Similar possible for Central Gateway Architectures)

Get in touch with us for further information



[www.fev.com/en/
signature-solutions](http://www.fev.com/en/signature-solutions)