

FEV Signature Solutions Predictive Powertrain Controls

Our predictive controls framework offers a scalable set-up to enable a customized solution for your product

FEV offers

- ▶ Comprehensive framework of powertrain predictive control software for electrified powertrains in various domains
- ▶ White box option to enable you to use FEV's solution as basis for your own development
- ▶ Scalable approach serves different complexity trade-offs, such as on-board vs. cloud computing or online optimization vs. enhanced derived rule-based strategies
- ▶ Customization services for prototypes or series applications
- ▶ Additional services as modification/extension, integration, commissioning and calibration, business case evaluation and consulting



Why FEV

- ▶ Proven functions applied to various vehicle applications and continuous optimization
- ▶ Customization by FEV to exactly address customers' needs
- ▶ Cross-domain competence from a single source
- ▶ Customer friendly license model, as one time license fee and tailored license scope

Selected reference projects

PREDICTIVE CONTROLS DEVELOPMENT

Asian OEM

PHEV Passenger Car

Predictive Energy Management

- Development of E-horizon reconstructor model
- Implementing an AI based prediction algorithms
- Multi-layer optimization algorithm for on-board energy optimization of different horizons



Predictive catalyst heating strategy

DE102017126091A1 (application)

Asian OEM

Range Extender Passenger Car

Predictive Energy Management

- Adaptation of FEV patented algorithm to optimize decision on hybrid or electric driving mode based on road-preview data
- Model-in-the-loop simulation to evaluate the algorithm in different cycles and conditions



Patents
Method to optimize fuel consumption of a hybrid vehicle

DE102018101926A1 (application)

European Research Project

Fuel Cell Coaches

Combined cloud based and on-board predictive energy management

- Application to various types of busses
- Development of hybrid control software
- Predictive energy management over the entire route



Start stop system for an engine

DE102023124039A1 (application)

Asian Non-Road Mobile Machinery OEM

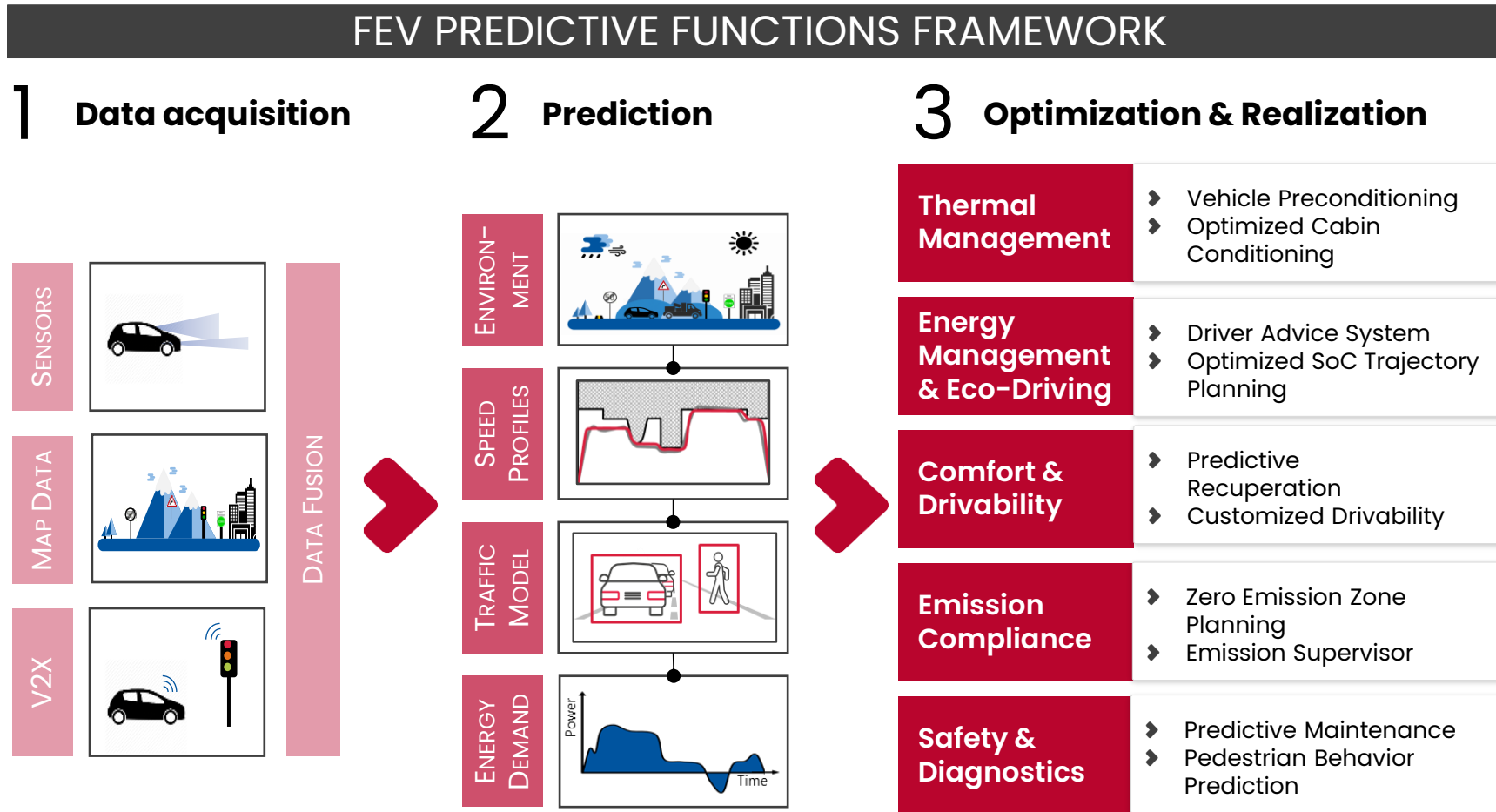
Series HEV Wheel Loader

Predictive Energy Management

- Phase recognition of typical operation cycle
- Online optimization algorithm to optimize energy consumption for current phase
- Driving and hydraulic operating conditions are part of optimization



The FEV predictive control framework is applicable to various domains



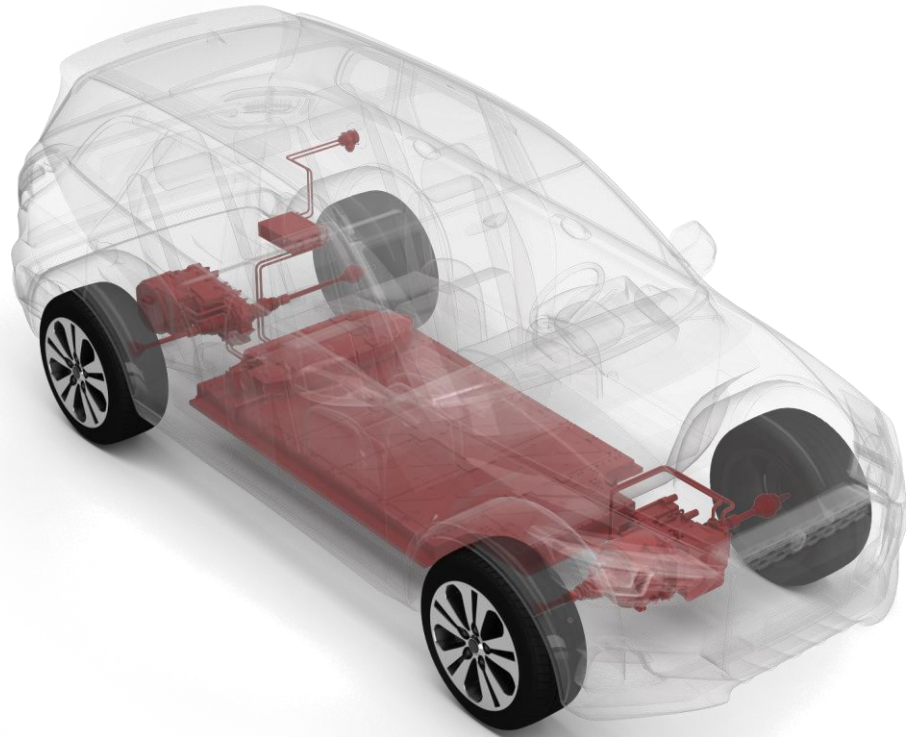
Re-usable & scalable set-up for many objectives

- Data fusion of various data sources
- Implementation of prediction models defining system boundaries
- Optimization of the objective and realization via system activation

FEV Predictive Functions Framework provides a tool chain to implement a variety of features

FEV's predictive control functions and services

SPECIAL FEATURES



Consulting services

Market and brand DNA analysis including customer **willingness-to-pay** assessment for predictive features. **Business case** development and evaluation for **different distribution approaches**

E-horizon reconstructor

Reconstructing the dynamic information (eg. traffic flow) and static information (e.g. speed limits) – received from map-provider according to **ADASIS V3** specification for different horizons

Speed prediction module

Provide the speed trajectory input for predictive management. **Physics-based and AI driven models** used for higher accuracy

Powertrain operation optimization

Optimizing **energy consumption, emissions and driver comfort trade-off** via **SOC and thermal management** considering **different prediction horizons**, e.g. by dynamic programming or model predictive control

Cloud computing

Unique capabilities to establish cloud-based optimization and connectivity via FEV's **V2X rapid control prototyping** software package and toolchain

Get in touch with us for further information



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