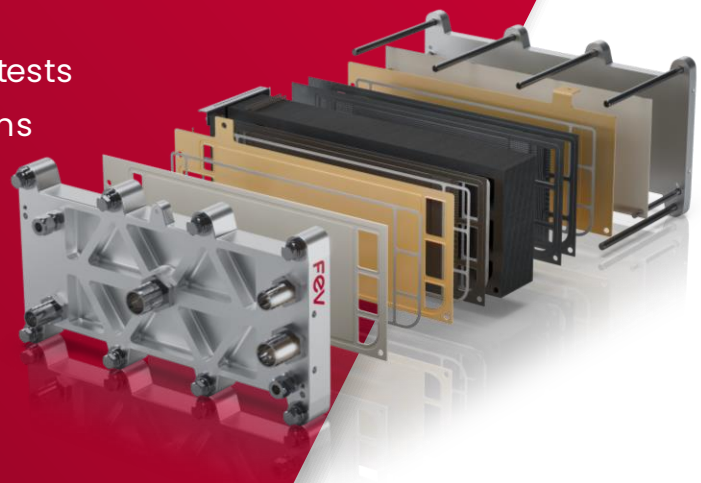
FEV Signature Solutions

Fuel Cell Aging Analysis and Lifetime Improvement

Assess and improve the lifetime of your fuel cell stack

FEV offers

- Advanced fuel cell stack aging models
- Precise lifecycle prediction tools
- Optimization of operating strategy to reduce stack aging
  - Implementable with your or FEV's FC onboard controls
- Durability testing
  - Customizable accelerated durability tests
  - Fast, reliable durability testing solutions



Why FEV

- Proven stack aging models validated in real-world fuel cell applications
- Customizable solutions to fit specific customer requirements
- Continuous optimization based on the latest fuel cell degradation data
- White box approach for customers to develop their own testing protocols
- Customer-friendly, flexible licensing model with tailored scope

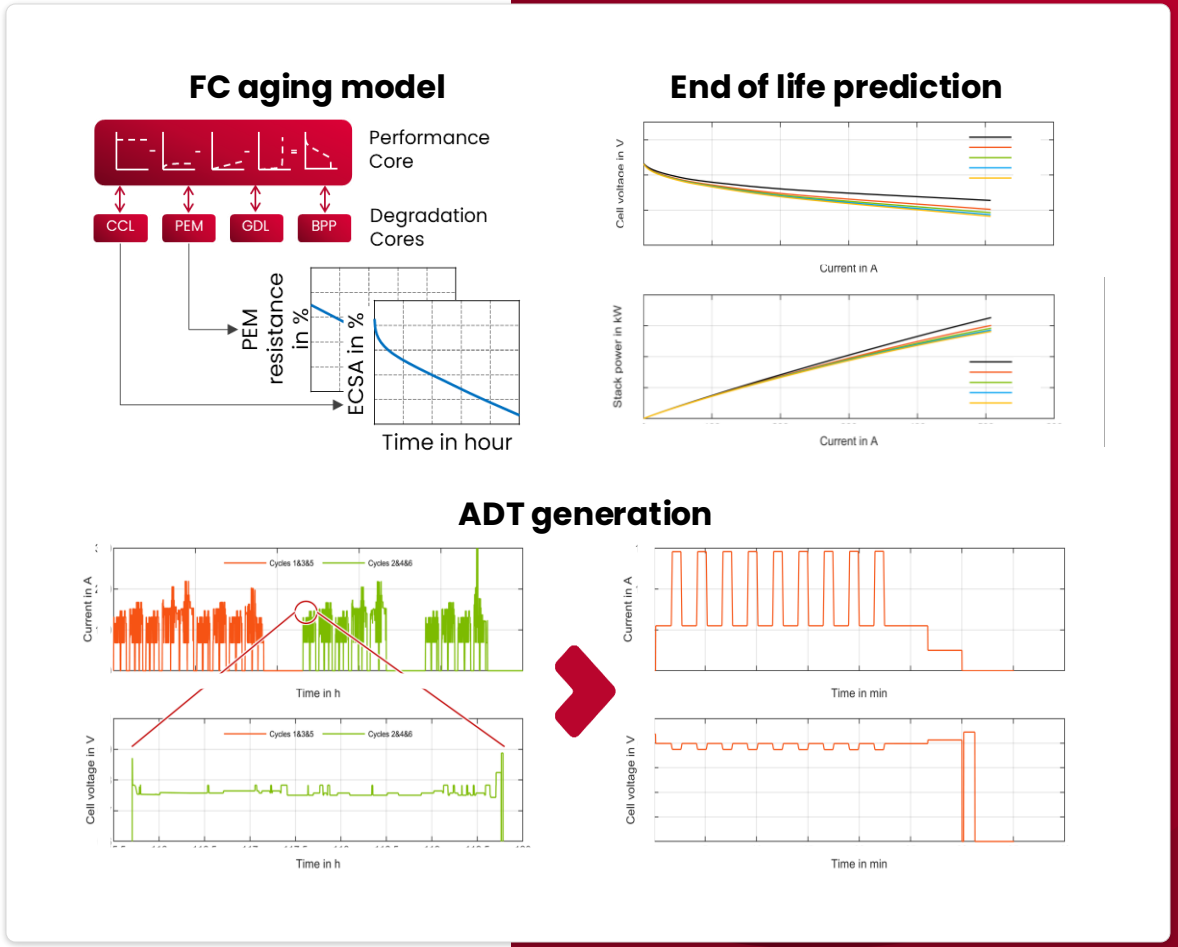
Development of a degradation model for fuel cells and the definition of an accelerated durability test cycle

CLIENT: RENOWNED AUTOMOTIVE MANUFACTURER

- Support to develop a degradation model for fuel cells used in commercial heavy-duty vehicles
- Support to define an accelerated durability test (ADT) cycle
- Completion in 2024

FEV responsibility

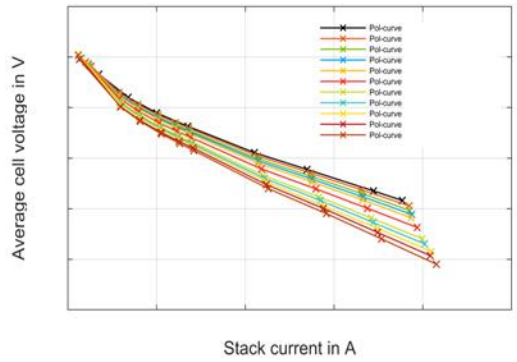
- Detailed analysis of pre-test data to form the basis for degradation model calibration
- Development and calibration of a degradation simulation model
- Definition and optimization of the final ADT cycle to replicate End of Life behavior



Fuel cell aging models allow quantify the end-of-life performance, support the development of the operating strategy and speed-up the validation

Lifetime prediction

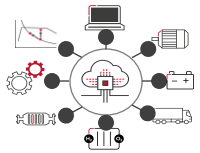
- Use customer relevant test cycles to analyze the performance after e.g. 20.000 h
- Identify critical test cycles
- Perform sensitivity studies

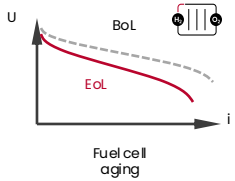


Evaluation of hybrid operating strategies

- The fuel cell power requirement is depending on the layout of the hybrid architecture and the operating strategy
- The FC aging simulation together with powertrain models allow to vary the hybrid operating strategy and evaluate the impact lifetime


Vehicle models

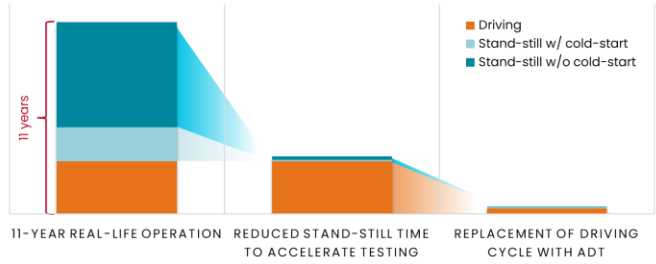

Operation strategy



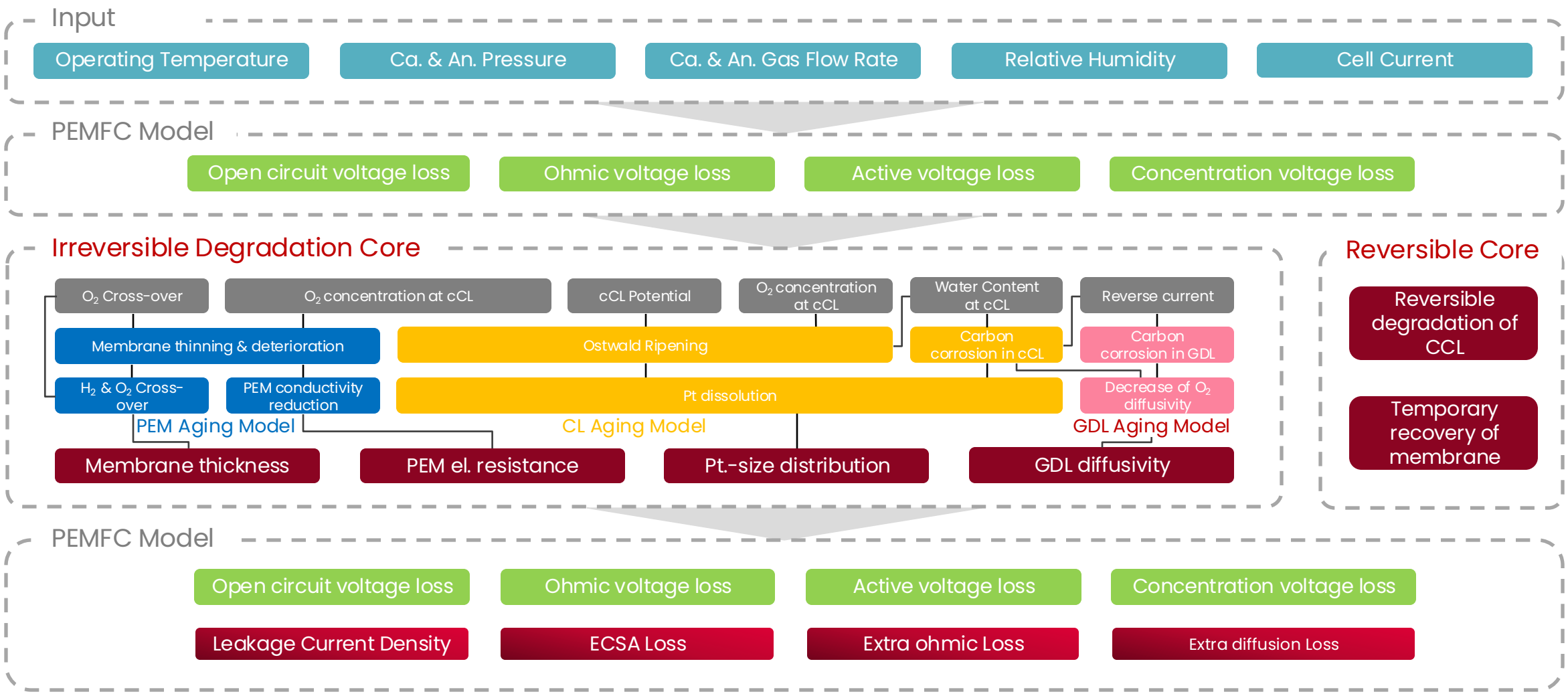
Fuel cell aging

Definition of accelerated stress test cycles

- Comprehensive assessment of load cycles and stand-still periods
- Identify stressors and parts of the cycle with low degradation
- Realistic aging behavior despite accelerating by a factor > 6 beyond “quick wins”



Overview of FEV fuel cell degradation model structure and sub-models
Both, irreversible and reversible degradation is modeled in a physical way



Get in touch with us for further information

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