MAKE IT NEW

Science, future facts, sustainability and power distinguish the innovation + transfer network of the FVV. Sustainable, climate-effective technology solutions emerge from pre-competitive bottom-up research.

Science for a moving society

MAKE IT NEW

Science for a moving society

Future Facts
Forschung

Industrial Collective Research (IGF) empowers companies to solve joint research and technology problems on a science-based approach. It provides access to a continuous stream of new knowledge they can use to create their own products, processes and services.

Sustainable Solutions
Verantwortung

FVV Research is globally networked to find scientific and technological foundations for climate neutrality and zero-impact emissions from sustainable energy conversion systems. We always keep an eye on society's expectations and the technological requirements for sustainable development.

Science
Wissenschaft

Industrial research and development benefits from the fact / field-based collaboration with the science community, universities and non-profit research institutions, on the future of technology. This creates innovative power in industry and excellence in research, teaching and learning.

The FV**V-Model**

The V-model is a well-established engineering process model that the FVV has adopted for IGF project planning: Society's demands and the associated technological requirements for sustainable energy conversion systems are specified from the system level down to the component level and implemented in research projects.

WE ARE THE
POWER BEHIND ALL DRIVES

OUR TASK IS TO
KEEP THE FUTURE OPEN

SCIENCE FOR A MOVING SOCIETY – THE NEW CLAIM

Science for a moving society

Our task is to keep the future open

The FVV is globally networked to create **science-based insights into forward technologies for climate neutrality and zero-impact emissions from sustainable energy conversion systems. We have a clear fact-based compass and we are always open to the best solution from a technical, economic and environmental point of view.** In doing so, we organise open-topic research along the value chains, bringing together companies with the same interests regardless of size and economic power. We network bright minds and benefit from their knowledge and experience. We think ahead and open up paths to the world of tomorrow for young talents. **This is how inner drive and passion give rise to science for a moving society.**

We are the power behind all drives

In our innovation network, globally operating manufacturers of energy carriers, power systems, sustainable powertrains and prime movers such as vehicle / aircraft / industrial engines, fuel cells and turbo machines, as well as their suppliers and development service providers, conduct together with universities and other research institutions pre-competitive, collective research on future technologies. **The goal is to operate energy converters – engines, hybrid powertrains, turbines, compressors, turbochargers and fuel cells – with renewable energy sources in new (partially) electrified, integrated and digitalised conversion systems in a more efficient, cleaner and sustainable way** – to the benefit of society, climate, environment and industry.

SOCIAL RESPONSIBILITY

SUSTAINABLE DEVELOPMENT GOALS
https://sdgs.un.org/goals

SOCIETY'S EXPECTATIONS

- Affordable and clean energy
- Climate action
- Industry, Innovation and infrastructure
- Responsible consumption and production
- Decent work and economic growth
- Partnership for the goals

In its Agenda 2030, the UN set out seventeen global Sustainable Development Goals. The FVV bases its work around six UN Sustainable Development Goals, each of which is given equal weighting.

SUSTAINABLE DEVELOPMENT

TOMORROW'S INDUSTY AND RESEARCH

→ Life cycle assessment
→ Transformation of the energy system
(defossilisation, renewable energy sources)
→ Clean and just mobility
(decarbonisation, sustainable mobility solutions)

→ Industrialisation, digitalisation
→ Resource and energy efficiency, circular economy
→ Environmental compatibility (air, water, soil)

→ Globalisation, raw material chains
→ Economic geography, industrial locations
→ Qualification (education, science, research)

Megatrends
Members
FVV

SUSTAINABLE DEVELOPMENT

SUSTAINABILITY | SOCIETY

FVV organises science-based, forward-looking research. We think ahead and open up paths to the world of tomorrow for young talents. → Future facts, orientation studies → Academic research, qualification of young engineers

PRE-COMPETITIVE RESEARCH TOPICS

COMPETITIVE STRATEGY IMPLEMENTATION

GLOBAL MARKETS

SYSTEM

Energy infrastructure and storage

Interaction of energy sources and system components, energy infrastructure and external storage. → Chemical energy carriers and alternative fuels beyond application → Standardisation → Life cycle analyses

Sustainable powertrain systems

Road / rail vehicles: classic powertrains (ICEV), hybrid / electrified powertrains (PHEV, BEV, FCEV), aircraft engines, marine propulsion, mobile machinery, power systems. → Energy storage within the application → System efficiency → Air pollution, global warming, noise, sound, radiation → E-machine combined with battery

METHODS | TOOLS

→ Development tools
→ Artificial intelligence
→ Emission control / EMC

SUBSYSTEMS

Energy conversion systems

Innovative and / or optimised energy conversion systems minimising environmental impact and maximising process efficiency and engine performance. → Engines → Electric motors → Fuel cells → Turbo machines → Zero-impact emissions

COMPONENTS

Materials science and recycling

All conventional topics on materials research in connection with new energy sources, production methods and recycled materials. → Strength → Tribology → Recycling

KNOWLEDGE TRANSFER

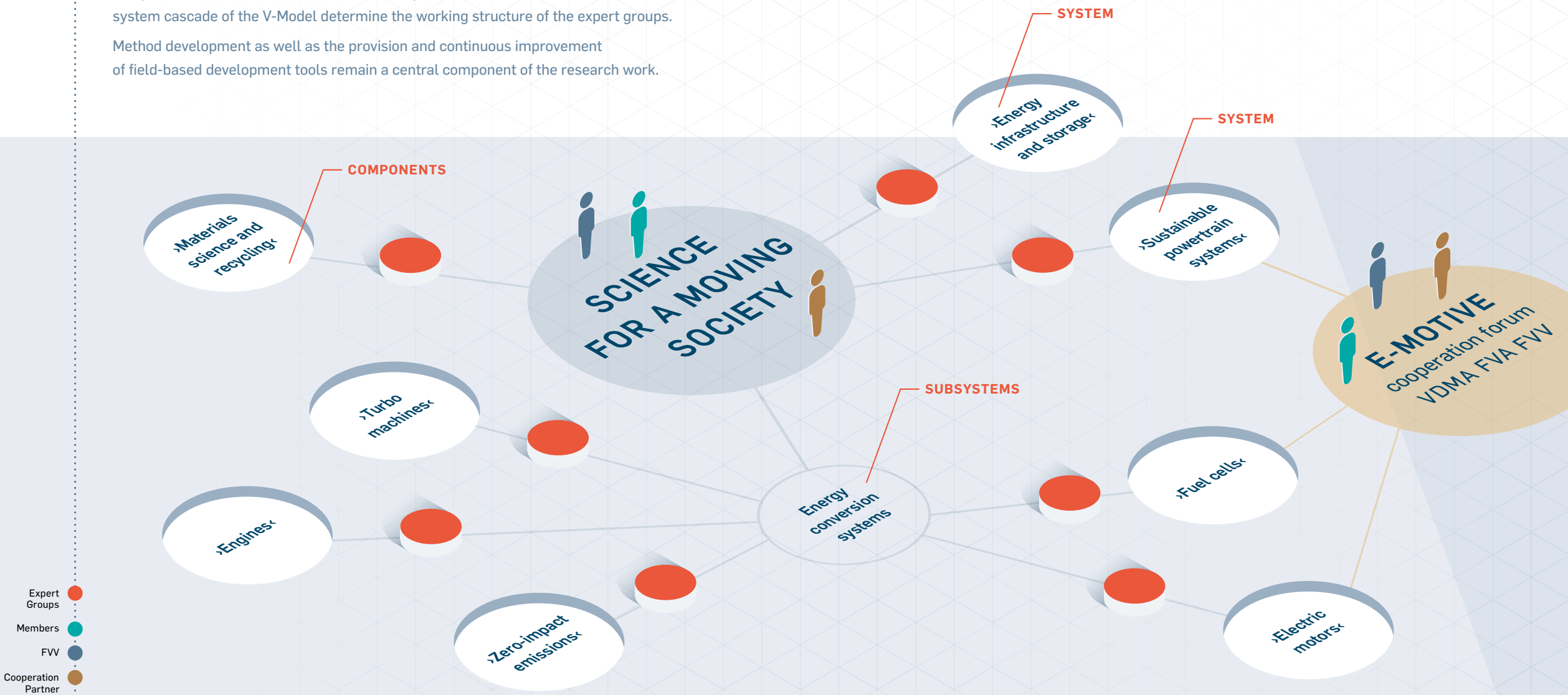
Industrial Collective Research (IGF) is both trend-setting and open-topic. Its core element is the transfer of knowledge, which reaches its natural system boundary with the competitive implementation of the research results. From here on, companies use the new knowledge to develop their own products, processes and services.

Board
Expert Groups
Members
FVV

EXPERT GROUPS

The priorities for sustainable research, development and innovation within the system cascade of the V-Model determine the working structure of the expert groups.

Method development as well as the provision and continuous improvement of field-based development tools remain a central component of the research work.



EXPERT GROUPS – TERMS OF REFERENCE

Together we develop ideas for the future. Experts from member companies meet in the groups to identify common research needs and design projects accordingly. The Scientific Advisory Committee of the FVV appoints chairpersons for each group to lead the scientific work.

Energy infrastructure and storage

Interaction of energy sources and system components, energy infrastructure and external storage.

SYSTEM

→ Chemical energy carriers and alternative fuels beyond application → Standardisation → Life cycle analyses

+ General issues related to demand and availability of energy sources / carriers
+ Production, quality, distribution and availability of hydrogen, electricity-based and alternative fuels
+ Standardisation topics on future energy carriers and related issues such as infrastructure and storage
+ Life cycle assessment (LCA)
+ Development of collaboration projects with other institutions to serve the interests of FVV members (e.g. workshop with the fuel / energy industry, ...)

Sustainable powertrain systems

Road / rail vehicles: classic powertrains (ICEV), hybrid / electrified powertrains (PHEV, BEV, FCEV), aircraft engines, marine propulsion, mobile machinery, power systems.

→ Energy storage within the application → System efficiency → Air pollution, global warming, noise, sound, radiation → E-machine combined with battery

+ Questions on energy storage in the aforementioned applications
+ System efficiency of energy conversion processes e.g. charging, system control / regulation, sensor technologies, ...
+ Thermal management
+ Zero-impact emissions, greenhouse gas emissions (e.g. CO_2), noise, sound, electromagnetic compatibility (EMC)
+ E-machine combined with battery / ICE [interface to E-MOTIVE platform]
+ Impact of legal, social and political requirements onto powertrain systems, circularity
+ Development / engineering of tools for i.e. the system architecture and interaction of powertrain assemblies

EXPERT GROUPS – TERMS OF REFERENCE

Energy conversion systems

Innovative and / or optimised energy conversion systems minimising environmental impact and maximising process efficiency and engine performance.

SUBSYSTEMS

→ Engines

- + All conventional engine development topics
- + Optimisation and development of new energy conversion processes focusing on e. g. increasing process efficiency of future varieties of fuels (including use of hydrogen)
- + Reducing the environmental impact
- + Process-focused adaptation of related components and (sub-) assemblies
- + Effects of increasing electrification to the ›engine‹ subsystem and its aggregates
- + Digitalisation
- + Development and improvement of related development / engineering tools based on changing and adopting application / subsystem requirements

→ Electric motors [interface to E-MOTIVE platform]

- + Improvement of electrical motor properties in mobile applications
- + Electrical energy storage systems (battery)
- + Power electronics of the electrical motor and electrical energy storage system
- + Application-focused adaptation of related components and (sub-) assemblies
- + Development and improvement of related development tools e. g. simulation tools, measurement and testing methods

→ Fuel cells [interface to E-MOTIVE platform]

- + Air and hydrogen system path, media conditioning and purification
- + Thermal management of the fuel cell stack
- + Optimisation of fuel cell specific components and (sub-) assemblies e. g. ion exchanger, compressors, ...
- + Research on materials at fuel cell specific conditions and effects, e. g. on bipolar plates, membranes, sealings concerning stack performance, loading characteristics, ageing (durability, degradation), humidification, ...
- + Stack performance / efficiency improvements e. g. performance effects of component and assembly tolerances
- + Safety requirements and definitions
- + Development of defined evaluation methods towards industry standards (generic, ›best practice‹)
- + Technology comparison PEM, High-temperature PEM, SOFC
- + Development and improvement of fuel cell specific development tools e. g. simulation tools, measurement methods (e. g. impedance analysis)

EXPERT GROUPS – TERMS OF REFERENCE

Materials science and recycling

All conventional topics on materials research in connection with new energy sources, production methods and recycled materials.

SUBSYSTEMS

→ Turbo machines

+ All conventional turbomachinery development topics
+ Optimisation of aerodynamics
+ Optimisation of turbomachinery specific components and (sub-) assemblies
+ Research on materials of turbomachinery specific conditions and effects; e. g. high-temperature, loading characteristics, ageing, resonances, use of hydrogen
+ Development and improvement of turbomachinery specific development tools

→ Zero-impact emissions

+ Exhaust aftertreatment concepts, systems and components
+ Alternative aftertreatment system technologies and approaches
+ Effects of the use of alternative fuels and operating liquids
+ Interactions of exhaust components, primary and secondary exhaust species
+ Non-exhaust emission evaluation of all mobile applications (incl. electrified), e. g. brake dust, tyre abrasion, ...
+ Interaction emission and immission / air quality
+ Carbon capture approaches and technologies
+ Development and improvement of related development tools, e. g. simulation tools, measurement and evaluation methods

COMPONENTS

→ Strength → Tribology → Recycling

+ Tribology, strength, fatigue models and improvements
+ Properties, strength and fatigue characteristics of materials for electric powertrains (e. g. copper)
+ Durability and robustness of electrically isolating materials (e. g. aspect of partial discharge, ...)
+ Impacts and interactions on components and (sub-) assemblies caused by novel energy types (e. g. hydrogen, e-fuels, methanol, ...)
+ Components made by additive manufacturing, their properties and related method approaches
+ Material properties impact of recycled materials
+ Energy footprint of components and assemblies depending on material and manufacturing process, circularity
+ Development and improvement of group related development tools e. g. simulation tools, measurement and evaluation methods

EXPERT GROUPS – SCIENTIFIC COORDINATION

Status: 06.10.2023

SYSTEM

›Energy infrastructure and storage‹

NN

SYSTEM

›Sustainable powertrain systems‹

Thorsten Oberpenning
Rolls-Royce Solutions

SUBSYSTEMS

›Engines‹

Energy conversion systems

Dr. Christian Weiskirch
MAN Truck & Bus

SUBSYSTEMS

›Electric motors‹

Energy conversion systems

Carsten Weber
Ford-Werke

SUBSYSTEMS

›Fuel cells‹

Energy conversion systems

Dr. Volker Formanski
BMW Group

SUBSYSTEMS

›Turbo machines‹

Energy conversion systems

Heinz Knittel
MTU Aero Engines

SUBSYSTEMS

›Zero-impact emissions‹

Energy conversion systems

Dr. Frank Bunar
IAV

COMPONENTS

›Materials science and recycling‹

Dr. Dieter Eppinger
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INNOVATION + TRANSFER NETWORK

RTD performers directory

Members directory

Science for a moving society

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