Funding scheme

In the future, hydrogen technology and fuel cell technology will play a major role concerning issues of mobility and clean energy supply. In order to maintain the global competitiveness of Germany for the future, the federal administration, industry and science have initiated the national innovation program hydrogen and fuel cell technology (NIP) as a strategic alliance. Besides research and development, demonstration projects are run on a significant scale. For core tasks so-called lighthouse projects have been established. They will implement tasks under conditions of daily routine in order to test for technical and economical maturity. The NIP will continue until 2016. The total budget is 1,4 Billion Euro. The budget is provided by the federal administration – the Federal Ministry for Economic Affairs and Energy (BMWi) and the Federal Ministry of Transport and Digital Infrastructure (BMVI), respectively – and by the participating industry on equal shares. The National Organization Hydrogen and Fuel Cell Technology (NOW) is tasked with coordination and management of the NIP.

Outlook

Beyond the funded research and development projects under the umbrella of e4ships, the development of a focused strategy for the market introduction is necessary to further support the integration of fuel cell systems into ships. For this purpose, the initiation of succeeding projects for shaping future markets is a logical continuation of the current activities. The continued German policy of supporting technology development for the maritime industry is of central importance. This continuity will contribute to securing the position of the high-tech region Germany in Europe and globally, and will support value creation in this region.

nip
Nationales Innovationsprogramm Wasserstoff- und Brennstoffzellentechnologie

funded by: Federal Ministry of Transport and Digital Infrastructure
coordinated by: NOW

Project partner

The project is bringing together renowned German ship owners and yards, leading manufacturers of fuel cells as well as class societies.

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e4ships nip
Fuel cells in marine applications

Our course:
towards a climatefriendly energy supply on board ships using fuel cells

About e4ships

"e4ships – fuel cells in maritime application" is an association of leading German yards, ship operators, manufacturers of fuel cells, equipment suppliers and classification societies. The association is working on a joint industry project, which is partly financed by public funds. The common interest is in the use of fuel cell technologies on ships for environmentally friendly energy supply for supply systems on ships.

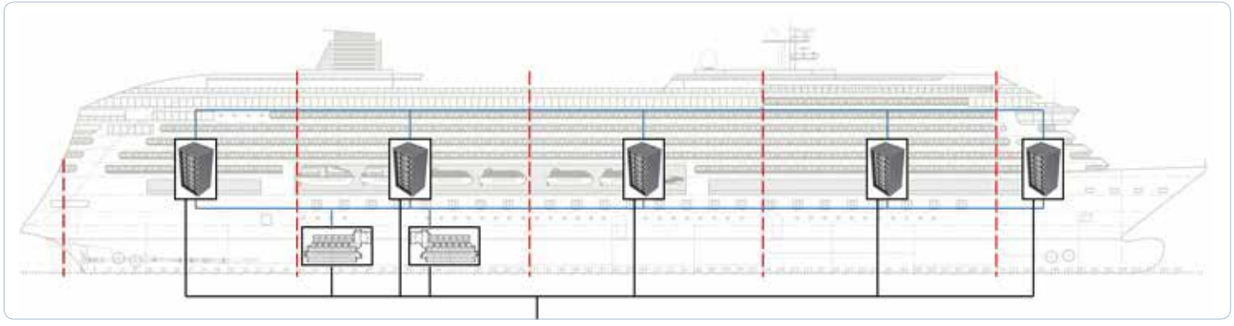
In addition to working on solving specific technical aspects in dedicated individual projects, a common project – the strategy module – is dealing with issues of climate protection, economics of using fuel cell technology, technical standards pertinent to safety and a strategy for market introduction. This is addressing in additional novel fuels like ultra-low sulphur diesel oil or natural gas.

The specific objectives of the strategy module are:

- Benchmark of existing energy supply systems with novel fuel cell based systems which are developed in this joint industry project. Benchmark parameters include sustainability and energy efficiency.
- Identification of investment- and operating costs of fuel cell systems as a basis identification of potential for future optimization.
- Definition of technical use cases and further roadmaps with respect to restrictions on space and weight and power demand on seagoing ships.

The tasks include the contribution to the development of international rules, regulations and standards for type approval of fuel cell systems and their integration with ship systems. Other contribution is addressing the use of low-emission fuels like ultra-low sulphur diesel oil, natural gas or methanol on ships and their availability in ports. The focus is alignment with the International Maritime Organization (IMO), the international regulatory body for shipping.

Two demonstration projects for using fuel cells on ships are executed under the umbrella of the lighthouse project e4ships.



Concept of decentralized energygrid based on fuel cell systems for hotel supply and conventional combustion engines for propulsion systems

Fuel cell module open and completed with drawer box, fuel cell rack with 16 fuel cells modules

Principle of a fuel cell

Air → Fuel cell → Thermal processes

Fuel: LNG / methanol → Fuel cell → Electric processes

Project Pa-X-ell

Under the lead of MEYER WERFT, the project Pa-X-ell is putting to the test high-temperature PEM fuel cells on passenger vessels. Basis are standardized units that are designed in a modular way. The units can be connected to larger power scale. The fuel cell systems are integrated into commercially available 19-inch racks.

A 30 kW installation for demonstration purpose will be installed to demonstrate the production of electricity, heat and cold (so-called trigeneration) in a first phase of the project. This will serve as a basis to feed power into the ship's grid from a 120 kW system in parallel to the conventional energy supply on a passenger vessel.

The installation will use an internal reformer and methanol in its initial setup. A centralized reformer for natural gas will be integrated into the fuel cell subsequently. Distributed power generation with several plants will be tested in a second phase.

Project SchIBZ

The project SchIBZ is realized by a consortium that is lead by ThyssenKrupp Marine Systems. In the core it sees the development of a scalable, integrated hybrid fuel cell system for seagoing ships, having a power capacity of 50 to 500 kW.

The plant is intended to serve as prime energy source for the supply with electricity on seagoing vessels of all kind. The fuel is low sulfur diesel, as it is used for road traffic. To adapt the system to natural gas is a mid-term goal.

The installation is a hybrid system with an electrical efficiency of about 50 %, using a high performance Lithium-Ion battery to buffer the dynamics of the fuel cell and the ship's grid. A 100 kW plant will be built as a container solution and tested in real operating conditions in the supply of the board network at sea.

CAD representation of the experimental setup with a hybridized 100 kW SOFC system on board of MS Forester

Recently developed 25 kW SOFC basic module after the first test with more than 1000 h. Future systems will be put together from these modules

Front view of laboratory diesel reformer for the test with two 5 kW SOFC modules

Part of the SOFC lab setup with one of the two 5 kW modules

Test of a SOFC module on maritime capability (inclination, vibration)