

Demonstration of micro combined heat and power, μ CHP based on Danish fuel cells

Relevance of the project

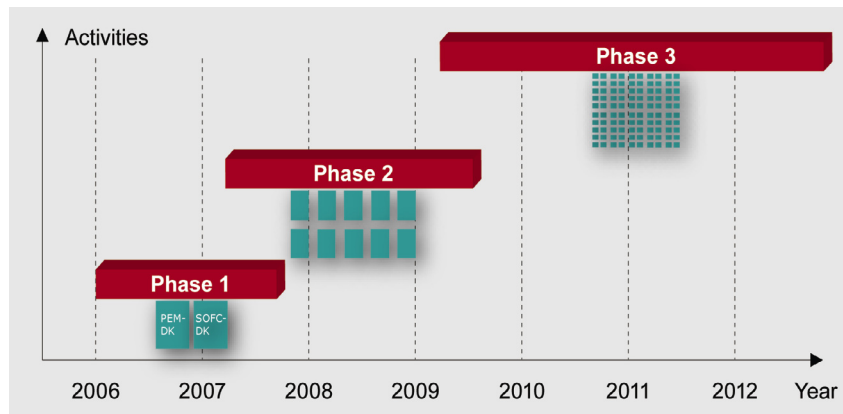
For several decades, the Danish energy industry has been recognised for its leading products in environmental and energy technologies. By extensive research, Danish fuel cell companies and research institutes have placed Denmark among the nations fighting to commercialise fuel cell technology.

The prospects of fuel cells for μ CHP are promising. Above all, the technology will help secure an environment-friendly and safe energy supply in the future. Furthermore, the technology could develop into an important Danish export success.

Both in Denmark and in the EU, it is rated that by 2020, stationary CHP systems based on fuel cells will be well on the way towards commercialisation. It has further been calculated (HPF strategic overview, 2005) that by 2020 there will be an installed power output of 8-16 GWe in the EU and a sale of approx. 100,000 - 200,000 units annually.

Project description

Eight Danish companies with complementary interests and with Danfoss as the founder and project manager are co-operating on a three-phased project on demonstrating μ CHP based on Danish fuel cells.



The three phases, following each other, begin with prototypes of different μ CHP units and end up in demonstrating 100 “close to commercial” μ CHP fuel cell units at “real end users”.

- Phase 1 - μ CHP prototypes, α -test and improvements of sub-components;
- Phase 2 - Demonstration of prototypes at “professional users” (β -test);
- Phase 3 - 100 demonstration units at “real end users”.

Phase 1

During Phase 1, both PEMFC and SOFC technologies will be tested in μ CHP α -prototypes. The prototypes are function tested, and improvements are made to the prototypes before Phase 2.

Phase 1 is currently under implementation with support of the Danish PSO programme run by Energinet.dk. The α -tests are in

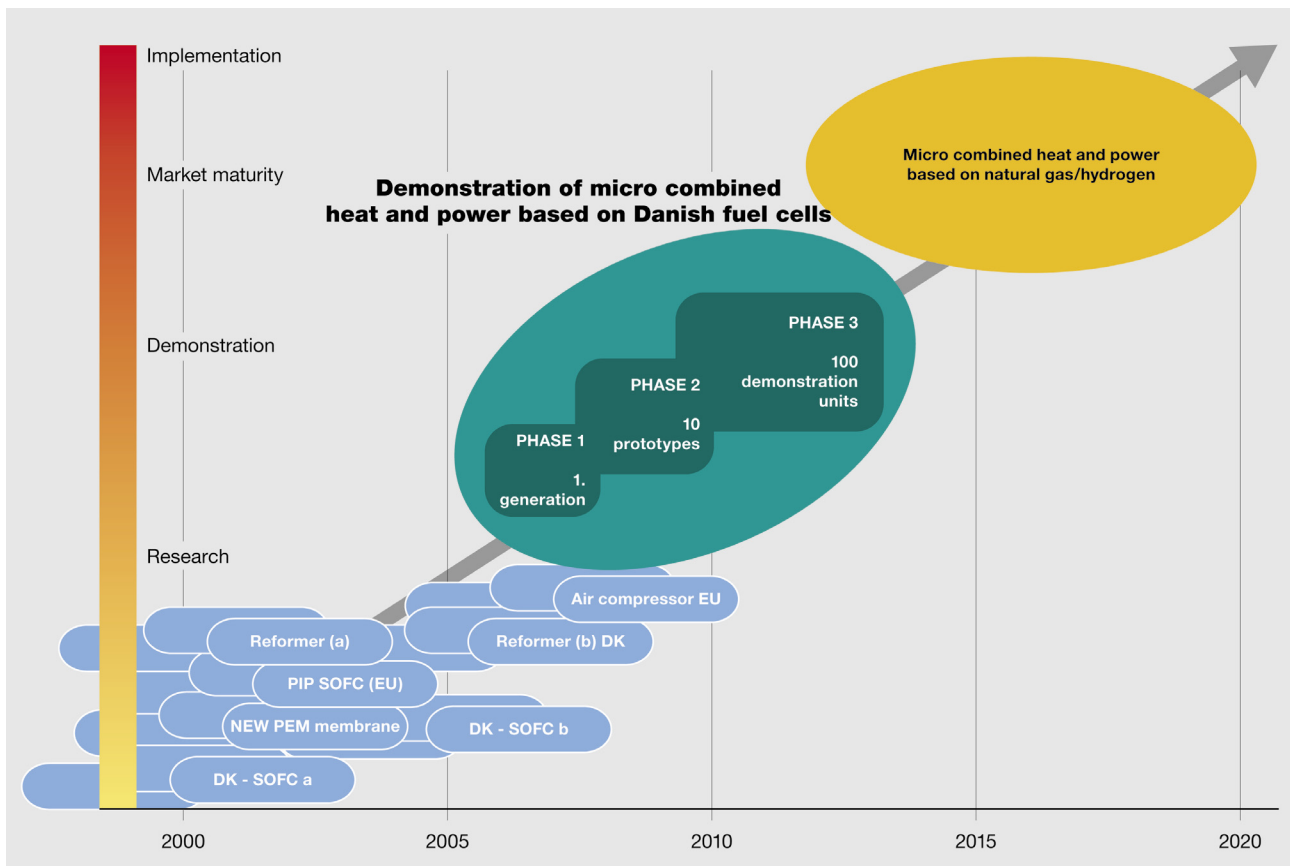
good progress, and a number of results have already been obtained. Also the important preparations for the future prototype demonstration (Phase 2) and the large-scale implementation (Phase 3) are in good progress.

Interaction with Danish FC community

The project participants have made a great effort in establishing relations to other external FC projects, including a hydrogen project in Nakskov and have inspired to the start of a number of related projects.

Important results and findings of related projects have been scrutinized to ensure the optimal linkage with the current project. Hence, the intention of establishing an overall linkage to main actors and activities in the Danish FC community and of contributing to speeding up commercialization of Danish products and concepts is being successfully pursued.





Phase 2

Based on the experience from Phase 1 and on the research carried out in the companies, β -type μ CHP units will be designed, implemented and tested during Phase 2. The 10 to 15 units in the β -test will include the following combinations:

- LT-PEMFC units fuelled with H₂;
- HT-PEMFC units with reformer;
- SOFC units with catalytic partial oxidation;
- SOFC units with reformer.

The β -test units are developed, produced, installed and tested. The

tests will in phase 2 be conducted by energy distributing companies around the cities Sonderborg and Nakskov. The test hosts will ensure that the units run and are serviced, and that the experience is transferred to Phase 3 of the project.

Phase 3

Before μ CHP systems can be sold on “close to commercial” terms, it will be important to get experience from a certain number of reference systems at “real end-users”.

By establishing approx. 100 systems, experience in installation,

operation, maintenance and in end-user satisfaction will be obtained. At the same time, a necessary statistical confidence is established before deciding on an actual production. In phase 3, focus will be on the continued technical development of the fuel cell system and the mass production possibilities. The test setup of the 100 μ CHP units will be remotely controlled. In part of the test the units will be operated as a virtual power plant.

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