

Danish Partnership for Hydrogen and Fuel Cells

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Danish Partnership for Hydrogen and Fuel Cells

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1 Danish Partnership for Hydrogen and Fuel Cells

A Danish national strategy for technological development within hydrogen and fuel cells identifies areas with development potential and provides guidelines for prioritization which can be used when formulating the various programmes for strategic research, development, and demonstration. The Danish national strategy proposed an organizational set-up based on comprehensive collaboration in executing a highly qualified, cross-disciplinary, and cross-institutional research, development and demonstration effort. In autumn 2007 this set-up became the Danish Partnership for Hydrogen and Fuel Cells. Participants in the Partnership comprise Danish key players from industry, research institutions, and authorities. Authorities as public funding providers participate with a status as observers. This enables efficient structuring of technological development and the necessary funding and optimum framework conditions can be discussed and defined. The Partnership enables all participants to make road maps and strategies, to define strategic directions and common goals, and to discuss and assess the extent to which the R, D & D activities meet the defined common goals for technical development. The Partnership also ensures international co-operation.

2 Hydrogen and Fuel Cell Technologies

Hydrogen and fuel cell technologies and products will improve the air we breathe, ensure secure and reliable energy supplies, reduce the emissions that cause climate change, and create economic growth and highly skilled jobs.

The potential applications for hydrogen and fuel cells are boundless from running our vehicles, heating and powering our homes, and generating electricity powering the grid to powering our cellular phones, laptops - and even children's toys.

The electric power supply systems of the future will be characterized by a high proportion of renewable energy sources, and by decentralized, externally determined generation. In just over 20 years, Danish companies have pushed wind power from being a dream into a global multi-billion dollar industry. Denmark is in a strong position in terms of integrating more and more fluctuating and unpredictable energy sources such as wind power in the grid by hydrogen and fuel cells.

Hydrogen and fuel cells are not the only solution to overcome these challenges. However, they form an important part of the solution by offering very efficient and flexible production, conversion, storage, and use of energy. Fuel cells are potentially more simple and more quiet than alternative methods of electricity generation because they have no moving parts and they are less prone to unplanned outages.

3 A Strategic Direction for the Future

Denmark is a small player in an international context as there is a considerable focus on hydrogen and fuel cell technology development worldwide. This fact highlights the

importance of formulating a unified Danish approach to the development and utilization of Danish strengths and resources in this field. In June 2005 a Danish national strategy for research, development, and demonstration of hydrogen and fuel cell technologies was published.

The purpose of the strategy is to identify areas with development potentials and to provide guidelines for prioritization which can be used when formulating the various programmes for strategic research, development, and demonstration in the energy field. Danish activities in this area was based on the criterion that the initiatives should have a commercial potential beyond the domestic market and that the initiatives should be based on existing Danish competences.

The overall and long-term goal of the strategy is to ensure:

that Denmark develops and demonstrates effective and competitive technologies and systems that integrate hydrogen and fuel cells – primarily based on renewable energy sources – as an energy carrier in a clean, effective and reliable energy supply, and that Denmark takes a leading position in this field.

This large and complex task requires strong partnerships and a collaborative environment. It involves the private sector, public authorities and research, and educational institutions as well as regional development environments. It requires that their competencies can be coordinated and consistent technological solutions can be developed and demonstrated.

Table: Danish Focus Areas.

Production	Area where funding is recommended	R&D	Demonstration
	Small reformers (conventional fuel for hydrogen)	Development and integration into plants	Efficiency, reliability and price
	Electrolysis via reversible fuel cells	Improved understanding of processes; development of prototypes	Design and choice of materials
	Joint production of hydrogen-containing liquid fuel and hydrogen from biomass	Optimised production of pure hydrogen and hydrogen-containing liquid fuel	Efficiency, reliability and price
Storage	Metal hydrides and amines, nanoporous materials and light pressure containers	Lab.-scale optimisation, nanotechnology – new materials	Design and functionality, low price
Application: stationary, portable and transportation	Development of fuel cell technologies and system-integrated activities	Cell, stack and system development, system integration, improved efficiency, useful life, lower costs	Design, operation, reliability, useful life and price. Infrastructure (distribution, filling stations, etc.)
Systems analyses, etc.	Socio-economic analyses, system and infrastructure analyses	Socio-economic and other analyses (life cycle, public acceptance, means, evaluations, etc.) Integration of new components	
	Safety, standards and environmental analyses	Analyses and evaluation of safety and standards (for both systems and components)	

4 Public-Private Partnership: A Danish Way to Success

The Danish organizational set-up is based on comprehensive collaboration in executing a highly qualified, cross-disciplinary and cross-institutional research, development and demonstration effort.

The main activities occur in the forum of dialogue. Here the key words are sharing of knowledge, integration and innovation through collaboration. Six different research, development, and demonstration activity lines are shown. The individual Steering Teams comprise key players (industry, research institutions, and authorities) involved in and responsible for activities in each activity line. Authorities participate as public funding providers. The task of the Steering Groups is to provide an overview of each project area, to make road maps and strategies to define strategic directions and common goals and to discuss and assess the extent to which the R&D activities meets the defined common goals for technical development.

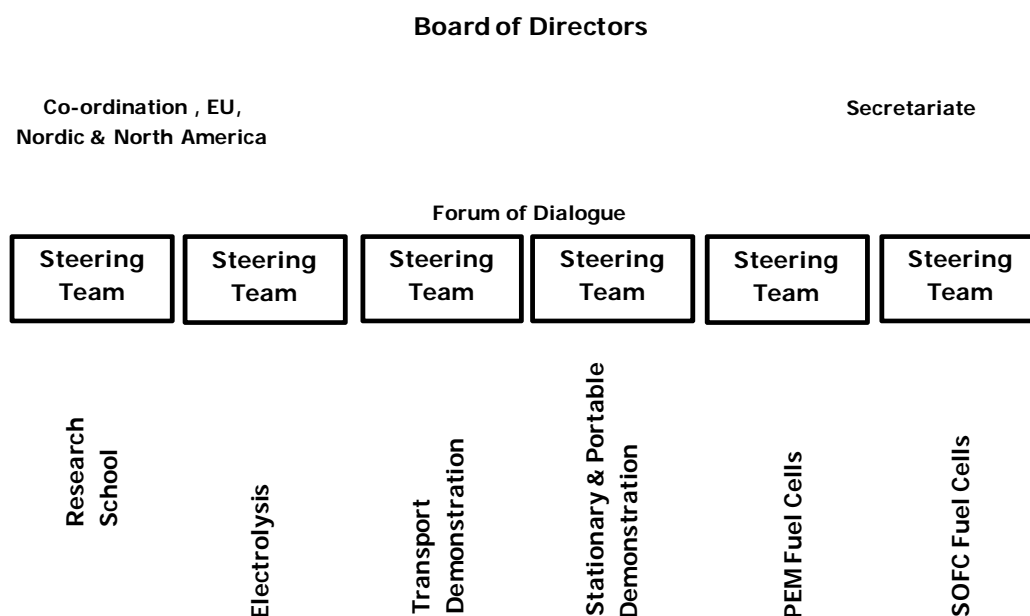


Figure: Organizational set-up.

A secretariat has been established to ensure:

- Active and professional communication and dissemination of information about hydrogen and fuel cells to all stakeholders in the Partnership and to society in general.
- Cooperation among the stakeholders of the Partnership.
- International co-operation with the European FCH-JU and other international players.

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