

Green research infrastructure

If Denmark is to reach the Climate Act objectives by 2030 and 2050, then we lack green testing facilities and research infrastructures. This is what DFIR has learned through conversations with key players who are working within the green transition. What is the best way to utilize the test capacity in Denmark if we are going to develop, scale, test and implement the green technologies by 2030 and 2050? Both providers and users point to challenges and potentials in the Danish research and innovation facility landscape, and the ground is prepared for further dialogue at DFIR's annual conference.

Denmark, like the rest of the world, is facing a huge challenge in its efforts to respond to and halt the extensive climate changes that have been forecast. The first steps were taken with the adoption of the Climate Act and the formulation of different concrete research and innovation missions. The journey towards the zero-emissions society in 2050 has begun. It will be a long journey filled with challenges. At the same time, Denmark also possesses a range of strongholds, which can be exploited to create the innovation needed and establish new jobs and growth. However, a precondition for green technology being developed and applied in time is a well-functioning supply of development, scaling, testing and implementation facilities available for the many different players in the green transition.

Lack of facilities for the green missions

A main theme of DFIR's conversations with the key players is the lack of facilities for the four new research and innovation missions formulated in continuation of the Climate Act. Within the four areas *carbon capture*, *green fuels*, *climate-friendly agricultural and food production* and *recycling and reduction of plastic waste*, there is a need to build facilities, including trained staff,

covering the full value chain from the research based development of components and materials to the actual implementation and system integration of the new green technologies.

Public investments in facilities for research and technological development are made via the so-called road map for research infrastructure primarily directed at the universities and the Green Labs DK Programme directed at enterprises. Research infrastructure and facilities are, however, financed via public and private foundations too, in the form of earmarked funding or as part of larger project funding. Even though more public research funding is channelled in the direction of the green transition, and the private foundations increasingly follow suit, there is only little funding focus on the establishment and operation of facilities for green research and innovation. Hence ultimately, researchers and enterprises have to look abroad to buy themselves access.

The National Committee for Research Infrastructure

The establishment of new national research infrastructure in Denmark mainly takes place through the National Committee for Research Infrastructure (NUFI). Every year, DKK 60-80m are invested in the implementation of new research infrastructures that are based on the road maps, which are published at recurring intervals. The most recent road map from 2020 partially prioritises infrastructure that can support the green transition. But with the formulation of the four new research and innovation missions, it may be time to rethink the road map process and increase the funds with a view to building a green research infrastructure. A rethink of the road map process could also include facilities higher on the TRL scale and a stronger coordination with Innovation Fund Denmark, which will play a vital role in the work with the four missions. The same demand for coordination could also be extended to the private players and the various innovation clusters that have been set up.

Research and innovation facilities



Enhanced collaboration between industry, RTO's and the universities

The existence of green facilities is one thing, but they should also be put into use. Providers and users agree that in Denmark we do not use the facilities at the universities and in the enterprises to the full. A framework is missing for how the facilities can be utilized broadly and operated by trained staff. Currently, the Research Alliance, holding the same wish for better access and use, is mapping all facilities at RTO's (the Danish GTS Institutes), universities, utility companies and municipalities that are available to Danish enterprises. But how to ensure the most efficient use of the facilities that have not been made immediately available? That question has been raised several times in DFIR's conversations about better use of green facilities.

The goal must be to enhance the collaboration on facilities for green research and innovation across public and private sectors

The challenges of utilizing facilities and the financing of staff could be solved by enhancing the collaboration between the RTO's and the universities. Universities possess a great deal of state-of-the-art research infrastructure with great relevance to the green missions. If the universities were to establish a closer collaboration with the RTO's on operation and staffing, more customer-oriented business models could be developed to ensure far greater accessibility to the facilities, in particular for industry. Industry also holds state-of-the-art equipment for the green missions, which could be of great interest to other public or private users. Correspondingly, the use of those requires the development of business models and trained staff that can both ensure sensible operation and address the competitive and IPR-related challenges that may be associated with gaining access to the facilities.

The ambition must be to strengthen the collaboration across public and private sectors on facilities for green research and innovation and at the same time to take a critical look at the regulatory obstacles that may inhibit the collaboration. A cooperation on facilities may in itself potentially improve the quality and applicability of the research and innovation carried out. At present, DFIR is looking at international experiences with sectoral collaboration, where in particular the German Fraunhofer Institutes have a long tradition of linking universities and industry. But much inspiration can be derived from home too.

Denmark is in a leading position in the wind area

When DFIR speaks with international players within the green transition, it is clear that Denmark, in particular in the wind area, is seen as a pioneer country when it comes to facilitating research and innovation. The Danish wind

sector comprises an ecosystem of facilities along the whole value chain, from development to scaling and implementation. Denmark has the large areas at Østerild where mega wind turbines are tested and has nacelle testing facilities at LORC at Lindø. Moreover, aerodynamics and power electronics are tested and developed at the Technical University of Denmark and Aalborg University. In addition, Denmark has a wealth of large and small facilities and living labs that test the integration into the electrical grid, new materials, WindPower to X, etc.

Apart from the existence of those state-of-the-art facilities, the wind sector has been particularly innovative as far as sectoral collaboration on the facilities is concerned. Some facilities are run on commercial terms whilst others are run in project collaborations between enterprises, universities and RTO's. Those experiences – good and bad – from the wind industry may turn out to be of immeasurable value when the work to establish broadly available testing and infrastructure facilities for the four missions begins. Therefore, in collaboration with the Danish Centre for Studies in Research and Research Policy at Aarhus University, DFIR is preparing an overview and analysis of research infrastructure and facilities in the wind energy domain.

Climate Ends and Means: DFIR's Conference on 25 November 2021

At this year's DFIR Conference "Climate Ends and Means", DFIR will address the above themes and questions, among others. At the conference, key stakeholders within the green transition domain will debate the challenges involved in establishing new testing facilities and research infrastructures for the green missions as well as the various business models and the wish for enhanced collaboration across the sectors. Key questions are: Should universities and RTO Institutes collaborate on research infrastructure? Should Denmark have a new green infrastructure road map? Should NUFU take part in the green funds? How should we utilize industrial facilities better? How should we select and finance mega-facilities with focus on implementation and system integration? You can read more about the conference [here](#).

Further information



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