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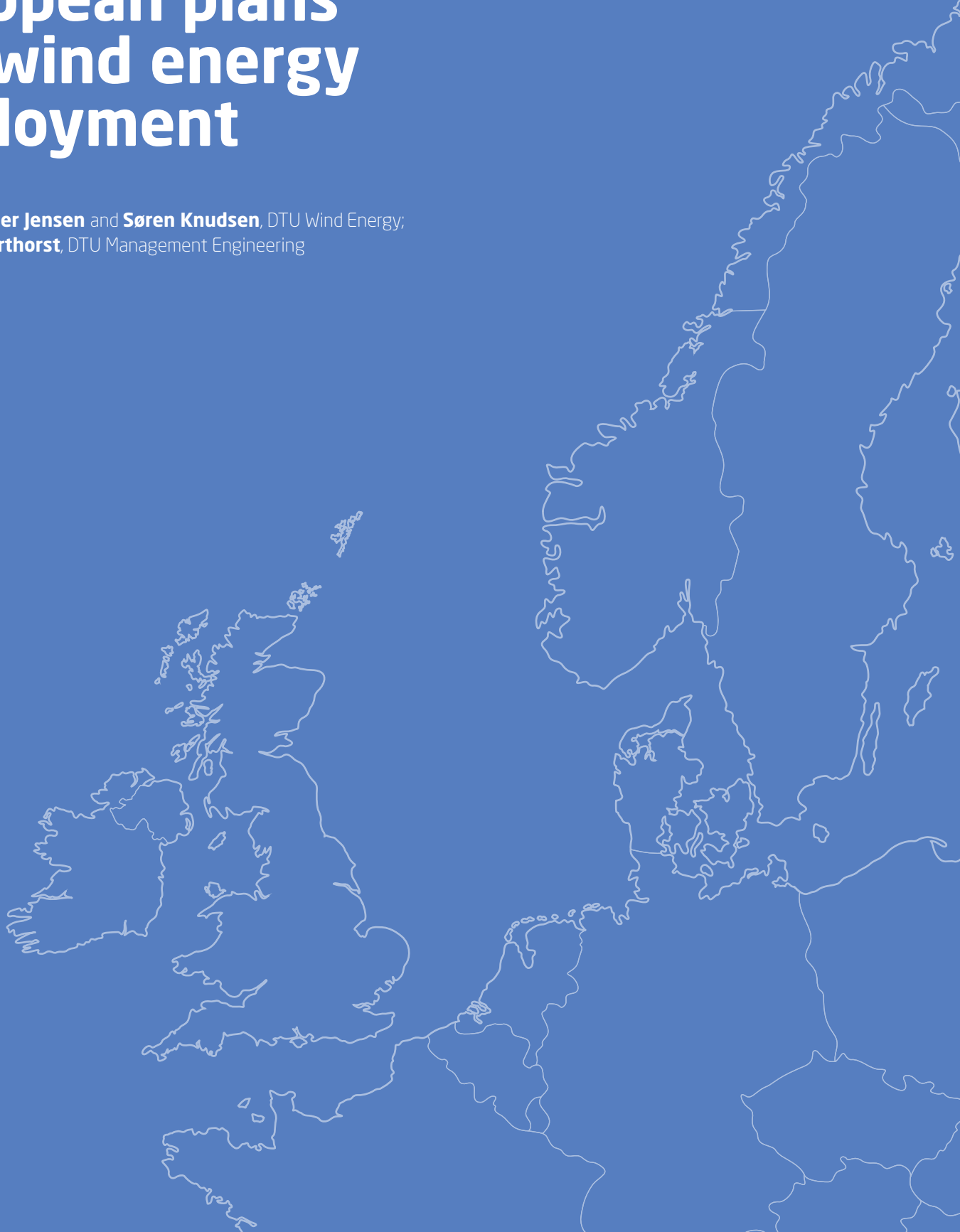
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Chapter 5

Danish and European plans for wind energy deployment

By **Peter Hjuler Jensen** and **Søren Knudsen**, DTU Wind Energy;
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→ The technology pillar of the European Energy Policy is the European Strategic Energy Technology Plan (SET-Plan). The SET-Plan is a strategic plan to accelerate the development and deployment of cost-effective low-carbon technologies.

The implication for wind energy technology is clear: wind energy – offshore and onshore – must be affordable and competitive.

In this chapter we outline European policies directed towards the ambitious target of large-scale use of wind energy in the European electricity supply system, and the scenarios that foresee up to 34% of Europe's electricity coming from wind by 2030. First, however, we address Danish energy policy and strategy in the context of wider European plans.

Danish energy policy and strategy up to 2050

Denmark has a long-term vision for an energy system independent of fossil fuels: by 2035 the Danish heat and power sector should rely only on renewable sources, and the total energy system, including transport and industry, should be totally decarbonised before 2050. An important milestone on the way is for wind power to supply 50% of Danish power consumption by 2020. To reach this short-term goal the Danish parliament has agreed on a significant increase in wind power up to 2020, including 1,000 MW of offshore turbines, 500 MW of near-shore turbines, and a net increase of 500 MW in onshore wind capacity after accounting for the decommissioning of old turbines.

An energy system independent of fossil fuels is a demanding challenge, requiring an effective and cost-efficient transition from the existing energy system to one that is radically different. A new supply structure based on intermittent energy resources such as wind power will require a much more flexible system, including a strong network of interconnectors to neighbouring countries, fast-responding backup and storage facilities for power and gas, and flexibility in the way consumers through demand side management use energy. Where the latter is concerned, heat pumps could be an important link between the power and heating sectors, while electric

vehicles – if introduced intelligently – could greatly benefit not only transport but also the power system, by facilitating the integration of variable renewable energy sources. Denmark already has well-developed energy connections to Germany, Norway and Sweden; recent proposals include new transmission lines to the UK and the Netherlands.

European plans for renewables in the energy supply system

The EU member states have long-term targets in four different areas of energy policy:

1. A binding agreement to reduce greenhouse gases by 2020 by 20% compared to 1990.
2. A mandatory target for renewable energy sources: by 2020, 20% of the EU's final energy demand has to be supplied by renewable technologies such as wind, solar and biomass.
3. A voluntary agreement on energy efficiency, with the objective of cutting EU energy consumption by 20% by 2020 compared to a reference projection.
4. A target of 10% renewable energy, including bio-fuels, in transport by 2020.

These targets will be achieved through the use of renewable energy sources that include wind, solar, hydro, tidal, geothermal energy and biomass. The aims include cutting greenhouse emissions and becoming less dependent on imported energy, while encouraging technological innovation in industry and creating European jobs in the renewable energy industries.

Figure 6 presents the renewable energy targets of the EU27 member states for 2020 against their 2005 penetration level into the energy mix. This information is extracted from the National Renewable Action Plans for 2020.

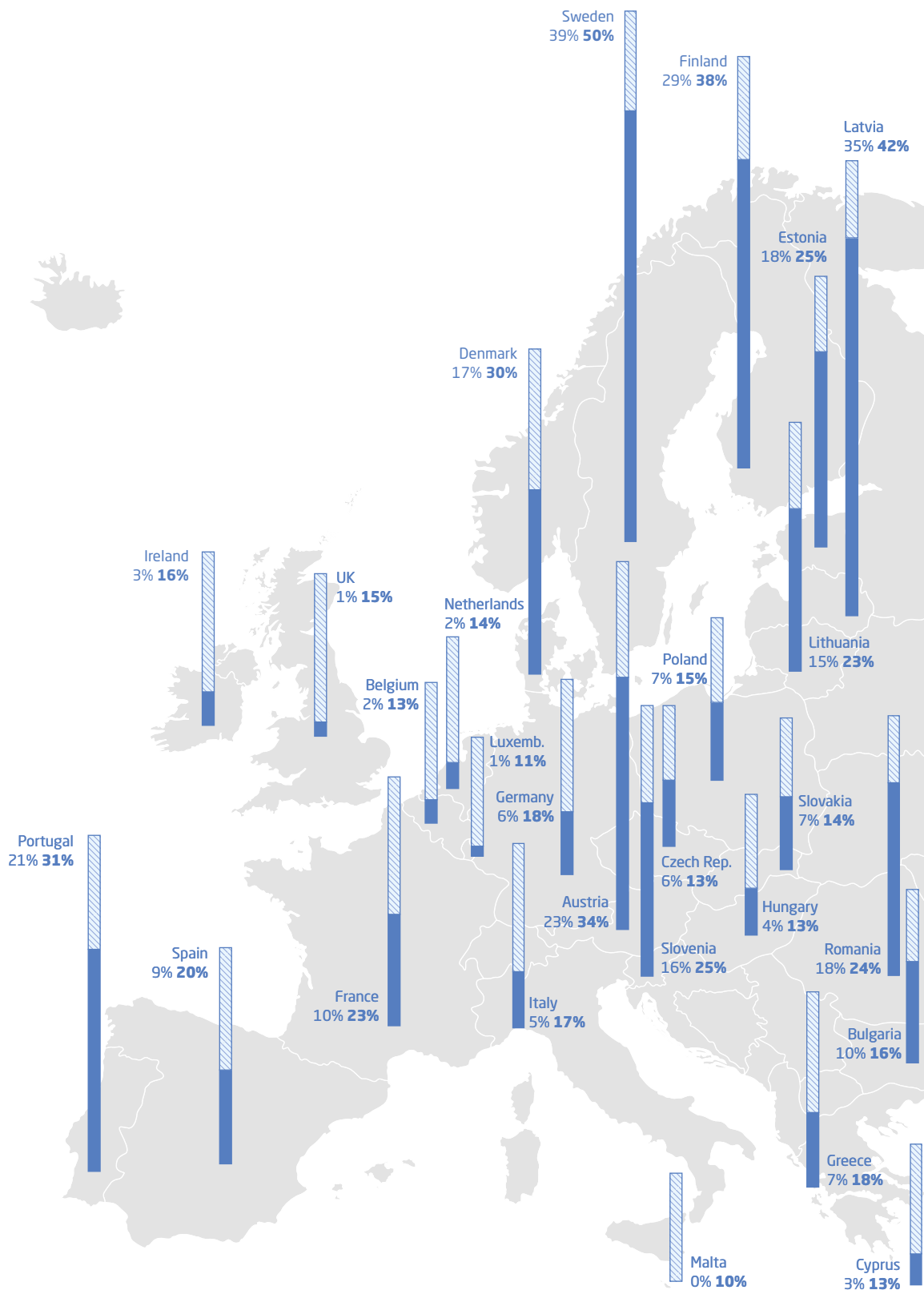
European SET-Plan for the strategic development of energy

One of the major challenges in Europe is that the 28 members of the European market to a large extent

Figure 6 - National renewable energy targets as percentages of final energy consumption.

National renewable energy targets as percentages of final energy consumption.

■ Share 2005
▨ Target 2020



have individual policies for energy, employment, climate and trade.

Through the SET-Plan the European Commission has therefore tried to establish an energy technology policy for the EU as a whole. This strategic plan aims to accelerate the development and deployment of cost-effective low-carbon technologies. The SET-Plan includes measures relating to planning, implementation, resources, and international cooperation in energy technology.

Through the SET-Plan, the European Commission both formulates research policies and strategies for the European research area, and also tries to harmonise the research policies and strategies of the member countries by encouraging them to accept a Europe-wide energy strategy.

Two of the most important instruments in the implementation of the SET-Plan are the 2020 R&D programme and the European Wind Initiatives (EWI) strategies set out through the Wind Energy Technology Platform (TP-Wind) and the European Energy Research Alliance (EERA). The EWI strategies and the Strategic Research Agenda (SRA) serve as input to the Commission and the member states in their development of the 2020 European Energy Research Programmes.

European Wind Energy Technology Platform

In 2006 the European wind energy sector launched the European Wind Energy Technology Platform (TP-Wind). As with other Technology Platforms in Europe, TP-Wind is supported financially by the European Commission. TP-Wind is composed of stakeholders from industry, government, civil society, R&D institutions, finance organisations and the wider power sector, at both member state and EU levels. It is the body with Europe's broadest representation of both the wind power industry and

The primary objective is to work towards the more efficient and large-scale use of wind energy globally, with special focus on a high penetration of wind energy in the European energy supply system, by reducing the social, environmental and technological costs of wind energy. TP-Wind published

its first Strategic Research Agenda (SRA) in 2008, followed by a revision in 2014. On the basis of the first SRA the European Commission published a Wind Energy Technology Road Map for the European research and demonstration programmes. TP-Wind is also responsible for the European Wind Initiatives (EWI), which are recommendations for the Commission's 2–3 year R&D Framework programmes, of which the latest is the 2020 R&D programme.

The Commission uses the SRA and EWI reports as background, together with input from the member states, when formulating its European R&D programme calls.

TP-Wind sees wind energy as the leading renewable energy technology. Given the right support, TP-Wind expects that wind energy could provide up to 34% of EU electricity by 2030. However, this target will not be achieved if the sector and policy makers think only in the short term. Long-term, strategic action in technology and policy research is fundamental; TP-Wind facilitates the development of effective, complementary national and EU policy to build markets, as well as a collaborative strategy for technology development. Its aim is to achieve cost reductions that will ensure the full competitiveness of wind power, both onshore and offshore.

TP-Wind has developed very consistent SRA and EWI reports that the EU uses as the voice representing the wind industry and the research community. These are also used in the member states as reference documents in the national wind energy research programmes. The EWI operates alongside the EERA programme presented in the next section.

EERA Joint Programme on Wind Energy

The European Energy Research Alliance (EERA) is an instrument of the SET-Plan. It represents public research, and was established by leading European public research organisations including DTU. EERA focuses on medium- to long-term research, and complements the European Industrial Initiatives (EII) that fulfil a similar function for industrial R&D. EERA aims to strengthen, expand and optimise EU energy research capabilities through the sharing of

world-class national facilities in Europe and the joint realisation of pan-European research programmes (EERA Joint Programmes). The primary focus of EERA is to accelerate the development of energy technologies to the point where they can be embedded in industry-driven research. To achieve this, EERA streamlines and coordinates national and European energy R&D programmes.

The objective of the EERA Joint Programme on Wind Energy (JP Wind) is to plan and carry out excellent medium- to long-term research to support the Technology Roadmap's activities on wind energy (the EWI), including topics that influence the use and deployment of wind energy. The Joint Programme is formulated as a joint research programme under a number of strategic research themes, each with goals and planned activities. The participants have agreed on the basic structure for a common research programme in wind energy, and carry out their activities so as to make best use of competences, research facilities and other resources available within the partnership. The research programme is strategically directed towards the scientific challenges that follow from the SET-Plan and the RES Directive: large-scale integration of wind power and accelerated deployment of offshore wind, including very large offshore wind turbines. JP Wind comprises six sub-programmes: Wind Conditions, Aerodynamics, Structures and Materials, Grid Integration, Offshore Wind Energy, and Research Facilities. An additional sub-programme on Wind Energy Economics is under development.

The aim of JP Wind is to foster better coordination and ultimately integration of European research activities in wind energy research, with the aim of accelerating the transition towards a low-carbon economy, and maintaining and increasing European competitiveness. Through its coordinating effect on the research communities, the Joint Programme should benefit future as well as current decisions on the setting of research priorities. JP Wind also aims to integrate its various capacities and resources – available through the joint research activities carried out among its partners – with other ongoing European and national projects.

Progress in implementing the European Wind Energy Research Area

The vision of the development of the European Research Area (ERA) is a tremendous challenge. A central element has been the introduction of new instruments and mechanisms to stimulate joint programming between national and European research. The SET-Plan is the framework for the technology development pillar of the European Energy Policy.

The SET-Plan introduced two new R&D instruments. The first of these is the European Industrial Initiatives, which have a short- to medium-term focus on demonstration and research, and operate through public-private partnerships in seven different technology domains, including wind. The second is the European Energy Research Alliance (EERA) and its joint programmes.

Danish wind energy research has played a proactive role in the European arena for several years. A strategic, partnership approach to international cooperation is essential to ensure critical mass, develop synergies and ensure continuing “smart specialisation” in research competences. This is essential if Denmark's wind energy knowledge is to match the needs of the global wind industry and so to play its part in future markets. These partnerships and alliances have become increasingly important to the wind energy innovation chain both in Denmark and internationally.

Increased globalisation has accentuated the need to find new ways of collaborating, often in networks, wherever long-term effort is required. In the past, collaboration took place on an ad-hoc basis, from project to project. As mentioned above, however, a shift towards more strategic long-term collaboration based on an agreed programme is essential. The Commission is accordingly focusing more and more on such collaboration, including clear links between projects with national funding and those at European level.

The most recent example of this is the recently started IRPWIND project. With co-funding from the EU, IRPWIND will help the EERA JP Wind partners move

from a collaboration model based on ad-hoc project participation to a joint strategy and work plan. In short, IRPWIND should accelerate collaboration from its current voluntary status to create an integrated European programme for wind energy research.

Danish wind energy researchers, companies and the energy sector at large have all benefited from the global knowledge base in the past. The next steps – taking advantage of the internationalisation of wind energy research and innovation, and creating R&D collaborations with better coherence and direction

– require a clear strategy for internationalisation from Danish ministries and funding authorities. This is clear from the requirements of joint programming mechanisms including the EIIIS and EERA.

Organisations performing research in wind energy must be active in influencing the development of research strategies for wind energy, since national authorities and the European Commission cannot handle this challenge by themselves. This calls for an international, proactive and strategic approach from universities.