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IX.37 Regulation of wind energy in the European Union

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Abstract

Wind energy is a key piece of the energy transition taking place in the EU. This renewable source of energy already represents 13 per cent of the annual electricity consumption of the EU – overwhelmingly from onshore facilities – with this share expected to double by 2030. This chapter analyses several legal aspects of the development of onshore wind energy, both in EU and national law, for a panel of Member States (Denmark, France, Germany, and Spain). Indeed, reaching this current level of wind energy penetration in the EU has required the development of stable and consistent national legal frameworks alongside generous support schemes. In recent years, these schemes have evolved to allow for wind energy to be better integrated into the electricity market. The legal frameworks established have also served to protect and preserve the wider environment (encompassing biodiversity, landscapes, residential areas, and some technical aspects such as radars and air navigation). Recently, new regulatory challenges have arisen regarding the repowering (replacement) of aging wind farms.

Keywords

Wind energy, support schemes, participation, biodiversity, landscape, neighbourhood, radars, repowering

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IX.37.1 Introduction

The European Union's (EU) energy transition impacts multiple sectors, including heating/cooling, transportation, and electricity. The electricity sector must facilitate and promote a change in the way electricity is consumed (energy efficiency and energy savings) and produced (from fossil and potentially fissile fuels to renewable energy sources). In electricity generation specifically, wind energy is expected to play a major role.

Labussière and Nadaï describe wind energy in the following way:¹

The physical encounter of the wind with the blades of the wind turbine extracts the kinetic force of the wind (individuation) and turns it into a mechanical force (rotation). [. . .] The rotating blades drive a gear system which allows a shaft alternator (1500 rpm) to generate electricity. [Finally,] a transformer [. . .] increases the voltage up to 20 kV.

The amount of electricity generated by a wind turbine depends on the wind speed, the wind's direction, and the turbine's direct physical environment (the presence of trees, hills, valleys, buildings, etc.). Consequently, its output is variable – although predictable – with forecasts for a couple of days ahead possible.²

In 1992, Grubb hailed the technology's generation, stating that it had 'developed very rapidly since the mid-1970s [. . .] [it] is already competitive without subsidy in the most favourable conditions'.³ After this somewhat optimistic statement, Grubb correctly foresaw wind energy's 'clear potential to become an important component in power generation during the first few decades of the next century'.⁴

Indeed, onshore and offshore wind power in the EU in 2019 amounted to 13 per cent of the total electricity generation,⁵ close to lignite and hard coal combined.⁶ The share of wind power is forecasted to double to 26 per cent by 2030.⁷ Although offshore wind represents a growing share of the new added capacity, the vast majority of new capacity added comes through new onshore installations.⁸ Germany is the clear leader in terms of total installed capacity and generation,⁹ although it is experiencing a marked slowdown,¹⁰ while Denmark, a pioneer of this form of electricity generation,¹¹ leads in terms of share of wind energy in electricity consumption (48 per cent of total electricity generation).¹²

According to the International Energy Agency, wind power will become the primary generation source for electricity consumed in the EU by 2027. It is also estimated that 1 100 TWh of electricity may be generated through wind power in the year 2040, sufficient to meet 31 per cent of total EU electricity consumption.¹³

Hence, it appears that wind power is already an important component of EU electricity generation, with its role only set to increase over coming years, fulfilling Grubb's

¹ Labussière and Nadaï (2018) 65.

² For a broader description of wind energy, see: Jankowski (2010) 267–71.

³ Grubb (1992) 163.

⁴ *ibid* 164.

⁵ Agora Energiewende and Sandbag (2020) 13. This figure includes the United Kingdom, a country with an above average share of electricity generated through wind power (20 per cent).

⁶ *ibid*, Comparison of Figures 3-6 (p 16) and 4-1 (p 23) respectively.

⁷ *ibid* Figure 3-10, p 19.

⁸ *ibid* Figure 3-7, p 17.

⁹ *ibid* Figure 3-6, p 16; Wind Europe (2020) 9.

¹⁰ Wind Europe (2020) 13.

¹¹ Rønne (2009) 255.

¹² Wind Europe (2020) 17.

¹³ Deign J, 'IEA: Wind Will Be Europe's Largest Energy Source by 2027' (*Greentech Media*, 27 September 2018) <<https://www.greentechmedia.com/articles/read/iea-wind-to-be-europes-largest-energy-source-by-2027#gs.m0mc77>> accessed 26 March 2020.

prediction. But this form of electricity generation faces many challenges. While some of these have already been overcome, others persist. In each case, the legal framework in place in host countries has been used to strike a balance between the targets for wind energy development and its impacts on technical, economic, environmental, and social parameters.

This chapter analyses the primary issues faced by wind energy, including the impact that wind energy can have on the environment, and the legal framework which has been implemented in this respect. Much of this chapter will focus on onshore wind energy in four EU Member States with differing experiences concerning the development of wind energy: Denmark, France, Germany, and Spain.¹⁴

IX.37.2 Legal solutions to issues faced by wind energy

The competence to regulate in matters of energy in the EU is shared between EU institutions and the Member States (MSs).¹⁵ The EU focuses on matters concerning the internal energy market, security of supply, interconnections and fixing targets for the development of renewable energy.¹⁶ MSs, meanwhile, are free to design their energy mix – providing EU targets are complied with. Hence, when analysing the legal framework applicable to wind energy in the EU, it is necessary to look at both the EU and MS levels.

IX.37.2.1 Economic issues: costs, support schemes, citizens' participation, and community ownership

Economic issues are of prime concern for electricity generation from any source. Indeed, in a liberalised energy market (such as the EU's), the cost at which electricity is produced is often the singular most important consideration. However, reasons other than pure costs (such as security of supply or environmental considerations) may also be taken into account, and it is through consideration of these that it is possible to make a strong case for supporting a specific form of electricity generation. The way in which ownership of electricity generation facilities is divided may also be a crucial factor in achieving local public acceptance.

IX.37.2.1.1 Evolution of wind energy costs A common tool to establish the cost of energy production by specific technology is the levelised cost of energy (LCOE).¹⁷ In 2018, the International Renewable Energy Agency observed that, in the case of wind energy, 'the global weighted average LCOE declined from USD 0.40/kWh in 1983 to USD 0.06/kWh in 2017, an 85% decline'.¹⁸ This evolution was similar to experiences

¹⁴ For more on offshore wind, see Chapter 45 of this volume.

¹⁵ The Treaty on the Functioning of the European Union (consolidated version, 7 June 2016) 2016 OJ C 202/47, art 4(2) in conjunction with art 194.

¹⁶ See Roggenkamp and others (2016) §§ 4.376–4.378.

¹⁷ According to the US Energy Information Administration (EIA), the levelised cost of electricity represents the average revenue per unit of electricity generated that would be required to recover the costs of building and operating a generating plant during an assumed financial life and duty cycle.

¹⁸ IRENA (2018) 110.

in Denmark, Germany, Spain, and France between the 1980s and 2016.¹⁹ As a consequence, in 2017, (onshore) wind energy in Europe was within the cost range of fossil fuels, demonstrating competitiveness against other electricity generation technologies.²⁰ On a global scale, experts estimate that a further 24 per cent reduction by 2030 and 35 per cent reduction by 2050 is possible.²¹ It is nonetheless important to point out that cost reductions fuelled by technological progress can be slowed by external factors, such as increases in the price of raw materials or reduced access to cheap financing.²²

IX.37.2.1.2 Wind energy support schemes To achieve this steep decline in wind energy costs, states have had to support an industry that is only now beginning to mature.²³ This long-term support has proved essential, with Denmark and Spain illustrating that, historically at least, lack of support has halted the industry's development. In the early 2000s, a change of political majority in the Danish parliament led to the abolition of wind support schemes, resulting in almost no new wind power capacity being built from 2003 to 2008.²⁴ A similar situation occurred more recently in Spain following the governing *Partido Popular*'s decision to retroactively modify past support schemes contracts, abolishing support for new facilities and imposing a new tax on electricity generation. As a result, only 14 MW were installed in 2014, while in 2015 no new capacity was installed.²⁵

Vandorpe has identified that 'it would seem better or more convenient to be able to impose simple, *fixed* parameters on support ("You will receive X euros from the government for Y years.")'.²⁶ This is commonly referred to as the Feed-in-Tariff (FiT) system – a system implemented in Germany in 1990 for electricity produced by renewable energy sources. The German government hoped that the system would 'spread out during the following years into many other European Member States' support mechanisms and beyond that on a global scale'.²⁷

More recently, following guidelines issued by the European Commission in 2014,²⁸ many EU MSs moved to a different support scheme for wind energy. The level of support offered through this support scheme – the Feed-in Premium (FiP) – is established based on a competitive allocation process (tendering or auctions) wherein developers declare the minimum subsidy level required per unit of electricity generated and sold on the wholesale market.²⁹

¹⁹ *ibid* 111, Tables 5.1 and 5.2.

²⁰ *ibid* 40, Figure 2.3.

²¹ Wisner and others (2016) 2.

²² Aït-Yahia (2018) 1.

²³ See Chapter 33 of this volume for more information on the promotion of renewable energy sources.

²⁴ Hvelpund and Sperling (2018) 351–2.

²⁵ Lucas (2018) 1129; del Río and Calvo-Silvosa and Iglesias (2015).

²⁶ Vandorpe (2016) 299.

²⁷ Fouquet (2018) 492–3.

²⁸ Commission, 'Guidelines on State aid for environmental protection and energy 2014–2020' (Communication) 2014/C OJ C 200/01.

²⁹ These requirements have been included in Directive (EU) 2018/2001 of the European Parliament and of the Council [2018] OJ L 328/82, art 4.

The FiP has been utilised in France,³⁰ Denmark,³¹ Germany,³² and Spain³³ with some variations and exemptions, such as for small-scale wind turbines³⁴ or for community driven projects.³⁵ This new system has led to interesting results, with much onshore and offshore wind capacity now built with little to no premium at all.³⁶

IX.37.2.1.3 Citizen participation and community ownership While the question of citizen financial participation and community ownership of wind farms may be considered an extension of the public participation policies,³⁷ in some EU MSs, these financing tools have become so significant for the sector's development that it requires specific attention in the context of economic issues.

Among the four MSs chosen to illustrate wind energy development in the EU in this chapter, two quite different paths have been taken regarding local financial participation. Denmark and Germany are world leaders in terms of wind energy capacity owned by local entities (citizens, cooperatives, etc.), while in France and Spain, the vast majority of wind energy installations (especially medium and large installations) are owned by private companies.

Hvelpund and Sperling have identified that, in Denmark, 'co-operative wind turbines were established in the frail infancy phase of wind power development from 1977'.³⁸ In the early 2000s, 80 per cent of wind turbines installed were owned by cooperatives or had single owners. However, this percentage declined sharply in subsequent years due to the application of a new, riskier support scheme, which increased market exposure.³⁹ Since 2009, the Danish legal regime has included a requirement to offer community

³⁰ RES LEGAL Europe, 'Compare support schemes' (*RES LEGAL Europe*) <<http://www.res-legal.eu/>> accessed 26 March 2020.

³¹ *ibid.*

³² Fouquet (2018) 508–12.

³³ del Río (2017).

³⁴ See, e.g.: Fouquet (2018) 511–12.

³⁵ *ibid.*

³⁶ For Denmark: Shumkov I, 'Vattenfall Wins 600-MW Danish Offshore Wind Tender with Record-Low Bid' (*Renewables Now*, 9 November 2016) <<https://renewablesnow.com/news/vattenfall-wins-600-mw-danish-offshore-wind-tender-with-record-low-bid-546117/>> accessed 26 March 2020. For Germany: Knight S, 'Germany Entangled in Onshore Auction Dilemma' (*Windpower Monthly*, 4 June 2018) <<https://www.windpowermonthly.com/article/1466510/germany-entangled-onshore-auction-dilemma>> accessed 26 March 2020; Wehrmann B and Wettengel J, 'Support-Free Bids Again in Germany's Second Offshore Wind Auction' (*Clean Energy Wire*, 27 April 2018) <<https://www.cleanenergywire.org/news/support-free-bids-again-germanys-second-offshore-wind-auction>> accessed 26 March 2020. For France: BloombergNEF, 'France Onshore Wind Auction Sees Price Drop' (*Bloomberg*, 5 March 2018) <<https://about.bnef.com/blog/france-onshore-wind-auction-sees-price-drop/>> accessed 26 March 2020; Richard C, 'French Onshore Tender Undersubscribed' (*Windpower Monthly*, 7 September 2018) <<https://www.windpowermonthly.com/article/1492187/french-onshore-tender-undersubscribed>> accessed 26 March 2020. For Spain: Tisheva P, 'Wind Firms Win Most of Spain's 3-GW Auction' (*Renewables Now*, 18 May 2017) <<https://renewablesnow.com/news/wind-firms-win-most-of-spains-3-gw-auction-569140/>> accessed 26 March 2020.

³⁷ Presented in section IX.37.2.2.3.

³⁸ Hvelpund and Sperling (2018) 354.

³⁹ Bauwens, Gotchev and Holstenkamp (2016) 140.

members a 20 per cent ownership stake in wind power installations if the height of a turbine exceeds 25 m,⁴⁰ with the rules regarding to whom these shares must be offered predominantly focusing on the distance of a residence from the wind turbine.⁴¹ It is thus clear that the Danish legislature considers local financial participation normal for wind energy developments.

In Germany, close to 50 per cent of the wind turbines currently installed are owned by private citizens (often via cooperatives) or by farmers. The remaining 50 per cent are largely split between small and medium-sized enterprises (SMEs) and regional and municipal utilities companies, with only 5 per cent being held by the four incumbent utilities companies.⁴² This was made possible by the development of an adapted regulatory framework facilitating local participation, tailored to fit the different situations of local investors.⁴³

It should be noted that in both Denmark and Germany, the reform of the support scheme towards an auction and direct market sale system led to a dip in local financial participation.⁴⁴ While measures have been adopted to provide a more secure and interesting regime for these distributed investors, more time is needed to observe their effectiveness.⁴⁵

Historically marred by a highly centralised electricity system, France has lagged behind in terms of citizen financial participation in wind farms, with only 3 per cent of the installed capacity qualified as 'participatory projects' by the *Agence de l'environnement et de la maîtrise de l'énergie*.⁴⁶ In recent years, however, several pieces of legislation incorporating provisions incentivising higher shares of local ownership (directly by citizens, via cooperatives, or through municipalities or regions) have been passed.⁴⁷ Among other financing instruments for locally funded wind energy developments, crowdfunding has seen some interesting developments in France.⁴⁸

Spain finds itself in an even more dismal situation than France in this regard. Capellán-Pérez, Campos-Celador and Terés-Zubiaga have noted that Spain 'lacks a tradition of municipal utilities', and that 'the modern renewable energy cooperative movement [in the country] is at an early stage of development'.⁴⁹ There have been no moves of note towards establishing a legal regime that seeks to incentivise local financial participation, and there was no identifiable facilitatory regime for citizens' bids in recent (2016–17) wind and solar energy auctions. Even the largest Spanish renewable energy cooperative, *Som Energia*, have stated that they 'have not been able to develop any new

⁴⁰ Rønne (2016) 185.

⁴¹ Hvelpund and Sperling (2018) 364.

⁴² Fouquet (2018) 505.

⁴³ See: Yildiz (2014).

⁴⁴ Fouquet (2018) 504.

⁴⁵ For Denmark: Bauwens, Gotchev and Holstenkamp (2016) 140; for Germany: Langer and others (2018) 135.

⁴⁶ Defining 'participatory project' is rarely a straightforward task. In this instance, it is likely to include projects that were not fully financed by local citizens or cooperatives. See: ADEME (2016) 5.

⁴⁷ Fontaine (2018) 470–3.

⁴⁸ Banet (2016) 325–7.

⁴⁹ Capellán-Pérez, Campos-Celador and Terés-Zubiaga (2018) 216.

projects as the Spanish government blocked all FITs for new projects and retroactively changed FITs for existing projects'.⁵⁰

IX.37.2.2 Environmental issues: how to ensure a positive local integration for wind turbines?

In EU law, the common denominator for all these topics is Directive 2011/92/EU (the 2011 EIA Directive).⁵¹ Per Article 4(2), MSs are to determine if an environmental impact assessment (EIA) is required for projects listed in Annex II (in which wind farms are specifically mentioned).⁵² Whether or not an EIA is needed depends on the threshold criteria set in Annex III – one such consideration being whether the project is located in (or proximate to) a nature reserve. Hence, a wind farm need only undertake an EIA should the Annex III threshold criteria be exceeded. In France, this minimum threshold is: any development featuring a wind turbine of at least 50m in height; or a wind farm composed of turbines of between from 12 to 50 m in height with a total installed capacity of at least 20 MW.⁵³ In France, EIAs must analyse the potential impacts on, *inter alia*, biodiversity, human population and health, soil, water, air and climate, cultural heritage, and landscapes.⁵⁴

IX.37.2.2.1 Biodiversity Grubb outlines the direct and indirect positive aspects of wind energy on biodiversity as follows:⁵⁵

It produces no solid or liquid wastes, and no gaseous emissions. It requires no external fuels and so avoids the environmental problems of fuel extraction and transport [. . .]. Siting is not dependent on the availability of cooling water, and land can be shared with other applications such as farming.

Nevertheless, there is a scientific consensus that wind farms can at times kill a considerable number of birds and bats. In the case of birds, however, dangers posed by wind turbines rank far below that of other human constructions (such as windows or cars). Data on the impact of other human activities on bats, meanwhile, is less forthcoming, with the topic seldom studied outside of wind energy. It is nonetheless inescapable that wind turbines pose an acute danger to some protected species, including some birds of prey.⁵⁶

⁵⁰ REScoop MECISE, 'Som energia' (*REScoop MECISE*) <<http://www.rescoop-mecise.eu/aboutmecise/som-energia>> accessed 26 March 2020.

⁵¹ Directive 2011/92/EU of the European Parliament and of the Council [2011] OJ L 26/1.

⁵² *ibid* Annex II(3)(i).

⁵³ *Arrêté du 6 novembre 2014 modifiant l'arrêté du 26 août 2011 relatif aux installations de production d'électricité utilisant l'énergie mécanique du vent au sein d'une installation soumise à autorisation au titre de la rubrique 2980 de la législation des installations classées pour la protection de l'environnement et l'arrêté du 26 août 2011 relatif à la remise en état et à la constitution des garanties financières pour les installations de production d'électricité utilisant l'énergie mécanique du vent* (2014 Environmental Code), art R. 122-2, I – in conjunction with its table in annex and section 2980 of the list of classified installations for environmental protection.

⁵⁴ *ibid* art L.122-1, III.

⁵⁵ Grubb (1992) 165.

⁵⁶ Dai and others (2015) 912–13.

Under EU law, biodiversity protection is provided for primarily by Directive 92/43/EEC (the Habitats Directive)⁵⁷ and Directive 2009/147/EC (the Birds Directive).⁵⁸ Under the Habitats Directive, the conservation of natural habitats and wild fauna and flora is promoted by the creation of a network of Natura 2000 areas across all MSs,⁵⁹ wherein national legislation can prohibit the installation of wind turbines ‘without any requirement for a prior assessment of the environmental impact of the project’ (although some additional conditions apply).⁶⁰ The European Commission has also provided guidance on the compatibility of national wind energy developments with Natura 2000 zones.⁶¹ The Birds Directive, meanwhile, regulates hunting, and requires MSs to designate Special Protection Areas (SPAs) for the conservation of threatened species and migratory birds.

IX.37.2.2.2 Landscape The perceived negative visual impact of a wind farm on a local landscape is often one of the main reasons cited by those opposing new developments.⁶² Indeed, wind turbines may be visible even from a fairly distant location on a clear day. However, this ‘problem’ is largely subjective, and is influenced by personal perceptions on the energy source generally.⁶³

Consideration of landscapes within EU legislation is limited to Article 3(b) of the EIA Directive, which imposes an obligation to take landscapes into account. However, the 2000 European Landscape Convention of the Council of Europe – which has been adopted by most EU MSs⁶⁴ – binds parties to ‘undertake to recognise landscapes in law as an essential component of people’s surroundings’, ‘to establish and implement landscape policies’, ‘to establish procedures for the participation of the general public’ and ‘to integrate landscape into its regional and town planning policies’.⁶⁵

Among EU MSs, national legislation generally requires any new wind farm project to consider the landscape in its EIA. Requirements may be more explicit, with a 2014 statutory order in Denmark demanding that wind farms ‘be arranged in a geometric pattern that is easily perceived in relation to the landscape’.⁶⁶ As a general rule, when assessing the authorisation request to build a wind farm, the administrative body must decide whether the impact of a wind farm on the landscape is acceptable or not, sometimes under the guidance of landscape policy documents (classifying some areas as highly valuable).

⁵⁷ Council Directive 92/43/EEC [1992] OJ L 206/7.

⁵⁸ Directive 2009/147/EC of the European Parliament and of the Council [2009] OJ L 20/7.

⁵⁹ Council Directive 92/43/EEC art 3.

⁶⁰ Case C-2/10 *Azienda Agro-Zootecnica Franchini sarl and Eolica di Altamura Srl v Regione Puglia* [2011] ECR I-6561.

⁶¹ European Commission (2011).

⁶² Rand and Hoen (2017) 141.

⁶³ Dai and others (2015) 915.

⁶⁴ Council of Europe Treaty Office, ‘Chart of signatures and ratifications of Treaty 176’ (*Council of Europe*) <<https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/176/signatures>> accessed 26 March 2020.

⁶⁵ European Landscape Convention (adopted 20 October 2000, entered into force 1 March 2004) ETS No. 176, art 5.

⁶⁶ *Bekendtgørelse om planlægning for og tilladelse til opstilling af vindmøller, BEK nr 1590 af 10/12/2014*, art 2(5).

IX.37.2.2.3 Neighbourhood and public participation The erection of a tall structure in the local landscape is not the only disturbance experienced by neighbouring residents of wind farms. Wind turbines can also be a source of noise or light pollution. The propagation of the noise is dependent of the local topography, the wind speed, and the characteristics of the wind turbines.⁶⁷ Such disturbances must be studied during the EIA. In some MSs, noise is cited as a reason for the existence of a legal minimum distance between wind turbines and houses, though the specific distance varies across MSs. For example, while France requires wind turbines to be located a minimum of 500m from houses,⁶⁸ in Denmark the minimum distance is calculated by multiplying the height of the wind turbine by four.⁶⁹ In Germany, the distance varies by *Länder*, and in Spain by *Comunidades Autónomas*.

For the reasons stated in the paragraphs above, public participation is essential during the development of wind farms. Under EU law, Article 6 of the 2011 EIA Directive requires that the public is informed 'early in the environmental decision-making procedures' and that people should 'be given early and effective opportunities to participate in the environmental decision-making procedures'. It is therefore up to the MS to take measures to respect these provisions. These developments in EU and subsequently MS legislation were 'profoundly influenced' by the 1998 Aarhus Conference.⁷⁰ Owing to the rather detailed international and EU legal frameworks, public participation regimes tend not to vary much between MSs, with wind energy developments directly impacted.

IX.37.2.2.4 Radars and air navigation Wind farms can disturb technical environments, as they can distort and block military and civil radars used for air navigation and obtaining weather information.⁷¹ Moreover, wind turbines situated around airports or in low-altitude training zones may impact the navigation systems of airplanes.

Each MS has its own rules to address this issue. In France, an administrative order sets the minimal distance from each type of weather radar. For a wind turbine to be placed more proximally, an authorisation from the radar's operator is required.⁷² In general, wind farms must seek to avoid impacting radar and air navigation systems, especially inside demarcated predetermined areas. The definitions of such areas (and the technological fixes required) may sometimes be subject to negotiation.

IX.37.2.3 Emerging issues requiring regulatory action

Wind turbines have grown significantly in both height and in power output over recent years. It is this, combined with the aging of wind infrastructure across EU MSs, that has brought new issues (requiring regulatory solutions) to the fore. The primary issue, as research from Ziegler and others illustrates, is repowering:⁷³

⁶⁷ Dai and others (2015) 913–14.

⁶⁸ Environmental Code (n 53) art L.553-1.

⁶⁹ *Bekendtgørelse om planlægning for og tilladelse til opstilling af vindmøller*, BEK nr 1590 af 10/12/2014, art 2(3).

⁷⁰ Langlet and Mahmoudi (2016) 164–5, 178–86.

⁷¹ Dai and others (2015) 915–16.

⁷² Environmental Code (n 53).

⁷³ Repowering refers to the replacement of significant components of a wind farm, generally at

In 2016, 12% of the installed wind turbine capacity in Europe was older than 15 years. This share increases to 28% by 2020. These wind turbines will soon reach the end of their designed service life, which is typically 20 years.⁷⁴

The aging of wind turbines in Europe is clearly already an issue, and an acute one for Denmark, Germany, and Spain, which have seen massive deployments of wind energy since the end of the 1990s.⁷⁵ Repowering allows for the re-use of an existing site for wind energy – a site with a preponderance of long-term wind data, good wind potential, and (potentially) existing local acceptance of turbines.

As there is no EU legal framework on this emerging issue, MSs must decide whether to provide a specific set of rules to facilitate repowering. In the past, Germany has opted to award repowering bonuses.⁷⁶ However, repowering currently faces barriers, as the process requires developers to undergo the same legal procedures as during the first development (environmental studies, authorisations). The extension of the mandatory distance between wind turbines and residential areas may even prevent repowering in some locations,⁷⁷ as existing locations may be too close to residential areas.

IX.37.3 Conclusion

This chapter analysed several legal aspects of the development of wind energy in the EU. This key renewable source of energy already represents 13 per cent of the annual electricity consumption, with this share expected to double by 2030 and grow further after. Reaching this current level of wind energy penetration in the EU has required the development of stable and consistent national legal frameworks alongside generous support schemes. In recent years, these schemes have evolved to allow for wind energy to be better integrated into the electricity market. The legal frameworks established have also served to protect and preserve the wider environment (encompassing biodiversity, landscapes, residential areas, and some technical aspects such as radars and air navigation). Recently, new regulatory challenges have arisen regarding the repowering (replacement) of aging wind farms.

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least the turbines themselves and often all, or parts, of the electric cables and substations by new material, often with a higher installed capacity.

⁷⁴ Ziegler and others (2018) 1261.

⁷⁵ *ibid* 1262.

⁷⁶ *ibid* 1265.

⁷⁷ *ibid*.

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