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Considering time in land use planning: An assessment of end-of-life decision making for commercially managed onshore wind schemes

Rebecca Windemer

Cardiff School of Geography and Planning, Cardiff University, Glamorgan Building, King Edward VII Avenue, Cardiff, CF10 3WA, UK

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ABSTRACT

Despite its ostensible future orientation, research on land use planning has given relatively little consideration to temporality, either empirically or conceptually. The need for analytical advances becomes clear when considering the treatment of 'end-of-life' issues for renewable energy facilities like onshore wind. Expanding renewables is central to sustainable energy futures yet land use regulation often treats consents as 'temporary', raising questions about how the trajectories of energy transition are maintained into the future. In the first significant analysis of these issues, this paper presents evidence from the UK case where the majority of wind farms are commercially owned. It first examines 'the problem' – the extent to which UK wind energy capacity is nearing 'end-of-life'. Second, using insights from Foucauldian perspectives on problematisation, it examines how and how far national governments are seeking to influence decisions about three critical issues: (i) repowering, (ii) temporary consents and consent renewal, and (iii) decommissioning and removal. The research shows government actions playing catch up and intervening selectively, only partially shaping the multiplicity of potential outcomes. One explanatory factor is attitudes towards wind energy expansion, with governments varying in the extent to which they seek to maintain wind energy *projects* into the future or wind energy *spaces*, and/or renegotiate the terms of development (e.g. to add new social concerns). Limited attention to decommissioning is a surprising omission across the board.

1. Introduction

Consideration of time has long been seen as central to the way in which planning systems control and shape future development (Davies, 1972). Time intersects with planning in many ways, one of which is the scope for using time-limited permissions to control the temporal impacts of certain infrastructure. Such regulatory approaches allow planners to ensure that projects which do not need to be permanent do not become so and create a point of reconsideration when the time limit of consent approaches expiry, perhaps to require removal. While there is a small body of research that considers temporary planning permissions, this has focused largely on temporary uses of vacant land or buildings within urban development (e.g. Patti and Polyak, 2015; Honeck, 2017). Very little research has assessed the temporal framing of planning regulation, considering what is controlled, over what time period, and what might happen when time runs out. This is a potentially important omission given some of the contradictory temporal dynamics of the expansion of renewable energy technologies like wind and solar.

Researchers have identified the ability to easily remove infrastructure as one of the key sustainability benefits of wind energy (e.g. Pasqualetti et al., 2002; Le Dû-blayo, 2014; Corvellec, 2007). This impermanency of infrastructure is argued to enable energy generation sites to easily return to their previous condition following decommissioning (Jaber, 2013) and is articulated by developers to promote wind energy as beneficial (Corvellec, 2007). However, this *potential* reversibility of impact says little about the dynamics of change and development. Consenting for wind and solar energy in the UK appears to facilitate reversibility in that permissions are 'temporary', usually for a set 25-year period with a requirement to subsequently decommission. In practice, energy companies may wish to extend the operational life of their assets. Allowing extensions may be a critical element of long-term sustainable energy transitions, yet this qualifies claims to 'temporariness'. At the same time, little is known about how policy generally and land use policy in particular treats 'end-of-life issues'.

What adds to the importance of this issue is that, in the context of increasing pressure for land, the future development and scale of the onshore wind sector will likely depend largely on its ability to retain the licence to operate in current sites (Ziegler et al., 2018). The need to understand considerations surrounding repowering (discussed below) has been identified as important due to the tendency for the best located sites to already be occupied by older, less efficient technology

E-mail address: windemerr@cardiff.ac.uk.

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(Hulshorst, 2008), however, there is a lack of research regarding how these processes are controlled by the planning system. Research in Denmark revealed that while repowering onshore wind is portrayed as a lower risk and lower cost option than developing off-shore windfarms, public opposition creates a potential challenge (Himpler and Madlener, 2012). There may be systemic reputational risks too. End-of-life restoration issues have been an endemic problem in many countries' for a range of land uses, notably minerals extraction, and this feeds in to social concerns about new developments. The scope for comparable risks to emerge with renewables is a further reason for examining end-of-life decisions.

As the renewable energy sector in many countries begins to enter an era where initial planning consents and equipment are becoming time-expired, facilities have three key sets of end-of-life options. Firstly, to end the operation of the infrastructure, involving either removing the infrastructure through decommissioning or in some cases abandonment (although the research presented here considers whether this is likely). Secondly, to increase the operational life of the existing asset through extending the planning consent while making no material changes to the infrastructure (possibly involving a like-for-like replacement of parts). Finally, to repower the infrastructure with newer turbines, creating a material change to the site and usually involving replacing the existing turbines with fewer, larger turbines[1] .

This paper seeks to advance our understanding of how end-of-life issues are addressed within land use planning systems. The paper seeks to understand the rate at which wind energy facilities are approaching 'end-of-life' in the UK and to answer the following research question: '*To what extent is the issue of end-of-life decision making for renewables problematised and regulated by government*'. Through examining government efforts to control end-of-life decision-making and any omissions and ambit in the scope of state action it aims to understand which issues are considered to be a problem. Such a research question is shaped by dilemmas of uncertainty: how might policy-makers seek to steer situations that span from the present to the further future, in which myriad outcomes are possible? The focus is on planning control of end-of-life decisions, for which there is a significant research gap (for a review of the slightly more extensive literature on technical and economic aspects, especially from developers' perspectives, see Ziegler et al., 2018). In the electricity-generation field in the UK such time limited consents apply only to wind and solar (not nuclear, fossil or hydro), and indeed most planning permission for built structures are in perpetuity – time limitations are the exception. In providing context for the research it is important to note that the majority of wind farm sites in the UK, and particularly older sites, are commercially rather than community owned.

In order to address such issues this paper examines how far onshore wind farms are moving towards end-of-life decisions and the policy framework and experiences of end-of-life procedures for England, Wales and Scotland. The three main categories of end-of-life decisions - decommissioning, repowering and asset life extension - are assessed in order to explore the nature of decision-making processes, the planning decision outcomes, challenges faced and the implications of current policy approaches. It also provides a summary of patterns of public responses to such decisions to date. To assist in the interpretation of the data, Foucauldian perspectives on problematisation are drawn upon, to help make sense of state steering in fluid, uncertain development contexts. Conceptual questions about time in planning are discussed next, followed by an account of the research methodology adopted. The main results are then presented, making use of intra-UK comparison between the devolved nations, with a discussion and conclusion reflecting on the significance of the findings.

[1] In some sense the lines between repowering and life-extension may appear blurred as they both change the temporal impacts of the infrastructure, particularly in cases where life-extension leads to increased efficiency and as repowering extends the life of a site.

2. Consideration of time

Land use planning systems deal with changes and entities that can have lasting impacts, yet analysts have noted that the temporal frames of planning practices awkwardly match the temporal dynamics of the things being regulated. Questions surrounding the conceptualisation of time have been widely debated in the field of planning with a central critique challenging planning's claims to provide a longer term perspective than other public policy areas (Moffatt, 2014; Davies, 1972). Critics of contemporary planning have argued that it has moved away from its aim of achieving strategic long term visions to focus on short term managerial and operational activities, potentially ignoring longer term temporal processes (Couclelis, 2005).

It has also been recognised that different time frames are operating simultaneously within planning, but they have rarely been fully considered (Van Der Knaap and Davidse, 2010). Abram (2014) identified that planning is characterised by conflicting temporal frames and that there is a lack of practical and theoretical attention given to these temporal contradictions by planners. It has been suggested that the current approach in planning focuses on regulatory notions of time in the sense of fixed start and end points (Davoudi, 2012), often linked to targets and the speed of the development process. From such a perspective planning can be seen to focus on managing the present while leaving problems to be resolved in the future (Abram and Weszkalnys, 2011). In the case of renewables, as with many other forms of development, while some externalities are controlled through the initial consenting process, others may be left open to be addressed in an often indeterminate future.

How time is conceptualised can influence the focus of planning as well as how it treats and considers the future population (Moffatt, 2014). Planners use certain notions of time as organising concepts (Davoudi, 2012), however within planning theory and practice there is often a lack of consideration regarding the way in which planning regulation, partially and incompletely, is used to organise the temporality of spatial change caused by development. There is also a lack of consideration regarding the way in which leftovers (things not considered or regulated, such as elements of the end-of-life decision making process) actually disrupt those approaches. In the case of windfarms, a 'temporary' permission and the associated wording in planning documents suggests that the infrastructure will be removed at the end of the permitted period. However, in situations where repowering or asset life extension occurs, this is not the case and the 'temporary' nature of windfarms changes. Such processes may enable the infrastructure to be present for much longer than originally consented and expected, perhaps also attaching new additional requirements, however there is a lack of understanding regarding the impact of doing so or how such decisions are made. At the very least, the meaning of 'temporariness' becomes open to question.

In response to these debates about the treatment of time in planning, this paper aims to explore the multiple temporal processes associated with end-of-life decisions for onshore wind. Rather than treating planning processes and wind energy development in the binary terms of absence or presence, it gives closer attention to the social and physical changes occurring over different timescales that can impact an existing development, especially as key elements - the economic or physical viability of the infrastructure and/or the terms of any initial consent - come to an end. In so doing, it conceptualises a world in which developments, environments and social concerns are all in motion, offering a valuable counterpoint to most renewable energy and planning research, which focuses solely on the original granting of consent. Such research is often snapshot in nature, concerned with whether or not initial projects attain 'social acceptance'. There is the well-known 'u-shaped' graphic of public acceptance, which dips during planning processes but recovers once infrastructure is complete (see Wolsink, 2007a). Studies of renewable energy projects that return to projects and social acceptance issues in later stages of their development are few. Research rarely looks longer term, or at end-of-life decisions,

Table 1
onshore wind policy contexts.

	Wales	England	Scotland
Approach to onshore wind	Positive towards the expansion of on-shore wind, coupled with a belief in the desirability of nationally-directed spatial steering.	Effective 'block' on new onshore wind since the 2015 Written Ministerial Statement.	Positive towards the expansion of on-shore wind, including extension and replacement of sites and larger turbines.
Decision making level	Applications over 10MW installed capacity - submitted to the Welsh Ministers, as Developments of National Significance Under 10 MW - LPA.	Since 2016 all applications decided at LPA level	Over 50 MW -Government Consents Unit Under 50 MW- LPA level
Scale at which suitable areas are identified	7 Strategic Search Areas with indicative MW targets identified nationally.	Advice against spatial zoning policy reversed from 2015, with all wind development now required to be in area allocated for such in local plans.	LPA's should identify the most appropriate areas for onshore wind in their development plan, using guidance issued by Scottish Government.

consequently the temporal and end-of-life issues have gone rather unnoticed, and so too have the potential far-reaching implications for the overall installed capacity of onshore wind. Questions thus arise as to how far state actors might intervene, to shape outcomes and the strategic concerns that shape what they do.

Theoretical insights from Foucault can help interpret these situations and the drivers of government action, especially his concept of 'problematisation'. The start point here is the observation that state intervention does not arise from nowhere (problems are not 'natural'), but from processes of problematisation – beliefs about problems and what needs to be governed (Rose, 1999; Dent, 2009). This propels the need for techniques, procedures and knowledge-making practices that seek to act on human behaviour (Foucault, 1991)– in the context of this paper, the decision-making of developers, planning bodies and other actors on development projects. Using these propositions interpretively, an analysis of state interventions (or non-interventions) in a policy field can illuminate problematisations (Dent, 2009).

A Foucauldian perspective also alerts us to the fact that problems cannot be fully resolved; and the often-quoted observation that government is a 'congenitally failing activity'(Miller and Rose, 2008) may be especially appropriate when considering the future, where the inevitability of multiple and contingent future pathways makes predictive intervention hazardous and partial. Moreover, Dent (2009) warns against a reading of Foucault that assumes a world of monolithic, singular problematisations: policy fields may be characterised by multiple problematisations that prove hard to align. Such insights have much to offer the analysis of planning and temporality, and end-of-life decisions for renewables specifically, given the diverse ways in which planning regulation concerns, energy policy goals and landscapes may intersect.

Space does not allow the detailed discussion of landscape within this paper but, as a concept permeated by temporality (around history, change and social attitude formation), some key points need mentioning. Issues of landscape are often central in decision making for energy infrastructure, particularly wind farms and thus, potentially, to end-of-life decision making. The development of wind farm infrastructure can impact the characteristics and identity of the place where the infrastructure is located, interrupting the 'permanence' of a landscape that some expect (Pasqualetti, 2000). An assessment of the visual impact of wind farms is often the most decisive factor in planning and visibility studies, however such an assessment is complex, affecting how changes over time might be interpreted. Wolsink (2018) identified that visual impact is not simply an assessment of the aesthetics of the infrastructure itself, but of wider landscape concerns such as (but not limited to) a person's assessment of the landscape, the change in the character of the landscape and a person's attachment to place. It is thus incorrect to assume that changes that increase the visibility of turbines (in some measurable geometric sense) will automatically be perceived negatively (Wolsink, 2018). So, while repowering often creates a change in visual landscape impact through the use of larger turbines, it should not be assumed that this will result in an increase in perceived negative impact, particularly as a smaller number of larger turbines is usually preferred than larger numbers of smaller machines (Sustainable Energy Ireland, 2003). Existing research suggests that impact of the design of turbines and wind farms are far less important for community acceptance than the (perceived) qualities of the landscape (Wolsink, 2007b) – and this too can potentially change through the life of a windfarm.

3. Methodology

The research reported here was designed to shine spotlights on three categories of end-of-life decisions for onshore wind, within a comparative research design, using a comparison of England, Wales and Scotland. This enabled an exploration of how different decision making contexts and approaches to onshore wind influenced end-of-life considerations (See Table 1; information therein draws from Power and Cowell (2012) and Cowell and Devine-Wright (2018). In a wider European context, UK planning is marked by the relatively high level of discretion available to decision-makers in determining planning applications, which adds to the contingency (Thornley and Newman, 1996).

In order to investigate how the 'temporary' planning period has been treated, in policy and practice, a number of complementary desk-based research methods were used.

Data on the status, age and characteristics of wind farms was obtained from the UK Government's Renewable Energy Planning Database and the RenewableUK database. This data was used to provide an overview of the status of the sector and assess the expected timing of end-of-life decisions.

A policy analysis was undertaken involving all policy and guidance relating to end-of-life processes or the temporary nature of wind farms in England, Wales and Scotland (see Table 4). An assessment of policy involved consideration of the content and limitations of each policy, a comparison of policy change over time and between countries. This was followed by semi-structured interviews with the relevant government departments in each country. Using thematic coding (Lapadat, 2010); with the policy analysis, this sought to tease out government problematisations revealed by the patterns of intervention and the justifications given.

All repowered, life-extended and decommissioned sites identified in the databases were investigated in more detail using Local Planning Authority (LPA) files in order to explore the coverage of any expressed rationales for interventions. The analysis involved examining and coding the decision letters and application documents as well as the responses of organised stakeholders and wider publics in order to obtain an overview of how and why decisions were made and whose interests appeared to be reflected.

4. Status of the sector

4.1. Ageing infrastructure – an emerging problem?

A review of the age and status of existing windfarms reveals the extent to which end-of-life decision making is becoming an increasingly

Table 2
Age and installed capacity of wind farms in England, Wales and Scotland (Based on 2018 data from Gov.UK and RenewableUK).

Age of wind farms (Years)	England		Wales		Scotland		Total	
	Number and % of all turbines	Installed capacity (MW) and %	Number and % of all turbines	Installed capacity (MW) and %	Number and % of all turbines	Installed capacity (MW) and %	Number and % of all turbines	Installed capacity (MW) and %
5-14	836	1473	238	430	2066	4770	3140	6674
	48.7%	52.9%	30.6%	35.3%	59.4%	61.9%	52.6%	57.0%
15-19	71	56	43	38	150	142	264	237
	4.1%	2.0%	5.5%	3.1%	4.3%	1.8%	4.4%	2.3%
20+	82	35	312	135	96	54	490	224
	4.8%	1.26%	40.1%	11.1%	2.8%	0.7%	8.2%	1.9%

prominent issue. In 2018 in England, Wales and Scotland there were 462 wind farms aged 5–14 years (42% of windfarms), 40 (4%) aged 15–19 years and 22 aged 20 or over (data regarding turbine numbers is expressed in the table below). The oldest wind farms usually have a far lower installed capacity, hence repowering provides the opportunity to significantly increase the installed capacity of sites. Table 2 reveals that end-of-life considerations are an issue that is creeping towards us steadily rather than reaching a sharp tipping-point, at least until 2025 (see also Ziegler et al., 2018). It is notable that a more significant proportion of the capacity in Wales – an early 'leader' in UK wind power development (McKenzie Hedger, 1995) has entered the final few years of expected life.

4.2. End-of-life pathways

Repowering can be seen as a life-extending act driven by the owner /developer of the site; thus, it is beneficial to explore developer's intentions and the wider implications of their decisions. At the time of writing, in England, Wales and Scotland, 22 wind farms had been granted permission to repower of which 17 had been implemented. Additionally, one wind farm (Castle Pill) was considered to be a site extension rather than repowering. Two schemes had been refused permission to repower, with one refused on two occasions. The situation reveals a high success rate for repowering applications (compared to initial applications), demonstrating that wind farms are continuing to exist for longer than the initial temporary permissions would suggest, albeit often in different formations.

Repowering provides an opportunity to increase the efficiency of existing sites through upgrading the infrastructure with new, more efficient, turbines particularly as many of the older windfarms are located in sites with the greatest wind resource (Mitchell, 1996). This generally changes the characteristics of the site as, in most cases, it involves replacing turbines with a smaller number of taller, higher capacity, turbines, thus, there are effects other than a change in duration. Looking at the 22 sites in the UK that have been granted permission to repower revealed that on average repowering has decreased the number of turbines on a site by 39% but increased the height of turbines by 90.4%. Significantly, the average increase in installed capacity (MW) of the site is 155% or when the 1 turbine scheme (Ramsey) is removed from the equation, the average increase is 121% (see Table 3). It is worth considering that despite the significant increases noted here, in some locations land restrictions may create a potential barrier to repowering due to the increased space requirements of larger, more efficient turbines with greater rotor diameters. Moreover, the greatest increases in installed capacity are likely to occur from upgrading the earliest sites due to the improvements in wind turbine technology.

Differences emerge regarding end-of-life time frames for the infrastructure, in particular between the end of consent and other

Table 3
Characteristics of sites granted permission to repower in England Wales and Scotland. Based on data correct as of August 2018. Not including Bu windfarm as permission lapsed and site now decommissioned. Not including Castle Pill wind farm as it was considered to be an extension rather than repowering.

Sites granted repowering permission	Change in turbine numbers (Original = O, Repower = R) and (%)	Change in Turbine Height (to blade tip) (Original = O, Repower = R) and (%)	Change in installed capacity (MW) (Original = O, Repower = R) and (%)
Blood Hill	O = 10 R = 2 **−80%**	O = 43 R = 45.5 **5.8%**	O = 2.25 R = 0.8 **−64%**
Cammas Nan Gail	O = 2 R = 2 **0%**	O = 27 R = 45 **66.7%**	O = 0.1 R= 0.45 **350%**
Carland Cross	O = 15 R = 10 **−33%**	O = 49 R = 100 **104.1%**	O = 6 R = 20 **233%**
Caton Moor	O = 10 R = 8 **−20%**	O = 48.4 R = 90 **86.0%**	O = 3 R = 16 **433%**
Cemmaes	O = 24 R = 18 **−25%**	O = 42 R=76 **81.0%**	O = 7.2 R = 15.3 **113%**
Coal Clough	O = 24 R = 8 **−67%**	O = 49 R = 110 **124.5%**	O = 9.6 R = 16 **67%**
Delabole	O = 10 R = 4 **−60%**	O = 49.5 R = 110 **122.2%**	O = 4 R = 9.2 **130%**
Goonhilly Downs	O = 14 R = 6 **−57%**	O = 49 R = 107 **118.4%**	O = 5.6 R=12 **114%**
Great Eppleton	O = 4 R = 4 **0%**	O = 71 R = 115 **62.0%**	O = 3 R = 8.2 **173%**
Great Orton II	O = 10 R = 6 **−40%**	O = 60 R = 68.5 **14.2%**	O = 3 R = 3.96 **32%**
Harlock Hill / Furness	O = 5 R = 2 **−60%**	O = 53 R = 99.5 **87.7%**	O = 2.5 R = 4.6 **84%**
Haverigg	O = 5 R = 4 **−20%**	O = 45 R=76 **68.9%**	O = 1.125 R = 3.4 **202%**
Llandinam	O = 103 R = 34 **−67%**	O = 45.5 R=122 **168.1%**	O = 31 R = 102 **229%**
Llangwyryfon	O = 20 R = 11 **−45%**	O = 42 R = 66 **57.1%**	O = 6 R = 9.35 **56%**
Ovenden Moor	O = 23 R = 9 **−61%**	O = 48.9 R = 115 **135.2%**	O = 9.2 R = 18 **96%**
Ramsey	O = 1 R = 1 **0%**	O = 45 R=125 **177.8%**	O = 0.225 R = 1.8 **700%**
Rhyd-y-Groes	O = 24 R = 13 **−46%**	O = 46 R=79 **71.7%**	O = 7.2 R = 11.7 **63%**
Spurness	O = 3 R = 5 **67%**	O = 100 R = 105 **5.0%**	O = 8.25 R = 10 **21%**
St Breock	O = 11 R = 5 **−55%**	O = 53.5 R = 100 **86.9%**	O = 4.95 R = 12.5 **153%**
Taff Ely	O = 20 R = 7 **−65%**	O = 53.5 R = 110 **105.6%**	O = 9 R = 17.5 **94%**
Tangy III	O = 22 R = 16 **−27%**	O = 77 R=125 **62.3%**	O = 18.7 R = 36.8 **97%**
Wansbeck Blyth Harbour	O = 9 R = 1 **−89%**	O = 45 R=125 **177.8%**	O = 2.7 R = 3.4 **26%**

Table 4
Emergence of relevant wind energy policy in England, Wales and Scotland.

Country	Consent duration policy	Repowering and life-extension policy	Decommissioning policy
England	Use of temporary consents first suggested in 1993. 2011 policy identified typical turbine design life of 25-years and 25-year consent as typical. Identified that applicants may seek consent for differing time-periods and suggested use of conditions. Identified the time-limited nature of wind farms as an important consideration when assessing impacts.	First mentioned in 2011 - repowering applications should be determined on their individual merits. 2018 National Planning Policy identified that repowered turbines are exempt from the planning constraints placed on new onshore wind farms, providing no further detail. No consideration of life-extension.	First considered in 2011, policy recognising the need for applicants to set out details of what will be decommissioned. 2013 guidance suggested use of conditions to ensure turbine removal and land restoration.
Wales	First mention of the use of temporary planning permissions in 1993 guidance. 25-year consent period mentioned in non-statutory guidance. No policy on consent duration.	TAN 8 (2005) set out positive approach for repowering or life extension of sites outside Strategic Search Areas, subject to environmental and landscape impacts (no mention of other locations). Planning Policy Wales 10 (2018) set out positive approach to repowering and lifeextension more broadly including recognition that sites may change.	First mention of decommissioning in 1996. Use of decommissioning conditions suggested in various documents from 2005 onwards with lack of detail.
Scotland	1994 policy stated that temporary permissions will rarely be justified. 2007 policy identified temporary consents of 20 /25 years as common. 2014 policy stated that areas identified for wind farms should be suitable for use in perpetuity, while recognising that project consents may be time-limited. 2017 policy confirmed that there are no current statutory or legislative limits to the duration of consent.	First recognised in 2012. 2014 policy recognised benefits of repowering and identified the current use of a site as wind farm as a material consideration. 2017 policy identified the various forms of repowering including life-extension and set a position of clear support for repowering. It also recommended renegotiation of community benefits during repowering.	First mentioned as possible consideration in 1994. 2007 policy specified use of conditions to ensure decommissioning and site restoration, taking into account any proposed after use of the site.

temporalities. In some cases, the physical / economic life of the equipment may not be aligned with the consent. Some of the earliest sites do not have a time-limited consent and thus do not face the regulatory time-pressures to submit a repowering application. Here different risks arise, of redundancy, inefficiency and potential site abandonment. In other cases, the decision has been taken to extend the consent life of the existing infrastructure in order to get the most out of the existing assets, which can often operate for longer than their 25-year consent period. Asset life-extension involves extending the operational life of the infrastructure (usually for 5–10 years) and, in regulatory terms, this is achieved through altering a condition of the planning permission. During this process some components of the existing turbines may be replaced but the overall height and layout of the site remains the same, and thus compliant with the original consent.

As life-extension applications vary a condition on an existing planning consent they are much less 'visible', hence it is difficult for researchers to identify such applications. In order to get an estimate of the occurrence of life-extension, the planning history of all wind farms aged 18 or over that have not repowered was reviewed, revealing that 3 had submitted a life extension application. All three submitted the life-extension application in their 24th year of operation, reflecting discussions with industry representatives revealing that such applications are undertaken at a later opportunity than repowering. Nonetheless, this figure is an estimate that is unlikely to cover all life-extended applications as some may make this decision earlier, perhaps as a strategy, applying for a shorter period then attempting, at an early stage, to extend the permission.

Two wind farms have been decommissioned, Bu in Scotland and Chelker Reservoir in England. Experiences of decommissioning suggest that developers carry out decommissioning, as specified in planning conditions, without direct LPA involvement such as approving an updated decommissioning methods statement or specifying particular requirements. Despite this, both sites have been returned to their previous use of open agricultural land. However, there may be greater challenges in the future in cases where the relationship between regulation and the range of interests is more complex. As noted above, some of the earliest windfarms do not have time-limited consents, specifying instead removal of the turbines when the infrastructure stops working for a certain period of time. These consents rely on enforcement action from the council (which is discretionary, not obligatory) to ensure turbines are removed unless the developer decides it is in their interest to do so. Turbines are not the whole facility either, creating potential legacy and impact issues regarding wind infrastructure in sensitive landscapes, particularly the debate surrounding the environmental arguments for leaving or removing concrete turbine foundations from deep peat areas. Such areas of concern are being investigated by government conservation bodies such as Scottish Natural Heritage. There is potential for greater challenges to occur for some of the earliest wind farms where planning permissions failed to specify full decommissioning of the site. Such situations create potential for infrastructure to be abandoned, potentially creating permanent impacts.

4.3. Public response to repowering and life-extension

A significant feature of the wider social science literature on renewable energy and wind energy in particular is concern for the social acceptance of new facilities (Wüstenhagen et al., 2007). Given this, it is important to examine how the public respond to end-of-life decisions. Reviewing public comments on applications – the substantive remarks made and their frequency - appeared to show that public opinion has little direct influence on the outcome of applications but provides an overview of the most popular reasons for support and objection. Those supporting applications often did so on the basis of supporting renewable energy, preferring wind turbines over other forms of energy and due to positive impacts created by the original scheme. Sites that had the most positive reactions to repowering appeared to be those where the local community could identify the benefits that the wind farm had provided and where it had become a recognised part of their local area. There is evidence of perceived familiarity in some locations, reflected in comments describing turbines as a 'local landmark' or part of the 'local landscape'[2] . This supports research suggesting that people are often more favourable of the infrastructure once constructed (Warren et al., 2005). In some cases, those supporting repowering felt that the developer had listened to and involved the community during the consultation process, reflecting existing literature highlighting the importance of meaningful, responsive public consultation (Firestone et al., 2018; Gross, 2007; Hindmarsh and Matthews, 2008).

An analysis of comments submitted online to Local Planning Authorities in response to repowering applications (full copies of all

[2] Planning appeal decisions Caton Moor, 2004 and Carland Cross, 2010

public comments were available for 9 of the repowering applications) revealed that the most frequently reported reasons for opposition (cited as reasons across all 9 cases) included visual impacts, impacts on the local economy and tourism and noise and residential amenity, particularly due to changes in size. This reflects existing literature identifying visual impact as a central reason for opposition to wind farms (Wolsink, 2007b). However, change to the temporary nature of the development was also a common reason for objection in three of the cases, showing public disquiet that a prior agreement had been broken and, in some cases, raising concerns that approval for repowering will set precedent for other sites. Perceived breaches of trust have been identified as undermining public attitudes elsewhere and necessarily have a temporal narrative to them (Walker et al., 2010). Landscape changes that had occurred over the 25-year period of the planning permission could be seen to influence arguments of those opposing, particularly in cases where the land had become part of a designated landscape.

Most life-extension applications have faced lower levels of opposition with fewer public comments than repowering cases. Reasons for support reflected those submitted to repowering applications, often identifying the contribution to the local area and renewable energy production as well as acceptance that the visual impacts would remain unchanged. Reasons for opposition centred on arguments that the original development was granted 25-year permission, impact on views and a lack of trust towards developers. Unusually, in Kirkby Moor the life-extension application faced significantly greater opposition than in other sites with 153 comments of objection and 68 of support, however this was far less than the refused repowering application at this site which received 532 comments of objection and 141 of support, suggesting that repowering can create far greater public concern. Such differences are reflected in public comments which discuss the benefits of being able to see the infrastructure and its impacts rather than developing new turbines, reflecting apprehension towards prospective changes to facility size and layout. Moreover, those opposing repowering are often concerned about the impacts of larger turbines. While the Kirkby Moor site is unique due to the location of the site and the life-extension application being submitted after a refused repowering application, the preference for life-extension over repowering is reflected in many public comments.

Of course, renewable energy schemes are enmeshed in a complex set of social relations: while the focus on consenting processes and impacts is one, research shows that social responses are also mediated by project ownership and control, which can be very different between locally-developed schemes and those put forward by major, incumbent private companies (Warren and McFadyen, 2010; Musall and Kuik, 2011). In terms of this research, however, there is not (yet) the number of community-owned schemes in the UK to make researching end-of-life considerations viable.

To summarise, while existing literature suggest that familiarity with a development can lead to contentment (Warren et al., 2005), this may not always be the case as turbines do not become an accepted part of the landscape in all areas, particularly in places where they are perceived to be creating negative impacts, not be working or to not be providing local benefits. Moreover, in areas where they have become accepted, the changing impacts of repowered schemes may become a focus of opposition, too. Experience so far demonstrates that there is a contingency of potential end-of-life outcomes and impacts. It is clear that neither temporariness nor permanence is simple in terms of decision making or perceived effects. What is evident is that there are a range of impacts and contexts to end-of-life decisions that influence the way in which the public respond to the various options, including the way in which the existing infrastructure is considered and viewed, the perceived benefits gained from the infrastructure, the perception of the developer and the potential changes created by the end-of-life option. The question thus emerges as to how the multiplicity of potential outcomes might be regulated.

5. Steering temporal contingencies – planning policy responses

While most British wind farms have been granted a time-limited 25-year planning consent, reflecting a desire to treat windfarms as temporary, often with a promise of removal, instances of repowering and life-extension have shown that this duration often changes, thereby altering the temporary nature of the assets. In this context a question arises as to how the duration as well as the presence and impacts of the infrastructure are controlled by the planning system and how the planning system reflects what has been happening in practice. A review was undertaken comparing all national planning and energy policies relating to the temporary nature, duration and end-of-life processes for wind farms in England, Wales and Scotland, since 1990. Table 4 provides an overview of how policies have developed in each country, demonstrating the different attention paid to the duration of the infrastructure and the various end-of-life options.

5.1. The duration of consent

Policy regarding the duration of wind farm consents was compared, revealing significant differences between the three countries. In England, 2011 policy identified, for the first time, a limit of 25-years as typical with permissions described as temporary as at the end of the period the infrastructure must be removed. This position can be seen to have developed from earlier policy that suggested impacts 'may' be made temporary through using conditions. Policy also identifies the 'time-limited' nature of project consents as an important consideration when assessing landscape and visual impacts. In effect, the prospects of being temporary are presented as a factor militating in favour of consenting windfarms and finding their impacts more acceptable. Meanwhile, in Wales the only mention of the 25-year duration is in a 2008, non-statutory document, despite this, most permissions are for 25-years with planning application documents often specifying the benefits of this temporary period when discussing impacts of schemes.

Interviews with government officials in England and Wales revealed uncertainty regarding where the 25-year planning period originated from but identified the benefit, particularly to local communities, of providing an opportunity to review the development and assess its impacts. Some suspected that the 25-year permission may have arisen as it was the expected useful life of the turbine, but this has not been confirmed. While Welsh Government respondents identified that time-limited consents are useful given the speed of technological change and in providing the benefits of control and the ability to return the land to its previous use, they appeared open to considering arguments regarding increasing the 25-year permission. For UK Government officers, significantly, they identified that the temporary nature of original consents may cause difficulties during repowering or life-extension, suggesting that the duration of consents should be looked at in planning guidance, but providing no certainty that it will. What such policies reveal is that while the 25-year period is nowhere specified in legislation it appears to have become treated as a norm, perhaps through the impact of precedent creating an inherited fixity.

English and Welsh positions have come to contrast markedly with Scottish policy which, in 2017, confirmed that despite common assumptions that onshore wind consents should be for 25-years there are no statutory or legislative limits to consent duration. This departs from their 2007 policy which simply described temporary consents of 20–25 years as 'common practice' (Scottish Government, 2007, 56). Part of the Scottish Government's approach is to shape the use of *sites* over time, rather than just regulating the time frame of projects. Thus, the approach set out in Scottish policy is that '*areas identified for wind farms should be suitable for use in perpetuity*' (Scottish Government, 2014a, 170).

Scotland regards extending the life of existing sites as a form of repowering, thus their position is reflected in their positive approach to this activity (Scottish Government, 2017). There are no specific policies

relating to life-extension in England, thus decisions fall under the position on wind energy in local development plans in each area and wider government guidance. When asked about guidance for life-extension in England, the UK Government identified a knowledge gap and a need to understand the intentions and varying approaches of the sector in order to be able to help LPA's appraise different situations. Notably, at the time of interview (in early 2018) the Welsh Government did not appear to have considered what a life-extension application would involve, however support for repowering and life-extension was later included in revised planning policy published in December 2018. This lack of detailed consideration of life-extension reflects a lack of wider temporal outlook in planning, with policy development in England and Wales being largely responsive rather than engaging in future-oriented steering. Reflecting on governmentality as problematisation, one might infer the government in England does not see any major problems in the likely treatment of life-extension decisions.

5.2. Repowering policy

While repowering and life-extension applications have so far experienced a high success rate, it is important to consider the policy context in which decisions are made. In England repowering has come to be treated more guardedly, as an 'exception' from its otherwise very anti-wind policy stance. Significantly, in July 2018 the revised National Planning Policy exempted repowering applications from the constraints on new onshore wind applications, suggesting a recognition of the need to support it (Ministry of Housing, Communities and Local Government 2018, footnote 49). Previously, these applications were likely to be treated in the same way as other wind farm applications and thus influenced by England's overall policy approach, which has become markedly more restrictive since 2015.

Wales has a policy of spatial zoning of wind energy specified through 2005 policy (TAN8), allocating Strategic Search Areas (SSA) as the most appropriate locations for new large-scale wind energy development. In accordance with this policy wind farm development should be focused within the 7 SSAs, each of which have indicative targets for installed capacity, with LPA's guiding the development within each area. TAN8 considered repowering applications as a permissible exception to their otherwise quite robust zoning policy through identifying that there may be opportunities to repower sites located outside the SSAs, it was however, rather limited in failing to specify how applications and impacts would be assessed. Significantly, in 2018 Planning Policy Wales (edition 10), for the first time, set out a positive approach to repowering and life-extension of wind farms in Wales, identifying the importance of such schemes to meeting decarbonisation and renewables targets. The policy explicitly states that LPA's should support schemes, recognising that viability and technological changes may result in repowering schemes having a different format. On a LPA level it specifies that LPA's should set broad criteria for the determination of schemes *'based on the additional impact of the new* scheme' (Welsh Government, 2018, 5.9.2). While this policy sets out a recognised need to support repowering and life-extension, it lacks detail regarding assessment of applications and how applications could potentially increase community, environmental or other benefits.

Scottish Policy sets out a positive approach to repowering, identifying the benefits of repowering existing sites and explicitly classifying the current use of the site (as a wind farm) as a material consideration (Scottish Government, 2014a, 174). In this way the initial, 'temporary' development leaves a legacy for future decisions, militating in favour of future wind energy. The 2017 policy statement built on this positive approach confirming that the government's position *'remains one of clear support in principle for repowering at existing sites'* (Scottish Government, 2017, 35*),*identifying the different variations of repowering and the benefits of repowering including maximising value for Scotland in terms of economic, social and environmental benefits. As indicated above, one potential benefit of end-of-life 'moments' is that potentially they provide opportunities for reconsidering the wider social and environmental relations around development. To date only the Scottish Government has made this opportunity explicit. Their 2017 policy provides a positive consideration of communities including the renegotiation of community benefits or shared ownership. As others have noted, policies for socialising the benefits of wind were already more advanced in Scotland than other parts of the UK (Strachan et al., 2015).

As outlined in Table 1, the uneven pattern of intervention within the UK can be seen to reflect the approach to governance and planning of onshore wind in each country plus attitudes to wind energy more widely. Each country has a different approach generally to siting, with temporal implications. Thus, the Welsh Government's SSAs, written into national guidance, might themselves be considered a device that confers long-term presumptions in favour of wind energy in end-of-life decisions in these areas, even though the recent positive approach to repowering and life extension, by ushering in larger turbines, may challenge the landscape assessments on which the wind energy zones were defined. In Scotland, long-standing concern to expand and legitimise wind energy, plus equally long-standing support for strategic spatial planning is reflected in their approach to repowering and the desire to pro-actively steer decisions. In England, a laissez-faire approach from 1990 to 2010 in planning generally, has jerked sharply toward doctrines of localism. Both the UK and Welsh Government expressed willingness to learn from existing experiences of repowering, with the UK government identifying that it needed to be looked at in more detail in order to provide clarity for LPA's and prevent inconsistencies of outcome.

5.3. Decommissioning policy; securing the end of temporary consents

In many ways, repowering and life-extension push the regulation of 'end-of-life' further into the future, but ultimately it does arrive and, for some projects, it has already been reached and passed. It is important to consider the policy context for decommissioning in order to understand how the removal of this infrastructure is controlled and to explore how or whether changes that may have occurred over the lifespan of the infrastructure are considered.

In England policy identifies that '*the extent to which the site will return to its original state'* is a possible relevant consideration in assessing the impacts of wind farm applications, reinforcing the conception of such developments as temporary (Department of Energy and Climate Change, 2011). However, as sites and the land around them are always in a process of flux this raises questions regarding the feasibility or desirability of returning to an original state. Policy lacks detail regarding the decommissioning process. Welsh policy has long identified the role of LPA's in securing '*the decommissioning of developments and associated infrastructure and remediation of the site as soon as their use ceases'*(Welsh Government, 2016, 12.10.6) (see Table 4). Planning conditions and legal agreements are recommended to ensure this is achieved but it places the onus on LPA's, giving them discretion. The policy is conveyed in non-statutory guidance to LPA's on decommissioning and after use of sites and is very high level. Scottish Policy identifies the need for decommissioning conditions as one of the considerations for energy infrastructure proposals and additionally identifies the importance of ensuring that finance is secured for site restoration. Planning guidance states that '*in many cases, wind turbines can be decommissioned and sites cleared and restored easily and rapidly*'(Scottish Government, 2014b, 2.7.17) reflecting the widely shared assumption that this process will not cause difficulties.

In comparison to developing policy or guidance for repowering, there appears to be less immediate government concern to develop decommissioning policy. Through a Foucauldian lens, one can interpret this as reflecting beliefs that decommissioning is socially unproblematic; perhaps also neo-liberal preferences against placing regulatory requirements on businesses. Significantly, in interview the UK

government department for Business, Energy and Industrial Strategy identified that cases of abandonment may occur in instances where insufficient conditions were put in place during original permissions, suggesting that permanent impacts could occur from temporary developments. However, their expectation that repowering will happen reflected an assumption that less consideration needs to be given to decommissioning futures. Similarly, legacy issues have not been fully addressed in Wales, with interviewees identifying bonds as something they need to consider in the context of legacy issues but revealing that they have only just tackled this issue with open-cast coal mines. Ironically, one might say that UK governments face a backlog of legacy issues. Scottish Government confirmed that there are no plans to produce further guidance about decommissioning and that it is between the developer and LPA to negotiate, thus even if it is believed that such things need governing, it is not judged to be a central state responsibility.

In all nations policy does little more than flag the salience of decommissioning and is quiet on the details. There is a lack of guidance about how the process should be carried out leaving this domain highly open, for developers, LPAs and maybe others to argue about questions such as 'how much decommissioning', 'to what end' and 'how secured'? In the face of future uncertainty this may not be unreasonable. Furthermore, no one would claim that the physical legacy of renewable energy developments equates in scale and severity to that of nuclear power (Blowers, 2017) or opencast mining (Ibarra and De las Heras, 2005) which have left immensely costly remediation challenges. Nevertheless, wind energy does have material consequences, and the spatially extensive nature of wind farms in rural areas give the legacy issue significance. Wind farms reaching end-of-life may leave concrete foundations or other equipment; projects may shape landscape meanings and perceptions if left in situ. There are risk judgements to this lack of problematisation. While a lack of detailed attention to regulating future post-wind land use may be understandable, the lack of attention to what elements of wind facilities should be removed is a different dimension and could be more problematic.

6. Discussion; how the planning system considers temporality

The findings above have captured outcomes to date with end-of-life decisions, focusing on three main categories: repowering; consent extension and decommissioning. It has also highlighted that these categories get combined (so repowering may bring life-extension), that other issues get woven in to end-of-life 'regulatory moments' (such as new time limits or restoration commitments) and that, while most developer efforts to seek some form of life-extension are successful, there are no guarantees. It also shows the patchy nature of government planning policy. Following a Foucauldian perspective on problematisation, what does this limited state action reveal about the problems that are regarded as significant?

Policy for repowering and life-extension is limited in England, creating a rather open context for end-of-life decision making. Life-extension has not really been captured by policy overall, despite its increasing prominence. The limited evidence to date suggests that life-extension faces less public objection, raising the question of whether duration matters in its own right to people if the physical scale of impacts do not change. However, changing the duration of permissions could reduce the need for life-extension applications. English and Welsh policy for repowering is also limited, with a lack of consideration regarding how impacts should be assessed. While there are benefits of remaining open to change, as it is impossible to imagine exactly what may happen in the future, a policy absence entails risks, not least for ongoing availability of wind energy. Governments are only just starting to recognise that repowering is happening and – to the extent that they are concerned about renewable energy deployment - needs to be supported. Little consideration in England has been given to how this should be facilitated in practice; meanwhile, Wales has only recently considered how such applications should be treated. In comparison, Scotland seems keener to act on end-of-life decisions, to maintain wind energy output; they have thus considered what social relations need to be managed to make that the likeliest outcome. Scotland has acted on wind *sites* and possibly social relations, to assert the permanence of land allocation decisions for wind (and frame the scope for future social resistance), while allowing developer flexibility regarding configuration of infrastructure within the 'envelope' of the site.

The research has also revealed areas of potential disingenuousness in the planning systems' treatment of wind farms as 'temporary', or at least a gap between the narrow technical meaning and unfolding materialities-temporalities of development. Firstly, experience suggests that wind farms tend to reproduce over time. Through repowering, the infrastructure is becoming a more permanent feature of the landscape that will remain in place for longer than the consented 25-year period. This raises questions regarding the 'temporary' nature of the development and whether it is really appropriate to treat or consider wind farm permissions as if they will expire and cease to exist.

Secondly, what makes the issue above important is the way in which the 'temporariness' of wind farms has been used as a potential virtue in planning as a quality that weighs positively in consent decisions where things like landscape impacts are likely. In all countries there are examples of the 'temporary' and 'reversible ' nature of the impacts of the infrastructure being used to gain support through making the otherwise potentially unacceptable, acceptable due to its duration. In such a way the consideration of time within planning can be seen as a way of achieving political gain (see Myers and Kitsuse, 2000; Van Der Knaap and Davidse, 2010). Significantly, in Scotland there is a move away from the idea of renewables as temporary and a move towards a broader temporal perspective and more flexible approach to duration of the infrastructure as demonstrated by the 'in perpetuity' policy, clear support for repowering and in confirmation that permissions do not have to be 25-years. Through doing so the 'temporary' development leaves a legacy on future decisions and does not 'vanish'. Such flexibility appears to benefit developers and those supporting a pro-wind strategy. In contrast, policy in England still refers to the benefits of a temporary 25-year permission. While there are evident benefits of a time-limited consent, particularly in the context of possible future energy technology changes, this can create a disadvantage when there is no clear policy or assessment for repowering or extending the consent period.

It has been suggested that through focusing on a strict notion of time with set boundaries, certain items get left out of consideration of the planning system and can return to create difficulties in the future (Abram and Weszkalnys, 2011). The research has shown various instances and patterns of this. There are instances in England and Wales where sites have begun to reach the end of their permitted life without clear guidance and their owners have thus held off from making decisions and particularly in instances of sites which lack detailed decommissioning requirements.

While there is evidence of an increasing recognition that policy needs to change to reflect what is beginning to happen at existing sites, there are significant differences across the UK in current progress and approaches. This becomes manifest in different spatial and temporal controls of the infrastructure. The different treatment of end-of-life considerations within policy points to the divergent ways in which this issue is problematised and, indeed, the multiple problems that end-of-life decisions bring together (Dent, 2009). One such problematisation is the potential contribution of repowering to energy and climate change targets and the need to secure it. Thus, differences in policy approach can be seen to relate to the emphasis given to this priority in the energy policy of each country. Approaches to spatial coordination in systems of governance also have an effect (see Table 1). Scotland's position on increasing the temporal lifespan of the infrastructure can be seen to reflect their positive, pro-active approach to onshore wind, ambitious renewable energy targets, and their long-standing interest in spatial approaches to identifying suitable sites (Power and Cowell, 2012).

Similarly, spatial control is key to the positive approach to wind energy in Wales (Cowell, 2017), although they appear to be less pro-active and have only recently given consideration to the temporal aspects of the infrastructure. Comparatively, in England, repowering is being treated more guardedly, as an 'exception' from its otherwise very anti-wind stance, which reflects post-2010 political rhetoric of localism (i.e. the focus on local control), a longstanding unwillingness to direct centrally that areas for windfarms should be designated, and also an energy policy position which has cooled markedly towards onshore wind.

If government intervention is taken to be revealing of problematisation, then the limited national attention given to decommissioning implies that governments see little problem here, believing perhaps that acceptable outcomes will be achieved with relative ease. While there is some, albeit limited, recognition that decommissioning may need to facilitate a future use of the land, there is a lack of discussion regarding how this could be achieved in practice. This policy silence could be seen as allowing an array of potential future uses, within certain limits, but it also removes an opportunity to discuss the issue of what next? There is a possibility that decommissioning for some of the earliest sites may create challenges in situations where appropriate decommissioning requirements or bonds have not been put in place, creating the possibility of abandonment. Concerns regarding abandonment and dereliction form a dimension of wind farm opposition (Fadie, 2017; Fugleberg, 2014). In such situations repowering and life-extension can provide the benefit of improving decommissioning requirements. However, this creates situations in which a need for site restoration, and the difficulties of securing this, may be used to try to gain support for a new application; similar to cases where opencast coal mining has been justified in relation to the restoration of sites previously used for deep mining (see Milbourne and Mason, 2017). An absence of initial controls creates the context for a trade-off, in which a longer life for a wind farm – and probably an increase in capacity – is the public 'price' of greater assurance of the eventual end-of-life outcome.

7. Conclusion

The potential temporariness of renewable energy technology and the reversibility of any impacts it might have has been rather taken for granted and little research has been undertaken as a result. Research on social acceptance of renewable energy has concentrated attention mostly on initial consenting decisions, tacitly assuming that this is the key decision-point shaping the evolution of wind energy capacity into the future. Yet as this research has highlighted, keeping consented wind energy capacity in place over time faces a number of issues and complexities, and ought to be seen dynamically.

This study has shown the potential problems surrounding 'end-of-life issues' -temporariness is anything but simple. It has shown that 'end-of-life' is a bundle of concerns, affecting: the specific equipment, with company assessments of viable physical or commercial life and the benefits of replacement (see also Ziegler et al., 2018); the temporal terms of any planning consent, which have conventionally been time-limited; the ongoing presence of a wind energy-generating facility and its relationship to that site and the public. Each has their own temporality, which require coordination but can create the possibility for tensions. The research has also provided a cross-cutting, comparative assessment of the dynamics to date of the three main categories of formal 'end-of-life' decision: repowering; extending the consent period for the existing equipment (or equipment of comparable scale and configuration); or bringing a facility to a close and decommissioning. To date, most applications for repowering and life-extension in the UK have been successful. As a corollary, one can see that temporariness is a *potential* quality of onshore wind, but most often the duration of wind farms has been extended further into the future. The complex reality of 'temporariness' is also becoming apparent in emerging discussions about which components of closed facilities need to be removed. Site abandonment – a fourth category of end-of-life decision – has yet to happen in the UK, but national regulation has done little yet to prevent it.

This research sought to understand to what extent the issue of end-of-life decision making for renewables is problematised and regulated by government. The findings show government policy on end-of-life issues to be limited in scope and patchy, especially in England. Interpreting this state of affairs through a Foucauldian perspective on problematisation, one might deduce that policy-makers have not come to regard end-of-life issues as a sufficiently important problem to warrant action. However, this rather one-dimensional reading neglects a number of important things, which may be more widely relevant to the analysis of end-of-life action. Comparing national policies across England, Wales and Scotland shows the interventions to be more comprehensive in Scotland and this is explicable in part as a greater concern to shape the contingency of end-of-life decisions in favour of maintaining wind energy capacity. It also highlights the elements of end-of-life decisions that states can choose to act on, in order to extend control into the future. Notably, we see governments seeking to establish the long-term appropriateness of existing *sites* for wind power, to provide a conducive context for the consideration of future wind energy *projects* (be they life-extensions or repowerings). Indeed, English, Welsh and Scottish Governments have all moved to adopt supportive policy stances on repowering applications. Again, the 'temporariness' of wind energy is being renegotiated.

What we are seeing here is the strategic selectivity of the state (Jessop, 1990), but conducted in the face of the very considerable contingency of the future, in which wind energy, projects and landscapes may evolve in multi-various combinations. Partiality of policy is perhaps therefore inevitable. Yet it is still important to consider which kinds of future are being embraced within policy, which actor concerns, and which tend to be omitted. Policy has tended to shift to affirm the long-term appropriateness of wind energy in extant wind farm locations. Only in Scotland, thus far, is the government encouraging end-of-life decisions to enhance the benefit flows to 'host' communities. Governments across the UK have been content to issue minimal advice on decommissioning, effectively passing any problem to local communities. While central governments have yet to problematise this issue, such judgements may prove misguided: risks of site abandonment and dereliction risk marring the 'green' connotations of wind energy, whatever claims might be made about the potential 'reversibility' of the impacts of such technologies.

While this paper has focused on the UK, the assessment has relevance in a host of other countries, especially in Europe, where there is evidence of tightening of spatial constraints around new onshore wind energy development, which makes the dynamics of end-of-life decisions increasingly important. In many places, more intensive exploitation of existing wind power sites will be a key development trajectory for onshore wind. It will thus be significant to understand how the duration of energy, and other infrastructure, is treated in other countries. It will also be important to understand the influence of different ownership forms on end-of-life decision making, again in an international context. In conceptual terms, the analysis presented here affirms the need to understand and reflect upon the way in which planning policies consider time and whose interests are being reflected or set aside as a result of the process and terminology used within planning as suggested by Graham and Healey (1999) and others. There is also a need for research to better understand how the temporalities of energy infrastructure are considered by the public, to assess whether the patchy problematisation by governments has widespread support.

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