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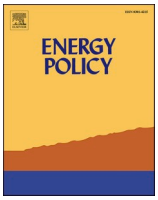

Acceptance should not be assumed. How the dynamics of social acceptance changes over time, impacting onshore wind repowering

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ABSTRACT

Local community acceptance is a key influence on wind farm siting decisions. However, there is a temporal limitation to much social acceptance literature in that it does not consider how perceptions of the local community may change over the operational life of a wind farm and in the context of end-of-life applications for repowering or life-extension. In response, this paper increases the temporal depth of our understanding of social acceptance through presenting the results of survey research undertaken with communities living close to two English wind farms that have experienced end-of-life applications. For many respondents, perceptions of their local wind farm did not change following construction or over the life of the scheme, contrasting with common expectations that acceptance will increase over time. The findings reveal that community support for applications to repower or life-extend is influenced by experiences of living with the wind farm over time. It also shows how factors that have been found to impact perceptions of new wind farms, particularly the benefits that people experience, involvement in the planning process, and relationships with the developer, can influence responses to end-of-life applications. These insights are used to provide recommendations for end-of-life policy.

1. Introduction

It has been suggested that local acceptance may constrain our ability to achieve renewable energy targets, particularly in the case of wind energy (Wüstenhagen et al., 2007) as local opposition is often considered as a central barrier to gaining permission for new wind farms (Landeta-Manzano et al., 2018). The long-term future of existing renewable energy sites has been given significantly less consideration than new sites as it is often expected that perceptions will improve once developments are built and operational (Gipe, 1995; Wolsink, 1989, 2007) and that familiarity over time will lead to public contentment (Warren et al., 2005). However, existing social acceptance research has generally lacked consideration of how local perceptions may change over the life of an operational scheme. Also missing from existing research is consideration of how local perceptions may change in the context of applications for repowering (removing existing turbines and replacing with new turbines, often of a different size and layout on the site) or life-extension (extending the duration of the existing planning permission) of a wind farm. This is a notable gap in understanding the dynamics of social acceptance as repowering is considered to become the next big challenge for the wind energy industry (Frantál, 2015; Kitzing et al., 2020) and, in many countries, has not yet been subject to detailed policy consideration.

In the UK, wind farms are often promoted to communities on the basis of having 'temporary' planning consent with a condition requiring removal at the end of a set period, usually 25 years. The oldest sites are now reaching this point (Windemer, 2019), elsewhere in Europe and the US sites have begun to reach the end of their operational or consent life. Failing to consider changes over a longer period has created a clear limitation in our current understanding of social acceptance, particularly as an end-of-life application presents an important moment in which communities have the opportunity to influence the future of a site (Philpott and Windemer, 2022). Moreover, there are only a limited number of potentially suitable sites for wind energy and many of the first wind farms are considered to have been built on the windiest sites (Hulshorst, 2008; Mitchell, 1996). Due to the scale of technological advancements in wind energy technology, repowering provides the opportunity to significantly increase the energy generated from a site (Abadie and Goicoechea, 2021). Evidencing this, a 2019 review of approved repowering applications in Great Britain (GB) identified that on average the maximum installed capacity had increased by 155% (Windemer, 2019). There is thus a clear need, both from a policy and academic perspective, to understand how and why local perceptions of wind farms may change over time, influencing end-of-life decision

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making and to consider how this should be reflected in policy.

This paper responds to this knowledge gap through providing the first consideration of how the social acceptance of local communities changes over the life of an operational wind farm and in the context of end-of-life applications for repowering or life-extension. Specifically, it presents the results of public surveys administered to communities living within 3.5 km of two of the oldest GB wind farms. The paper explores public perceptions and experiences in two different locations, a site that faced high levels of public opposition in response to repowering and life-extension applications (Kirkby Moor) and a site where repowering faced little opposition and the repowered site is operational (St Breock). The paper also explores how factors that have been found to influence local community responses to wind farm applications in existing research may influence perceptions over a longer period. The paper seeks to answer the following research questions:

1. How do local community perceptions of a wind farm change over time, in the context of an end-of-life application?
2. What factors influence community responses to end-of-life applications?

Through answering these questions, this paper reveals the importance of considering community experiences over the longer period of wind farm operation, particularly as the findings contrast with existing studies that assume that familiarity over time will lead to acceptance. From a policy and industry perspective, the research reveals the importance of ensuring that communities are benefiting and treated well by developers from the outset and over the operational life of a renewable energy development, particularly as repowering provides a key policy window in which renewable energy development can occur.

The following section provides an overview of the limited existing literature exploring how social acceptance of wind farms changes over time and in turn affects the context for end-of-life decisions. The research design is then discussed and cases introduced. The paper then discusses the survey results, including recalled opinions before and after construction of the wind farms, perceptions of the end-of-life applications, and the factors influencing perceptions, before conclusions and policy recommendations are provided.

2. Social acceptance of wind farms and the need for a greater temporal perspective

2.1. Change in social acceptance over time

There is a sizable body of literature exploring the social acceptance of energy projects. In considering the social acceptance of renewables it is worth reflecting on the introduction to the special issue on social acceptance that was published in this journal in 2007. In their introductory paper, Wüstenhagen et al. (2007) identified three key features of renewable energy innovation that brought new dimensions to understandings of social acceptance studies that were based on non-renewables. The first key difference was that renewable energy projects tend to be smaller-scale, with consequently more decisions being taken, secondly that the relative visual impact per MWh output is usually higher due to lower densities, greater visibility and greater proximity to settlements. and thirdly that most renewables do not compete on a level playing field with incumbent technologies, creating decision making regarding future benefits. Since then studies on social acceptance of renewable energy and particularly on wind energy have grown significantly (Batel, 2020; Fournis and Fortin, 2017). There is not space in this paper to do justice to the vast research exploring the social acceptance of renewable energy or how research in this field has developed, for this, Batel (2020) provides a useful overview.

There is a large body of literature exploring the factors influencing local perceptions of wind farms and public responses to proposed developments, many of these factors can be seen to have an implicit - but scarcely considered - temporal dimension. Key factors that have been found to influence social acceptance of new or proposed wind farms include, visual impact (e.g Jobert et al., 2007; Jones and Eiser, 2009; Pasqualetti, 2011; Wolsink, 1989), place attachment,(e.g. Devine--Wright, 2009; Devine-Wright and Howes, 2010; Haggett and Futák--Campbell, 2011), developer-community relationships,(e.g. Aitken, 2010a; Firestone et al., 2018; Toke, 2005), community trust in the developer (e.g. Ellis et al., 2007; Gross, 2007; Wolsink, 2007), trust in the planning process, particularly the ability for communities to participate and have meaningful impact (Strachan and Lal, 2004; Walker et al., 2010; Warren et al., 2005; Wüstenhagen et al., 2007), and community benefits (e.g. Baxter et al., 2013; Suškevičs et al., 2019). While providing useful insights regarding public perceptions, such studies are generally focused on the build-up to decisions and framed by crises, as most studies focus on opposition to proposed schemes (Ellis et al., 2007). Such focus has resulted in a lack of consideration regarding the result of lived experience in a place following change (Bailey et al., 2016) and there is thus a need to consider these factors over a longer period to investigate potential implications for the future of existing sites. Meanwhile, providing a more temporal consideration, the cumulative impact of increasing numbers of small-scale wind farm developments in a location has also been identified as an area of concern (Scott et al., 2014). Adding a different temporal dimension to considerations of social acceptance, research undertaken in Ontario, Canada by Fast and Mabee (2015) identified that developers who tried to understand the local history of a project site and included that history in the wind projects were more successful.

Whereas much social acceptance research is concerned with looking at a site at one moment in time, there is a small body of literature considering a wider temporal frame. A key argument emerging from such studies is that familiarity with a wind farm will positively influence people's opinions (Warren et al., 2005; Wheeler, 2017). It has been suggested that people living close to wind turbines perceive them more positively after installation (Damborg and Krohn, 1999; Warren et al., 2005) and that positive perceptions are more likely for those who see turbines daily (van der Horst, 2007). Attitudes to wind farms have been suggested to follow a U-shaped curve, ranging from very positive when people are not confronted by a local proposal, to less positive when people experience an application, to more positive again following construction (Damborg and Krohn, 1999; Gipe, 1995; Wolsink, 2007), with the tacit assumption that this applies in perpetuity. The U-shape curve diagram provided in Wolsink (2007) depicts this relationship. However, there is a lack of consideration regarding how values may alter over the full operational lifespan of the infrastructure. Moreover, Wolsink (2007,1199) recognised that the U-shape curve is 'by no means a guarantee for improvements in attitudes after construction' as the 'effect can only be seen if the existing environmental impact is adequately dealt with in the eyes of the local population'. The U-shaped curve hypothesis also appears to consider the development and decision-making process in simple binary terms (i.e., the infrastructure was not there and now it is), ignoring the scope for projects and their contexts to evolve. There is thus a need to explore how sites may change over time and how this may influence decision making regarding the future. Opposing arguments of familiarity, Sovacool (2009) argued that once values are formed regarding energy, they are difficult to change. Indeed, Devine-Wright (2005) stated that the assumption that public perceptions improve over time is not supported by empirical evidence and thus there is a need to understand contextual influences on specific sites.

There are a few studies exploring changes in recalled perceptions of wind farms over a longer period. These studies enable participants to recall their experiences of living with a wind farm and their earlier responses to applications and through doing so provide a useful temporal dynamic to understandings of social acceptance. Wilson and Dyke (2016) explored changes in community perceptions of a two turbine development five years after operation, finding that although some negative perceptions remained, attitudes generally became more

favourable over time as the community became used to the turbines. They identified that acceptance appeared more nuanced than the U-shaped curve model suggests as community responses are multi-layered with different curves of acceptance relating to different areas of concern. Eltham et al. (2008) explored whether pre-construction perceptions of a Cornish windfarm changed 14 years following commissioning. Although the findings revealed statistically significant changes between recalled opinions of 1991 and opinions in 2006 regarding an increase in the number of residents finding the wind turbines visually attractive and considering wind energy to be a valuable asset, the results identified no reliable change in opinion regarding residents' acceptance. Meanwhile, survey research undertaken by Kontogianni et al. (2014) found that experience of wind farms marginally affected positive public perceptions but significantly influenced negative public perceptions.

2.2. Consideration of repowering and life-extension

Energy acceptability studies largely lack consideration of the time-limited nature of developments or possible repowering or life-extension. There have been very few studies considering end-of-life and those that do are often focused on the potential for repowering and life-extension from a technical or economic perspective (e.g. Abadie and Goicoechea, 2021; Lacal-Arántegui et al., 2020; Nivedh et al., 2013; Prabu and Kottayil, 2015; Ziegler et al., 2018). Of particular note from these studies are the technical considerations impacting the decision between repowering and life-extension, with studies highlighting the benefit of repowering due to advancements in technology, if permitting regulations allow (Abadie and Goicoechea, 2021). Life-extension is generally considered as an option if repowering is not feasible and is influenced by policy or legal requirements which vary across countries, subsidy schemes for existing and new turbines, and the technical health of the existing turbines (how long they can continue operating from a structural safety perspective) (Ziegler et al., 2018). However, while providing a useful overview of technical considerations, such studies lack detailed consideration of how such applications impact public perceptions. This is important, not least because public support is often invoked in justification for continuing developments on existing sites, but often without evidence.

There is a small body of literature considering public responses to end-of-life applications. However, such studies are limited in scope and do not provide a detailed exploration of how local perceptions may have changed over time. It has been suggested that while repowering onshore wind farms is portrayed as a lower risk and lower cost option than developing offshore windfarms, opposition to larger wind farms creates a potential challenge (Himpler and Madlener, 2012). Research exploring the impacts of repowering campaigns in Denmark revealed that while campaigns sought to address the issue of 'poorly located wind turbines', 'it was found that re-powering did not lead to lower overall visibility and density, but to higher distance for some of the inhabitants' (Möller, 2010, 240). Meanwhile, in the most detailed consideration of community acceptance at end-of-life, Frantál (2015) undertook surveys with local governments and communities in the Czech Republic. The research found that almost half of public respondents and the majority of government representatives would support either repowering or new turbines in their municipality. It identified two central factors influencing support - diversified economic profit for local communities and landscape impacts. The significance of the visual impact was outweighed by appraisal of economic benefits, suggesting that meeting expectations of the economic benefits of existing projects (a temporal process) will have a significant impact on acceptance of future development. As the research focused on hypothetical repowering projects there is a need to explore if these factors remain important when residents are faced with an actual repowering application.

An important consideration for end-of-life decision making is procedural justice, with existing studies recognising the importance of public participation including adequate information, respect and fairness in decision making processes for wind farms (Gross, 2007). There is currently a limited temporal dimension to considerations of procedural justice with Elmallah and Rand (2022) identifying the need for planning processes to evolve in order to ensure participation in decision making beyond the siting of wind farm projects, including in their construction, operation and decommissioning. Highlighting the importance of procedural justice, Mills et al. (2019) found that if residents felt that the wind farm siting process was fair then their perceptions of the site remained constant or improved over time, but if they felt that they were unable to participate, or their input was ignored, their perception of the site decreased over time. Wade and Ellis (2022) considered another important justice dimension, the challenges surrounding land ownership during repowering. They identified that not all existing wind farm landowners may continue as landowners during a repowering i.e. that there may be less beneficiaries. They thus suggest adopting more social configurations of wind rights that would give more power and benefit to communities. There is a need for more studies to build upon this work and particularly to consider procedural justice around end-of-life decision making.

Considering end-of-life decision making in Great Britain, Windemer (2019) provides an overview of public responses to repowering and life-extension based on formal comments submitted to planning applications. The most common reasons for opposition to repowering included visual impacts, impacts on the local economy and tourism and noise and residential amenity, whilst the most common reasons for support included support for renewables and wind energy and positive impacts created by the original scheme. The paper also provides an analysis of end-of-life policy, concluding that policy is limited, particularly for repowering and life-extension in England where policy only clarifies that repowering applications are not subject to the policy constraints on new onshore wind farms. The paper identifies that most sites are expected to have a decommissioning plan in place and conditions requiring infrastructure removal and land restoration should be part of planning consents, but that decommissioning policy is limited.

Existing research in this field can be seen to have both conceptual and empirical limitations in relation to the temporalities of social acceptance (please see Küpers and Batel's paper in this special issue for a wider consideration of temporality in social acceptance research). Studies considering end-of-life have lacked detailed consideration of community perceptions. Many existing social acceptance studies appear to consider sites as if they will be operating in perpetuity and thus there is an absence of consideration regarding the temporal preferences of communities and how their perceptions may change over the operational life of the infrastructure or in the context of applications to repower or life-extend. There is an absence of academic literature considering how sites and the communities living close to those sites may evolve over their life time and how this may impact decisions regarding the future. In response to this gap, this paper aims to explore how community perceptions change over this longer time period and if the factors that have been found to influence responses to new developments influence responses to end-of-life applications.

3. Methodology

As one of the first studies exploring changes in social acceptance over the full operational life of wind farms and in the context of end-of-life applications, this research aimed to provide more than a comparison of two sites. Instead it used two different sites as a way to explore different community-specific factors and longitudinal themes. For each case, the survey aimed to understand if perceptions of the local wind farm had changed over time, perceptions of the repowering or life-extension applications, and if factors that have often been found to influence local community response to wind farm applications, particularly the role of community benefits, community-developer relationships and trust and involvement in the planning process were

also true over a longer time period. The survey also sought to understand perspectives on the height of turbines (drawing upon insights from Frantál (2015)) and on the duration of planning consents. The design of the survey was informed by site visits and a detailed review of the planning applications for the original and end-of-life applications in each case.

3.1. Research locations

Great Britain (GB) was chosen as the location of this research as most sites are subject to time-limited 25-year planning consents, requiring decommissioning at the end of that period and as sites are beginning to reach that stage (Windemer, 2019). In the UK (GB plus Northern Ireland) onshore wind energy accounted for 11% of total electricity generation in 2020. In England, where the two survey cases are located, most wind farms are owned by large commercial developers due to the absence of policy or financial support for community-owned projects (Braunholtz-Speight et al., 2020; Curtin et al., 2018; Nolden, 2013). At the time of writing, wind farm planning decisions, including end-of-life applications, in England are decided by the Local Planning Authority (LPA). Repowering applications in England can be undertaken at any time in the projects lifecycle and involve a new full planning application, any existing subsidies would not continue to the repowered site.

This survey research formed part of a larger project investigating end-of-life decision making for the oldest wind farms in GB. As part of that research the planning files for all repowering applications were investigated, (see Windemer, 2019). Four wind farms were then chosen for in-depth case study research. The wind farms reflected four of the oldest sites across GB and were selected due to having different public responses to repowering and life-extension. The cases were chosen to be similar in several dimensions, most importantly size and proximity to a settlement. All cases were owned by commercial developers as community-owned cases form a small minority of all, and particularly of the older, wind schemes in GB. While the case study research involved interviews with all actors involved in the sites, including community members and groups, it was felt that this reflected those with a high level of interest in the scheme. The survey research was therefore initiated in order get a more in-depth understanding of the communities living closest to the wind farms. The Kirkby Moor site provided an opportunity to explore a site that had faced high levels of community opposition to

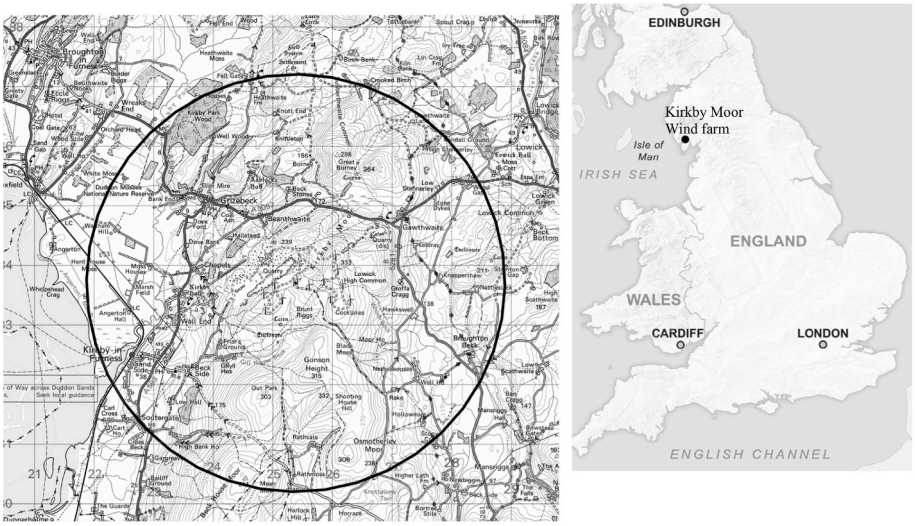

Fig. 1. The location of Kirkby Moor wind farm and the 3.5 km study area.
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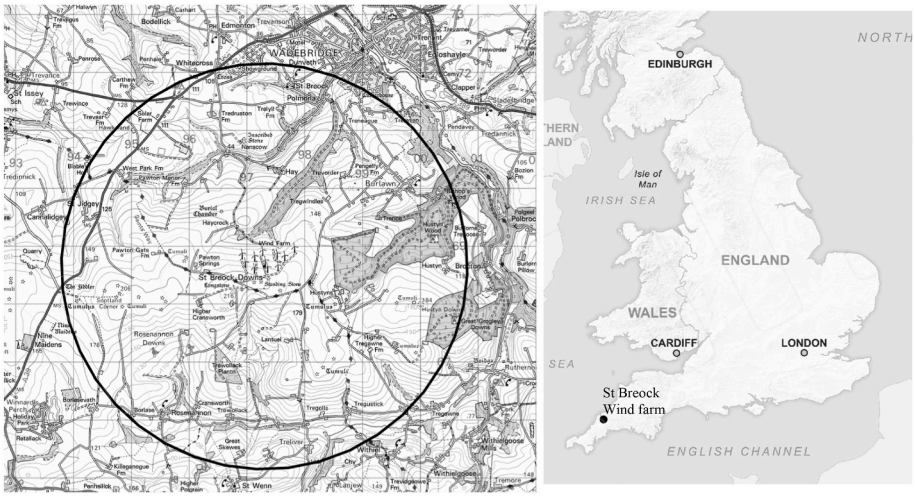

Fig. 2. The location of St Breock wind farm and the 3.5 km study area
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both the original and end-of-life planning applications. Meanwhile the case of St Breock was chosen in order to explore a less controversial site where people also had the experience of living with an operational repowered wind farm (of which there are not yet many). Both sites are introduced in detail below.

Kirkby Moor wind farm (see Fig. 1) is located just outside the Lake District National Park in England. It is situated on moorland 2 km from three villages and close to four smaller settlements. There are also some rural and farm properties within 1 km of the site. The wind farm is currently owned by a large international developer that was formed as a merger of two existing companies in 2017. A separate international company managed the site. Permission for 15 × 40.5m (tip height) two-blade turbines with an overall maximum installed capacity of 4.8 MW was granted by the Sectary of State in 1992. The reasons for approval included the need to proceed quickly with renewable energy and develop wind farms '*in different places to test their economic viability and environmental acceptability*' (Sectary of State decision March 1992). This permission contained an unusual decommissioning condition, requiring removal of the turbines but not any of the associated infrastructure such as cabling or transformer boxes. Following a minor amendment, 12 × 42.4m three-blade turbines became operational in 1993 (the change from 15 to 12 turbines reflects the change from two-blade to three-blade turbines). An application to repower the site with 6 × 115m (tip height) turbines with an overall maximum installed capacity of 12MW–18MW was submitted in December 2014 and refused by the LPA in November 2015, with a key reason for refusal being visual impact. The repowering application generated a lot of opposition with 532 objections and 141 comments of support submitted to the LPA, with key reasons for opposition including the need for removal in line with the original 25-year planning consent and the visual impact on the protected moorland. A life-extension application for 8.5 years was submitted to the LPA in August 2017 and refused in by the LPA in December 2017 with central reasons for refusal being the continued impacts on landscape and heritage. This application received 153 objections and 68 comments of support. The life-extension was then appealed by the developer, to be decided at the national level, and permission was granted in July 2019 after the completion of this research. Both end-of-life applications offered full decommissioning of the existing site (an improvement on the decommissioning condition mentioned above).

St Breock wind farm (see Fig. 2) is located close to St Breock village, one mile from Wadebridge in Cornwall, England. The site was previously owned by a large international energy company, who sold it to a large UK wind energy company in 2010. Permission for the original wind farm, comprising 11 × 53.5m (tip height) turbines, with an overall maximum installed capacity of 4.95 MW was granted at appeal in 1993 and became operational in 1994. Permission was granted in perpetuity with no requirement to decommission the turbines at the end of a fixed period. Permission was granted in 2003 to repower the site with 8 × 80m (tip height) turbines, the consent was not implemented. A 25-year consent was granted in 2012 to repower the site with 5 × 100m (tip height) turbines, with an overall maximum installed capacity of 12.5 MW. This repowering application received 72 public comments comprising 67 of support and 5 objections. The repowered site became operational in 2015.

3.2. Contextual research

Before undertaking the survey research, the sites were visited and a content review of planning files, comments submitted to planning applications and relevant local newspaper stories was undertaken in order to provide context. Interviews with the developer, planners, community groups and opposition group members also provided context for designing the survey. The planning files for both the original and end-of-life applications were analysed in NVivo to identify relevant information, particularly regarding community involvement and benefits. All public comments submitted to the end-of-life planning applications were analysed and categorised in order to understand the arguments for and against the applications. Newspaper headlines relating to the end-of-life applications were identified from an online search and were also analysed to pick out key themes. However, the focus of this paper is to present the full survey results in detail rather than to present the results of the wider project.

3.3. Survey design, administration, and analysis

The topics covered in the survey are outlined in Table 1. The survey firstly provided background information about the applications to

Table 1
Survey design.

Topic	Questions asked
Background information	- Length respondent has lived in area. - Age. - Postcode. - How frequently they see the wind farm.
Attitudes	7 statements as Likert scale questions (on a scale of 1–5 strongly agree - strongly disagree). Covering: - Opinion of wind energy in general, in the local area and the specific windfarm. - Willingness to sacrifice views of the landscape in order to increase renewable energy. - The need to address climate change. - The role of wind farms in addressing climate change. - Opinion of the wind farm.
Place attachment attitudes	7 place attachment statements as Likert scale questions (on a scale of 1–5 strongly agree - strongly disagree).
Recalled perceptions of the original windfarm	- Recalled perceptions of the original windfarm pre-construction (if residents were living in the area) on a Likert scale 1–5 (strongly supported-strongly opposed). - Question asking why they had that perception and if they submitted a comment to the planning application (open ended). - Question asking if their perceptions changed following construction (multiple choice). - Open ended question to explain why their perception changed.
Perception of current wind farm	- Perception of the operational wind farm on a Likert scale 1–5 (strongly support-strongly oppose). - Open-ended question on perceived positive and negative impacts of the wind farm.
Perception of repowering/life-extension applications	- Perceptions of the repowering/life-extension planning application, on a Likert scale 1–5 (strongly supported-strongly opposed). - Question asking why they had that perception and if they submitted a comment to the planning application (open ended).
Awareness of 25-year planning consent	- Question asking if respondents were aware of the duration of the planning consent (multiple choice).
- Preference for repowered/ original wind farm (St Breock)	- If (eligible) question asking if respondents had a preference for the repowered or original scheme, (multiple choice) and why (open ended).
- Characteristics of acceptance of wind farms	- 13 statements as Likert scale questions (on a scale of 1–5 strongly agree - strongly disagree) covering the following topics: - Community/economic/social benefits - Community-developer relationships and trust - Duration of planning consent - Community involvement in the planning process/community influence - Preference for smaller or larger turbines - The future of the wind farm

ensure that respondents understood terms such as repowering. A pilot study was undertaken to test the surveys before administering.

The surveys were administered within a 3.5 km circumference around each wind farm to broadly reflect the area of significant visual impact identified in the end-of-life planning applications. Through doing so the research aimed to target those people who were likely to see the wind farm most often and most clearly. The surveys were administered in June 2018 via one envelope hand delivered to each house addressed to 'the occupier'. The envelope contained a cover letter, a printed copy of the survey and free-post return envelope. Additionally, an online version of the survey was provided so that residents had the option to complete it online or by hand. The survey results were analysed in SPSS and presented through descriptive statistics and the use of Spearman's Rank Correlation Coefficients. The qualitative comments were analysed and have been summarised within the paper.

4. Results and discussion

The following section discusses the survey results. Due to their different experiences of end-of-life applications the cases provide an opportunity to explore and understand two very different longitudinal community experiences. Section 4.2-4.3 explores how community perceptions of both wind farms changed over their operational life and in the context of end-of-life applications. Section 4.4 then provides an exploration of the factors that influenced community responses to end-of-life applications. Table 5 at the end of section 4 provides an overview of the responses for both locations.

4.1. Overview of survey respondents

The number of surveys delivered to each site reflected the number of homes located within the 3.5 km radius of each wind farm. In Kirkby Moor 430 surveys were administered and 128 complete responses were received, reflecting a 30% response rate. Additionally, 3 almost-complete responses were included. 95% of respondents see the wind farm either every day or most days. Fig. 3 shows the age of respondents. Most (79%) were aged 50 or over. As 61% of residents in the Kirkby-in-Furness (LA17) postcode area are aged over 45,[1] the respondent population is slightly skewed towards those aged 50 plus. Fig. 4 provides an overview of how long respondents have lived in the area. Spearman's correlation tests were run to see if there was a relationship between length of residency or age of respondents and opinions of the repowering or life-extension applications, however there were no statistically significant relationships.

In St Breock 280 surveys were administered and 74 complete responses were received, reflecting a 26% response rate. Two partial responses were also included. 83% of respondents see the wind farm either every day or most days. Over half of the respondents (53%) were aged 60–79 (see Fig. 5). This is generally in line with the older demographics of St Breock.[2] However, significantly, no respondents were aged 29 or younger, perhaps due to the tendency for a head of household to reply. Fig. 6 provides an overview of how long respondents have lived in the area. Spearman's correlation tests were run to see if there was a relationship between length of residency or age of respondents and perceptions of the repowering (both before and after construction), however this produced no statistically significant relationships.

As shown in Table 2, in both locations survey responses revealed very high levels of agreement across all place attachment indicators, however these did not correlate with perceptions of the end-of-life applications.

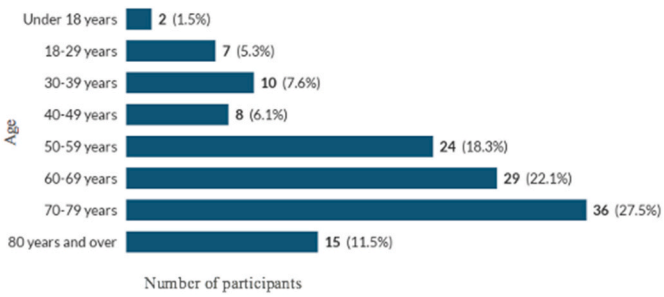

Fig. 3. Age of participants, Kirkby Moor.

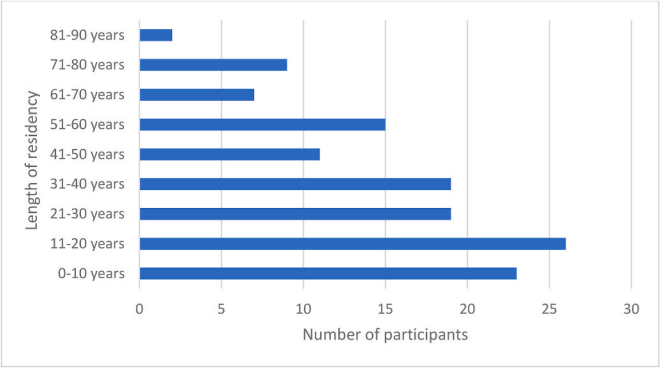

Fig. 4. Length of participant residency in area, Kirkby Moor.

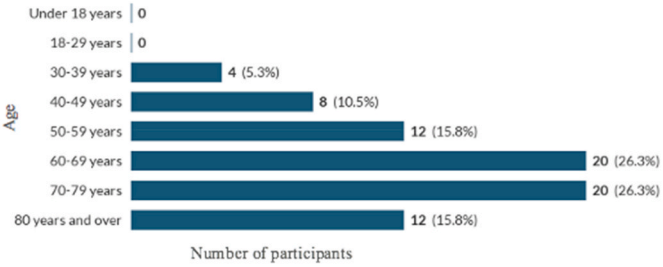

Fig. 5. Age of participants, St Breock.

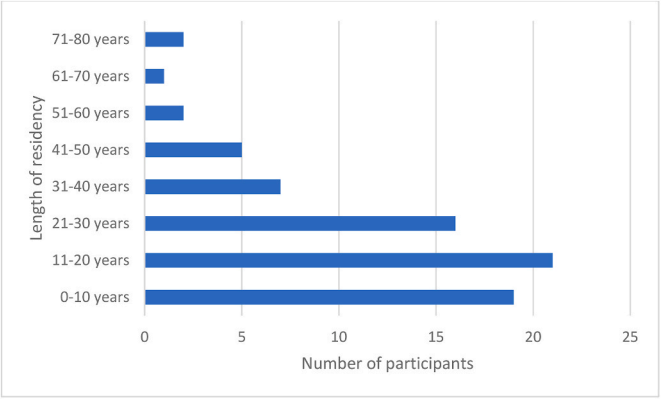

Fig. 6. Length of participant residency in area, St Breock.

[1] Based on 2011 UK Census.
[2] 2011 census, see Wadebridge Area Neighbourhood Plan - Evidence Report.

Table 2
Summary of responses to place attachment statements for Kirkby Moor (KM) and St Breock (SB).

Statement	% agree or strongly agree	% disagree or strongly disagree	% neutral
I am very attached to this place	KM: 99 SB: 96	KM: 0 SB: 0	KM: 2 SB: 4
This place plays a central role in my lifestyle	KM: 95 SB: 93	KM: 1 SB: 0	KM: 4 SB: 7
This place is special to me	KM: 95 SB: 88	KM: 0 SB: 1	KM: 5 SB: 11
One of the major reasons I live where where I do is because of the surrounding landscape	KM: 49 SB: 91	KM: 16 SB: 4	KM: 35 SB: 5
Living here says a lot about who I am	KM: 72 SB: 70	KM: 8 SB: 5	KM: 20 SB: 25
The things I do here I would not enjoy doing as much somewhere else	KM: 71 SB: 59	KM: 14 SB: 10	KM: 15 SB: 31
I do not intend to move away from this area in the future.	KM: 86 SB: 83	KM: 6 SB: 5	KM: 8 SB: 12

4.2. Change in perceptions over time and perceptions of repowering and life-extension in Kirkby Moor

All survey respondents provided their perception of the existing operational wind farm at the time of the research (2018). Half of respondents identified that they were opposed or strongly opposed to the wind farm while 31% identified that they supported or strongly supported it. Respondents were asked to note any positive or negative impacts of the wind farm. The most common identified positive impact was money provided to local causes although many people stated that they didn't know much about it, that it was a small amount, or linked it to bribery. Generation of renewable energy and provision of walking routes were also common reasons for support. The majority of negative comments mentioned visual impact with the second most common response being noise. Other negative impacts included impact on the environment, flooding and impact on tourism and house prices.

The repowering application generated significant reaction with only 9% of survey respondents identifying their position as neutral. This reflects the high numbers of comments submitted to the LPA during the planning application (532 objections, 141 support and 755 signatures on developers pre-printed support cards). Over half of respondents (58%) opposed the repowering. The most common reasons included the proposed increase in height and consequent visual landscape impact but also desired removal of the wind farm in accordance with the 25-year agreement, alongside the knowledge that the wind farm was a 'trial' to test wind energy. Other common reasons included preference for offshore wind, noise, environmental and ecological impacts, impact on designated landscapes, opposition to wind energy, presence of other wind farms in the surrounding area and lack of trust in or perceived greed of the wind farm developer. Only 21% supported the repowering, with the most common reason being support for renewables. A small number of comments identified that they had become used to the wind farm or a lack of perceived negative impacts from the existing wind farm. The range of comments reflect existing literature emphasising the multi-layered nature of public acceptance (Wilson and Dyke, 2016) but also highlight the significance of community experiences of the wind farm over time.

Similar to the repowering, over half of all survey respondents opposed the life-extension. The majority of negative comments identified that the original wind farm was for a 25-year period as a 'trial' to test wind energy and thus should be removed, reflecting one of the most common reasons for opposing repowering. Other common reasons included a lack of benefit for the local community as well as changes that had occurred over time, including other wind farm developments and preferences for offshore wind. Just over a quarter of respondents supported the life-extension. The most common reasons were different from repowering as they identified the benefit of getting maximum life from existing infrastructure and not seeing harm from the existing site. Others mentioned improved decommissioning provision and consequential benefits for the moor. These were broadly reflective of the official comments submitted during the planning application, of which there were 68 supportive comments and 153 objections. Life-extension may face less active opposition than repowering as the physical infrastructure is not changing. Together, responses to both applications reveal that where communities have not had a positive experience of living with a wind farm over time, they are not likely to support a life-extending application.

Existing literature suggests that experience of wind farms or familiarity changes local opinions of the infrastructure to become more positive over time (van der Horst, 2007; Warren et al., 2005; Wilson and Dyke, 2016). The most common model of this is the U-shaped curve of social acceptance which suggests that attitudes to wind power change from very positive when people are not confronted by a local proposal, to less positive when people experience an application in their local area, to more positive again following construction (Damborg and Krohn, 1999; Gipe, 1995; Wolsink, 2007). However, the recalled opinions undertaken after a longer period in this research did not reflect such a pattern. Of the respondents that were living in the area before the original wind farm was built (44% of all respondents, 57 in total), 19% recalled supporting the wind farm before it was built, 49% opposed and 32% neutral. The majority of respondents (66%) identified that their opinion remained the same following construction of the wind farm, 19% that their opinion became more negative and 15% more positive, suggesting that, for most, familiarity did not lead to greater acceptance. Similar to perceptions of the original wind farm, 60% of these respondents opposed and 18% supported the repowering. Fig. 7 provides an overview of these respondent's perceptions of the wind farm, pre-construction, perceptions of the operational wind farm and of the repowering application, showing an overall slight increase in negative perceptions over time and in response to repowering. These findings contrast with previous research that has been undertaken soon after a development has become operational and without the context of an end-of-life application. The results show how for many, perceptions of the infrastructure did not change over a more prolonged period, adding support to the argument of Devine-Wright (2005) that an increase in positive perceptions are context dependent and cannot be assumed to occur for every site.

4.3. Perceptions of the original and repowered wind farms in St Breock

The case of St Breock provided an opportunity to explore perceptions of the operational repowered wind farm and the original wind farm. Of the 40% of respondents who were living in the area at the time of the original planning application, 47% recalled supporting the wind farm before it was built, 20% opposing and 33% as neutral. Similarly to Kirkby Moor, the majority (77%) of those who had lived in the area before the original wind farm was built identified that their opinion remained the same following construction, 13% stated that their opinion became more positive and 10% that their opinion became more negative.

88% of respondents lived in St Breock during the repowering application. Of these, 34% were unaware of the application and 25% identified their perception as neutral. This reflects the lack of formal response (only 72 comments were submitted to the LPA) and suggests that either a lot of local residents were not especially concerned about repowering or that local people were disengaged from the planning process. Meanwhile 30% of survey respondents supported the repowering, with the most common reasons including support for renewables or wind energy, familiarity, lack of negative impacts from the existing turbines, and the decreased number of turbines. Only 11% opposed the repowering with the most cited reasons including height and visual

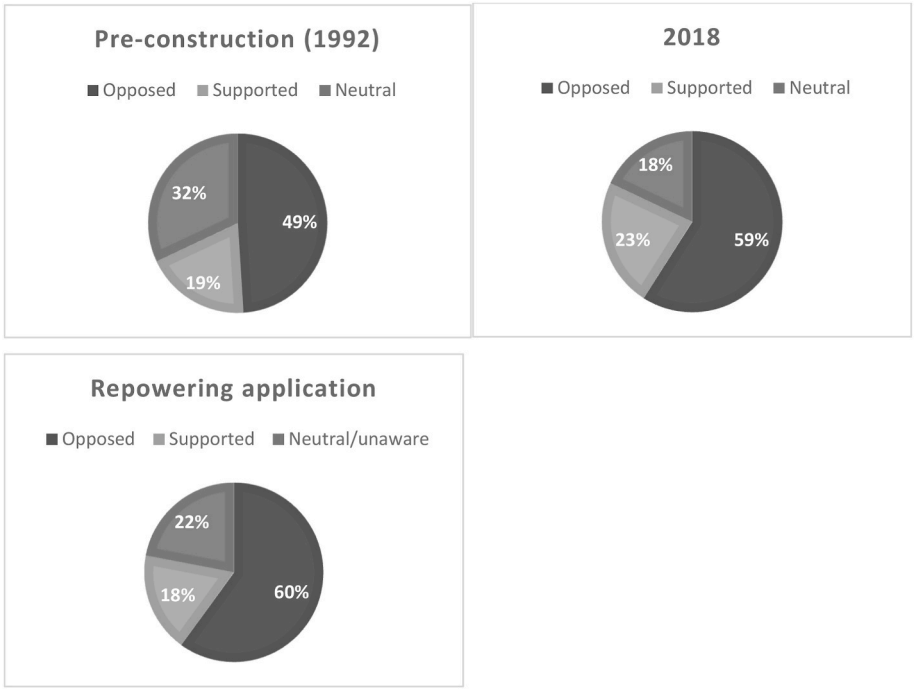

Fig. 7. Perceptions of the wind farm, of those living in the area before the Kirkby Moor wind farm was built. (Source: author).

impact. This demonstrates that where members of local communities are not experiencing negative impacts from the existing infrastructure they may be less likely to actively respond to an application to repower. The majority of respondents (78%) stated that their perception remained the same following construction of the repowered wind farm, adding strength to the argument that perceptions will not always become more favourable following construction. Of those that did change, 19% became more positive with the most common reasons including lower visual and noise impacts than the previous scheme or their expectations and 3% became more negative, identifying the height of turbines as the reason.

All respondents provided their perception of the operational (repowered) wind farm at the time of the research, 66% supported the repowered wind farm, 22% were neutral and 12% opposed. The most identified positive impact was the community fund and projects that it supported. Other common responses included benefit to the environment and climate, generation of renewable energy and lower visual impact as a result of the decreased turbine numbers. The most identified negative impacts were visual and landscape impacts. Such findings reveal the opportunities of maximising the benefits of repowering schemes including increased energy outputs, environmental enhancements and community benefits.

4.4. Factors influencing social acceptance over time and in relation to end-of-life applications

This research sought to understand if factors that have been shown in existing literature to be generally true of impacting the social acceptance of wind farms also apply when considering sites after a longer period of time and in the context of applications to repower or life-extend. While this research found that for many, perceptions did not change over the life of a scheme or in the context of an end-of-life application, there are a number of factors that were found to be positively correlated with support for both the existing sites and end-of-life applications. Such factors were also identified in the qualitative survey responses and thus provide useful insights on influences on social acceptance over a longer period of operational wind farms. The results of the Spearman's correlations tests[3] are discussed below with the detailed results presented in Tables 3 and 4. For Kirkby Moor corelation was tested with support for the existing wind farm, support for repowering and support for life-extension. In St Breock, correlation was tested with support for the operational, repowered wind farm.

Table 3
Results of Spearman's correlations Kirkby Moor.

	Support for existing wind farm	Support for repowering	Support for life-extension
'Wind farms create social benefits for the local community'	Spearman's Rho = .646** p = 0.00	Spearman's Rho = .273** p = 0.02	Spearman's Rho = .363** p = 0.00
'Wind farms create economic benefits for the local community'	Spearman's Rho = .709** p = 0.01	Spearman's Rho = .311** p = 0.01	Spearman's Rho = .374** p = 0.01
'Wind farm developers care about the opinion of local residents'	Spearman's Rho = .613** p = 0.00	Spearman's Rho = .275** p = 0.02	Spearman's Rho = .312** p = 0.00
'I trust wind farm developers'	Spearman's Rho = .691** p = 0.00	Spearman's Rho = .410** p = 0.00	Spearman's Rho = .387** p = 0.00
'Local people's opinions are given adequate consideration during the planning process for wind farms'	Spearman's Rho = .535** p = 0.00	Spearman's Rho = .314** p = 0.00	Spearman's Rho = .359** p = 0.00

** correlation is significant at the 0.01 level (2 tailed).

[3] Correlations: A positive correlation between two factors represents a positive direction of the relationship..20-0.39 = "weak".40-0.59 = "moderate".60-0.79 = "strong".

Table 4
Results of Spearman's correlations St Breock.

	Support for existing repowered wind farm
'Wind farms create social benefits for the local community'	Spearman's Rho = .578** p = 0.00
'Wind farms create economic benefits for the local community'	Spearman's Rho = . 471** p = 0.01
'Wind farm developers care about the opinion of local residents'	Spearman's Rho = .618** p = 0.00
'I trust wind farm developers'	Spearman's Rho = .661** p = 0.00
'Local people's opinions are given adequate consideration during the planning process for wind farms'	Spearman's Rho = .623** p = 0.00

**correlation is significant at the 0.01 level (2 tailed).

4.4.1. *Community benefit from the existing wind farm*

The benefits that communities receive from wind farms has been found in existing research to impact levels of acceptance (Baxter et al., 2013; Frantál, 2015; Suškevičs et al., 2019). This research revealed that community benefits also appear to positively influence perceptions of wind farms over a longer time period, and can influence responses to end-of-life applications. In Kirkby Moor, Spearman's correlations revealed strong positive correlations between support for the existing wind farm and both the statements 'wind farms create social benefits for the local community' and 'wind farms create economic benefits for the local community'. There were also weak positive correlations between the statements on perceived social and economic benefits of wind farms and support for the repowering and life-extension applications (see Table 3). In St Breock, the Spearman's correlations revealed moderate positive correlations between support for the operational repowered wind farm and the statements on perceived social and economic benefits of wind farms (see Table 4).

Qualitative responses revealed the importance of communities being able to recognise the benefits that the wind farm has provided over its life, for example in being able to identify and value the projects that the community fund has supported, in order to increase support for both the existing site and continuation of a site as a wind farm through repowering or life-extension. An important consideration here is if the community benefit funds have led to widely recognisable changes that have clearly benefited the local community, or if they have been considered as a bribe. Those considering the benefit fund to be a bribe raised questions regarding how the money had been advertised and spent, particularly highlighting a lack of knowledge of how the money had been allocated, this is despite the community benefit fund in both locations being distributed through a community organisation. This longer-term experience reflects literature identifying the potential challenges associated with the distribution of community benefit payments (Aitken, 2010b; Brannstrom et al., 2011; Cass et al., 2010; Cowell et al., 2011).

4.4.2. *Relationships and trust between communities and developers*

Community-developer relationships and developer transparency have been found to positively impact attitudes to new or proposed wind farms (Firestone et al., 2018; Toke, 2003; Wüstenhagen et al., 2007). Trust between the developer and communities has also been identified as important for community acceptance in existing literature (Aitken, 2010c; Friedl and Reichl, 2016; Ricci et al., 2010; Walker et al., 2010; Wolsink, 2007). This research shows that it is also important for end-of-life applications. Public comments (submitted to the planning applications and in the survey) identified poor relations with the developer in Kirkby Moor, including perceived greed and a lack of trust in the developer, as a contributing reason for opposition to the end-of-life applications. Such attitudes were reflected in perceptions of the interests of wind farm developers. Only 11% of respondents agreed with the statement 'wind farm developers care about the opinion of local residents,' while 62% disagreed. Results of a Spearman's correlation indicated that there was a strong positive correlation between the statement and support for the existing wind farm and weak correlation with support for the repowering and life-extension applications (see Table 3). Similarly, only 11% of respondents agreed with the statement 'I trust wind farm developers' with 61% disagreeing and there was a strong positive correlation between the statement and support for the existing wind farm. This suggests that developers establishing an ongoing relationship and trust with the community over time is a path to creating stronger long-term support for the wind farm and for life-extending applications.

In St Breock, 18% agreed with the statement 'wind farm developers care about the opinion of local residents' 38% disagreed and 43% were neutral. Similarly, 13% agreed with the statement 'I trust wind farm developers, 39% disagreed' and 47% were neutral. For both statements there was a strong positive correlation between the statement and support for the repowered wind farm (see Table 4). Thus, while this site experienced higher levels of support, the levels of trust in developers was low, reinforcing the challenges, and also the importance, of developers engaging and building trust with the community. It is also important to consider here that it is not possible to confirm if those selecting neutral are truly neutral or are undecided (Hodge and Gillespie, 2007). Overall, findings from both sites emphasise the value of developers maintaining a relationship with the community over the operational life of the wind farm and on seeking early engagement to input views into end-of-life decision making.

4.4.3. *Visual impact and height change*

Visual impacts have been identified as one of the most important factors influencing perceptions of wind farms (Johansson and Laike, 2007; Pasqualetti, 2000; Wolsink, 2000, 2007). This research revealed that this is also true of end-of-life applications. In both cases visual impacts formed a central reason for opposition. As repowering usually involves turbines of an increased height (Windemer, 2019), the survey sought to understand how respondents considered such a change. There is an industry expectation that people will prefer a smaller number of larger turbines (Sustainable Energy Ireland, 2003) and the findings in St Breock reflect this. 56% of respondents stated a preference for a smaller number of larger turbines, with only 12% disagreeing with the statement 'a smaller number of larger turbines is better than a larger number of smaller turbines. Of those who had seen both sites, 42% preferred the repowered site despite the 87% turbine height increase, with the most common reasons including the decrease in number of turbines and lower visual or landscape impacts. Only 8% preferred the original wind farm due to the visual impact on their property. However, it is worth noting that for half of respondents the visual change did not make a difference.

Meanwhile, the case of Kirkby Moor demonstrates how communities will not always consider a smaller number of larger turbines as an improvement and may even consider it worse, particularly when repowering involves a significant increase in turbine height. In this case only 14% agreed with the statement 'a smaller number of larger turbines is better than a larger number of smaller turbines.' Qualitative responses reflected the findings of research in Denmark demonstrating how opinions may become more negative as a result of increases in the size and number of developments (Möller, 2010). Notably, only 37% agreed

with the statement 'I would support repowering at Kirkby Moor if the turbines remained the same height', reflecting that while in this particular case the increased size of the turbines contributed to opposition to repowering, there were several contributing factors beyond that. It has been suggested that wind farm sites located further away from designated landscapes such as National Parks are often considered more acceptable (Harper et al., 2019). This research has found that such valued landscapes may also influence perceptions of repowering, with qualitative comments noting the impact on the designated moorland next to the site. Many responses also noted the cumulative impacts of the development of other (offshore and onshore) wind farms in the area, which was not the case in St Breock. This reflects existing literature highlighting public concerns regarding the cumulative impact of increasing numbers of small-scale wind farm developments in an area (Scott et al., 2014). Thus when considering end-of-life applications there is a need to consider more than just the site itself as perceptions may be influenced by changes that have occurred in the surrounding area. What this research reveals is that perceptions of the suitability of turbine height on a landscape is context-dependent and there is thus a need for policymakers and developers to consider this.

4.4.4. Involvement in the planning process

Existing research highlights the importance of community participation and influence in the planning process for wind farms (e.g. Barry et al., 2008; Mills et al., 2019; Strachan and Lal, 2004; Wolsink, 2007). It has been suggested that for planning to be seen as legitimate there needs to be clear and open communication, participation and engagement with communities (Gross, 2007; Hall et al., 2013; Zoellner et al., 2008). This research revealed that this is also important for end-of-life applications. In Kirkby Moor only 26% of respondents agreed with the statement 'local people's opinions are given adequate consideration during the planning process for wind farms' while 54% disagreed. There was moderate correlation between this statement and support for the operational wind farm (see Table 3). Meanwhile, despite the lack of formal opposition to the repowering application, in St Breock only 15% agreed with the statement 'local people's opinions are given adequate consideration during the planning process for wind farms' 48% were neutral and 37% disagreed. There was strong positive correlation between this statement and support for the operational, repowered wind farm (see Table 4). The results from both surveys suggest that opportunities for community participation in the planning process for end-of-life applications require greater consideration in order to increase potential support.

4.4.5. Awareness of the duration of planning consent

Awareness of the temporal regulation of schemes can be seen as context-dependent and particularly influenced by opposition. Duration formed a central component of opposition in Kirkby Moor where the handling of, and opposition to, the original scheme can be seen to have left behind important legacies that impacted end-of-life applications. There was a high level of awareness (70% of all participants) of the 25-year consent and many comments reflected desired removal in accordance with this planning condition. Such awareness is likely to be reflective of the high level of publicity of the repowering and life-extension schemes in local press, the planning consultations and by local opposition groups and did not correlate with age or length of residency. This case reveals that where the public consider infrastructure as temporary, the positive trade-offs used to help justify the repowering are not necessarily enough to change perceptions, particularly if many do not feel that they have benefitted from the existing scheme.

Comparatively, in St Breock the original consent was granted in perpetuity, but the repowering was granted for 25 years. Only 17% of participants were aware of the 25-year consent duration for the repowering. This is reflective of the low levels of involvement, awareness or opposition to the repowering application. Of those who were aware, reasons included attending the local presentation and reading planning documents. Thus, in a case with little controversy there may be limited knowledge of the duration of consent and it may have little impact on levels of acceptance over time or responses to end-of-life applications.

Table 5
Summary of results.

Survey topic	Kirkby Moor (KM)	St Breock (SB)
Opinion of operational wind farm at time of research	Original wind farm operational 31% supported. 50% opposed. 19% neutral.	Repowered wind farm operational 66% supported. 12% opposed. 22% neutral.
Recalled perceptions pre-construction	Original wind farm: 44% of respondents living in area. 19% supported, 49% opposed, 32% neutral. 66% identified that their opinion remained the same following construction, 15% became more positive, 19% more negative.	Original wind farm: 40% of respondents living in the area. 47% supported, 20% opposed, 33% neutral. 77% identified that their opinion remained the same following construction, 13% became more positive, 10% more negative. Repowered wind farm: 88% of respondents living in the area. 30% supported,11% opposed,25% neutral. 34% unaware. 78% of respondents opinion remained the same following construction, 19% became more positive and 3% more negative.
Response to repowering (and life-extension in KM)	Repowering: 58% opposed. 21% supported. 9% neutral. 12% unaware of application. Life extension: 53% opposed. 26% supported. 10% neutral. 11% unaware of application.	Repowering: 11% opposed. 30% supported. 25% neutral. 34% unaware of application.
Perception of community benefit	Strong positive correlation between perceived economic and social benefits of wind farms and support for the existing wind farm and weak positive correlations with support for the repowering and life-extension applications.	Moderate positive correlation between perceived economic and social benefits of wind farms and support for the repowered wind farm.
Relationship/trust with developer	62% of respondents disagreed with the statement 'wind farm developers care about the opinion of local residents'.	38% of respondents disagreed with the statement 'wind farm developers care about the opinion of local residents'.
Perception of height change	54% disagreed with the statement 'a smaller number of larger turbines is better than a larger number of smaller turbines.	12% disagreed with the statement 'a smaller number of larger turbines is better than a larger number of smaller turbines.
Involvement in the planning process	54% disagreed with the statement 'Local people's opinions are given adequate consideration during the planning process for wind farms'.	37% disagreed with the statement 'Local people's opinions are given adequate consideration during the planning process for wind farms'.
Awareness of duration of planning consent	High level of awareness of 25 year consent (70% of participants).	Low level of awareness of 25 year repowering consent (17% of participants).

5. Conclusion and policy implications

This paper provides the first consideration of how local social acceptance may change over the operational life of wind farms and in the context of applications to repower or life-extend. In doing so it adds a temporal dimension to the existing understandings of the dynamics of social acceptance of wind energy. Through undertaking surveys in two very different contexts, one with high opposition and another less-controversial site, it was possible to gain an understanding of the different factors that may influence responses to end-of-life applications. Such an understanding is important in considering how to improve the experiences of those living with existing wind farms and also in shaping policy for the future of these sites. Such policy development is becoming increasingly important as, globally, wind farms start to reach the end of their operational or consent life.

Exploring the perceptions of those living in Kirkby Moor revealed that for many participants who lived in the area at the time of the original planning application, perceptions of the infrastructure did not change following construction of the wind farm, over the life of the scheme, or in the context of an application to repower. The findings thus suggest that a U-shape curve response of public attitudes (see Wolsink, 2007) may not occur over this longer period. While these results are based on recalled opinions over a long time period, the recalled change in perceptions following construction of the repowered scheme in St Breock shows a lack of perception change with only six years passed since construction. The findings thus contrast with existing expectations that familiarity will lead to greater levels of acceptance (e.g. Warren et al., 2005).

The two cases reveal how public support for the continuation of sites through end-of-life applications is influenced by experiences over time and the site context e.g. cumulative impacts or land designations. As St Breock demonstrates, in cases where people have positive experiences over time, fewer people may be aware of, or have an opinion of, an application to repower and thus will be less inclined to respond or actively oppose. Meanwhile, Kirkby Moor demonstrates how in projects that had a contested birth, oppositional attitudes may alter little over time and end-of-life applications may provide an opportunity for opposition to resurface. It also reinforces how controversies and statements made during an original application may resurface during an end-of-life application. Kirkby Moor also reveals the challenges regarding land designations and cumulative impacts from other wind farms. The results thus demonstrate that public support for the industry's repowering-equals-net-gain hypothesis is greatly mediated by the site context.

There are necessary considerations here for policymakers and developers, that it may not be possible for all sites to repower as some communities are anticipating removal at the end of the original consent period and not all communities will have had positive experiences of their local wind farm. The question remains as to how much influence such communities will have during end-of-life applications and there is potential for more developed policy and guidance to help facilitate this. There are also policy considerations needed for alternatives to repowering. Life-extension may provide a useful approach in some locations as a way of getting the most out of the existing infrastructure, without making any changes other than repairs on a like-for-like basis. Another alternative that could enable an increase in generation, while minimising change in visual or other impacts, would be partial repowering where the turbines themselves are not removed but parts of the infrastructure, such as the blades, are replaced with newer technology.

The research also revealed that relationships between practices and public attitudes identified more widely in wind farm research, particularly the benefits that people experience from wind farms, their relationships with the developer, and their perception of the planning process can also influence applications for repowering and life-extension. There is thus a temporal dividend to developers building ongoing relations with communities. The findings emphasise the need for meaningful engagement with communities from the start and throughout the operational life of a wind farm rather than only during the time surrounding planning applications in order to build trust, ensure that communities are benefitting over the life of a scheme (e.g. that they are aware of community benefit funds), and to provide opportunities to address concerns.

While this paper has made an important contribution through adopting a broader temporal approach to social acceptance and highlighting the factors that may influence responses to end-of-life applications, there is a clear need for future studies to build upon this research. This study has only explored two sites, both in England and there is thus a need to investigate experiences of different sites, particularly in different countries with different policy contexts or wind farm ownership arrangements. A significant limitation of this paper is that it was based on recalled opinions over a long time period, as such it relied on participants being able to remember how they were feeling a long time ago, which could now be impacted by their current opinions. It is suggested that future research aims to overcome this limitation through involving longitudinal studies (as suggested by Wüstenhagen et al., 2007) undertaken over the life of a scheme, or alternatively returns to sites that have been studied previously to see if attitudes have changed over time. A further limitation of this study that it solely focuses on the results of the community surveys rather than providing a broader consideration of how the wind farm sites have changed over time. Future studies could overcome such limitations through including indicator-based research such as exploring the distribution of economic impacts from the wind farm over time or through exploring written and social media content about sites over time. While this study explored two very different cases, there is a need for research to see if the same patterns occur for other sites with different characteristics. This paper thus proposes a new research agenda, exploring how end-of-life decisions are made, if local community interests are being reflected in decision making and with what consequences. As an increasing number of wind farms approach the end-of-life stage such research will be increasingly important.

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CRediT authorship contribution statement

Rebecca Windemer: Conceptualization, Data curation, Formal analysis, interpretation of results, manuscript preparation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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