



Repower to the people: The scope for repowering to increase the scale of community shareholding in commercial onshore wind assets in Great Britain

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ABSTRACT

Internationally, commercial onshore wind farms are starting to reach the end of their operational or consent life, posing a new and mounting challenge with potentially dramatic permutations for the sector. Replacing existing turbines with new infrastructure through repowering has the potential to significantly increase the installed capacity of existing onshore wind sites without also increasing the footprint of development. However, local community opinions will form an important aspect of such end-of-life decision making. Traditionally, community benefit funds have been used to provide financial payments to host communities, but this is not always what is sought by a local community. The repowering of wind sites presents a distinct moment to reconsider and renegotiate how a local community benefits from hosting wind infrastructure. Herein lies an opportunity for the community to partner with commercial developers to obtain shared ownership of repowering projects, potentially through the support of existing community energy organisations. This paper draws upon semi-structured interviews with commercial developers, community energy practitioners and intermediary bodies in Great Britain to critically evaluate, for the first time, the scope for repowering to increase the scale of community shareholding in commercial onshore wind assets. The findings reveal support for shared ownership in principle with various rationales for this support, but many challenges are identified in practice. Recommendations are provided regarding how planning systems and government policy could evolve to facilitate shared ownership during repowering.

1. Introduction

Globally, onshore wind farms are starting to reach the end of their operational or consent life, creating the need to make decisions about their future. In Great Britain, most wind farms were granted 25-year planning consents, with a requirement of removal at the end of the set time period [1]. Elsewhere, wind farms are starting to reach the end of their operational life of approximately 20–25 years [2]. When sites reach end-of-life they have three main options. The first is to decommission, removing the infrastructure and returning the land to the previous condition. The second is life-extension, increasing the duration of the existing planning consent of a wind farm without changing its physical features (and thus without increasing the amount of energy produced). The third option is repowering, involving a new planning application to replace existing turbines with more efficient, often larger

(and often fewer) new turbines to increase generation capacity. A 2019 study in Great Britain identified that repowering had on average increased energy output of sites by 155 % while the number of turbines had decreased by 39 % and turbines had become 90 % taller [1]. Technology has changed significantly over time and as a result wind turbines have become larger and have increased in energy generation capacity. As well as changes in technology, the locations close to wind farms may also have changed over time either due to new development occurring close to the site or due to changes in the composition of the local community. The end-of-life point for onshore wind farms thus presents new challenges and opportunities for the planning system, wind developers and local communities. However, to date there has been an absence of research exploring the potential for new forms of community benefit during repowering.

Repowering provides an opportunity to significantly increase energy

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generation from existing sites, making an important contribution to energy decarbonisation targets, but it also involves continued impacts for local communities. There are thus potential challenges surrounding issues of energy justice and concerns for intragenerational fairness for communities that are impacted by the infrastructure, particularly in cases where repowering will lead to wind infrastructure and associated impacts remaining in place for far longer than initially thought. As repowering involves a new planning application it presents an opportunity for community involvement. There is a potential that local community acceptance will form a challenge for the repowering of some onshore wind projects, as early research has shown that some communities may oppose repowering applications [1]. Therefore, it is important to understand how existing wind farm sites can continue in harmony with the local community.

While community benefit funds (providing a payment to communities) have traditionally been used to ensure that communities benefit from nearby wind energy developments, they have not always been valued by communities [3,4]. Meanwhile, in recent years there has been an increasing recognition of the potential role of community-owned energy projects in increasing the speed of the transition to renewables [5,6] including a recognition of the range of benefits that they can create such as local economic benefits, education and acceptance, local participation in the energy system, community building and innovation [7]. Repowering provides an important opportunity to reconsider facility-community relations, including the scale and delivery mechanism for any benefit streams. Rather than the continued use of community benefit funds, repowering provides the potential to facilitate community buy-in to commercial projects, widely known as community co-ownership or shared ownership, wherein a project is partly owned by a community with the other (usually majority) portion of ownership rights conferred to a private or public body who often leads the development [8]. Such an opportunity has the potential to provide a new form of benefit for local communities and also provide an alternative solution to address the challenges faced by community energy groups that have struggled to fully own wind energy generation assets.

Considering how repowering can lead to enhanced community benefits is also important in ensuring that repowering projects remain in line with new projects. Since the early days of wind farms, the previous norm of relatively small benefit funds has been replaced by proportionately larger funds [8] and, internationally, there has been a move towards encouraging shared ownership of wind energy projects [9]. There is thus a need to consider how repowering can offer the other forms of community benefit that are now being offered at new sites.

In response, this paper provides the first academic investigation of the scope for repowering to increase the scale of community shareholding in commercial onshore wind assets. It draws upon perspectives on the role of participation [9–11] to explore developer and community motivations for considering shared ownership of existing wind farms. It considers end-of-life as an opportunity to re-evaluate considerations of community benefits and energy justice. As a second contribution, this paper provides a first of its kind investigation into developer and community actor preferences regarding the shared ownership model. This research focused on developers and community energy practitioners in England, Scotland, and Wales as Great Britain is one of the first countries to face end-of-life issues related to onshore wind on a significant scale [12]. However, the research findings have implications on an international level.

Specifically, this research answers the following questions:

1. Are developers and community energy stakeholders interested in community co-ownership arrangements implemented at the moment of repowering? For each actor:
 - a) What factors motivate interest or disinterest?
 - b) What model of community co-ownership is preferred?

2. What are the key challenges to embedding community co-ownership in a repowering project, and how can they be overcome?

The next section provides a review of existing research relevant to this topic. Section 3 provides an overview of the research methods. Section 4 then presents and discusses the research findings including the policy context, levels of support for shared ownership, rationales for support, the challenges of shared ownership, preferences for shared ownership models, policy preferences, and consideration of whether it is easier to embed community shareholding during repowering or at a new site. A conclusion is then provided with recommendations for policy and future research.

2. Community benefits, co-ownership and the end-of-life point

2.1. Community benefits of onshore wind

Developers often actively intervene in the relationship between project and people through the provision of financial ‘community benefits’ attached to wind farm projects. The ‘community’ in receipt of these benefits does not have a universal definition [13], but the primary aim of this intervention is usually to foster community acceptance and perceptions of distributional justice related to the development in order to attain a ‘social license to operate’ [14]. As such, the community which receives benefits usually includes those living closest to the development and anyone living within a defined theoretical zone of visibility, as they are often considered by developers to be most affected by the direct impacts of the wind farm [3,14]. Hence, some refer to community benefits as ‘compensation schemes,’ because they are used by developers to redress “perceived imbalances between adverse impacts and benefits related to renewable energy projects” (i.e., to redress distributional injustice) [15,p2].

In the context of commercial wind farm development in Great Britain, community benefits provision began in the 1990s and has evolved into a norm, with such packages now expected for communities hosting wind infrastructure – but they are not mandatory [8,16]. The value of community benefit funds has also increased over time as wind farms have become bigger [8,17]. This circumstance is also reflected beyond the UK [16]. Consequently, it is expected that the ‘social license to operate’ [14] i.e. what needs to be done to gain the approval of the local community, may have shifted over time as the benefits provided at existing projects shape expectations for new projects [18]. Community benefits come in various forms and are separate from the standard benefits associated with a project, such as local employment, tourism, and improved road and grid infrastructure [15]. Most commonly, they comprise fixed annual financial payments from the developer to the community near a wind site via a community fund [8], but they can also include direct investment in the local economy, supply of electricity locally and reduced electricity tariffs [19]. Alternatively, and less commonly, the developer may offer the community an opportunity to invest in the project and claim a share of revenue and/or equity through shared ownership [8]. This is a different form of community benefit as the community has an ownership stake in the wind farm rather than receiving a set payment.

Empirical support from both qualitative and quantitative studies has been found for the hypothesis that community benefits, including community shared ownership, increase community acceptance of onshore wind assets in Great Britain and elsewhere [15,20–24]. However, community benefits provision may not always lead to increased local support [20]. The mode of community benefits, how any financial payment is made, the amount offered, how the developer defines the community in receipt of benefits, if the community was consulted by the developer, timing, and perceived reasons for the provision of benefits can all influence a community's perception of community benefits [20,25,26]. If the community perceives procedural or distributional injustice, or a considers a community benefit fund as bribery, then this

can generate opposition to a proposed wind farm [27].

2.2. Community co-ownership

Shared ownership (also referred to as co-ownership or joint ownership) of renewable energy involving a commercial developer and a local community remains relatively rare in Great Britain [28]. This is not surprising given the highly-centralised energy system and marginal contribution of community renewables to energy generation [8]. Existing qualitative and quantitative studies on shared ownership have assessed rationales for engaging in shared ownership [8,9]; profiled the different shared ownership financial models [9,29,30]; and estimated the potential for co-ownership to increase the scale of community renewables [31,32]. Of particular relevance to this paper is the work of Goedkoop and Devine-Wright [9] who conducted one of the most comprehensive academic studies of the perspectives of developers and community energy groups regarding shared ownership of renewable energy projects through qualitative interviews. They identified that trust and community perception of the developer's motives shape outcomes. They also applied the work of Stirling [33] to consider community and developer rationales for engaging in shared ownership, using the categorisation of normative (it being the right thing to do), substantive (a way of achieving improved outcomes for all) and instrumental (a way to achieve a particular aim). They concluded that, at the time of the research in 2015, shared ownership was most likely to occur with developers that expressed a normative rationale and with communities that were willing to accept what developers offer. Providing another useful consideration of engagement in shared ownership, Johansen and Emborg [34] undertook survey research to explore local perceptions of the Danish wind farm co-ownership scheme (a scheme requiring new wind farms to be at least 20 % community owned). From almost 2000 responses they found that demographic factors, including age, gender and income, influenced the appeal of co-ownership and that the majority of potential investors already supported the proposed wind farms.

Existing research has revealed that shared ownership offers benefits to both the commercial developer and a community [9]. Often, the developer will have majority share and control of the project [8]. They benefit from a source of investment which may increase community acceptance of the development and in turn pave the way for a smoother journey through the planning system [8,23]. Meanwhile, communities may benefit from the vast resources, skills, and experience of a large commercial developer, who can hedge a great amount of risk [8]. The potential benefits for a community in partnering with a commercial developer can also be measured in relation to the difficulties involved with the community fully owned business model. Fully community-owned projects rely on effective community-friendly subsidies, as well as volunteers with the passion, skills and expertise for community energy which cannot be expected to exist evenly across society [21,35]. This, coupled with planning systems which are often disproportionately demanding for communities to navigate alongside market-based financial support systems which are more suited to large energy companies, makes community-owned projects challenging to bring to fruition [8]. With that context, shared ownership has been identified as a mechanism to achieve scale in the community energy sector, especially in a subsidy-free environment [36]. However, there are transaction costs associated with shared ownership. For example, the extra administrative effort from the developer to partner with a community which may lack skills and expertise [15]. Co-ownership also makes community energy dependent on large companies and reinforces the existing socio-technical regime which has produced a highly centralised energy system and works against the founding principles of community owned energy to an extent [8,37].

Existing literature details three common financial models for shared ownership: joint venture (JV), shared revenue (SR), and split ownership (SO) [38]. The most common of these is the SR model wherein the community buys a right to receive a certain proportion of the overall

revenue from the renewable energy development. Specifically, the commercial developer owns, develops, and operates the project, while a community receives a share of the project's revenue without having an equity stake [9]. In such arrangements, the community has no voting power. Secondly, the SO model involves splitting a project into portions, with each portion separately owned by a commercial or community entity [30]. The community has a say in decision-making and is responsible for the costs and revenue associated with its portion of the wind farm. Lastly, the JV model involves a commercial developer and community jointly setting up and part owning a separate company which owns the wind farm [38]. The split is not usually 50/50, with the community often taking a minority stake.

2.3. The end-of-life point

Existing considerations of community benefits and co-ownership have focused on new onshore wind projects. Meanwhile, the focus of academic literature on onshore wind end-of-life has involved feasibility analyses of the different end-of-life options alongside limited consideration of the long-term legacy effects of ageing infrastructure [39]. Much literature on repowering and life-extension has focused on technical and economic considerations [12,40–43], studies seeking to understand the motivations of developers at the end-of-life point [12,44], the extent of government regulation of end-of-life decision-making [1,39], and policy instruments to support repowering [45].

Of particular relevance to this paper, Frantál [46] conducted survey research in the Czech Republic to explore how local governments and residents considered existing wind projects and their attitudes towards potential future repowering. The findings identified two key factors influencing future repowering projects: correct landscape siting and a diversified economic profit for the local community. Such an insight raises the significance of exploring the potential for a local community to profit through shared ownership during repowering.

If communities have higher demands due to lived experience, as Frantál [46] hypothesised, then offering an ownership stake to a local community may provide an alternative way of ensuring that communities can benefit. This research thus aims to contribute towards bridging the gap in knowledge on the relationship between end-of-life options and the local community.

3. Methods

To understand the scope for repowering to increase the scale of community co-ownership of onshore wind assets, it is appropriate to elicit the perspectives of those who own, develop, and operate commercial renewable energy as well as potential community partners. Given that navigating the end-of-life point and relations with a local community are also complex processes, this research adopted a qualitative approach involving in-depth semi-structured interviews. An analysis of policy and grey literature was undertaken ahead of the interviews to provide a detailed overview of current Great Britain (GB) policy and industry considerations of this topic. The policy documents included all relevant national planning and energy policy documents, searching for policy related to repowering, life-extension, shared ownership or community benefits for onshore wind. Relevant grey literature was identified through an online search for variations of the phrase 'wind farm repowering' and 'community shared ownership of wind farms' focusing on the GB context. This involved 26 documents in total.

In-depth semi-structured interviews were undertaken with 23 participants representing commercial developers, community energy organisations, and intermediary bodies across England, Wales and Scotland. The 23 participants represented 6 large commercial renewable energy developers and 14 community energy organisations. The developers represented some of Great Britain's largest onshore wind generators, all had used community benefit funds at their existing sites, and

one had experience of community co-ownership. The community energy organisations included community benefit societies, community trusts, and cooperatives, which either owned and/or received financial benefits from a wind farm, as well as third sector intermediary bodies set up to represent and support community renewables. Most of the community organisation interviewees were invested in community energy projects (most being onshore wind) and one community group interviewee had experience of shared ownership involving another community group and a developer. Community energy organisations were chosen as interviewees rather than the general public as they provide an established group that could facilitate community co-ownership of a project. Of the 14 community energy organisations, 7 were based in Scotland, 2 in England, and 7 in Wales, while the commercial developers had onshore wind projects throughout Great Britain and internationally.

A generic purposive sampling strategy was employed to ensure that participants had relevant knowledge, authority, and stake in the research problem, and to ensure that the sample represented onshore wind stakeholders in England, Scotland, and Wales [47]. To help with stakeholder mapping, UK government and RenewableUK databases of onshore wind projects approaching end-of-life were consulted to identify specific projects and related information such as names of developers. Existing literature, LinkedIn, and web-based searches were also used to identify potential participants. Thereafter, snowball sampling was employed.

Interviews were undertaken in August–September 2021, during which time governments encouraged working from home in the context of the Covid-19 pandemic. As such, all interviews were conducted online using the video call software of the participant's preference, such as Zoom or Microsoft Teams. All participants enabled video during the interview and all interviews were audio and video recorded with the consent of participants to enable the interviewer to fully engage. All interviews, except for two, were conducted one-to-one, while the other two included two interviewees from the same organisation.

The aim of the interviews was to understand how repowering and shared ownership are interpreted by developers and community energy stakeholders, as well as to elicit perspectives on the scope for community co-ownership to be facilitated on a commercial onshore wind repowering project. As only a very small number of sites have been repowered, the discussions around embedding community co-ownership were hypothetical, but based on considerations of developers' current operational sites. There will be a large number of sites reaching the repowering stage in the next 5 years so developers are currently thinking about repowering but most are not yet at the stage of implementing repowering projects [1]. There is value in undertaking the research at this stage, before repowering has started, in order to understand what the opportunities and barriers may be. As per the semi-structured nature of interviews, each interview was tailored to the interviewee but also guided by a set of open-ended questions. There was a separate interview guide for commercial developers and community energy stakeholders, with overlap between the two where relevant to ensure consistency and to aid later analysis and comparison.

All interviews were transcribed with the consent of participants using Otter.ai software. The data was then coded thematically using NVivo software. The final codebook is organised into 9 themes and 23 sub-themes (as outlined in Table 1 below). The table outlines how these themes have translated into the following chapter of this paper. Some themes are discussed together below in order to create a more detailed narrative and to enable a consideration of rationales for participation. Quotes are used to provide a representation of what respondents said.

4. Results and discussion

The following section firstly outlines the policy context for community shared ownership of onshore wind farms in order to understand the circumstances in which current considerations are situated, including any rules or norms that may be in circulation. The level of support for

Table 1
Coding themes.

Theme	Sub-themes	Section of results & discussion chapter
1. Interest in shared ownership during repowering		4.2
2. Developer Interests and motivations	2.1 Developer focused on financial gain. 2.2 Developer interest in co-ownership with community. 2.3 Developer motivation for co-ownership with community.	4.2 and 4.3
3. Significance of end-of-life to local communities	3.1 Repowering opportunity for 100 % community ownership. 3.2 Repowering opportunity to increase co-ownership.	4.2 and 3.
4. Shared ownership incentives	4.1 Benefits of shared ownership for communities. 4.2 Shared ownership improves public acceptance of wind project.	4.3
5. Developer-community relations at end-of-life	5.1 Communities could initiate shared ownership. 5.2 Developer's approach to community ownership. 5.3 Public acceptance not guaranteed.	4.4
6. Shared ownership barriers and challenges	6.1 Administrative burden. 6.2 Defining 'community'. 6.3 Existing shareholders. 6.4 Lack of experience of community co-ownership. 6.5 Local communities capacity and interest. 6.6 Securing finance.	4.4
7. Preference for shared ownership model		4.5
8. Facilitating community co-ownership during repowering	8.1 Carrots vs Sticks. 8.2 Government policy. 8.3 Role of communities. 8.4 Role of developers. 8.5 Role of intermediary bodies.	4.6 (also throughout chapter)
9. Timing of shared ownership	9.1 Repowering vs new site. 9.2 Stage of project development.	4.6

shared ownership is then discussed, before a discussion of developer and community rationales for supporting shared ownership during repowering. The challenges of shared ownership are considered and the preferred model of shared ownership and preferred policy model are presented.

4.1. Policy context

Government policy or guidance was identified as a potential driver to facilitating community co-ownership during repowering. In England, policy is set by the UK government who published their first Community Energy Strategy in 2014. At the time, they believed that from 2015 it would be the norm for communities to receive offers of investment in commercial projects [48]. This was reiterated a year later in the government's response to the Shared Ownership Taskforce [49]. In this document, they stated an expectation that shared ownership would be offered to a community on renewable energy projects which are "i) taken forward by a commercial project developer, ii) exceed £2.5 million in project costs, and iii) are for the primary purpose of exporting energy into a public network" [49, p12]. Since 2015 there has been no further progress on this. While this paper does not explore the reasons for the lack of policy progress, it is worth noting that in 2015 the government introduced a restrictive planning policy for onshore wind farms in

England and removed financial subsidies [50]. Meanwhile, the Scottish Government outlined a target in 2017 [51] for at least 50 % of new renewable energy projects to have an element of shared ownership by 2020. Shared ownership is defined by the Scottish Government as “any structure which involves a community group as a financial partner over the lifetime of a renewable energy project” [38,p4]. Their definition of a community group centres on “people who are bound together because of where they reside, work, visit or otherwise spend a continuous portion of their time” [38, p4]. The Welsh Government has a target for “new energy projects to have at least an element of local ownership” from 2020 [52]. The configuration of local here is ownership by individuals or organisations based in Wales.

In 2021 the UK Government published ‘Community Engagement and Benefits from Onshore Wind Developments, Good practice guidance for England’ [53]. This guidance document includes a section on shared ownership, recognising the benefits of shared ownership and providing advice for good practice. The document mentions that repowering may provide an opportunity for communities to seek a different form of community benefit, for example shared ownership, but there is no policy requirement. In Scotland a 2015 guidance document sets out advice for developers and communities on facilitating shared ownership for onshore renewables [38]. This encourages developers to offer shared ownership “as early as possible” on every new or repowered development, and this offer should be in addition to a community benefits fund equivalent to £5000 per MW-installed per annum [38,p12]. While this is not a policy requirement, the Scottish Government has supported its narratives with substance in the form of the Community and Renewable Energy Scheme, which provides grant funding, loans to help communities with pre-planning costs, and advice to communities in facilitating full and shared ownership of renewable energy assets [51]. All three nations are quiet on how action on shared ownership might be mandated, with all upholding the long-standing planning convention that issues of ownership and community benefits are not normally material planning considerations. This lack of policy compulsion makes developer voluntarism key, thus emphasising the importance of understanding developer and community motives for engaging in shared ownership.

4.2. Level of support for shared ownership during repowering

The interviews sought to explore community and developer perceptions of shared ownership in order to understand the potential opportunities and challenges for introducing shared ownership during repowering. Several participants (both developers and community groups) across England, Wales and Scotland supported shared ownership between a developer and community in principle. This arrangement was identified by community actors and intermediaries as a particularly appealing lever to upscale community renewables given the paucity of financially viable community-led wind developments in a subsidy-free environment. Participants also appeared to recognise potential benefits of co-ownership in improving public acceptance. No participant said they were opposed to the concept of shared ownership during repowering, while a few participants both on the developer side and community side qualified their support for shared ownership in contexts where it was feasible and attractive, as explained in the following quote.

“The principle of the answer is yes, but would we do it would depend on the outcome of a feasibility study, because we would need to know what the turbines were, what form of grid connection they’ve got, what other investors and obligations the owners had, as to whether or not it would be worthy of us putting in what you’re suggesting is around half a million quid or possibly one and a half million of the community’s money.” (Participant T, community actor).

A couple of developers stated they were supportive of shared ownership but do not proactively offer it in their standard approach to

community consultation, as highlighted in the quote below.

“if communities have other ideas, they want more ownership, they want to take more stake and they want community partnership rather than kind of ownership, then that’s something we’re also happy to look at.” (Developer E)

In addition to support for shared ownership, 6 community actors also identified the moment of repowering as a key opportunity for community energy groups to wholly buy wind sites from developers who wish to offload them at end-of-life.

4.3. Rationales for shared ownership support

Fiorino [11] and, subsequently, Stirling [10,33] outlined three perspectives on the role of participation. These perspectives were used by Goedkoop and Devine-Wright [9] to explore the role of trust and justice in shared ownership of renewables. We have drawn upon these studies to provide a description of the three perspectives of the role of participation in shared ownership: a normative rationale (shared ownership is the right thing to do); an instrumental rationale (shared ownership is a means to achieve desired ends); and a substantive rationale (shared ownership can achieve better outcomes for all).

In this research, developers expressed a range of normative, substantive, and instrumental rationales for engaging in shared ownership with a community during repowering. Instrumental motivations were most vocalised, with shared ownership perceived as a means to achieve various ends, such as greater public acceptance for a repowered wind farm and reputational advantage:

“I think it’s a reputational thing [...] we wouldn’t want to be singled out as the bad guy that doesn’t do it” (Developer A)

Adding to the instrumental rationale, developers identified that consideration of shared ownership in government guidance documents had made it something that they now have to consider.

Normative rationales were expressed by one developer (quoted below), who believed that offering the community a stake in a wind farm is the right thing to do. In talking about their approach to existing sites and future repowering they explained:

“the whole ethos of the company is to be a good neighbour [...] and to work alongside the communities and help them out where possible and involve them in the wind farm as much as they want to be.” (Developer D)

Similar to developers, community rationales for supporting shared ownership with a commercial developer during repowering were characterised largely by instrumental motivations. The most common rationale vocalised was the difficulty of fully community owned and developed onshore wind, particularly in a subsidy-free environment, framing co-ownership with a commercial entity as a viable alternative to scale up community renewables. Indeed, one community actor said the commercial sector was “the only option we’ve got” (Participant L). The viability of the community-owned business model has substantially decreased for many communities across Great Britain due to the closure of the feed-in-tariff in April 2019 and the lack of a suitable replacement to provide financial support and encourage community energy generation [54]. Other instrumental motivations included the greater lucrative nature of ownership compared to community benefit funds and the capacity for this funding to propel sustainable development in communities and more fairly distribute project outcomes, exhibiting distributional justice concerns [3]. While instrumental thinking was most common, normative motivations were also expressed, such as the importance of a sense of ownership and community empowerment:

“I mean it's good from the community point of view of raising awareness and getting people involved and some ownership as well as a sense of ownership” (Participant U, community actor). *“[community benefit funds are] really the crumbs falling from the table, and your communities ought to be sitting at that table and sharing in the meal.”* (Participant G, community actor).

4.4. Shared ownership challenges

While the results revealed support for shared ownership during repowering in principle, there was also widespread recognition, particularly amongst developers, of the challenges in achieving it in practice (see Table 2). The challenge most cited by developers was the extra layer of administrative complexity that involving a community would add to a wind project. This is to be expected for any type of additional owner of a project, given the additional legal agreements, rights, and obligations; but developers felt that this challenge was heightened when partnering with a community. For example, the Financial Conduct Association (FCA) introduces a large responsibility on developers in how they offer investment opportunities to ordinary people.

The UK community renewables sector has developed over the past decade to the size of 319 MW total installed renewable electricity and there were 424 community energy organisations across the UK, as of 2020 [54]. Despite this track record, some developers expressed concern for the capacities of community groups to co-own wind farms during repowering. For example:

“having that conversation with someone who's potentially a lay person, with a whole bunch of other lawyers and agents and stuff like that. It's quite an involved conversation to have, particularly if they're not convinced they would definitely want to do it or can raise the funds.” (Developer C).

Negative expectations that developers and community actors have of each other is not likely to be helpful for shared ownership and perhaps has contributed to the limited extent of shared ownership being implemented on new sites [9]. Some developers viewed communities as amateurish and lacking in capacity:

“there's things that in life people are good at. Dentists are good at teeth. Wind farm developers are good at wind farms. Communities are not good at running wind farms [...] Bringing into some form of responsibility for co-ownership or something like that is really not their bag.” (Developer C)

The majority of community actors expected developers to focus on profit, minimise community engagement, and use any community engagement instrumentally to achieve certain ends, such as greater public acceptance for repowering a wind project. Such perceptions were based on existing experience:

“we've seen a good few [developers] are looking to duck any form of responsibility for the local communities. It is just something that gets in the way of their progress.” (Participant I, community actor.)

Some community actors expressed scepticism and distrust in developers to offer shared ownership for normative reasons. These attitudes are significant because negative expectations of the other reduces willingness to engage in collaboration and helps theorise why so few successful co-ownership examples exist to date [55]. This suggests that trust is an integral ingredient of successful shared ownership, echoing the findings of Goedkoop and Devine-Wright [9]. Trust is something that can be built between a developer and community over time, highlighting the significance of repowering as a moment for implementing shared ownership.

While no participant opposed the concept of shared ownership during repowering, where it is attractive and feasible, a challenge mentioned by one developer was that in practice, when developing new sites, they have faced a lack of interest in shared ownership from the communities they are developing near:

“We are certainly open to discussing [shared ownership] with communities and [...] I'll be honest with you, it's not something that communities bring up in terms of ownership and where that discussion does come on it kind of falls away due to a community's desire for benefit rather than sharing in the risk as well as the reward.” (Developer E).

This purported lack of interest could be due to communities not having knowledge of the option or lacking the capacity to manage risk. Intermediaries and developers both highlighted a lack of community capacity as a key challenge to shared ownership during repowering. Community energy usually relies on volunteers with interest, time and expertise to engage in shared ownership and navigate highly technical documents. This social capital can be expected to vary from place-to-place [21].

The capacity of a community is inextricably linked with how a community is defined, which itself is another challenge. The majority of participants identified defining the ‘community’ in shared ownership arrangements as not straightforward. Given that the practice of community benefits provision is well-established in Great Britain, developers have experience in trying to define the community to receive benefit. This history has shown that there is no universal definition of ‘community’ [13,17]. This is significant because the definition of community shapes the viability of shared ownership. For example, the definition contributes to the distribution of project outcomes which can influence public opinion of a project [56]. Indeed, wind farm projects have failed where definitions have left out important stakeholders, such as those most local to a project [21]. Meanwhile, some of the interviewees noted that it may be necessary to expand the definition beyond those living closest to the proposed development to make co-ownership viable during repowering. This suggests that a lack of community capacity can be overcome by re-defining the ‘community’ to incorporate a wider geographical area. Since many wind farms are located in sparsely populated and sometimes very low-income areas, this approach can potentially facilitate shared ownership during repowering. But the implications of geographically expanding the definition of community can have negative consequences [21] and thus there is a need to consider community perceptions:

“how does that local community feel about an investor from London or Cardiff or something investing into a wind farm in north Wales, for example? That's probably one of the challenges for the sector in terms of when we are offering community ownership.” (Developer A)

In the context of end-of-life, there may already be an existing community benefit fund set up and so the repowering project may benefit from the existing definition of community. However, the people that are captured within the definition of community may not be the same since people may move residence over the operational life time of the existing wind farm. Furthermore, re-negotiating community benefits to secure the greater benefits of co-ownership often cannot avoid re-negotiating the community involved.

The majority of developers spoke of a hierarchical approach to community benefit provision and community buy-in. Developers unanimously thought that those most impacted by a wind farm development - often defined as those living most proximate to development - should receive most incentive and preferential treatment regarding community investment in the project. This highlights that distributional justice concerns define how a developer seeks to approach a community when developing or repowering a wind farm. This hierarchical approach is explained by developer F:

“What I think we’re working on is a phasing so you offer [...] in round one to the local people first, and give them an opportunity and [...] potentially give them a slightly better rate, and then in round two, then you can widen that out to a larger grouping” (Developer F)

4.5. Preferences for shared ownership model

As mentioned in Section 2, existing literature on shared ownership has profiled its different business models [9,29,30]. But to the knowledge of the authors, no study has collected data on developer and community actor preferences regarding the shared ownership model. This section thus provides an analysis of such preferences for the first time.

All developers expressed a preference for the shared revenue model, wherein the developer owns, develops, and operates the wind farm, while a community receives a share of the project's revenue without having an equity stake [9]. Developers preferred this arrangement because they perceived it as simpler and involving less interference from a community, since they would be a partner with no equity which would make it easier to offload the project later. Any desire to minimise interference from a community would be reflected in the percentage stake on offer to communities. As one developer explained:

“I suppose when we gave it to them, it would be what rights we gave to them. I think we would probably give them rights as a wholly silent owner. They would have a defined right for very specific things [...] we can't sell from under them, we can't do X, Y or Z, but I suspect [...] whatever percentage they have, we would probably want to retain legally carte blanche to do what we wanted, without [...] taking their share and their value away from them in a kind of unfair way” (Developer C)

In addition, many developers justified their preference for shared revenue as better for communities as it involves less risk. For example, in a shared revenue arrangement, a community's financial windfalls would depend on the operation of the whole wind farm rather than a singular turbine as per the alternative split ownership model [30], as explained below:

“I think we generally prefer the almost virtual turbine or turbines. It think it's just generally a bit easier to administer. If you go down the communities really want to be able to point at a particular turbine and say ‘that one's ours’ then really that doesn't offer the communities as much protection as just a stake in the overall wind farm. Say for example if that one machine happens to have a load of downtime, mechanical issues or electrical or whatever, if they have a stake in the overall wind farm instead then their revenue is that little bit more guaranteed almost, obviously without using that word.” (Developer B)

Similarly, on the community actor side, the majority preference was also for revenue share agreement, not least because many were concerned about turbines being out of action:

“To own a turbine, it's kind of emotionally appealing that this is the community's turbine and open visits and all the rest of it. On the other hand, the risks really are much more spread if it's shared profit because a single turbine, if it's down for maintenance, you're losing income from it.” (Participant U, community actor)

Community actors also stated a desire for the percentage stake to be sufficient to have a material say in decisions regarding the wind farm. They had different ideas for the percentage to achieve this while, in any

case, it was acknowledged that scale of project and finance capabilities would determine this. Furthermore, a community actor with experience of shared ownership expressed desire for an equity stake, in addition to a share of the profits. While another community actor pointed to the difficulty in raising finance without an equity stake in the project.

Finally, a few participants suggested that any regulation of shared ownership should not be prescriptive in terms of the model or percentage of capital value of project offered as community ownership, because communities, developers and wind projects are diverse:

“It's probably not a one-size-fits-all though. Every community is different. Every community's got different pressures and issues and things that they want to see and things that they don't want to see. So that's where we'll try and tailor that offering, if you like, to each community that we deal with” (Developer E).

Overall, preferences regarding the commercial model of shared ownership were mostly tied to perception of and appetite for risk. There is largely agreement between community actors and developers on the financial mechanism for reward in shared ownership, that being a share of the wind farm profits. This suggests some optimism regarding the feasibility of co-ownership during repowering. However, there are many other aspects of co-ownership to seek agreement on, such as the percentage share of profits, at what point the community becomes co-owner, as well as other rights. Where a clash of preferences occurs between a developer and community group, it is plausible to assume that the developer is more likely to implement its preferences over others, given it has significant resources and is often the majority owner. Indeed, a community actor with experience of shared ownership with a developer, did mention that the community relinquished some of their preferences where the developer had other ideas. This exhibits how shared ownership as a method of expanding community energy can create an increased dependence on corporate energy companies.

4.6. Preferences in policy and timing

It is not mandatory anywhere in Great Britain for developers to offer communities buy-in to their wind farm projects, unlike elsewhere in Europe where wind developers must offer local citizens a share in their projects [57]. Of those interviewed in this research, all developers were steadfastly opposed to mandatory offers of community shareholding in wind farms, citing that such a policy would be unfair and wrongly assumes that all projects and communities can suitably facilitate shared ownership. Meanwhile, most community actors supported a mandatory policy but also welcomed more incentives. Many felt that little would be achieved without mandating shared ownership due to an assumption that developers are not going to do it voluntarily. This broadly reflects the findings of Goedkoop and Devine-Wright [9] on developer and community perceptions of a mandatory shared ownership policy. Nevertheless, developers, intermediaries, and community actors all expressed some concerns regarding unintended or negative side effects from a mandatory policy; for example, a mandatory policy in a certain area may disincentivise investment in that location:

“you are potentially putting investment in your administrative area at risk when you make these types of policy or compliance regulations.” (Participant D, intermediary)

There was no clear pattern in responses to the question of whether shared ownership would be easier to implement on a new site or on a repowering project. A couple of developers perceived new sites as easier

given there is no history of shareholders, who may make it difficult to implement shared ownership at end-of-life for a repowering project. Others believed repowering would be an easier moment to embed shared ownership. Some community actors and developers thought that communities are likely to be more engaged in a repowering project than they were for the initial project two decades earlier; while if there is an existing community benefit fund, such funds could help finance community buy-in to a commercial repowering project. The precedence of a wind farm already being on that site was thought to be helpful too, as the community would be familiar with the turbines and developer:

“I guess what might make things easier on a repowered site is the community would already be used to the wind turbines and may already have some kind of relationship with the developer.” (Participant F, community actor)

Meanwhile, other participants thought that new sites and repowering projects face similar challenges with shared ownership, since a new planning application and new community engagement are needed in both contexts, while repowering may also require a new grid connection. In addition, a repowering project will often involve larger turbines and so any previous consent on that site for smaller turbines cannot be compared. Related to this, Frantál [46] has considered community attitudes at the moment of repowering, hypothesising that communities will be more engaged with repowering projects and will have higher demands in regard to community benefits. If this was to appear in practice, it perhaps makes public acceptance harder to obtain on a repowering project, creating the incentive to offer community co-ownership.

Overall, as summarised in Table 2, while repowering can provide unique opportunities for implementing shared ownership of a wind farm, there are a number of significant challenges that need to be overcome. Most significantly, defining the community involved, the relationship with existing shareholders, the relationship between the community and developer, and the lack of incentives.

Table 2
The potential for repowering to facilitate community shareholding.

Factors making repowering a more conducive moment for providing community shareholding	Factors making repowering a less conducive moment for providing community shareholding
-Established relationship / trust between the community and developer	-If trust has not developed between the community and developer over time
-Communities may be more engaged in decision-making regarding the wind farm due to lived experience or due to changes in personnel living within the defined community	-Potential change to the ‘community of relevance’
-The existing community benefit fund could help finance community buy-in to a commercial repowering project	-Existing shareholders (who may not agree to community shareholding)
-Communities may have higher demands for benefits (i.e., the ‘social license to operate’ may have shifted over time)	-No mandatory policy / lack of incentives
-Developer and community willingness to geographically expand the definition of community through repowering in order to increase feasibility of community shareholding	-Developer and community unwillingness to geographically expand the definition of community through repowering in order to increase feasibility of community shareholding

5. Conclusion

This paper has, for the first time, considered the potential opportunities and challenges for repowering to increase the scale of community shareholding in commercial onshore wind assets in Great Britain. Through doing so, it has furthered academic debates related to how the repowering of onshore wind farms should be facilitated in order to maximise social benefits. It has also led to insights and recommendations of international relevance.

This research sought to understand if developers and community energy stakeholders are interested in community co-ownership arrangements implemented at the moment of repowering and if so, what factors were motivating interest and what model of community co-ownership was preferred. The findings revealed support for the principle of shared ownership during repowering amongst both developers and community energy actors, with recognition that it would need to be feasible and attractive. Co-ownership of repowered wind farms was seen by community energy actors and intermediaries as an attractive solution to increase the level of community energy in Great Britain given the challenges faced in developing community owned schemes in a subsidy-free environment.

Applying the three perspectives on the role of participation [9–11] facilitated an exploration of developer and community rationales for engaging in shared ownership at the moment of repowering. Instrumental motivations for supporting shared ownership were most commonly vocalised by both developers and community actors. For developers, shared ownership was perceived to meet desired ends such as greater community acceptance for a wind farm and to comply with government guidance. Meanwhile, community actors perceived shared ownership as a viable alternative to the community fully owned business model.

Regarding models of shared ownership, shared revenue - wherein the developer owns, develops, and operates the wind farm, while a community receives a share of the project's revenue - was the financial model of overwhelming preference amongst developers, intermediaries, and community actors. Such a preference was largely tied to perception of and appetite for risk, with shared revenue perceived as less risky than alternatives. The findings also revealed that while community energy practitioners would support mandatory shared ownership offers during repowering, commercial developers want it to remain voluntary, reflecting preferences for considerations of shared ownership for new wind farm developments identified by Goedkoop and Devine-Wright [9].

The findings reveal the unique opportunity that repowering provides for facilitating community co-ownership. Compared to new sites, repowering provides the benefit of an established relationship between the developer and community, existing community experience of the wind farm and the potential that the community may be seeking a different form of benefit. There is also potential for the community benefit fund from the existing wind farm to be used to help finance community buy-in to a commercial repowering project. However, the research also revealed the challenges to embedding community co-ownership in repowering projects. While there was support for shared ownership in principle from developers, intermediaries and community energy practitioners across England, Wales and Scotland; several challenges to this arrangement were identified in practice. Some of these challenges reflect the general challenges with embedding co-ownership in renewable energy projects such as administrative complexity and a lack of community capacity (see also Goedkoop and Devine-Wright [9]).

However, other challenges arose that were unique to the moment of repowering; including the relationship that has developed between the community and developer over time, the role of existing shareholders, and the potential need to change the community of relevance (see Table 2).

The findings of this research can potentially be used to help overcome such challenges and thus ensure that communities benefit from repowering, internationally. A policy mandating offers of community shareholding would not of itself solve issues related to community capacity, identified as a key barrier to successful shared ownership. Instead, the findings suggest that policy efforts should focus on increasing the capacity of communities to be attractive potential partners to developers, particularly for those locations where there are not already established community energy organisations. Given that the majority of interviewees vocalised instrumental motivations for engaging in shared ownership, this paper suggests that further incentives for shared ownership should be provided. For example, through ringfencing some subsidy support to projects with community shareholding. Finally, those producing policy, targets and guidance related to shared ownership should not prescribe a particular model, but instead focus on process. Communities, developers, and wind projects are diverse and capacity and interest for shared ownership varies from place-to-place. As such, policymakers could provide templates for different models in consultation with developers and communities but build-in flexibility so these could be modified locally. This can help reduce the administrative complexity associated with shared ownership and it would be particularly helpful for developers without experience of community shareholding.

More research into shared ownership and end-of-life is needed. This paper has contributed to addressing this gap, but the scope has been restricted to shared ownership stakeholders in England, Scotland, and Wales in a specific social context and time. In future research it would be worthwhile applying the research questions used here to other geographical contexts with varying levels of end-of-life and shared ownership experience. Such studies could identify criteria for successful shared ownership by focusing on how such relationships originate, including characteristics of key institutions such as the planning system. Future studies could also seek the views of wider publics. Additionally, given that the findings indicate community buy-in to commercial repowering wind projects is feasible and attractive for both developers and communities, future research should now increase understanding of the best way to facilitate shared ownership at repowering. End-of-life remains a new issue for the wind industry, but future studies will be able to benefit from more experienced participants.

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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