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Original research article

The best-laid plans: Tracing public engagement change in emergent Smart Local Energy Systems

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A B S T R A C T

To be fair, acceptable and ultimately successful, decentralised energy projects involving technological innovations require engagement with users, local communities and wider publics. Yet relatively few studies have adopted a dynamic, temporal approach to understand how publics are engaged with as projects develop over time. We address this gap by researching three case studies of 'Smart Local Energy System' (SLES) demonstrator projects involving combinations of power, heat and transport technologies funded under a UK government programme. Guided by literature on public engagement methods and rationales, as well as how users and communities are framed by stakeholders, we track engagement approaches over time from stages of project initiation to technology deployment. Engagement defined as communication and consultation predominates over participation and community empowerment, with instrumental rationales used to frame publics as consumers enabling technology deployment. Disruptions to engagement attributed to external factors such as the COVID-19 pandemic and BREXIT were interpreted both positively and negatively, including the implications of disruptions for social inclusion and fairness. The potential for SLES to catalyse broader social transformations in a context of environment and climate emergency is discussed.

1. Introduction

Whilst energy research has historically focused on technical challenges [1], much recent scholarship has established the importance of drawing on social science and humanities-based perspectives [2], for instance regarding public engagement in environmental decision-making. Policymakers and project stakeholders now widely acknowledge the importance of public engagement in tackling energy issues [3], such as energy system design [4], benefit distribution [5] and governance arrangements [6], but there are often conflicting ways of defining, conceptualising and categorising engagement [7], with ongoing debate around how publics are framed [e.g. 8] and the value of some forms of engagement over others [7,9].

How public engagement is envisaged and defined matters because it has implications for fair and inclusive energy transitions [7,10]. Research beyond the field of energy highlights how engagement processes can entrench social exclusion, if participatory decision-making processes do not empower marginalized groups [11]. Investigating power dynamics in energy transitions requires tracking interactions and motivations across time rather than at single points in the lifecycle of projects [12]. For instance, Windermer's [13] study of onshore wind energy end-of-life decisions shows how social attitudes and motivations evolve [14] across the lifespan of a project. Similarly, Hargreaves and colleagues' [15,16] study of domestic smart energy monitors shows how familiarisation leads technologies to be 'backgrounded' over time, changing how they are interacted with. These changes in interactions show a need to trace how projects engage with publics over time, specifically since few studies consider the dynamics of public engagement through all stages of energy technology deployment.

Despite an increasing focus on decentralised energy initiatives in the UK and internationally [17–19] empirical research on the implications of changes in engagement over time have been overlooked. Acknowledging a rhetorical shift in UK energy policy from 'community energy' to 'local energy' since 2015 [17,20,21] this paper investigates dynamics in public engagement practices in three UK 'smart local energy system' (SLES) demonstrator projects. These are projects that promote the 4Ds [22] of energy transitions (digitalisation, decarbonisation, decentralisation and democratisation).

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We start by setting the scene for the paper, outlining the role of public engagement within decentralised energy projects and the specific context of emerging SLES projects (Section 2). We then detail our research approach (Section 3) before investigating how engagement evolved within SLES case studies (Section 4), before discussing the implications of that evolution for fair and inclusive energy transitions (Section 5).

2. Background

2.1. Framing public engagement with energy transitions

Rowe and Frewer [9] categorise public engagement in terms of three distinct types: communication, consultation, and participation. These types are differentiated by the nature and flow of information between 'sponsors' and participants, and by the degree of power held by different actors. This flow can be one-way (i.e. communication), two-way but controlled by the sponsor (i.e. consultation), or two-way with equal status held by sponsors and participants (i.e. participation). Communication and consultation are characterised by power asymmetry between sponsors and participants. In these types, power is predominantly held by the sponsor and participants either passively receive communications or the nature of how they respond is pre-determined by the sponsor. Crucially, to categorise engagement methods a consideration of efficacy in transferring information between sponsors and participants is required. Rowe and Frewer's [23] Typology of Public Engagement provides valuable insight by, in addition, categorising engagement mechanisms according to six dimensions that detail further characteristics of engagement approaches. These include participant selection (i.e. the degree of control over who participates), facilitation (whether further elicitation of response is facilitated or not), response mode (whether response is open and discursive or closed), information output (whether pre-set or flexible) medium (face-to-face or non face-to-face) and aggregation (whether facilitation of aggregation takes place in a structured or unstructured way) (Table 1 for example).

Engaging with communities in ways outlined by Rowe and Frewer [23] and fostering public participation in energy transitions presents a series of challenges, not least since tensions can arise between the prioritisation of democratic ideals of participation and its pragmatic value and role [11]. For instance, in a study looking at wind energy and oil and gas development in North America, researchers found there were 'contested scales' regarding how decision making should take place [24]. Whether participation processes can adequately echo public interests or indeed provide meaningful routes for members of the public to occupy influential roles is unresolved [25], and subject to change over project lifespan.

We draw on a framework that distinguishes engagement *with* publics from engagement *by* publics [26], or engagement conducted and enabled by communities versus engagement enabled by a third sector organisation, private company or local authority. While our primary focus in this research is on the dynamics of engagement with publics, this is not to say that we do not value research that opens up the diversity of engagement by publics in energy transitions [e.g. 7, 8]. Instead, our focus is on understanding managed transition dynamics in contexts where innovative local energy systems emerge. Specifically, we examine how SLES project partners conceptualise and practice public engagement over time.

A central emphasis in research on public engagement is the different rationales held by instigating stakeholders, instrumental (e.g. installation of smart meters or heat pumps in domestic households [27]), normative (e.g. looking to conduct engagement because it is deemed the 'right' thing to do [28]), or substantive (enabling benefits beyond the defined energy project, such as enhancing social capital).

Despite critiques for its normative emphasis, Arnstein's ladder of participation remains a useful typology to understand and distinguish between various forms of engagement practices [29] as it draws attention to how much control publics can have over change, with high control expressed as empowerment, moderate control associated with tokenism and 'non-participation' representing an absence of control. The normative understanding is that empowerment or citizen control is more desirable than tokenism or non-participation. Cardullo and Kitchin's [30] scaffold of participation strengthens the contemporary relevance of the original typology by acknowledging neoliberalism through including a 'choice' rung in which publics are framed as self-interested market-driven consumers [31].

We view Arnstein's and Cardullo and Kitchin's [30] ladders as important mechanisms to frame how SLES could view communities (as customers and consumers), thereby offering a valuable conceptual resource. This resource adds to the work of Rowe and Frewer [9] as it provides a landscape in which to categorise engagement mechanisms. In the case of Arnstein's work, we make the judgement that SLES patterns of engagement becoming less participatory, with more emphasis on consultation and communication, are less desirable than becoming more participatory. This is because it reduces opportunities for user/community empowerment, just processes and outcomes, and increases the potential for SLES to be vehicles for community manipulation or tokenistic engagement. Regarding Cardullo and Kitchin's work, we view a narrowing of focus towards users viewed as market actors, as having negative impacts on community empowerment and just outcomes.

There has been debate that energy social science research fails to adequately address the systemic character of the engagement challenge, and understand the 'ecology' of its multiple forms [7]. Chilvers et al. [32] argue that current approaches fall short of capturing the interconnected ways publics interact with energy systems. While agreeing, our focus nevertheless is on how 'sponsors' of decentralised energy projects distinguish and conceptualise publics, and how these conceptualisations have consequences for 'successful' project delivery and the enabling of wider energy transitions [33]. This is to affirm that formal stakeholder engagement *with* publics and the conceptualisation of those publics are vitally important topics for understanding energy transitions [34]. However, research is lacking into how these conceptualisations and practices of engagement with publics might change over time.

Intertwined with the process of 'how' engagement takes place is 'who' - which individuals or groups are engaged with, and how they are framed by stakeholders. This is of importance when considering local contexts where existing relationships and power dynamics are highly influential [35]. Participatory approaches to local energy transitions are challenging, and not guaranteed; an inclusionary process does not always generate just processes and fair cost and benefit distribution [2]. Consequently, we aim to determine *who* is being included within engagement processes, who may be being overlooked and whether this

Table 1
Example typology of engagement mechanism. (A full typology of engagement mechanisms detected in this research can be found in appendix).

Mechanism	Selection method: controlled/ uncontrolled	Elicitation facilitation; yes/ no	Response mode: open – closed	Info input: set- flexible	Medium of information transfer: face to face/non face to face	Facilitation of aggregation: structured/ unstructured	Communication, consultation, participation.
Press release	Uncontrolled	No	N/A	Set	Non FTF	N/A	Communication

changes over time, as projects emerge from initial stages to deployment of technologies in local areas (35).

We consider our approach novel, by tracing changes in how communities, customers or consumers are viewed by SLES stakeholders and how the resultant engagement approaches impact on inclusion. In relating dynamics of engagement with ideas of justice, we are drawing on existing literature on public participation and its connection with ideas of environmental justice and just transitions (10).

2.2. A systemic approach to decentralised energy: Smart Local Energy Systems (SLES)

SLES are a relatively new concept, yet to be formally defined [36], involving socio-technical innovations that combine digitalisation of technology with local action to decarbonise energy (electricity and heat) and transportation [37]. Mostly used in the UK context to date, SLES have links to associated ideas globally, including '[local] smart grids', 'smart energy systems', 'distributed energy systems', and 'renewable energy communities'. SLES differ from these concepts by adopting a multi-vector approach, which can encompass heat, transport, storage, and power generation [37]. Consequently, SLES offer a pathway to fundamentally change how places generate, store and use energy, how mobility takes place, how heating and cooling occurs, and how we interact with energy-related data. In this sense, SLES are locally specific, systemic and heterogeneous [36]. SLES configurations have the potential to change household energy practices, mobility activities, financial structures, and larger energy infrastructures [38]. These new configurations provide routes to consider what engagement looks like as projects emerge, providing a platform for potential engagement innovation. Understanding SLES engagement is important, as a key hurdle to local integration of renewables is the fostering of acceptance, finding pathways to overcome resistance from incumbents, and aligning visions [39].

With funding from the UK government, SLES are part of a strategic move to invest in innovative energy systems as part of broader economic strategies for 'clean growth' [40]. SLES are, therefore, manifestations of a policy shift in the UK away from decentralised energy initiatives oriented around the communitarian ethos of 'community energy' towards a 'local energy' approach [17,30]. A key feature of the UK government's SLES approach is multi-sectoral partnerships. SLES projects are led by teams of stakeholders including Distribution Network Operators, local authorities, technology companies, third sector organisations and academic researchers. This emphasis on partnership-driven local energy initiatives is notable given past research on public engagement in urban energy projects [41]. Rydin et al. [41] showed that compared with community-led initiatives, projects led by partnerships evidenced less emphasis upon public engagement, with least emphasis on public engagement evident in projects led by private companies. The authors concluded that the 'success' of urban energy projects is, at least in part, down to social factors. This includes bringing together local stakeholders and 'wider community engagement' [42]. The projects that Rydin and Turcu [42] detected to be most successful and longstanding were those with a secure business model and a community sector lead – which in turn can be viewed as a proxy for a commitment to extensive and sustained community engagement. These findings have implications for our understanding of the dynamics of public engagement in SLES. They suggest that SLES partnerships which include third sector organisations are more likely to undertake extensive engagement with publics as part of SLES deployment, and to remain committed to that goal during shifting contexts of technology deployment.

We investigate engagement practices and changes in engagement practices over time, by undertaking qualitative research with three UK government funded demonstration projects. In doing so, we aim to reveal ways in which engagement practices might change over time in response to events or forces that may disrupt initial plans (see Fig. 1).

We highlight factors impacting public engagement over time and investigate how these forces influence project partner response. By focusing on partners' perspectives on engagement, insights can be generated into the types of factors thought to influence change, partners' interpretations of these, and any shifts in engagement activities taking place.

Three research questions guide our approach:

RQ1. *How do SLES project partners practice engagement with publics and does this change over time?*

RQ2. *How do partners interpret and respond to factors influencing engagement?*

RQ3. *What are the implications of changing engagement practices for fair and acceptable energy transitions?*

3. Methodology

We use a comparative case study approach to investigate public engagement in diverse geographical contexts [37]. This research adopts an interpretivist/constructivist approach to researching engagement practices. It interprets project partner discourse to understand engagement rationales and reasons for change over time [43].

3.1. Case studies - PFER demos

We selected case study projects funded under the UK Government's Prospering from the Energy Revolution (PFER) challenge programme. PFER aims to enable decentralised energy systems that deliver heat, mobility, and power. It has a primary goal of devising replicable business models applicable in multiple contexts, as part of wider low carbon energy transitions [5]. £102 m of funding was provided to 3 large scale 'demonstration projects'. Projects were awarded funding in early 2019, with project teams launching in mid-2019. ReFLEX Orkney, Local Energy Oxfordshire (LEO) and Energy Superhub Oxford (ESO) form the PFER demonstration project roster (Fig. 2 shows demonstrator locations, Table 2 provides further project details). PFER, at funding stage, did not

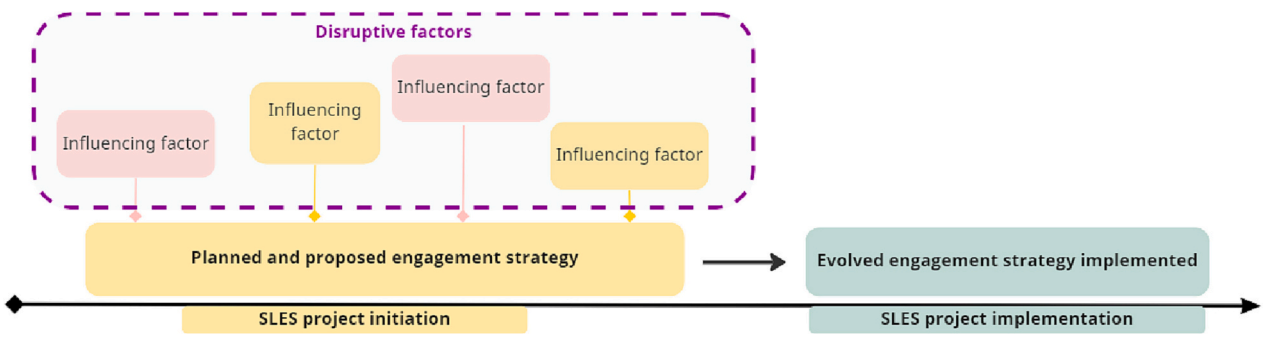


Fig. 1. Framework of engagement evolution within SLES projects.

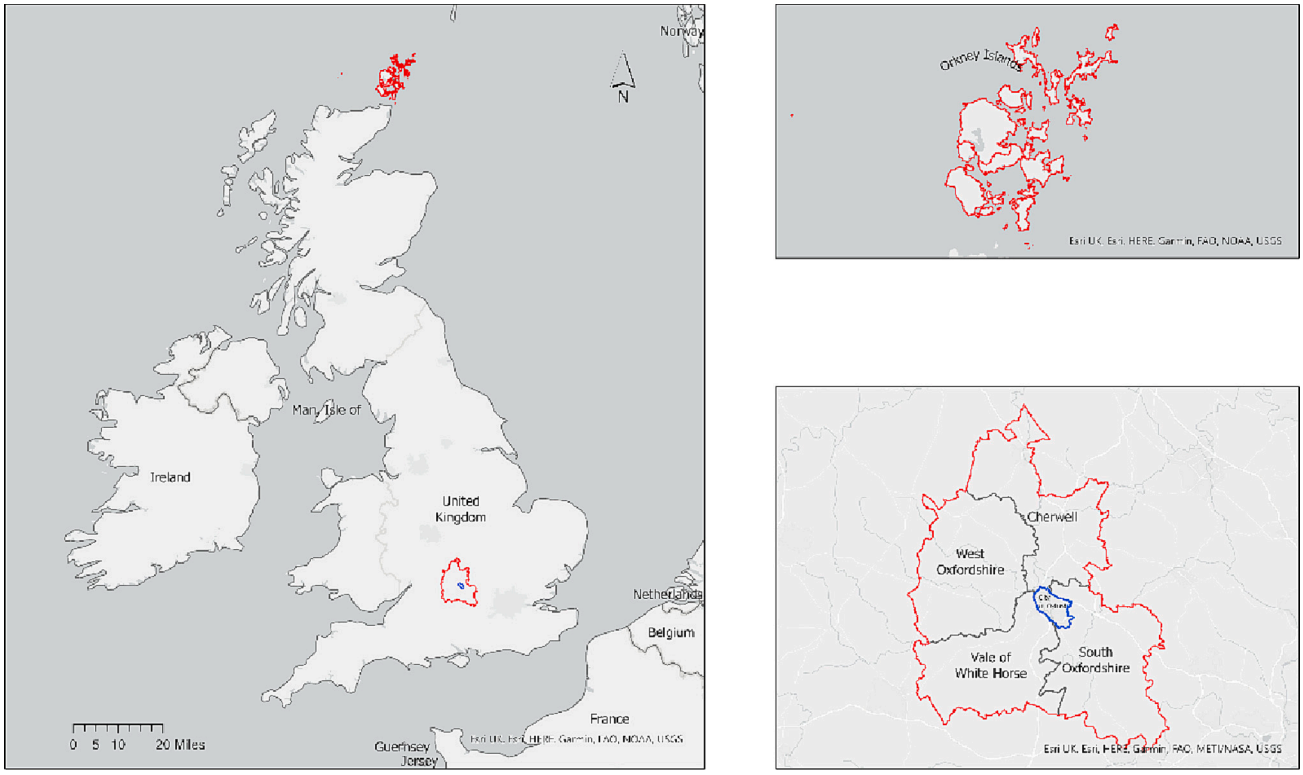


Fig. 2. Locations of SLES case studies (Oxford, Oxfordshire, and Orkney). *Re*-produced by permission; Walker et al. [37].

specify in detail what engagement should look like. This meant the 'demonstration projects' had relative free rein to conceive their own engagement strategies in different ways.

Researching varied case studies has multiple benefits. Firstly, each project aimed to deliver a different combination of technological innovations ranging from heat pumps and EV charge points to large scale battery storage (see Table 2). Secondly, the composition of project partners differed. While all projects involved private companies, local authorities and researchers, only LEO and ReFLEX included third sector organisations as partners. Finally, the projects took place in contrasting geographical settings, encompassing urban neighbourhoods (LEO and ESO), rural settlements (ESO) and an archipelago (ReFLEX). In turn, these provide different socio-cultural contexts that afford opportunities and challenges for public engagement [36].

3.2. Data collection

Data was collected within a research program (EnergyREV – also funded under the PFER programme) running parallel to case study timelines. This enabled access to project partners through a qualitative research approach comprising workshops and semi-structured interviews (Table 2). Initial data collection took place at the early stages of each project (December 2019–February 2020), with follow-up data collection taking place during the deployment phase (June–September 2021). Given the projects involved novel multi-sectoral teams, workshops were selected to allow observation of partner interactions and negotiations at project initiation. When returning to case study projects in 2021, the COVID-19 pandemic, and associated social-distancing restrictions, influenced the decision to conduct online semi-structured interviews. Interviews were conducted with project leads and engagement leads due to their remit and knowledge of engagement rationales and practices. The occurrence of COVID-19 during data collection is considered both a force impacting SLES emergence and our research more generally. Accordingly, we focus on how pre-existing engagement plans were influenced by a global pandemic, building on insights from Busch and Hansen [44], and Crowther et al. [45].

The workshops involved the Pattern-IT methodology to identify project goals and methods of engagement with identifiable groups [46]. This round-table discussion format formed approximately 70 % of the workshop time, with the remainder consisting of semi-structured discussion exploring engagement practices and proposed engaged groups [47]. In contrast to the workshops, interviews looked to elucidate which groups had been engaged with, how and why engagement had changed over the course of the study period, and the engagement outcomes expected.

3.3. Data analysis

Content and thematic analyses were coupled to explore engagement mechanisms over time, and to identify factors influencing change. Content analysis helped to gain an understanding of frequencies, which suggest what is important in the data (higher frequencies/occurrences are indicative of higher significance) [48]. However, this only describes data in numerical form and in name only, lacking depth. Adding thematic analysis gives the added possibility to explain 'why' certain frequencies exist, along with what underlying assumptions, conditions and factors may be present [49], offering a fuller articulation of how influential factors influence SLES user engagement and project delivery. To provide granular detail on how engagement was undertaken and what changes took place over time, we employed Rowe and Frewer's [23] Typology of Public Engagement at this stage to categorise mechanisms in accordance with Table 1. Appendix summarises mechanisms and characteristics, and relevant qualitative data used to identify them.

We used inductive coding to identify themes and possible attributions of change due to specific factors (identified at content analysis stage), particularly highlighting how engagement described at initiation stages (engagement mechanisms type and characteristics, along with target group) differed or was similar to that described at the implementation stage. Where we detected differences, analysis probed interpretations of why engagement had changed, supplemented with

Table 2
SLES Project and dataset descriptions.

	Project initiation	Project implementation
	Workshops (conducted Dec 2019-Feb 2020)	Semi-structured interviews (Jun-Sept 2021)
Project	Participants (all names are pseudonyms)	Participants
Local Energy Oxfordshire (LEO) "Project LEO is running trails in Oxfordshire to understand how new technologies and services, particularly at the 'edge' of the network – closest to the point where people are using energy – can benefit local people, communities, and the energy system. (https://project-leo.co.uk/)	Six participants (Workshop 1) • Sean (private sector) • Will (private sector) • Thomas (private sector) • Meghan (third sector) • Susan (academia) • Peter (academia) Three participants (Workshop 2) • Carol (local authority) • Katelyn (local authority) • Olivia (local authority)	Two participants; • Samantha (third sector) • Claire (private sector)
Energy Superhub Oxford (ESO) Our Electric Vehicle (EV) charging network – connected to the National Grid's high voltage electricity transmission network – will bring an unprecedented amount of power to Oxford for rapid vehicle charging, along with innovative, small 'shoebox' ground source heat pumps will show one way in which we can help to eliminate the carbon associated with heating our homes and businesses." (http://energysuperhuboxford.org/)	Five participants • David (private sector) • Mary (academia) • Lois (private sector) • Anne (private sector) • James (private sector)	Three participants • Jessica (private sector) • Amanda (private sector) • Stuart (academia)
ReFLEX Orkney (ReFLEX) "ReFLEX aims to decarbonise the three main areas of energy use on Orkney - heat, transport and electricity - by digitally linking 100 % renewable energy with demand and storage into a flexible integrated energy system." (http://reflexorkney.co.uk)	Seven participants • Oliver (private sector) • Emma (third sector) • Adam (third sector) • Lauren (private sector) • Joseph (local authority) • Jacob (local authority) • Liam (private sector)	Three participants • Charles (private sector) • Emma (third sector) • Ruth (private sector)
TOTAL PARTICPANTS	21 (LEO = 9, ESO = 5, ReFLEX = 7)	8 (LEO = 2, ESO = 3, ReFLEX = 3)
Data collection duration	From 1 h 45 min to 2 h 30 min	From 40 mins to 1 h 30 mins

selected quotes and reviewed by the author team. This two stage analysis revealed the nature and characteristics of engagement at the two data collection points. It also explored how and why engagement was suggested to change. Due to both workshops and interviews covering engagement in its widest sense for the demonstrators, analysis focused on discourse surrounding public engagement – specifically who was considered SLES 'users'. As such we deemed engagement discussions regarding the activities of other stakeholders, including government or financiers, as out of scope.

The main author produced codes and themes to understand how each mechanism and target group was framed drawing on qualitative data. The lead author interrogated the total corpus of data, with co-authors subsequently examining segments of coded data. Any differences of view in coding between authors were reconciled within regular sessions where all authors discussed coding and arrived at consensus [50].

4. Findings

4.1. How did SLES partners engage with publics and did this change over time?

We address the first research question by detailing who project partners engaged with, how this engagement was conducted, and whether both dimensions evolved over time. Partners identified a range of specific groups they engaged with, including potential adopters, intermediaries, potentially impacted groups, local neighbourhood groups, as well as non-specific indeterminate publics (i.e. un-targeted engagement) (see Table 3). Intermediaries provided a means for partners to reach potential adopters, for example taxi drivers via taxi association representatives, private homeowners via action groups representing residents, and social housing tenants via landlords. Varied SLES technologies and services were the focal point of this engagement, including heat pumps aimed at social housing occupants (ESO), solar PV and heat pumps aimed at private homeowners (LEO), and car chargers aimed at private car owners (ReFLEX). The number of groups engaged varied substantially depending on project and data collection time point. This varied from nine identified groups within ESO at the early project stage, to three in ReFLEX at the implementation stage.

Both continuity and change are evident in which groups were engaged with. In terms of continuity, only engagement with indeterminate publics did not decrease over time, unlike all other target groups. Of these, engagement with potential adopters (i.e. social housing occupants, private home owners, and car owners) in relation to specific technological offerings (heat pumps, EVs or battery chargers) decreased the least. There was a clear reduction in efforts to engage local neighbour groups, potentially impacted groups and intermediaries. This pattern indicates a narrowing over time in who was engaged with. This suggests a prioritisation of engagement with publics framed as consumers of SLES propositions, rather than community empowerment [30].

Project partners identified 35 mechanisms used to engage with publics. Overall, the quantity of mechanisms varied substantially depending on case study and time point, from 13 mechanisms (ESO initiation stage) to 7 mechanisms (LEO and ReFLEX implementation stage). We analysed qualitative references to categorise engagement mechanisms guided by the three categories of Communication, Consultation and Participation detailed by Rowe and Frewer [9] (see Table 4 and appendix). Across the case study projects, 20 communication mechanisms were identified, 14 consultation methods, and only one participation mechanism (community steering groups, LEO). This indicates a strong emphasis on one-way information provision (communication) rather than two-way engagement with publics (consultation) or genuine dialogue (participation).

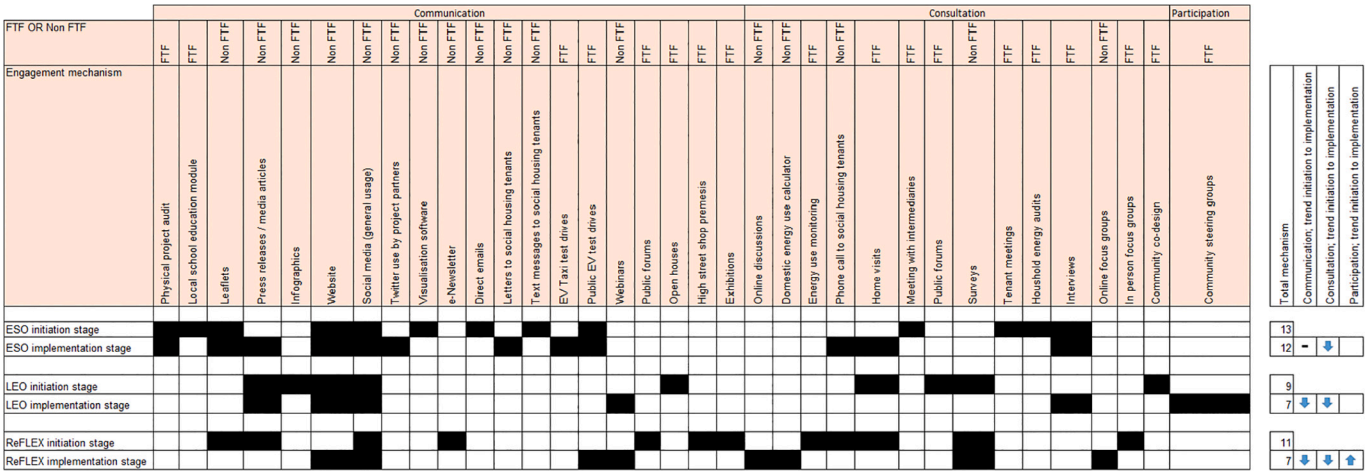
Examples of communication mechanisms included leaflet mailing to local residents (for example to inform residents of how a heat pump works), press releases aimed at indeterminate publics raising awareness of the project to 'get the message out', and sending letters and text messages to social housing tenants concerning heat pump installation. Examples of consultation included surveys aimed at gauging interest in SLES products and services among local residents, home visits aimed at promoting the sale and installation of heat pumps to homeowners, and interviews with taxi drivers concerning potential uptake of electric vehicles.

LEO had the most participatory mechanisms, aimed at communities

Table 3
Groups engaged by SLES partners at emergent and implementation project stages.

Overarching group		Local neighbour groups	Potentially impacted groups		Intermediaries				Potential adopters							
Subgroup	Indeterminate publics	School students within SLES area	Cyclists / cycle way users locally	Taxi drivers (Oxford hackney carriage drivers).	Taxi association rep (Oxford city)	Residents action group within project area	Sustainability action group within project area	Social housing landlord within project area	Social housing occupants within SLES design. (Potentially adopting heat pumps).	Private homeowners within project area. (Potentially adopting heat pumps and solar offerings).	Private car owners within SLES project area. (Potentially adopting EVs and domestic chargers).	Car drivers and commuters requiring public charging. (Potentially adopting large public battery charger).	Total	Number of adopter groups engaged	Number of potentially impacted groups engaged	Number of local neighbourhood groups engaged	Number of intermediaries engaged
ESO early project stage	•	•	•	•	•			•	•	•		•	9				
ESO mid project stage	•			•					•			•	4	↓	↓	↓	↓
LEO early project stage	•					•		•	•	•	•		6				
LEO mid project stage	•					•				•	•		4	↓	-	-	↓
ReFLEX early project stage	•						•			•	•		4				
ReFLEX mid project stage	•									•	•		3	-	-	-	↓

Table 4
Methods of engagement employed over time.



rather than individual consumers or households. LEO partners used co-creation discourse in contrast to ESO or ReFLEX partners. This focused on resident action groups and evolved over time from co-design of new residential properties to working in collaboration with community steering groups in targeted neighbourhoods. We classify this as an evolution from consultation to participation [9], due to project partners leading and designing co-design mechanisms, then progressing to participation as decision-making is shared with a community steering group. This evolution was planned at the early stages of the project, with co-design processes being used to identify local community needs, identify challenges and next steps, and devise local steering groups to collaborate in SLES deployment.

> *In terms of that co-creation, it's mostly about putting together a local steering group within a community, and it's been…understanding what are the challenges. We pick communities where we knew they might already be working on something that could benefit from being part of this.*
>
> Samantha (third sector); LEO interview. (6th May 2021)

While participation is present in LEO, it is constrained. Although community steering groups were involved in the implementation of the SLES (i.e. specific forms of technology deployment) in particular neighbourhoods, there is little evidence that they were involved in steering the SLES overall. In addition, participants indicated that constraints of time and funding made engagement in 'the most challenging' geographical areas more difficult. We conclude that if SLES partners only select community areas that are easier to engage with, this could lessen social inclusion in SLES delivery.

> *When you know you've got to run a project like this, you don't automatically go and find the most challenging geographical area to run these projects in because you got a finite amount of time. So you do try and choose those areas that already has..for example, a healthy community.*
>
> Claire (private sector); LEO interview. (23rd April 2021)

Over time, partners described a reduction in face-to-face engagement

mechanisms and an increase in virtual approaches. Other changes included a reduction in mechanisms with flexible information input (e.g. coffee mornings), and a reduction in mechanisms eliciting both open and closed responses, with an increased reliance on non-responsive one-way communication approaches (e.g. press releases, websites). Mechanisms using a controlled selection of participants (e.g. surveys) reduced over time, with approaches with uncontrolled selection routes (e.g. internet-based information provision) remaining unchanged. These changes can be interpreted as a decrease in focused, targeted and face-to-face engagement practices, and an increase in uncontrolled, virtual and open mechanisms.

In summary, engagement with publics by SLES project partners used predominantly communication and consultation mechanisms, with the relative emphasis upon communication strongest in the ESO case study. The LEO case study, by contrast, indicated rhetoric of co-design and sustained interest in community participation, which can be attributed to the presence of third sector organisation leadership with an emphasis upon community empowerment. Nevertheless, even in this case, engagement was focused on SLES delivery in specific neighbourhoods rather than co-creating systemic change with publics using deliberative methods. Across the phases of research from project initiation to deployment, engagement methods shifted away from face to face and targeted engagement, to more remote, uncontrolled and open engagement. Overall, there was also a reduction in the number of specific groups targeted, with indeterminate publics and potential adopters being the only groups not reducing. Decreases over time, in the range of publics engaged with, together with a lack of emphasis upon participatory approaches (apart from LEO), indicate a risk that SLES deployment neglects matters of social inclusion and the potential to catalyse broader public engagement with sustainability transitions.

4.2. How do partners interpret and respond to factors influencing engagement?

Workshop participants identified and discussed multiple factors influencing engagement with publics over time.

4.2.1. COVID-19 - Negative impacts

The COVID-19 pandemic was the most significant force identified by partners. Across the case studies, COVID-19 impacts on activities were widespread, with the most prominent impact being the removal of opportunities for in-person engagement.

> *We had the business plan and marketing plan ready to launch. But unfortunately as soon asCOVID hit this was knocked back. How can you launch your business where you cannot actually meet people?*
>
> David (Private Sector); ReFLEX interview. (21st June 2021)

In a climate of uncertainty, some project partners commented about a required level of flexibility due to disruptions to planned engagement activities. One participant stated a requirement to 'stretch' engagement even when communication methods were considered the only mechanisms available due to COVID-19 restrictions.

> *So lots of in person work and of course things haven't worked out that way. So we've had to sort of reimagine things a little bit. You know. I have been lucky enough. I was able to sort of, you know, stretch, stretch their own little bit more into communications.*
>
> Claire (private sector); LEO interview. (23rd April 2021)

Not all engagement could go online, however. For ReFLEX partners, the provision of EV test drives aimed at private car owners persisted over time. However, they were subject to repeated stop-start restrictions as lockdowns came and went. Partners deemed test drives particularly important as a key route to enabling EV engagement. Partners in LEO expressed concern for those left behind by this shift to online engagement, and the consequent limitations on the range of voices involved in each project.

> *I think COVID has meant that we haven't been able to do as much awareness raising as probably we would have done. So we had to be a little bit more, you know, a bit more targeted and you're never going to catch people walking in the street with a webinar.*
>
> Samantha (third sector); LEO interview. (6th May 2021)

In the case of specific target groups such as social housing occupants, ESO partners described the evolution away from face-to-face methods as lessening the quality of interactions with potential heat pump adopters.

> *The engagement with the tenants wasn't what we would normally do, and it kind of fell by the wayside a little bit during COVID… apart from letters, we couldn't contact them… For all of the ones which have phones, we called them every now and again just to check up on them. How's your heating system? How's everything going? But it's not the same as actually going to them and speaking to them.*
>
> Amanda (private sector); ESO interview. (1st September 2021)

This shift to more remote methods of communication shows that efforts were made to adapt engagement and retain consultation methods, with open elicitation facilitation, open response routes, and flexible information input. As with other target groups, social housing tenants' specific characteristics also influenced engagement activities. For instance, low levels of smart phone ownership (and limited internet connection) was suggested as a reason for holding face to face activities such as coffee mornings, to enable interactions with and among tenants and address questions regarding heat pump installation. Following COVID-19 restrictions limiting in-person engagement, this shifted to the use of letters, text messages and phone calls, due to tenants' limited ability to access virtual engagement methods (e.g. webinars or online discussions).

Partners stated COVID-19 created a climate of uncertainty about what would be feasible in the future. This included the delay or complete removal of activities such as country shows, tenant liaison sessions, schools education schemes and high street shop premises for publics to access information and advice (ReFLEX). As such, engagement planning or implementation was halted, to ensure preparatory work did not waste time or resources.

> *We haven't been able to do nearly the level of engagement that we would have liked to have done, particularly prior to us launching the company. For example not having like the local shows last year and the agricultural shows, those are a major aspect in the events calendar in Orkney…a really useful space for us to go and speak and update people face to face and people could come ask questions.*
>
> Emma (third sector) and Ruth (private sector); ReFLEX interview. (15th July 2021)

In the case of ReFLEX, country shows were regarded as social highlights of the community calendar. Restrictions due to COVID-19 limited opportunities to hold project roadshows, which normally take place across multiple Orkney Islands. These roadshows were described as occasions to take electric vehicles, batteries, chargers and heating systems to large community events. As such, retaining the test drives from project ReFLEX headquarters was suggested as particularly important, even with COVID-19 cleaning and social distancing demands. Due to the geographical nature of the Orkney archipelago, transporting EVs for test drives across the islands was curtailed, with islands essentially isolating from each other. The ReFLEX team reflected on this travel restraint as a 'curbing' of project thinking that limited engagement.

> *With the Isle communities, if they haven't had any cases on the islands and the Outer Isles and we've got cases (COVID-19) on mainland Orkney, you know, they're sometimes they're not keen for people to come up to risk, you know bringing contact. So it's had the effect of stopping us doing things when you weren't able to. But it's also curbed our thinking about what we should do and whether or not it's a good idea, you know, we kind*

of hold back on things, we better wait and see what happens with that before we do something.

Emma (third sector) and Ruth (private sector); ReFLEX interview. (15th July 2021)

COVID-19 was suggested to limit routes to engage with publics not already interested in SLES technologies. Participants suggested it limited interactions with people who wouldn't naturally seek out the demonstrator's offering.

The people that we've had throughout so far, or at least a lot of the early people that were interested, whether people that are aware that this is coming up are probably like the eager early adopters sort of people, so we still have I think there is still quite a lot of work to do.

Emma (third sector) and Ruth (private sector); ReFLEX interview. (15th July 2021)

4.2.2. COVID-19 - Positive impacts

COVID-19 impacts on engagement were not always perceived as negative. Some partners saw the pandemic as bringing positive engagement outcomes. In the case of the enforced use of virtual engagement mechanisms such as webinars, an increase in the quantity of routes to engage the public was noted.

For our webinars, (engagement) is at a level that I don't think we would have had if we've been doing it in person. Because I think people have that "I don't want to travel. I don't want to, you know. I don't want to go places" and actually by doing webinars we're getting a really good amount of engagement from them.

Claire (private sector); LEO interview. (23rd April 2021)

Moreover, the view of COVID-19 as having positive outcomes for public engagement was framed by one LEO project partner as increasing the democratisation of SLES implementation:

COVID's been very strange in terms of its impact on engagement, so in one sense it's actually really democratizing.

Samantha (third sector); LEO interview. (6th May 2021)

For some, a shift to virtual methods of engagement resulted in a wider range of types of publics interacting with the project [22], and a broadening of SLES futures that were imagined by users [30]. As such, the impact of the pandemic on engagement seemed mixed, opening up new pathways for engagement via remote methods of communication and consultation, as well as closing down opportunities through limiting face to face interactions, and driving a focus on early adopters as primary target groups.

4.2.3. BREXIT

The UK exiting the European Union was deemed an influencing factor on engagement. This was suggested to introduce more complex purchasing and import protocols, which could cause delays in imports of project-related technology. This was specified as a key issue by ReFLEX project partners when promoting EV ownership (e.g. delays in car arrival timescales and the installation of EV charging points).

It's been a huge challenge, to get the project up and running, to get it promoted to help people understand and then manage expectations and not sound like just making excuses…But unfortunately the people who are now waiting for chargers are the same people who were waiting for months for a quote for a car because of problems over Brexit.

Emma (third sector) and Ruth (private sector); ReFLEX interview. (15th July 2021)

4.2.4. Delays in project delivery and project extensions

Factors such as BREXIT, which caused delays in product delivery, had negative impacts on engagement practices. Partners expressed concerns about the impacts this had on community perceptions of projects, given extensive time gaps between project marketing and awareness raising on the one hand, and concrete actions and technology installation on the other.

There's a long time in between the local community, for the first few months in 2019 we went out to the shows speaking to people doing loads of engagement, being told this is going to be the best thing ever, and then there was a long period of, you know, the project not launching.

Emma (third sector) and Ruth (private sector); ReFLEX interview. (15th July 2021)

Delays led SLES partners to reassess engagement strategies to avoid any negative response due to perceived lack of project activity. For example, ReFLEX project partners reflected on how learnings occurred due to these delays, focusing on the need to more closely match plans for engagement timings with project delivery schedules.

A direct impact of the pandemic was the provision by the funding programme of an extended timeframe for project delivery. This involved a one-year no-cost extension to each demonstration project. This extension was viewed positively by project partners, providing more time to engage target groups. This was most clearly evident in the case of heat pump installation in social housing (ESO).

The fact that the project has got extended by 12 months is a boon in a way. Because actually when we're talking about the heat and encouraging tenants to switch over to time of use actually I think time is really crucial.

Amanda (private sector); ESO interview. (1st September 2021)

This statement highlights a positive impact of delays on engagement, with longer project durations providing more time for partners to encourage behaviour change and understanding of time of use tariffs. It also suggests that initial project delivery timeframes determined by the PFER programme constrained in-depth public engagement. Although these were adjusted due to unforeseen changes and influences, it could be argued that the timeframe initially agreed for project delivery underestimated the duration required for effective user engagement.

4.2.5. Social learning

Finally, there was some indication that engagement changed over time in SLES case studies due to project partner evaluations of engagement outcomes. In the ESO case study, some partners viewed initial engagement in the form of communication mechanisms as overly technical for target audiences. This suggests a predominant information-deficit perspective about publics [50] held by project partners. In response, changes were made, post initial engagement, to address potential misunderstandings and alleviate concerns.

I think in terms of communication… it's quite technical, some of it, and how that translates to public communications is often people get the wrong end of the stick or they simplify.

Stuart (academia); ESO interview. (14th July 2021)

In this instance ESO used press releases as an initial engagement mechanism. As a communication method, it does not allow for controlled selection or facilitate elicitations, and it lacks an open response mode. Press releases are also inflexible in their information input and non-face-to-face in their medium of information [26].

5. Discussion

Driven by the aim to understand how SLES partners engage with publics as new projects progress from emergence to deployment stages, we investigated how public engagement is represented and interpreted by SLES partners. This revealed an emphasis on communication and consultation mechanisms used to engage potential adopters or technology users, intermediaries, local neighbourhood groups and publics

more generally. Analysis of change over time indicated shifts in engagement away from face-to-face methods, as well as a narrowing of focus upon potential adopters alongside communication with indeterminate publics, with less emphasis upon engagement with local neighbour groups, potentially impacted groups, and intermediaries.

These shifts raise critical questions concerning the dynamics of SLES emergence as evidenced across the case studies. Firstly, with a relatively small range of project partners deciding messaging, the variety of future energy visions within a locale or community may be overlooked. The narrowing of inputs into project deployment risks limiting the uptake and acceptance of project innovations [51]. In turn, this could moderate both the embedding of new initiatives in particular places and communities. In addition, it could moderate the potential for partners to learn lessons relevant to upscaling elsewhere. Without inclusive engagement processes, the challenge to enable a just transition to more sustainable energy systems, with fair distribution of costs and benefits is greater [52]. Limiting methods of response therefore undermines social inclusion and the promotion of a more democratic input into SLES design and deployment. This is problematic considering that key barriers to local integration of low carbon technologies and services are often non-technical, and in many cases linked to the fostering of acceptance, overcoming resistance, and the alignment of visions [42].

Shifts over time to increase the number of untargeted one-way communication mechanisms also meant an increased reliance upon engagement with indeterminate publics. Given these changes, whether engagement is targeted at those most in need of local energy system change is questionable. Notably those in fuel poverty with precarious socio-economic circumstances, who are also less likely to be early adopters of heat pumps or EVs that require upfront investment. This raises questions of procedural fairness, along with the level of inclusion, which may cause an unjust distribution of SLES costs and benefits [4].

The identified shifts in engagement were attributed to a range of factors including COVID-19 and BREXIT. That projects were disrupted by both is unsurprising. An emerging body of research has begun to catalogue the impacts of COVID-19 upon energy transitions, identifying an 'engagement crisis' arising from restrictions in face-to-face interaction [45] and a curtailment of intermediary work in community energy projects [44]. The findings of this research, to an extent, support these early studies. Nevertheless, a narrowing of who is engaged with, together with a reduced emphasis upon consultation are not inevitable shifts. After all, both consultation and participation mechanisms using remote delivery methods are not novel (e.g. online focus groups, [53]), even if they raise important issues of digital inclusion [54]. Instead, our findings provide insights into engagement prioritisation by project partners in the context of a government-funded deployment programme founded upon narratives of clean growth, technological innovation and local solutions upscaling. In that context, when faced with unexpected constraints, our findings suggest that project partners responded by prioritising technology deployment and income generation.

By viewing publics chiefly as consumers (i.e. potential adopters) and engagement as attempts to influence those choices through communication and consultation approaches [30], opportunities to engage with residents as individual citizens and community members are overlooked (with LEO as a key exception). This is despite the consensus that with community level decentralised energy schemes, increased levels of 'success' are achieved by projects with a strong emphasis on community engagement and participation [51]. Such projects are also more likely to endure, beyond specific funding schemes [41]. This limiting of participation, even if responsive to significant challenges such as a global pandemic, raises questions about SLES deployment's inclusiveness.

Viewing publics as customers not only renders collective empowerment less likely [29], it also reduces opportunities to engage with publics around broader aspects of environmental and climate emergency. Conversations with publics around local decarbonised heat, transport, power generation and storage innovations could offer starting points to catalyse engagement relating to broader sustainability transitions. This includes changes to local environments leading to biodiversity loss, air and water pollution etc. As such SLES deployment could be re-imagined as place-based processes of social transformation [45], focusing on climate change mitigation to achieve enduring social, environmental and economic change.

Our contribution to the wider literature on public engagement is twofold. Firstly, despite academic recognition of the importance of engagement, previous research has typically looked at engagement with energy projects at one time point (usually at early stages). Few studies have considered context changes and potential disruptions to initial plans. Secondly, we deem our approach to contribute to understanding the ongoing process of tracing how projects become rooted in a place, moving from awareness raising to technology deployment. For instance we extend work by Hargreaves et al. [16] by studying the response to [external] disruptive events, something not explored by those authors when studying households' energy practices over time. Theoretically, Cardullo and Kitchin's iteration of Arnstein's Ladder is invaluable here, particularly considering much of the engagement activity was around market offerings. This notion of commercial offerings is something Arnstein's original work does not focus on. As such our data supports Cardullo and Kitchin's revisions/updates to Arnstein's Ladder. The boundaries between Rowe and Frewer's communication, consultation, and participation are not always clear cut. Examples of online chat facilities within websites, or exhibitions offering project information and routes to answer specific questions, highlight how mechanisms can sometimes be considered indicative of both communication and consultation types of engagement.

Several limitations of the research are acknowledged. Although we selected all demonstration projects receiving funding via the PFER programme, we recommend future research to examine engagement with publics in the context of community-led local energy system projects. Second, we acknowledge a relatively small number of interviewees at the second point of data collection. Just as the case studies were impacted by COVID-19 restrictions, so was the research. This required a shift from in-person group workshops to in-depth interviews conducted remotely. While doing so, we interviewed key individuals who drove engagement practices across the case studies and maintained the qualitative approach, ensuring methodology consistency. Third, we are aware of the relatively short time gap between phases of data collection in attempting to reveal the dynamics of change. However the magnitude and significance of changes impacting on the case studies across this time period, especially COVID-19 and BREXIT, merit detailed research attention. This impact of COVID-19 also highlights limitations to the generalisability of our findings, given the unprecedented curtailment of social interactions arising from the pandemic. However, we believe that this limitation is a matter of degree. External factors are always likely to influence and impact how engagement pans out in actuality in contrast to project partner intentions. How partners respond to those disruptive events and impacts over time is a highly important research topic [53].

6. Conclusion

Findings highlight that engagement with publics in SLES case study demonstration projects was mainly characterised by communication and consultation mechanisms, with a view of publics as consumers. Despite important differences between SLES and other decentralised energy initiatives, these findings support previous research indicating limited attempts by partnerships, and private companies in particular, to genuinely engage with communities, in contrast to initiatives led by third sector community organisations [41,42]. In turn, this provides empirical support for research that questions the implications for inclusive energy transitions of rhetorical shifts in policy away from 'community energy' to 'local energy' [17].

Findings add to a growing literature on COVID-19 impacts on energy transitions [44,45], and provide meaningful insights into how engagement with publics evolves over time as partners seek to implement local

technological innovations despite disruptive events. These highlight the importance of using a temporal, dynamic approach to understand public engagement with new decentralised energy systems [26], and the need for a stronger emphasis upon engagement within literatures on technology innovation and energy system transitions [54]. While responses to disruptive change were occasionally positive, they can predominantly be characterised as negative. It is also clear that some project partners recognised the negative implications of these shifts for equity and fairness in energy transitions.

Recognising the diversity among the cases - chiefly the strong emphasis upon community participation in the LEO case - we note that the provision of limited opportunities for community empowerment suggests a continued necessity to highlight the potential for local energy initiatives to go beyond narrow, short-term technology deployment goals. Viewing conversations about novel energy systems as a catalyst for broader engagement around sustainable transitions can prevent missed opportunities. Conceiving SLES projects as contexts to co-create systemic change with publics in particular localities using participatory methods, projects can contribute to broader goals of place-making, just transition and social transformation in a context of environment and climate emergency.

Declaration of competing interest

All authors have participated in (a) conception and design, or analysis and interpretation of the data; (b) drafting the article or revising it critically for important intellectual content; and (c) approval of the final version.

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Data availability

Data will be made available on request.

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