Talking about targets: how construction discourses of theory and reality represent the energy performance gap in the United Kingdom

Abstract

Targets for energy performance in operation have been advocated as a solution to the well-documented mismatch between the expected and actual energy use of buildings. Although construction industry actors will be crucial in realising these targets, their response to them is currently under-explored. Augmenting research on how middle actors shape energy consumption, this paper examines how everyday talk in the construction industry sustains this mismatch, drawing on a study of a hospital construction project with targets for energy in use. It applies Gilbert and Mulkay's approach to discourse analysis, particularly their interest in "accounting for error", to data drawn from interviews with actors across the construction project, observation of daily life on site, and an examination of written interactions. Findings show how actors make a discursive division between the "theory" and "reality" of energy use. Expressing scepticism about "theory", in particular, allows them to rationalise problems with future operational energy consumption and thereby mitigate their professional liability. This division therefore perpetuates, rather than overcomes, the separation between energy in design and operation, displacing a more collaborative discussion of performance expectations. This challenges the assumption that targets for energy in use can be effective without accompanying changes in industry incentives and ways of working. This paper argues for more attention to the patterns of talk that are found in the construction industry, in order to uncover how this crucial set of actors will respond to new energy policy incentives.

Key words

Discourse; non-domestic buildings; construction; energy performance gap; energy performance targets; middle actors

1. Introduction

European Union member states share obligations to reduce energy used in the building stock, in particular through the Energy Performance of Buildings Directive (The European Parliament and the Council of the European Union, 2010). However, they also share the challenge of ensuring that new buildings deliver on these objectives (Brunsgaard et al., 2014; Herrando et al., 2016). The frequent failure of newly-constructed buildings to play their part in meeting energy efficiency aspirations has been termed the "performance gap" (Carbon Trust, 2011; de Wilde, 2014). Understanding this gap is difficult as there are a myriad of potential contributing factors, illustrated in Figure 1 below.

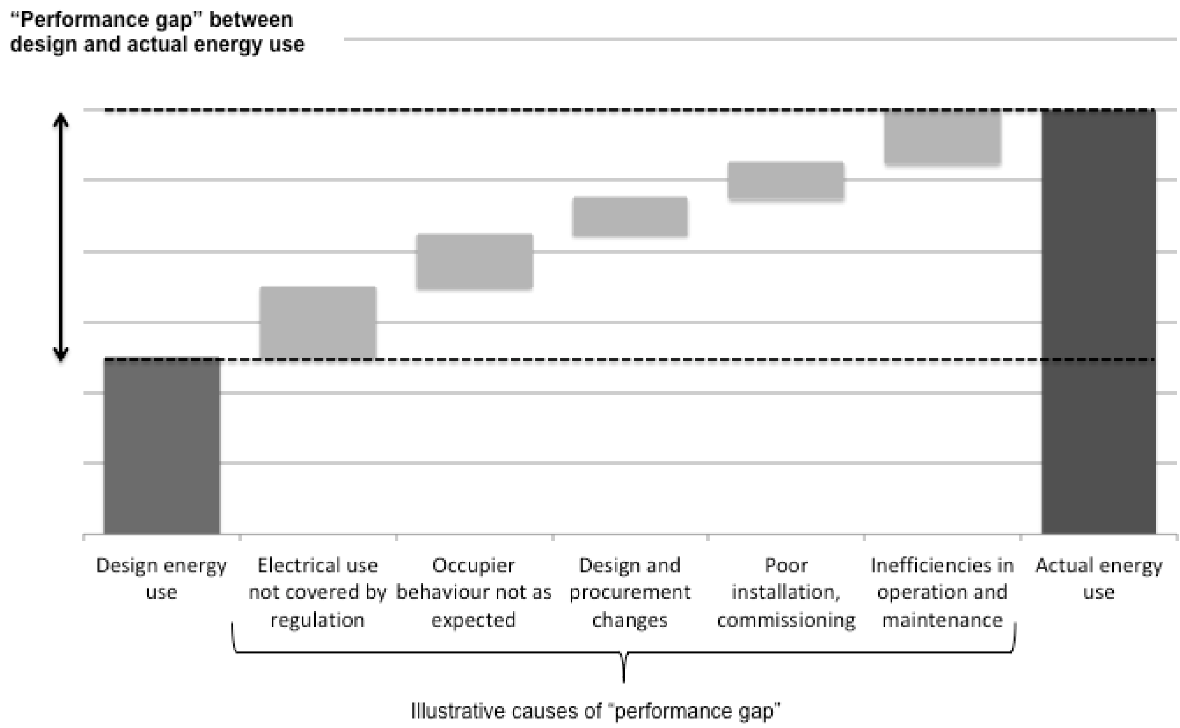

Figure 1 - Illustrative causes of the "performance gap" between design and actual energy use (adapted from: Carbon Trust, 2011; Bunn and Burman, 2015).

This paper focusses on the non-domestic building sector in the United Kingdom, which accounts for around 10% of national carbon emissions, and where policy innovation to curb energy consumption is arguably badly needed (Committee on Climate Change, 2017). Existing research has already highlighted the ineffectiveness of current national regulations in offering tools to predict and monitor the energy performance of non-domestic buildings once they enter into use (Burman et al., 2014). Market-based initiatives for new buildings in the United Kingdom, notably the Building Research Establishment's Environmental Assessment Method (BREEAM), have also struggled to drive emissions reductions in operation (Lowe et al., 2017). This suggests that new instruments are needed in this sector to encourage buildings that perform in practice, as well as on paper.

One potential strategy is to introduce new mechanisms, such as targets or ratings, to assess buildings on their energy efficiency in use (Tuohy and Murphy, 2014; UK Green Building

Council, 2016), and therefore overcome the current focus on design compliance (Mallaburn, 2016; Cohen et al., 2017). Specific targets for energy and carbon in use have already been used in some public sector projects, and a few commercial buildings (Palmer et al., 2016; Jain et al., 2017). Yet previous research has indicated that an obligation to consider energy performance in use through targets or benchmarks does not necessarily guarantee a better building (Dasgupta et al., 2012; Morgenstern et al., 2016). This suggests that a more detailed understanding of stakeholder responses to such new incentives for in use energy efficiency is needed.

The present paper responds by exploring operational energy and carbon targets in a case study non-domestic project. It focusses on the stakeholder group that is arguably most affected by the introduction of energy targets, but is still relatively under-researched in terms of its response: construction industry actors. Gilbert and Mulkay's approach to discourse analysis (1984) is used to identify the contrasting "interpretative repertoires" used by professionals to support or disagree with the findings of others in their field. The repertoires allow actors to "account for error", by rationalizing factors behind professional "mistakes", and reinforcing the values of good professional work. Drawing on this idea, this paper explores how construction actors in the case study project talk about energy targets, analysing the patterns of participants' discourse found in interviews, observation, and documentary data. By concentrating on how actors rationalise energy performance expectations in their own terms, the aim is to use this analytical framework to engage with the important debate on operational energy performance in buildings, balancing theoretical novelty with socially useful research outputs (Sovacool et al., 2018).

The paper will begin by reflecting on what research has uncovered about stakeholders' responses to energy policy through discourse and narrative research. Here it considers how this paper can contribute to the literature, and to our knowledge of how construction industry actors could be encouraged to reduce buildings' energy use. It will then describe Gilbert and Mulkay's form of discourse analysis in more detail, and its application to professional communities. The next section will describe the case study background and the methods of data collection. The findings will explore how construction actors in the case study create a discursive separation between the "theory" and "reality" of energy performance, which enhances rather than overcomes differences between a building's design and operation. The discussion that follows considers actors' concern for professional liability, and how this may displace more collaborative discourses. Finally, the paper offers conclusions and implications of this work for both construction companies and policy makers. It also argues that future research attention could usefully be paid to construction actors' talk around energy, complementing work already focussing on their practices.

2. Research context

2.1. The value of examining energy talk in construction

The words we use to talk about energy and carbon are important. As Moezzi et al. have observed, "energy stories" merit study because of their power to shift our perspective, as they "change who speaks" and "who gets heard" (2017:8). For instance, actors involved in the implementation of energy efficiency may speak about it in very different terms to those used in research or policy (Galvin and Terry, 2016). The language in which the environmental performance of a building is assessed also shapes its "story" and stakeholders' responses to it (Cole, 2005; Coleman and Robinson, 2018), and potentially therefore the judgement as to its success (Janda and Topouzi, 2015).

Research into high-level societal discourse around low carbon and energy issues has already revealed how language can shape understandings of new policies. For example, energy systems models may create a world and a narrative of the future that is “discourse dependent and socially constructed” (Ellenbeck and Lilliestam, 2019:74). Cherry et al. (2015) showed how the focus of media discourse on technical and economic paradigms of low carbon housing pushed out other potential solutions. These studies reveal valuable insights into the active role that discourse plays in shaping society’s response to energy efficiency and reducing carbon emissions. However, they have not yet explored the ground level response of communities to energy policies, for whom the glacial movement of societal change may be experienced as immediate and destabilising in their everyday lives (Graff et al., 2018).

Meanwhile other research indicates the value of exploring the response that energy transitions meet “on the frontline” through local communities’ discourse (Darby, 2017). In evaluating the performance of a building, gathering “survey stories” from occupiers’ experience can be a vital counterpoint to technical, quantitative data, by revealing not just what happened to energy use, but also why (Day and O’Brien, 2017). Moving between high level shifts in policy discourse and its localised implementation can, for example, reveal the considerable interpretative flexibility of sustainable buildings policies, and the resulting variation in their outcomes, as they are continually re-negotiated between the many actors involved in construction projects (Moncaster and Simmons, 2015). Yet despite this, there is often little feedback from implementation into built environment policy (Foxell and Cooper, 2015), meaning that the insights that could come from exploring how wider objectives actually feed through into the local discourses of individual communities are lost. Thus it is vital to consider how new energy policy instruments are "negotiated on the ground" (Schweber, 2017:302) by the stakeholders whose day-to-day lives they affect.

In addition to providing an “on the ground” perspective on low carbon policy implementation, a focus on localised discourse may also reveal the mutability of the underlying concepts and ideas that are drawn upon. Discourse analysis shows us, for example, that “the concept of a green building is a social construct”, meaning a common commitment to “sustainable building” is actually subject to individually varying, and contested, conceptions (Guy and Farmer, 2001:140). General policy aspirations for more “low carbon” or “zero carbon” buildings must also negotiate the practical boundaries of what this includes within its definition, (Schweber et al., 2015). There is therefore a tension between shifting and slippery definitions of “green” buildings and the translation of these into tangible actions and artefacts (Stenberg and Räisänen, 2006). Attending to the everyday discourses of the professional groups charged with the implementation of low carbon buildings policy could therefore reveal much about how they perform these translations.

Talk in construction is of particular relevance to energy targets, given the influence of construction companies and their subcontractors as important “middle actors” in buildings’ energy outcomes (Janda and Parag, 2013), and the well-documented difficulties of communications between the different professions and stages of construction projects (Kesidou and Sorrell, 2018). In response to Janda and Parag, the importance of middle actors to energy use in buildings has started to receive greater recognition by social scientists (Schaffer and Brun, 2015; Wade et al., 2016; Gram-Hanssen and Georg, 2018). These studies indicate that middle actors are much more than passive intermediaries for energy transitions, as their ways of responding to various imperatives strongly influences subsequent energy use. A recent study by Wade et al. (2018), for example, indicates that language plays an important role in architects’ and heating installers’ professional positioning, which may in turn restrict their advocacy for energy-saving opportunities. However, research that focusses directly on construction actors' discourse around energy, or response to energy targets, is relatively sparse.

Gluch and Räisänen, (2009) used critical discourse analysis to examine the dissemination of environmental priorities in major construction projects. They uncovered differences in the form and culture of communications between management and project staff, which directly affected the level of engagement. Ludvig et al. (2013) examined the response of a Swedish organisation that owns and manages a number of large public buildings to a new regional energy target. Using concepts of organisational sensemaking, the study found that the target became successfully "anchored" within the organisation, facilitated by a sensitivity to the appropriate times and forms to engage with stakeholders. These studies indicate that discourse is a vital part of engagement with energy policy amongst built environment professionals. Thus an appreciation of how construction actors talk about the challenge of energy targets amongst themselves will contribute to the existing pool of knowledge around energy discourse, the "performance gap", and the potential of energy targets like these for national low carbon buildings policy. This paper does so by applying discourse analysis to a particular case study of energy targets.

2.2. Employing a discourse analysis of "accounting for error"

Discourse analysis comes in many forms (Alvesson and Karreman, 2000). The version used here is Gilbert and Mulkay's (1984), which has its roots in Science and Technology Studies (STS). Gilbert and Mulkay based their work on a case study of biochemists researching oxidative phosphorylation. The community of biochemists was engaged in debating the relative reliability of the divergent findings of different and competing expert groups. From this case study, Gilbert and Mulkay identified a number of recurrent patterns in which scientists spoke about their work, which they termed "interpretative repertoires". The scientists used these repertoires to "account for error" in their discussions of whether research findings were deemed to be correct or incorrect. The concept is illustrated in Figure 2 below. As this shows, Gilbert and Mulkay found that their case study scientists used one interpretative repertoire when they wished to promote a particular finding or person's work, and another when they wished to discredit it. In this way, they used the repertoires to "justify and validate" (1984:64) their versions of events, and to suggest that unreliable results ("errors") were created by poor practice, or the intrusion of inappropriate (non-scientific) factors. Gilbert and Mulkay's repertoires can therefore be used to construct a dichotomy between reliable and unreliable science, and in doing so, to draw the boundaries of a professional community and its knowledge (Mulkay, 1993).

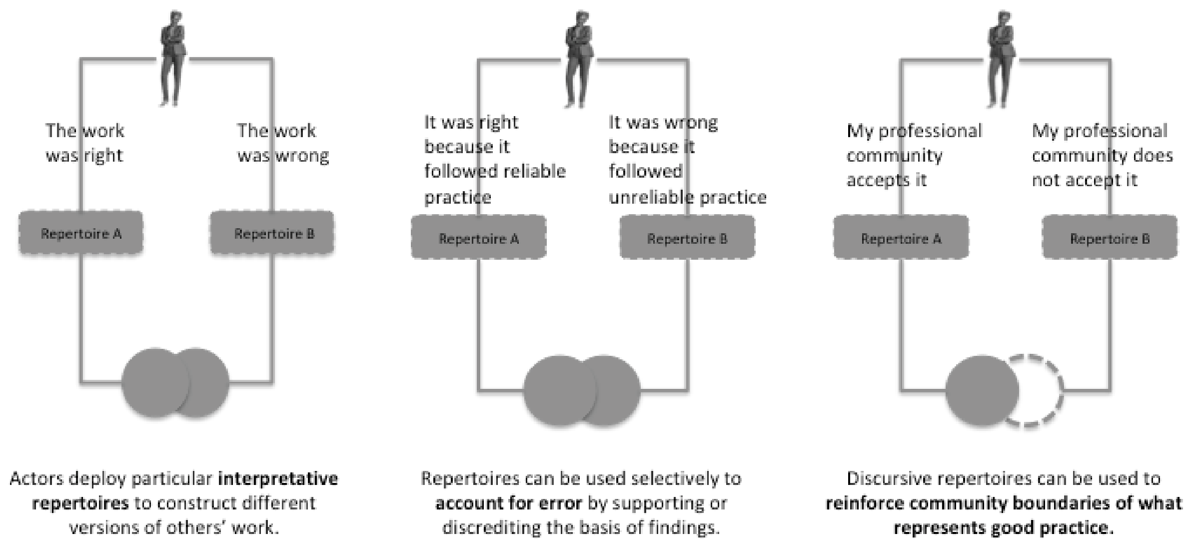

Figure 2 - "Accounting for error" in Gilbert and Mulkay's discourse analysis (1984)

Whilst Gilbert and Mulkay's approach later evolved into a widely used form of discourse analysis (Potter and Wetherell, 1987), the original approach has been most often employed in the scientific arena where it began. Research over the years has, for example, used Gilbert and Mulkay's repertoires to show how scientists use discourse to defend controversial positions and undermine their critics (Hedgecoe, 2001; Michael and Birke, 1994). The concept of "accounting for error" has been used to show how repertoires excuse scientific errors by implicating the influence of external factors (Kerr et al., 1997), and how they are used to distinguish between fraudulent research and scientific truth (Augoustinos et al., 2009). Most recently, Will and Wiener (2014) used interpretative repertoires to explore rationalisations of "good" and "bad" dietary habits. Although Sherratt et al. (2013) have, for instance, employed some of the key concepts of interpretative repertoires to explore discourse around safety on construction sites, Gilbert and Mulkay have not been used to examine how construction actors talk about energy use in buildings.

This paper does exactly that. It is important to note that there are clear differences between the diversity of professions involved in a complex non-domestic building project and the more homogeneous community of biochemists on which the original work focusses. However, there are also interesting parallels. The community scale of Gilbert and Mulkay's discourse analysis may suit a case study of a construction project, as it deals with what discourse reveals about how professionals work together on a particular concern, and how they rationalise their differences. Gilbert and Mulkay's approach enabled them to explore the professional frictions between different scientific teams, and the terms they employed to agree or disagree with each other. This aspect has the potential to transplant well to construction, in spite of the differences in the nature of the communities.

Additionally, Gilbert and Mulkay's sensitivity as to how actors' accounts of events created or reinforced concepts of good professional practice is attractive in light of how the discourses of construction's middle actors were likely to represent the energy performance gap. Both Gilbert and Mulkay's scientists and the construction actors must confront an evolving, technical phenomenon where the causes are under debate. Both are also required to "account for error" in presenting interpretations of events and explaining when things go wrong (1984:63). These parallels suggest fruitful common ground, whilst bearing in mind that it is in the differences between empirical cases that new insights may be discovered (Vaughan, 2014).

3. Background and method

3.1. The case study project

Data was gathered from a new-build hospital project in the United Kingdom with targets for energy and carbon emissions in use. The main construction contractor, referred to in this paper as "Construction Co.", was responsible for the project's design, build, and facilities management. Targets for energy and carbon in the operational phase of buildings are currently exceptional in the United Kingdom. This case study therefore represents a rare opportunity to assess how construction actors respond to this unusual, and potentially challenging, requirement. Construction Co.'s contract contains legally binding targets for the hospital's energy use and carbon emissions in operation, beyond the requirements of national building regulations and the BREEAM standard (Table 1). Construction Co. is liable if actual performance exceeds the targets due to failings in design or construction (Doc - construction energy targets penalty clause). For the sake of simplicity these two targets are referred to collectively as the "energy targets".

Operational targets (the "energy targets")	**Operational energy target** Comparison of energy in use in $GJ/100m^3$ to target energy use specified in contract. The target is in the range of 35–55 $GJ/100m^3$, consistent with National Health Service requirements at time of procurement.
	Operational carbon target Comparison of carbon emissions in use in $tCO_2/100m^3$ to target emissions specified in contract. Target is approximately 30% improvement on Building Regulations at time of procurement.
Features of energy efficient and carbon saving design	• On site renewable generation • Efficient fabric performance (e.g. U values exceed minimum per Building Regulations) • Solar shading • Highly efficient heating, ventilation, and cooling systems • High efficiency lighting • Enhanced Building Management Software to aid energy monitoring
Expected air permeability	5 $m^3/(h.m^2)$ at 50Pa.
Expected BREEAM rating	Excellent

Table 1 – characteristics of the case study hospital and its energy targets

(Derived from: Department of Health, 2013; Doc – Sustainability Statement)

3.2. Method

Data was gathered from a mix of interviews, observation, and documents, and in total comprised: 31 interviews; 177 documents; and 73 hours of observation. Participants were drawn from many different departments and roles across Construction Co. and its subcontractors (Figure 3). Interviews participants were encouraged to talk about how they approached the energy targets in their daily work, who they communicated or worked with on the targets, and what difficulties, if any, they encountered. Field notes were used to record a range of construction activities relating to the targets, including site work, events, meetings, and conference calls. Documents were examined from various stages of the project, including: contracts, reports, presentations, planning submissions, design documents, and emails. Data sources are referred to by type ("Int", "Doc", "FN") and the individual source name in the findings.

The fieldwork engaged with the hospital during its construction and commissioning. Details of bid and design were collected from participants, who were also asked to reflect on, or provide information on, plans for operation. The construction and commissioning phases are a critical part of an energy efficient building's evolution that falls in the "gap" between design and operation, and are therefore of significant interest to researching actors' attempts to mediate between those two points. However, two key challenges for both the construction actors and the researcher are the complexity of energy use in hospitals (Kolokotsa et al., 2012), and the extended timescales and variations in personnel between design, construction, and operation. This means data coverage of events or actors in such a project is inevitably selective (Marshall and Bresnen, 2013).

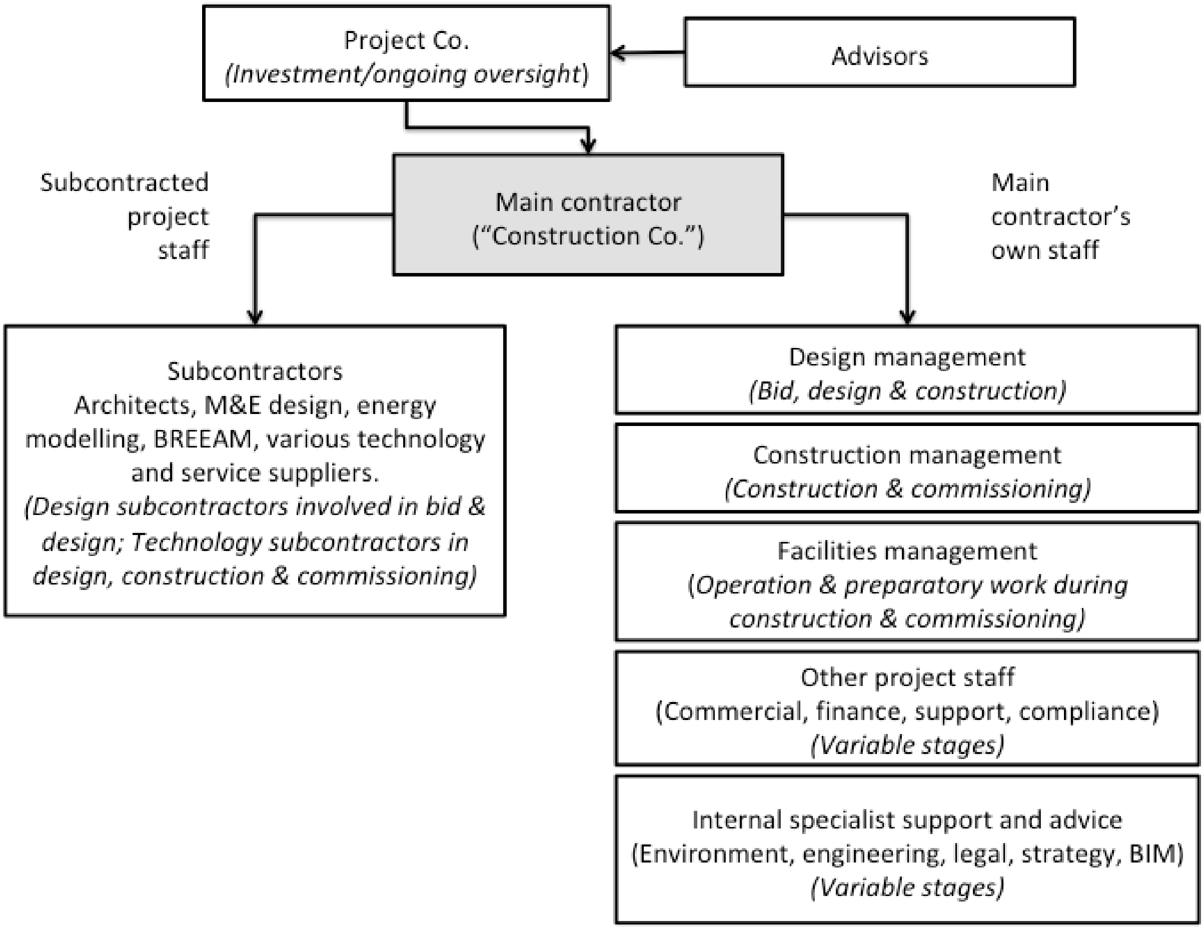

Figure 3 – Schematic of participants engaged during fieldwork

Coding and analysis were performed using NVivo. Following Gilbert and Mulkay's approach, the analysis began with an open mind. Interpretative repertoires are identified from linguistic patterns recurring across many participants' discourse on a particular topic, or within a particular community, such as the construction actors in this case. Hence, the present analysis focussed on searching for differences in content, form, or features found in different actors' accounts, as well as the functions of these discursive patterns and their consequences. The analysis indicated that when participants wanted to account for possible "errors" in achieving the contractual energy targets, both in their views on the eventual outcome, or in the work done to support it, they used contrasting repertoires of the "theory" and "reality" of energy use. The next sections will explain the characteristics and associations of these two repertoires and the difficulties that actors perceive in mediating between them, using Gilbert and Mulkay's framework. The discussion will then step back to consider how this can help us understand the response of the construction actors to the new incentive of targets for energy performance in use.

4. Repertoires of theory and reality

A discursive separation between the "theory" and "reality" of building energy use appeared consistently across the data in the study. These exact words are not always used, but the distinction recurred with enough regularity, and within the discourses of a variety of project actors, to be reasonably confident that it represented the "patterned variations" that Gilbert and Mulkay describe (1984:40). The interpretative repertoires were characterised by a verbal contrast drawn between a theoretical design or prediction of energy, and what "really" happens:

> "One thing is design and one thing is how it really works"
>
> (Int – Design Subcontractor 8)
>
> "There will be a difference between what we think and what's going to happen".
>
> (Int – Project Co. 1)

Sustaining this generalised and recurring contrast were a series of activities with which "theory" and "reality" were associated. Each repertoire was also ascribed certain characteristics, from which their relative reliability was derived. The findings that follow explore the repertoires of "theory" and "reality" in detail.

4.1. The theory of energy use

"Theory" is firstly associated with existing regulations and standards that focus on design, as, in spite of the energy targets, compliance with these familiar requirements is still often uppermost in actors' minds when they talk about energy or carbon (Int – Technology Subcontractor 9, FN - site inspection tour). However, professionals directly involved in complying with regulations and standards do not regard their design calculations as "real". Part L of the building regulations, which deals with energy conservation, is a clear example:

> "Design Subcontractor 8: We are just in process to re-calculate the energy.
>
> Interviewer: Ah ok. The Part L?
>
> Design Subcontractor 8: No, the real energy."
>
> (Int – Design Subcontractor 8)

The non-regulatory BREEAM standard, which rates buildings on a number of sustainability indicators including energy and carbon, is another example in which design participants spoke of "theory" (Int – Design Subcontractor 1; Int - Design Management 3). A BREEAM credit, for example, is anticipated for undertaking a thermographic survey of the completed hospital:

> It will show, Environment Support 1 says, leaks and insulation gaps – but they are only required to find them, not actually remedy them, although the theory is they will.
>
> (FN – on site field notes 5)

The focus of regulations and standards on design is one of the central reasons behind the performance gap (Cohen et al., 2017). However, as the project's energy targets are imposed in addition to, not instead of, regulations and standards, these "theoretical" requirements continue to occupy actors' time and attention. Those closely involved in working on compliance with BREEAM and building regulations, such as design subcontractors and Construction Co.'s own environment support specialists, use "theory" to describe their limitations. However, others in the project with less day-to-day involvement may lack the detailed understanding to separate them from the calculations for the operational energy targets, as one of the design subcontractors worries:

> "I think a lot of people actually think these carbon figures are real. But they are not."
> (Int – Design Subcontractor 8)

The repertoire of theory frequently appears when actors talk about energy modelling, which may be discursively separated from "reliable" data. Two of Construction Co.'s engineers, who provide technical support throughout the project, illustrate this scepticism:

> "So we had our energy simulation and we had reliable empirical data."
> (Int – Engineering Support 2a)
>
> "It's a simulation based on a kind of like a scenario, or what we call normal use. And the only thing we can be sure of, is that it will never, ever occur in reality!"
> (Int – Engineering Support 1)

The data contains many explicit criticisms of models by a range of participants, including software problems, data omissions, optimistic assumptions, and an inability to predict occupiers' behaviour (FN - conference call with Engineering Support 1; FN – internal energy experts meeting 1). Despite this, the energy model remains the principal tool for assessing energy use at the design stage, and hence also a key driver of the strategy to address the operational energy targets (Doc - energy and carbon proposals). Thus the theoretical repertoire can be used to express dissatisfaction with current compliance processes and tools for predicting energy use, by both those who produce them and those who use them.

Following the usual approach for projects, the detailed design work, and the supply of energy-using technologies, is outsourced to specialist subcontractors. These activities are also tarred with the theoretical brush by Construction Co. staff, who rely on their results due to their specialist project tasks or in design and construction management. Design subcontractors, it is suggested, may specify solutions that "can't actually be sourced in reality" (FN - meeting with engineering support team; Int - Environment Support 4), or use performance criteria under "optimal functioning" (FN - conference call with Engineering Support 1). Equipment suppliers are blamed for exaggerating what they can offer (FN – environment support meeting 1), and giving performance figures that work only "in the factory" (FN - site inspection tour). Construction Co.'s managers explain their role in sense-checking subcontractors' specifications for such issues:

> "They quite often…try and push it to get the best. Which is fair enough. But some of the things they asked for wasn't achievable."
>
> (Int - Construction Management 1)

Optimism about operational efficiency might be unproblematic in projects without operational energy targets. However, in the case of the hospital, it causes Construction Co.'s staff concern about the problems theoretical assumptions may pose for energy performance of the building in use. The interviewee above, for instance, goes on to worry that he might not have asked enough questions of the subcontracted design team (Int – Construction Management 1).

Once the bid is won, the contract terms may encourage theoretical assumptions. For example, on site renewable technologies are selected to comply with the hospital's carbon target (Doc - energy statement), but may be expensive to run. Some participants from both Construction Co. and its subcontractors suggest that therefore the technologies will not be used for long, and the carbon target will only ever be achieved on paper (Int – Technology Subcontractor 3; FN – on site field notes 1). Similar scepticism is expressed about the effect of weather data on energy projections, as the contract stipulates a weather file from a different area of the country to that in which the project is actually located (Doc - academic review of design), leading to a unrealistic projection of operating conditions. Poorly-structured client expectations are therefore also perceived to incentivise theoretical representations of energy and carbon.

4.2. The reality of energy performance

As with "theory", the "reality" of energy use is a repertoire also used by a range of actors across the construction project. A key feature of "real energy", is that, unlike "theory", it can be measured:

> "All I'm interested in is when the building is fully occupied, what does it use?…Because literally, what else is real?"
>
> (Int – Engineering Support 3)

Some of Construction Co.'s management staff suggest that assessing "real" energy will be a fairly straightforward measuring and comparing process (Int - Design Management 1). One participant tells me that this will be facilitated by building management software, as you just "hit a key and it produces reports" (FN - meeting with Construction Management 3). This presents operational data as free from the unreliable mediation of assumptions and perverse incentives of “theory”. According to this representation, energy that is metered is more accessible and more reliable than energy that is modelled, despite the potential for each to inform each other.

A more detailed exposition of how “real” energy data could be collected is given by Construction Co.’s staff who will be involved in the building’s early operation. They foresee a gradual process of learning about the individual building, familiar to them from previous projects:

“Normally at 6 and 12 months, you'd be talking to [Facilities] going, how's the energy going? ...they'll start the energy trend running straight away. They'll be looking at it…and it allows them to understand actually what the running of the building is like. …Because to some extent...until you put it into use, you don't know…there's always this...one is hypothetical, and one's real.”

(Int – Engineering Support 3)

The importance of a detailed, tangible understanding of the building in use is also described by one of the technology suppliers, as he describes how he will be “fine-tuning” and correcting “mistakes” in the early stages of operation (Int – Technology Subcontractor 7). Immediacy is another quality of “real” energy, which Project Co. 1 places value on, as his duties include overseeing the hospital’s operational performance:

> “Well you need the granularity and you need the [clicks fingers]…You wanna look at it right at that very moment, and say what is going on.”
>
> (Int – Project Co. 1)

“Real” energy use is therefore characterised by a situated responsiveness to circumstance and experience, which is distinct from the assumptions made by theoretical models.

As “real” energy is strongly associated with the idiosyncrasies of individual buildings, various actors doubt whether the work done by subcontracted designers can envisage these in adequate detail. As a visiting consultant observes, even the most intricate of models will find it difficult to simulate actual conditions, as they will “get you close but not close enough” (FN - site inspection tour). Occupiers are often taken to play a significant role in the quirks of “real” energy use. They may use the building in different ways, or to a different extent, than design standards assume (FN - meeting with engineering support team; Int – Project Co. 2). As a result, the “human factor” is considered a major, and possibly insurmountable, uncertainty by those involved in design and throughout the project’s lifecycle (Int – Design Subcontractor 8; FN - meeting with engineering support team). It is notable that this worry about unforeseen circumstances and behaviours is shared by professionals from the subcontracted organisations and Construction Co.’s own staff.

4.3. How actors talk about the separation of repertoires

The repertoires of theory and reality therefore reveal the professional activities that construction actors associate with reliable and unreliable energy data, and the characteristics that accompany them. Table 2 below shows how these combine to impute the reliability of energy data in “reality” and its unreliability in “theory”. Attending to how actors sustain these groupings through their talk also highlights how they use the repertoires to “account for error”, in this case to rationalise any potential “performance gap” in meeting the project’s energy targets.

Repertoire:	**Theory**	**Reality**
Associated activities	Design, technology supply, bidding for work	Ongoing engineering support and facilities maintenance
	Generic compliance requirements	Situated and specific
	Modelling	Measuring
Characteristics	Intangible	Experienced
	Unclear, complex assumptions	Visible, accessible
	Optimistic	Achievable
Implication	**Unreliable**	**Reliable**

Table 2 - repertoires of theory and reality

The repertoire of theory is therefore used by many different actors in the project in association with energy projections that they wish to present as uncertain, or flawed in some way. In Gilbert and Mulkay's case, unreliable findings were explained by the intrusion of inappropriate, non-scientific factors. In this case study, it appears to be established industry processes that participants suggest may foster unreliable energy expectations, such as incentives in bidding for projects, design energy modelling, and technology specifications. This also includes building regulations and voluntary standards, whose requirements continue to run alongside the new energy targets and which can become confused with them. It also includes the contract terms that have introduced the energy targets. Construction Co.'s staff use "theory" to express doubts about the reliability of subcontractors' specialist design tools and processes for predicting performance in use. However, some of these specialist subcontractors also use "theory" to draw attention to the inevitable uncertainties and limitations of their work. This suggests a shared emphasis amongst many of the construction actors, who use the repertoire of "theory" to present the shortcomings of existing structures and ways of working to meet the new demands of operational energy targets.

Commercial barriers that separate companies and internal departments are represented as contributing to the separation, by limiting the exchange of energy-related information. For example, although subcontractors who are closely involved with energy modelling emphasise its inherent limitations and uncertainties, Construction Co.'s staff do not have access to the underlying detail (Int – Engineering Support 6). They may therefore feel that they lack a nuanced understanding of it:

> "I wouldn't know if the [energy] model is right, wrong or indifferent."
>
> (FN - meeting with Construction Management 3)

In another example, some subcontractors emphasise that their work may be difficult to understand for "non-specialists", and that consequently they do not transfer "all the backhouse stuff" to Construction Co. (Ints – Design Subcontractor 8, Technology Subcontractors 7, 9). In standard projects, such a detailed understanding of operational energy performance is not necessary for Construction Co.. However, with the introduction of the energy targets, any failure to transfer information relevant to operational performance between professional groups risks that critical changes, assumptions, or uncertainties are not exposed or discussed. In a key illustration of this point, the energy model is updated only very rarely during construction, and the standard variation procedures for design changes made during construction do not record energy impacts (Int – Design Subcontractor 8; FN - environment team meeting 3; Doc - variation form). The resulting lack of common understanding leads to a further reinforcement of the unreliability of "theory".

Another way in which actors separate "theory" and "reality" is by noting physical presence or absence at the building in its construction or operation phases. The repertoire of "real" energy emphasises physically "being there", implying that those who are not present on site cannot understand it. So, for instance, design subcontractors are criticised by Construction Co. staff for being "on their backsides in London" (FN – on site field notes 1), whereas a member of engineering support staff states his credibility by saying that he frequently visits the site: "if you look in the boot of my car, you will find a site bag with a pair of boots in it. And if I need to put them on, I'm on… " (Int – Engineering Support 3). This verbal emphasis on the physical separations between activities enhances professional divisions that already exist between the different phases of the building's design, construction, and operation.

Professionals from both sides of design "theory" and operational "reality" also lament the frequent failure to feed operational energy data back into design work. For instance, when considering the limitations of previous project information to inform their work on the hospital, one of the design subcontractors reflects that:

> "I think what would improve the situation if the companies were willing to share...how they run the energy basically, what is measured energy, and you could really get a real picture…but it's a very hard information to get, and not many people I suppose are willing to give that information…"
>
> (Int – Design Subcontractor 8)

His point is supported by comments from a member of the in-house engineering support team, who reflects on a lack of detailed operational energy data from previous projects, (Int-Engineering Support 2a), and from a participant in Project Co. as to the lack of thermal testing of projects to highlight where problems occur in the building fabric (Int – Project Co. 1), both of which could have been used to inform the hospital.

Therefore although actors talk about the value of “real” energy data, it is not often available to them, as it is not regularly collected on projects without energy targets. This means that the divisions between project phases and professions persist. As a result, subcontractors involved in design, such as design engineers or technology suppliers, primarily have access to “theoretical” energy data, which they cannot test against “real” data. Whereas those involved in the building’s operation, such as Construction Co.’s facilities managers and engineering support staff, have potential access to “real” energy data, but few commercial avenues to link it to design “theory”. This serves to perpetuate the distinctiveness of energy “reality”.

Interestingly, tools that could encourage more mediation between different representations of energy use are not a feature of construction actors’ discourse. For example, participants very rarely mention either the Chartered Institution of Building Services Engineers’ TM54 (CIBSE, 2013), which explicitly addresses the evaluation of operational energy performance, nor the Soft Landings framework (Agha-Hossein, 2018), which aims to focus construction industry actors on building outcomes. When explicitly asked about TM54, a member of the engineering support team says that Construction Co. have not used it (FN – meeting with engineering support team). Regarding Soft Landings, Construction Co.’s own staff, including those who will be involved in operation, express uncertainty as to whether it is being used on the project (Ints – Construction Management 1, Facilities Management 2, Design Management 3), whilst a subcontractor suggests it has been rejected as “too expensive” (Int –

Technology Subcontractor 7).

Moreover, a fear of liability is sometimes revealed in discourse, and which may contribute to lack of mediation. For instance, an Environment Support professional observes that bringing more energy modelling work into Construction Co. would also bring unwelcome cost and risk with it (FN – environment support meeting 3). One of his colleagues suggests that amending a subcontractor's specification is unduly "risky" for Construction Co. as it could leave them "liable" (FN – talking to Environment 6n). Moreover, as section 4.2 shows, Construction Co.'s staff often mention the problems of unpredictable occupant behaviour, for which they are not immediately liable, but rarely mention the performance of the building fabric, for which they are. This concern for liability is considered further in the discussion that follows.

5. Discussion

5.1. Theory, reality, and professional liability

The findings illustrate how Gilbert and Mulkay's interpretative repertoires can be used as a lever to open up the construction actors' own problematisation of energy performance. What is most notable is that the introduction of operational energy targets has not created a discussion around the practical means to bring "theory" and "reality" together in this case. If energy targets are considered as a potential policy incentive, it is important to ask why. In Gilbert and Mulkay's original case study, actors used discourse to delineate reliable and unreliable professional practices. The construction actors' distinction between reliable and unreliable energy data, as just shown, also follows this pattern. This discussion will argue that actors' fears of missing the energy targets, and scepticism about the adequacy of existing ways of working to support the control of energy performance in use, may lie behind their verbal division between the theory and reality of energy use. This prevents an open discussion of the uncertainties of energy performance amongst project stakeholders, and in doing so, may help perpetuate the performance gap.

If actors distrust existing "theoretical" predictions of energy use, those in either Construction Co. or its subcontractors who are accountable in any way for the targets may become anxious about being blamed if energy performance is not as expected. As one engineer who has been heavily involved in the contract negotiations for the targets suggests, as much as Construction Co. sees the "green" aspects as important, what he was "really looking at" was "risk" (Int – Engineering Support 2b). In response, professional positioning around who is liable for what is a common feature of actors' discourse about the energy targets. For example, Construction Co. staff may emphasise that the responsibility for energy performance lies with subcontracted designers (Ints – Design Management 1, Engineering Support 3), whilst subcontractors may try to limit their responsibility by emphasising that their work offers "recommendations not promises" (Ints – Design Subcontractors 2, 6, 8, Technology Subcontractor 7). As shown in the findings, actors responsible for producing "theory" in bidding or design, or for reviewing it, may emphasise its limitations. Contrasting the reliability of "theory" and "reality" allows professionals to account for the potential errors of energy performance, by drawing attention to the systemic problems in construction processes and systems that hinder their efforts to build a low carbon building. This displaces the risk of specific accountability from them or their organisation onto more generic difficulties with the prediction and control of energy performance.

For Gilbert and Mulkay's community, and for the construction actors, the repertoires that describe reliable and unreliable work are mutually reinforcing, forming two sides "of the same coin" (1984:79). In the case of the energy targets, the more that “theory” is represented as unreliable, the more it forms a contrast to the reliability of “reality”, and the more difficult and risky the task of meeting the energy targets becomes in actors’ talk. This in turn will likely increase the anxiety about being blamed for professional errors, and so further reinforce the incentive to emphasise the problems of “theory”. The result is that the current discourses found amongst the construction actors may enhance divisions between design “theory” and operational “reality”. This is in direct contrast to the purpose of a target for energy in use: to reduce the energy performance gap by bringing them together.

5.2. Alternative discourses of energy performance

An emphasis on the difficulties of reconciling “theory” and “reality” has an additional effect of displacing other discourses around the eventual performance of the hospital project. If professionals’ discourse focusses on liability management, they are more likely to shy away from investigating reasons behind energy performance issues, for fear of increasing the company’s risks of incurring financial penalties or blame, as illustrated in Section 4.3. This leads to pessimistic and sceptical conversations around the futility of uniting “theory” and “reality”. Hence, dialogues around risk may prevent Construction Co. pursuing more sources of “real” energy data, and impede its ability to mediate between “theory” and “reality”.

The division of repertoires is also enhanced by limited change to standard ways of working, in spite of the energy targets. Lessons could be learnt from the implementation of PassivHaus certification in domestic construction (Johnston et al., 2016), in which significant changes had to be made to the construction process in order to ensure that actual performance was in line with design. As this case shows, existing processes do not necessarily facilitate the exchange of information relevant to energy performance in operation between Construction

Co. and its subcontractors. Examples include Construction Co.'s failure to engage more directly with energy modelling, or to connect its own teams better, such as in the activities of bidding and construction. This hampers Construction Co.'s ability to make important links between design "theory" and operational "reality".

Continuing to talk about the difficulties of reconciling the "theory" and "reality" of energy use tends to entrench representations targets as risks to be managed, rather than opportunities for individuals and their organisations to develop experience in better-performing buildings. The findings show that data from previous projects are not often collected, to the potential detriment of design. Fear of liability is unlikely to encourage either Construction Co. or subcontractors to share more of this data. Therefore, although the findings show that energy targets do foster discussions in Construction Co. and its subcontractors around the challenges of guaranteeing performance in use, the risk of the penalty for failure may not necessarily lead to more effective working processes, nor an energy efficient building in operation.

These findings indicate how the construction of stakeholders' conversations around energy targets runs alongside the physical construction of the building project itself. Incentives for more low carbon buildings may not produce the results expected if they act on existing professional cultures in ways that exacerbate existing divisions rather than overcoming them. Importantly, if Construction Co. and its subcontractors felt able to discuss the grey areas of energy performance openly, such as key assumptions and sensitivities, then they might shift away from the black and white contrasts of opposing repertoires. A clearer, more nuanced understanding of the eventual energy use of the building could result. For this to be achieved, contracts and working processes need to be reconsidered. However, alongside this, more thought about ways to change the conversation about energy targets amongst construction industry actors is also needed. Revealing how construction professionals themselves problematise the energy performance gap in their conversations about energy targets is one step towards a better understanding of this.

6. Conclusions

Targets for energy in-use have been suggested as one solution to the "energy performance gap" of the United Kingdom's non-domestic building stock, where actual energy use is often significantly more than that which was anticipated. Construction industry actors are likely to play a significant role in implementing these targets in individual building projects but, prior to the present study, their current response to such targets had not been examined in detail. This paper has investigated a case study project to establish not what construction actors do in response to energy targets, but what they say, employing Gilbert and Mulkay's discourse analysis. This is a particularly apt approach to reveal how actors' discourse navigates the uncertainties inherent in the case study project's eventual energy performance, and enables them to account for the potential "error" of failing to meet its energy targets.

The findings indicate that whilst the targets do foster a sense of accountability for energy performance in use amongst some actors, as hoped for by some authors quoted earlier (Burman et al., 2014; Cohen et al., 2017). However, they also expose areas in which these actors doubt the capacity of existing processes to help them meet the energy targets. Professionals fear the unpredictability of energy in use, and the resulting risk that they will be held liable for any performance variations. Emphasising the contrasts between energy "theory" and "reality" enable them to shift individual professional accountability onto systemic problems. In this way, the construction actors' response to energy targets in this instance is not to discuss the means by which energy design "theory" and operational "reality" may be brought closer together, but to continue to stress how far apart they are. This in turn contributes to the embedding of existing ways of working that perpetuate the performance gap.

This paper points to the value of examining how policy incentives for low carbon buildings, such as targets for energy in use, are spoken about on the ground in construction. New incentives are less likely to stimulate change if stakeholders choose evasive strategies rather than practical responses. Progress in incentivising construction companies to take responsibility for the performance of their product will not be made if energy targets are spoken about internally as things that are too difficult or too risky to take responsibility for. This suggests that energy targets need to be accompanied by other measures, such as public procurement contracts that foster collaboration and innovation more effectively, rather than simply passing down accountability, as in this case. This would help both construction companies in reducing their risk and improving their experience in building performance, and deliver on national policy aims to reduce energy use in the building stock. Although specific, the case presented here can offer insights as to the challenges of accountability for operational energy performance of buildings for construction in the United Kingdom and elsewhere, given the global reach of many large construction companies, as well as the shared European commitment to energy efficiency in buildings that was noted in the Introduction.

This study enhances the existing literatures on energy discourses, especially those that consider the situated complexities of stakeholders' responses to policy transition. It also contributes to research on middle actors, attending to the agency of construction sector actors in the changes needed to make buildings more energy efficient. Gilbert and Mulkay's approach focusses on how professionals' talk creates divisions between good and bad practice, and narratives that explain away potential errors. Listening to what construction actors say about the new obligations of the energy targets in this study tells us what they, rather than what policy, perceive the challenges to be in producing buildings that meet design expectations. Their talk touches on anxieties around contract incentives, commercial relationships, information availability, workplace tools, and professional liability that other research approaches might not uncover. As such, this form of discourse analysis is a powerful tool to reveal how these influential actors' talk has a formative effect on building energy performance. In terms of research addressing the effectiveness of building energy policies, it therefore makes a case for more attention to the words used by stakeholders engaged in implementing them, in addition to their actions.

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