DEMANDING ENERGY

SPACE, TIME AND CHANGE

Edited by Allison Hui, Rosie Day, and Gordon Walker

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Editors

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Preface

One of the core interests of this book is to situate discussions of energy demand and the performances and practices that constitute it within particular spaces and times. It would be remiss of us then if we didn't similarly situate the book itself.

Demanding Energy grew from and was supported by the nexus of practices around the DEMAND Centre (Dynamics of Energy, Mobility and Demand), a multi-institutional research collaboration funded by the Engineering and Physical Sciences Research Council (grant number EP/K011723/1) as part of the Research Councils UK (RCUK) Energy Programme and by Électricité de France (EDF) as part of the R&D European Center and Laboratories for Energy Efficiency Research (ECLEER) Programme. Established in 2013 and co-directed by Elizabeth Shove and Gordon Walker, the centre set out with three core propositions: (1) that energy demand is an outcome of social practices, (2) that such practices are shaped by institutions and infrastructures and (3) that these arrangements reproduce historically and culturally specific interpretations of need and entitlement. These propositions became the basis for a wide range of empirical projects around four main themes: trends and patterns in energy demand, how end use practices change, managing infrastructures of supply and demand, and normality, need and entitlement.

Inspired by a range of creative and engaging intellectual and social exchanges featuring reading groups, seminar series, writing exchanges

around 'pieces of thought', annual 'clan gatherings', floorball, photo competitions, birthday cake, cooking and recipe sharing (see www.demand.ac.uk), authors in this collection were able to develop a novel, shared approach to understanding what energy is for. Those authors who were not a part of the DEMAND Centre itself joined in with the discussions as participants in our programme of international visitors or co-presenters at conferences, including the DEMAND International Conference in April 2016 (http://www.demand.ac.uk/conference-2016/). We are indebted to all of those colleagues, and particularly other DEMANDers, who shared in these practices with us—shaping our trajectories of analytic and theoretical development as well as ensuring our exchanges were sometimes unconventional and as often as possible fun.

In between the discussions that sparked these chapters and the discussions that we hope emanate from them lies the text itself. Many thanks to Oliver Fitton for his work and innumerable tracked changes, emails, draft documents and pieces of feedback during the compilation of the manuscript.

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Demanding Energy: An Introduction

Allison Hui, Rosie Day, and Gordon Walker

The café is quiet this morning. Just a few customers taking their time: a couple with suitcases stopping off on their way to the railway station and a guy settling in with his pastry and laptop. I like working here when it's this empty—my thoughts wander in interesting ways. It's a good place for trying out new ideas. Whenever I can, I get here early to make sure I can get a table and plug in whatever needs charging. And sit away from the heaters and the speakers—some of the music's ok, but not all of it. Most mornings, I reckon there are more staff here than customers. New ones keep appearing—fetching boxes from the store room, looking at clipboards, bringing toppings to make up sandwiches for later in the day. Can't work out how their shifts are arranged. There are a few more customers coming in now, coffees to be made, money exchanged. I wonder if anyone will have time to change that burned out light bulb.

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Accounts of energy demand can start from many places. Physicists might begin with the first law of thermodynamics, the rule that energy cannot be created or destroyed. Economists might start from models that forecast future trends in relation to economic growth. Utility company workers might privilege the meters whose readings slowly measure accumulating flows of gas or electricity. Bus company managers might emphasise the route changes that become necessary as diesel vehicles are retired to make way for electric ones. Policymakers might foreground the emissions targets and international agreements on climate change that (perhaps) make managing energy demand a priority.

In this book, we start from somewhere else, from an interest in what energy is for (Shove and Walker 2014; Walker 2014). Our core question is a provocatively expansive one and up to this point remarkably understudied: what social processes constitute and make energy demand? Just as the starting points above establish different concerns and lead to different lines of investigation, so too our starting point is decisive in setting up the questions and lines of analysis that follow. By asking about the social processes that constitute energy demand, we mark out a concern for how energy demand is embedded in the shared practices and activities that make up the ongoing flow of society—such as working, commuting, eating, going to music festivals, staying in hotels, cleaning houses, visiting hospitals, walking dogs, travelling in retirement and running cafes, among many other diverse and varied things. In order to understand energy demand—its making, patterning, variation and dynamics—we argue that it is necessary to understand the practices and processes that underpin and ultimately give rise to the consumption of energy from different sources (electricity, gas, solid fuels) and the use of various energy services (transportation, heat, Wi-Fi).

We do not therefore focus on energy demand as a 'thing' with particular measurable effects, for example on supply infrastructures, or from which projections of future trends or conclusions about strategies for change might be directly drawn. Indeed, in many of the discussions in this book energy itself fades into the background as we step back from the metrics (Kw/h, ktoe: kilotonnes of oil equivalent) and energy efficiency ratings that are common foci in other accounts. Instead we foreground the diverse and varied *processes of demanding energy* that are woven into

daily life (e.g. Rinkinen 2015) and contemplate how these processes have been changing over time and will continue to do so. This collection represents the first sustained effort to pose questions in these terms, develop analytic strategies and provide empirical insights that start from a concern for understanding what energy is for.

Stepping back from energy demand per se, in order to ultimately better understand it, involves focusing upon complex social relationships. There is no simple answer, for example, to the question of what or who it is that demands energy. At times it might make sense to privilege groups of people when providing explanations, or at other times technologies, and both have been studied extensively in other energy research (e.g. Isaac and van Vuuren 2009; Sahakian 2011; O'Doherty et al. 2008; Burholt and Windle 2006). Yet our starting point also makes it possible to consider how particular working practices, lifestyles, infrastructures or stages in life might be the units most consequential for processes of demanding energy.

The authors in this collection devote close attention to this range of units of analysis in order to better understand how demanding energy is a part of the practices of everyday life. For some, this involves close empirical investigations of what people are doing and how this is socially understood, an orientation informed by well-established precedents within qualitative, ethnographic and hermeneutic research. Instead of just taking for granted categories that summarise social activity—such as 'cooking', 'working' or 'home computing'—authors delve into the diversity and variation within and between such categories, engaging in detail with temporally and spatially situated enactments. Looking carefully at what people are doing and how energy becomes embroiled in these activities facilitates the challenging of assumptions about the relationship between social dynamics and energy, relationships that have been 'black boxed' or totally overlooked in previous research and policy. In addition, investigating a range of actors, materials and practices situated at particular moments, or evolving as part of historically specific transformations, allows discussion of what lies behind and before many of the summary tables, metrics, trends and load curves that are common touchstones within discussions of energy. As a result, stepping back from energy per se is shown to provide a fuller understanding of what contributes to

demanding energy, and where, therefore, opportunities for change may arise. Whilst familiar energy technologies and infrastructures are ever present in these accounts, stepping back from energy per se means that they are not separated or isolated from the social worlds that they are resolutely embedded within.

In addition to this general interest in data that evidences what energy is for, and not only how much of it is used or via which technologies, some authors engage directly with theories of social practice. This body of literature provides varied accounts of how the social world is constituted by people's on-going practices, which create, sustain, transform and are influenced by diverse social structures (Giddens 1979, 1984; Schatzki 1996, 2002; Shove et al. 2012). In summarising this literature, Reckwitz emphasises how it provides a different means of approaching the role of the body, mind and knowledge in social processes (2002). Whereas economic analyses focus on single actions and choices, and other cultural theories focus on either the knowledge and meanings of the mind, the signs and symbols of texts, or the dynamics of intersubjective speech acts, practice theories focus instead upon 'blocks' of activity: "pattern[s] which can be filled out by a multitude of single and often unique actions" (Reckwitz 2002: 250). These patterned blocks are practices, a unit of study and analysis that is socially constituted, and which is shaped not only by people's actions and statements but also by socially appropriate materials, understandings, goals and procedures. It is therefore not individual dynamics that are of primary concern, but how socially shared and patterned practices are reproduced and changed. Indeed the social world can be understood as a nexus of practices (Hui et al. 2017) with particular material relations (Shove 2017; Morley 2017), power relations (Watson 2017), interconnections (Blue and Spurling 2017) and variations (Hui 2017) of relevance for thinking about energy demand.

For some authors in this volume, this theoretical orientation informed their research design, leading them to ask research questions that seek to uncover how an attention to practices, rather than, for example, the individual attitudes, behaviours and choices dominating many existing discussions of energy and sustainability (Shove 2010), can explain previously ignored or misunderstood dynamics of energy and transport demand. Others go much further, engaging in detail with specific concepts from

practice theories in order to develop new empirical analyses and theoretical resources. In these cases, authors show that developing better understandings of energy demand is not about creating new categories or representations of energy demand itself, but rather about finding ways of describing and summarising social dynamics that then have important implications for how demanding energy is constituted, patterned and changing. Therefore, at the same time as they provide case-specific insights, the chapters also serve as exemplars that demonstrate and develop the scope for more sophisticated and theoretically engaged understandings of what energy is for.

By privileging processes of demanding energy, and the practices involved, this collection also challenges established boundaries within discussions of energy demand. Across the existing literature, transport-derived energy demand has largely been discussed independently from building-related (domestic and non-domestic) use and demand—as even a cursory examination of journal and book titles reveals (e.g. Inderwildi and King 2012; Williams 2012). Yet this boundary appears increasingly to be an artefact of sectoral and disciplinary boundaries, rather than an empirically sensible analytic strategy. Transformations such as flexible or teleworking, online shopping and an increase in social media apps and platforms are undoubtedly affecting where and when demanding energy occurs. Yet little evidence exists on these effects: as a 2015 UK Department for Transport report bluntly admits: "There is little or no evidence on the impact" of such developments upon travel demand (Department for Transport 2015: 66). Starting with an interest in processes of demanding energy, however, provides another way forward, as it makes any distinction between travel-derived and domestic energy demand something to question through empirical investigation rather than a pre-existing assumption. Travelling is not always easily separable from the activities that it facilitates—an insight already well established within discussions of 'derived demand' (Mokhtarian and Salomon 2001)—and therefore researching demanding energy is open to the interweaving of both. This collection therefore seeks to create greater dialogue between transport and energy literatures, by juxtaposing contributions that focus on each, as well as featuring contributions that address both together.

As well as focusing on demanding energy as ongoing processes caught up in social practices and dynamics, the subtitle of this book also indicates a concern with space, time and change. The spatial, the temporal and ongoing change are fundamental to all social processes, shaping of all relationships, ever present and always being (re)produced. It would be hard to find three more foundational concepts of social scientific enquiry. Yet the richness and depth with which they have been addressed in available socio-theoretical analyses has yet to be integrated into socio-scientific understandings of energy demand. Our decision to foreground them was therefore not only because they are foundational to social life, but also because of a need to move beyond largely implicit or limited discussions of space, time and change within existing energy demand literature. Engaging more intensively with social scientific understandings of space, time and change, we argue, provides more vivid and nuanced understandings of social practices, and ultimately of what energy is for. In the three sections that follow we therefore lay out some of this territory and particular understandings of space, time and change that can contribute to more interesting and developed analyses.

1.1 Space and Demanding Energy

All energy use evidently takes place in space and in principle can be demarcated in those terms. A television set consuming electricity can be located in cartographic terms at an address, at a point in physical space. Such individual instances of energy use can be combined into bounded spatial units—such as energy consumption within a household or within an office—units which are then amenable to aggregation into bigger ones: districts, town, regions, nations and so on. In one sense then, there is an apparently straightforward spatiality to energy demand that aligns with an understanding of space as physical, fixed and laid out across an objective surface on which the social world plays out (Massey 2005). In some cases, chapters in this volume work with this straightforward understanding of space; Durand-Daubin and Anderson, for example, contrasting cooking and eating practices in two national contexts, UK and France, although in terms of patterns of activity rather than energy use per se.

Assigning energy use to fixed locations and bounded units is not, however, without its complexities. For example, though airplanes in flight have fuelled at particular locations on the ground, their use of energy is in motion, in airspace marked by natural airstream flows and quite different air traffic control boundaries (Lin 2016). Mobile phones are similarly measured in energy consumption terms at locations of charging, yet carry their store of electricity with them so that this energy can be used for work in multiple locations, distant in space (and time) from where they were charged (Lord et al. 2015). Along with other information technologies, phones are also reliant on infrastructures of data flow and storage that can stretch across the globe, all powered and reliant on energy for their functioning (Wiig 2013). How exactly then can we locate the energy use entailed by the movement of a text message—in the sending device, the receiving device, the extended and largely unknowable communication network with its many powered interconnecting technologies? Though such conundrums may be approached as matters of accounting—ones laced with important questions of responsibility and governance, particularly when energy consumption is turned into carbon units (Barrett et al. 2013)—doing so maintains a focus upon metrics of energy demand rather than understandings of what energy is for.

To engage more with what energy is for, it is useful to ask not how we can locate energy use in such examples of complex practices, but how we can investigate the networks and various forms of relationality that social theorists of space prioritise in their accounts (Thrift 2006). Manifestly the social world is not just played out across a continuous physical surface, but is cut through with varied forms of interconnection between people, phenomena, ideas, ways of living, technologies and much else. These interconnections are enacted through the mobilities and flows of varied chains of people and things (Urry 2007), and the importance of these social phenomena has led to discussions not only of the compulsion to proximity (Boden and Molotch 1994) but also the existence of network capital which facilitates forms of physical or digital connectedness (Larsen et al. 2006). Within social scientific research, acknowledging and investigating connections, networks and proximity has thus helped to develop a language for the empirical analysis of varied topological relations and the stakes of their reproduction or change (e.g. Mol and Law 1994).

Building upon this work, it becomes clear that energy consumption takes place through various networks and forms of relationality. Rather than commenting upon Cartesian maps of airplane routes, consideration is instead focused on how a moving airplane enables a set of relations between points of departure and arrival that transcends their physical separation and distance. Similarly, a text message provides an instantaneous proximity and intimacy between distantly located people that serves to collapse geography as more conventionally understood. Energy demand is caught up in varied ways in such flows and interconnections—the flying of the airplane, the movement of the text message—and sustains and enables their reproduction. Moreover, expectations, norms and institutions become established around and in relation to these energy demanding flows; see, for example, in this volume Day et al. on expectations of long distance leisure travel, and Jones et al. on the changing norms of virtual and co-present collaboration in business. Energy demand and most cases of contemporary networks of flows are thus closely interconnected.

Taking a step further, it follows that space is not a given thing, but being continually produced as an outcome of social processes. Physical space evidently does exist and can be talked about in standard objective terms, but more integral to the processes and dynamics with which we are concerned in this book is socially produced space. As Lefebvre notes, "Every social space is the outcome of a process with many aspects and many contributing currents… In short, every social space has a history" (1991: 110). Approaching space in this way as "the product of interrelations" (Massey 2005) that are continually being made, and as the product of material and immaterial flows that shift, reform and transform over time (Sheller and Urry 2004), presents different questions and opportunities for understanding social processes and how energy demand is both constituted and implicated in the making of different spatialities.

Firstly, approaching space as continually made and remade in practice brings into question many dichotomies and apparently straightforward relations of relevance for understanding what energy is for. For example, the home as an intensively lived everyday space has been the focus of much critical examination engaging with the multiplicity of discourses

and ideals with which it has historically become infused (Blunt and Dowling 2006). Beillan and Douzou, in their chapter in this volume, take on some of the classic binaries applied to the home (public-private, indoor-outdoor), showing empirically how the space of the home is produced through living in a shifting profile of materialities and meanings that are sustained, remade, acquired and discarded over time. Faced with such fluidity, applying binary spatial categories rapidly becomes problematic. For example, seeing the home as only 'indoor' is problematic, they argue, because for its occupants it is in continual interaction with 'outdoor' in terms of the use and meanings of windows, doors and balconies. As energy flows are also mediated by those relations (see also Hitchings 2011), this questioning of dichotomies uncovers important dynamics obscured by how spaces have been traditionally categorised. Other examples of problematic spatial categories feature across the contributions in this volume, including in the chapters by Burkinshaw and Mullen and Marsden, who discuss how the notion of distinct 'workplaces' and pathways of commuting to and from fixed locations is becoming increasingly incoherent with the realities of when and where work and employment is being enacted.

Secondly, investigating how spaces are made and remade highlights the extent to which demanding energy is an intrinsic part of such transformations. Cities are the most emblematic materialisations of spatial transformation and are routinely associated with a density of energy use, arising both from the intensity of urban activity and the assemblages of people, technologies, institutions, infrastructures and much else that make up the production and reproduction of contemporary urban space (Bulkeley et al. 2014; Rutherford and Coutard 2014). In spatial terms cities are where diverse networks of flow most intensely come together, necessarily dependent on energy both for the interrelations through which they are made as city spaces, and held together as (imperfectly) functioning and developing social, economic and infrastructural systems. Urban infrastructures support all sorts of activity and practice performances, evolving in their form and prevalence as patterns of infrastructural relations and interconnections shift over time (Shove et al. 2015); a co-evolving set of processes captured to some degree in Wiig's chapter in this volume focused on digital connectivity.

Whilst the energy dependence of such intensely realised space-making is apparent in general terms, in Allen's chapter in this volume, this becomes far more explicit. Following how rural green fields are dramatically transformed for short periods of time through the making of a music festival, he shows how the coming together of multiple co-terminus flows (of people, vehicles, performers, toilets etc.) actively works in combination to turn rural space into a sort of temporary urban one: an appropriate place for sleeping, cooking, eating, taking drugs and dancing, rather than for solitary rambling or animal grazing. While such a special case of spatial transformation is dramatic and striking—bringing energy infrastructure and energy use into an explicitly new (if temporary) set of spatial relations—it is also revealing of the slower processes of transformation generally involved in space-making and remaking, as well as of the established relations that are temporarily 'left behind' when everyday practices are relocated and performed to some degree differently—as they are not only in festival-going, but in many other instances of living elsewhere, holidaying or visiting (see examples of such instances in chapters by Sahakian and Day et al. in this volume).

Thirdly, the unevenness in the processes through which space is made and remade has implications for how demanding energy is also differentially constituted. For many engaging with the spatial in relational terms, power and politics are central concerns, drawing out both how past and current power relations are reflected in the spatial configurations that now exist, but also the possibility for these to be made differently in the future. Massey (2005: 85), for example, argues that the "intrinsic relationality of the spatial, is not just a matter of lines on a map: it is a cartography of power". While none of the contributions to this volume directly conceptualise their analyses of demanding energy in terms of uneven power relations, we can certainly find these lurking in the shadows. In a focus strikingly different from that of much of the existing energy and inequality literature concerned with the fuel poor (e.g. Harrison and Popke 2011; Chard and Walker 2016), Sahakian shows how wealthy expat households in Switzerland have a particular agency in space-making and in the production of energy demand. They are able to fill their voluminous homes with multiple, large, expensive energy-using appliances and employ staff to keep them clean and tidy at all times in

order to (re)produce a status expressed through the qualities of where and how they live. Their self-acknowledged privilege, located in a key geographical node in the global circulation of finance and capital, is thus intrinsic to the materiality of their distinctive domestic spaces, with demanding energy a necessary and substantial ingredient.

In stark contrast, Mullen and Marsden make clear how the households in their study are caught in very different cartographies of power, with instabilities and uncertainties in the network of spatial relations interconnecting home, work and education that make car dependence a hard to avoid and afford necessity. The need to travel from home to sites of work or education across physical space, and to use the energy-intensive car to achieve this is, in their account, overlain with economic and social relations formed by such things as zero-hour or temporary contracts, problematic landlords, mortgage payments, bus routes and the health of family members. For these households the social production of space therefore brings fragility to their performed, routine days and problematic consequences for well-being.

In such ways then we can see that taking on space in a more sophisticated way, recognising its multiplicity, relationality and dynamism, has much to bring to understandings of what energy is for. Whilst not often a dominant or overt element in spatial narratives, energy demand is integral to the making of past, present and future socio-spatial relations (Calvert 2016), an observation pertinent not only to the empirical sites encompassed in contributions to this volume, but also to the production of space in many other contexts, settings and parts of the world we have not been able to extend to.

1.2 Time and Demanding Energy

Just as energy use takes place in spaces and through spatial relations, so too it occurs in time. Time can also be considered as both independent from and intertwined with human activities. Early social theorists of time made a distinction between natural time and social time (Sorokin and Merton 1937; Evans-Pritchard 1939). Natural time is the temporality of natural processes—astronomical cycles, ecological rhythms, seasons,

tides—while social time is a construct by which we organise, and experience, everyday life. The two are linked, in that social time is to some extent structured by the natural rhythms of day and night, annual cycles and so on. As humans we are also subject to our own 'natural' bodily processes which have cyclical and linear temporalities, such as bodily ageing. Both, moreover, have implications for what energy is for. Despite technological developments, the temporalities of nature that underpin social organisation continue to have clear bearing on energy demand (Walker 2016): fairly obviously, we use lighting in hours of darkness, heating in colder seasons, cooling in warmer ones. Apart from such relatively basic needs, other social conventions are pinned to natural cycles and may occasion energy demand, for example for mobility for summer holidays, or lighting for winter festivals.

Although social time may have some anchoring in natural or ecological time, (and leaving aside for now reflections on how we have altered 'natural' processes and their temporality), like socially produced space, it is a more constructed and multifaceted phenomenon. Social time arguably became more decoupled from ecological time with the industrial revolution and the widespread deployment of clocks. While time is at its basis a relational quality, a means of orientation or ordering, clock time is a social institution that quantified and measured the abstract, and created a system of accounting and control that was fundamental to the development of capitalism (Adam 1990, 1995; Thompson 1967). Clock time facilitates temporal processes such as scheduling and coordination, in terms of the temporal placement and duration of activities. Through such means, it enabled mass mobility, mass production, education, shared leisure and many aspects of consumption.

The social production of clock time has many facets and implications for energy demand. For one, we often live by schedules, and as our activities are scheduled, so is our energy demand (Walker 2014). Coordinating practices around normal working hours, for example, contributes to regular peaks in demand: of traffic during twice daily commuting 'rush' hours and of domestic electricity and gas consumption during evening periods of cooking, eating and leisure. These peaks are increasingly problematic for energy production and associated emissions, as roads and power stations approach or exceed capacity during these times. As a

result, they need to be planned for, and capacity, which is often redundancy, to be built in (Torriti et al. 2015; Torriti 2016). Temporal peaks of energy demand are therefore phenomena that lead to further consumption of resources, time (as in time spent in traffic congestion) and energy itself—see for example Wiig, this volume, on the energy consumed by data centres awaiting peak internet traffic.

Given the problematic peaking of energy and mobility demand, there is growing interest in flexibility: the potential to produce time differently through the de-synchronisation of activities at a societal level so that they are spread more evenly through the day, week or year. We can see such a move in German and Dutch policies of scheduling school holidays over different weeks in different regions of the country to reduce pressure on transport systems and leisure facilities. Investigating how rhythms and synchronisation are enacted within institutions is an important line of investigation, as shown in the contributions to this volume by Curtis et al. and Blue, in order to understand how flexibility might contribute to different temporal arrangements.

As our authors highlight, however, it is easier to reconfigure the temporal relations of some practices than others. Durand-Daubin and Anderson's chapter, for example, reveals the perhaps surprising temporal obduracy of French lunching and dining routines, and how such obduracy is less apparent in the UK. They suggest that one key to understanding this may be to investigate what activities cooking and eating are sequenced with—an interrogation of temporal sequences at a daily level thus informing the analysis of change over longer time periods. The temporal relations around travel can similarly be challenging to reconfigure. Burkinshaw's chapter, which discusses the limits to the take-up of flexible working hours, finds that a major reason for the continuation of rush hour journeys is the temporal sequencing of journeys to work with other necessary household activities, notably journeys to school. Problems can arise then through lack of coordination, or when flexibility in one set of practices or activities meets inflexibility in another. Southerton (2012) identifies people's difficulties in coordinating practices in time as underlying generalised feelings of harriedness and time-related anxiety. Energy demand may also be implicated: Mullen and Marsden (this volume) identify unpredictable flexibility in working hours as resulting in more

resource intensive means of travel as people opt to keep a car, because inflexible—and at the same time sometimes unreliable—transport schedules cannot meet their needs. These contributions highlight that although social time is constructed through activity, the extent to which temporal relations can be remade is an important focus for research on demanding energy.

Whilst on one hand the units of clock time facilitate discussions of particular schedules, peaks, synchronicities and opportunities for flexibility, this ability to count and account for time also tends to make us think of time as a resource. Time can appear to be something that is consumed by practices (Shove 2009). We only have so much time, and practices use it up. Practices also compete for our time. For example, in Day et al.'s contribution to this volume we see how leisure travel among retired people rivals for time with family responsibilities and caring practices, while in Durand-Daubin and Anderson's chapter, cooking and eating are seen competing with work as work hours become more flexible. The effects on energy demand are complicated and hard to predict; in some instances it may mean less of an energy consuming practice such as long distance leisure travel, or cooking, but it could mean more shifting of energy consumption to other spaces such as restaurants and take away outlets.

Thinking of time as a resource, and one often with monetary value (Adam 1990), also leads to perceptions of wasted time, and the need to save time. Saving time can increase energy consumption as we enlist appliances to help us to perform tasks faster, or remotely: see Greene, this volume. The notion of time-as-resource might also lead us to think about whose time matters and whose time is used for what. Some people such as domestic staff in Sahakian's chapter, or indeed some of the husbands in Greene's, are engaging in energy consuming practices so that other people's time can be freed up. Our outsourcing of energy consuming practices, such as cooking, is as much about time budgeting as anything. And, as Mullen and Marsden's chapter illustrates, one person's flexibility—such as an employer's—is another person's chaos and wasted time as they wait for public transport at badly served hours.

Approaching time as something that practices consume prompts valuable explorations into processes of demanding energy, but as Shove (2009) suggests, we might also, alternatively, see practices as producing

time. That is, the temporality of our lives is emergent from the nature and rhythms of the practices that we engage in. Quantitatively, we might gauge the passing of time by the completion of particular activities, projects or life stages. Qualitatively, periods of time take on a particular significance or character because of the practices that we engage in—for example, the holidays are the holidays because we do certain things and don't do certain others.

In considering the qualitative aspects of time, Cipriani (2013) discusses a distinction in classical Greek between *chronos*, understood as sequential, linear or cyclical time, and *kairos*, signifying the right or proper time for something (see also Szerszynski 2002). Kairological time is highly relevant for understanding what energy is for, as it relates to the organisation of routines and the extent to which temporal flexibility is possible. Psarikidou, in this volume, discusses kairological time in notions of when it is safe or not safe to take public transport, in that case linked also to natural rhythms of day and night. In Day et al.'s chapter, taking a longer perspective, retirement is seen in a kairological sense by their research participants as a time of freedom and the time of life for leisure travel. Given the existence of quite energy intensive travel such as cruising, this has significant implications for the patterning of energy consumption over the life course, and also in society more broadly, as demographic patterns shift.

As this brief discussion has illustrated, theoretical concepts related to dynamics of social time are important resources for describing patterns within social practices and energy consumption, as well as for developing rich discussions of how social practices are constituted and changing. Whilst an interest in change has been implicit in our discussions of both space and time, the next section turns to address this more explicitly.

1.3 Change and Demanding Energy

The importance of change to understanding energy consumption might, on the face of it, seem obvious. Existing discussions of energy demand, after all, place considerable emphasis upon making certain changes in order to do things such as optimise systems or manage and reduce overall

consumption. Though these are important concerns, and the authors in this collection seek to contribute in various ways, change is not primarily discussed in this more instrumental sense. The same move from nouns to verbs that leads us to focus upon demanding energy rather than energy demand as a thing applies here—authors are more concerned with studying the changing dynamics of what energy is for than particular changes that will impact energy demand.

This approach can be tied back theoretically to the understanding that the social world is constituted by practices. The model of agency underpinning this idea, as expressed in theories of practice, is one built upon the principle of indeterminacy. As Giddens suggests, "it is a necessary feature of action that, at any point in time, the agent 'could have acted otherwise'" (1979: 56). Schatzki concurs that people's activity is in this way fundamentally open, regardless of context: "No matter how strongly his or her ends, desires, hopes, preferences, and the like 'point toward,' or even 'single out,' a given path of action, nothing guarantees that it or any other particular action is performed" (2002: 232). Seeing action as indeterminate thus becomes an important prompt for its empirical study. Processes and practices must be interrogated because their activities cannot be taken for granted. Further, and of particular importance for studies of demanding energy, Giddens notes that this study of the reproduction of practices must come before considering any consistency in their outcomes or consequences (1979: 214). That particular practices demand more or less energy than others, for example, should be considered only after having grasped how the practices themselves are reproduced.

A question then arises as to whether focusing on practices privileges the reproduction of practices over their transformation or change. Some descriptions of practices might appear to privilege stability in this way—Reckwitz for example makes the very strong claim that: "For practice theory, the nature of social structure consists in routinization. Social practices are routines" (2002: 255). He follows on to suggest that change must then occur through "everyday crises of routines" (2002: 255). Whilst identifying particular practices as units of enquiry requires some understanding that they consist of similarly patterned activities that are repeatedly performed, this foregrounding of routines is unhelpful because of how it discourages recognition of the indeterminacy of action. That is,

misunderstandings can easily arise that routine is more foundational to or inevitable within practices than change. At other times, authors may appear to emphasise change—as in Giddens' statement that "Change, or its potentiality, is thus inherent in all moments of social reproduction" (1979: 114). Whilst this is consistent with the idea of indeterminacy, and with the acknowledgement that "Absolute repetition is only a fiction of logical and mathematical thought" (Lefebvre 2004: 7), it could also lead to misunderstandings that all action is change. Ultimately, theories of practice do not prima facie privilege either routine and stability or transformation and change—"stability and change come together in the social site" and researchers are the ones who identify differences of consequence (Schatzki 2002: 254).

For the authors in this collection, studying changing practices is thus in part about identifying differences of consequence for understanding what energy is for. In many instances, these consequential (though sometimes unintended) differences are inextricable from space and time, which come together in societal schedules and cycles as well as more significant social transformations that reconfigure spatio-temporal relations (Giddens 1979: 205). As societal conventions, tastes, policies, institutional organisations, population dynamics and economic relations evolve through practices we can identify changing temporal patterns of energy demand over the long term. In Greene's chapter, for example, we see how institutional change in Ireland affecting policies and norms around women's work impacted the distributional energy intensity of domestic practices in individual households. We see similar longer-term change in norms and expectations in Day et al. and Durand-Daubin and Anderson's chapters.

Such change in temporal patterns of practices and associated energy demand is inextricable from spatial transformations—especially related to the evolving affordances of technologies and infrastructures (Shove 2009). The growth in aviation over recent decades enables routine long haul travel of Day et al.'s retirees and Jones et al.'s global consultancy employees, among others. Internet-enabled technologies and data-related infrastructure, as discussed by Wiig, allow practices to be bundled and layered—travel can be performed at the same time as work, learning or social interaction, increasing energy consumption on the one hand, but

potentially also changing feelings towards public transport as time spent on it is no longer 'wasted', as Psarikidou discusses. Such technologies have also enabled the at least partial de-synchronisation of work practices, though considerable pull still exists to co-presence and synchronisation, as Burkinshaw discusses.

The shape and trajectories of longer-term transformations are also undoubtedly affected by the particular sites under consideration. As Giddens argues: "all social change is conjunctural. That is to say, it depends upon conjunctions of circumstances and events that may differ in nature according to variations of context" (1984: 245). Focusing as it does upon cases from developed countries in the Global North, we therefore acknowledge that this book is limited in its purview. After all, if action is inherently indeterminate, then it is important to study a wide range of practices, in diverse spaces and times, in order to ensure that inappropriate summaries are not made. Therefore whilst we begin to develop a set of concepts, methods and cases appropriate for the study of demanding energy in this book, it will be important that they are further tested and developed in dialogue with cases from other regions and social, political and economic sites in the future.

The final quality of change that is central to the chapters of this book, alongside indeterminacy and spatio-temporal transformation, is interdependency. Whilst the actions contributing to any one practice are indeterminate, it is not enough to consider change in relation to single practices alone. Demanding energy therefore must be interrogated in relation to what Giddens, quoting Etzioni, suggests is a fundamental "interdependence of action: in other words, to 'a relationship in which changes in one or more component parts initiate changes in other component parts, and these changes, in turn, produce changes in the parts in which the original changes occurred'" (Etzioni 1968 in Giddens 1979: 73). The multiple units that can become embroiled in demanding energy—people, practices, technologies, meanings and institutions—are thus shown to transform in relation to each other in expected and unexpected ways. This is important for understanding existing and potential flexibility in practices and energy demand. The chapters by Blue and Curtis et al. take up this concern within different institutional contexts. For Blue, the importance of finding ways to change energy demand