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Towards systematic reductions in energy demand

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Introduction

Transitions in Energy Efficiency and Demand began by outlining the challenge put forth by the Paris Agreement – the aspirational target of keeping the increase in global average temperature to 1.5°C above pre-industrial levels, and the firm target of achieving an increase well below 2°C. At the time of writing this book, media headlines suggest that this target is slipping through our grasp and the scientific evidence warns of failing targets (Climate Action Europe, 2018; Rogelj *et al.*, 2016). Indeed, to have a reasonable chance of reaching these goals, emissions must peak by 2020 and fall by more than 70 per cent in the next 35 years (Cooper and Hammond, 2018; Geels *et al.*, 2018); a formidable and unprecedented challenge that requires radical and far-reaching transformations of the whole energy system, including significant increases in energy efficiency and considerable reductions in energy demand.

In the introduction, we noted too, that the process by which we tackle the issue of energy demand defies any simple solution: No single policy or innovation is likely to make a notable impact. Thus, the means of reducing carbon emissions are various, ranging from the increased efficiency of existing energy-using devices, to the development of entirely new systems, and complex, relying on elaborate combinations of technology, policy, social practices, infrastructure, and culture to succeed. There are also many stumbling blocks – both historically embedded and contemporary – that might prevent rapid and consistent progress. Examples of this include the complexity of energy demand; the need for large-scale, rapid change; growing demand for energy; societal disinclination to change; the insufficiency of market mechanisms, and the plethora of economic barriers. Against this somewhat pessimistic backdrop, this chapter offers overarching insights gathered from the book's various and wide-ranging case studies, to end with a cautiously hopeful, and optimistic path forward.

Through a common commitment to a sociotechnical approach, the chapters presented in this book have sought to use a wide range of social science perspectives to tackle the complexity of the energy demand reduction challenge. Our aim was to do this for an academic audience, while also having in mind the needs of various decision-makers, such as policymakers, entrepreneurs,

engineers, activists, researchers and others involved with the areas of energy efficiency and energy demand. The result has been a diverse range of chapters that examine how new low-energy innovations emerge and diffuse, and how this process is shaped by market forces, government policy, social interactions and cultural norms, as well as the complex interactions between all of these – and other – factors. The innovations examined in this book include new technologies, energy systems, business models and behaviours, as well as combinations of these.

This chapter proceeds as follows: First, we restate the importance and utility of the sociotechnical approach and the framework of innovation emergence, diffusion and impact first outlined in Chapter 2. Second, we discuss the importance of this approach for energy demand reduction in the UK context. Third, we outline what this means for countries beyond the UK. Finally, we introduce a series of policy principles that set the scene for our overall conclusion, an agenda for ongoing research and policy action into the systematic reduction of energy demand.

This conclusion necessarily takes a big-picture perspective. Because energy demand is such a complex phenomenon, running through virtually every aspect of human society in one way or another, and influencing (and being influenced by) so many different sociotechnical systems, there can be no one-size-fits-all solution. Thus, we note from the offset that given the wide breadth of topics covered throughout this book, only each chapter can give specific, case-relevant recommendations. Rather than duplicating these, this conclusion aims to offer general principles and heuristics.

Restating the sociotechnical approach

The most obvious takeaway from this volume, especially for a non-academic reader, should be the value of a sociotechnical perspective. This has, first and foremost, offered a novel framework for considering not only the technical aspects of the demand reduction challenge, but also its social, political, economic and cultural complexities. More specifically, it has drawn together a series of theoretical advances that guide the way we can and should consider such challenges, and, most pressingly, their solutions. For academics who may already be familiar with the sociotechnical approach, the chapters in this volume suggest fruitful new areas for scholarship that applies sociotechnical theory to the challenge of energy demand reduction. Beyond academia, this approach presents a useful way to imagine and understand the challenge of demand reduction and wider societal implications.

Transitions in Energy Efficiency and Demand contains many examples of the value of a sociotechnical approach. Chapter 9 (Figus *et al.*) investigates energy-saving innovations and economy-wide rebound effects and demonstrates the benefits for aggregate social welfare that can be achieved though improvements in the energy efficiency of domestic boilers, for instance. In contrast, however, Chapter 6 (Jenkins *et al.*) uses issues in the rollout of smart meters in the UK to

show what happens if people are forgotten throughout the transitions process, cautioning that some social groups may become *more* vulnerable or marginalised. Similarly, Chapter 5 (Hopkins and Schwanen) points to the selectively managed experimentation with vehicle automation that involves some actors, but excludes others, perpetuating existing power dynamics. Finally, Chapter 11 (Webb) illustrates that effective policy towards energy efficiency in UK buildings may be hampered by political reliance on classical economic theories and short-term price metrics, and a failure to link up policy strategies; a uniquely social failing. In each case, the sociotechnical approach reveals the actors we need to engage with if we are to reach climate change and emissions reduction targets in a socially-just way. These insights also restate the importance of both technologically radical *and* socially radical change, or as is the ultimate aim, a systematically radical combination of both (Dahlin and Behrens, 2005).

In various places, our chapters also show that the challenge of reducing energy demand is much more complex than simply relying on market mechanisms to incentivise people to invest in the 'right' innovations. This fairly blunt approach is likely to result in unintended consequences, which could either undermine the transition, or make it harmful for vulnerable groups. Jenkins and Sovacool (Chapter 13) provide perhaps the clearest set of practical lessons that can be taken from a sociotechnical approach (at least as far as niches are concerned), when they observe that the existing literature on Strategic Niche Management emphasises the critical roles of niche experiment financing, mutual learning, and brokering partnerships for successful niche development.

A second key point revealed by our sociotechnical approach is that of *co-evolution* between different elements of a sociotechnical system (Geels, 2004). Linkages may emerge between the evolution of technologies and users, or between technology, industry structure and policy institutions (Geels, 2005). For instance, the linkages between technology, industry structure and policy institutions are shown in Brockway *et al.*'s (Chapter 8) exploration of exergy economics, and Webb (Chapter 11) identifies the inevitable interconnection between energy and political values and beliefs. These chapters reinforce our point that energy demand must be viewed as a holistic problem, and cannot be reduced to any one factor, viewed in a vacuum, nor addressed with any one solution such as a new technology or a new regulation governing energy companies. In this vein, Kern *et al.*'s work on policy mixes (Chapter 12) provides critical insights on the co-evolution of policy and sociotechnical change which calls for more explicit attention to policy processes, and which in turn may enable a better understanding of the dynamic nature and causal links between the two.

Beyond these two overarching lessons, we further identify merit in the specific sociotechnical themes of emergence, diffusion and impact, initially introduced by Geels *et al.* (Chapter 2). Although these themes overlap and are non-linear, they provide a process-oriented framework that explores how low-energy innovations develop and become established; how they achieve widespread adoption, and, crucially, how low-energy innovations ultimately impact energy demand.

Under the theme of emergence, the chapters reveal, in accordance with Geels *et al.* (2018), that we must identify the techno-economic, finance and investment, cognitive (contrasting views and perceptions around consumer preference, for example) and social (including instabilities within networks of actors) uncertainties that limit the emergence of new innovations. Doing so is especially important considering that the aforementioned co-evolution processes will inevitably create further obstacles for sustainable alternatives, which are already saddled with the teething problems facing all new technologies (e.g. smart meters) (Mokyr, 2010; Unruh, 2000).

For the theme of diffusion, gaining endogenous momentum behind innovations, and understanding how these innovations can become embedded within policy, social, business and user environments is central. Finally, in terms of impact, and with the acknowledgement that it is extremely difficult to do so, we must seek to better understand the influence of incremental innovations, such as loft and cavity wall insulation; explore rebound effects; analyse impact scenarios, and develop modelling tools for systematic sociotechnical transitions (Geels *et al.*, 2018). Taken together, the detailed consideration of emergence, diffusion and impact provided in this book provides opportunities for far-reaching transformations. From here and working towards practical utility of our research and findings, we now consider what the sociotechnical approach means for the UK, for international audiences, and for policy practice.

Reflections on the UK context

To date, the UK *has* made significant progress in decreasing energy demand through both technological innovations and the offshoring of manufacturing (Hardt *et al.*, 2018), yet as the chapters in this book demonstrate, much more can be done. Despite the recognition from the UK government that reducing demand is a more cost-effective approach to reaching national climate goals than building additional capacity, all of the so-called 'low-hanging fruit'[1] have been plucked and at the time of writing, energy efficiency and demand policy in the UK is somewhat confused. In fact, without further progress, the Committee on Climate Change (2016, 2018) warns that UK policies will fall well short of the fifth carbon budget – a legal emissions restriction that forms part of a long-term target of reducing greenhouse gas emissions to 80 per cent below 1990 levels by 2015.

Taken together, the case studies presented in this book have shown that UK progress on energy demand transitions is something of a mixed bag. Some innovations – including electric vehicles (EVs), automated vehicles (AVs, also known as 'driverless', 'self-driving' or 'autonomous' vehicles), and smart meters – certainly still appear to be in the emergence phase. EVs for personal mobility (Chapter 4), for instance, are constrained by the lack of simultaneous development of energy storage of mobile power supplies. The emergence of AVs (Chapter 5) is constrained in the experimentation phase by limited visions of the 'real world', with fewer opportunities for surprises and second-order

learnings. Likewise, smart meters (Chapter 6) are still undergoing technological development and face the constraint of resistant and reluctant consumers.

Progress is slow at best as policymakers appear to reluctantly and tentatively commit to change. This is perhaps most dramatically illustrated by Bergman's work on EVs (Chapter 4), which shows that policymakers' visions of how change will occur still uphold the dominant regime structure of the car industry, which is based on the continued prominence of conventional vehicles in the medium term. Also, in the transport sector, Hopkins and Schwanen (2018a, 2018b; Chapter 5) show how a technological solutionist discourse prevails in responding to the environmental externalities of transport. This is despite the fact that transport accounts for approximately 25 per cent of the UK's CO_2 emissions (with two-thirds of that coming from cars and vans) and therefore offers a significant option for large-scale energy demand reduction (Chapter 4; Chapter 5; Committee on Climate Change, 2014). It seems that British policymakers are uncomfortable even *imagining* radical change in transport-related energy demand, much less implementing it.

The two UK cases discussed by Roberts and Geels (Chapter 10) on historical transitions show that this somewhat reticent approach to embracing radical sociotechnical change is not new to the UK. The transition to road transport in the UK was only given policy support after the British road transport system was already widely established. Policymakers dramatically accelerated the transition to modern agriculture in response to a wartime food shortage, but in that case, they acted only in response to an existential threat combined with a decade of lobbying from farmers. Moreover, their actions mainly consisted of developing a domestic system that had been in place overseas for since the late nineteenth century. If this pattern continues in the era of climate change, the UK might thus be limited to being a follower, rather than a leader, in low-carbon transitions.

A further case-in-point are current approaches to energy efficiency improvements in buildings, which account for approximately one-quarter of UK carbon emissions and therefore, present considerable potential for further savings and improvements (Clarke *et al.*, 2008; Rosenow *et al.*, 2018). Chapters by Brown *et al.* (Chapter 7) and Webb (Chapter 11) identify failures with policy initiatives such as the Green Deal, despite the fact that the Committee on Climate Change (2015, 2016) estimates that there is cost-effective potential to reduce direct emissions from all buildings by a third by 2030, and to achieve near-zero emissions by 2015. If proactive policies are implemented and support restored, this retrofit rollout alone could add approximately £25.3 billion of value added to Britain's GDP (Guertler and Rosenow, 2016). In this regard, UK decision-makers must not only imagine positive change, but also heed the positive business case for it.

Constructively, the chapters on diffusion and impact highlight a number of key findings towards averting and redressing this somewhat unsupportive policy trend and provide evidence of what successful policymaking might look like. For instance, Kern *et al.* (Chapter 12) demonstrate that to be effective, UK

policymakers need to develop well-managed portfolios of policy goals, strategies and instruments, the mix of which needs to be (re-)assessed and modified as necessary. These policies, they argue, should focus on 'efficiency first' as a policy goal which goes against the current strategy, where, to date, none of the £256 billion investment pipeline for energy infrastructure has been allocated to energy efficiency improvements (Rosenow and Cowart, 2017).

Following a case study of stalled progress on energy efficiency policy for UK buildings, Webb (Chapter 11) reinforces our earlier point that British policy mindsets must shift away from classical economics' insistence on the efficiency of markets towards a valuation framework structured around societal responsibility for welfare and sustainable prosperity. Webb adds that to reach energy efficiency goals, the British government may even require departmental reform, as energy-saving is relevant to multiple ministries, none of which are focused on the issue (particularly in the case of low-carbon buildings). British policymakers, activists, researchers, and others trying to influence change, should more carefully look at what kinds of broader sociotechnical developments can *enable* greater political will to accelerate transitions to sustainability. Thus, UK energy demand and energy efficiency policy requires a consistent, front-and-centre seat at a number of interlinked tables.

Lessons for other countries

Roberts and Geels (Chapter 10) warn that despite being instructive, policymakers should be cautious when copying lessons from foreign examples given their different political, economic, cultural and technological particularities. Nonetheless, the primarily British case studies discussed in this book certainly have relevance beyond the British context and suggest a wider range of broadly applicable lessons.

First, we stress the importance of *visions and expectations*. While these might seem rhetorical and ultimately not constitutive of actual on-the-ground change, the evidence in this book shows that they can have powerful performative impacts not just on the uptake of energy-saving innovations, but also on the effects that these innovations have once adopted. Roberts and Geels (Chapter 10) show how visions of a motorised future in the UK; of clean, efficient, natural gas in the Netherlands; and of a cooperatively-run, sustainable heating system in Denmark, proved decisive in shaping choices by both policymakers and private actors that allowed the deliberate acceleration of sociotechnical transitions. Bergman (Chapter 4), on the other hand, demonstrates how visions and expectations not only help determine whether low-energy innovations diffuse widely, but also what form they will take after doing so. This is important given that during the emergence phase, any innovation has several ways in which it can be used in practice. EVs can simply result in the same patterns of automobility, for instance, or they can result in completely new kinds of travel patterns that have a much greater effect on energy demand. Where the UK has arguably failed in this regard, other countries can succeed.

The second international lesson relates to the importance of *incumbent power and resistance*, which appears, one way or another, in virtually all chapters of this book. Drawing on Hughes (1987), Chapter 2 (Geels *et al.*) identifies sources of so-called 'lock-ins', including sunk investments in skills, factories and infrastructures, for example, as well as economies of scale and the momentum of established rules and institutions, each of which restricts opportunities for change. Others refer to incumbent business models and industry groups. In their work on the emergence of AVs, Hopkins and Schwanen (Chapter 5) contribute to understandings of the politics and power-laden nature of urban experimentation, with reproductions of the status quo. Roberts and Geels (Chapter 10) go into detail illustrating how overcoming incumbent resistance is not just a matter of fighting it directly; sometimes, such as in the case of Dutch natural gas, incumbent actors can be bought out, or even co-opted to become active partners in the transition. If enough incumbents can be brought onside in this way, then their power acts in favour of energy transitions rather than against them, and therefore, may create the necessary pre-conditions for radical change to happen. These incumbents are not just policy and industry elites, but also users. Admittedly it is strange to think of users (who, in the case of energy demand, are essentially the various and multiple general publics), as incumbents. Like industrial and political actors, however, they have entrenched interests, practices, and preferences that they are reluctant to change. They, too, might have to be bought out for radical change to occur.

A third common point is that of *technological and policy mixes*. This book has illustrated the paramount importance of looking both at the interaction between different kinds of interventions and innovations, and at the broader sociotechnical effects that can have. Kern *et al.*'s research on policy mixes (Chapter 12) has some obvious lessons for this as it applies to policy measures that take account of existing complex policy mixes, and which simultaneously take advantage of existing innovations while developing new, more radical ones for the future. This point is articulated by Brown *et al.* (Chapter 7), who recommend a mix of standards and regulations, financial measures, new institutions, and intermediaries to address the problem. Policymakers should be fully aware of all the policy and technological mixes they are dealing with before intervening to change something. They can also look for pre-existing systems or policies they can build from, rather than trying to create radical change from scratch.

The final insight has to do with *users and practices*. Users impose normative conditions on transitions, as discussed by Jenkins and Martiskainen (Chapter 3) and Jenkins *et al.* (Chapter 6). They therefore must play a fundamental role in the innovation process not only for the sake of moral considerations such as a commitment to democracy, but also because transition policies that succeed at the expense of some vulnerable element of society are likely to be politically unstable. Users should therefore be active participants in energy transitions, rather than passive beneficiaries, a finding reiterated by Hopkins and Schwanen (Chapter 5). Ultimately, the various publics have the biggest single role (albeit a collective, often unguided, and sometimes unconscious one) in actually

enacting change. As Figus *et al.* (Chapter 9) show, the ultimate impact of rebound effects depends to a large extent on the specific circumstances of particular user groups and how they compensate for energy savings in one area with increased energy use in other areas.

Taken together, these lessons may seem somewhat abstract, but alongside the specific recommendations and applications presented in each chapter – which draw on material from New Zealand, Denmark, Japan and Finland, among others – they provide important practical recommendations and cautionary tales.

Recommended policy principles

While the primary value of *Transitions in Energy Efficiency and Demand* lies with its sociotechnical approach and the range of substantive insights and conceptual contributions developed throughout each chapter, we also offer a secondary benefit: nine promising policy principles for accelerating high efficiency, low demand change. Developing the points made above, we now discuss each of these in turn.

First, policymakers should, whenever possible, be *ambitious, inclusive, and challenging* when setting their visions, roadmaps, plans and other devices for orienting a transition in energy demand. While incumbent actors might have the easiest claim to expertise on the future possibilities that exist, this comes with a bias that might lead to reproduction of existing patterns of energy demand, rather than wholesale change. Chapter 2, for instance, demands a broader view of the process, which takes into account learning and experimentation, the multiple conditions necessary for systemic change, and the coalitions of interest that can block or support emerging niche innovations (Geels *et al.*, Chapter 2). Bergman (Chapter 4), recommends that policymaker's engagement with visions includes a larger variety of futures, scenarios of disruption and failures to meet emissions reductions and other targets. These, he argues, could be commissioned from a wider variety of actors, including outsiders and niche players who can challenge, rather than support, dominant visions.

Second, policymakers should *avoid looking for single, silver bullet technological or policy interventions and move towards policy and technological mixes*. This necessitates an embrace of complex, multi-faceted approaches that include targeted regulations, subsidies, public relations campaigns, and other strategies that take account of (and, when possible, augment) existing policy and technological mixes. Critically, this includes a move beyond a sole focus on market mechanisms or drop-in technological fixes (e.g. Chapter 5; Hopkins and Schwanen). As Geels *et al.* (Chapter 2) show, this forces us to look beyond carbon pricing as a policy panacea. Research on policy mixes provides a particularly promising avenue here: Brown *et al.* (Chapter 7) develop an especially nuanced and tangible set of recommendations in keeping with this notion that includes a mix of regulations, financing and incentives along with the establishment of new institutions and the recognition of energy efficiency as a strategic infrastructure priority.

Third, *policies should aim to support present-day incremental change, while also building towards radical change in the future*. This applies to all aspects of developing efficiencies in energy demand, including technologies, networks, business models, regulatory structures and user practices, and comes as acknowledgement of both the dramatic change required, and of the cumulative effect of small steps to get there. It further suggests a rethinking of the radical/incremental dichotomy that is so prevalent in discussions about climate policy. While radical policy changes to deliberately accelerate transitions should be the ultimate goal, incremental changes should be seen not as an inferior alternative to these, but as near-term facilitators of the more aggressive cuts to energy demand. This becomes especially important when you consider that the more individuals that are successfully engaged and take on energy efficiency schemes, the greater the potential success of transition pathways.

Fourth, *users should be considered as a critical component in any process of change*. The ultimate impact of transition policies on users should be socially just, and supportive of practices that already exist at the user level. Wherever possible, policymakers should try and build on practices that users are already demonstrating or needs that they are already articulating. Jenkins and Martiskainen (Chapter 3) note, to this end, that throughout the transition process, governments and business must identify those who may be vulnerable and then both ascertain and make provision for them through targeted subsidies, exemptions and efficiency measures (e.g. in energy efficiency policy). As one very tangible option, this may take the form of a funded Energy Cafés that acts as a triage service, bringing together local authorities, health workers, community organisations and individuals in a trusted setting, providing advice and ensuring that energy needs are met. The risk of not doing this is that we fail particular social groups through insufficient consumer engagement, as is warned by Jenkins *et al*. in their exploration of the UK smart meter rollout (Chapter 6).

Fifth, *transitions should have a clear normative goal*. Innovations do not just take the form of new technologies, but can also be social or procedural in nature, and this makes them inherently normative affairs. The energy justice framework introduced in Chapter 3 suggests that transitions in energy demand should occur in a way that ameliorates, rather than exacerbates, energy poverty. In order to fulfil this aim, it thus becomes paramount that we engage with a wide range of both practical and normative voices. This will require the British government, for one, to address its current tardiness (shown by Webb in Chapter 11) in responding to the voices of researchers, advisory bodies and lobbyists, even when they highlight the benefit of alternative transition pathways (or indeed, caution their failure, as was the case with the Green Deal (Mallaburn and Eyre, 2014)).

Sixth, *transition policies should, where possible, act on technologies that already exist*. Radical innovations are useful, but they take time to develop and up-scale. As Geels and Roberts (Chapter 10) suggest, focusing on technologies that are already well established in other contexts means that policymakers are simply acting to consolidate, and, perhaps, to accelerate, transitions that are already

well underway, and can also benefit from previously developed technical performance, user communities, and business networks. Knowing their strengths, these can be developed using innovation policies in advance of deliberate acceleration e.g. promoting them as public goods, avoiding monopolies or coercive policies that will aggrieve users.

Seventh, *transitions will always have unintended consequences, and wherever possible, these have to be acknowledged, anticipated and managed.* This is particularly important in energy demand, as energy-saving innovations have a tendency to produce rebound effects, which reduce their ultimate effectiveness. It is also key in the context of Brexit, where certain types of outcomes may be difficult or impossible to anticipate (Geels *et al.*, Chapter 2). Bergman (Chapter 4) shows how this could be achieved by commissioning visioning documents from a larger variety of actors, including outsiders and niche players, who can challenge, rather than support, the views of incumbents. This, he writes, would enable more scope and choice for policymakers to meet policy goals and targets, and leave us better prepared for foreseeable and unforeseeable changes to transport in the future; a lesson that undoubtedly extends beyond his case study of EVs. It seems important, too, to acknowledge small, often knock-on consequences.

To this end, Figus *et al.* (Chapter 9) warn that a focus on rebounds highlights the failure to achieve the technologically feasible energy use reductions and neglects the wider range of economic and social impacts that energy efficiency improvements can deliver beyond climate change alone. These include, the co-benefits of household energy efficiency stimulating the UK's economy, leading to increased employment, investments and wages which achieving substantial, yet smaller than anticipated, reductions in energy use, for instance. Or, as Shrubsole *et al.* (2014) warn, a negative set of implications that extend as far as increases in feelings of social isolation if windows are too airtight and noise cannot infiltrate.

Eighth, *the spatial dynamics, and potential spatial and temporal asymmetries of policy interventions need to be acknowledged, and where possible, avoided.* This has implications across the three dimensions of innovations discussed in this book; emergence, diffusion and impact. In the emergence and diffusion phases, for instance, innovations are likely to have spatially and temporally distinct characteristics, playing out at national through to local scales. As an illustration, Chapter 5, Hopkins and Schwanen point to the replication of existing dynamics in the trialling of new technologies. Given the likely costs of emerging innovations (e.g. AVs, EVs) diffusion in wealthy suburbs – and policies to accelerate diffusion – are likely to have unequal impacts. Guiding visions and expectations are also often a-spatial; they homogenise places and overlook diversities in people, infrastructures, cultures, etc., with implications for public and political acceptance. Likewise, impacts may benefit some places, while disadvantaging others, at least in the short-medium term.

Ninth, and finally, *policies should aim to address all three facets of transitions*: The emergence of radical alternatives, the diffusion of new sociotechnical

Table 14.1 Six sociotechnical research debates and areas for future study

Theme	*Research debate*
Emergence	• The contribution of outsiders and incumbents to emergence • The role of visions and expectations in emergence • Geographies of innovation emergence and impacts for social equity
Diffusion	• Political will and contextual pressures for deliberately accelerating diffusions • Policy mixes for accelerated diffusion
Impact	• Rebound effects of low-energy innovations • Frameworks for evaluating broader impacts

Source: the authors, with reference to Geels *et al.*, Chapter 2.

systems and their ultimate impact on energy demand. Thus, it is critical that going forward, sustained and long-term policy to support sustainable innovation accounts for the various steps along the innovation pathway, to ensure not just successful emergence into the marketplace, but also that the innovation(s) is/are as impactful as possible in order to meet the challenge of energy demand reduction.

Conclusion: the future of energy demand research and policy

If there is one lesson we hope the readers of this book take away, it is the value of a sociotechnical approach in understanding transitions in energy demand. Looking beyond this, we hope that readers engage with each of the chapters that are relevant to their own practice and implement the recommendations given within. We return too, to the new areas of research reflected upon in Chapter 2 (and summarised and in one case, further developed in Table 14.1), which not only have the potential to build on each other to achieve radical, systematic change, but place this volume at the forefront of a new research agenda into the future of energy demand research and policy.

What is more, we reiterate the magnitude of this challenge and state once more, that reductions in energy demand will not be accomplished by following any one magical formula. This book's focus on complexity and context-dependence should be sufficient evidence of that. We have provided general principles, heuristics, cautionary tales and ideas, but transitions on-the-ground will always depend on the ingenuity, imagination and dogged effort of those who work on making them happen. To all engaged in meeting this challenge, we wish them good luck.

Note

1 The distribution of energy-efficient boilers, as one example.

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