CHAPTER 7

NEEDED: A DEMAND-SIDE STRATEGY

Introduction

Energy policy, including EU energy policy, has traditionally focused on the supply side. For instance, energy security is generally defined as 'security of supply' rather than in terms of an active role for consumers in the matching of supply and demand.[1] Climate change objectives are also being met largely through action on the supply side of energy. The degree of intervention there—for example, in supporting low-carbon generation—has consistently been much higher than on the demand side. A recent EU study (Ecofys 2014: iii) suggested that some 70 per cent of the intervention total, in terms of the resources devoted to the measures, goes to support for production, with a mere 8 per cent or so on energy efficiency (and a negligible amount on demand response). Perversely, the largest single form of intervention on the demand side is via preferential (lower) levels of taxes on energy for some groups of consumers (for instance, lower rates of Value Added Tax on domestic energy consumption or lower carbon taxes for carbon-intensive industries), a practice which undermines climate change policy by encouraging the use of energy.

The only partial exception to this supply-side orientation is energy efficiency, which has always been a policy mainstay, at least in terms of presentation, if not substance. Yet there is much more to the demand side than energy efficiency, and developing a full understanding of the demand-side resource and integrating it properly into overall energy policy will be one of the main challenges for policy makers over the coming decades.

1 See, for instance, the Commission's description of EU energy security at http://ec.europa.eu/energy/security_of_supply_en.htm. Similarly, the UK government produces a Statutory Security of Supply Report, jointly with Ofgem.

This chapter looks at existing EU policy towards the demand side, focusing necessarily on energy efficiency, since that is where the main activity has been hitherto; it suggests that the Commission is aware of the need to develop a more comprehensive approach to the demand side, but that its steps in this direction have so far been only very tentative. It argues that if the EU is to make the fundamental transition it is aiming at—towards 'a sustainable, low-carbon and climate friendly economy that is designed to last' (COM 2015a: 2)—it will need to give much more consideration to the need for a major policy shift towards the demand side, and it will need a joined-up approach. This includes designing markets with a view to facilitating demand response, but also goes much wider and includes many aspects of energy policy, as discussed below.

The central role of energy efficiency

Energy efficiency has always been at the centre of EU policy, and policy rhetoric, particularly in relation to decarbonization. It is one of the three pillars of the so-called 20-20-20 targets: the 2020 Climate and Energy Package agreed in December 2008 which called for a 20 per cent reduction in greenhouse gas emissions, a 20 per cent share for renewables in the EU energy balance, and 20 per cent energy savings by 2020. The energy efficiency target was the only one of the three which was non-binding; this may reflect the supply bias reflected above as well as the intrinsic practical complications involved in making an energy efficiency target binding (complications which are themselves part of the reason for the supply-side bias—it is more difficult to monitor and enforce progress on the demand side). It remains a central component of the 2030 goals, with EU leaders having already agreed on a target of at least 27 per cent improvement in energy efficiency, in line with the renewables target for 2030. So far, the energy efficiency target is still indicative, despite the fact that a number of member states had asked for a binding target. (However, this may not be so significant a discrepancy as in the past, given the uncertainty about the governance arrangements for the 2030 targets—see Chapter 11).

The non-binding nature of these targets might suggest a relatively low status in comparison with other measures, as might the rather confused understanding (discussed later) of what energy efficiency actually means in practice. But this would not be the impression given by EU rhetoric, which only just falls short of treating energy efficiency as the all-purpose 'magic bullet' which can solve all energy policy problems. For instance, in its 2020 strategy document, the Commission suggested that 'energy efficiency is the most cost effective way to reduce emissions, improve energy security and competitiveness, make energy consumption more affordable for consumers as well as create employment, including in export industries' (COM 2010: 6). Elsewhere the Commission has claimed that 'in many ways, energy efficiency can be seen as Europe's biggest energy resource' (COM Energy Efficiency 2015).

In the preamble to the 2012 Energy Efficiency Directive, the text reads:

> The Union is facing unprecedented challenges resulting from increased dependence on energy imports and scarce energy resources, and the need to limit climate change and to overcome the economic crisis. Energy efficiency is a valuable means to address these challenges. It improves the Union's security of supply by reducing primary energy consumption and decreasing energy imports. It helps to reduce greenhouse gas emissions in a cost-effective way and thereby to mitigate climate change. (Council Directive 2012: 1)

Similarly, in its energy efficiency communication last year, the Commission states:

> Energy efficiency has a fundamental role to play in the transition towards a more competitive, secure and sustainable energy system with an internal energy market at its core. (COM 2014c: 2)

The examples could be multiplied. Energy efficiency is not only supposed to be fundamental to achieving the EU's main energy goals, like security, environmental protection, and competitiveness, it is also regarded as the most cost-effective route. One could be forgiven for assuming that it should therefore be the most developed and most important policy measure. But in fact, as noted above, it is a relatively minor element in the policy picture, and it is not even a binding target for 2020 or 2030.

The reasons for this are discussed later on. First, however, there is a brief description of existing EU policy measures.

Policies and measures

The main general instrument in this area is the Energy Efficiency Directive 2012/27/EU (which replaced two earlier directives, one on combined heat and power, and the other on energy services). It contains a number of measures designed to help meet the 20 per cent savings target for 2020. Unlike the target itself, these provisions are binding (though as discussed below, compliance remains a general issue).

The directive requires member states to:

- Set national targets in line with the overall 20 per cent target
- Carry out an assessment of national heating and cooling systems with a view to estimating the potential for efficient district heating and cooling schemes
- Assess the energy efficiency potential of their national gas and electricity infrastructure, including such matters as tariff policy and rules for dispatch
- Oblige energy providers to achieve cumulative end-use energy savings of 1.5 per cent of annual sales over the period 2014–20, or take measures to promote equivalent savings
- Ensure that metering and billing practices enable consumers to take informed decisions
- Develop public procurement rules designed to ensure the purchase of energy-efficient products by public sector bodies

In addition to these general measures, there are specific measures in particular sectors, including:

- **Buildings**. The Energy Performance of Buildings Directive (2002, revised in 2010/31/EC) requires member states to establish minimum performance standards for new buildings and those undertaking renovation. However, most buildings in Europe are not new—indeed around 40 per cent of residential buildings were constructed before the 1960s, at a time when building regulations gave little attention to energy efficiency. The provisions in the Energy Efficiency Directive that have been described are intended to go some of the way towards filling this gap.
- **Appliances**. The EU has had schemes for ecodesign, currently the Ecodesign Directive (2009/125/EC) which sets standards for the energy efficiency of appliances (Minimum Energy Performance Requirements—MERS), and for the energy labelling of appliances. Legislation on labelling goes back at least to 1992. Currently, the main relevant measure is the Energy Labelling Directive (2010/30/EU) which establishes ratings and standards for some household appliances. Parallel measures apply to non-domestic equipment. As part of its package of consumer-oriented measures to implement the Energy Union, the Commission has published a review of the energy labelling measures (Report 2015). While it calls for some revisions to the directive, it does not mark a major change of emphasis.
- **Transport**. Limits are set on the average emissions of new passenger vehicles and vans which have the effect of encouraging improved technical efficiencies, and there have been extensive discussions with car companies aimed at improvements in the efficiency of the vehicle fleet over time. Directive 2009/33/EC on the Promotion of Clean and Energy Efficient Road Transport Vehicles aims to encourage environmentally friendly vehicles, mainly via public procurement. Along with high motor-fuel taxes in Europe (largely the responsibility of national governments), these measures have led to a European vehicle fleet which is efficient by international standards.

Overall, therefore, it might seem that the EU has a reasonably comprehensive, if relatively conventional, set of energy efficiency policies. It certainly regards its package of measures as successful, arguing that the EU 'has already put in place the world's leading set of measures to become more efficient in our energy consumption' (COM 2015a: 12). The IEA points out that 'collectively, the European Union has lower energy intensity than its major trade partners and a similar level to Japan' (IEA 2014b), as shown in **Figure 7.1**.

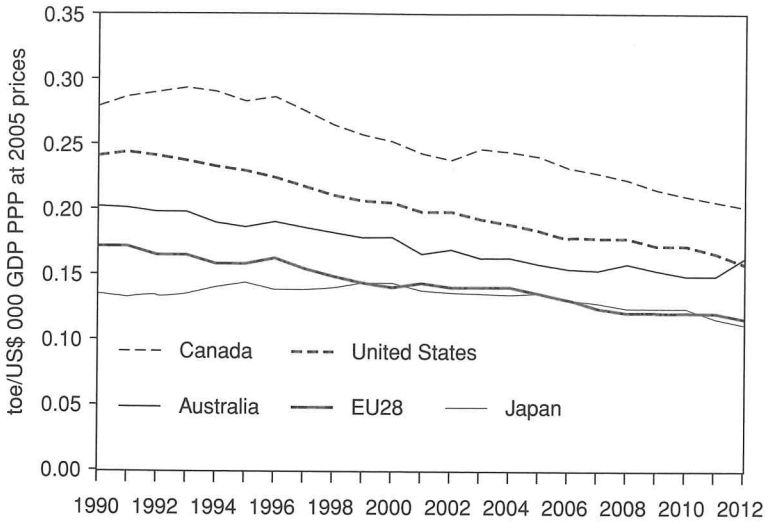

Figure 7.1: Energy intensity in the European Union and in selected IEA member countries, 1990–2012

Sources: *Energy Balances of OECD Countries*, OECD/IEA, Paris; *Energy Statistics of Non-OECD Countries*, OECD/IEA, Paris

The limitations of energy efficiency

Not everyone shares this perception, of course. For instance the Delors Institute, in discussing the need for an Energy Union, has summarized the position in the following terms: 'energy efficiency is now taken seriously but remains an underdeveloped objective' (Delors 2015).

In any event, the positive picture painted by the Commission begs major questions:

- Does the reality match the rhetoric? If energy efficiency is the 'magic bullet' described above, should the EU not be doing more?
- To what extent have member states' and EU policies actually reduced energy consumption? The declining trend in consumption could equally be explained by increasing energy prices and low rates of growth. Can the contribution of energy efficiency be measured?

- Is energy efficiency really the central challenge on the demand side?

On the first question, it should be recognized that it is not just in the EU that the rhetoric does not always match the reality; that accusation has been made against most countries. It is no doubt the case that governments could be doing more. However, it could also be argued that a large part of the perception that energy efficiency policies are inadequate stems from overblown expectations about what they can achieve and a failure to take account of the limitations of energy efficiency as a way of delivering security and lower emissions.

The first general problem arises from a confusion about what 'energy efficiency' actually means. The standard definition of energy efficiency is that it is essentially a form of productive efficiency. That is, in the words of the World Energy Council: 'Energy efficiency improvements refer to a reduction in the energy used for a given service (heating, lighting etc.) or level of activity' (WEC 2010). On its energy efficiency website, the IEA gives a similar definition: 'Something is more energy efficient if it delivers more services for the same energy input, or the same services for less energy input' (IEA 2015). The basic concept here is clear enough. Nonetheless a number of questions remain. For instance, is the qualification 'cost effective' understood to be part of the definition? It is not generally stated but often seems to be implied. More fundamentally, in the present context, energy efficiency, as defined, is a ratio (between energy input and service output). There is nothing in the definition which necessarily implies that the result will always be lower inputs. Yet policy makers often use the term 'energy efficiency' as equivalent to 'reduction in energy demand'. With other forms of productive efficiency (such as labour productivity) the argument is often the other way round: that unless efficiency (productivity) is improved, businesses will be less competitive, so be able to employ less labour—that is, that greater efficiency leads to greater use of the input in question, not less. It is not obvious that energy efficiency is necessarily different.[2] In other words, energy efficiency

2 There is an extensive literature on the subject which cannot be done justice to here. For some discussion of the issue please see

may lead to a reduction in energy use in line with the increase in efficiency, but it is not guaranteed to do so—there are a series of so-called 'rebound effects' at individual and economy-wide level which complicate the picture (that is, effects which lead to an increase in energy demand, such as higher comfort levels in response to the installation of home insulation).

The issue is often avoided or elided in the public statements of policy makers. For instance, the preamble to the Energy Efficiency Directive quoted earlier states baldly that energy efficiency reduces energy consumption. A similar and potentially confusing blurring of the picture underlies the stated energy efficiency targets. Improving energy efficiency by 20 per cent by 2020 does not mean reducing absolute consumption by 20 per cent but saving 20 per cent by reference to some forecast of what EU energy consumption might have been. Apart from the obvious difficulty—how do we know whether the forecast was realistic in the first place?—there can be many reasons why energy use turns out to be lower than forecast, for instance (this is directly relevant to the present situation) low economic growth and high energy prices. Technology can also have a significant impact. Indeed, there is an element in many energy forecasts representing Autonomous Energy Efficiency Improvement (AEEI) which reflects the efficiency improvements from the normal process of technical advance and equipment turnover, quite independent of any specific government energy efficiency policies. This element was traditionally taken to be around 1 per cent a year. Since recent economic growth in the EU has been at or below this figure, AEEI alone would be enough to stabilize energy demand, quite apart from any other factors. (Even with ex-post decompositions of energy demand, the same uncertainties arise. There may be an element ascribed to energy efficiency but it is generally a residual, after non-efficiency factors like activity levels, structural changes, and so on are taken into account. It is not generally possible to separate the efficiency element out between the various different drivers—government policy, prices, exogenous technical improvements, and the like.[3]

OIES 2011, UKERC 2007, and UKERC 2015.

3 See Fraunhofer 2014.

The energy saving obligation

The problems which apply to the overall target also apply to what is, by far, the most significant new binding measure in the Energy Efficiency Directive, namely the requirement on member states to set up an energy efficiency obligation scheme for their energy suppliers. These schemes must produce annual energy savings at least equal to 1.5% of their energy sales to final customers over the period up to 2020. This is a mandatory measure. However, like the 20 per cent target, it does not necessarily mean an absolute 1.5 per cent reduction in the volume of energy sales, but a reduction as compared with what would otherwise have happened. In other words, companies are required to show they have taken energy-saving steps, such as installing insulation for households, which result in their sales being 1.5 per cent less than they would otherwise have been. Indeed, the directive states that 'the requirement to achieve savings of the annual energy sales to final customers relative to what energy sales would have been does not constitute a cap on sale or energy consumption' (Council Directive 2012: 4). But this means that it will, in practice, be very difficult to assess what effect, if any, the obligation has had.

Some of these difficulties are clear, even in advance. For instance, a report in early 2015 from the Coalition for Energy Savings (CES) drew attention to a number of respects in which member states' plans might be dependent on savings which were ineligible (for instance, because they would not occur until after 2020) or which seemed to depend on double-counting. Only two states (Denmark and Ireland) were judged as having produced assessable and good quality reports in which most measures and claimed savings appeared correct; the other reports were not fully coherent or not assessable at all and many of the claimed savings were questionable (CES 2015).

The problem is compounded by the widespread failure to undertake effective monitoring of compliance or assessment of the results of energy efficiency programmes. For instance, the UK Energy Research Centre has concluded that 'the evidence base is remarkably weak', commenting on its website that:

> while multiple policies and interventions have been employed... rigorous ex-post evaluations are rare - as is systematic assessment of the lessons from such evaluations. This contributes to uncertainty and controversy over what such policies have achieved and provides an inadequate basis for future policy design. (UKERC 2015)

Often, evaluation is lacking even at the most basic level—compliance. The latest IEA review of EU energy policies comments, in relation to energy labelling and MERS, that for energy labelling:

> two-thirds of the products surveyed were correctly labelled...18 to 21% of products were not labelled at all...Compliance with MERS is more complex and costly so less information is available...The original ATLETE (Appliance Testing) project...found that only 43% of the products passed on all parameters. (IEA 2014b)

The Commission itself, in its latest review of labelling (Report 2015), recognizes that compliance is a problem and (not for the first time) promises steps to improve it. Overall, however, it is by no means clear, as the CES study shows, that governments have a clear picture of how their policies are being implemented in practice or what the impacts are. In the UK, for instance, there is some evidence that despite the tightening of buildings standards, poor construction practices have resulted in the energy performance of recently-built housing actually being poorer than it was a few decades ago.

A further complication in relation to the Energy Efficiency Directive is that it allows member states to pursue different schemes that are 'at least equivalent' to the energy saving obligation imposed on companies. This is in deference to countries like Germany, which claims that energy efficiency activities of its KfW public development bank produce as much voluntary energy saving in Germany as the compulsory corporate scheme will in other countries. Assessing this 'equivalence' will add another layer of complication, especially given that there is also a series of exemptions and credits insisted on by certain member states. **Table 7.1** shows how these concessions reduced the savings the Commission had hoped to get from the obligation.

The comments above are not intended to challenge the underlying aim of the directive, which is to change the business model of utilities so that they do not see themselves as

Table 7.1: Projected savings (mtoe): Energy Efficiency Directive v. original Commission plan

Measure	*Original savings*	*Final text savings*
Energy saving obligation	75.0	52.0
Grids, demand response	7.5	17.0
Co-generation	25.0	11–12
Energy audits	8.5	8.5
Metering, billing	27.0	5.5
Public procurement	4.8	1.2
Building renovation	4.2	0.4
Total	152.0	c.97

Source: Platts, citing European Commission estimates

providers of energy so much as providers of energy services, such as heating, lighting, and so on. They should compete on the efficiency with which they can provide these services rather than solely on the cost of the energy they supply. Breaking the link between a utility company's profits and the volume of its energy commodity sales could be a significant route to achieving a revolution in energy efficiency.

But it is not clear whether this aim has been reconciled with the aim of more effective competition in energy markets, where the goal, as discussed in the previous chapter, is ultimately the lowest possible price per kWh. A switch to service, as opposed to commodity, provision on the part of utilities presupposes a move away from this pricing model and a closer relationship between utility and customer than mere price comparison. It may also require changes in regulation: if a customer trusts a utility enough to let it come into her house and install double-glazing and insulate the roof, it may be that the same customer is unlikely to switch the following day to another energy supplier. But it will also be the case that the utility will want some assurance that switching will not take place, for instance in the form of longer-term contracts or contracts which package together energy supply and energy-using equipment. However, this poses a challenge for regulators in fully liberalized markets, who have traditionally tended to resist long-term contracts and

the bundling of different services. In the liberalized energy market model that the EU has chosen, the right for customers to switch from one supplier to another is considered vital. There is evidence from California, which allows utilities monopoly control over their customers but regulates the utilities very heavily, that a permanent company–customer relationship, plus the right incentives, can produce exceptional gains in electricity efficiency. Though it is not clear whether the EU would regard this as a price worth paying, there may be, however, a case for changing the way customer switching is viewed in Europe.

There have also been stresses between the overall goals and member state autonomy. For instance, one of the directive's provisions was the requirement for member states to renovate each year at least 3 per cent of all their public buildings, measured by floor space. At the insistence of Germany, a federal state with many layers of government, this requirement was limited to the buildings of central government. Another serious dilution of the Commission's proposal related to smart metering. The Commission had hoped the directive would define the functioning of smart meters more clearly, so as to ensure the meters' installation would benefit the consumer as much as the energy company, for instance providing consumers with monthly bills based on monthly readings. In the end, the directive did little more than re-state the goal (already in previous legislation) of equipping 80 per cent of customers with smart meters by 2020.

So, despite its essentially non-controversial nature, energy efficiency brings up the same tensions as other elements of energy policy; between the EU as a whole and the competence of member states, and between the EU's competition and environmental goals.

Energy security

As with the relationship between energy efficiency and energy demand, a similar confusion of thinking also often occurs when it comes to the relationship between energy efficiency and **energy security** (see **Box**). That relationship is by no means as clear-cut as the rhetoric would imply.

Energy efficiency and security

The links between energy efficiency and reduced demand are complex. But, even leaving these complications aside, the role that improving energy efficiency plays in helping to improve energy security, on the assumption that it does reduce energy demand, is also far from straightforward. Reduced energy demand may indeed lead to a lower requirement for fuel imports, but it does not mean any reduction in the need for energy services. It is important to remember that energy efficiency is about reducing the consumption of energy for the provision of a given energy service, rather than reducing the consumption of energy services. So the level of energy consumption across an economy is not of itself a measure of that economy's dependence on energy services, and the level of a country's energy imports are not a measure of its dependence on imports for energy services (even leaving aside the question of whether imports are per se insecure). A country with a high level of energy efficiency may use less energy (or imported energy), but exactly the same level of energy services, as its less efficient counterpart. An interruption in energy supply would then affect it just as much as it would affect the less efficient country, as both would lose the same amount of energy services. In other words, the efficient country is not obviously more secure or less dependent on energy.

One way of looking at it is that in an efficient country, each unit of energy (or of imported energy) is more valuable to the economy because it provides more energy services; the loss of that unit of energy is then that much more painful, and the loss of a given proportion of supply has as much effect as in a less efficient country (and the loss of a given absolute amount of energy has more impact). Indeed, it is quite likely that an inefficient system has more redundancy built into its energy demand structure (i.e. that it will find it easier to reduce demand without difficulty in an emergency); it is also likely to have more diversity of supply (e.g. more terminals and pipeline connections) as a result of its greater demand.

So it could well be that an inefficient country is more able to reduce demand quickly and is more, rather than less, secure, at least in the sense of having more potential resilience in the face of an interruption.

Furthermore, energy is a complementary good, that is, it is used in conjunction with energy-using equipment to produce the relevant energy service. This means that the cost or quantity of demand for energy itself is not a measure of the economy's dependence on energy services. For instance, a commonly used measure of dependence is expenditure on energy (or energy imports) as a percentage of GDP. But the potential GDP loss from a hiatus in energy supply is much greater than that percentage figure: at the extreme, if a modern economy were deprived of the energy it needed for moving goods and people, for running its computers and communications, for providing clean water, and keeping people warm and secure, the GDP loss would be almost total, rather than the few percentage points suggested by the energy/GDP ratio. In general, just as the Value of Lost Load for electricity is typically 100 times or more the cost of supply, so the cost of an interruption to any form of energy supply can be many times the cost of the underlying physical energy. The cost of an interruption reflects the value of the energy services concerned, and is not dependent on the size of the energy input for the supply of those services.

A demand-side strategy in support of decarbonization

So the tendency to treat energy efficiency policies as synonymous with demand reduction, and in turn with greater energy security, is at the least oversimplified. More fundamentally, even if there were a reasonably direct link between energy efficiency policies and the level of demand, current policy is not well targeted to achieving the low-carbon transition. A demand-side strategy for this purpose would involve:

- Reducing demand for high-carbon fuels.
- Promoting demand for low-carbon sources and investment in low-carbon applications.

- Encouraging fuel switching to low-carbon sources.
- Complementing other measures, like the ETS.
- Promoting demand response and flexible demand (see Annex 1 to this volume).

Energy efficiency as currently practised does little or none of this:

- It is not targeted on carbon or high-carbon forms of demand but on demand in general.
- It does not take account of the changes taking place on the supply side. Supply-side measures are leading to the decarbonization of some sources relative to others. For example, many countries are aiming to decarbonize electricity within a relatively short timescale. Efficiency measures aimed at electric appliances (as many are) will have an increasingly small impact on carbon emissions.
- Energy efficiency policies do little or nothing to promote demand for low-carbon sources or encourage fuel switching. Indeed, measures which improve the efficiency of fossil fuel appliances and vehicles will tend to encourage their use, and continued investment in such equipment. So, if the response to the challenge in the previous bullet point is to switch energy efficiency support from electricity to other fuels, that could run counter to the need to facilitate the transition to electricity. For instance, the more efficient conventional cars become, the less attractive electric cars are in relative terms.
- Energy efficiency does not fit well with other elements of decarbonization strategies. For instance, if it does indeed achieve a significant overall reduction in energy demand, it would have the effect of reducing the carbon price in the ETS (see Chapter 8).
- There is a wider problem, as discussed in Chapter 6. The overall strategy of the EU in general, and of many member states, is to decarbonize electricity and then switch other sectors to electricity and away from fossil fuels (for instance, increasing the use of electric heating in residential premises, and encouraging electric transport). The supply-side focus of the measures implemented so far has the effect of increasing electricity prices, which can only discourage switching to

electricity. While improved energy efficiency may lower the cost of the transition to a lower-carbon energy system for consumers overall, it will not offset the impact of higher electricity prices, at least as currently practised. Without a more active and targeted demand-side strategy, there will therefore continue to be a tension between all three main elements of the decarbonization policy (energy efficiency, the ETS, and renewables).

- Current energy efficiency policies do little to promote demand response. Energy efficiency measures like labelling and MERS are aimed solely at energy consumption, not at creating a more flexible demand side.

More generally, there is a wider need, and an opportunity, to develop a full demand-side strategy, including demand response, in view of changes in technology and government objectives which make such a strategy both more necessary and more practicable. The rationale for a supply-side policy bias, if it ever existed, is now outdated, and energy efficiency need no longer be the primary focus on the demand side.

What a developed demand-side policy might involve

Annex 1 to this volume sets out the reasons why a more fully developed demand response strategy is needed to help enable the transition to a low-carbon energy system. The Commission appears to recognize this need in its vision for the Energy Union, which places considerable stress on consumer empowerment. In its Framework Strategy document, it declares:

> 'Most importantly, our vision is of an Energy Union with citizens at its core, where citizens take ownership of the energy transition, benefit from new technologies to reduce their bills, participate actively in the market, and where vulnerable consumers are protected.
>
> 'To reach our goal, we have to move away from an economy driven by fossil fuels, an economy where energy is based on a centralised, supply-side approach and which relies on old technologies and outdated business models. We have to empower consumers through providing them with information, choice and through creating flexibility to manage demand as well as supply. We have to move