Energy efficiency in UK energy policy: a step change towards a low carbon economy

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Abstract

In February 2002, the UK Government's strategy advisory body published 'The Energy Review'. This report to Government was written following an extensive six month public consultation. The report suggested that moving to a low carbon economy posed a major potential challenge, and that a 'step change' in energy efficiency leading to reductions in energy demand was required. Since the publication of the report, the government has initiated a further consultation which has lead to the publication, in February 2003, of the UK's first Energy Policy White Paper since 1967.

There has been wide agreement throughout both consultations that energy efficiency has a key role to play in achievement of both short and long term carbon abatement goals, regardless of decisions taken about supply side options. However, a number of debates are now ongoing concerning, for example: the relative importance of efforts for increased deployment of known solutions compared to the development of new technologies; the potential for synergies between efficiency options and emerging technologies such as D-CHP; and more general questions about how to bring about the required increase in the historic rate of energy efficiency improvement.

This paper examines some of these debates, and the implications they have for energy efficiency policy. It addresses the question of how the required step change in the energy efficiency of the economy can be achieved, and how this will fit in with other options for moving towards a low carbon economy.

Introduction

The well known Bruntland definition of Sustainable Development given within *Our Common Future* (WCED, 1987) – meeting the needs of the present without compromising the ability of future generations to meet their own needs - is widely quoted, but usually out of the intended context. The next sentence make this general concept much more specific and increases the scale of the challenge many times over, by stating that overriding priority should be given to the needs of the world's poor. As Gerit Vonkeman (*pers comm*, 2003) has observed, *Our Common Future* identifies Peace, Security, Development and Environment as the core challenges for achieving Sustainable Development. For environmental reasons, it might be necessary to reduce global resource use by a factor of between 2 and 5. To achieve development, security and peace, it is essential to effect greater global equity, with redistribution of resource use between rich and poor regions: this may require the rich countries to reduce resource use by a factor of 10 to 50 in the coming decades.

This paper discusses the scale of the challenge for low carbon policy-makers, and argues for the importance of concerted action across demand and supply sides, and at all stages of the life-cycle of low carbon technologies. However, the current debate – and this paper – is focused on improvements which might help us to achieve what could be described merely as *environmental* sustainability – we have barely started to face up to the deeper challenge presented by the intended meaning of *sustainable* development.

Context

Over recent years, a policy consensus has been growing around the desirability of a shift to a low carbon economy for

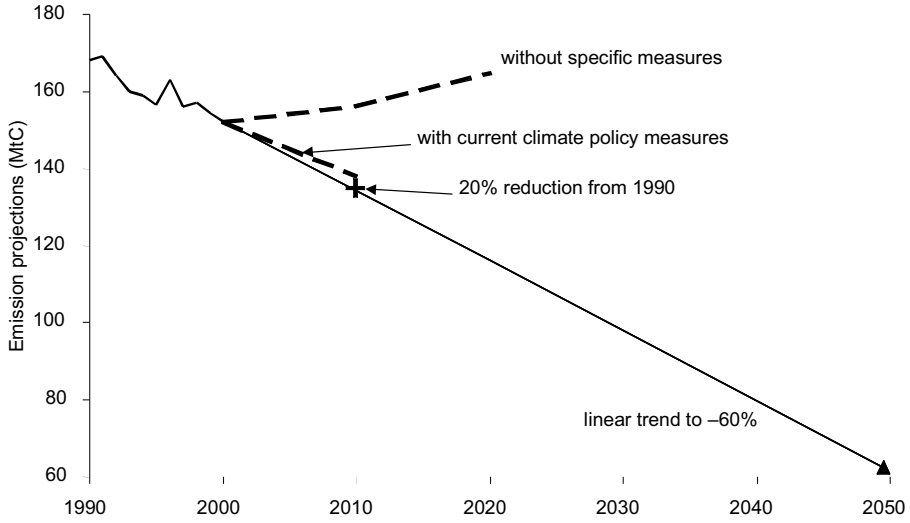

Figure 1: *Implications of a 60% reduction target for long term action.*

the UK. It is in this context that the Government has conducted recently the most comprehensive review of energy policy since the mid 1960s.

STARTING THE DEBATE

In 2000, the Royal Commission on Environmental Pollution published its 22nd report: 'Energy – the Changing Climate' (RCEP, 2000). This was the result of a two year study of energy prospects for the 21st century, which had as its main focus 'the implications of considerably reducing the use of fossil fuels as an energy source in the UK by 2050, or even phasing them out completely'.

The report supported a 60% reduction in UK carbon emissions by 2050 in line with global climate stabilisation through a convergence and contraction approach, and based its investigations around 4 scenarios of possible UK energy futures that would meet this reduction target. All the scenarios involved substantial reductions in energy use compared to present trends, ranging from stabilisation at 1998 levels to almost halving energy use by 2050.

Figure 1 illustrates the implications of a 60% reduction target for long term action by comparing a notional linear trend over 50 years with the forecast effects of existing climate policy to 2010. It is clear that whilst the current measures within the UK's Climate Change Programme may not leave us far from an interim target for 2010, a more intensive level of activity will be need to be sustained for a further 40 years if the 60% reduction target is to be achieved.

One of the report's key observations was that 'absolute reductions in energy demand and a large deployment of alternative energy sources will be needed if the UK is to make deep and sustained cuts in carbon dioxide emissions while protecting its environment and quality of life'. The study concluded that current energy policies did not strike the right balance between protecting the interests of future generations whilst at the same time achieving 'social justice, a higher quality of life and industrial competitiveness today'.

THE ENERGY REVIEW

In the summer of 2001, the Government asked one of its advisory bodies, the Performance and Innovation Unit (PIU) of the Cabinet Office, 'to examine the long term challenges for energy policy in the UK, and to set out how energy policy can ensure competitiveness, security and affordability in the future' (*Foreword by the Prime Minister*, PIU 2002). This was in part a response to the recommendations in the Royal Commission's report. The team undertaking the review comprised a mix of civil servants from the PIU and the Department of Trade and Industry (DTI) and external energy experts. During the course of the review, the team received evidence from and/or held consultation meetings/workshops with over 500 organisations and individuals with an interest in energy issues. In February 2002, the team's report to Government was published as 'The Energy Review' (PIU, 2002). This did not constitute a statement of government policy, but rather a basis on which a debate on the future of energy policy could be launched.

The report's main recommendations for future energy policy included: the suggestion of a 'strong likelihood' that very large carbon emissions reductions would be needed over the next century; the need for establishment of new sources of energy which 'are, or can be, low cost and low carbon'; the need for economic instruments to make all energy users aware of the cost of carbon emissions; the need to address institutional barriers to investments in renewables and cogeneration (CHP), and the need for a step change in energy efficiency. The paper also highlighted the cost-effectiveness of energy efficiency and renewables policies (c.f. nuclear and carbon sequestration options) in meeting immediate policy priorities.

NATIONAL POLITICAL COMMENT

Comments from the UK Prime Minister during 2002 suggest that there is some recognition in Government of the need for significant emissions reductions over the long term and also of the potential additional benefits for the UK.

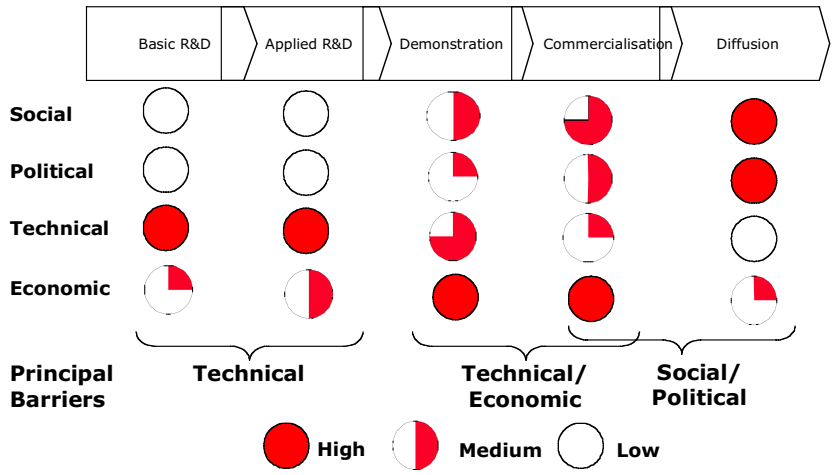

Figure 2: *Barriers in the stages of the innovation chain. Adapted from: the Carbon Trust.*

In a statement in Mozambique prior to the World Summit on Sustainable Development (Blair, 2002), the Prime Minister commented that 'the rich nations especially need to use resources much more efficiently' and went on to acknowledge that Kyoto was only the beginning: 'it will at best mean a reduction of 1% in global emissions… we know from recent reports that to stop further damage from climate change… in fact we need a 60% reduction worldwide'.

In his foreword to 'the Energy Review', he commented that 'achieving global emissions reductions will need major technological innovation, and I am convinced that the UK would benefit from being ahead of the game in moving to clean and low carbon technologies and in sharply improving our performance on energy efficiency'.

THE DEVELOPMENT OF THE WHITE PAPER

Following the publication of the Energy Review, the Government launched a further consultation around a number of issues it wished to consider in more depth. Written comments in response to the consultation paper (UK Government, 2002) were received from over 500 organisations and individuals, and a series of workshops with interested parties were held, together with a number of consultation events involving the general public. These were concluded in the early autumn of 2002, following which a team of civil servants from the DTI and the Department of Environment, Food and Rural Affairs (DEFRA) were tasked with drafting the Energy Policy White Paper. The paper was published in February 2003 (UK Government, 2003), and represents a formal statement of the framework for the UK Government's Energy Policy.

Issues

Throughout the consultations surrounding the PIU study and the development of the White Paper, a number of key issues relating to energy efficiency and its relative role in the transition to a low carbon economy have been raised and debated. Examples of these are reviewed here.

DEPLOYMENT OF EXISTING TECHNOLOGIES VERSUS INNOVATION

One point of debate has been the relative importance which should be given to further deployment of existing technologies and to new technological innovation. The lack of uptake of well-proven and cost-effective energy efficiency technologies is a familiar problem, yet it is one for which the solution remains elusive. A key question is therefore whether these technologies have 'had their chance' and should be ignored, with the policy focus on support for research, development and demonstration. However, this may simply repeat past mistakes, and lead to a new generation of cost-effective solutions for which the market simply does not reach sufficient levels of saturation. Perhaps we should not be considering deployment and innovation as two opposing options, but rather looking to an innovation chain that continues beyond demonstration and into the development of a self-sustaining large scale market for low carbon products. These ideas were explored for the United States (PCAST, 1999) using the concept of the "Energy-Technology innovation pipeline", delivering new technology from the lab to the market.

Within the UK, the Carbon Trust is a government-funded organisation which is intended to play a central role in the UK's transition to a low carbon economy, assisting UK businesses to reduce CO_2 emissions by funding and supporting technological innovation and the adoption of more efficient working practices. The Trust have adopted the concept of the innovation chain as a basis for their operating strategy, and have identified a set of barriers which exist at each of the five key stages of it. As shown in Figure 2, the nature and strength of the barriers vary across the chain, and whilst one barrier category may dominate at any one stage, there is for each category a continuum across a number of stages.

In devising long term policy frameworks, it is therefore unhelpful to reduce reality to a view of batches of technologies which exist at particular stages and which face a single barrier (i.e. "existing energy efficiency measures are commercialised and just need help with diffusion'): the set of social barriers to the uptake of technologies, for example,

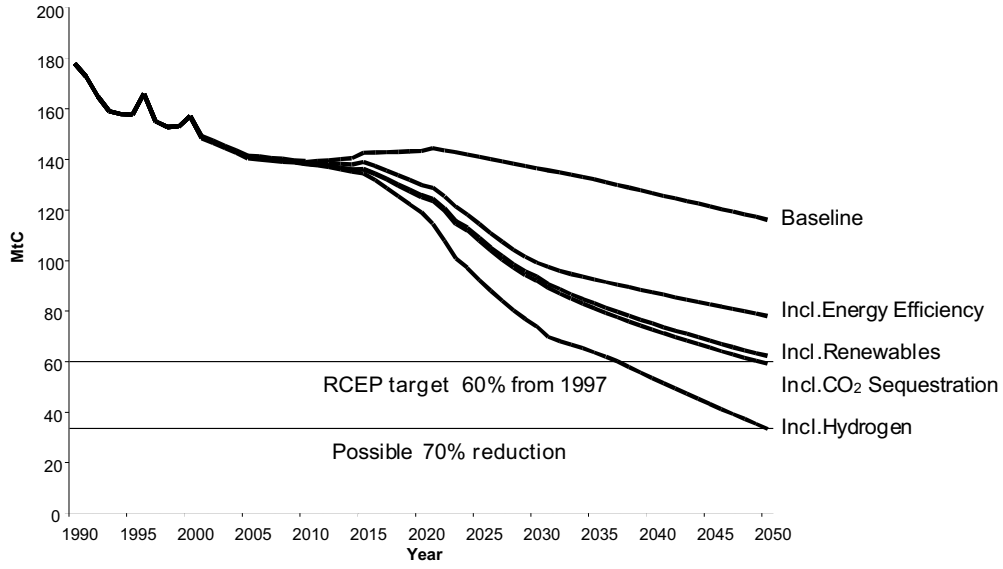

Figure 3: *Carbon Trust Low Carbon Futures.*

extends way back into the demonstration and commercialisation stages too. If we are to achieve deepening emission cuts over many decades, it will be essential that policy is designed so as to link each stage to the next, and facilitate a more effective 'conveyor belt' of options flowing from inventor to consumer.

SHORT TERM AND LONG TERM PRIORITIES

Whilst the above suggests integrated policy development for the long term, the shorter term debate over the relative importance of deployment of existing technologies and new technological innovation has continued. This may be extremely important in how short-term priorities are set, with a view to carbon reduction targets for 2010 and perhaps 2020. At time of writing the Energy Policy White paper has not been published, and thus the balance of support to be given between these areas is not certain. However, a range of recent modelling work both undertaken for, and independent of Government makes clear the imperative to take forward a wide variety of options if long term ambitions are to be met.

For example, Figure 3 illustrates a set of scenarios developed by the Carbon Trust. The upper line represents a baseline in which a number of barriers to the deployment of known energy efficiency and renewable technologies across all sectors have been removed, leading to a substantial and continued decline in emissions. The remaining lines represent the prospects for a wider range of emerging technologies in both end-use and supply. The projections illustrate that to achieve the 60% objectives, and perhaps even go beyond them, action is needed in all areas simultaneously: efficiency and low carbon supply; and deployment of known technologies and innovation for new ones. The figure also illustrates the importance for very deep cuts in emissions of moving beyond innovation and deployment of cleaner 'artefacts' or individual pieces of hardware, towards systems innovation – in this case a transition to a hydrogen economy.

SYNERGIES BETWEEN ENERGY EFFICIENCY AND OTHER SMALL SCALE LOW CARBON OPTIONS

At the broadest level, modelling undertaken for the DTI has illustrated the importance for low carbon supply technologies of implementing a strong programme of efficiency measures. Marsh et al (2002) note that 'The reductions in energy demand through efficiency measures considerably reduce the investment needed in low carbon technologies in order to meet the (carbon) abatement targets'. This study showed that approaching a 60% carbon emission reduction for 2050 requires complete decarbonisation of electricity production and some substitution of hydrogen for fossil fuels in transport, even with energy efficiency improvements assumed almost to eliminate overall demand growth despite continued economic growth. In the absence of such efficiency improvements, the costs of emissions reduction would increase enormously, as substitution would be required for fossil fuels throughout transport and other high value sectors, and such options as hydrogen aircraft would be required.

At the micro level too, important synergies between efficiency and low carbon supply options are emerging. Residential or Domestic Combined Heat and Power (DCHP) based on Stirling engines, micro-turbines or eventually fuel cells suffers from the very 'peaky' nature of load profiles for an individual consumer – both in terms of heat and power. This issue is more severe than for a conventional generator serving a larger set of consumers, where significant smoothing of load profiles occurs through small differences between individual lifestyles. Implementation of energy efficiency measures in combination with DCHP can both reduce the absolute heat and power demands – and thus reduce the size of the plant needed – and the difference between base and peak loads – improving the load factor and thus economic viability of the DCHP. Many other examples can be found.

There are also circumstances where efficiency and low carbon supply options can work against each other. For ex-

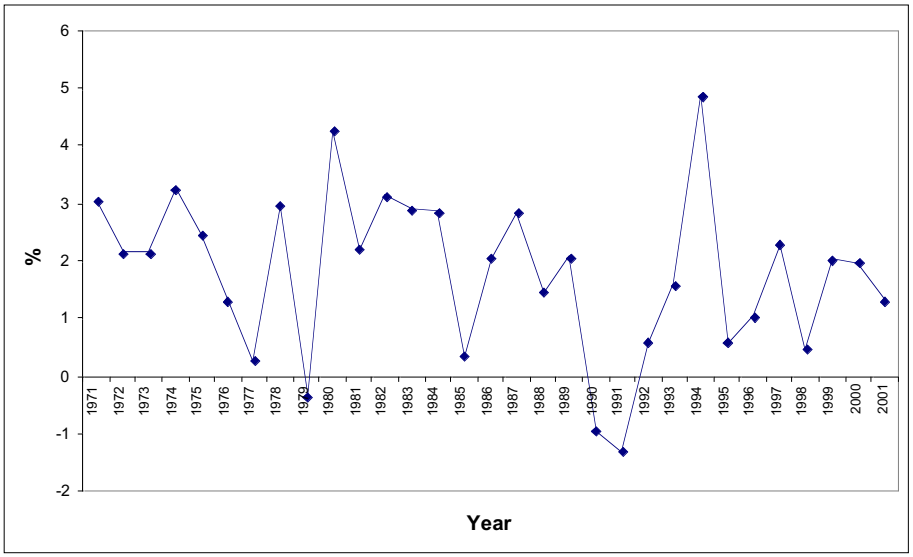

Figure 4: *Annual % reduction in energy intensity of the UK, 1971-2001.*
Source: DTI, 2003: energy statistics from DTI, 2002; GDP data from the Office of National Statistics.

ample, where space heating demands for a residential building are reduced to very low levels through superior energy efficiency measures, the rationale for DCHP may disappear. But whilst this has market and commercial implications, it matters less to the prospects for achieving a low carbon economy.

DOES THE RATE OF ENERGY EFFICIENCY IMPROVEMENT NEED TO BE INCREASED SIGNIFICANTLY?

As Figure 4 illustrates, the annual percentage improvement in the energy efficiency of the UK economy (measured as energy intensity) has varied over the past thirty years between a high of almost 5% and a low of -1.3%. The average annual improvement has been 1.8% over the period, falling slightly to an average of 1.7% for the last decade.

The Energy Review suggested the need for targets for all sectors of the economy, but proposed only one: an average 2% per annum improvement in the energy efficiency of housing. Initially this may seem consistent with the average rates of improvement already achieved across the UK economy. However, looking more closely at the housing sector, efficiency has improved by an average of just over 1% per annum over the 30 years to 2000, and by only 0.6% per annum on average between 1990 and 2000 (DTI, 2003: figures from the Building Research Establishment based on the Standard Assessment Procedure for energy ratings for residential buildings). Hence in this sector at least, there is a need for a significant increase in policy and/or market activity.

The White Paper has not adopted the Energy Review proposal for a set of targets for energy efficiency. Instead it describes the carbon emission reductions which are believed to be achievable from each key sector or activity. To 2010, more than half the emissions reductions in the existing Climate Change Programme (the lower dashed line in Figure 1) - around 10 MtC per annum by 2010 – are expected to come from energy efficiency, and the Government believes that energy efficiency can contribute around half of the additional 15-25 MtC savings likely to be needed by 2020. Within these 2020 expectations, 4-6 MtC of savings are expected to come from households and 4-6 MtC from business and public sectors. Translating into energy efficiency terms, as the White Paper states', savings of this magnitude would need roughly a doubling of the rate of energy efficiency improvement seen in the past 30 years'. The Government states that it will publish an implementation plan within a year, which will describe in further detail the delivery of the strategy described in the White Paper. Setting sectoral energy efficiency targets is one approach which might be used.

Policy

HOW FAR WILL EXISTING INITIATIVES TAKE US?

As mentioned previously, the low level of uptake of many energy efficiency technologies is a persistent problem. In recent years there have been some notable policy successes, such as the transformation in some countries of the market for efficient cold appliances brought about by energy labelling, the application of minimum efficiency standards and supporting national policies. Nonetheless there remain areas where present policies are clearly not accessing to an optimal degree the available efficiency potential. These can be illustrated by reference to the buildings sector.

Residential buildings: the state of the market

Figures recently released by the DTI (DTI, 2003; original data from the Building Research Establishment) illustrate the differing success stories of energy efficiency options in the residential sector. Whilst ownership of gas fuelled central heating systems stood at almost 74% in 2001, the proportion of dwellings with the potential to have cavity wall insulation which actually had it was only 32%. Although the increase in market penetration of the two technologies over the period 1987-2001 was very similar (18% and 14% of the market respectively), a far greater increase for cavity wall insulation might have been expected given its relatively low

starting point compared to central heating. For example, the proportion of dwellings with over 80% double glazing rose from 16% in 1987 to 47% in 2001.

These figures are accompanied by very different market conditions for the different technologies: double glazing and gas central heating systems have been installed largely as a result of consumer demand (led by enthusiasm amongst house builders), whilst the cavity wall insulation market is dominated by government and utility funding programmes.

Residential buildings: policy programmes

The policy response for measures in residential buildings focuses either on transferring the investment requirement from consumers to programme delivery or other organisations - as in the case with building regulations for new housing, the fuel poverty alleviation programme (Warm Front, whereby low-income consumers who meet defined eligibility requirements are offered subsidised energy efficiency measures) and to a certain extent with the energy suppliers energy efficiency obligations (the Energy Efficiency Commitment, which requires energy suppliers to meet energy efficiency targets through residential customer investments which may be wholly or partially subsidised by the utility) - or on attempts to overcome the traditional market barrier of lack of information, for example with the national network of Energy Efficiency Advice Centres and national media campaigns.

This policy approach does have the potential to deliver the required energy efficiency improvements over the next one or two decades. The Energy saving Trust, in its submission to the consultation on the White Paper (EST, 2002), demonstrates how the PIU target for the residential sector to 2010 can be met with an increased level of activity in policy areas that already have programmes in place. For example, a staged increase in the level of activity by energy suppliers under the Energy Efficiency Commitment such that it would reach 2.5 times its present level by 2010, would deliver in itself over half the efficiency improvement required by this date. Although support for expansion of the scheme from the energy supply industry is qualified (e.g. electricity suppliers wish to see those offering other fuels such as oil delivering against a commitment also), the industry has not ruled out such expansion (EA, 2002).

Taking decisions about energy efficiency partly or wholly out of the hands of individual consumers can therefore work. Expansion of the Energy Efficiency Commitment and tightening of energy efficiency requirements in the Building Regulations are two obvious examples of this approach. As this will undoubtedly deliver results in the short to medium term, such options must be a part of the policy package. But will they help us to move beyond present policy goals and towards a truly sustainable low carbon economy? This question is returned to later.

The Services sector

Energy use in the commercial services sector in the UK is growing at a faster rate than any other sector except transport. This reflects an increase in activity in the sector, but also increasing demands for buildings related energy services (e.g. space conditioning) and use of IT together with a complete lack of priority given to energy efficiency. Energy costs are a very small proportion of total costs in the sector and to date policy activity targeting businesses has been designed and implemented with far more intensive energy users in mind.

Discussions with key stakeholders in the UK commercial property market confirm that the Climate Change Levy on business energy use introduced in April 2001 has had little if any impact in this sector. The Levy was offset by reductions in business taxation on employment, and many commercial sector organisations are actually financially better off as a result. Also, the supporting measures introduced with the Levy are in many cases not applicable in the sector: the tax exemptions linked to negotiated emissions reduction agreements have generally been applied to energy intensive sectors, and the Enhanced Capital Allowances available, providing preferential tax treatment for defined investments in energy efficiency apply only to equipment classed as 'plant and machinery' – individual pieces of equipment are eligible but systems approaches are not, and indeed the legislation on which the Allowances are based specifically excludes investments in buildings, thus ruling out any building fabric related measures.

Activity in the sector could be increased if these key mechanisms were redesigned to be more widely applicable. However, the most significant barrier mentioned by stakeholders wishing to effect change is the lack of a market for energy efficient office space. Many large property development, investment and management companies seem willing to offer energy efficient offices if only the demand for them appears. Current policies will not generate this demand as they focus largely on providing information and incentives to an audience already familiar with the idea that energy efficiency is good for business.

WHAT NEEDS TO CHANGE?

Developing a new social norm where efficiency is expected

The lack of consumer demand for some energy efficiency technologies discussed above leads to a second question: regardless of whether a sufficient level of government intervention will result in the required level of uptake of these technologies, are present policy approaches the best path to tread?

What current policies have singularly failed to do is create generalised market demand for energy efficiency, through an expectation that 'good' is synonymous with 'efficient', leading the 'smart' consumer to choose an efficient option wherever possible.

The EST suggest that to generate progress in the residential sector beyond 2010 we need to 'demonstrate that energy efficient behaviour by individuals is normal, widespread, has positive connotations and that action can make a difference' (EST, 2002). Other commentators go further, proposing that energy profligacy should be made as socially unacceptable in the UK as the wearing of fur (David Fisk, *pers comm* 2002).

Considering the potential need for additional energy efficiency improvements beyond 2010 to meet targets such as those proposed by the Royal Commission, let alone to progress towards genuine sustainability, and thinking about the levels at which existing policy options would therefore

have to operate in the absence of increased market demand for efficiency, the need to generate greater understanding and support for decarbonisation seems inherently sensible.

Extending the innovation chain to include market development

The conceptual innovation chain shown earlier leads towards 'diffusion', with efforts in this final stage focused on removing barriers to the successful uptake of otherwise commercial technologies. An example here is the experience with condensing boilers for space heating, where the technology and economic case are largely proven, and yet problems with the supply chain and installation appear to have hampered their selection by householders. However, it might be helpful to add a further stage to the innovation chain, reflecting an explicit concern with fostering and developing large scale markets for the technologies. It is at this point that we need innovative new approaches which lead to the development of a new social norm and increased demand pull.

As mentioned earlier, in the longer term we will need to see innovation in energy systems, and not just in isolated parts of the complete energy chain. This also implies elements of market development. An example here is the development of more efficient vehicles using fuel cells: innovation is needed in markets for such vehicles, for the supporting technical services and for the fuelling infrastructures, and a supportive policy environment will be required to enable these markets to flourish.

Local and regional involvement

As noted by Paul Rutter (formerly technology advisor at BP, *pers comm* 2003), it is unlikely that the world will find a single energy solution at as low a cost as fossil oil. There will therefore be a need for a variety of options, to capture the benefits of suitability to local needs and niche characteristics. We may therefore expect a re-emergence of local and regional differentiation in energy mix and technologies, perhaps reflected in different forms of decentralised energy provision, and a consequent strengthening of local institutions with responsibility for energy planning and policy.

Institutional support for local solutions is growing in the UK. There are a small but significant number of UK local authorities signed up to the 'Cities for Climate Protection' initiative co-ordinated by ICLEI, and some regional initiatives are emerging. For example, in the South West of England, the Cornwall Sustainable Energy Partnership has developed a sustainable energy plan for the region (Nec, 2001), and the Greater London Authority has just published its draft London Energy Plan (GLA, 2003).

The proposals contained in the London plan demonstrate how local activity can reinforce and at times drive forward action at a national level. One of the main principles behind the plan is that London should meet or exceed its fair contribution to national carbon dioxide emissions reduction targets. The London Sustainable Development Commission has recommended that this be translated to a target of a 20% carbon emissions reduction in 2010 compared to 1990 levels. The ongoing consultation on the draft plan seeks views on the role of the various sectors in meeting this overall 20% target. Additionally, efforts are being made to deliver stakeholder sign-up to the 20% target via a public pledge. The discussion of the roles of different sectors may help to inform any national target-setting process and, if the attempts to engage key stakeholder groups are successful, this could encourage national targets beyond those presently in place for the residential sector.

Development of new markets may be pushed by local plans: for example, the London plan identifies opportunities for the support of alternative vehicle fuels via their use in London's large vehicle fleets, and the potential for London to become 'a showcase for sustainable commercial and public sector buildings'.

There is a general move towards the devolution of power from central to new regional government structures. This may contribute to diversification in energy strategies, as exemplified by areas of Scotland and the North East of England, where existing local government is strongly supporting renewable energy development, building on the regions' historical strengths in offshore engineering and unemployment through decline in coal mining activity. But as with any change in governance structures, it will be vital to ensure that linkages are well-formed between national and local policy.

Is a step change achievable?

As discussed, a low carbon future will require the establishment of an effective innovation chain from invention to market diffusion and development. Through the work of the Carbon Trust, this message appears to have been well received by policy-makers. The variety of barriers acting across different segments of the chain, with the exception of market development, is also now well understood, and research and policy programmes are emerging.

The White Paper is full of references to 'innovation', which appears to be gaining favour across Government as a strategy for integrating environmental and business objectives. Applied to the development of renewables, there is evidence both within the White Paper, and in the follow-up activities, that a comprehensive approach will be taken: DTI are already reviewing the barriers to successful innovation, with a scope wide enough to encompass basic R&D and market creation. There is less evidence that the innovation chain concept has taken strong root for energy efficiency. The White Paper cites energy efficiency as a priority area; it notes investment in research and development is particularly likely to yield major breakthroughs; it states that policies have to tackle barriers to the uptake of efficiency across all energy users; and it presents some specific policy commitments. But there is little evidence of thought given to the necessary linkages between the stages of the innovation chain for energy efficiency to ensure an uninterrupted flow from lab to market, and thus there is some doubt about the coherence of the overall set of measures.

To move forward from here, we must first accept that a 'step change' does not refer to a one-off large improvement in energy efficiency, rather it applies to attitudes and approaches. The step change we need is in activity and support, to deliver significantly augmented levels of both technical innovation and diffusion into the market. This will require continued and consistent action over several

decades, something which the Energy Policy White Paper addresses.

Many elements of policy included in the White Paper will help greatly in the building of new attitudes: the implementation of the European buildings Directive will, through its labelling elements, provide a similar enabling mechanism for market transformation in buildings as the energy label has provided for appliances; the UK government's determination to include emissions trading at the heart of its policy should engage the power of the market. But, the existence of fuel poverty in the UK remains a stumbling block. Until fuel poverty is eradicated, energy efficiency policy in the UK cannot provide the consistent messages required to bring about a change in social norms. Energy use in the residential sector will not be taxed, and exhortations to use energy wisely will be confounded as politicians celebrate ever cheaper energy prices. The eradication of fuel poverty must remain a priority, and policies which would worsen the problem are not acceptable. However, greater care over the implementation of policy within the constraints this imposes is needed. For example, political capital should be made from the delivery of low cost energy services rather than cheap fuel. Equally, policy makers have to resist the temptation to use any trial of new energy efficiency technologies as an excuse to direct more investment towards low income households: installation of PV roofs on social housing is not the most cost-effective way to lift households out of fuel poverty, nor is it the way to build a market for the technology by appealing to richer social groups with a liking for new technological 'gadgets'. The White Paper does not address this problem, simply reiterating the government's commitment to the eradication of fuel poverty.

As mentioned earlier, the reliance on the energy utilities Energy Efficiency Commitment to deliver efficiency improvements for smaller consumers removes elements of decision making from those consumers and may be counter productive in the longer term. The White Paper suggests that reliance on this mechanism is likely in the future to be increased in scale and potentially expanded to cover smaller business consumers. However, there is a commitment to developing new approaches to encourage a more energy services oriented approach from suppliers in the delivery of the Commitment: if this can be achieved, then EEC may become a very effective tool to encourage a new way of thinking.

The White Paper does set the necessary framework in as much as it accepts the need for emissions reductions in the region of 60% by 2050 and sets one of the main goals of energy policy as putting the UK on a path to achieve this reduction. Whether policy will succeed in achieving its goals remains difficult to judge: many of the mechanisms to be employed will not be defined fully until the publication of an implementation plan, due within the next year.

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