eef The manufacturers' organisation

THE LOW-CARBON ECONOMY – MOVING FROM STICK TO CARROT

RE-ENGINEERING POLICY

#RE-ENGINEERINGPOLICY

September 2015

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1. EXECUTIVE SUMMARY

Ambition and aspiration are good things. Together, they drive growth, prosperity and positive transformation – so long as they are accompanied by the practical means of making transformation happen.

When it comes to industrial decarbonisation, however, Britain has set itself ambitions and aspirations that the government's expert advisers in the Committee on Climate Change believe current policy mechanisms are unlikely to deliver.[1]

The government has rightly begun to review many of those policies. This report is manufacturing's agenda for what a wide-ranging review should consider.

Britain's industrial greenhouse gas emissions were falling long before government established policies aimed at reducing them. Technological progress and the operation of the market improved industrial energy efficiency at a faster rate between 1980 and 2000, before the introduction of climate change policy mechanisms, than has been achieved since, when cost-raising policy has succeeded cost-raising policy.[2]

Policies driving emission reductions in industry are overwhelmingly based on creating negative incentives for energy use, pushing up prices and affecting the international competitiveness of many UK firms. By 2020, the impact of climate policy on the electricity prices paid by energy-intensive industries in the UK is forecast to be over double that faced by their French and German competitors.

It is also worth noting that, while direct UK greenhouse gas emissions have fallen significantly in recent years, this has been almost entirely negated by increases in the emissions associated with the goods we import. Consideration also needs to be given to addressing this part of our carbon footprint to ensure we are not overtaxing UK business while exporting our emissions abroad.

Meanwhile, the positive side of the policy mix has focused heavily on the power sector where many technologies are already considered relatively mature. Little attention is paid to industrial emissions even though authoritative government-sponsored analysis indicates that future progress will depend heavily on innovative and commercially untested technologies.[3] For example, 37 percent of the emissions reduction that it is estimated could be achieved from energy-intensive industries between now and 2050 is forecast to come from carbon capture and storage, a technology that remains largely undemonstrated in an industrial context and prohibitively expensive.

FROM STICK TO CARROT

Britain is at risk of missing a huge opportunity. Policymakers must stop hitting firms with the big stick of ever-higher carbon taxes and levies, eroding their global competitiveness. Instead, they should be offering carrots, incentives to install energy saving equipment, invest in unexplored low-carbon technologies ahead of the curve, and become leaders in the low-carbon markets that must inevitably boom over the next couple of decades if governments around the world are to meet their climate change targets.

A government study published earlier this year suggests the UK's low-carbon economy is already as big as the food and drink sector and twice the size of the chemicals industry, contributing £55 billion to the national economy and experiencing healthy growth.[4]

Members of EEF and its subdivision UK Steel are already making wind turbines, electric vehicles, and phase-change substances that can help regulate room temperature, and revolutionising their business models to improve resource efficiency. Others are trialling algal biofuels and planning industrial carbon capture and storage projects. They are doing so because they see a market opportunity.

For manufacturers, climate change policy has for too long been burdensome. The UK should seek to make its ambitious climate change targets a matter of economic ambition. Business and government need to work together to invest in making the low-carbon future not only transformational, but profitable.

POLICY RECOMMENDATIONS

Reforming energy taxation, efficiency schemes and bills

The government's decision to review the taxation landscape for business energy efficiency is right.

There are currently five separate but overlapping regulatory programmes attempting to drive energy efficiency and emissions improvements in business, each with its own reporting and compliance obligations and timelines (EU Emissions Trading System, Climate Change Levy and Climate Change Agreements, CRC Energy Efficiency Scheme,[5] Energy Savings Opportunity Scheme, and mandatory greenhouse gas reporting under the Companies Act). On top of this, businesses' electricity bills include a baffling range of levies supporting decarbonisation of the grid.

This confusing mix is causing unnecessary costs and administrative burdens, and – crucially – failing to incentivise the cost-effective improvements known to exist across industry.

The government should:

- Look to reduce the overall burden of energy taxation and levies by the end of this Parliament, starting with the removal of Carbon Price Support.
- End the CRC Energy Efficiency Scheme (CRC) and if necessary recover its revenue stream via adjustments to the level of Climate Change Levy paid by former CRC participants.[6]
- Introduce a new voluntary Energy Efficiency Investment Tax Discount.
- Replace the numerous levies aimed at supporting low-carbon electricity generation on bills with one single low-carbon levy.

Decarbonising manufacturing's most energy-intensive sectors

The inadequacies of the current policy mix are particularly noticeable in energy-intensive industries, which are jointly responsible for around two-thirds of UK industrial emissions. Here, the relative impacts of energy and carbon-related taxes and pricing schemes are much higher, especially for sectors competing globally against firms facing none of the same challenges. They also undermine any capacity to invest in the new technologies need to make a real dent in emissions.

The Industrial Decarbonisation & Energy Efficiency Roadmaps to 2050 developed by government, industry, academics and other stakeholders and published earlier this year, present clear, agreed pathways for eight of the UK's biggest sources of industrial emissions for the first time. If realised, they should deliver a 73 percent cut in emissions from these sectors but at a cost of up to £16 billion, a figure industry cannot afford while remaining globally competitive.[7, 8]

The government should:

- Take forward the Industrial Decarbonisation and Energy Efficiency Roadmaps, developing an action plan for each sector.
- Explore project finance and investment incentives (for example, to incentivise use of recoverable heat and fuel switching).
- Develop a targeted innovation and deployment programme to further develop technological solutions for decarbonising energy-intensive industries.
- Find a funding mechanism for a demonstration programme for near-to-market technologies.

– Evaluate the best economic and environmental use of all types of biomass, including virgin and waste material.

A more supportive environment for innovation

The UK government dedicates only 4% of its total R&D spend to energy and environmental projects, less than the governments of many key competitors, potentially holding back a promising market.

If the UK is to continue playing a leading role on climate change, companies based in Britain must see the benefits of this stance, and be given more help to realise them, not just shoulder the extra costs.

The prize could be substantial. The global market for low-carbon environmental goods and services was estimated to be worth £3.4 trillion in 2011/12, while meeting the UN's goal of keeping average global warming to 2°C is expected to require $1 trillion (£0.65 trillion) of spend on clean energy systems alone each year by 2030, providing considerable opportunities for suppliers of suitable technologies.[9,10]

The government should:

– Promote the opportunities in clean technology more widely.
– Increase the percentage of government R&D funding spent on energy and environment to at least match the EU average by reallocating funds from different areas.
– Better signpost the public money and support available to companies wishing to innovate in this area, ensuring that the associated rules and reporting requirement are kept in check.
– Provide more support, through the Green Investment Bank or similar organisation, for the scale-up and commercialisation of low-carbon technologies and business models.
– Ensure that the wider regulatory environment encourages innovation by creating predictability and stability, market-wide standards and labelling schemes for appropriate products, and suitable public procurement signals.

[1]Committee on Climate Change (2015) *Meeting Carbon Budgets - Progress in reducing the UK's emissions 2015 Report to Parliament*
[2]UK Industrial energy intensity improved at an average of 2.3% a year from 1990 to 2000 and at 1.5%/year from 2000 to 2013. See chart 4 page 9.
[3]DECC & BIS (2015) *Industrial Decarbonisation & Energy Efficiency Roadmaps to 2050: Summary report*
[4]See table 5 for summary of recent official data
[5]CRC originally stood for Carbon Reduction Commitment but its name was shortened before its launch
[6]For descriptions of these and other schemes please see table 1
[7]Ibid 3, and related reports
[8]Note: 73% represents the maximum potential estimated by the roadmaps if substantial barriers can be overcome and the necessary technology developed
[9]BIS (2013) *Low Carbon Environmental Goods and Services (LCEGS): Report for 2011/12*
[10]New Climate Economy (2015) *Seizing the Global Opportunity*

2. THE UK'S CLIMATE CHANGE COMMITMENTS

The UK has made and signed up to a whole host of commitments to address climate change at the international, EU and national level, most of which have to be delivered over the next 35 years.

Given climate change is a global problem and the UK is only responsible for 1.1 percent of international greenhouse gas emissions, a strong international response remains the best approach (see chart 1). However progress to date has been limited. Even the UN talks in Paris at the end of this year, billed as another chance to make a historic deal, are not expected to deliver the emissions cuts required to ensure the world experiences less than 2°C of average warming.

In this context, the UK and EU have decided to take a leadership role and act as first movers. This is partly also in recognition of the developed world's responsibility for the majority of historic greenhouse gas emissions.

In the UK, the first policies tackling industrial greenhouse gas emissions were introduced in the early 2000s. In 2008, the flagship Climate Change Act was passed with support from all major political parties. This commits the country

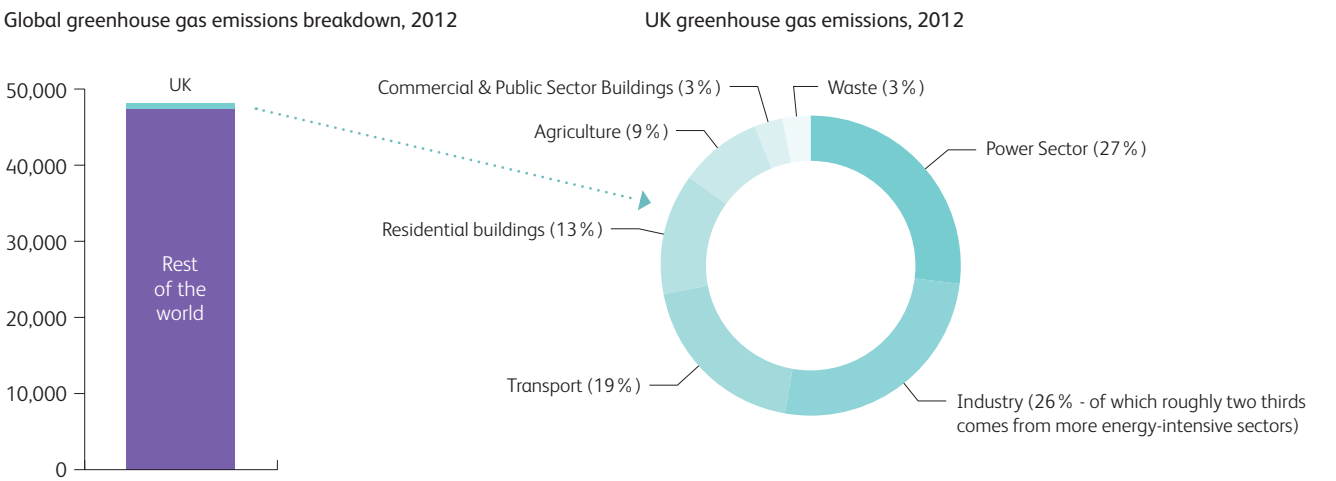
THE KEY CLIMATE CHANGE COMMITMENTS THAT APPLY TO THE UK:

- UN Framework Convention on Climate Change: limits average global warming to 2°C.
- UN Kyoto Protocol target: EU to reduce greenhouse gas emissions to 20% below 1990 levels by 2020.
- EU 2020 climate and energy package: 20% reduction in greenhouse gas emissions below 1990 levels by 2020; 20% of energy from renewable sources; 20% improvement in energy efficiency (non-binding).
- EU 2030 climate and energy package: 40% reduction in greenhouse gas emissions below 1990 levels by 2030; 27% of energy to come from renewable sources; 27% improvement in energy efficiency (non-binding).
- EU Emissions Trading System (ETS): included sectors must collectively deliver a 21% reduction below 2005 levels by 2020 across the EU and a 43% reduction by 2030.
- EU Effort Sharing Decision (sectors not covered by the EU ETS e.g. domestic transport and agriculture): 2020 emissions must be 10% below 2005 levels (target is shared by member states with the most able taking on a 20% reduction while the least able can increase emissions by the same amount. The UK's goal is 16%). The 2030 target is 30% with UK expected to be asked for 40%.
- UK Climate Change Act: Greenhouse gas reduction of at least 80% below 1990 levels by 2050. This includes interim targets or 'carbon budgets': 2nd carbon budget (2013-2017) – 29%; 3rd carbon budget (2018-2022) – 36%; 4th carbon budget (2023-2027) – 50%.

to reducing emissions by at least 80 percent below 1990 levels by 2050, and creates five-yearly carbon budgets to help ensure a cost-effective trajectory towards this longer term goal (see chart 2). Recommendations on the levels of these budgets are provided by an independent Committee on Climate Change.

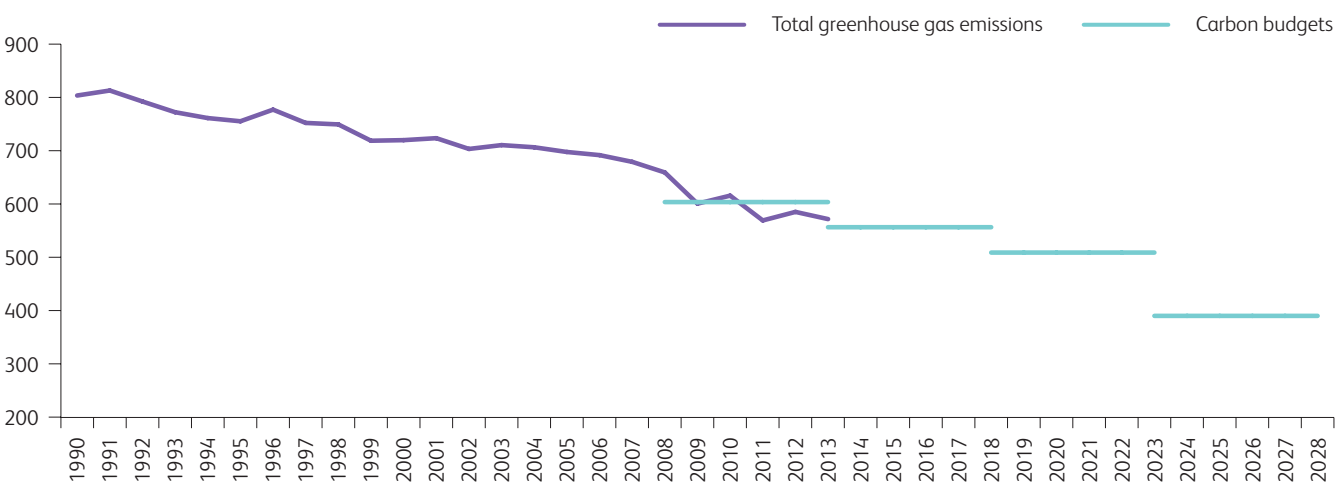
The UK's decision to lead by example on climate change has some benefits in driving the development and early adoption of new technologies, but has also added to manufacturers' costs and regulatory burdens. This is particularly problematic for those that have to compete with producers overseas not facing the same requirements.

Chart 1: UK manufacturing's share of total global greenhouse gas emissions in 2012 (million tonnes of carbon dioxide equivalent)



Source: World Resources Institute (CAIT Data), Committee on Climate Change (2013) *Meeting carbon budgets - 2013 progress report to Parliament* and EEF analysis

Chart 2: The UK's progress against its carbon budgets (million tonnes of carbon dioxide equivalent)



Source: DECC (2015) *2014 UK Greenhouse Gas Emissions, Provisional Figures*, Committee on Climate Change (2015) *Meeting Carbon Budgets - Progress in reducing the UK's emissions*, and EEF analysis

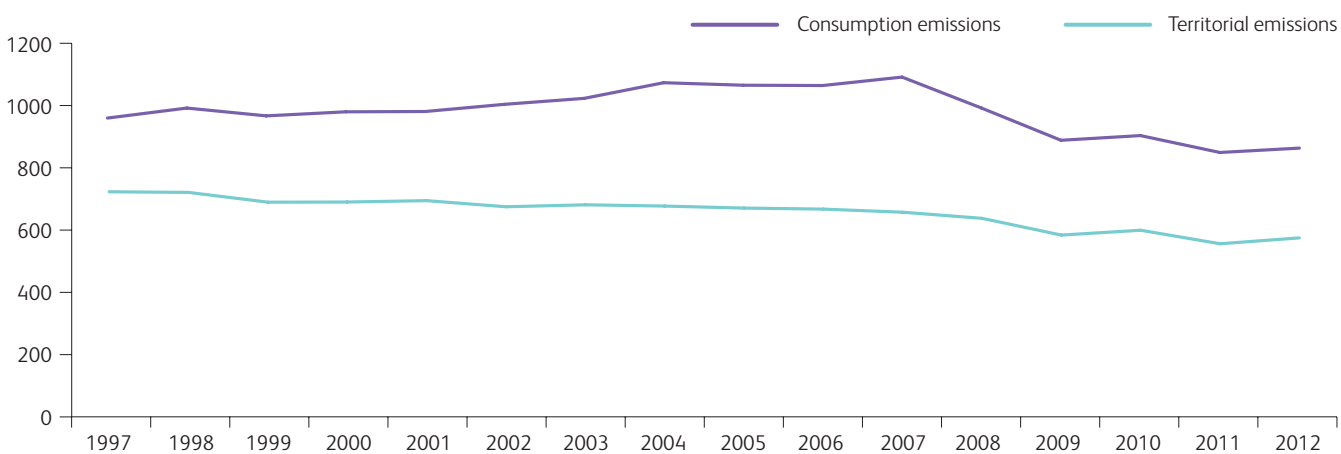
IMPORTED EMISSIONS

A drawback of being an early mover, for both the UK's domestic economy and the global climate, is highlighted by the issue of 'imported carbon'. The UK's direct greenhouse gas emissions have fallen substantially since 1990 – provisional government figures for 2014 suggest a 36 percent fall – but most of this progress has been wiped out by increases in the total carbon footprint of the goods and services we import (see chart 3). Some of these have been helped to compete with UK products thanks to our carbon taxes.

If imported carbon is taken into account, the UK's total carbon footprint only appears to have dropped by 7 percent between 1990 and 2012, the latest year for which data is available.[11]

It is reasonable for UK policymakers to focus primarily on direct emissions as that is where they can have the biggest impact, but greater attention must be paid to ensuring UK emissions are not effectively being exported overseas, especially to countries with lower emissions standards. Government should do far more to track these emissions and begin to consider how they can be addressed.

Chart 3: Trends in direct and consumption-based greenhouse gas emissions, 1997-2012 (million tonnes of carbon dioxide equivalent)



Source: Defra (2012) *UK's Carbon Footprint 1997-2012*

[11]University of Leeds (2015) *Policy brief: Climate change targets must reflect the impacts of our consumption*

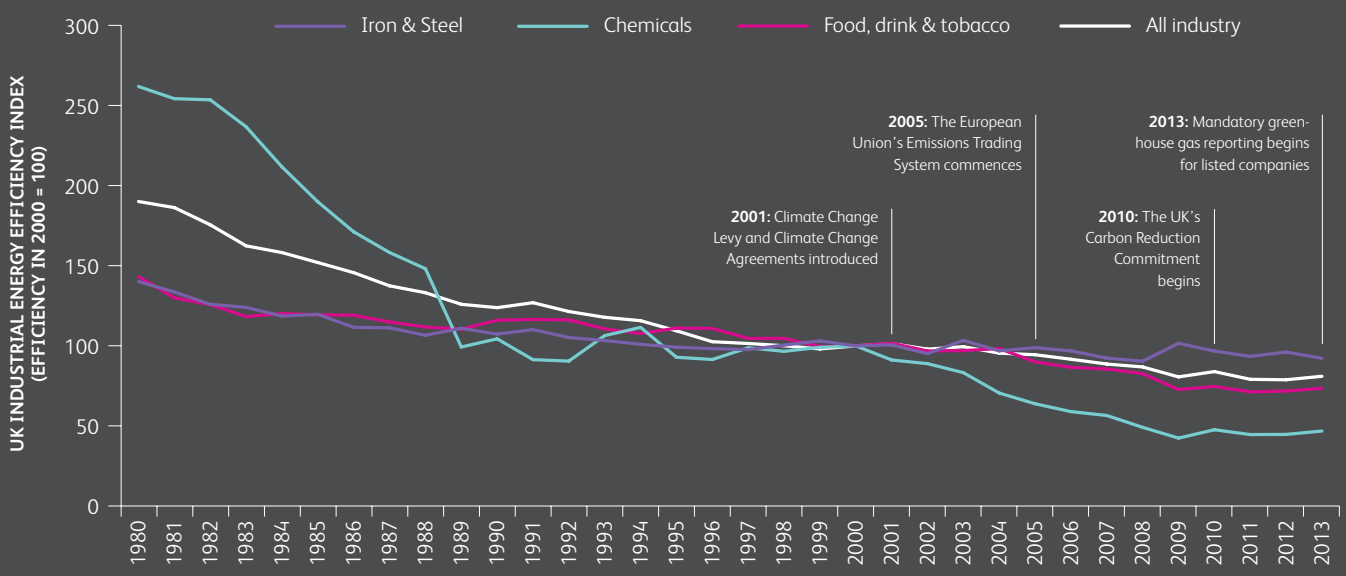
3. THE BARRIERS TO LOW-CARBON MANUFACTURING

Some of the technologies needed to decarbonise the electricity grid are already reaching maturity. Photovoltaic cells, for example, could start to compete with conventional sources of generation as soon as 2020. However, the power sector has been given billions of pounds of taxpayers' and energy consumers' money to help it adjust to the new low-carbon imperative and reach this point. Manufacturing's evolution is less advanced.

In some sectors, industrial energy efficiency could be improved substantially simply through the wider application of existing technologies, but expensive and commercially risky new solutions like carbon capture and storage and the clustering of different industrial processes on single sites will be needed in those responsible for the lion's share of emissions.

Manufacturers are more than willing to explore these options and play their part in meeting the UK's climate change targets but they need a more supportive regulatory environment.

Chart 4: Energy intensity of UK industry 1980-2013: more policies, less progress?



Source: DECC (2015) *Energy Efficiency Statistical Summary 2015* and EEF analysis

STALLING ENERGY EFFICIENCY

Industry has already made considerable strides in cutting energy use and greenhouse gas emissions through technological improvements, fuel switching and other means. Industrial energy intensity, measured as energy consumed per unit of production, is 14% lower than it was in 2005 and has fallen by 57% since 1980 (see chart 4).[12]

However, the rate of improvement has slowed since the mid-1990s despite considerably more regulation and policy intervention. This raises a serious question about the effectiveness of the measures used to date.

The primary approach employed by UK governments seeking to enhance efficiency and reduce industrial emissions has been to tax carbon and energy and assume the market will deliver emissions reductions in response to the price signals that this creates.

However, today's confusing mix of carbon reporting schemes and carbon-related taxes (see table 1) is not transparent and is causing unnecessary administrative burdens. The blunt use of numerous price signals also risks undermining competitiveness, especially in sectors with few remaining options for reducing emissions, while it is also failing to properly incentivise the next suite of projects that can improve energy efficiency and reduce emissions.

Table 1: The main carbon reporting schemes, taxes and incentives

	Description	Potential impact on competitiveness	Complexity for participants	Co-ordination with other energy efficiency measures	Effectiveness for manufacturing
Climate Change Levy/ Climate Change Agreements	A tax on non-domestic energy use. Firms can receive up to a 90% discount if in a sector with a Climate Change Agreement (CCA). CCAs set energy efficiency or carbon-saving targets (53 sectors and around 9,000 sites covered).	Low (for firms in CCAs)	Medium	Moderate	Medium
CRC Energy Efficiency Scheme	Imposes mandatory reporting requirements and a carbon levy on large users of electricity (around 2,000 organisations).	Low	High	Moderate	Low
Energy Demand Reduction	Currently in pilot form, the scheme provides funding, via an auction, for organisations to reduce their electricity consumption at peak periods through energy efficiency measures.	Low	High	Weak	Medium (if enduring scheme can be established)
Energy Savings Opportunity Scheme	Requires mandatory energy assessment audits from around 7,000 UK organisations. The first round of assessments are due by the end of 2015.	Low	Low	Moderate	Potentially medium
Enhanced Capital Allowances	Allows companies to write off 100% of the cost of new energy-saving plant or machinery against taxable profits in the financial year the purchase was made.	Low	Medium	Weak	Low
EU Emissions Trading System	EU-wide system capping emissions from power stations and other large combustion plants, and allowing participants to trade shares of the cap.	High	High	Weak	Medium
Mandatory Greenhouse Gas Reporting	Compulsory requirement for companies to include emissions data for their entire organisation in their annual reports.	Low	Low	Weak	Low
Renewable Heat Incentive	Subsidy for organisations using biogas and technologies such as ground-source heat pumps.	Low	Low	Moderate	High

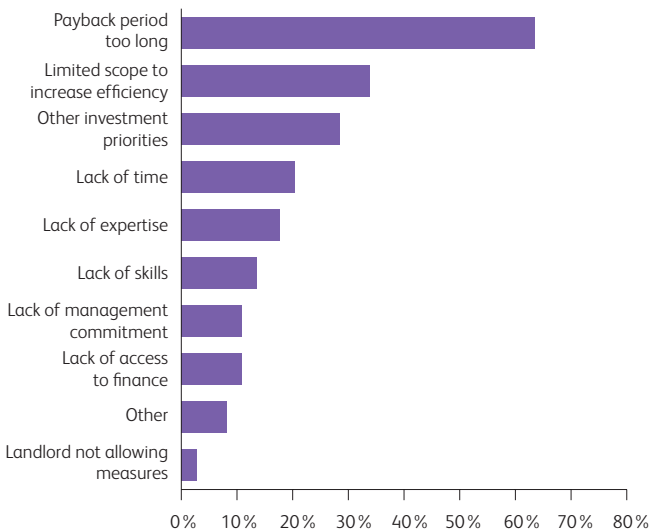
Source: EEF analysis

Despite the plethora of schemes, manufacturers still report a range of financial, knowledge and business barriers that inhibit innovation and investment in energy efficiency equipment and low-carbon processes. This includes an insufficiently rapid return on investments, difficulties accessing capital, resource and knowledge gaps within companies, and conflicts with other investment priorities (see chart 5).

There have been amendments to some schemes over the years, but the whole portfolio of policy in this area is crying out for rationalisation and reform. There are also no incentives for emerging approaches to improving energy efficiency, such as the adoption of innovative business models (see section 6).

Chart 5: Reasons why manufacturers rejected possible energy management or efficiency measures

Percentage of companies selecting each option



Source: EEF and npower (2014) *Business Productivity and Energy Efficiency*

DIFFERENT APPROACH NEEDED FOR ENERGY-INTENSIVE SECTORS

Around two-thirds of industrial greenhouse gas emissions come from a handful of activities and processes that consume large amounts of energy or, like steelmaking and cement manufacture, emit carbon dioxide as part of their basic chemistry.

These sectors – which also include chemicals, food and drink, glass and ceramics – have a real incentive to cut energy use but are running out of available options. Even if there were more incremental improvements available, these alone would not be enough to deliver a decent share of the UK's carbon budgets.

If we are to transform these sectors rather than lose them more radical improvements are needed. This will include rethinking their entire chemistry and choice of feedstock, and in some cases fitting technology to capture and store underground, or reuse, the carbon they emit.

Until these options become available, the current policy framework will not drive decarbonisation and merely acts as a financial penalty. This is particularly the case for industrial plants competing in global markets which cannot pass the costs of carbon policies on to their customers without losing market share. Where companies have plants inside the UK or EU and outside they may invest preferentially in the non-EU ones because of the reduced regulatory risk while allowing EU plants to sink into decline.

For some energy-intensive sectors, including steel, these challenges come on top of a series of other threats including surplus production capacity in the global market, unfair trade practices, a strong pound, and a host of other regulatory pressures.

Many of the technologies needed would not pay for themselves without an enormous – and crippling – increase in the carbon price. Energy-intensive industries simply cannot afford to decarbonise on their own and require the kind of support the government has for years offered to the energy sector.

[12]DECC (2015) *Energy Efficiency Statistical Summary 2015*

4. REFORMING ENERGY TAXATION, EFFICIENCY SCHEMES AND BILLS

Government is recommended to:

- Look to reduce the overall burden of energy taxation and levies by the end of this Parliament, starting with the removal of Carbon Price Support.
- End the CRC Energy Efficiency Scheme (CRC) and if necessary recover its revenue stream via adjustments to the level of Climate Change Levy (CCL) paid by former CRC participants.[13]
- Introduce a new voluntary Energy Efficiency Investment Tax Discount.
- Replace the numerous levies aimed at supporting low-carbon electricity generation on bills with one single low-carbon levy.

As identified in the government's recent Summer Budget, and explained earlier the UK's patchwork of energy efficiency and taxation policies has become increasingly complex and confusing.

The government is right to have begun a review of energy efficiency taxation; its scope ought, however, to be wider and cover the full range of levies and taxes imposed on energy bills.

There are some solid reasons for complexity. What works for one sector will not necessarily work for others. However, the current situation is mostly the result of fragmented and disjointed policy formation, and is hindering companies on the receiving end of these measures. EEF believes a more suitable framework of climate and energy policies can be developed that retains the positives and nuances of the current system but better delivers against policy objectives and improves the UK's business environment.

With these aims in mind, we present several proposals for improvement. They do not represent a comprehensive package of reform but rather a suggested starting point on which industry and government should look to build.

REDUCING THE OVERALL BURDEN OF ENERGY TAXATION AND LEVIES

It is correct and sensible to eliminate the public sector deficit. This government has correctly indicated, however, that fiscal rectitude is compatible with a commitment to keep the tax burden low, and energy taxes are high. In the context of its wider aim of setting out a roadmap for corporate taxation, the government should commit to reducing the total burden of energy taxes and levies on business by the end of this Parliament.

This is a question of wider fiscal policy as much as energy policy, since many of the taxes and levies related to climate and energy policy are not spent on decarbonisation and instead form part of general taxation.

Any reform should begin with Carbon Price Support, a tax paid by fossil fuel electricity generators to top up the carbon price in the EU Emissions Trading System. Generators pass through this cost into wholesale prices, increasing prices for energy consumers, but the measure does little to actually reduce emissions. The criticisms of Carbon Price Support have already been well documented but in brief the chief flaws of the policy are as follows:

- Firstly, as the EU Emissions Trading System caps emissions from the power sector and heavy industry at EU level, there is little point in an additional unilateral measure driving emissions down more rapidly. Any over-performance in the UK will simply be offset by increased emissions elsewhere in the EU.
- Secondly, most new low-carbon electricity generation in the UK will in future be subsidised through Contracts for Difference (CfDs). These give generators a guaranteed price per unit of energy generated, essentially a top-up subsidy over and above the prevailing wholesale price. A higher carbon price will simply reduce the proportion of revenue these generators receive via the CfD and increase the amount from the wholesale price. As there will be no net difference in generators' revenues, the carbon price provides no additional incentive for investment.
- Thirdly, it is cheaper for the consumer to subsidise new low-carbon generators directly and exclusively via CfDs rather than through a carbon price. This is because a CfD provides a revenue stream just to the targeted low-carbon generator whilst a carbon price provides a revenue stream to all low-carbon generation (for example by providing a windfall profit to existing nuclear plants) and to government.

It is also becoming increasingly obvious that meeting our national renewable energy target for 2020 will be more expensive than envisaged. The Office for Budget Responsibility has recently published figures suggesting the government will breach the cap set by the Levy Control Framework on the amount energy consumers will be charged for low-carbon government policies by 20 percent in 2020/21, with an estimated spend of £9.1 billion compared to the £7.6 billion cap.[14]

The new government has begun to act on this issue, recently announcing a number of proposed changes to the Renewables Obligation and Feed-in-Tariff subsidy schemes. However, there are increasing calls for a post-2020 Levy Control Framework budget to be set as soon as possible. It is essential this is underpinned by a thorough review of the reasons for the projected overspend and due consideration of what can be done to save consumers' money during the 2020s.

ENDING THE CRC ENERGY EFFICIENCY SCHEME

The CRC, a mandatory carbon reporting and levy scheme covering around 2,000 large but non-energy intensive businesses and public sector organisations, has existed for five years and has been unpopular and heavily criticised for the majority of that time (see chart 6). The government originally intended to use it to penalise the worst performers and recycle revenue from the scheme back to the best performers. In the event, the Exchequer has retained all revenue and industry has largely viewed the scheme as an overly complicated tax.

The initial collection and collation of data at the outset of the scheme increased awareness and focussed minds, but

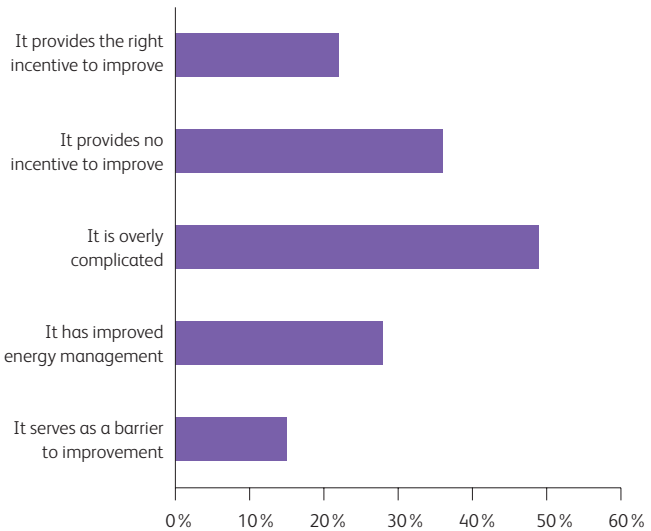
it is hard to see that the administrative elements of the scheme still provide a benefit. This is especially true now the Energy Savings Opportunity Scheme (ESOS) has been introduced, obliging all large organisations to undergo a comprehensive energy audit once every four years.

The continued operation of the CRC does little to address barriers to industrial energy efficiency other than by increasing energy costs and marginally reducing payback periods, which are falling anyway as energy bills rise. To put the CRC's price signal in context, in 2014 it increased participants' electricity costs by nine percent but by 2020 this is projected to fall to just three percent.[15] For gas, the figures are 11 percent and 10 percent respectively. Even this price signal effect is hampered by CRC costs sitting apart from energy bills.[16]

The publication of CRC data may act as a slight reputational driver for some big-name brands but they would be concerned in any case about their sustainability credentials. For many companies sitting within supply chains the reporting and publication of data has little or no impact.

Government should scrap the scheme and instead – if it needs to for fiscal reasons – recover the lost revenue through changes to the Climate Change Levy (a tax on non-domestic energy consumption which raises around £700 million a year).[17]

Chart 6: UK manufacturers' views on the CRC Energy Efficiency Scheme



Source: EEF Climate, Energy and Environment survey 2014

RECOVERING CRC REVENUES VIA THE CLIMATE CHANGE LEVY?

There a number of ways government could recover CRC revenues through the Climate Change Levy (CCL), some of which would make no overall difference to government revenues or industry's costs, while others could increase businesses' costs significantly. Until an opportunity arises to cut energy taxes, a revenue-neutral approach would limit the effects on competitiveness, especially the competitiveness of energy-intensive industries which are extremely sensitive to increases in energy costs.

Two possible revenue-neutral approaches to recovering CRC revenues are as follows:

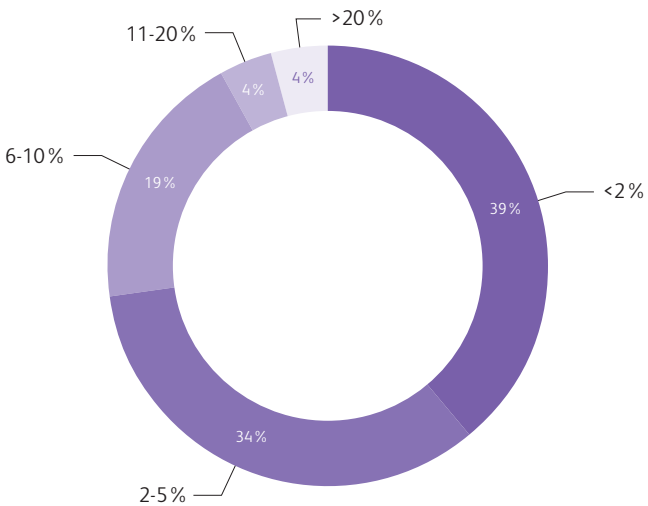
- A first option would be to retain current CCL rates for the majority of energy consumers but introduce a higher rate for organisations currently within the CRC that matches the combined level of CCL and CRC charges. This would ensure the changes are cost-neutral for all businesses. The CRC-payers would benefit from a reduction in administrative complexity and compliance costs.
- A second approach would be to apply one rate of CCL across all organisations at a level that is still cost-neutral for business as a whole and revenue neutral for government. If the reforms were made in 2016, it is expected this approach would result in a 4% increase in energy prices for non-CRC participants and a similar sized decrease for CRC participants.[18]

Within the context of these proposals, it is important that the existing level of CCL discount available to sectors that have committed to emissions reduction targets under a Climate Change Agreement (CCA) with government, and the discount for mineralogical and metallurgical activities, are retained for reasons of competitiveness and to deliver on policy objectives. These discounts provide energy-intensive industries with much needed protection from rising energy prices. Their removal would have a damaging effect on the competitiveness of many sectors at a time when they are experiencing energy price increases driven by other government policies.

Just as importantly, it is vital that government retains the CCA model. It remains the only existing example of an energy policy that takes a sector-specific approach and provides industry with a positive incentive to improve rather than applying yet another tax. To lose this would represent a major step back.

Chart 7: Energy spend as a proportion of manufacturers' turnover

What proportion of your UK company turnover is currently spent on energy?



Source: EEF (2014) *Energy policy for manufacturers: an agenda for government*

THE ENERGY EFFICIENCY INVESTMENT TAX DISCOUNT

Scrapping the CRC and adjusting the CCL would simplify the policy landscape but do little to tackle barriers to energy efficiency and unlock the potential improvements we know exist.

Part of the problem with expecting price signals to deliver energy efficiency is that companies cannot be expected to behave in line with the dictates of oversimplified economic models. Energy prices as a whole are already high enough to make a range of energy efficiency measures cost-effective.[19] However, efficiency improvements are competing for management attention with other potential investments that also have powerful business cases, often in groups looking to allocate investment between different countries as well as different priorities. Energy costs make up less than five percent of overheads for three-quarters of companies; something more than price is needed to bring energy to the attention of those business leaders (see chart 7).

Energy tax increases will nudge energy efficiency up the list of a business's priorities but impossibly large increases would probably be needed to make it a top priority for scarce investment money across most organisations. That would have a detrimental impact on many sectors and is not efficient.

Government needs instead to be smarter in how it uses energy taxation to drive improvements. If it is prepared to look beyond the revenue raising potential of energy taxation, it could deliver significant energy efficiency improvements whilst cutting costs for business by introducing a new energy efficiency investment tax discount.

Such a discount would reduce an organisation's CCL bill in exchange for it investing an amount equivalent to the saving in energy efficiency improvements. This would run in parallel to the existing system of Climate Change Agreements, which sets emissions reduction targets

in exchange for CCL discounts in some sectors and as discussed earlier should be retained for competitiveness and stability reasons.

Applicants for the new discount would be expected to keep a record of energy efficiency measures and actions that had been taken and their corresponding spend. Checks on these could even be incorporated into the four-yearly energy audits most large companies will have to complete as part of the Energy Savings Opportunity Scheme introduced by government this year.

The government would need to produce guidance on which measures would be eligible and what elements of the corresponding spend could be included, but this need be no more complex than the existing capital allowance rules. By allowing organisations to retain money that would have otherwise been paid in tax and ring-fencing it to energy efficiency spend, a tax relief would help draw attention to potential efficiency improvements, help them compete with other business priorities and save organisations money.

The relative costs and benefits of this kind of measure would depend on how government chose to implement it. In one scenario, such a tax discount might cost around £1.5 billion between 2016 and 2020 and could guarantee an equivalent collective spend on energy efficiency from participants.[20] Even with rather conservative estimates of uptake, this measure could deliver more than ten times the annual investment in energy efficiency expected from the same organisations under the CRC. It should therefore bring much more rapid improvements in energy efficiency.[21]

A SIMPLE LOW-CARBON LEVY

Energy bills, and particularly electricity bills, are now composed of so many different elements it is virtually impossible for anyone but market experts to fully understand them.

When the various components of the Electricity Market Reform programme start appearing on bills, electricity consumers will have four separate levies relating to grid decarbonisation to contend with (for the Renewables Obligation (RO), Feed-in Tariffs (FiTs), Contracts for Difference (CfDs) and Capacity Market). This is on top of the energy taxes discussed above and carbon costs passed through from the EU Emissions Trading System and Carbon Price Support.

THE ENERGY-INTENSIVE INDUSTRIES COMPENSATION SCHEME

The impact of the UK's climate change and energy policies on electricity bills is particularly severe for very energy-intensive firms, potentially increasing their annual electricity bills by 59 percent by 2020.

As a result, government and industry have worked closely together to establish a comprehensive package of compensation and exemption measures that, once fully implemented in April 2016, will shield organisations from up to 85 percent of those additional policy-led costs.

It is vital government completes the scheme as planned by 2016 if these industries are to remain competitive, and provides this or equivalent support into the future.

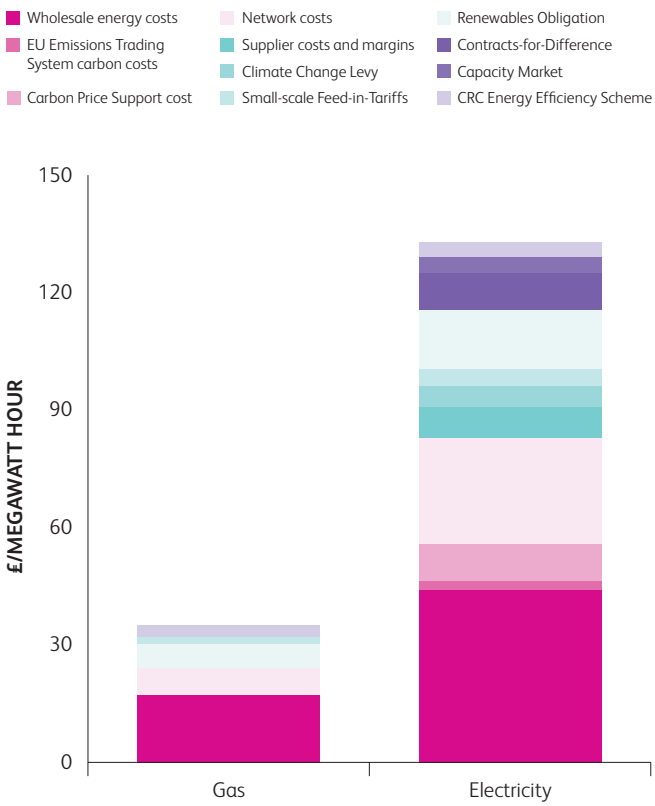
From 2020, the Department of Energy and Climate Change (DECC) estimates that business energy bills will break down as shown in chart 8.

During the last Parliament, energy companies came under persistent criticism as a result of increasing energy prices and alleged uncompetitive practices. Some of this resulted from the highly complex nature of government energy policy and limited understanding of the role it plays in rising prices. This kind of confusion increases the risk of ad-hoc policy responses that in their turn create uncertainty, investment hiatus and can ultimately increase the cost of energy.

Some of the confusion around bills could be tackled by presenting the separate charges for RO, FiTs, CfDs and the Capacity Market as a single low-carbon levy. Energy suppliers would show this on consumer bills, alongside a breakdown if required, and government would publish an 'all in one' estimated figure for the total charge ahead of each financial year along with projections for subsequent years.

This would not amend the operation of renewable support schemes themselves but would give consumers a single figure from which to assess their energy costs and plan for the future. Disparities between government estimates of policy costs and actual charges made by energy suppliers would be far more obvious and could be questioned more easily.

Chart 8: Projected energy price breakdown for medium-sized businesses in 2020



Source: DECC (2014) *Policy impacts on prices and bills, and EEF analysis*

[13]For descriptions of these and other schemes please see table 1
[14]OBR (July 2015) *Economic and Fiscal Outlook*. Figures provided here are in 2011/12 prices
[15]DECC (2014) *Policy impacts on prices and bills*
[16]Representatives from manufacturing businesses at an EEF focus group in 2015 noted that CRC costs are generally presented to finance departments once a year as an invoice and independently from discussions on energy costs. Furthermore, little, if any, discussion is had about how to reduce CRC costs for the following year
[17]Based on EEF analysis of past rates
[18]This estimate assumes a total revenue of £3.1 billion from 2016 to 2020 and a tax base of 550 terrawatt hours of electricity and 600 terrawatt hours of natural gas. These figures are based on DECC's energy and emissions projections and a broad assumption that all public sector energy consumption, two thirds of commercial sector consumption and one third of industrial consumption is subject to the full CCL.
[19]DECC (2012) *Energy Efficiency Strategy: The Energy Efficiency Opportunity in the UK* estimates some 196 TWh of cost effective energy savings to be made through to 2020 based on 2012 energy prices
[20]These calculations assume the following:
– The CRC is dropped and replaced by the first of the two revenue-recovery options discussed earlier.
– Companies can claim back the full cost of energy efficiency measures against the higher-rate addition to the CCL paid by former CRC participants (effectively providing a 60% discount rate on the combined costs of the standard CCL and higher-rate CCL)
– That 50% of those eligible for the tax discount claim it
[21]An impact assessment on CRC simplification prepared by DECC suggests capital costs to business arising from the scheme (i.e. spend on energy efficiency measures arising specifically from the CRC) of £334 million (2015 prices) over the period 2014 to 2025

5. DECARBONISING MANUFACTURING'S MOST ENERGY-INTENSIVE SECTORS

Government is recommended to:

- Take forward the Industrial Decarbonisation and Energy Efficiency Roadmaps, developing an action plan for each sector.
- Explore project finance and investment incentives (for example, to incentivise use of recoverable heat).
- Develop a targeted innovation and deployment programme to further develop technological solutions for decarbonising energy-intensive industry.
- Find a funding mechanism for a demonstration programme for near-to-market technologies.
- Evaluate the best economic and environmental use of all types of biomass, including virgin and waste sources.

Mindful of the particularly acute challenges that some of industry's most energy-intensive sectors face to decarbonise their operations (see section 4), government and business worked together to publish a series of decarbonisation and energy efficiency roadmaps in early 2015 that assess the extent to which the UK's most energy-intensive industrial sectors can substantially reduce greenhouse gas emissions by 2050 whilst remaining competitive. This collaborative model has been a very successful way of working.

The sectors examined were iron and steel, food and drink, chemicals, glass, ceramics, cement, pulp and paper and refineries. Collectively these represent around two thirds of industrial emissions.

The roadmaps, the culmination of eighteen months of collaboration between government, industry, academics and other stakeholders, look in depth at the technologies that might deliver emissions savings and what steps government and industry need to take to introduce them.

While the decarbonisation of the energy sector has received considerable attention and support from government, this kind of focus has not yet been placed on industrial decarbonisation.

SIX KEY TECHNOLOGY OPTIONS

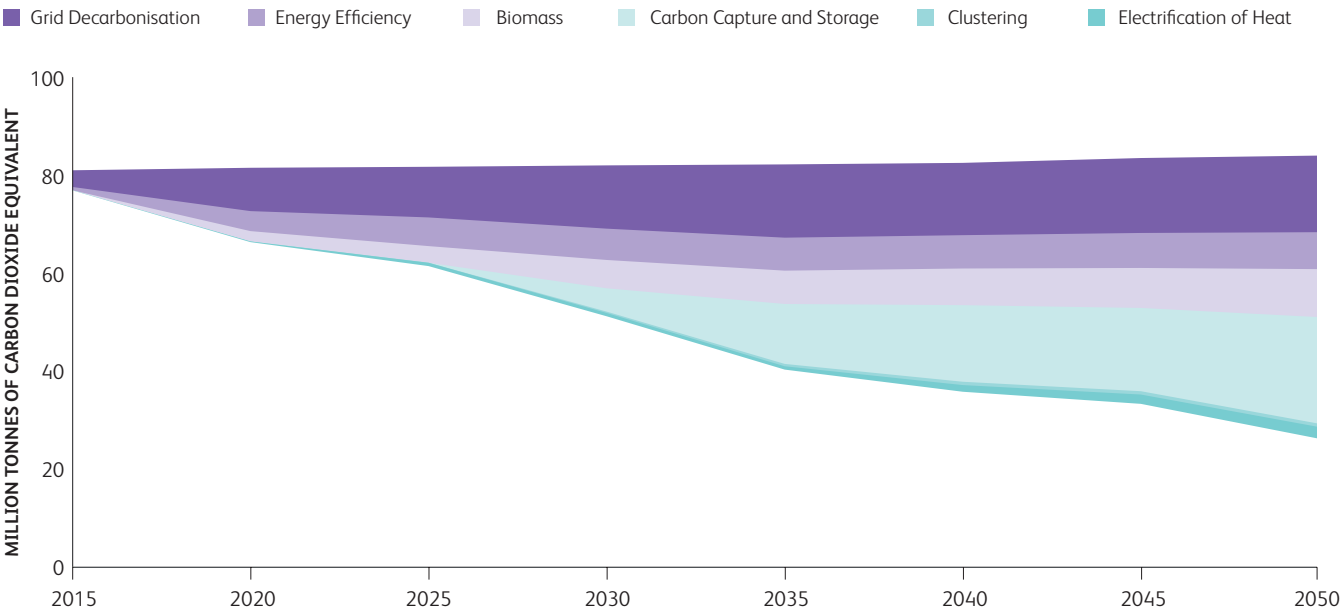
What the roadmaps have categorically helped to illustrate is that emissions reductions across the eight sectors are heavily reliant on a limited number of technological options (table 2).

Table 2: Top six cross-cutting options to decarbonise manufacturing

Option	Description	Sectors	CO2 saving potential by 2050 (as a % of max potential)[22]	Barriers
Decarbonisation of the grid	Introducing low-carbon electricity via the National Grid and increased deployment of electricity-based processes onsite.	All sectors.	25.4 %	– Outside the scope of manufacturers' direct influence.
Carbon Capture and Storage	The capture of greenhouse gases from large sources and its transportation and storage (see box on Teeside Collective).	Iron and steel, chemicals, oil refining and cement. In the longer term potentially also glass and ceramics.	36.5 %	– There is currently no business case for companies to make this investment. – Untested in the UK in an industrial context. – Less suited to some locations.
Biomass	The use of biological material (biomass) as a fuel or feedstock in place of fossil fuels.	Chemicals, food and drink, pulp and paper, cement and ceramics.	15.7 %	– Competition with other sectors for feedstock. – Cost dependent on supply/demand of biomass. – Reliant on some untested technologies. – Lacks policy framework to ensure best use of material.
Electrification of heat	The deployment of technologies that use electricity for heat instead of gas, for example microwaves and electric kilns.	Chemicals, food and drink, pulp and paper, glass and ceramics.	4.3 %	– Can only make a marked impact when low-carbon electricity is comparable in price with gas. – Untested technologies.
Energy efficiency	The deployment of a range of traditional and cutting-edge technologies to reduce the amount of energy required to produce products.	All sectors.	12.8 %	– Technology awareness of small companies. – Payback periods. – Business barriers. – Some technologies untested.
Clustering and collaboration	The co-location of industrial sites to enhance resource use and share the costs of infrastructure and technologies.	All sectors.	1.1 %	– Competition law. – Knowledge barriers. – Infrastructure-related costs.

Source: DECC & BIS (2015) *Industrial Decarbonisation & Energy Efficiency Roadmaps to 2050*, and EEF analysis

Chart 9: The contribution of key options to decarbonise manufacturing



Source: DECC & BIS (2015) *Industrial Decarbonisation & Energy Efficiency Roadmaps to 2050: Summary Report*

Grid decarbonisation, carbon capture and storage and biomass have emerged as particularly significant (see chart 9). Indeed, for some sectors, there is a very limited chance that they will be able to achieve any significant reductions in greenhouse gas emissions without them.

Yet all have associated risks or barriers. Grid decarbonisation is outside industry control, biomass currently lacks an adequate policy framework, and industrial carbon capture and storage technology is not yet proven in a commercial setting.

Furthermore there are only a limited number of investment cycles between now and 2050. Steel plants are only updated every 25 to 40 years, for example, and pulp and paper plants every 30 to 60 years. To avoid the risk of locking in high-carbon technologies, particularly if retrofit options are not available, affordable ultra-low-carbon technologies must be ready in the late 2020s and early 2030s.

The deployment of these options will not be cheap, but equally it is hard to say at the moment how expensive many might be, especially those still being researched. With some technologies, costs fall quite quickly once production and deployment rates increase but this might not be the case for equipment that cannot be scaled up to a mass market.

The roadmaps suggested that the collective costs of decarbonising energy-intensive sectors could range from £6 billion, under a scenario that saw a 27 percent reduction in emissions, to £16 billion under the maximum potential emissions reduction scenario of 73 percent. However there are considerable uncertainties attached to these estimates.

INDUSTRIAL LOW-CARBON PLAN NEEDED TO DRIVE TECHNOLOGY DEVELOPMENT AND DEPLOYMENT

As section 3 argues, industrial decarbonisation demands radical choices, and will not be delivered by increasing energy and carbon prices. The current policy framework for energy and climate change is simply not designed to deliver the scale of transformation needed. Nor will it bring forward the vast levels of investment required to take these technologies to market at the pace required.

A concerted joint effort is needed from government and industry to bring forward these technologies in a coherent, coordinated and cost-effective way, whilst also being mindful of what is going on in other countries. Some of the actions needed to deliver the roadmaps are set out in table 3.

Central to this will be the development of individual action plans for each of the eight sectors, backed by clear financing plans.

There also needs to be a targeted innovation programme for energy-intensive industries (see section 6), a debate about how to fund a demonstration programme for near-to-market technologies and a review of existing legislation and how it fits with the lessons learnt from the roadmaps. We would also like an evaluation of the best economic and environmental use of all types of biomass, including waste and virgin sources.

If government cannot provide substantial interim support to energy-intensive sectors to help them decarbonise, it needs to recognise that the various carbon taxation and pricing schemes are not going to drive decarbonisation but will simply continue stopping British firms competing fairly with producers in other parts of the world.

THE TEESSIDE COLLECTIVE

A cluster of chemicals, petrochemicals, steel and energy companies based in the Tees Valley are attempting to become a hub for clean industrial production through construction of a carbon capture and storage (CCS) network to collect emissions from four of their sites and store it under the North Sea from 2024.

The companies – SSI, National Grid, BOC Linde, Lotte Chemicals UK, Growhow, TVU and NEPIC – and Tees Valley Unlimited, the Local Enterprise Partnership for the Tees Valley, hope the project will reduce the competitiveness impacts of carbon policies and provide an attractive location for investors concerned about carbon emissions. The intention is also to nurture the development of technologies that use carbon dioxide as a raw material.

A recent government-funded study has concluded that despite the unique challenges presented by the project, including devising a funding mechanism for CCS, there are no insuperable technical barriers preventing it being operational from 2024.[23]

[22]Based on Combined Max Tech pathways in current trends scenario
[23]Teeside Collective (2015) *Blueprint for Industrial CCS in the UK: Executive Summary*

Table 3: Elements of a low-carbon industrial action plan for energy-intensive sectors

	2015-2020	2020-2030	2030 and beyond
Competitiveness	– Implementation of Energy-Intensive Industries (EII) Compensation Scheme (see page 17) in full. – Ensure as ambitious and equitable UN global climate agreement as possible. – Robust policies adopted to level the playing field for UK plants competing internationally if global levels of ambition are not consistent. – Continue support for industrial strategies to demonstrate to investors the government's commitment to UK industry. – Ensure the fifth carbon budget agreed under the Climate Change Act reflects outcome of the roadmaps.	– Move to technology-neutral auctions and gradual withdrawal of subsidies to drive competition and reduce costs of grid decarbonisation to the consumer.	– UK to help ensure all global climate change commitments are aligned.
Collaboration	– Joint industry/government sector-specific working groups established. – Competition law clarified to support greater industry collaboration and allow factory performance to be benchmarked. – Identify potential clustering hotspots and ensure planning and other rules are aligned to encourage them.	– Drive industrial clustering where possible and incorporate into future land use planning.	
R&D	– Establish an innovation programme to develop low-carbon technologies with match funding from government and industry, being mindful not to replicate efforts overseas. – Ensure maximum potential is made of EU funds and make sure rules of next EU Emissions Trading System (ETS) innovation fund are fit for purpose. – Research new sources of biomass such as woodchip to increase supply.	– Fully support industrial plants applying to the EU ETS innovation fund.	
Finance	– As the Green Investment Bank moves into private ownership, it should ensure funding is accessible, at a reasonable rate, to as wide a range of projects as possible. – Explore project financing mechanisms for industrial decarbonisation.	– Establish project financing mechanisms.	– Establishment of a sufficient global carbon price to ensure low-carbon industrial processes become a global norm, driven primarily through market mechanisms.
Industry-led action	– Strengthen expertise in developing compelling business cases for decarbonisation. – Assessment of skills needed by sectors to decarbonise. Investment in those skills, possibly via the Science Industry Partnership. – Assess opportunity for process electrification.	– Expand experimentation with circular business models to further enhance efficiency.	
Demand-orientated mechanisms	– Support EU-wide development of standard product lifecycle tools and encourage wider use of Environmental Product Declarations. – Align government procurement with best lifecycle outcomes.	– Build interest among consumers in low-carbon products.	– Support adoption of global carbon price to ensure low-carbon products can become cost effective.
Materials/Fuel sources	– Evaluate the best economic and environmental use of all types of biomass, including waste and virgin material. – Foster a consistent recycling scheme across the UK which seek to increase material quality. – Establish material flow analysis for key resources. – Address knowledge barriers to use of biogas. – Create a mechanism to ensure that biomass is being used where it adds most value to the economy.	– EU wide standards for recovered materials in place to promote high quality recyclates. – Explore financial mechanism to support deployment of biomass into industry sectors. – From 2020, remove distortions in biomass market.	– Ensure very high levels of high quality recycling. – No later than 2035, put in place support for biomass deployment in industry.
Industrial carbon capture and storage (CCS)	– Adopt a strategy for the development of a carbon dioxide transportation network. – Assess geographical constraints to CCS deployment.	– Assist in funding initial CCS network infrastructure during the 2020s. – Development of demonstration industrial CCS projects.	– Networks in place for the major sector hubs (eg Teesside, northwest England, Grangemouth, Humberside) in early 2030s.

6. A MORE SUPPORTIVE ENVIRONMENT FOR INNOVATION

Government is recommended to:

- Promote the opportunities in clean technology more widely.
- Increase the percentage of government R&D funding spent on energy and environment to at least match the EU average by reallocating funds from different areas.
- Better signpost the public money and support available to companies wishing to innovate in this area, ensuring that the associated rules and reporting requirement are kept in check.
- Provide more support, through the Green Investment Bank or similar organisation, for the scale-up and commercialisation of low-carbon technologies and business models.
- Ensure that the wider regulatory environment encourages innovation by creating predictability and stability, market-wide standards and labelling schemes for appropriate products, and suitable public procurement signals.

If the UK is to meet its carbon targets without losing out competitively, the British manufacturer of the future will have to deliver sophisticated, low-carbon products on demand from ultra-low emissions factories. It may also need to be far more resource efficient than its counterparts today, keeping the carbon footprints of its products down by reducing waste, maximising recycling and exploiting alternative business models such as leasing and take-back (see box).

Delivering this vision of a high-tech, low-carbon manufacturing sector and wider UK economy requires substantial investment in future manufacturing technologies and products.

However, this should not be seen as a burden: there is clear evidence innovation drives productivity and economic growth, and some indication that patents in clean technologies have a greater spillover effect than other types.[24]

Several key low-carbon technologies, including the wind turbine and lithium ion batteries used in electric vehicles, were invented in the UK but we do not have a good record of nursing ideas generated by our world-leading universities through to commercial deployment. While the UK is now placed to capitalise on the move to low-carbon vehicles, its initial advantage on lithium ion batteries was lost, and there are currently no domestic manufacturing facilities for large-scale wind turbines.[25,26]

This has to change. If the UK is to continue taking a leading role on climate change, its economy should see the benefits of this stance, and firms must be helped to realise them, rather than just shouldering the costs. It must also be able to demonstrate internationally that taking a leading role is compatible with a growing economy.

RESOURCE EFFICIENT BUSINESS MODELS IN A MORE CIRCULAR ECONOMY

The circular economy is a vision for the economy where materials are kept in productive use for as long as possible. Products are given longer lives through service and repair. When they can no longer be maintained they are brought back to new, or better than new, condition through innovative manufacturing techniques, or components are salvaged and reused, and the remnants recycled.

It is an idea that is becoming increasingly attractive as a way of addressing the risks to UK competitiveness associated with sourcing raw materials and scarce commodities from overseas. It may also help reduce the environmental impacts associated with our increasing demand for products, whilst supporting growth and business competitiveness. Evidence suggests it can also help companies substantially reduce energy consumption in their factories.

To benefit, manufacturers design products which not only perform strongly in use but are easy to look after and salvage when no longer needed. This is driving new ways of selling products to customers, including leasing them rather than selling them, and providing services that keep products functioning for as long as possible. Products can also be returned at the ends of their lives.

These kinds of approach are already used by some manufacturers of expensive equipment such as engines. For example, Rolls Royce offers customers "power by the hour", selling the service of its jet aeroplane engines rather than the engines themselves. The company then monitors and maintains the engines while customers use them and when they need to be replaced the exotic metals contained in them are recycled and used to make new engines.

Another example can be found within construction equipment manufacturer Caterpillar. It gives its customers a deposit back when they return their engines. They are then restored to new and resold at a considerably lower price, but with a warranty identical to a new engine. Caterpillar reports that making remanufactured engines reduces its energy consumption and use of raw materials by as much as 85%.

This will require a more focused approach to getting British low-carbon technologies to market. The proportion of public R&D funding dedicated to this area is disproportionately low both in relation to the opportunity and to our competitors, and companies must also be persuaded to spend more. Particularly important or promising technologies must be helped through their infancy, commercialisation and roll out, and promoted overseas to build exports.

PROMOTE THE OPPORTUNITIES IN CLEAN TECHNOLOGY MORE WIDELY

The global market for low-carbon environmental goods and services was already estimated to be worth £3.4 trillion in 2011/12, while meeting the UN's 2°C global warming target is expected to require $1 trillion (£0.65 trillion) of investment in clean energy systems alone each year by 2030, providing considerable opportunities for suppliers of suitable technologies.[27,28]

However, there is little public discussion about the opportunities decarbonisation can present outside the electricity sector, and confusion among some manufacturers about how terms like the green economy and low-carbon economy translate to the real world and their businesses.

When EEF asked its members about the opportunity they saw in a low-carbon economy, 35 percent said there was little or none for their company.[29] Follow-up interviews revealed some had said this purely because they were not involved in the renewables industry, but then went on to cite pressure from their customers for more energy efficient products as one of the main factors driving their product offering.

EEF's annual Innovation Monitor shows fewer members consider the development of low-carbon technologies to be a driver for innovation now than in 2010, and that it is a less significant driver than environmental regulatory compliance (see table 4).[30]

The lack of clarity around terms like the low-carbon economy is also illustrated by the different definitions used in three similar-sounding government assessments of the scale of the low-carbon and environmental goods and services sectors (see table 5). These arrived at quite different results, even for apparently similar sub-sectors.

There needs to be as broad a vision of the low-carbon economy and clean innovation as possible. If companies are to buy into the concept they have to see where they can fit into it. More resource-efficient business models and other trends such as digitisation will also play a key role in cutting emissions and should be captured where possible too.

Table 4: Factors cited as driving innovation in EEF member companies[31] (percentage of companies citing factors)

Option	2010	2013	2014	2015
Improving energy efficiency[32]	-	-	-	39.1
Complying with environmental standards and regulations	42.1	46.2	43.6	37.3
Developing low-carbon technologies	26.4	14.7	14.1	19.3

Source: EEF (2015) *Innovation Monitor 2015/16*

Table 5: UK government studies on scale of low-carbon/environmental goods and services sectors

Report	BIS (2013) *Low carbon environmental goods and services: Report for 2011/12*	BIS (2015) *The size and performance of the UK low-carbon economy: Report for 2010-13*	ONS (2015) *UK environmental goods and services sector: 2010-12*
Products and services included	Companies were included if at least 20% of estimated sales activity was attributed to the low-carbon environmental goods and services sector.	'Activities which generate products or services which themselves deliver low-carbon outputs'. Only the portion of a firm's economic activity relating to low-carbon goods and services was included.	In line with Eurostat definition, 'the main purpose' of goods or services had to be environmental protection or resource management.
GVA	N/A, Sales in 2011/12 were £128.1 billion (6th highest globally).	£26.2 billion for the core low carbon economy in 2013 and £44.9 billion including its supply chain.	£26.3 billion in 2012.
Growth	4.8% increase in sales from 2010/11 – 2011/12.	8.7% year-on-year growth between 2010 and 2013.	1.5% increase in GVA between 2010 and 2012 (less than for whole economy).
Direct employment	937,923 in 2011/12.	269,800 in 2013.	357,000 in 2012.
Largest constituent sectors	Alternative fuels (15%) and wind energy (12%).	Waste processing, energy from waste & biomass (49%), and low-carbon electricity (23%).	Wastewater and water management services (36%), water quantity management (17%), recycling (9%).
Comments	Also included international comparisons.	Some potentially arbitrary inclusions: industrial energy efficiency products excluded for example, and condensing boilers excluded on grounds that they do not represent a step-change from existing technologies while energy-efficient windows and doors included.	Experimental statistics prepared in line with EU rules entering force in 2017.

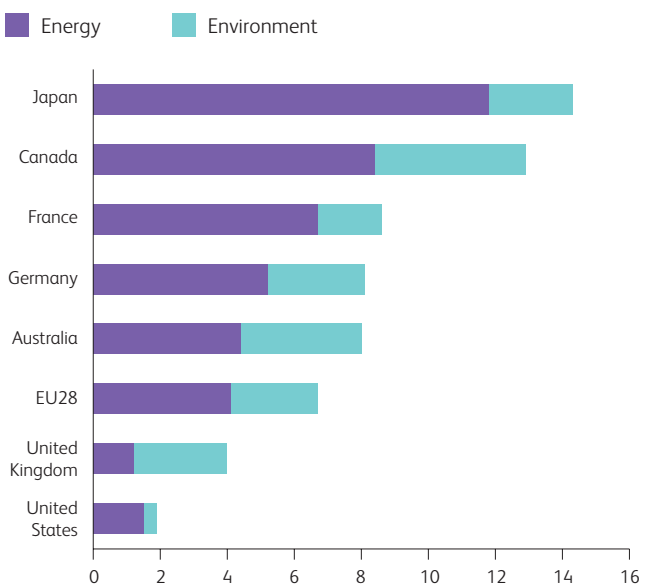
The same considerations must also be embedded into industrial, skills and innovation policy. The sector strategies drawn up under the last government were patchy in their discussion of sustainability, and there was no overarching approach to it amid the industrial strategy.

MORE SUPPORT FOR LOW-CARBON R&D AND DEPLOYMENT

The UK spends less on R&D as a proportion of GDP than the OECD average, and a far smaller share of its public R&D budget in the energy and the environmental fields than many key competitors (see chart 10).

Many of the approaches already being taken by the government bodies supporting innovation are welcome (see table 6), and could in some cases be scaled up and better publicised.

Chart 10: Percentage of government R&D budget spent on energy and environment in 2013 or last available year



Source: OECD (2014) *Science, Technology and Industry Outlook 2014*

Table 6: Key funding bodies and mechanisms with remits that include supporting low-carbon innovation

Funding mechanism/body or incentive	Description	Comments
Research Councils	Fund early-stage, university-based research. Budget in 2014/5: £2.6 billion.	Individual funding decisions are made by researchers rather than government.
Innovate UK	The UK's innovation agency, it supports business-led innovation through a variety of programmes and mechanisms (including funding competitions, Catapult Centres, KTNs, KTPs and SBRI). Total 2014/15 budget: £421 million.	Commitments by priority area in 2014/15 included: £13 million for resource efficiency; £82 million for energy; £13 million for built environment; and £70 million for transport. Relatively low awareness of its role among some businesses.
– Knowledge Transfer Networks (KTNs)	Work with business, academia and other organisations to share information, collaborate and bid for public funding. There are currently 16 networks including for energy, and sustainability & resource efficiency.	Dedicated networks play a valuable role in informing and connecting companies with researchers and experts, with a limited budget.
– Knowledge Transfer Partnerships (KTPs)	Place recent graduates into firms to deliver specific projects in partnership with universities.	It is claimed every £1 million of government spending delivers a £4.25 million annual increase in company profit before tax, £3.25 million investment in plant and machinery and 112 new jobs. Process sometimes seen as complicated and number of partnerships fell 40% between 2010 and 2014.[33]
– Catapult Centres	Dedicated centres where businesses can access equipment and expertise that would otherwise be out of reach. There are currently nine, including centres for offshore renewable energy, energy systems and future cities.	Recently established so hard to evaluate effectiveness. Awareness levels relatively low among SMEs.
– Small Business Research Initiative (SBRI)	Runs competitions in which SMEs can win public sector contracts to research new products and services to meet future policy or procurement needs.	Can help overcome funding gap for early stage companies. Covers a wide range of technology types. Awareness levels low.
Energy Technologies Institute (ETI)	Public-private partnership between five global energy and engineering companies and the UK government. Funds projects that accelerate the development of affordable, secure and sustainable energy technologies.	Ensures government funding is appropriately targeted and industry match funding helps make public funds go further. Some stakeholders have questioned whether results should be more widely shared given public funding input.
R&D tax credits	Tax incentive for investment in R&D: equivalent to 130% of R&D spending for large companies, and 230% for SMEs.	Benefits from long-term stability, meaning there are high levels of awareness and familiarity.
Horizon 2020	EU research and innovation programme, often requires collaboration with partners from other countries or sectors. Includes significant funding for climate, energy and environment issues. Budget c€80 billion over 2014-20.	UK has historically won a high share of EU R&D funding.

Funding mechanism/body or incentive	Description	Comments
Carbon Trust	Not-for-profit company originally established by government to help companies and public sector cut emissions. Has run several technology-led programmes including public-private Industrial Energy Efficiency Accelerator and similar industry-led offshore wind project.	Supply chain focused programmes can be valuable way to build trust and a good working relationship between large companies and potential smaller suppliers. Also ensures challenge is targeted at real problems and gives suppliers confidence there is a market.
Green Investment Bank	Created by government to invest in energy and waste sectors, and initially capitalised with £3.8 billion of public funding. Government now plans to sell majority stake.	Limited range of project types covered, and generally involving mature technologies. Current rules mean individual manufacturers unlikely to win funding.
EU Emissions Trading System innovation funds	For EU ETS participants only. Initially just CCS and renewables but due to be expanded to industrial projects after 2021.	Expansion is welcome but rules need reform to accommodate industrial projects.

Source: Funding bodies' websites, EEF analysis

Discussions with EEF's members reveals many are unaware there is funding or advice available for low-carbon innovation, let alone where to look for it. Even if they have heard of the relevant bodies, there is a bewildering mixture of different timelines, requirements and obligations that can be hard for smaller companies to navigate. Many perceive dedicating precious time and resources to competitions with no guaranteed outcome as being risky.

Although the overall landscape is confusing, we would prefer stability at this stage rather than risk losing valuable mechanisms and creating more confusion through a major overhaul. However there needs to be signposting of the opportunities available in the low-carbon field through the expansion and wider promotion of the Low Carbon Funding Landscape Navigator, a tool established by the Energy Knowledge Transfer Network.

Where possible, rules for funding should be kept as simple as possible. Potential applicants are sometimes deterred by the extensive monitoring and reporting requirements attached to any money.

In addition, more support is needed to overcome the finance gap for green technologies at the demonstration and deployment stage. The Green Investment Bank, which some companies had hoped would address this, only funds the roll out of more established technologies in a limited range of sectors, and on too large a scale to help individual manufacturers. It should consider acting more as a provider of risk capital and as a promoter of innovation, although an expansion of its remit might be harder to mandate if the bank is sold.

TARGETING KEY TECHNOLOGIES

EEF would like as wide a range of companies as possible to feel included in moves to a low-carbon economy and for there to be a broad base of funding available to support the development of new greener products, processes and business models.

However, there also needs to be a more targeted approach to support key technologies that appear to be essential for decarbonising the UK economy and may not emerge through market forces alone, and where the UK has a genuine chance of gaining a competitive advantage.

This includes the technologies highlighted by the decarbonisation roadmaps discussed in section 5, which are essential for the continued existence of a series of

key UK industries. One option that could be considered for this area is a supply chain-based model along the lines of the Carbon Trust's Industrial Energy Efficiency Accelerator Programme (see table 6 for description). This was jointly funded by government and industry. Public sector involvement helped build connections and trust, and established the rules of engagement between companies of different sizes and backgrounds.

Which technologies should be targeted should be reassessed regularly, including the UK's relative progress compared to other countries, to ensure we do not continue supporting options that no longer seem capable of living up to their original promise.

CREATING A MARKET FOR INNOVATION

Equally important in encouraging low-carbon innovation are the demand-centred measures creating markets for cleaner products and services (see table 7 for some examples). Appropriate policies, targets, and standards act as considerable drivers for change and innovation. Inconsistent or poorly thought through approaches can have the opposite effect, locking in existing high-carbon technologies, creating boom and bust cycles, or putting domestic companies at a disadvantage in global markets.

EU tailpipe standards for cars have driven substantial reductions in carbon dioxide emissions but some of the mechanisms previous governments have put in place to fund installation of domestic insulation and other energy efficiency products lie at the opposite end of the scale, failing to provide a consistent framework for improvements and creating a boom-and-bust market for installers.

It is impossible to make recommendations on all the demand-centred measures available, but we would suggest government takes a concerted look at particular product groups and how all the potential drivers of innovation affecting them can be aligned.

This should include a more determined approach to product standards and labels, promoting them publicly and explaining their purpose when they are the target of tabloid headlines, as is often the case with EU ecodesign standards for products like lightbulbs and vacuum cleaners.

EUROPEAN COURT RULING ON VAT RELIEF FOR DOMESTIC ENERGY SAVING PRODUCTS

The European court ruled in June that the UK was breaching EU rules by only charging 5 percent VAT on a range of domestic energy-efficiency products including insulation, heat pumps, solar panels and wood-fuelled boilers.

The VAT directive only allows EU member states to deviate from their standard taxation rates under a strict set of circumstances. The court decided the UK's justification for its discount, based on a derogation for provision, construction, renovation and alteration of housing as part of a social policy, was not valid.

Firms supplying the affected products are unhappy at the decision. If the UK removes the discount, they fear demand for these products will fall, further depressing a market that has taken a number of recent knocks.

However, there are suggestions that the European Commission, which brought the case against the UK, is now considering whether a derogation to the VAT directive aimed specifically at energy-efficient products might be feasible.

This approach would create more certainty for equipment suppliers and installers while also continuing to address a major source of greenhouse gas emissions and preserving the Conservative government's pledge not to increase income tax, national insurance or VAT over the next five years.

Table 7: Some of the regulatory measures creating demand for clean technologies

Energy and carbon taxation and pricing: Theoretically believed to provide a clear driver for the development of cost-effective tools to decarbonise industry and power sector but often not the case in practice (see section 4).
Renewable energy targets and subsidies: Strong support mechanisms in Germany and Spain in the past drove considerable innovation in renewable energy technologies. Uncertainty about future subsidy levels here is currently holding investment back.
Product standards: Consistent predictable product standards have successfully driven innovation in the automotive sector (average carbon dioxide emissions from new cars sold in the UK have fallen by 24% since 2007).[34] These are expensive for the sector and its suppliers, but have the advantage of applying equally to all firms wishing to access the EU market. The EU's ecodesign regulation has sometimes proved controversial but is making considerable energy efficiency improvements to domestic, commercial and industrial goods.
Product labels: EU has introduced mandatory energy labels for many domestic electrical and electronic goods. Some industrial buyers feel greater expansion of labels to their sector could be valuable in making the case for more expensive but ultimately more efficient equipment.
Consumer incentives: Vehicle excise duty is currently linked to a car's carbon dioxide emissions, although this signal is being weakened, and there are VAT discounts available for domestic energy-efficiency products (see box). Could be capacity for similar schemes for other products, e.g. for electrical and other energy-related goods carrying top-rated energy labels.
Green Public Procurement: There has been less emphasis by central government on green public procurement in recent years, partly as a result of the focus on cost savings. EEF members are being asked for sustainability information by a wide range of public sector buyers but often about their onsite environmental management, not the credentials of their products.
Trade policy: If a global agreement can be reached on climate change, there could potentially be a huge export market for low-carbon goods and services. In addition, some decarbonisation technologies may be better suited to other countries and climates. UK diplomats are very involved in spreading knowledge about decarbonisation but are sometimes limited by boundaries with UKTI which charges for some of its export services.
Building standards: There are a range of standards for greening buildings, but flagship targets have been dropped creating uncertainty. When set right these can be a powerful driver of low-carbon design.

Where standards are set at EU or international level, the UK needs to make sure it is fully involved in the development process and represents the needs of all domestic businesses. There have been examples of ecodesign standards being set that exclude alternative solutions such as remanufactured products because only a limited range of companies were consulted. Existing rules need proper enforcement too.

More thought should also be given to consumer incentives and public procurement. The recent changes to Vehicle Excise Duty announced in the Summer Budget are disappointing in this regard. The incentive to buy lower emissions cars – and support those companies manufacturing them – could have been maintained while still ensuring an increase in total revenue. Government should also find a new way to justify the lower rate of VAT for domestic energy-saving products that can be accepted by the European Commission (see box).

When it comes to public procurement, loading too many requirements on buyers might prove counterproductive. However, they should at least be looking at the total lifetime cost of the products they buy from purchase through use to disposal and replacement, and considering different business models such as leasing. This would help reward manufacturers of more energy efficient and durable products, and those developing new more resource-efficient business models.

[24]Dechezleprêtre, A et al (2013) *Knowledge spillovers from clean and dirty technologies: a patent citation analysis*
[25]Royal Academy of Engineering (2014) *Wind energy: implications of large-scale deployment on the GB electricity system*
[26]Siemens is due to begin building wind turbine blades in the UK from 2016
[27]BIS (2013) *Low Carbon Environmental Goods and Services (LCEGS): Report for 2011/12*
[28]The New Climate Economy (2015) *Seizing the Global Opportunity*
[29]EEF Climate, Energy and Environment survey, 2014
[30]EEF (2015) *Innovation Monitor 2015/16*
[31]The same question was asked each year: "What factors were drivers of your company's innovation activity in the past 3 years?"
[32]Not included in the survey until 2015
[33]Figures from most recent (March 2014) quarterly statistical report on current KTPs
[34]SMMT (2015) *New Car CO2 Report 2015*

7. CONCLUSION

Manufacturers are keen to play their part in decarbonising the UK economy. They are already reducing their own greenhouse gas emissions and producing new products and services that do the same for others.

However, the current policy environment needs a fundamental rethink, in terms of both its short-term regulatory drivers and its more general direction of travel.

As the new government has recognised, businesses face an array of energy taxes and levies that are bewildering and painfully complicated to administer.

A blunt use of energy price signals is not sufficient to adequately tackle the barriers to energy efficiency investment in many organisations and can be crippling for those with very energy-intensive manufacturing processes and competition from less-regulated countries overseas, especially when combined with the levies added directly to their energy bills to pay for greening the electricity grid.

We suggest the forthcoming review of energy taxes and levies takes a broader approach than currently envisaged, and looks at whether energy taxes could be phased down over the longer term, schemes merged to remove the most burdensome, and new ways found of highlighting potential energy efficiencies.

However, this alone will not be enough to substantially reduce the carbon footprint of the handful of very energy-intensive sectors responsible for two-thirds of industrial emissions.

As the Decarbonisation and Energy Efficiency Roadmaps to 2050 recently published by government show, the long-term solutions for these sectors will require many billions of pounds of investment in new technologies, which they simply cannot afford on their own. A clear strategy is needed to help address this gap.

At the same time, policy is vague about the development of the next phase of low-carbon technologies. Given the UK's decision to take a leading role on climate change, setting ourselves targets beyond those of our main competitors, there needs to be a proper effort to capitalise on any advantage we gain from early action.

Manufacturers based in the UK must be helped to see the opportunities decarbonisation can bring and benefit from them, not just shoulder the extra costs.

ABOUT EEF

We are the voice of UK manufacturing and engineering and a leading provider of business support. We want manufacturing industry, and your business, to be able to thrive, innovate and compete, both locally and on a global scale.

We work with the UK's manufacturers from the largest to the smallest and because we understand manufacturing so well, policy-makers trust our advice and welcome our involvement. We work with them to create policies that are in the best interests of the sector, that encourage a high growth industry and boost the manufacturing sector's ability to make a positive contribution to the UK's economy.

Our policy work delivers real business value for our members, giving them a unique insight into the way changing legislation will affect their business. This insight, complemented by intelligence gathered through our ongoing member research and networking programmes, informs our broad portfolio of business support services which include HR & employment law, health, safety and environment and productivity improvement. We also provide a wide range of training, from engineering apprenticeships to management and leadership development.

To find out more about becoming an EEF member, contact us on 0808 168 5874 or email us at enquiries@eef.org.uk

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