

Carbon and Energy Targetology and Trade-Offs

Strategy Unit Note

Summary

The UK is committed to controlling its emissions of greenhouse gases, principally CO₂. This implies building an effective economy-wide management system which keeps us in line with national and international carbon constraints in the face of uncertainties in prices, demand and policy effectiveness.

The national carbon management task is analogous in scale to the inflation targeting process of Bank of England, but with longer timescales, greater inertia in the system and a much more complex suite of policy instruments. Our practical experience in building such a system should also inform our long-term approach to the international climate regime, and how targets should be defined under it.

In the transition to long run stabilisation targets many different types of international target may be used by countries, and not all will be defined in tonnes of carbon. However, developed countries who wish to participate in trading schemes will face quantitative carbon targets throughout this period.

The development by the UK of a credible low carbon management programme will be an important step in persuading other countries that climate change is a solvable problem, and future international commitments (as opposed to simple technology driven programmes) are credible and useful.

The UK's short-run climate change targets were set politically, not on a basis of a well-worked out carbon management plan. The 5 Year Energy Strategy has brought these issues into sharp relief, as a distinct carbon gap emerges in UK policy and questions are raised over the competitiveness impacts of bridging this by 2010.

This paper asks the following questions:

- Are the UK carbon targets sensible in view of our long run goals?
- What are the costs and benefits of shifting/changing our targets?
- How should we define future targets in order to ensure least cost compliance?
- What is the scale of trade-offs with UK competitiveness in hitting the targets?

UK Energy Policy: Two targets; Two constraints.

Energy policy has two high level quantitative targets, and two more loosely defined constraints.

Two Energy Policy Targets

- Low Carbon: 20% reduction in CO₂ emissions below 1990 levels by 2010, on track to 2050 target in 2020 which implies an approximately 30% reduction by 2020.
- Fuel Poverty: All vulnerable groups out of fuel poverty by 2010 (as far as reasonably practicable), all fuel poverty eliminated by 2016. These are statutory targets and some NGOs are already threatening judicial review as current policies will not deliver the 2010 target.

Two Energy Policy constraints

- Competitiveness: no target – but assumption that energy **prices** should be broadly in parity with major competitors - especially in high energy use sectors

(though total energy **costs** would be a better measure). Most policy activity focuses on increasing competition in UK energy supply markets.

- Energy Security: quantitative targets for short run UK electricity and gas reliability. Qualitative goals to manage the transition to net gas imports, including increased EU market liberalisation, source country stability and infrastructure investment issues; no target for fuel diversity or price fluctuation exposure.

Current estimates are that the UK could miss its 2010 target of 20% reduction in CO₂ by 7-8 percentage points. Around 50% of this comes from higher GDP growth and increased coal burn as gas prices have risen faster than anticipated, and 50% results from under-performing policies.

It is also unlikely whether the UK will meet its statutory energy poverty targets without a rapid increase in public spending and associated programmes.

Given this context the 5-year strategy should address are the costs and benefits of sticking to the UK's low carbon targets, and whether they should be changed to reflect how the energy system is responding to current policies and prices. Analysis of this can be divided into two areas:

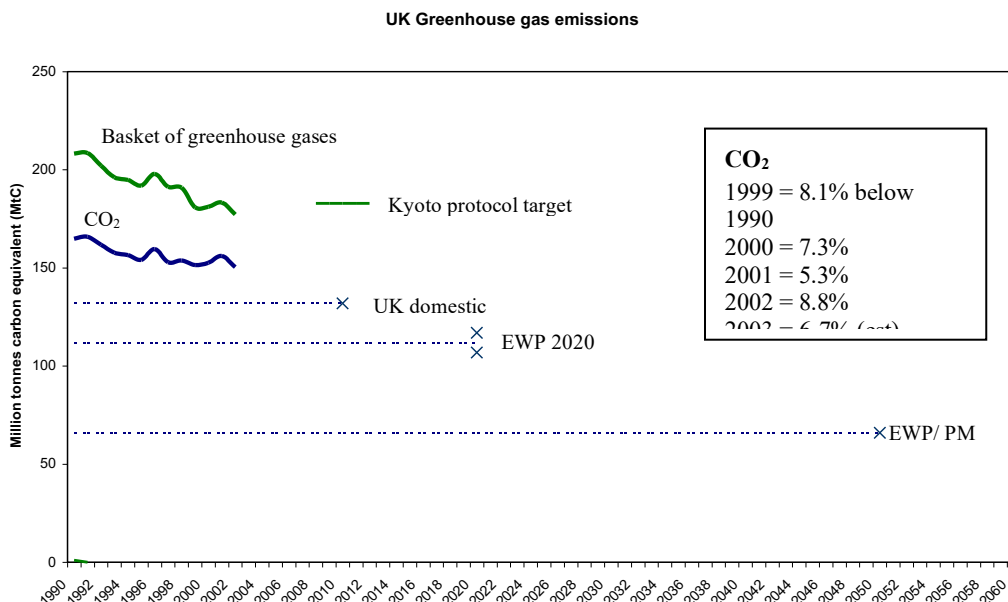
- **Long term:** are the UK's 2010 targets consistent with an optimal trajectory to our long-term goal of 60% reduction by 2050?
- **Short term:** what will be the economic, regulatory and political (domestic and international) impact of missing the 2010 target? How can this be minimised even if the UK continues to under-perform?

The UK's Long-term Low Carbon Trajectory

Purpose of the UK's 2010 and 2050 targets are:

- to show international leadership on tackling climate change, and the feasibility of decoupling GDP growth and CO₂ emissions.
- to give credible expectations of a low carbon future and so encourage investment and R&D into new technologies, with the aim of minimising future costs.

2010 and 2020 goals put the UK on a straight-line emission reduction trend to the 2050 goal.



There are real questions on whether this is the most efficient path to take or whether greater delay (or back-loading) emission reductions (implying a weakening of the 2010 target) would be more efficient. Greater back-loading will tend to reduce present costs if:

- new low carbon technology will emerge whatever the UK's emissions trajectory.
- Investment turnover is relatively quick, allowing new technologies to be bought in the final 20 years without large scale scrapping of existing infrastructure
- There is little risk that the UK will be asked to reduce by more than 60% by 2050.

Overall none of these points hold for the UK.

- The literature on low carbon innovation¹ argues that cost reduction and technology emergence will occur mainly from learning by doing and market growth, not disruptive innovation and research. Therefore, steady market growth in low carbon technologies is the key to ensuring innovation actually happens. The UK market is not large enough to drive these processes on its own and achieving the UK's target is important in so far as it helps encourage other countries to meet their Kyoto (and beyond) targets. The main exception to this effect is perhaps fuel cell and hydrogen technologies which are receiving significant investment on energy security and air quality grounds.
- Investment turnover in most energy-using capital is slow: transport infrastructure over 100 years; housing 50-100 years; commercial/industrial buildings 20-40 years; power generation 20-40 years (but shortening). Shorter life cycles are only seen in transport and domestic appliances which completely turnover every 5-15 years.
- The 60% by 2050 target is based on the aim of achieving stabilisation at 550ppm in the atmosphere. With equal per capita emissions allocations the UK would in fact need to reduce emissions by over 80% by 2100. Recent scientific discoveries seem to be increasing the probability of extreme climate scenarios which would impact the UK. This implies that the 550ppm target is more likely turn out to be too high to prevent "dangerous interference" with the climate system and sharper cuts may well be required.

These factors tend to argue against significant back-loading and support the current approach of an approximately linear reduction path. However, there has been little systematic "pathway" modelling of the UK climate programme which could weigh these factors quantitatively.

The studies that do exist show little advantage in delaying action across the board if we aim to achieve the same total cumulative emission reduction by 2050, as the cost of faster emission reductions in 2030-2050 would be very high due to the need to scrap existing investment. If the UK aim was just to reach a 60% reduction in 2050, not to achieve comparable cumulative emissions reductions by 2050, then delaying reductions is the cheaper option but the cumulative total is 25-50% smaller². However, in this case the unit cost of emission reductions rises as action is delayed as faster cuts are more costly.

¹ For example, "Assessment of technological options to address climate change" ICCEPT, December 20, 2002

² "Options for a Low Carbon Future: Part 2", AEA Technology for DTI, February 2003

If the UK maintains its role as a leader in global emission reductions then following a back-loading trajectory implies a similar reduction in global emission reductions and therefore slower growth in global low carbon technology markets, which is not factored into current modelling.

The 2010 CO2 reduction target still seems sensible in terms of the UK's long run climate change objectives if we value total emissions saved to 2050.

Given the UK's long term objectives, action to meet the 2010 target is best focused on setting credible incentives and regulations to change longer-lived infrastructure (e.g. housing, power grid) and drive innovation (e.g. renewables, fuel cells), unless it is zero or negative cost to reduce emissions by turning over shorter-lived capital (e.g. domestic appliances).

The review of the UK Climate Change programme, and work on post-2012 approaches, should examine closely emission trajectories, global innovation and the optimal timing of abatement measures.

Managing the 2010 Target

Though the 2010 target seems to make sense in long run terms, it still throws up short run management issues:

- How should various "sub-targets" (e.g. on CHP) be handled?
- What tolerance should we aim to have over meeting the target? Should policies aim to over or undershoot the target symmetrically?
- How should temporary "blips" with no long-term implications – e.g. increased coal burn - be handled?
- How should any business cycle impacts be managed?

Sub-targets

The 2010 target is intended to drive fundamental change in the UK energy and transport systems, mainly through private sector activity and innovation. The key to this is for the government to provide consistent expectations that give companies the certainty to invest and innovate; knowing there will be a growing (competitive) market in the future for their products and services. This type of reasoning underpinned the recent extension of the renewables obligation to 2015

The overall low carbon target is delivered by several different industries, and through several sub-targets on: renewable energy, CHP, energy efficiency schemes/agreements, transport and carbon trading.

There are also several areas where the low carbon programme must be delivered through government action, notably: public sector purchasing and estate; electricity grid; urban and transport planning.

The diversity of industries involved means that credibility of each individual sub-targets is more important for delivering industry action than meeting the overall carbon reduction target.

The basic principles for managing different types of targets should be:

- **Market-stimulating/innovation forcing targets** should have clear forward expectations and err towards over-achievement and longer timescales: for

example, the EEC targets could be set forward to 2015, rather than being extended in three tranches to 2011.

- **Government targets:** targets on government activity and purchasing should be handled in the same manner as private sector targets to enable rational forward investment decisions but should also contain a stronger innovation and market forcing element (as emphasised in recent draft OGC advice³).
- **Regulatory targets** (e.g. building and appliance regulations) are limited by the natural rate of turnover in each sector, unless incentives for accelerated uptake and replacement are given (e.g. fiscal incentives through taxes and rebates). Regular expectations of reviews are critical to drive innovation in these sectors, rather than quantitative target levels.

The purpose of setting targets should be clear. The current climate change programme confuses “targets” which are actually just expectations of market outcomes (e.g. on CHP), and firm targets which are intended to drive action and innovation and are backed up with implementing policies (e.g. tax credits). This results in confused signals when “targets” are missed or abandoned, possibly lowering the credibility of government commitment in other areas. Qualifications of targets which result from interdepartmental negotiations (e.g. “if possible” etc) often add to this confusion and reduce the effectiveness of targets in stimulating change.

For example, the current projections show that the UK’s CHP “target” will not be hit because of changes in relative fuel prices, and there are no government policies in place to rectify this. In this case either policies should be designed to meet a (revised) CHP target, or the target should be abandoned; perhaps being replaced with a set of incentives instead.

The low carbon programme will always contain a myriad of sub-targets and objectives, some of which will need to be revised or dropped as time moves on. The process of setting and revising targets needs to more explicitly consider the impact of these revisions on business and public expectations.

Key stakeholders should be engaged more closely in the setting and monitoring of targets, so that they understand, and to an extent “own”, the logic of any revisions or under-performance. It is better to scrap or revise targets that will not be hit, rather than allowing under-performance to undermine the credibility of other government objectives.

Tolerances in Hitting the Overall CO2 Target

The impact of missing the UK 2010 CO2 target is political, the UK’s Kyoto obligations will be easily met. In future commitment periods we will need to decide on a strategy of over or undershoot depending on projections of the price, the availability of tradable allowances and the strength of international sanctions. However, our experience in trying to meet the 2010 target will be important in understanding how “controllable” national emissions are and informing UK policy on the structure and compliance procedures around future international targets.

From the existing DTI/DEFRA/DfT analysis it seems that even if we hit all our existing sub-targets (and there is work to do here) – and therefore maintain industry expectations and incentives – overall 2010 emissions could still be only 12-13%

³ “Capturing Creativity: nurturing suppliers ideas in government”, Office of Government Commerce, 2004.

below 1990 levels. A decision on how much extra effort to place on meeting the 20% target will not be driven by the fear of losing industry credibility but by broader political issues.

Various options for bridging the carbon gap suggest that with some extra funds (including on fuel poverty - see below), fiscal measures and extending energy efficiency programmes into the business sector around half of the current gap could be bridged at little cost. However, time lags in implementing new policies mean that measures beyond this, though possible, are either costly or uncertain.

Uncertainties in future baseline projections could also result in changes of +3% to -3% in total emissions, with lower emissions more likely; though this will be balanced by undershoot in existing programmes.

Therefore, even with increased effort the likely final range of UK reductions could be anywhere between 13-20% below 1990 levels. Unless we plan to strongly overshoot the target we cannot guarantee to hit the target in all foreseeable circumstances; risks may work for or against us.

The 5 Year Strategy needs to have a clear view on what constitutes an acceptable risk of missing the 2010 target, and how to ensure that the UK retains credibility in its carbon programme even if we fail to meet the target.

For the 2010 target the following political issues are relevant:

- domestic politics: the Green NGOs see the 20% target as the jewel in the crown of UK environment policy and would object violently to any pulling back in the short term. They are already sceptical about the impact of current policies, know that a carbon gap is emerging and are publicly (and internationally) undermining the UK's leadership position by publicly questioning our ability to hit the 20%.
- international politics: the UK gains no credit for meeting its Kyoto obligations – especially in the EU – because of our dash for gas dividend. However, the UK does get credit for its carbon reduction programme and meeting the 20% target would send a strong signal and set the scene for the post-2012 negotiations.

Moving or weakening the 2010 target would remove all the credit the UK might gain from its investment in managing carbon. Rather we need to ensure that a (likely) failure to meet the 20% target on the dot is seen as a matter of unfortunate circumstances, not a failure of political will or planning. This can be done by:

- Making the range of uncertainty around the emissions baseline caused by price changes and industrial restructuring a matter of public debate – and essentially arguing that the UK aims to meet 20% given the midpoint baseline estimation (a symmetrical target). The issue of GDP growth is handled below.
- Introducing a clear risk management system where only controllable reductions are counted into the policies aimed at meeting the UK target. Completely voluntary emission reductions (e.g. via advice and information programmes) would be folded into baseline uncertainty.
- Ensuring that implementation plans for all existing sub-targets are credible and have industry support.

- Scrapping or revising any targets which we do not have policies in place to meet (notably CHP).
- Having clear plans in place to change long-lived infrastructure of timescales beyond 2010 (e.g. houses, commercial buildings, planning and energy infrastructure) with the aim of setting in train clear long run incentives for change.

Adopting this approach would require an increase in planned carbon reductions to put us on a trajectory to meet the 2010 target given our midpoint estimation of baseline emissions.

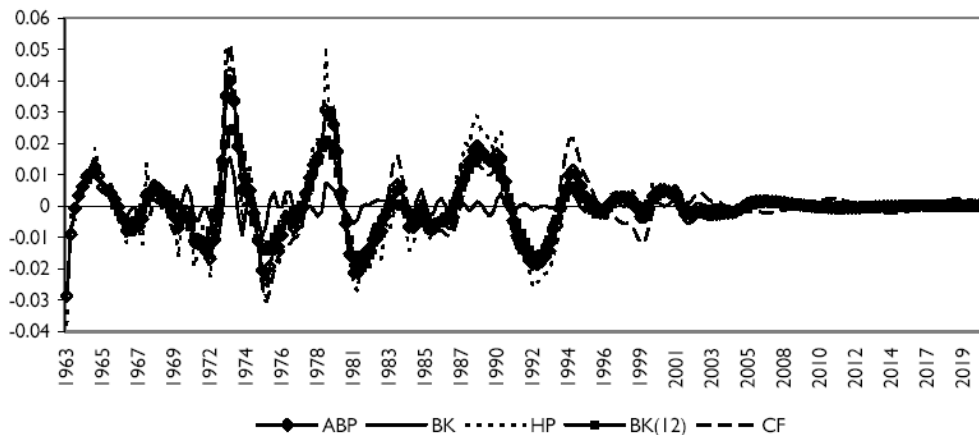
An additional option would be to buy international carbon credits to cover any shortfall. Bridging a gap of 1-2% in 2010 would cost between £60-£180 million per annum. This could be bought inside the EU or be directed at stimulating low carbon markets in key developing countries through the REEEP.

Business Cycles and GDP Growth

Energy use is linked to GDP in the short run, and business cycle shifts will lead to temporary rises in CO₂ emissions which could result in us missing the notional target in 2010. However, Chart 1 shows current best projections of UK business cycles and suggests that these effects will be far less important than in the past and can be probably be ignored⁴. In the future extension of emissions trading will reduce some of the uncertainties caused by energy price and GDP fluctuations, but this will probably not impact transport which is one of the most volatile sectors.

Increases in trend GDP growth are a more fundamental (if welcome!) problem, and in current projections have added 2.7 MtC onto the UK target in 2010. However, as the key aim of the climate programme is to decouple emissions from GDP growth any changes need to be included in the baseline risk management of the target and should be balanced by increased policy interventions.

Chart 1. Estimated business cycle for the UK using selected alternative measures of the cycle



⁴ **“Business cycles and turning points: a survey of statistical techniques”** by Michael Massmann, James Mitchell and Martin Weale (NIESR) in the **National Institute Economic Review**, no. 183, January 2003