

Methane emissions trading



One of the key issues in this report is whether methane trading is a viable option for the UK. Market based trading schemes are currently a popular option for dealing with a range of environmental issues. A consequence of the diverse and diffuse nature of methane sources is that policies with the potential to address the mitigation of methane emissions are similarly varied and tend to be focused within the individual sectors (*e.g.* waste, agriculture, coal mines). Methane emissions trading offers the possibility of a consolidated approach that could apply across all sectors.

This chapter explains the concept of emissions trading and looks at both the UK and EU Emissions Trading Schemes, before outlining the options for trading methane. This sets the context for the remaining chapters in which the various sources of methane are discussed in detail and the possibility of methane trading for each sector is explored, amongst other policies for the mitigation of methane emissions.

3.1 Emissions trading concept

Emissions trading is a mechanism for delivering emissions reductions at minimum economic cost. It is a move away from the traditional 'command-and-control' regulatory approach to a market-based mechanism, directly involving those responsible for the emissions and allowing the polluters to decide their own emissions abatement pathway. Trading is therefore seen as a highly attractive option by both corporations and government and has become a central tenet of international policy to reduce greenhouse gas emissions, such as the Kyoto Protocol.

The UK has already implemented the first industry-wide trading system incorporating carbon dioxide, methane and other greenhouse gases. The EU Emissions Trading Scheme starts in 2005, although initially this will only cover carbon dioxide. Opportunities to include methane in the EU ETS are under review, but it will be 2008 at the earliest before methane is included.

Historically, trading was first proposed as an environmental policy instrument in the 1960s.^{35,36} Trading has become an increasingly popular measure over the last two decades, especially as part of pollution reduction regimes in the USA. In particular, trading is credited with the significant reduction in emissions of sulphur dioxide (a major source of acid rain), although it has been argued that these reductions would have occurred anyway.³⁷

As a policy tool, trading is well suited for GHG emissions control because the costs of reducing emissions vary widely between individual greenhouse gases, sectors and countries, providing opportunities and large potential gains from trade.³⁸⁻⁴⁰ The international carbon trading market is expanding rapidly and more than doubled in size in 2003 to 70 Mt CO₂e.⁴¹

How does trading work?

A traditional command-and-control approach imposes absolute performance or technological standards on companies, but takes no account of the individual economic burden placed on those companies.⁴² Such an approach is illustrated in Figure 9a, where the two plants face different abatement costs for achieving the same reductions in emissions. In Figure 9b, under emissions trading, the market determines the price of the commodity and the benefit to the company is determined by the difference between the abatement cost and market price. For instance, plant 1 gains £15 since it can reduce emissions by one tonne at a cost of £5 and then sell this credit on the market for £20. Instead of plant 2 actually undertaking emissions reductions and paying £30 per tonne, it can purchase a credit on the market for £20, thereby making a saving of £10 compared to the regulated approach. Hence, the overall cost of reducing two tonnes under trading is just £10, instead of £35 under the regulated scenario shown in Figure 9a.

Trading therefore has the advantage of enabling the most cost-effective implementation of the overall target, with cost benefits to all

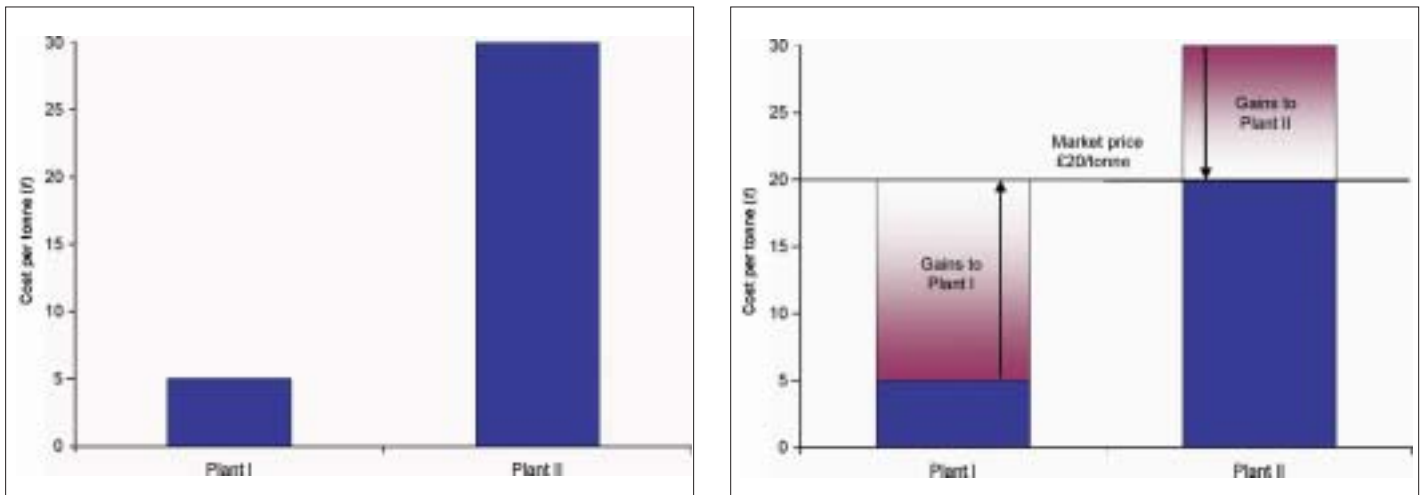


Figure 9: Comparison of (a) regulated approach & (b) market trading approach

companies irrespective of their individual abatement costs. Furthermore, trading provides incentives to invest in environmentally sound technologies. Emissions trading is thus seen as the “least bad of all options”⁴³ in terms of policy.

The carbon trading market is merely a mechanism for ensuring that baseline targets are met and its success in achieving significant greenhouse gas emissions reductions depends simply on where the baseline is set. Emissions trading combines buying and selling of emissions with the *right to emit* GHGs, identified through company or country specific allowances (also referred to as quotas, permits or caps). The total allowance of a regulated pollutant is determined centrally by government or international bodies. This baseline is reduced over time to achieve the desired emissions reduction in the required timeframe.

Allowances are distributed to entities, allowing market forces to control their price, and can be assigned in two ways: either through an auction, where allowances are sold on a market basis, or by ‘grandfathering’, where allowances are allocated on a discretionary basis, typically based on the historical emissions of an entity. Ideally, the system should reward companies that have already taken action to reduce emissions and penalise those that have not; grandfathering

enables such flexibility. Within a classic ‘cap and trade’ scheme, participants take on targets requiring them to reduce their emissions to a capped level, which may be more or less stringent than the overall baseline reductions.

Trading emissions is no different from trading other commodities. Once allocated or created, emissions allowances act as fully interchangeable commodities and they can be bought, sold and traded, or in some circumstances banked for future use. Account holders in a central registry can buy and sell allowances and trade either between themselves or with third party brokers. Entities with low abatement costs (costs of reducing emissions) or those that reduce their emissions by more than their allocated amount can sell their surplus (‘carbon credits’) to others who are not able to reach their target easily.⁴² Conversely, companies that exceed their limits can choose to purchase allowances on the open market to match their emissions or invest in abatement technology, generally whichever is cheaper. The market price of allowances will rise if the overall baseline is not being achieved, since demand will increase, and fall if overachieved. Allowances can even be retired without counterbalancing an actual emission thereby making the adopted baseline stricter and creating an additional environmental benefit.



The UK ETS covers emissions from both the generation and use of energy

When trading methane that has been combusted, either by flaring or to recover energy, the negative impact of emitting the combustion product carbon dioxide must also be accounted for. Burning one tonne of methane (equivalent to 21 tonnes of carbon dioxide) produces 2.75 tonnes of carbon dioxide. One tonne of combusted methane is therefore equivalent to 18.25 tCO₂e (21 - 2.75).

3.2 Emissions trading schemes

International Emissions Trading is the major mechanism of the Kyoto Protocol but, with the delay in ratification, other emissions trading schemes have been developed, most notably the UK and EU Emissions Trading Schemes (UK ETS and EU ETS).

UK Emissions Trading Scheme

The UK ETS was launched in April 2002 as a voluntary scheme to run until December 2006. The aims of the UK ETS are two-fold: to deliver cost-effective greenhouse gas emissions reductions and to provide UK industry with practical experience of emissions trading ahead of a European or international system. In this manner, UK businesses should be well placed to take a leading and influential role in both development and use of these wider schemes. The UK ETS was expected to deliver total savings of 2-4 Mt CO₂e by 2006 through encouraging fuel switching in power generation, principally from coal to gas.

Both direct and indirect emissions are covered in the UK scheme, meaning that emissions associated with both the generation and use of

energy are included. The scheme covers all industrial sectors apart from power generators. Landfill sites, households and the transport sector are all exempt.

The UK ETS is also unique in that it is a multi-gas trading system. Methane has been actively traded as part of this scheme by participants such as UK Coal, Shell and BP.⁴⁴ Allowances are traded in the 'currency' of carbon dioxide equivalents; the exchange rate for methane is simply the 100 year GWP of 21.

Participation in the UK ETS takes three forms: direct participation, as a climate change agreement (CCA) participant and as a trading participant. All participants are committed to the scheme for its full duration.

Direct participants operate on a 'cap and trade' basis and are required to make an absolute reduction in emissions against a 1998-2000 baseline over the period 2002-06. If targets are not achieved, penalties, and ultimately fines, are incurred. To encourage participation in the scheme, participants received incentive payments from the Government, set through a competitive bidding process. The UK Government committed a total of £215m incentive money (after tax), payable over five years (2002-6).⁴⁵

A total of 34 companies were successful in the auction of the five-year allowances, which took place in February 2002. These include Ineos Fluor, Dupont, Shell, UK Coal and BP. Collectively these companies have committed to reduce emissions by around 4 MtCO₂e/yr by December 2006. At the end of each year, organisations have a three month reconciliation period to compile their verified emissions report. By the end of this period they are required to demonstrate to the Government that they have sufficient allowances to cover all of their emissions. The first year results show 31 out of 32 direct participants met their emissions reductions targets.⁴⁵ All participants trading methane are acting as direct participants.

Climate change agreement participants are those companies already covered by the Climate

Change Levy (CCL). These participants use the emission or energy targets previously set through the CCL agreement, which, if met, entitle them to an 80% discount on the levy. This form of trading, sometimes referred to as 'baseline and credit', is used to either help meet the target by purchasing allowances, or by selling any over-achievement. If the target has been met and the over-achievement verified, allowances are given at the end of each compliance period. Targets for CCA participants are defined in terms of absolute emissions reductions (tonnes CO₂e) or relative targets according to levels of output (tonnes CO₂e per tonne product).

CCA participation covers 866 firms⁴⁶ which are expected to deliver additional emission reductions of over twice that of direct entry ETS participants.⁴⁷

Trading participants are companies, brokers or individuals not subject to reduction targets who opened trading accounts with the Emissions Trading Registry, which they then use to buy or sell allowances. In the first year of trading there were 35 active trading participants.⁴⁶

A fourth option that has been considered in the UK, but is not part of the current scheme, is participation through projects: the generation of credits from new emission reduction projects in the UK. Under this route, projects are not assigned a baseline and therefore the emissions reductions have to be quantified. The savings must also be additional (*i.e.* the reductions would not have occurred without the project). The UK Government decided not to use this option because of the risks associated with it in light of the EU's proposal for linking Joint Implementation (JI) and Clean Development Mechanism (CDM) projects into the EU ETS.⁴⁸

EU Emissions Trading Scheme

The EU ETS starts on 1 January 2005 and will be the first multinational scheme in the world with emissions trading between Member States of the enlarged European Union.

The European scheme is mandatory and covers

only direct emissions. It is divided into two phases: an initial phase (2005-2007) and a main phase (2008-2012) concurrent with the first commitment period under the Kyoto Protocol. Six sectors are covered: energy activities (all plants over 20 MW), oil refining, cement production, iron and steel manufacture, glass and ceramics, and paper and pulp production. The first phase of the scheme will only cover carbon dioxide emissions, but this will be reviewed by the Commission in 2006 and may be extended to other greenhouse gases, including methane. Gases not covered under the Kyoto Protocol may still be eligible for trading. Additional sectors will also be considered. The scheme may also be expanded to permit European companies to carry out emissions curbing projects around the world, as proposed by the European Commission in the 'Linking Directive'. This would convert credits earned into emissions allowances in the same manner that JI and CDM projects would work under the Kyoto protocol.

Member states were required to develop a national allocation plan for emission permits to companies by March 2004. This grandfathering process set targets for the relevant sectors and delineated methods for division of allowances (each worth 1 tonne CO₂) between participants of the respective Member States. The Directive allows up to 5% of allowances to be auctioned in 2005 and 10% after 2008. So far this process has resulted in a great deal of controversy with companies disputing their allocations.

All installations must meet their targets by reducing emissions or by buying allowances. Installations without sufficient allowances to cover their emissions will pay a direct financial penalty (40 € per tonne CO₂ from 2005-7, 100 € per tonne thereafter) and have to make up the deficit in subsequent commitment periods. For installations that have a surplus of allowances, Member States can allow banking.

More than 12,000 installations – representing approximately 46% of the EU's total carbon dioxide emissions – will participate in the scheme.

Market analysts predict that trading could be worth more than €7-8 billion a year by 2007, creating a brand new financial market.⁴⁹ Although the scheme does not start until 2005, the first deals have been brokered already with up to 250,000 credits traded in just one day.⁵⁰

Interaction of the UK and EU ETS

The UK and EU Emissions Trading Schemes differ on a number of issues (Table 7), which essentially make the two systems incompatible. One of the key differences lies in the trading arrangements: the EU scheme considers direct emissions only

Table 7: Comparison between the UK and EU Emissions Trading Schemes

	<i>UK ETS</i>	<i>EU ETS</i>
Type of scheme	<ul style="list-style-type: none"> • Voluntary 	<ul style="list-style-type: none"> • Mandatory
Period	<ul style="list-style-type: none"> • 1st period 2002-2006 • No guarantee of 2nd period, but review in 2005 	<ul style="list-style-type: none"> • Phase 1 2005-2007 • Phase 2: 2008-2012
GHGs	<ul style="list-style-type: none"> • All six GHGs 	<ul style="list-style-type: none"> • Only CO₂ in Phase 1 • Other gases may be included in Phase 2, provided adequate monitoring and reporting systems are available and provided there is no damage to environmental integrity or distortion to competition
Sectors	<ul style="list-style-type: none"> • Indirect and direct emissions (end-user) • All industrial sectors except power generators • Transport, landfill, households exempt 	<ul style="list-style-type: none"> • Direct emissions (source) only • Subset of IPPC sectors, excluding chemicals, food and drink and waste incineration • Energy activities (all plants over 20 MW), oil refining, cement production, iron and steel manufacture, glass and ceramics, and paper and pulp production
Type of targets	<ul style="list-style-type: none"> • Direct entrants (absolute targets) • CCA participants (absolute or relative targets) 	<ul style="list-style-type: none"> • Absolute targets for all participants
Market size	<ul style="list-style-type: none"> • 34 direct entrants (~ 1 MtC-reductions over 5 years) • ~6000 CCA businesses (~ 2.5 MtC/year) 	<ul style="list-style-type: none"> • More than 12000 installations (Phase 1) • 46% of EU carbon dioxide emissions
Allocation method	<ul style="list-style-type: none"> • Financial incentive (auction) for direct entrants • Negotiated energy saving targets through CCAs 	<ul style="list-style-type: none"> • Member states decide allocation method. They have the option to auction up to 5% in Phase 1 and 10% of allowances in Phase 2 • Commission retains the right of veto over national allocation plans
Compliance	<ul style="list-style-type: none"> • Loss and repayment of financial incentive for direct participants • Statutory penalties to be introduced • CCA participants have separate compliance procedures 	<ul style="list-style-type: none"> • Penalty of 40 €/tonne. • Increased to 100 €/tonne after 2008

Methane will not be included in the EU ETS until 2008 at the earliest



whereas the UK ETS incorporates emissions from end-users as well. Now that the EU scheme has been approved to start in 2005, it is highly unlikely that the UK ETS will continue beyond its current phase (2002-2006). The UK Government has confirmed that there will be no transfer of credits between the two schemes.

Cessation of the UK ETS in 2006 will have consequences on the trading of methane since methane will not be included in the EU ETS until 2008 at the earliest.

Methane trading

Although methane is already being traded successfully in the UK ETS, this is currently limited to emissions from active coal mines and offshore gas, thereby excluding a large proportion of other anthropogenic methane emissions. With the likely closure of the UK ETS in 2006, even this restricted level of trading will cease. There is no guarantee that methane will be incorporated into the EU ETS in 2008 and even if it is, there will still be a two year gap until methane trading is possible again. This delay will act as a deterrent to investment in methane capturing technologies if trading is the main incentive.

A separate methane market is not a viable option in the UK because the market would be too small to be liquid. For methane to be traded it must be incorporated into a multi-gas trading scheme.

If methane is included in the EU ETS from 2008, there are two possible routes through which methane could be introduced: through new installations or via the project entry route.

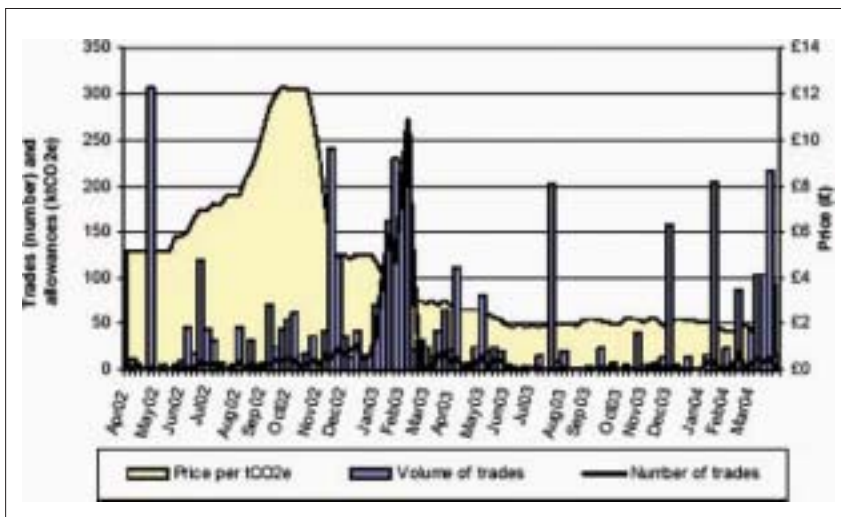
New installations. As part of the EU ETS review in 2006, new sectors beyond those specified in the first phase will be considered for inclusion in the scheme. This could open up methane trading from sectors such as the gas industry.

Project entry route. New projects have the potential to encourage emissions reductions, but only if the emissions reduction obtained is additional (*i.e.* they would not have occurred in the absence of the project).⁵¹ Through the 'Linking Directive', JI and CDM projects would permit entities in industrialised countries to develop greenhouse gas reducing projects.

However, because the EU ETS is focused on large emitters of carbon dioxide, small-scale emitters in the methane sector, such as farmers, are unlikely to be able to participate without aggregation.

Figure 10: UK ETS carbon prices, 2002-4

Source: DEFRA, 2004⁵⁵



3.3 Review of the UK ETS

The UK ETS has provided companies with experience of trading and established a trading support industry. However, there are some aspects of the scheme that were not wholly successful, providing valuable lessons in developing an effective emissions trading scheme.

In the first year of the UK ETS, trading went well with over 32 million allowances allocated to companies. Selling activity was initially dominated by a few direct participants.⁴⁷ This forced the price of carbon up to a peak of £12.40/t CO₂e in October 2002 (Figure 10). As more CCA companies had their emissions verified towards the end of the year, they then had

emissions to offer to the market causing the balance of selling activity to shift and the price to slump to £5/t CO₂e.⁵² Such problems are partly due to lack of liquidity in the UK market: the market is highly skewed as a result of the structure of the scheme, with very few players and the sellers generally outweighing the buyers.^{53, 54} Also, activity is dictated by CCA participants, who have provided much of the buying activity so far,⁵⁴ as most trading occurs when they need to demonstrate compliance once every two years. Shorter compliance periods would have ensured a more constant level of trading. Shorter compliance periods would have ensured a more consistent level of trading.

However, the direct participants are larger companies with lower abatement costs, and have sold to the CCA participants, who in general will have higher abatement costs due to economies of scale. In this sense, the scheme has been successful in achieving emissions reductions at lowest cost.⁵⁵

To date, approximately 2,000,000 allowances (1 allowance equals 1 tonne CO₂e) have been traded in the market, of which 580,000 allowances were bought for CCA compliance. Some sophisticated direct participants (*e.g.* oil companies) have been active in both in buying and selling, trading speculatively rather than as direct participants. Activity in the UK ETS has now dropped since CCA companies do not have to prove compliance until February 2005 and so there is no immediate incentive to purchase allowances in the market. There is still a limited amount of trading, with CCA companies buying at the current low price to hedge against future risks of price increases and meeting CCA targets. Allowances purchased now can be banked and used towards later targets.

The market integrity and environmental effectiveness of the scheme was badly damaged due to an imbalance in allocation of allowances amongst the direct participants.^{56, 57} Although the achieved emissions reduction was over six times greater than the direct participants'

collective target, the majority of savings came from just two companies, both of whose emissions were expected to fall anyway through regulatory requirements.⁵⁶ In other words, DEFRA awarded a huge 'hot air' surplus and compromised the integrity of the scheme, a fact which they have acknowledged.⁵⁵ The price of carbon had slid down to £1.75/t CO₂e by August 2003 as a result of oversupply from the direct participants.⁵⁸

Hence, although the UK ETS might have stimulated significant market activity, its effectiveness in contributing to greenhouse gas emissions reduction targets is questionable.⁴⁷ There is debate as to whether the scheme has delivered significant quantities of absolute emission reductions with participating firms reducing emissions further than would have occurred in the absence of the scheme.

3.4 Conclusions

Reflecting on the experience of the UK ETS, it is possible to identify some critical factors essential for effective emissions trading markets:

- *Commodity to trade.* To state the obvious, for trading to occur, there has to be a product or commodity to trade. This must be of sufficient volume and from enough individual sources to encourage liquidity. In practical terms, it must be possible to quantify the amount of gas recovered, which can be done most easily through capture.
- *A liquid market.* Emissions trading schemes must have sufficient supply and demand, supported by financial derivatives, if they are to function effectively.⁵⁹ In traditional commodity trading, markets are driven by supply and demand and the incentive to make profits, but, in the case of emissions trading, the system is driven by legislation which operates in a highly uncertain environment. Trading markets work more efficiently as their size increases. The more liquid the market, the more quickly a market price is established, offering greater certainty to all market participants.

- *Suitable mix of players.* Markets do not function efficiently if there is disparity in the size of players. Under the UK ETS, two large companies dominated the selling activity, set against the thousands of small CCA participants as buyers. For brokers, it is more cost efficient to trade large volumes of commodities than small volumes with many players, as the transaction cost for the latter will be high.⁵⁴
- *Additionality.* It is a primary requirement of any trading scheme that credits for reducing emissions must be additional to those required to fulfil other regulatory obligations such as the Renewables Obligation. This will avoid the double counting of emissions reductions ('hot air') that occurred in the UK ETS.⁵⁶ This also means that any new legislation will affect the viability of trading and, conversely, participation in a trading scheme makes legislating difficult. Governments are therefore faced with a choice as to whether to legislate or allow trading. This is a particularly difficult decision with regards to methane in the UK due to the two year gap between the UK ETS finishing and methane being introduced into the EU scheme.
- *Monitoring, reporting and verification.* Standards must be in place for setting baselines and reporting and verifying emissions for an entity. High standards of monitoring, reporting, verification and compliance are crucial to guarantee the environmental integrity and financial credibility of any emissions trading scheme.^{60,61} A reliable baseline against which savings can be measured is crucial. This gives certainty to what is being exchanged, the obligations to be met and sanctions to be imposed (in the case of non-compliance). Accurate verification of emissions also helps prevent incorporation of 'hot air' into the trading system, which can lead to a fall in market price.
- *Conflicting policies.* It is important to identify whether there are existing policies which may conflict with the trading scheme and thereby affect viability of the market. For instance, if the price of ROCs is higher than the market price for carbon, companies may choose not to trade and opt for ROCs instead.

Potential for methane trading

Methane trading has the potential to act as a strong incentive towards achieving significant reductions in methane emissions. However, not all methane produced in the UK will be eligible for trading: the diversity of methane sources means there is similar diversity in the feasibility of trading amongst different methane generating sectors. The criteria identified here will be used in the following chapters to assess the potential for methane trading in each of these sectors.