

United Kingdom

The World's Carbon Markets: A Case Study Guide to Emissions Trading

Last Updated: March, 2014

Brief History and Key Dates:

The United Kingdom Emissions Trading System (UK ETS) was the **first national, multi-sector emissions trading program** ever established. The purpose of the UK ETS was to introduce the concept of carbon pricing as an economic incentive for reducing carbon in the UK; the UK's intention was to apply – for greenhouse gases (GHGs) – a similar trading system that successfully reduced SO₂ and NO₂ emissions in the United States. The **UK ETS formed as part of the November 2000 UK Climate Change Programme legislative package**, which deployed three interlinked instruments, one of which was the UK ETS, for incentivizing emissions reductions. The other two instruments were a Climate Change Levy (CCL), which was a tax on fossil fuel users, and the ability to discount the CCL through undertaking a sector-wide Climate Change Agreement (CCA). CCA's set collective, sectoral targets on energy efficiency, and covered entities that overachieve in fulfilling their obligations may access the carbon market established through the UK ETS.

In April 2001, the emissions trading component of the Climate Change Programme came into effect. The program intended to provide flexibility for firms to meet their emissions reductions targets, and at the same time establish London's financial markets as the primary location for environmental trading. Direct participants, totaling 34 firms, took on obligatory reduction targets in exchange for government subsidies. In addition, 6,000 companies that have been part of CCAs have accessed the UK ETS.

The **UK ETS was effectively replaced by the mandatory European Union Emissions Trading System (EU ETS)**, the world's largest carbon market for emissions reductions, in 2007. There was overlap between the UK ETS and the EU ETS during 2005 and 2006, but the **UK ETS was voluntary** while the EU ETS was mandatory, so the EU ETS took precedence. Direct participants exited the program in 2007, shifting the focus solely towards sectors which had entered into CCA's. The original CCA scheme, which was administered by the Department of Energy & Climate Change (DECC), ended in March 2013. In its place, the Environmental Agency has administered a new CCA scheme spanning April 1, 2013 through March 31, 2023.¹

The UK ETS was a critical incubator for the concept of using trading to lower the cost of reducing emissions, and it helped provide a testing ground to construct the necessary components for a functioning carbon market.

Summary of Key Policy Features:

CAP/TARGET: The European Union (EU) negotiated a Kyoto Protocol (KP) commitment to reduce GHG emissions to 8% below the 1990 level by 2008-2012, and the **UK's individual KP commitment was 12.5% below 1990 levels**. In addition the British government set a **unilateral policy goal of reducing emissions to 20% below**

1990 levels by 2010. The UK ETS was established as a mechanism to assist UK efforts to achieve these targets. Subsequently, the UK Climate Change Act of 2008 put into statute a binding target for the **UK to reduce its emissions by 2050 to 80% lower than in 1990.**²

The **UK ETS mandated absolute targets** for firms directly covered by the program. However, a number of the CCAs, for which individual sectors constructed obligations based on negotiations with the government, set emissions intensity (tCO₂/unit of output)—not absolute—targets. As a result, these sectors could overachieve in fulfilling their intensity-based targets while their absolute emissions increased. If the excess permits generated from overachieving these intensity targets were sold to companies with absolute emissions targets, then overall emissions could in fact rise. To avoid this outcome, a **one-way “traffic light” or valve system** was introduced, closing the program to access if the net absolute carbon total would be increased by the transaction.

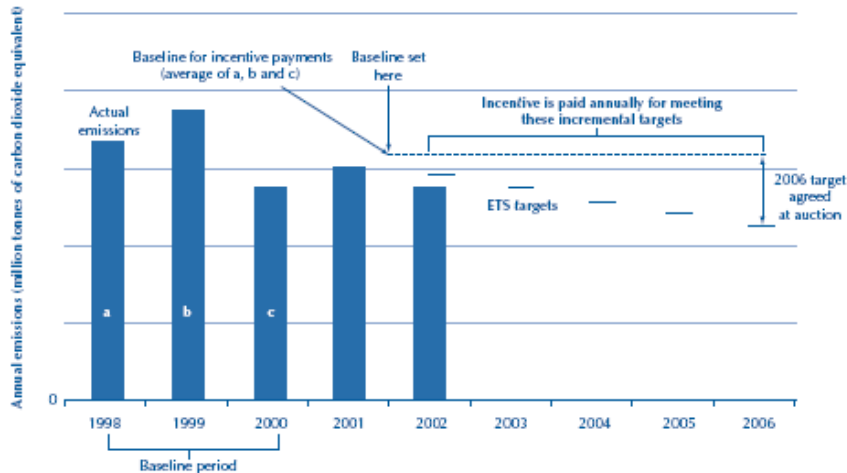
Scope/Coverage: 34 organizations and facilities agreed voluntarily to take part in the UK Emissions Trading System, undertaking emissions **targets that averaged 12% below the baselines measured.** This amounted to an **aggregate emissions reduction of 12 million tons CO₂-equivalent (CO₂e)** between 2002 and 2006, which is **0.43% of total UK emissions** over this period.³ The firms came from across **sectors** – with bids from non-energy intensive sectors welcomed – rather than from within a single sector as had been the case with Denmark’s pilot emissions trading scheme, which focused on the utilities sector only.

The program **covered emissions from six greenhouse gases**, measured by their Global Warming Potential (GWP): Carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).

The Climate Change Agreements are more broadly representative of the UK economy than are the direct participants in the UK ETS. As of 2012, **CCAs covered 54 sectors.** The full list of sectors is included in Annex 2 of this report.

Auction Overview: Auctions in the UK ETS have been used to determine the targets undertaken by direct participants. The primary auctioning of targets was **only open to direct participants and not those with CCAs**, as their targets were pre-determined in the CCA. The government **used a pioneering reverse-auction format that featured a descending clock mechanism.** The government offered payments to participants to commit towards greenhouse gas emission reductions since, at the time, there was no legal requirement to reduce emissions. For the world’s first auction for greenhouse gas reduction, in March 2002, the UK government offered incentive payments of GBP \$215 million. The auctions were treated as a procurement auction, with the price descending through the duration of the auction. The government posted a price per unit of emissions reductions, and firms bid the quantity of emission reductions that they were prepared to make at that price. In each new round, a lower price was announced and bidders indicated the quantity of emission reductions that they were prepared to make at the lower price, until the market cleared at the point the budget was able to cover the cost of reductions being offered at the posted price.⁴ Annex 1 provides an overview for how the auction process occurred under the UK ETS.

Allowance Distribution: Direct participants in the UK ETS entered voluntarily in the auctions that determined their emissions reduction commitments, and they implicitly agreed to the price the government would pay them to secure those reductions. Firms that reduced their emissions below their targets were able to trade the excess allowances in their compliance account to other firms. This provided additional financial incentive to go beyond their targets, with potential revenues above the government payments for securing an agreed reduction commitment. Baselines were determined using emissions over the period 1998-2000. **Allocation for each year** was equal to the baseline emissions minus the annual contracted emissions reductions to which direct participants agreed as part of the auction process described above. The graph below demonstrates how baselines were determined for direct participants:



Source: The UK Emissions Trading Scheme: A New Way to Combat Climate Change (2004)⁵

Firms in **sectors that undertake CCAs generate allowances** by overachieving relative to the target agreed upon between the government and representatives of the sector. This system is in place of firm-level allowance allocation from the central government authority.

Flexibility Provisions: For the duration of the UK ETS, allowances not retired for compliance could be banked. On January 1 2008, a number of rules regarding **banking of allowances** were enacted. Banked allowances generated after March 31 2007 were eligible for compliance during the first commitment period of the Kyoto Protocol (2008-2012). In addition, direct participants were allowed to carry over their allowances up to the banking limit, as follows:

$$\text{Total allocated allowances} - \text{Allowance adjustments} - \text{Total Verified Emissions}^6$$

For entities that participate in CCAs, carrying over allowances is permitted though subject to a banking restriction imposed by the Secretary of State.⁷

While banking was allowed to take place, **borrowing** provisions were not included in the regulations. In addition, the UK ETS did not include the **use of offset credits** for compliance.

Cost Containment/Volatility Management: Future abatement costs could be managed through banking allowances. The UK ETS did not, however, feature price controls at auctions, and price volatility did occur at certain moments. For example, spot prices for allowances dropped sharply in late 2002 in response to banking of allowances accrued by firms that had generated surplus allowances. There were also disputes about whether various carbon-reducing activities were directly or indirectly mandated through other anti-pollution legislation. This confusion may have led to some surplus UK ETS allowances, and after negotiations with the government some companies voluntarily retired surplus allowances.

Competitiveness and Anti-Leakage Provisions: One initial purpose of Climate Change Agreements in energy-intensive sectors was to protect these industries from losing competitiveness. By achieving targets set under these agreements, the covered CCA industries were eligible for an 80% **discount from the Climate Change Levy**.

Market Regulation and Oversight: Direct participants were subjected to **annual emissions verification**, and verifications of baselines were mandatory. Participants that failed to submit a verification report would not receive allowances for the ensuing commitment period. The **penalty** for not surrendering allowances to cover all emissions

was set at GBP #30 per ton. In addition, a firm's emissions target for the following year was reduced and the firm would not receive the incentive payments from the government that were conditional on achieving the agreed target.

The UK ETS also established an **electronic registry** to track allowance trading and issuance. The Department of Environment, Food and Rural Affairs (Defra) governed the access to the registry.

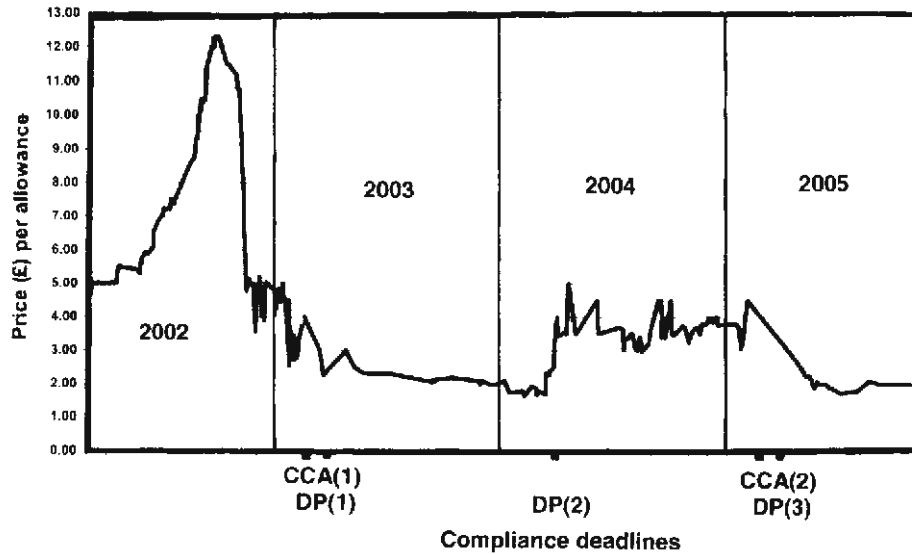
Complementary and Supplementary Measures: The UK Emissions Trading System was established alongside a Climate Change Levy, which is **a tax on fuels** introduced for British industry. The CCL is not a carbon tax, but instead a levy based on electricity generation or fuel use rather than CO₂ emissions, and is based on industrial uses rather than domestic consumption of energy. From 2000 to 2002, the revenue from this levy was used to offset a reduction in national insurance contributions taken by the government, but in 2002 this reduction expired and national insurance contribution rates returned to 2000 levels. The levy's funds are now used solely to fund energy efficiency initiatives and programs, including The Carbon Trust, an advisory service for businesses to reduce process emissions.⁸

In addition, the UK has put in place a number of policies to incentivize investments in clean technology and energy efficiency. The **Renewables Obligation (RO)** was put in place in 2002, with a target of generating 15% of all electricity from renewable sources by 2020.⁹ The scheme generates RO certificates (ROCs), which can be traded between utilities to satisfy their obligations, and rewards over-performance in reaching the target. During the UK ETS, the government could convert these excess ROCs into viable UK ETS allowances.¹⁰ The conversion was calculated by measuring the emissions reductions associated with renewable energy generation over the specified time period, versus the default emissions factor. The RO scheme has been extended to run until 2037.

Subsequently, the UK put in place in 2010 a **feed-in tariff** that operates alongside the RO to incentivize small-scale renewables generation. For units with capacity below 5MW, generation earns a tariff from utilities, and excess electricity generated can also be sold back into the grid for additional payment.¹¹ Finally, in 2011 the Government introduced a Renewable Heat Incentive, the world's first tariff-based incentive to deploy renewable heat technologies to reduce emissions in the heating sector.

Economic Projections: The UK ETS provided a good test of the economic efficiency of emissions trading, as the first large scale operational trading program. According to University College London (UCL), the **UK ETS performed as anticipated by the academic literature**, with the pattern of trades demonstrating that firms traded largely or entirely in a single direction. Analysis also showed that the three largest sellers in the market accounted for 50% of total sales and negligible purchases, and also took on additional uncredited abatement obligations in November 2004.¹²

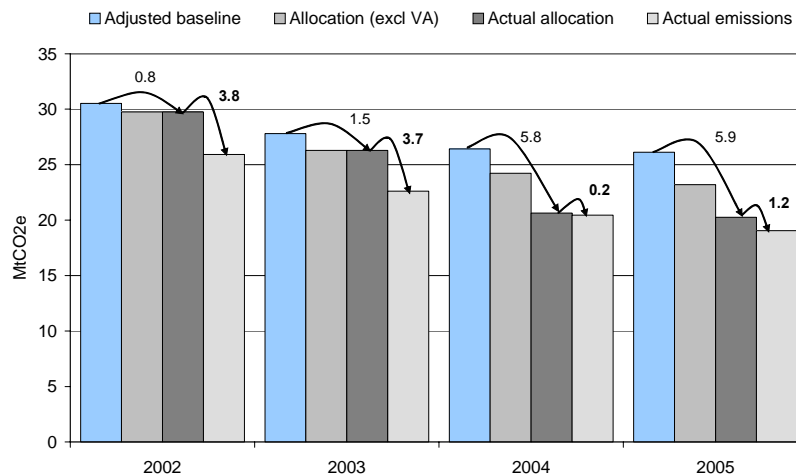
Results: According to Smith and Swierzbinski (2007), the ETS spurred an overwhelming success in abatement against the target reductions in its first two years of operation.¹³ Smith and Swierzbinski (2007) states that target reductions amounted to 0.79 MtCO_{2e} in 2002, whereas actual abatement was 4.62 MtCO_{2e}. Allowance prices in the ETS peaked during the first compliance year, 2002, at approximately GBP \$12/ton before falling sharply through the end of that year to below GBP \$3/ton. Following the end of the second compliance period for direct participants, prices rose and remained at around GBP \$4/ton before sliding throughout 2005 and settling at GBP \$2/ton. The following graph shows price fluctuations throughout the first three years of the program.



Spot Prices for current-vintage allowances in UK ETS. Source: Natsource Europe Ltd

The performance of each sector within the CCA program is included in Annex 2 of this case study.

A 2007 study commissioned by Defra also found that there was **significant abatement relative to targets** in the first four years of compliance. The graph below compares baselines to actual emissions achieved:



Source: Enviro (2006), *Appraisal of Years 1-4 of the UK Emissions Trading Scheme, Report prepared for Defra*

In this graph, we see that the gap between the baseline emissions and allocated allowances were the reductions that the UK ETS mandated for participants. In addition, the difference between allocated allowances and the actual emissions demonstrates that firms went beyond their targets and reduced emissions further.

What Distinguishes This Policy?

UNIQUE ASPECTS:

1. The UK **developed its ETS without the benefit of examples of similar programs elsewhere**. (A voluntary emissions trading program only covering the electricity sector had commenced in Denmark in 2001). The program's development required significant stakeholder agreement from environmental groups and the private sector to take on emissions reductions using an unproven instrument.
2. The UK **played a pivotal role in extending economy-wide ETS throughout the European Union**, as the development of the EU ETS was largely based upon the UK and Denmark's pilot programs.
3. The **UK ETS was arranged as voluntary program**. It provided an alternative, either through becoming a direct participant or signing onto a sectoral CCA, to paying the Climate Change Levy on fossil fuels.
4. The **descending clock auction format** led to cost efficient emissions reductions by discerning the marginal abatement cost for UK ETS participants and allocating government funding accordingly.
5. Hypothetically, if the excess permits generated from a CCA-compliant entity overachieving its intensity targets were sold to companies with absolute emissions targets as direct participants within the UK ETS, then overall emissions could rise. To avoid this outcome, a **one-way "traffic light" or valve system** was introduced, closing the program to access if the net absolute carbon total would be increased by the transaction.

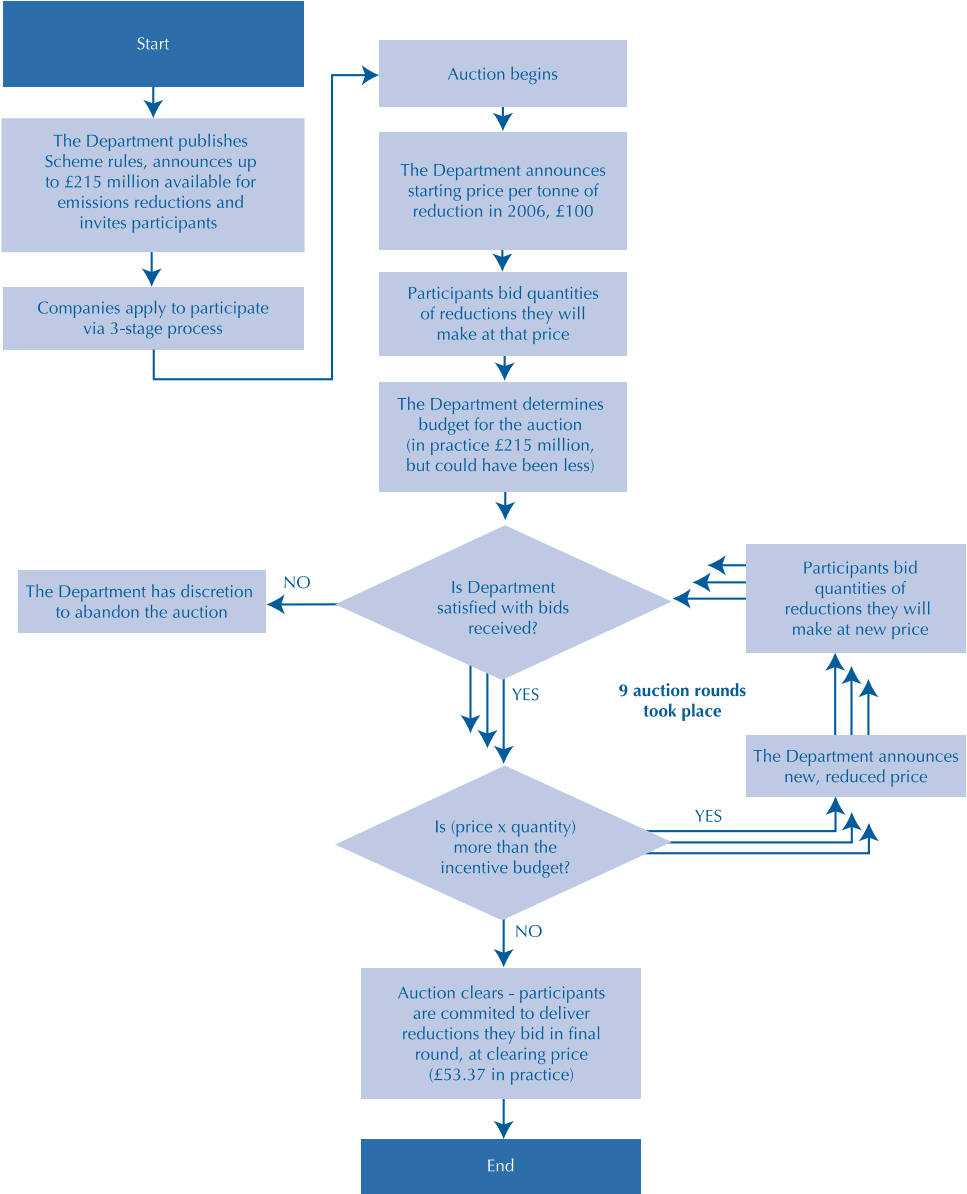
CHALLENGES:

1. The UK **introduced for the first time a national, economy-wide emissions trading system for greenhouse gas emissions**, applying ideas pioneered for reducing SO₂ and NO₂ in the United States.

LESSONS:

1. A national program can become part of a wider regional market in the future.
2. A significant number of companies prefer the option of greatest flexibility to achieve an emissions reduction target, rather than an arbitrary levy with no flexibility for compliance.
3. Banking enabled flexibility over time for companies making emissions reduction investments to comply with their obligations.

Annex 1: UK ETS Auction Procedure for Direct Participants



Source: The UK Emissions Trading Scheme: A New Way to Combat Climate Change (2004)¹⁴

Annex 2: Climate Change Agreement (CCA) Performance Summary of all Sectors

Sector	Target Period 1		Target Period 2		Target Period 3		Target Period 4		Target Period 5	
	Absolute Saving ktCO ₂ /year	Relative Saving ktCO ₂ /year	Absolute Saving ktCO ₂ /year	Relative Saving ktCO ₂ /year	Absolute Saving ktCO ₂ /year	Relative Saving ktCO ₂ /year	Absolute Saving ktCO ₂ /year	Relative Saving ktCO ₂ /year	Absolute Saving ktCO ₂ /year	Relative Saving ktCO ₂ /year
Aerospace	15	N/A	27	N/A	71	N/A	128	N/A	153	N/A
Agricultural Supply	23	46	1	74	24	114	24	109	24	171
Aluminium	2,000	2,600	2,227	3,409	2,323	3,378	2,772	3,874	1,827	2,346
Brewing	37	44	98	91	148	123	187	122	266	138
Calcium Carbonate	N/A	N/A	N/A	N/A	6	5	11	5	12	4
Cathode Ray Tubes	21	117	7	36	-	-	-	-	-	-
Cement	1,900	880	2,030	1,136	2,240	1,553	2,956	1,563	3,954	1,492
Ceramics										
non-fletton	71	45	74	84	162	44	229	14	563	-10
fletton	-5.9	-5.7	-20	-20	-17	-19	11	-2	22	-5
refractories	62	-7.3	89	-21	81	-36	93	-40	52	-2
whitewares	58	68	141	88	130	90	171	99	202	182
materials	3.2	12	22	28	5	14	65	40	143	77
Chemicals	2,000	2,500	1,520	3,524	2,031	2,977	2,958	2,398	3,855	2,686
Cleveland Potash	N/A	N/A	N/A	N/A	N/A	N/A	9	-9	27	-35
Coldstores	N/A	N/A	N/A	N/A	N/A	N/A	15	16	54	61
Craft Baking	-9	27	-29	52	-33	71	-44	93	-23	101
Dairy Processing	58	190	20	186	11	202	40	206	70	273
Egg Processing	1.8	7.5	0.3	4	-2	5	-2	4	-4	9
Egg Production (NFU)	10	15	4	27	4	22	15	32	16	36
Food & Drink	160	620	161	732	157	1000	30	1,102	170	1,449
Foundries	139	16	114	7	76	62	39	65	131	6
Geotextiles	N/A	N/A	N/A	N/A	0.1	0.7	6	5	8	2
Glass	39	251	-49	250	-6	226	-124	186	-6	98
Glass Manipulator	N/A	N/A	N/A	N/A	N/A	N/A	-1	1	1	1
Gypsum Products	-21	5.7	-50	1	-56	21	-45	36	72	32
Heat Treatment	N/A	N/A	N/A	N/A	5	9	2	22	68	29
Horticulture (NFU)	N/A	N/A	N/A	N/A	54	67	101	112	101	124
Industrial Gases	N/A	N/A	N/A	N/A	10	-2	22	-4	136	-15
Kaolin and Ball Clay	N/A	N/A	N/A	N/A	33	13	99	N/A	116	N/A
Laundries	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	14	22
Leather	6	2.9	6	0	8	4	8	4	7	5
Lime	173	51	125	91	104	99	121	64	296	73
Maltsters	7.5	22	0	36	21	42	-2	31	21	37
Metal Forming	23	46	26	92	37	76	61	145	105	91
Metal Packaging	18	28	21	39	24	41	31	61	47	72
Mineral Wool Producers	8.9	24	-9	63	-43	94	-43	104	-44	110
Motor Manufacturers	36	185	11	398	173	554	224	1,007	333	693
Non-Ferrous Metals	130	140	78	78	183	125	158	115	193	105
Packaging and Industrial Films	N/A	N/A	N/A	N/A	-1	0	0	3	-4	9
Paper	-510	2,600	-248	2,758	577	2,683	977	2,599	1,588	2,350
Pig Farming (NFU)	14	11	13	13	11	16	15	26	9	18
Plastics	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	58	111
Poultry Meat Processing	-30	38	-40	26	-36	38	-50	29	-40	48
Poultry Meat Production (NFU)	9.7	28	17	40	18	51	51	82	16	-6
Poultry Meat Rearing	72	82	65	77	39	19	36	10	29	13
Printing	-22	-5.4	-31	52	-47	32	-27	33	-4	-24
Red Meat Processing	27	12	-16	2	-31	62	-56	57	-48	67
Renderers	14	-0.59	-15	28	-59	7	-20	18	-56	25
Rubber Tyre Manufacturing	171	49	192	131	209	131	226	113	239	104
Semi-conductor Manufacture	60	41	29	324	117	1111	153	917	43	789
Slag Grinding	3.5	6.2	-9	12	-10	16	1	18	26	10
Spirits	45	17	94	64	64	93	-4	147	94	207
Steel	9,400	N/A	7,553	N/A	7,277	N/A	8,293	N/A	13,119	N/A
Supermarkets	15	1.1	-0.95	N/A	1.5	N/A	12	N/A	4	N/A
Surface Engineering	29	75	42	119	91	108	128	160	144	150
Textiles	114	50	115	107	106	62	72	83	87	63
Textiles (Energy Intensive)	N/A	N/A	N/A	N/A	-0.4	2	18	12	26	11
Wallcoverings	28	N/A	19	N/A	8	N/A	12	N/A	12	N/A
Wood Panel Manufacture	-22	-5.5	-15	68	98	160	180	159	159	184

Author Acknowledgements:

If you have any comments or suggestions for this case study, please do not hesitate to contact lead authors:

EDF co-author: Peter Sopher

EDF contact: Daniel Francis (dfrancis@edf.org)

Environmental Defense Fund (EDF)

1875 Connecticut Ave NW Ste. 600

Washington, DC

IETA co-author: Anthony Mansell

IETA contact: Robin Fraser (fraser@ieta.org)

International Emissions Trading Association (IETA)

20 F St NW Suite 700

Washington, DC

The authors would like to thank Ruben Lubowski, Pedro Piris-Cabezas, Jos Cozijnsen, Jennifer Andreassen, Joe Billick, Clayton Munnings, and Henry Derwent for very helpful comments and information for this case study. We take full responsibility for any remaining errors.

Disclaimer: The authors encourage readers to please contact the EDF and IETA Contacts with any corrections, additions, revisions, or any other comments, including any relevant citations. This will be invaluable in strengthening and updating the case studies and ensuring they are as correct and informative as possible.

¹ <https://www.gov.uk/government/policies/reducing-demand-for-energy-from-industry-businesses-and-the-public-sector--2/supporting-pages/climate-change-agreements-ccas>

² UK Climate Change Act (2008), Section 1. Available: <http://www.legislation.gov.uk/ukpga/2008/27/section/1>

³ IETA Calculations, using UK Department of Energy and Climate Change (DECC), UK Emissions Statistics (provisional) 2011. Available:

http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/uk_emissions/uk_emissions.aspxhttp://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/uk_emissions/uk_emissions.aspx

⁴ Laurence M Ausubel, 2002, Comments on Internet Auctions, Testimony before the Federal Trade Commission's Public Workshop on "Possible Anticompetitive Efforts to Restrict Competition on the Internet" October 10, 2002

⁵ http://www.nao.org.uk/publications/0304/uk_emissions_trading_scheme.aspx

⁶ UK Greenhouse Gas Emissions Trading Scheme 2002 (Updated 2005): Available:

<http://webarchive.nationalarchives.gov.uk/20090908171815/http://www.defra.gov.uk/environment/climatechange/trading/uk/pdf/trading-consolidated.pdf>

⁷ Ibid.

⁸ www.carbontrust.com

⁹ http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/renew_obs/renew_obs.aspx

¹⁰ http://www.british-energy.com/documents/Renewables_Obligation.pdf

¹¹ For more information, see http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/feedin_tariff/feedin_tariff.aspx

¹² http://www.homepages.ucl.ac.uk/~uctpa15/uk_ets.htm

¹³ Smith and Swierzbinski (2007), Assessing the performance of the UK Emissions Trading Scheme, *Journal of Environment Resource Economics* 37:131-158

¹⁴ *Supra*, Note 5