

Low-carbon innovation is up, but not because of the EU ETS

The EU ETS is the main instrument of European climate policy, and many policymakers envisage it as a driving force of the EU's transition to a low-carbon economy. By putting a price on emissions, the scheme is expected to encourage heavy polluters to develop new low-carbon technologies. At first glance it is encouraging to notice, then, that patenting for low-carbon technologies has surged in Europe since 2005. When analysing new data we find compelling evidence that the EU ETS has indeed encouraged regulated companies to develop new low-carbon technologies, but this effect is concentrated among too few companies to account for the surge in low-carbon patenting.

The share of patents filed at the European Patent Office to protect low-carbon technologies has varied between 1 and 2 percent over the past three decades. A sharp increase in the share, from 2 to 4 percent, is visible starting in 2005, but other factors, like rising oil prices, might explain the surge in low-carbon innovation over the same period.

Building on a recent study co-financed by the French environmental agency (ADEME), we compared nearly 3,500 companies that, by virtue of operating at least one sufficiently large installation, came under EU ETS regulations in 2005, with over 4,000 comparable companies that were exempted. Before 2005, these two groups were similar in size, in patenting activities, and operated in the same countries and economic sectors. Both groups would have faced similar macroeconomic conditions but from 2005 they faced different regulatory obligations for their emissions.

The firms look similar over the period 2000-2004, but since the EU ETS launched in 2005, EU ETS regulated firms have started filing more patents, especially to protect low-carbon technologies. We estimate that EU ETS firms have increased their low-carbon patenting by as much as a third compared to a counterfactual scenario without the EU ETS. Europe-wide, however, this accounts for less than a one percent increase in low-carbon patenting, hardly enough to account for the post-2005 surge visible in the aggregate data.

We investigated a number of causal and technical explanations for these findings – changing our estimation sample, looking at patenting by unregulated competitors, patenting by third-party technology suppliers, biases arising from measurement error, omissions of important control variables, etc – and find evidence that none offer a compelling alternative. We are left to conclude that the EU ETS has stimulated a strong response from regulated firms. However, we estimate that the EU ETS has in total spurred the creation of an additional 200 patents compared to a scenario without the EU ETS. This amounts to less than 5% of the observed increase in low-carbon patents filed at the EPO since 2005.

The EU ETS forms an integral part of the EU's roadmap to a low-carbon economy in 2050, but there remain different views about its ability to bring about low-carbon innovation on a large scale. On the one hand, many have argued the EU ETS would not encourage innovation because it provided overly generous allocation of emissions permits, and awarded free permits to polluters. Our findings indicate that EU ETS firms have responded quite strongly, which casts some doubt on this proposition. On the other hand, the European Commissioner for Climate Action Connie Hedergaard was recently quoted as saying that *"the ETS remains the engine to drive low-carbon growth in Europe."* New low-carbon technologies are needed, and the post-2005 surge suggests they may in fact be on their way, but our findings also indicate the EU ETS in its current form might not be the engine behind Europe's low-carbon innovation.

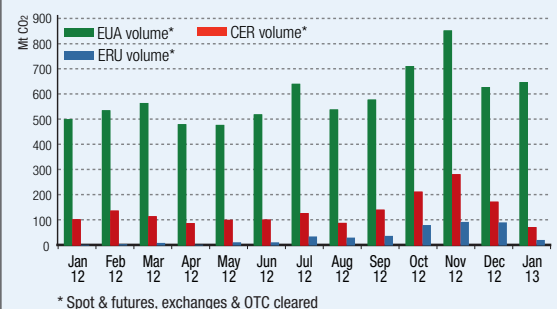
Raphael Calel and Antoine Dechezleprêtre

Grantham Research Institute on Climate Change, London School of Economics
r.calel@lse.ac.uk, a.dechezlepretre@lse.ac.uk

Key points

- On 23rd January, the Climate Change Committee approved the Commission's proposal aimed at updating the registry Regulation.
- On 24th January, the EUA price hit a new record low of less than €€/tCO₂ following a vote by the ITRE Committee, which rejected the Commission's backloading proposal.
- 59.6 million Phase 3 EUAs were sold at auction in January, and generated revenue of €95.7 million.

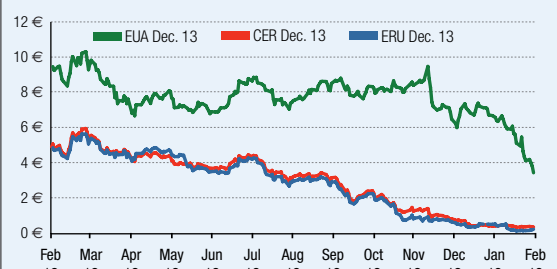
Trading volumes: EUA +3.1%, CER -57.9% ERU -75.9%



* Spot & futures, exchanges & OTC cleared

Source: CDC Climat Research calculation, based on data from BlueNext, EEX, ICE Futures Europe, NYMEX, Nasdaq OMX, and LCH Clearnet

Dec.2013 contract price: EUA -48.7%, CER -51.9%, ERU -19.0%



Source: CDC Climat Research, ICE Futures Europe

Fall in the EUA-CER Dec 2013 spread: -51.0%



Source: CDC Climat Research, ICE Futures Europe

Energy

Primary energy prices and electricity prices

		Jan. 2013	
Coal	API # 2 CIF ARA (First month in USD/t)	87.5 ▼	
Natural gas	NBP (spot in €/MWh)	27.3 ▼	
	TTF (spot in €/MWh)	26.5 ▼	
Crude oil	Brent (First month in USD/b)	112.3 ▲	
Electricity	Germany (€/MWh)	Spot	43.8 ▼
		Calendar	43.2 ▼
	United Kingdom (€/MWh)	Spot	59.2 ▼
		Next summer	58.4 ▼
		Next winter	64.9 ▼

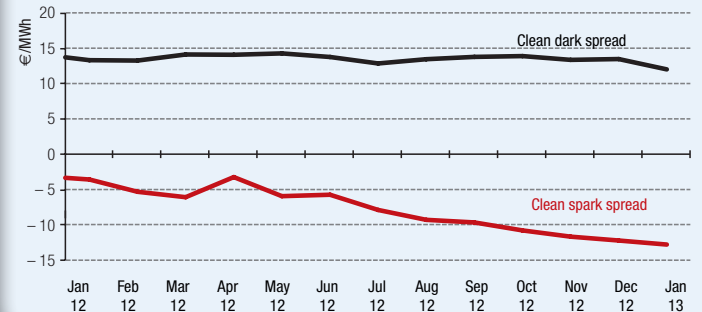
Sources: CDC Climat Research, Thomson Reuters

Clean dark, clean spark spreads and switching price

	Clean spark (€/MWh)		Clean dark (€/MWh)		Switching Price (€/tCO ₂)	
	spot	futures	spot	futures	spot	futures
Germany*	-11.0	-12.8	16.6	12.1	31.3	30.0
United Kingdom*	13.0	4.4	30.9	28.8	32.0	28.4

* Germany, 2014 calendar contract, United Kingdom, summer 2013 contract.

German baseload – monthly average of Cal. 2014 clean dark and clean spark spreads



Sources: CDC Climat Research, Thomson Reuters

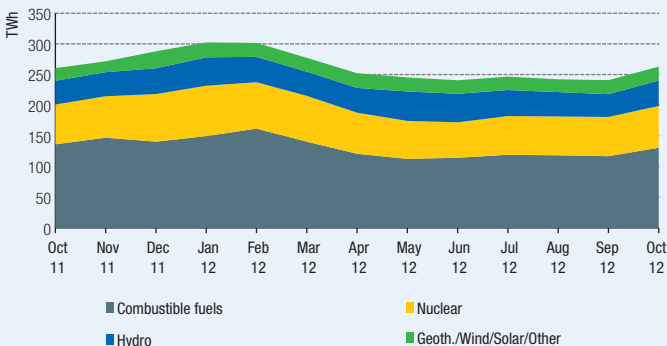
The price of Brent Crude rose by 4% in January, ranging between USD 110.30 and USD 115.50 per barrel. This increase was influenced by the recovery of the Chinese economy, an increase in geopolitical tensions in the Middle East and in tensions on the physical oil market. Good supply availability offset the cold temperatures, and put downward pressure on the price of day-ahead TTF gas, which fell by 3.6%. Due to the abundant supply, the price of month-ahead CIF ARA coal continued to plummet, and posted a new monthly decline of 4.3%. Against the backdrop of bearish energy markets in Europe and of the substantial fall in the EUA price (-48.3%), the price of baseload cal.2014 electricity in Germany hit a record low of €40.40 per MWh on 31st January. The theoretical 2014 CO₂ price that would encourage energy generators to produce electricity from gas rather than from coal reached 30.00€/tCO₂ in Germany and 28.40€/tCO₂ in the United Kingdom, i.e. around seven times the EUA price on the secondary market.

Production

Electricity production (TWh)

EU 20 (in TWh)	Oct. 12	Since Jan. 12	Past year (% change)
Production	262.9	2,612.5	0.9%
of which - Combustible fuels	130.6	1,284.8	-2.9%
- Nuclear	68.2	678.2	-3.9%
- Hydro	41.4	422.6	11.7%
- Geoth./Wind/Solar/Other	22.6	226.9	181.5%

* Gas, coal, oil.

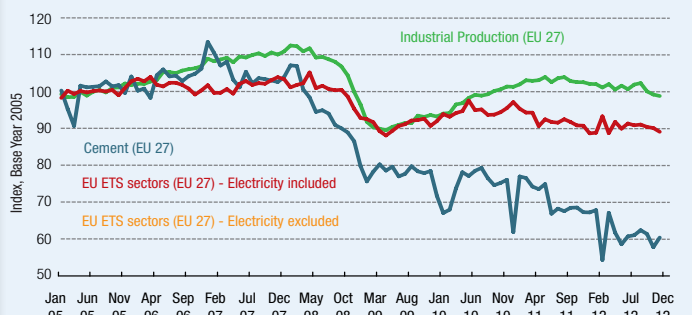


Source: CDC Climat Research, from IEA data

Production indices (Index base year 2005)

EU 27	Nov. 12	Last month (pts)	Year-on-Year (pts)
Indust. Prod (excl. construction)	98.7	-0.4	-2.6
EU ETS sectors production* (incl. electricity)	89.0	-1.0	-1.4
EU ETS sectors production* (excl. electricity)	79.1	0.7	-2.9
Electricity, gas and heating	94.2	-1.9	-0.6
Cement	60.4	2.6	-2.4
Metallurgy	86.6	-1.2	-4.7
Oil refinery	86.3	0.9	-1.5

* Index weighted by EU ETS sectors's weight in average total allocation over 2008-2012



Source: CDC Climat Research, from Eurostat data

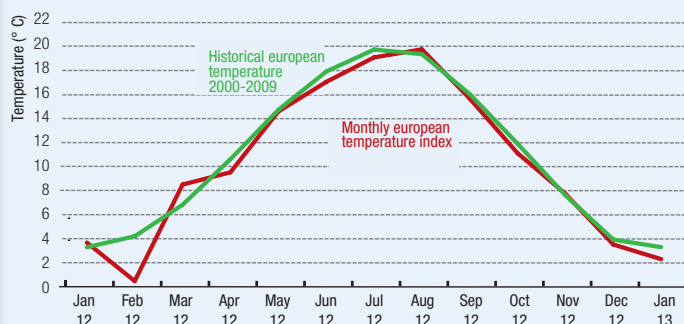
Our EU ETS sector output index posted a month-on-month fall of 1 pt, i.e. a steeper fall than that of the manufacturing sector as a whole (-0.4 pt). Conversely, the EU ETS index excluding the electricity sector increased by 0.7 pt. The cement sector registered the highest monthly increase (+2.5 pts), while the ceramics sector posted the steepest decline (-4.5 pts). Over the past 12 months, all the EU ETS sectors recorded a fall in their output indices, while the three sectors that experienced the steepest fall in output were the ceramics (-9.6 pts), steel (-4.7 pts) and glass manufacturing (-4 pts) sectors. The European business confidence index posted another fall in January, falling to -13.1, a 0.4 pt decline compared with December. Aggregate European electricity generation amounted to 2,612.5 TW between January and October 2012, up 0.9% compared with the same period in 2011. This increase was accompanied by increased use of hydraulic power (+11.7%) and other renewable energies (25.0%), and by a decline in the use of nuclear power (-3.9%) and fossil fuels (-2.9%).

Temperature impact

European temperature index (°C)

- Average of the Climpact Metnext indices for 18 European countries, weighted according to the emission allowances allocated to each country.

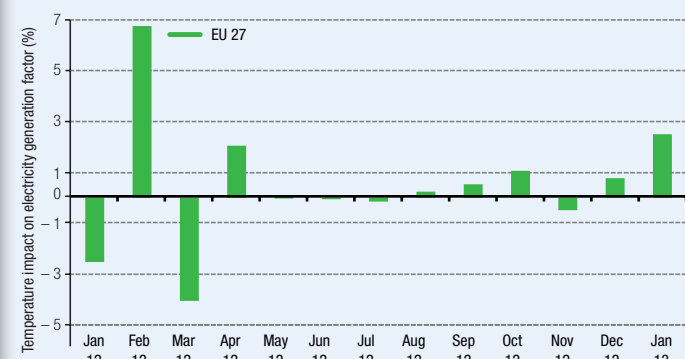
	Dec. 12	Jan. 13
Monthly average (°C)	3.5	2.3
Monthly average (°C) 2000-2009	3.9	3.3
Monthly minimum (°C)	-1.0	-1.4
Monthly maximum (°C)	7.2	8.2



Temperature impact on electricity generation factor (%)

- The impact factor, which is calculated on the basis of a statistical electricity generation model, expresses the temperature impact in relation to average weather patterns for the 10 years between 2000 and 2009.

	Dec. 12	Jan. 13
EU 27	0.8	2.5



In January 2013, the average weather & economy index within the EU-27 was below its ten-year trend of 1.0°C. Countries in Northern and Continental Europe experienced the coldest temperatures, with divergences from the historical trend of -3.2°C in Sweden, -2.6°C in the Netherlands, and -1.1°C in France. The average monthly temperatures for Southern European countries were roughly in line, or even slightly above the ten-year trend. According to the Climpact Metnext weather and economy model, the impact of the temperatures recorded was to increase gross European electricity generation by 2.5% compared with normal weather conditions. The temperatures increased electricity generation by 9.7% in the Netherlands, 3.0% in France and by 2.6% in Germany due to the increased use of central heating. The level of rainfall recorded in Oslo showed a -46 mm divergence with the ten-year trend, which increased the difference between the average monthly and ten-year dam fill rate in the Nordic Region to 3%, while the shortfall diminished in Spain (-7.7%).

Institutional environment

EUA supply

	2008	2009	2010	2011
Total free allocations (Mt)	1,958.5	1,973.7	1,998.3	2,001.2
Combustion	1,259.5	1,269.3	1,289.6	1,293.0
Oil refining	152.7	152.9	156.7	155.4
Coking plants	22.5	22.5	22.8	22.7
Metal ores	21.9	22.0	22.0	22.1
Steel production	185.0	184.8	185.2	185.4
Cement	211.4	214.2	214.6	214.3
Glass	25.2	25.5	25.7	26.2
Ceramic products	18.8	19.1	19.2	18.4
Paper	28.5	39.2	40.1	39.6
Other activities	22.9	24.2	22.3	23.9
Total allocations auctioned (Mt)	44.4	78.4	92.1	93.1

Source: CTL, UK Debt Management Office, EEX

CER and ERU supply

	Jan. 13	Last month change
Number of CDM projects	10,955	+21
<i>of which - registered</i>	6,058	+511
<i>with - CER issued</i>	2,078	+92
Cumulative volume of CER issued (Mt)	1,198	+43
CERs available until 2015, EU ETS eligible - CDC Climat Research estimate (Mt)*	2,071	n.a.
Number of JI projects	781	+18
<i>of which - registered</i>	593	+17
Cumulative volume of ERU issued (Mt)	587.2	+201.5
<i>via - Track 1</i>	564.6	+200.8
<i>via - Track 2</i>	22.6	+0.7

* CDC Climat Research's model: <http://www.cdcclimat.com/The-risks-of-CDM-projects-how-did-only-30-of-expected-credits-come-through,900.html?lang=fr>

On 23rd January, the Climate Change Committee approved the Commission's proposal aimed at updating the registry Regulation. The new text has been submitted to the European Parliament and Council for three months, and will enter into effect if no objections are expressed. Spain, Italy, the Netherlands, Slovakia and Latvia fully support the Commission's proposal to reschedule the auction timetable, which is known as backloading, while the United Kingdom, Austria, and Belgium will do so under certain conditions; the position of France and Germany is still unknown. On 24th January, following a vote by the ITRE Committee, which rejected the Commission's backloading proposal, the EUA price hit a new record low of less than 3€/tCO₂. The ENVI Committee, which is chairing the debate on this project, will vote on the ITRE Committee's position, the Groote report, and the ENVI amendments on 19th February 2013. The first stakeholders' meeting on the options of structural reform will be held in Brussels on 1st March 2013. 55.5 million Phase 3 EUAs were sold at auction in January, and generated income of €271.6 million.

Carbon markets dashboard

Primary market - EUA auctions in Phase 3

		Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13
Common Auction Platform + United Kingdom & Germany	Price (€/t)	-	-	-	-	-	-	-	-	-	7.54	7.01	6.31	5.05
	Volume (Mt)	-	-	-	-	-	-	-	-	-	3.00	48.19	38.51	59.63
Auction Revenues (M€)	Germany	-	-	-	-	-	-	-	-	-	22.62	107.67	35.89	42.61
	United Kingdom	-	-	-	-	-	-	-	-	-	-	43.03	32.71	39.40
	France	-	-	-	-	-	-	-	-	-	-	24.73	18.73	21.97
	Others	-	-	-	-	-	-	-	-	-	-	162.35	155.78	191.70
	Total	-	-	-	-	-	-	-	-	-	-	22.62	337.79	243.11

Sources: EEX, ICE Futures Europe

Primary market - CER and ERU issued (MtCO₂)

		Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13
Cumulative volume of CER issued UNEP-Risoe (Mt)		852	877	895	919	943	959	974	995	1,009	1,036	1,094	1,155	1,198
Cumulative volume of ERU issued (Mt)	Track 1 (Mt)	106,2	106,5	114,2	126,8	151,3	152,8	157,1	206,2	214,0	232,7	233,2	385,7	564,6
	Track 2 (Mt)	12,7	12,7	16,0	16,6	16,6	16,8	17,3	18,8	19,1	19,4	20,0	363,8	22,6

Sources: UNEP-Risoe, CDC Climat Research

Secondary market - Prices (€/t) and volumes: EUA, CER, ERU (ktCO₂)

		Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	
ICE Futures Europe	Daily spot	Price EUA phase 2	6.89	8.46	7.61	6.93	6.67	7.15	7.45	7.55	7.75	7.86	7.46	6.64	5.18
		Volume EUA phase 2	-	-	-	-	-	-	-	-	-	-	-	265	635
		Price EUA phase 3	-	-	-	-	-	-	-	-	-	-	-	6.79	5.19
		Volume EUA phase 3	-	-	-	-	-	-	-	-	-	-	-	59	322
		Price CER	3.77	4.47	4.14	3.88	3.58	3.65	3.34	2.90	2.10	1.49	0.89	0.40	0.17
		Volume CER	-	-	-	-	-	-	-	-	-	-	-	-	327
		Spread EUA-CER	3.12	3.99	3.47	3.05	3.09	3.50	4.11	4.65	5.65	6.37	6.57	6.24	5.01
	Dec. 13	Price EUA	7.74	9.42	8.41	7.54	7.21	7.69	7.98	8.05	8.18	8.24	7.78	6.88	5.35
		Volume EUA	68,819	87,267	97,018	117,472	115,382	86,167	100,827	99,723	125,361	172,430	200,276	189,911	418,524
		Price CER	4.60	5.18	4.82	4.39	3.90	3.96	3.66	3.24	2.35	1.68	1.07	0.52	0.38
		Volume CER	12,329	17,595	12,558	10,353	17,842	14,262	13,537	16,445	26,805	38,256	34,684	52,279	41,549
		Spread EUA-CER	3.14	4.24	3.59	3.15	3.31	3.73	4.32	4.81	5.83	6.56	6.71	6.36	4.97
		Price ERU	4.36	4.97	4.71	4.60	3.97	3.73	3.44	3.01	2.17	1.46	0.76	0.44	0.25
		Volume ERU	-	-	-	-	-	100	500	665	5,343	12,815	18,506	24,314	9,407
Dec. 14	Spread CER-ERU	0.24	0.21	0.11	-0.21	-0.07	0.23	0.22	0.23	0.18	0.22	0.31	0.08	0.13	
	Price EUA	8.31	10.15	9.06	8.11	7.69	8.22	8.48	8.56	8.71	8.69	8.20	7.22	5.61	
	Volume EUA	24,633	17,532	33,838	36,978	38,724	36,878	58,473	50,089	37,884	59,562	69,731	42,296	70,721	
	Price CER	4.84	5.44	5.05	4.63	4.14	4.18	3.79	3.43	2.51	1.78	1.15	0.59	0.43	
	Volume CER	1,834	1,587	4,716	5,105	2,552	4,081	12,152	8,270	5,157	11,757	7,128	3,505	5,883	
Dec. 15	Spread EUA-CER	3.47	4.71	4.01	3.48	3.55	4.04	4.69	5.13	6.20	6.91	7.05	6.63	5.18	
	Price EUA	8.94	11.04	9.78	8.68	8.10	8.68	8.98	9.04	9.20	9.08	8.61	7.57	5.87	
	Volume EUA	2,003	3,750	10,255	14,654	28,946	9,110	20,847	22,887	16,553	21,338	24,491	28,890	41,647	
	Price CER	5.08	5.69	5.27	0.49	4.40	4.40	3.91	3.50	2.62	1.89	1.23	0.68	0.51	
	Volume CER	2,660	700	1,079	1,330	1,542	2,980	2,776	2,493	2,520	5,030	4,094	2,738	2,281	
Spread EUA-CER	3.86	5.35	4.51	8.20	3.70	4.28	5.07	5.54	6.58	7.19	7.38	6.89	5.36		

Sources: ICE Futures Europe

Emission-to-cap by EU ETS sector and country: difference between distributed allocations of allowances and verified emissions

	2008	2009	2010	2011
Combustion	-253.1	-113.5	-125.8	-79.4
Oil refining	-1.4	7.6	14.3	14.6
Coking plants	1.5	6.8	2.9	3.2
Metal ores	4.3	11.0	8.8	9.0
Steel production	51.6	89.3	71.4	71.9
Cement	20.9	61.4	61.0	62.4
Glass	2.5	6.1	5.5	5.4
Ceramic products	5.3	10.0	10.2	9.4
Paper	6.4	10.7	10.0	11.0
Other activities	0.2	4.3	1.3	-1.8
Total (Mt)	-161.3	94.2	59.8	105.9

Source: CTL

	2008	2009	2010	2011
Germany	-84.0	-36.6	-54.4	-49.6
United Kingdom	-50.8	-15.0	-16.8	2.6
Italy	-8.5	24.1	8.5	5.2
Poland	-3.1	10.8	5.9	4.2
Spain	-9.6	13.7	29.5	18.2
France	5.5	17.5	23.4	27.2
Czech Republic	5.2	12.2	10.6	12.3
The Netherlands	-6.8	2.8	0.1	8.9
Romania	7.7	24.9	27.7	23.7
Others	-17.0	39.8	25.3	53.4
Total (Mt)	-163.3	94.2	59.8	105.9

Source: CTL