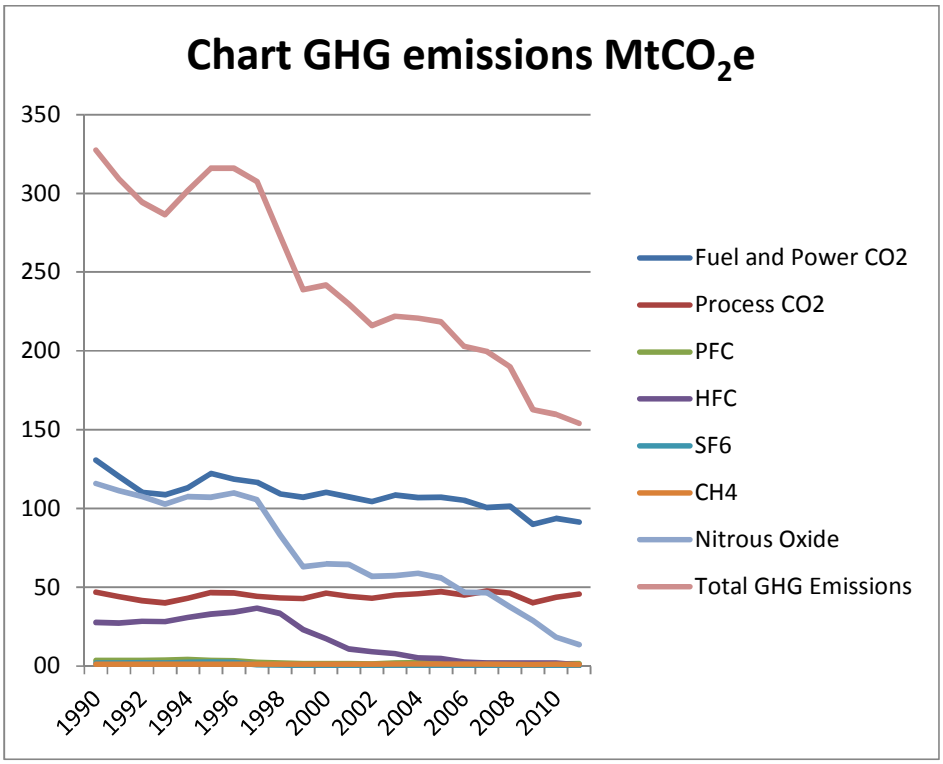
The Chemicals Industry – reducing GHG emissions: past present and future

PAST

Figure 1. shows the chemicals GHG emissions between 1990 and 2011 (see data in Annex I). The industry reduced overall GHG emissions by over 50% over that period. This was due to:

- Reduced emissions of F-gases and N_20. Emissions of F-gases are nearly zero and emissions of N_2O will be practically eliminated by 2015.

- Reduced CO_2 emissions from fuel and power, due to energy efficiency. These fell by 28% between 1990 and 2010. Over the same period, production in volume terms increased by 60-70%.



PRESENT estimates

The emissions reductions due to F-gases are not repeatable. Further emissions reductions will therefore depend on:

Further N_2O abatement

According to Facts & Figures, the industry reduced its N_2O emissions from 115.8 $MtCO_2e$ in 1990 to 18.3 $MtCO_2e$ in 2010. There are no directly comparable figures in the Roadmap, and a question as to how one might reconcile the figures for process emissions (see above).

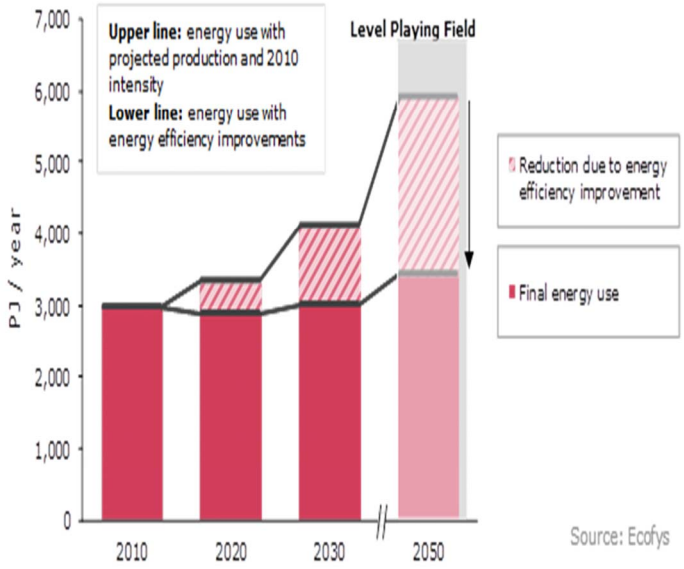
The Roadmap states that in 2007/8 average emissions were 4.7Kg per ton of nitric acid: and deems the figure in 2010 to be 2.9Kg per ton (page 65). It further states that this will be reduce to 0.4Kg by 2020 and 0.3Kg by 2030.

Applying a crude conversion factor between these data and the "facts and figures" suggests a reduction in N_2O emissions from 18.3 $MtCO_2e$ in 2010 to 4 $MtCO_2e$ in 2030.

This would reduce the industry's total GHG emissions from 159.7 $MtCO_2e$ in 2010 to 145.4 $MtCO_2e$ in 2030 (a 55% reduction from 2010 levels).

Energy efficiency gains

The wider industries' efforts are focused on further reducing CO_2 emissions through ever greater energy efficiency. The Cefic Roadmap considers these possibilities and concludes that the industry could increase its energy efficiency, in the level playing field scenario, by approximately 25% between 2010 and 2030.



The Roadmap makes it clear that achieving this reduction will depend on successful innovation: and that these efficiency improvements will be lower in other scenarios, where the level of growth and investment are lower. These improvements are consistent with the ambitious SPIRE programme in which process industries set a target of reducing their fossil fuel intensity by 30% by 2030.

Applying the 25% increase in energy efficiency to CO_2 emissions from fuel and power would mean that those emissions could fall by approximately 23.4 $MtCO_2e$ due to increased energy efficiency. On that basis:

- CO_2 emissions from fuel and power would reduce from 130.7 $MtCO_2e$ in 1990 to 70.2 $MtCO_2e$ in 2030: (a reduction of 46%).
- Total GHG emissions would decline from 159.7 $MtCO_2e$ in 2010 to 136.3 $MtCO_2e$ in 2030 (a 58% reduction from 1990 levels).

Combined effects

Many sectors of the chemicals industry do not produce N_2O emissions – and so much of the industry will be subject only to the potential gains, and emissions reductions from energy efficiency (ie a maximum reduction of c.46%).

However, for the industry as a whole, the sum of the reduced N_2O emissions and reduced CO_2 emissions due to increased energy efficiency would be a total reduction from 159.7 $MtCO_2e$ in 2010 to 122 $MtCO_2e$ in 2030 (a reduction of 62.5% from 1990 levels).

These forecast gains are based on the most optimistic assumptions for increased energy efficiency in the Cefic Roadmap and on an assumption of constant production. These assumptions are unlikely to be borne out in reality.

(a) Any growth in the industry would reduce the level emissions reductions: and equally industrial decline would lead to greater reductions in emissions.

(b) The level of investment in energy efficiency will be dependent on the level of growth (and so the overall level of investment) in the industry.

The Cefic Roadmap makes it clear that in other, less optimistic scenarios than the "level playing field" the level of investment in energy efficiency would also be lower. It says, (pages vii and vii of the Executive Summary) that the industry has "the potential" to reduce its emissions intensity by 40% by 2030: but that under other scenarios of fragmented action the reductions in emissions intensity would be only 30%.

As matters stand, there is no reasonable expectation that we will achieve a global level playing field: indeed the proposals published in January leave us closer to the "isolated Europe" scenario in the Roadmap.

In the circumstances, we consider it appropriate to take the lesser figure as a guide to what the industry can reasonably achieve in terms of energy efficiency. (This would not affect N_2O emissions) The final figures are, therefore a further reduction of 17.6 $MtCO_2e$ due to energy efficiency and 14.3 $MtCO_2e$ due to N_2O abatement by 2030. Overall emissions would fall from 159.7 $MtCO_2e$ in 2010 to 127.8 $MtCO_2e$ in 2030 (a 61% reduction from 1990 levels).

FUTURE targets

The question this leaves us with is, can the industry actually meet the 2030 targets proposed by the Commission?

The short answer is, "no!"

On the basis of the data presented in the Cefic Roadmap, and the figures for GHG emissions presented in Cefic Facts & Figures, a reasonably central prediction would be that the industry as a whole could reduce its GHG emissions to c.61% of 1990 levels by 2030: however, a significant part of this achievement will be due to reducing N_2O emissions to near zero. For those sectors of the chemicals industry that do not emit N_2O, emissions would be reduced due to energy efficiency improvements by about 46% from 1990 levels.

On these figures a headline target of a 40% reduction from 1990 levels might appear achievable. However, the headline target is not the whole story. The Commission proposes to implement that target for industry through reforms of the ETS. The Commission announced that these reforms would result in the ETS sector being asked to reduce its emissions by 43% from 2005 levels.

The precise effect of these proposals on any one industry within the ETS cannot be stated with any certainty – because the ETS is effectively a market for allowances. The total number of allowances will fall to 43% of 2005 levels by 2030 – but any one sector would be free to purchase more, or fewer, allowances depending on their needs. If one sector decarbonises more then another may be required to do less. That having been said, it is impossible to predict which sectors will achieve more or less: and so the only sensible basis for a forecast is an assumption that all are equally affected.

On that basis, then considering (i) the number of allowances attributable to the chemicals industry: and (ii) the linear reduction factor(s) proposed by the Commission for the period to 2020 and the period between 2020 and 2030: the proposals envisage/require the industry to reduce its emission by 70% from 1990 levels.

This is significantly more than the 61% that Cefic believes the industry, as a whole, can achieve. Anv estimate that is based on an expectation of substantial efficiency gains and zero growth between now and 2030. It is even further removed from any reasonably achievable target for sectors that cannot achieve emissions reductions through N_2O abatement.

Perhaps the most important observation to make in closing, is that the "no growth" assumption is entirely unrealistic. An industry facing a zero growth scenario for the next 16 years is not going to be encouraged to invest in energy efficiency: and can choose instead to invest in other parts of the World

which will give a better return. On the other hand, an industry that enjoys reasonable levels of growth between now and 2030 will inevitably emit more CO_2 at any given level of efficiency.

The more industry grows the harder it will be to meet the targets: the less it grows the less likely it will be to try to meet the targets. This is a catch-22 situation that risks running us into a downwards spiral of decarbonisation through deindustrialisation: that will only lead to the export of jobs and the import of "carbon emissions" in products needed to meet continuing demand.

ANNEX I

Industry Emissions: (Cefic facts and figures)

Mio tonnes (CO2 equivalent)	Fuel and Power CO2	Process CO2	PFC	HFC	SF6	CH4	Nitrous Oxide	Total GHG Emissions
1990	130,7	46,7	3,5	27,5	1,9	1,10	115,8	327,3
1991	120,4	44,0	3,5	27,2	1,9	1,06	111,3	309,2
1992	110,2	41,4	3,5	28,4	2,0	1,05	107,7	294,3
1993	108,7	40,0	3,7	28,3	2,0	1,04	102,7	286,4
1994	113,0	43,0	4,1	30,9	2,3	1,15	107,4	301,8
1995	122,0	46,6	3,6	32,9	2,5	1,18	107,1	315,9
1996	118,7	46,3	3,4	34,1	2,4	1,16	109,9	315,9
1997	116,7	44,3	2,4	36,6	0,8	1,16	105,5	307,4
1998	109,3	43,3	1,9	33,4	0,6	1,08	83,5	273,0
1999	107,1	42,8	1,6	23,1	0,3	1,03	63,0	238,7
2000	110,3	46,1	1,6	17,4	0,4	1,11	64,9	241,7
2001	107,2	44,2	1,6	10,9	0,3	1,09	64,5	229,8
2002	104,3	43,1	1,4	9,0	0,4	1,06	56,8	216,1
2003	108,4	44,9	1,9	7,9	0,4	1,20	57,3	222,1
2004	107,0	45,8	2,2	5,3	0,4	1,24	58,9	220,8
2005	107,0	47,3	1,8	4,7	0,4	1,24	55,9	218,4
2006	105,0	45,1	1,8	2,6	0,3	1,20	46,8	202,8
2007	100,6	47,7	1,7	1,8	0,1	1,16	46,7	199,7
2008	101,4	46,3	1,6	1,9	0,1	1,11	37,5	189,9
2009	90,0	40,1	1,0	1,9	0,1	0,96	28,8	162,7
2010	93,6	43,6	1,3	1,8	0,0	1,05	18,3	159,7
2011	91,3	45,5	1,5	0,8	0,1	1,02	13,6	153,9

Industry emissions (Cefic Roadmap)