3 Energy efficiency and climate issues

Strategy

- **Improving energy efficiency of our activities by realistic solutions compatible with the energy needs of a primary industry.**
- **Diversifying energy sources and making use of alternatives to fossil fuels wherever they are sustainable in ecological, economic, industrial and social terms.**
- **Helping develop arrangements for the recycling or destruction at the end of their life, for those of our products that have a potential greenhouse effect.**

Energy consumption
Térajoules

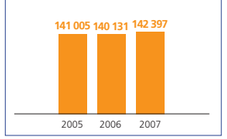
	2005	2006	2007
Coal	42 952	46 300	46 388
Oil	1 379	872	512
Natural gas	41 905	38 458	40 089
Hydrogen	3 046	3 363	3 346
Waste	184	308	500
Other fuels	1 710	1 709	1 662
Electricity	27 193	26 548	27 471
Steam purchased	22 637	22 573	22 401

Direct emission of greenhouse gases
From our production units, kilotonnes-equivalents CO_2

	2005	2006	2007
CO_2	8 683	8 550	8 548
CH_4	380	382	539
SF_6	239	239	123
N_2O	7	7	13
Other PFC	15	15	22
HFC 23	767	559	510
HFC 125	3	12	12
HFC 134a	32	13	19
HFC 227ea	19	16	22
HFC 143a	14	32	19
Other HFC	2	2	1

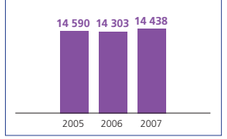
Total energy consumption
Terajoules

The stable energy consumption have occurred against a background of rising production and sales value.



Total (direct and indirect *) emissions of greenhouse gases
Kilotonnes CO_2 equivalent

This indicator includes the gases covered by the Kyoto Protocol.



* indirect emissions : CO_2 emissions associated with the production of the purchased energy

Our energy consumption is stable, whereas our production is growing. The energy consumption – and content (polymers) - for some of our large volume products is large by nature.

Developing long-lasting solutions regarding energy supply is a constant concern. This can be in the form of heavy investments or as partnerships or contractual arrangements extending over a long period.

Our production processes are improved by applying new technologies. As an example, the progressive introduction of new electrolysis units using membrane technology to produce chlorine and caustic soda allows electricity savings of up to 18%. This technology now accounts for 45% of our installed capacity.

A lot of very efficient steam-and-electricity cogeneration units have been established starting in the 1990s, very often in partnership with power generation companies. So far, these partnerships have enabled the electricity producers and Solvay together to avoid about 20% of CO_2 emissions.

Energy audits are in progress in those of our plants where consumption is greatest. While there remains scope for further savings, primarily by further recycling, they are limited by the thermodynamic constraints of chemical processes.

In terms of emissions of ozone-depleting substances, very large reductions have been obtained in our plants, corresponding to the requirements of the Montreal Protocol, and will ultimately lead to their total elimination.

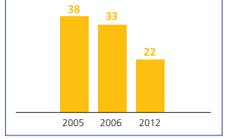
We are also working in a number of countries to encourage the introduction of electricity production based on wind or photovoltaic generation.

Production facilities that use non-oil raw materials are being established: There is a project taking place in Brazil to use bioethanol, partially replacing ethylene as the starting material for PVC production without competing with the food supply chain. In addition, there are plans for construction of a second industrial unit using the new Epicerol process to produce epichlorohydrin, using residues from the biodiesel industry as raw material (see page 27).

In order to treat and recycle fluorinated by-products from the manufacture of fluorocarbons (HFCs), Solvay Fluor has developed a high-temperature technology which destroys them and recycles the hydrofluoric acid stemming from this process. The process treats the by-products of our production units of Bad Wimpfen (in Germany) and Spinetta (in Italy). From 2000 onwards, this has indeed enabled the various sites to reduce their emissions of HFCs, especially HFC 23 (-7000 kilotonnes CO_2 equivalent) .

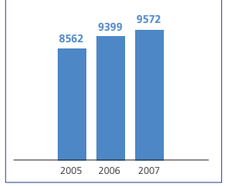
Total emissions of ozone-depleting gases (ODP)
Kilotonnes CFC11 equivalent

The emissions have fallen as a result of the progressive elimination of CFCs and now H-CFCs in our installations, and will be further reduced very significantly in the coming years.



Growth in Solvay production
Sales, millions of euros

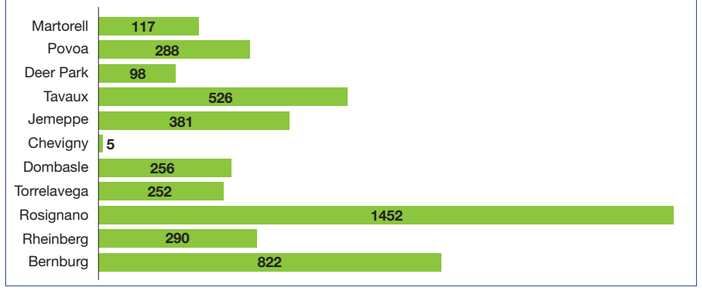
+ 11% between 2005 and 2007 (+31% since 2004).



CFCs and HCFCs, eliminated because of their impact on the ozone layer at the end of their use by our customers (in refrigeration units for example) can also be treated in these installations. This could be done at a larger scale if effective means of collection were established by all the stakeholders.

The SF_6-ReUse recycling program, implemented in Europe in collaboration with the Linde and Dilo companies, has now been extended to the United States for customers that use sulfur hexafluoride, a gas needed industrially for electrical insulation (see "Customers" chapter) but with a high global warming potential.

Steam-and-electricity cogeneration units
Total recurrent CO_2 reductions (total = 4,487 kilotonnes per year)



Various new projects to improve our energy performance, often in collaboration with industrial partners

- *in **Germany**, exploiting the heat content of processed and selected industrial waste products with a high biomass content;*
- *in **France**, a cogeneration power station fuelled by biomass, such as wood waste;*
- *in **Spain**, a plan for a cogeneration unit based on a gas turbine combined with a heat-recovery boiler;*
- *in **Bulgaria**, modernization of the thermal power station, with installation of the most modern generators;*
- *in **Italy** and **Germany**, heat-recovery projects to supply urban district-heating schemes.*
- *In **Argentina**, a 165 MW combined-cycle power plant is being studied to supply electricity for our Bahia Blanca plant*

Targets for 2012-2020

- **Reducing by 20% * CO_2 emissions, both direct and indirect (through energy purchases), associated with our manufacturing between 2006 and 2020.**
- **Reducing by 20% * our total energy consumption between 2006 and 2020.**
- **Establishing energy diagnosis audits at 80% of our manufacturing sites and all our administrative sites.**
- **Reducing by 30% the emissions of ozone depleting substances from our production sites.**
- **Studying upstream integration for some energy sources in certain regions, with the aim to secure our energy supply.**

*** assuming comparable activity perimeter**

Large reduction in emissions of greenhouse gases from Solvay Indupa's PVC plant at Santo André (Brazil)

The Brazilian authorities have approved a change from fuel oil to natural gas as the energy source when Solvay Indupa's PVC production at Santo André is increased.

This will make it possible to reduce dramatically not only the CO_2 emissions, by nearly 44,000 tonnes a year, but also those of sulfur, by 99%, carbon monoxide, by 90%, nitrogen oxides, and particulate matter. Carbon credits equivalent to five years' emissions have been obtained in connection with this project, in application of the Kyoto Protocol.

Up to discussion

Gaining access to renewable energy sources and raw materials

"Moving to renewable resources is an intention which it is currently difficult for us to put into practice on a large scale, given that we come up against two major limitations.

The first is that for our production to be viable from a business perspective, we must be able to see energy prices over the long term, whereas there is currently still great uncertainty over the markets for renewable materials.

The second limitation is that one of the conditions for this to be acceptable industrially – and, if necessary, politically – is the availability of a regular, sufficient and assured source of the renewables. The experience we have gained shows that such a prospect is still difficult to establish, in particular in contractual terms.

"In addition, we must be certain that the alternative resource (wood, bioethanol, glycerol from biodiesel, waste products, etc.) is technologically compatible with the characteristics of our production processes, and with the traditional fuels".

Michel Bande,
Manager of the International Purchasing Division