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Climate disturbances, the new industrial policies and ways out of the crisis

Synopsis

With the support of the European Commission.

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November 2009.

Looking ahead to the Copenhagen Summit on climate change the ETUC launched a campaign calling for policies that take account of protecting the climate, from

Both an environmental point of view and a social point of view.

This campaign was launched at a conference organised by the ETUC in London.

The study 'Climate disruptions, new industrial policies and ways out of the crisis', of which the main findings are gathered in this synthesis, was also presented.

This study clearly shows that we need to consider employment in all its dimensions.

There are opportunities for job creation in sectors such as those linked to renewable energy sources, as well as in energy efficiency, in particular in the building sector. But the study also demonstrates that this transformation is something that affects every sector and every job.

For all these reasons, the social dimension must be intimately involved in the European policies contributing to the development of the industrial strategies responding to the requirements of a low-carbon economy and workers' social aspirations.

Tomorrow's green growth must help to maintain and create quality jobs and social progress. Therefore, it is necessary to ensure a fair social transition, which means setting up proper social negotiations at every level with instruments for that negotiation process, the necessary funding, and new training to help in the transformation of employment.

Only if we can do this can the anxieties and threats be transformed into opportunities to create sustainable, quality jobs and curb social inequalities.

Joël Decaillon,
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1. The challenges: the definition of new industrial policies

Reducing CO_2 emissions is a major challenge for industry in general.

The low-carbon transition policies that will cover the period 2010-2030 are anticipation policies whose climate bounds are the commitments made by States to reduce greenhouse gas (GHG) emissions. Their pace and general implementing conditions will be updated by the Copenhagen summit.

For the sectors of the first and second industrial revolutions, coal and steel on the one hand, electricity and the automotive sector on the other, all parameters of the production and use of goods produced will be called into question by the introduction of a low carbon requirement synonymous with energy efficiency and savings.

Situated at the heart of the organisation of developed industrial societies, energy- and carbon-intensive sectors are also intensive in capital and qualified manpower. As such they are the living result of decades of regulatory, trade and taxation policies and measures which have ensured the industrial development of the European countries and shaped their economic and social organisation.

The combination of the three fundamental parameters of a society's economy, namely its modes of production, consumption and social organisation, requires the implementation of new industrial policies that bring coherent change to the market and regulations, the public and private sectors, taxation and finance, the social and technological spheres, as well as to the trade unions and the political dimensions.

Convergent multi-sectoral industrial policies

This study aims to encompass the full importance of the definition of these new industrial policies but it is beyond its scope to address all the sectors concerned or all the sectors selected at the same level. It thus opts for a dual level review:

- the first applies to the industries directly affected by low-carbon policies through new regulations or emissions trading on the carbon market;
- the second applies to the coal sector in three countries - Germany, Poland and the United Kingdom – which have very different experiences and policies.

The conclusions are specific to each sector and each country. However, certain converging principles emerge and model the new parameters of industrial policies adapted to the realities of the 21st century.

Adapting to these new realities means first and foremost defining new industrial policies within the framework of a globalised and financial economy. These industrial policies, while remaining compatible with market mechanisms, make it possible to develop prospects, consistency and guarantees in order to:

- finance over the medium and long term the low-carbon technological and social transition by giving industry a stable regulatory, fiscal and legal framework in its strategic orientations;

- organise a social transition which, over and above its occupational dimension, implies a profound change in wage relations and of which the new flexibility demanded of qualified labour is a pivotal evolution;
- protect the low-carbon transition from the abusive practices of the financialisation of globalised European economies, to prevent speculation of all kinds from denaturing the objectives by the means.

These are the conditions that must be met to stop the de-industrialisation of the European economies, which was recently worsened by the crisis of financial origin that struck late in 2008.

How to control the risks of rapid de-industrialisation through carbon leakage?

Policies to combat climate change come within a general context of a relative weakening of European industries that is the result of a number of factors, among which:

- the industrial growth of the emerging countries, which are becoming new competitors on the global market, first and foremost China;
- policies of relocation to countries with low costs, which are being implemented by many European transnational companies;
- the effects of the financial crisis of late 2008, whose economic and social consequences demonstrated the high degree of financialisation of the industrial economy of developed countries.

Under these circumstances, deregulated low-carbon policies contain the recognised danger of accelerating the de-industrialisation of the European economies.

To cope with this threat, the new industrial policies must therefore simultaneously include a defensive dimension aimed at combating carbon leakage and an offensive dimension aimed at organising the widespread use of clean and low-carbon technologies.

Applying regulations in Europe and consequently adding to the energy costs of production through policies to reduce CO_2 emissions, without equivalent measures being taken in other countries of the world, would be tantamount to emitting more CO_2 for the same production. The result would be the opposite of the objective sought.

This is particularly true given that, in many sectors, European industry ranks in the lower end of carbon emitters. Under these circumstances, substituting European production with extra-European production would in most cases result in higher pollution. This is the case for steel, chemicals, cement, clay products for construction and petroleum refineries.

Exposure to carbon leakage is thus the fate of any energy-intensive industry that is globalised by virtue of its trade.

The period that will open in 2013, with the auctioning of 100% of emissions from electricity production and the gradual auctioning of 30% to 80% of emissions from industrial sectors potentially exposed to carbon leakage, therefore brings great uncertainty. The European Commission's latest proposals confirmed the danger of carbon leakage in the absence of an international agreement.

Guarding against the risks of carbon leakage without penalising the competitiveness of European producers can take one of two forms, either the grant of free emissions allowances or border compensation measures.

The distribution of free emissions allowances is equivalent to granting subsidies, which would very quickly disrupt the play of competition between sectors and between domestic producers and importers.

On the contrary, border compensation measures would place importers and European producers on the same footing in terms of their carbon situation, in conformity with WTO recommendations.

This would nevertheless require three conditions:

- the definition of carbon standards by sector so as to determine the best available technology mixes;
- the creation of a European standardisation agency that is above the parties, charged with enforcing these standards;
- the promotion and organisation of carbon traceability for all goods traded worldwide.

Under these circumstances, comparisons of technologies or of production modes, known as* benchmarks*, may be the subject of economic, social and environmental definitions that combine competitiveness, energy efficiency and decent work.

Low-carbon research and development and the market

Initially, the emissions rights market was supposed to finance investments by operators to reduce their CO_2 emissions. Neither the first nor the second period achieved this result for a number of reasons, the most important being the over-allocation of quotas, but also because the mechanism simply does not work.

The auctioning of emissions allowances planned from 2013 responds to other objectives. It is mainly considered by States as a new source of revenue. The bulk of the amounts collected will not be earmarked on a priority basis for financing the fight against climate change: the constraint of allocating these amounts to low-carbon investments would only concern 20% of these revenues. The auctioning of CO_2 emissions thus becomes a source of revenue for the States, on bases that include possibilities for speculation, which strongly resembles a tax reform without being labelled as such.

The determination of a minimum and maximum carbon price by period would make it possible to introduce visibility and anticipation possibilities capable of limiting speculation while safeguarding States' revenues, notably for giving incentive for and participating in low-carbon investments, with priority for R&D.

To date, Ulcos, in the steel sector, is the only technology platform allowing an evaluation of the method that we will call "pre-competitive cooperation at European level" and of its initial results after several years of operation. Developed under a public-private partnership, Ulcos gives industrial firms in the sector a base from which they can embark on the first stages of low-carbon technology transitions needed in the coming years.

However, not all carbon-emitting industries have pooled the research and development resources needed for their low-carbon transformation, sometimes for reasons of competition between several European industrial firms, sometimes due to a lack of means and incentives on the part of States.

As a result, the research currently under way in many sectors is proving clearly insufficient. That said, an initiative similar to Ulcos was launched recently in coal technologies with development of the ZEP platform. Taken as a whole, the situation is still far from sufficient, however.

How can the carbon market become an efficient and competitive tool to break this R&D stalemate, which is quickly becoming a handicap for European industry?

The solution of linking the allocation of emissions allowances to research and development expenditure on low-carbon technologies could prove effective in a competitive framework.

Capture and storage: a multisectoral and territorial transitional technology

The capture, transport and storage of CO_2 have emerged today as essential technologies for many sectors with a view to achieving CO_2 emissions reduction targets in the coming years. This is the case for chemicals, refining, steel and cement production, as well as electricity generated from fossil fuel.

As transitional technologies preceding the introduction of green technologies, they imply the construction of new regional infrastructures shared by different industries. Indeed, capture will vary depending on the specific characteristics of each industry and remains in the competitive sphere, but transport involves different industries based on the same territory and storage will come under the responsibility of the public authorities, at least as long as it has no known deadline.

This raises the question of the tie-up between private means exposed to competition and public means.

These strategic technologies for carbon capture, transport and storage are complementary to the development of renewable energy sources.

A just social transition for an industrial Europe

Low-carbon policy has not to date been the cause of restructuring measures that eliminated jobs in 2009 or in earlier years. On the other hand, in the future, the prospect of a low-carbon economy will without a doubt contribute to the destabilisation of the workforce employed in carbon-intensive sectors.

By the same token, low-carbon investment policies will model employment of the future and will result in losses of existing jobs.

The employment issue must be studied from a dual point of view:

- the first is the transition from existing jobs and their characteristics to tomorrow's jobs;
- the second is the creation of jobs related to cross-cutting policies in the fields of energy (renewables), energy efficiency (energy-efficient products and materials in buildings: insulation materials, condensing boilers, heat pumps, thermal regulators), industrial processes (speed variators, cogeneration), or transport (electric vehicles) and smart grids.

A just social transition is at once indispensable to maintaining a competitive industry in Europe, possible through anticipation of the occupational conversion of the many workers concerned, and manageable if the framework in which it occurs:

- examines the questions of quality and location of the jobs concerned: while the employment balance is positive in certain sectors like renewable energy, hybrid engines and new infrastructures, it cannot be taken for granted that these jobs will be created in Europe and that they will be qualified.
- defines the frameworks for essential social and societal dialogue: the domination of the trans-national logic applied by firms requires the building of counter-powers that make it possible to democratise strategic choices for employment and for tomorrow's societies. Attaining this goal will require the creation of new institutions that allow debate and enable the different players to express their views and interests so as to build consensus where activity and industrial employment are integrated into regional life;
- defines the place of the public authorities, the State and cities and regions in financing the transitions in terms of employment and infrastructures.

The essential requirement of developing renewable energy

Among the different sources of renewable energy, four can be considered the most promising in terms of application and development potential: wind energy (particularly offshore), hydroelectric power, solar energy (thermal solar energy, photovoltaic solar energy and concentration of solar energy) and bioenergy.

Europe was a world leader in the field of wind energy with its production of turbines and installations long before the United States and China started producing large-scale installations in 2008. Offshore wind farm projects are creating real interest and could reach capacity of 8.7 GW off Europe's shores by 2015.

The investment costs per gigawatt (GW) needed for the construction of wind farms, hydroelectric plants or solar power stations until 2020 may seem high but they do not exceed the costs of conventional power stations. Cost estimates for the construction of new nuclear power plants can be even higher, from €4.2 to €7.6 billion per GW. The German electricity companies RWE and Vattenfall estimate the total investments needed for their carbon capture and storage (CCS) demonstration installations at between €1 and €2 billion, for capacity of 450 or 500 MW.

All forecasts show growth in jobs related to renewable energy in the coming decades. The corollary of the high level of investments needed to increase renewable energy capacities will be more jobs in engineering, machinery and equipment, and other sectors.

Review of sectors

The electricity sector: the question of occupational transitions

While different technologies can be used for electricity supply for buildings and transport, this is not yet the case for industrial applications that require the supply of high intensity electrical current. This is the principal reason why attaining Europe's targets for reducing greenhouse gas (GHG) emissions by 2030 necessarily involves implementation of carbon capture and storage technology (CCS).

Working from the scenarios studied (DG TREN as a baseline, DG Environment for NSAT), we introduced a deviation called "Syndex NSAT" that combines job creations in renewable energy with the dissemination by 2030 of CCS technologies.

Evolution of FTE jobs

FTE average/year 2005-2030 (thousands)

	2000-2005	Base line	NSAT	NSAT Syndex
Solids	5	85	39	13
Solids CCS	0	0	28	79
Oil	4	11	3	3
Nuclear	4	58	63	63
Gas	67	54	64	64
RES	147	191	452	452
Total	**227**	**399**	**650**	**676**

The impact of the financial crisis of late 2008 is very likely to delay the necessary investments.

The creation of jobs from investments in electricity production will come mainly from two sources:

- direct and indirect jobs in renewable energy and renovations of thermal power stations, of which more than 50% will have to be renovated. The number of such jobs is estimated at an annual average of more than 750,000 full-time equivalents (FTE) during the period 2005 to 2030, the vast majority of which in metallurgy, along with jobs in transport and distribution;

- jobs in the equipment sector, which would be similar in number.

Conversely, in thermal power stations (coal and heavy fuel oil), job losses would amount to around 21,000 FTE (14,000 for coal and 7,000 for heavy fuel oil), a majority of which concentrated in European Union countries, where coal dominates in electricity generation. The introduction of CCS makes it possible to limit such losses.

The key question for jobs in electricity generation is that of the shrinking of employment in coal-fired power plants, which cannot be offset by the development of jobs in renewable energy, since the latter correspond to different occupations with different status: a wind farm operator does not practice the same activity as a thermal power station operator.

Maintenance occupations have become essential today for increasing the rate of capacity utilisation and make an important contribution to optimising production costs.

In parallel with the net creation of jobs related to investments in electricity production, it is also important to highlight the job losses in coal sectors to 2030, i.e. a decline of between 74,000 (business as usual) and 87,000 mining jobs (NSAT alternative linked to measures under the European Union's climate-energy package) for the period 2005-2030, added to which are job losses in the production of mining equipment. It can therefore be estimated that job losses in coal mining in Europe in the scenario linked to the European climate-energy package will add up to between 77,000 and 87,000 and that they partly reflect the impact of ongoing restructuring measures in the coal industry (77 000) and partly the effect of "decarbonisation" of electricity generation (10 000).

Irrespective of the question of the evolution of existing thermal power stations, the question of the European Union's long-term policy for security of supply is raised.

Steel: a technological and occupational transition

Depending on the source consulted, the steel sector accounts for 6 to 7% of global CO_2 emissions, a figure that climbs to 10% if emissions from the mining and transport of raw materials are included.

The steel industry accounts for 30% of CO_2 emissions from all industries. China is the leading emitter, both because it is the world's leading steel producer and because its steel industry is 90% based on casting, which uses a wide range of technologies from the most modern to the most non-industrial type.

Up until 2020, the European steel industry will be protected by the allocation of free emissions allowances, like all the sectors identified by the European Commission as potential victims of carbon leakage, i.e. which must cope with international competition and are extremely energy-intensive.

On liquid steel integrated production sites, for production capacity of 200 million tonnes of steel, the number of jobs threatened in the short term by carbon leakage is estimated at 175,000. These job losses will be limited to between 24,000 and 45,000 for reasons other than climate adaptation to 2020.

The European programme, Ultra-low CO_2 Steelmaking (Ulcos), the flagship project of the European Steel Technology Platform (ESTEP), is a one-of-a-kind initiative in Europe. Among the 80 technologies studied under this programme, research has offered the possibility of implementing a technology compatible with the emissions reduction requirements imposed on producers: the recycling of gases from blast furnaces matched with carbon capture and storage would allow a reduction of at least 50% of greenhouse gas emissions per tonne of steel produced. With the technology of recycling blast furnace gases, we can expect an increase in employment resulting directly from this transformation in all plants using the casting process.

According to the hypothesis developed by Syndex, the European steel industry:

- would balance its trade balance for steel and would therefore increase its production capacities to keep pace with consumption;
- would benefit from a combined increase in electric steel and cast steel.

In qualitative terms, several developments must be taken into account:

- the evolution towards an industry of blast furnace functioning processes will involve major changes in ways of working: where the collective know-how of teams used to be essential to the smooth working of the tool, the new technology will impose much more binding consistency, based on advanced and computerised measurement and control tools;
- the intensification of the functioning of the tool towards more energy efficiency, accuracy and diligence in functioning standards will also have the effect of imposing further tension on tools and materials, which will certainly have consequences for workers' safety.

Refining

In the coming years, European refining will have to take up two major challenges:

- processing increasingly heavy crude oils while conforming to ever more demanding specifications (products and environmental);
- coping with increased consumption of diesel fuel in a context of overall decrease in demand, which cuts into margins.

These requirements will place serious constraints on the refining tool, which will be reflected in an increase in energy consumption and therefore of CO_2 emissions.

Refining falls into the category of industries exposed to the risk of carbon leakage (since it is already very open to imports), which means it will continue to receive free allowances until 2018. However, the introduction of benchmarks will promote the most energy-efficient units at the expense of the least efficient.

There will therefore be a risk for tools in which investments to improve energy efficiency are not made, particularly because this constraint comes on top of the intrinsic weaknesses of certain units: low margins, lack of local outlets, energy performance (disadvantageous in case of an increase in crude prices), absence of petrochemical synergy, etc.

The main short-term lever lies in the widespread use of cogeneration installations, thanks to which efficiency gains of 20% to 30% can be obtained. Unfortunately, the conditions do not exist for such development: high costs, owners reluctant to make long-term investments in units that could shut down in the meantime and difficulty securing financing for projects of this type.

The conditions for the development of cogeneration include:

- the need for a long-term view of CO_2 prices;
- guarantees from the public authorities and regulators on feed-in tariffs for the electricity produced;
- financial support for the construction of units.

In the longer term, CCS represents the greatest potential for reducing CO_2 emissions from refining. However, its deployment is complex due to the specific characteristics of this industry. According to CONCAWE (association for environment, health and safety in refining), CCS is not expected to be viable economically until 2025 at the earliest. In our view, this timeframe could be shortened with the introduction of ambitious policies to speed up and increase the number of pilot and demonstration projects.

In terms of employment, we estimate that there is a risk of shutdown of around 10 small refineries by 2020, resulting in the short term from the impact of the crisis on demand and margins, and in the medium term from measures to reduce vehicle consumption. These shutdowns could lead to the loss of 6,000 jobs (direct and indirect).

The risks of job losses for the 2020-2030 period are difficult to estimate and will depend on the pace of introduction of electric vehicles (hybrid or all-electric) and competition from regions of the globe near Europe (Middle East and North Africa).

Positive effects on employment are to be expected from the development of cogeneration and CCS: everything will depend on the rate and volume of investments. These will be mainly jobs in equipment manufacturers and parapetroleum firms, rather than in refineries.

Chemicals

The major risk in the chemicals sector is that enterprises may not meet the transformation challenges they are facing because the European chemicals industry is undergoing a profound transformation process under the effects of globalisation and financialisation. The current crisis is further clouding the issue. The risks of a restructuring of the European chemical tool is all the greater because it is old and because the investment and innovation strategies of the players operating on the old continent have not addressed these challenges (investments are tending to decline and are lower than investments in the sector in North America and Asia). The pressure on employment across Europe remains steady (–2% annually during the period 1997-2007).

Regulation through market forces alone cannot be effective in the field of chemicals considering:

- the diversity of technological, competitive and social situations in this industry;
- the multiple asymmetries that characterise this industry:
- different carbon intensity depending on the country and region (which raises the challenge of managing transitions and taking on the associated costs at geographical level),
- sectors or sub-sectors characterised by a defensive dynamic for some and offensive for others: sensitivity and exposure to the challenges of evolving towards a low-carbon economy are not the same (explaining the challenge of managing transitions and sharing the costs among the chemical branches),
- large groups and SMEs (raising the challenge of managing transitions and sharing the costs among different actors and in the territories).

The complexity and low intelligibility of the chemicals industry makes it all the more necessary to carry out impact studies and/or more reliable evaluations of the activity and employment challenges connected with the switchover to a low-carbon economy. The benchmarking tool (which is highly developed in the chemicals industry on technical, financial and social criteria) should be mobilised in a new and offensive way to promote social dialogue.

Available evaluations (McKinsey, AIE, etc.) show that the European chemicals industry has considerable potential to reduce GHG emissions, particularly through ongoing improvement of energy efficiency and greater use of renewable raw materials. This potential will require significant investments but in exchange offers advantages that should be highlighted (savings in operating costs, notably through ongoing efforts to reduce energy intensity, develop new markets and new economic models built on alternative resources that do not compete with agriculture, etc.) and whose emergence would gain by being promoted if significant savings can be identified throughout the product life cycle.

The development of low-carbon products and technologies in the European chemicals industry represents an opportunity to give fresh impetus to strong sectoral cooperation (in R&D and vocational training) in a sectoral approach which, under the effect of the fragmentation and financialisation of this industry, has become severely distended.

The emergence of new competences required by a sustainable chemicals industry and management of the transition from the traditional to a sustainable chemicals industry are major challenges from the point of view of employment. The setting up of a structural fund organising and/or providing support for this dual movement could constitute a political response, provided there is a definition of the conditions for implementation, aid and support that are sufficiently offensive and verifiable (notably by the social partners and trade unions).

Glass

The glass industry is an intermediary industry (80% of its production is earmarked for other industries in Europe) whose products can be likened to commodities. It is a much diversified industry in terms of both products and technologies. However, 75% of the volumes manufactured by this industry (at European level) concern the sectors of hollow glass (50%) and flat glass (22-25%). It is an industry organised primarily on regional bases, both for flat glass and for the bulk of production of hollow glass. For some segments which are smaller in terms of volume, the relevant economic area is more global (for example, hollow glass for consumer products, fibreglass, etc). Others are undergoing a transition from a regional economy to a global economy, including glass tableware items (domestic glass) and flat glass for the automotive industry (original glass and especially replacement glass), impacted by problems of migration of the automotive industrial system.

The glass industry generates 1% of GHG emissions from European industry although it accounts for 4% of industrial sites and 196,000 jobs. It is an energy-intensive industry that causes atmospheric pollution: these are its two major challenges. This industry has potential to improve its energy and environment performances, exploitation of which could be slowed by the strategies of players forming oligopolies in each of its sub-sectors (flat glass, hollow glass, fibreglass, tableware, etc.). The activism of these operators has led to recognition of a risk of carbon leakage for the glass industry, which will enable it to obtain an allocation of free quotas after 2012 on the basis of benchmarking. The switchover to a low-carbon economy represents an important opportunity for the glass industry, moreover, particularly in construction ("intelligent" glass from the standpoint of insulation and energy savings) and automotive applications. The glass industry is not one of the major industrial polluters; however glass melting is a high-temperature process and a source of atmospheric pollution. The main components of this pollution are those that result from combustion, notably NOx, SOx and particulates. The glass industry's manufacturing processes are also energy-intensive.

The glass industry's investment strategies give precedence to developing production capacities outside of mature zones and the streamlining of capacities in mature zones. The objectives focus more on accessing new markets than on relocating, since glass markets tend to be organised on regional bases. This is the case for most flat glass and hollow glass, which together make up nearly three quarters of volumes produced in Europe. Exposure to extra-European competition is high in a few sub-segments (tableware, reinforcement fibres, mass market glass packaging, etc.).

The crisis has not modified the basic strategic tendencies.

Climate change is more of an opportunity than a threat for the glass industry. Indeed, several areas of application are impacted positively by the challenge of the migration towards a low-carbon economy. Flat glass is most concerned. Its applications in construction are particularly sought after in the drive to improve energy performances (low-e glass, insulation, etc.). This also concerns automotive applications (lightening and reduction of consumption), as well as speciality applications (photovoltaic glass, solar panels). The fibreglass sector is also concerned in a complementary way through the development of certain energy applications (wind farms).

Sources of jobs appear to exist not so much in the production of flat glass (a capital-intensive sector representing around 16,000 people in Europe) as in processing (around 100,000), organised in SMIs, sometimes as subsidiaries of large glass groups, especially in low-energy construction applications.

Cement

In 2006, the cement industry in the European Union's 27 Member States emitted an average of 0.8 tonnes of CO_2 per tonne of cement. This figure is said to account for between 2.5% and 3% of the Union's total CO_2 emissions. This industry employs more or less 45.000 workers.

Its level of emissions places the European cement industry among the sectors most directly threatened by the carbon constraint if such a constraint applies unequally to European producers and importers.

To exit the alternative of "insufficient effort to reduce emissions" versus "relocation" a border compensation mechanism for countries without carbon constraints would be effective at preserving employment while providing support for emissions reduction.

Recommendations to optimise alternatives to business as usual (BAU) up to 2020 and 2030 and for a European industrial policy for cement can include:

- pursuit of the efforts under way (reduction in clinker factor, greater use of alternative fuels, transition to dry process);
- stimulation of R&D and European demonstration and deployment projects for new processes (clinker-free cements, new binders, eco-cements, etc.), by giving fresh impetus to cooperation between players in the sector;
- involvement of the cement sector in European R&D and demonstration-deployment projects for carbon capture and storage technologies carried out by other sectors (producers of fossil electricity, steel, refineries, etc.);
- mobilisation of all players in the decision-making chain (industry, administration and political leaders) to establish standards for cement composition, standards whose absence hinders the development of new processes;
- introduction of border compensation measures for imports not subject to carbon constraints before concluding a global sectoral agreement (negotiation of which was launched by an initiative of the World Business Council for Sustainable Development – WBCSD);
- development of sectoral schemes and tools for forward-looking management of the jobs and competences dedicated to new processes and products;
- appropriate training programmes for managers and workers of cement groups, but also for those of client sector enterprises (BPW), as well as individuals.

Aluminium

Like all non-ferrous metals, aluminium is not one of the sectors concerned by the first phase of application of the Kyoto Protocol, at least not directly. The first reason is the limited level of GHG emissions from non-ferrous metals, since CO_2 emissions from this sector are estimated at 3% of the total emitted by industry, i.e. a bit more than 0.5% of global emissions. Altogether, the production of a tonne of aluminium emits 5.2 t of CO_2 equivalent. As from 2013, the inclusion of direct emissions of CO_2 and fluorinated gases puts European aluminium in a new position.

Indirectly, aluminium producers – which are among producers of energy-intensive non-ferrous metals – are also concerned by the passing on of the price of CO_2 by electricity producers.

Higher electricity prices, due partly to the price of CO_2, could lead to a substantial change in the European sector's competitive position due to the simultaneous occurrence of two phenomena:

- more than half the long-term supply contracts for low-price electricity for aluminium producers will be renegotiated in the next five years;
- electricity producers will have to acquire 100% of their emissions allowances from auctioning as from 2013, according to the European rules adopted in 2008, a decision justified by the possibility of passing on the price of CO_2 in their sale price.

The situation in 2009 nevertheless turns out to be hard to compare with the progression of recent years, since numerous production stoppages lowered the global production of aluminium by 15% to 20%, making the less competitive producers more vulnerable, particularly those that have access to the least favourable energy mix. Hydraulic energy offers a decisive competitive advantage in this industry given its permanence.

There are around 35,000 workers in aluminium production, from bauxite to aluminium, and 275,000 in processing in Europe.

In our opinion, two dimensions should be favoured to safeguard an industry threatened with a major loss of competitiveness. Such a loss would have major negative consequences on employment in Europe. It is vital to:

- solve the issue of access to electricity at a competitive price through access to dedicated sources, since liberalisation measures have not succeeded in guaranteeing electricity at competitive prices;
- encourage technical solutions that reduce emissions of CO_2 and fluorinated gases through the development of precompetitive research: the example of the inert anode developed in certain research projects can prove promising in the short term.

The main handicap, even though it does not seem decisive, nevertheless resides in the weakness of European producers compared to the world's giants.

Automobiles

The automotive industry is one of Europe's most important industrial sectors and constitutes one of the pillars of European industrial production. The European automotive industry represents 31.8% of global automotive production.

According to the European Automobile Manufacturers' Association (ACEA), the automotive and up-channel industries employ around 12 million people in Europe, around 2.3 million of whom directly in the production of vehicles in 2007 and 10 million in the upstream industry.

The objective of reducing CO_2 emissions applied to the automotive industry concerns two different aspects: the reduction of CO_2 emitted by cars and commercial vehicles in circulation and the reduction of CO_2 emissions resulting from the vehicle production process.

In 2008, new vehicles emitted an average of 154 g of CO_2 per km. In 1995, only 3% of new vehicles emitted less than 140 g of CO_2 per km, compared with 42% today.

The European Parliament and Council of Ministers adopted new regulations on emissions from passenger cars in December 2008. More than 65% of new vehicles registered will produce an average of only 130 g of CO_2 per km up to 2012. By 2015, all new vehicles registered will have to meet this requirement, through the development of effective technologies.

The automotive industry was seriously affected by the financial crisis and recession that struck in the second half of 2008. Most experts are counting on the presence of a growing number of hybrid vehicles on the market in the coming years.

Consequently, projections for the evolution of CO_2 emissions by 2030 show considerable differences. This results mainly from the different hypotheses as to the proportion of hybrid and electric vehicles in the total number of vehicles in circulation and the total number of vehicles.

Based on the different projections by the sector, three hypotheses have been developed for 2015, 2020, 2025 and 2030. Each corresponds to a degree of penetration of hybrid and electric vehicles: the low hypothesis, the median hypothesis and the high hypothesis.

The employment impact on the engine assembly sector would remain limited in Europe up to 2030, in the case of a low penetration rate of all-electric vehicles and due to the hybrid transition, which guarantees a still important presence of conventional engines in tomorrow's vehicles.

Up to 2030, losses linked to the replacement of conventional engines by electric engines would represent, under the three hypotheses, from 17,000 to 34,000 jobs. Employment gains could make up for these losses, representing 80,000 to 160,000 jobs depending on the hypothesis[1].

The compromise found with the automotive industry on the directive on emissions from vans (130 g of CO_2 per km) will have to be revised without delay to achieve the target of 95 g of CO_2 per km recommended by the Commission. Making combustion engines cleaner will require a greater effort, as recommended by the T&E network at European level, with a target of 80 g of CO_2 per km by 2020 and 60 g by 2025.

Attaining this target implies a strengthening of technology platforms at European level, but also of clusters between industries and research and development centres.

Europe is lagging behind the Japanese on hybridisation and has to redouble its effort if it hopes to keep pace with powerful players like China in the field of electric vehicles. Without a powerful industrial player in batteries, the employment expected from the electric vehicle sector may not materialise.

Mineral insulation materials

Employment in the tile and brick industry adds up to 84,300 people in around 3,000 companies.

All these materials suffered from the crisis starting in the second half of 2008 and went into recession at different rates:

- in response to the abrupt collapse of volume of sales, most players in the insulating materials sector reduced their production capacities by shutting down plants (Saint-Gobain in Ireland, Ursa in Hungary, etc.) and/or reducing employment (precarious and internal);
- the decline in the tile and brick industry accelerated from the second half of 2008.

According to Eurima[2], the employment impact, including in the building sector, is between 220,000 (application of the European Energy Performance of Buildings Directive, EPBD) and 550,000 jobs (with an extended EPB Directive).

The potential for job creation can be estimated to fall within a range of 2.5% to 20%, i.e. between 1,000 and 8,000 jobs for the mineral insulation industry, between EPBD and EPBD extended to all types of housing.

In the third phase of the ETS mechanism, baked clay products will not be entitled to so-called carbon leakage protection, unlike concrete products and mineral insulation.

Capital goods

In the European Union of 27, the capital goods or machinery and equipment sector included around 164,000 enterprises and employed 3.7 million people in 2006.

With added value estimated at 50%, machinery and equipment are still a key sector on lead markets for energy efficiency and environmental

[1] NB: The calculated impact is limited, to date, to vehicle production (direct jobs including parts manufacturers) and does not include the potential impact upstream or downstream from the sector.

[2] European Insulation Manufacturers' Association – i.e. manufacturers of glass wool and mineral wool – which represents two thirds of production of thermal insulation in Europe.

technologies. The share of services is increasing significantly.

The hypotheses that underpin employment potential are as follows:

- Germany (Europe's leading producer in the sector of mechanical and industrial engineering) will keep its 35% average share of added value until 2020. This coefficient will on the whole apply to the European Union of 27;
- Labour productivity will increase by 3% per annum (average for all sectors);
- There will be no major relocations to countries outside the 27 European Union states. The share of imports in upstream investments in both sectors will remain stable.

According to the McKinsey studies, the lead energy efficiency market, namely the market for innovative solutions for energy consumption or transformation, will expand by 13% per annum between 2008 and 2020. It presents a wide range of growth zones and development possibilities for enterprises in the sectors of machinery and electrical equipment.

As long as the European Union's share in global production remains constant and the conditions for greater labour productivity and regional integration exist, it will be possible to create 670,000 jobs up to 2020 in the two market segments studied, of which two thirds in the sector of energy production technologies and equipment.

The growth resulting from this intensive and intersectoral division of labour will represent a potential of 250,000 additional jobs, with the support of upstream investments by this sector and the services sector, i.e. potential for more than 900,000 additional jobs.

2. The impact of a European clean coal sector on the three pillars of sustainable development

Technologies for sustainable use of coal must be based on an optimal mix of clean coal technologies – advanced integrated gasification combined cycle (advanced IGCC), combined cycle and ultra-critical production, cogeneration (CHP) from coal – and carbon capture and storage (CCS) technologies. Implementing these technologies will make it possible to eliminate between 90% and 100% of CO_2 emissions from fossil fuel power stations. This supposes a considerable increase in research funding in order to set up pilot projects at national and European level.

In the area of CCS, the European Union has the aim of setting up and operating from 10 to 12 installations by 2015, at an additional cost of between €7 billion and €12 billion (€9.3 billion according to Eurelectric). A short list of projects will be published in mid-2010.

In parallel, there is a need to design and implement instruments and mechanisms for forward-looking management of the labour and competences dedicated to the coal technology value chain linked to CCS in order to facilitate social and occupational transition. Indeed, the ETP-ZEP platform does not take account of social and occupational issues.

The European ZEP technology platform integrating low-carbon technologies for coal-fired electricity production will have to involve trade union organisations in its governance system and take account of their evaluations and proposals in the work of its task forces.

The positive repercussions for European industry are related mainly to investments for the renewal of coal-fired power plants to include CCS. The Syndex scenario, a variation on the NSAT scenario, incorporates hypotheses for deployment of the ZEP platform, i.e. 80 GW by 2030 (24 for NSAT). This scenario counts on 79,000 FTE jobs per annum until 2030 for construction (in the equipment industry). For the operation of power plants and maintenance of CCS installations, the positive impact could amount to 13,000 per annum in 2020 up to 31,000 in 2030 (+ 6,000 to 15,000 for maintenance).

Jobs in the equipment industry would total 834,000 by 2030 with distribution depending on qualifications and the stages of the value chain: production, engineering and R&D, installation equipment and civil engineering.

Clean coal and CCS technologies will be very innovative and capital-intensive. Their implementation will necessitate new qualifications and competences at an unequalled level. To illustrate the scale of the phenomenon, it has been said that, for the United Kingdom, this will create a new industry of the size of the petroleum industry. This explains the need to launch major training programmes on an unequalled scale, to organise the improvement in qualifications, failing which deployment will not be possible and could largely slip through the hands of the European industry.

The three country studies, namely the examples of Germany, Poland and the United Kingdom, reveal that the large-scale development of CCS projects must meet certain requirements at local level in terms of regulations, financing and social acceptance.

Coal in Poland, major energy and social challenges

Coal is a key raw material for the Polish economy. Some 95% of electrical energy is produced from coal and the country's large reserves ensure its energy security and relatively low electricity prices.

Poland's energy sector is nevertheless confronted with sizeable challenges in the short term: meeting the obligations resulting from the climate-energy package, in particular for greenhouse gas emissions, and the need to modernise generating equipment that is more than 60% obsolete and to further develop this equipment to meet growing electricity demand.

The energy strategy developed by Poland in response to these challenges gives more than its due to the development of renewable energy and to nuclear energy. More than half the electricity produced in Poland by 2030 is still expected to be based on coal, but there are no plans for the large-scale development of clean coal technologies (IGCC, CCS, Oxyfuel). On the contrary, primarily for reasons of cost, the different electricity producers are expected to rely on supercritical- and ultracritical-circle combustion technologies.

The productivity of the Polish energy sector is not high compared to standards in force in western European countries so these different changes are expected to lead to a decline of nearly 50% in the need for manpower in power stations (around 14,000 people in 2030, compared with more than 30,000 today). In parallel, the decline in the share of coal in the energy balance and the increased efficiency of future coal-fired power plants are expected to have negative repercussions on demand for hard coal and lignite and therefore to result in a decrease in employment in these sectors.

A large part of such job losses could be offset by those created in the sectors involved in the renewal of generating equipment (equipment manufacturers, assembly, civil engineering and others). According to estimates, this process could lead to the creation of around 26,000 jobs per annum up to 2030. However, it is difficult to determine the percentage of these jobs that will be created in Poland and the percentage in other countries. That will depend to a large extent on the Polish government's capacity to develop a clear industrial policy capable of fostering the development of local employment in the sectors concerned.

United Kingdom: a clean coal industrial policy

Coal constitutes a key element of the country's energy security. The United Kingdom's objective as a coal producer is to stabilise production and guarantee the security of imports.

The very ambitious objectives in terms of reduction of CO_2 emissions (totally carbon-free electricity production by 2030) and the organisation of a regulatory framework offer interesting prospects for CCS.

The United Kingdom, which has substantial advantages for the deployment of CCS technologies - an industry present throughout the value chain and considerable storage potential -, has the ambition of assuming leadership in these technologies and thus generating new jobs. To do so, the government plans to build four commercial-size (300 MW) demonstrators, while the industry and trade unions propose to develop such projects at all power stations.

In terms of jobs, the construction of the four demonstrators is expected to create 8,000 jobs a year from 2010 to 2020, and the general introduction of CCS in all generating equipment between 2020 and 2030 could create 17,000 jobs a year.

Taking account of the possibilities created for export by British companies, the government estimates the employment potential to 2030 at between 30,000 and 60,000 jobs a year.

The construction of a CO_2 transport network and the management of storage (to treat emissions from coal-fired power plants but also from other industrial emitters) could create 20,000 jobs a year for ten years in construction and 10,000 jobs a year in operations management.

However, given the many challenges that Britain's energy sector must meet, companies could have difficulty recruiting or training the necessary staff. In that case, all the technologies would be faced with a downturn in activity, which could have harmful consequences for the development of CCS, making it less attractive than nuclear or renewable energy. Shortfalls are anticipated in areas like science, technology, engineering and mathematics (STEM), but could also emerge for management positions, which help facilitate the change of culture and functioning of enterprises.

The main difficulty for implementation of CCS can be ascribed to the negative image of coal exploitation (an old and polluting mode of electricity production), which creates opposition to new constructions. Most players (electricity producers, equipment manufacturers, public authorities) recognise that a real effort needs to be made to inform the public about these technologies.

Germany: The Clean Coal technology and its perspectives on employment

The public debate on Clean Coal-technologies in Germany (CCS) started in 2003/2004. Only recently in 2008, Vattenfall launched the first CCS-pilot plant “Schwarze Pumpe” in the eastern parts of Germany, with a capacity of 30 MW. Other CCS-demonstration projects are in the planning phase and will by operated by RWE or Vattenfall.

The situation of the German energy sector is characterized by almost 47% of energy production in 2007 based on energy generation from lignite and hard coal[3] and the decision on the nuclear phase out. Therefore all scenarios for the future energy mix in Germany include a significant role of coal in energy generation. The German government and the large energy providers see CCS as a transitional technology to effectively reduce CO_2 emissions in coal fired power plants in order to make the use of coal “cleaner”.

The study’s main objective was to evaluate employment effects resulting from a deployment of CCS-technologies in Germany. According to two different scenarios for Germany developed by Prognos, the net employment effect for a fast introduction of CCS is expected to be positive with an increase of either 76.000 employees in scenario 1 or 102.000 employees in scenario 2 for Germany.

The German government, trade unions and the industry generally favour a rapid introduction of CCS, while the general public is only vaguely informed about this technology. The German trade unions IG Metal, IG BCE and ver.di commonly support research and development on CCS in Germany and consider CCS as solution to make coal “cleaner”. At the same time they assume that CCS may prevent the relocation of energy-intensive industries from the production site Germany and forecast a potential positive employment effect resulting from the introduction of this technology.

The current debate on CCS has gained public attention with the reading of the draft act on capture, transport and permanent storage of carbon dioxide, which was initially scheduled for June 19, 2009 in the German Bundestag. However, due to a public rejection of CO_2 storage and increasing pressure on political stakeholders in Schleswig-Holstein, the act was

[3] German energy mix in 2007: 23,8 % lignite, 22,8 % hard coal, 22,1 % nuclear, 12 % natural gas, 14 % renewable energies and 6.3 % other energy sources.

postponed and will be discussed by the new German government from October 2009 onwards.

However, the introduction of Clean Coal technologies in Germany faces three main uncertainties. The first problem is the lack of public acceptance of Clean Coal. Second is the unclear political framework in Germany which can only be removed by a new attempt for legislation. Third problem are the costs linked to the introduction of CCS. So far there is no clear decision on who will finance the additional costs. In Germany Costs for constructing new CCS-power plants or retrofitting existing power plants are estimated at 500 million € to 2 billion € per facility. In addition, costs for capture, transport and storage of CO_2 are estimated after a learning phase to 30 €/t CO_2 for lignite and 48 €/t CO_2 for hard coal, in new CCS-power plants. All of these costs indicate that rising costs for electricity generation are possible which might have an effect on electricity tariffs in Germany.

The new ETS is an important factor of influence. CCS might be economically feasible, if costs for CO_2 certificates correspond to costs for capture, transport and storage of CO_2.

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