Energy challenges for Europe to 2010; How to improve European competitiveness?

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1. Summary

Arcelor is a major industrial player, based in Europe but competing on a worldwide scale and constantly challenged by long-term investment decisions. For Arcelor as for all groups meeting this description, competitiveness is a key deciding factor. And of course, for Arcelor as for our peers, competitiveness can only be understood as that which contributes to Sustainable Development.

Within this context, the competitiveness and sustainability of energy supply is an increasingly relevant issue. Furthermore, one cannot separate considerations on energy supply (and use) from the global issue of how to address climate change. Arcelor competes for Raw Materials with the Energy industry, produces energy through its operations and classifies as a heavy energy-consumer. On all fronts, therefore, the competitiveness of European energy supply and the role of Energy in sustainable development is a real concern to our Group.

Europe is facing significant challenges in this arena, due to the need to balance short-term market issues with long-term environmental concerns and due to its reliance on external supply in a context of increasing demand from developing economies. A coordinated approach will be needed to face these challenges, to develop a real long-term strategy, with strong collaboration between the public and private sectors. Involving consumers in a market-segmented model will be essential, and increasing awareness about individual contributions to activate both demand and supply levers is increasingly necessary.

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We ask the Commission to continue playing its role, ensuring the framework in which European companies can compete, and we look forward to building on the important role we have long assumed in contributing to Sustainable Development in this area as others.

2. Energy is a key challenge for the European Union for the 21st century.

As already pointed out by the European Commission, the European Union is consuming more and more energy, leading to a growing dependence on imports, which is a structural weakness. Imports currently cover 50% of the Union's energy requirements, and over the next 20 years, the share of imports could grow to represent 70%.

This trend is especially worrying in the present context of a tightening supply/demand balance for oil, which pushes up the prices of all other primary energy sources. At the same time, demand for scarce energy resources is increasing (amongst others, from fast-growing, low-cost competitors), rendering long-term availability and competitiveness of energy products a tougher and tougher equation to solve. Finally, these trends take place in a context of global concern about climate change, significantly impacted by methods and practices of energy production and consumption.

As an example of present and future magnitudes, China, with a reported GDP share of only 4% in 2002, already represents 12% of the world's total primary energy supply and 11% of the corresponding electricity consumption. And, for the 20 years to come, the Chinese Government plans to invest new power plants for a total capacity ranging between 600 and 700 GW, which is nearly equivalent to the present net power capacity of the EU 25.

The European Union will also be obliged to invest substantially and successfully in energy over the next 20 years, while never losing sight of the quest for eco-efficiency:

- In electricity, both to replace existing plants and to meet increasing demand (between 200 & 250 GW in each case?)
- In natural gas infrastructures, especially to satisfy the requirements of new Combined Cycle Gas Turbines.

For both energy markets mentioned, market liberalization has led to significant changes geared to greater competition in supply. The question

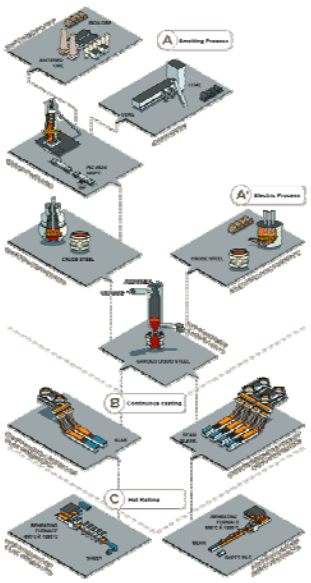
we raise now is whether these markets as currently operating are adapted to the long-term needs of large European consumers competing worldwide and facing global environmental challenges, such as steel?

3. The Steel industry plays an important role in the energy market, being at once a significant consumer and a producer

To produce crude steel, the two main routes start either from iron ore with coal used as reducing agent: the smelting process using blast furnaces or with steel scrap being melted and recycled in electric arc furnaces: the electric process.

Steelmaking process: the 2 routes

Comparison of energy consumption per ton of steel			
	Unit	Smelter process	Electric process
Coals+coke	kWh/t	5 800	130
Natural gas	kWh/t	310	420
Power	kWh/t	300	650



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Thus, the Steel industry is closely linked to the Energy Sector, in that:

- Both Steel and Energy industries share Coal as a raw material. In a way, coal gasification is one by-product of the conventional steel process.
- Steel produces energy, both through its coke-oven gases, used to substitute natural gas as a heating fuel, and through its blast furnace

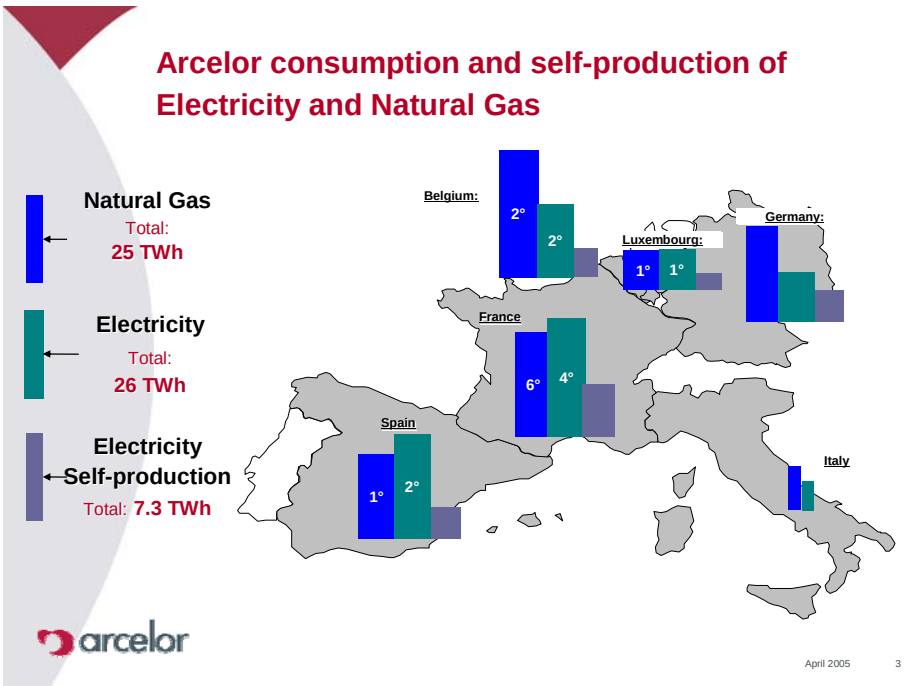
gases, used to produce electricity in dedicated power plants.

- The steel industry is amongst those consumers contributing to optimize the use of baseload capacities: steel plants run 24 hours a day and 7 days per week, without seasonal or peak/off-peak imbalances.

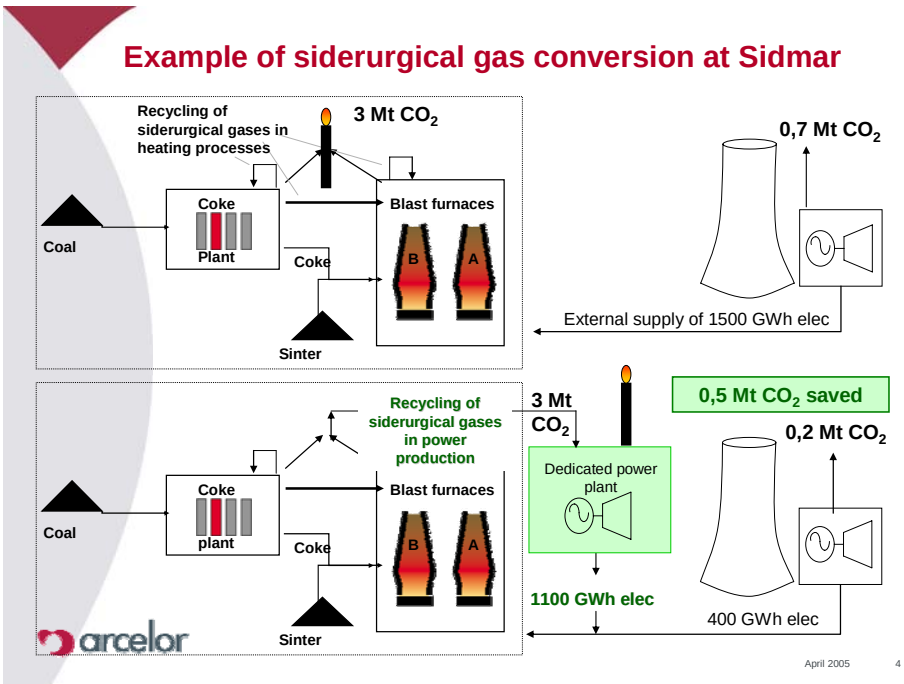
- The steel industry is a "heavy user": on the one hand, via its electric arc furnaces and, on the other, via the downstream mechanical transformation processes (hot and cold rolling mills, etc…): with about 100 TWh/yr electricity consumption in the EU 25, steel needs represent 10% of total industry needs.

Arcelor, the reference steel maker in Europe, is also an important energy consumer (even excluding coal consumption as a Raw Material), with more than 50 TWh yearly needs, to be split roughly 50/50 between natural gas & electricity. Excluding energy and utilities companies, we are ranked Number 1 or Number 2 consumers of Natural Gas and Electricity in 3 countries (Spain, Belgium and Luxembourg), we are amongst the biggest in France, and we take a significant share in Germany as well.

In total, Arcelor power requirements in Europe represent the equivalent production of three 1000 MW nuclear plants. As for Natural gas, total requirements amount to 25 TWh/yr, the same order of magnitude as electricity consumption.

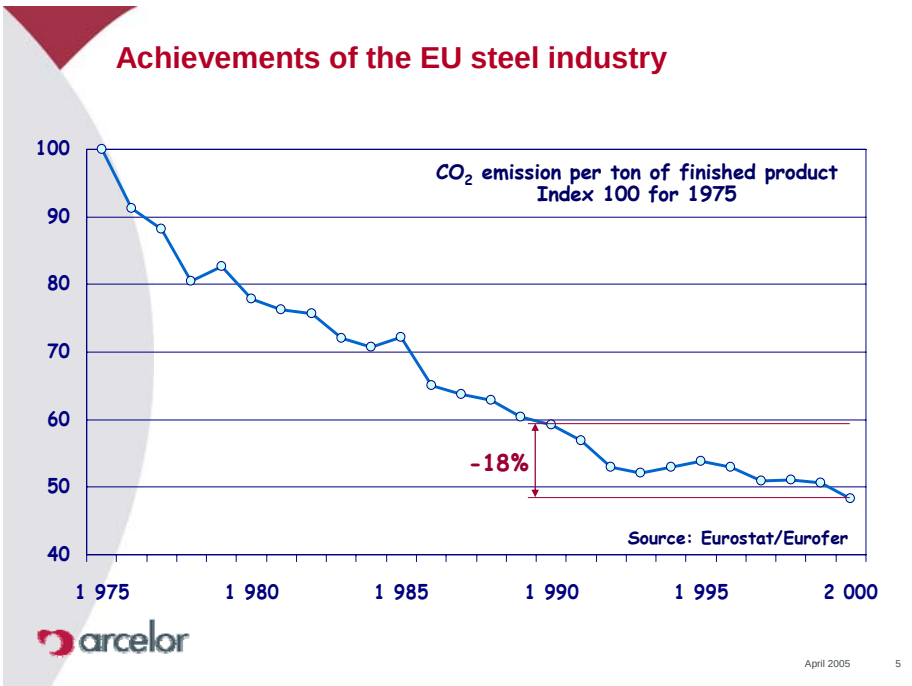


To cover at least partially these needs, Arcelor generates its own power from the coke oven/blast furnace/steel shop gases produced by the plants, generally through a tolling contract with an energy supplier. Self-produced power represents 1/3 of Arcelor power needs, almost the equivalent of one nuclear plant production.



Re-using steel manufacturing gases – thus reducing their release into the environment and, at the same time, reducing consumption of scarce resources in the form of energy – is a relevant consequence or example of Arcelor's commitment to Sustainable Development. And Arcelor's commitment mirrors that of the steel industry in general.

The Steel Industry – like all of Society – is faced with the challenge of Global Warming, which will demand from every economic player that it contribute to the reduction of greenhouse gas emissions, mainly of CO_2, at a drastic level. This is not yet a challenge for the very near future, which is dominated by the Kyoto protocol, but what is likely to be required in the post-Kyoto future. Note that already, over at least the last 30 years (i.e., before greenhouse gases became a household word), steel mills have continuously and successfully invested to significantly reduce the environmental impact – including raw material consumption – of their operations... to the extent that we are actually reaching the technical limits of further progress! For example, amongst other operational levers, one of the major drivers has been the migration of production from Blast Furnaces to Electric Arc Furnaces using recycled scrap. Given current recycling rates and technical considerations, it is almost impossible to go further.



The steel industry has been able to undertake these efforts due to its long-term perspective: Steel, like the Energy sector, is a capital-intensive industry. Note that, depending on the definition used, investment in environmental protection can be estimated between 5 and 15% of total capital expenditures to improve individual operations by the steel industry. And to illustrate orders of magnitude, note that when we decide the refection of a blast furnace (~150 M€) or to build a new steel shop (~230 M€) such as that being constructed in Charleroi, Belgium, we make a commitment for the upcoming 20 years. This is why, to continue investing in a European industrial base, we need long-term visibility in a transparent and competitive environment.

4. Is the European market adapted to the needs of European industrial leaders such as Arcelor?

As all markets, the Gas industry might be open to optimization. However, Arcelor at least has managed to work with its suppliers in a context of transparency, covering its long-term risks. Therefore, we are not able to provide specific recommendations, and we prefer in this article to concentrate on the Electricity market.

Regarding electricity market liberalization, the initial phase (2000/2002) did in fact improve European competitiveness. The restructuring of the German electrical industry has been a good example of the positive effects of market drivers.

However, we are still quite far from the final target:

- The European market remains fragmented with national sub-perimeters keeping their specific legislation and competitive environment. Cross-border congestions further help to maintain this situation
- The proposed market model, with a unique price reference based on spot prices, does not acknowledge the services brought by industry to the power system (long term commitment, stable consumption, peak shaving, etc…)
- There is neither visibility nor transparency on this market, which does not favor the development of win-win customer/supplier relationships. Firstly, until recently, only 3 years max contracts were proposed. Secondly, frequent distortions have been observed between market trends and the evolution of fundamentals: year-ahead prices affected by day-ahead peculiarities, etc…

In the absence of real competition on a European scale, prices systematically align on the (higher) marginal plant costs, which gives little incentive for the power companies to invest. Short-term views may prevail, incurring important risks:

i) Excessive caution in new investments will inevitably increase the risk of capacity shortage
ii) Preference for technologies with lower investment cost but higher operational costs may deteriorate long-term competitiveness.

Obviously, therefore, the European Energy market requires further improvements.

5. Arcelor is a long term actor on this energy scene and shares key challenges

Further improvements in the European Energy market must address the issues raised through the current implementation of existing models, while taking into account long-term needs, not simply of energy supply but in terms of sustainable development.

Arcelor might serve as a case in point of the many ways to address sustainable development challenges on the energy side. Firstly, we might recall that because of the steel industry's long value chain and the specificities of its industrial process, Arcelor uses several levers to optimize its energy consumption and production profile. However, this article represents neither the time nor the place for further detailing how far the steel industry has renewed its operating facilities and rebuilt a modern and efficient industry, lean in its use of energy and raw materials.

We prefer to insist here on the fact that sustainable development is everyone's concern, not only a matter of industrial processes but of a global commitment to integrating economic, environmental and social concerns in policies and practices. In this context, we will remind our readers of steel itself's powerful contribution, as reflected in Arcelor's by-line and driving objective: *steel solutions for a better world!*

Steel is an ecological and innovative product contributing to improve living standards. Highly recyclable, steel is a unique material due to its consumer- and environmental- friendly properties. Arcelor has committed itself to implementing a full-scale sustainable development policy building principally on the skills of people and the properties of steel. In its core industrial processes as well as in its key market segments (namely, automotive and construction), Arcelor's specific policies and practices facilitate its steels' contribution to sustainable development. We find worth detailing some results below, because they are examples of collaborative innovation to face energy issues.

Automotive sector: Arcelor is the worldwide leader in delivering high-standard and quality products to the Auto industry, which is addressing an important issue in its attempts to **reduce fuel consumption and decrease cars' CO_2 emissions**. Of course, steel, which represents nearly 50% of the weight of a car –and much more in the so-called "body in white" part-, could not remain passive in the face of this challenge, especially given the increasing number of cars worldwide. Thus, Arcelor and other steel makers have invested significantly and developed a renewed offer of steels contributing significantly to weight reduction in cars, allowing lower fuel consumption without sacrificing functionality, safety and aesthetics.

Specifically, through significant investments in R&D and continuous commitment, Arcelor and other advanced steel makers have developed high-strength steels which are not only 20 to 30% lighter than previous

products, but also allow for increased safety in case of collision, all while reducing costs for carmakers! Another success story are the so-called tailored blanks, which reduce overall weight while permitting reduced manufacturing time and operating costs by placing the needed steel in just the right place, according to safety requirements. Such examples, true for the auto industry, could be also applied to appliances or packaging, two big outlets of the steel industry.

Construction area: Steel has permitted **new building solutions**, a field in which a lot of progress can still be achieved to **reduce energy use and consequent CO_2 emissions**. Note that energy consumption in Buildings represents 46% of total energy consumption and is responsible for 25% of all CO_2 emissions (i.e., the same levels as industry *strictu sensu*). This alone shows the big challenge we are facing. Fortunately, after decades of "King Concrete", steel is coming back in the various fields of excellence of architecture and construction. Steel is a clean product, reusable, lightweight and solid. Recently the Millau Viaduct in France has demonstrated the many comparative advantages of steel in environment protection. More and more magnificent buildings worldwide use modern, aesthetical and very innovative steels, allowing both audacity and solidity.

Arcelor is developing a dedicated offer for Construction markets, thanks to global steel solutions aiming at environmental friendliness, reduced costs and significant energy savings. **This area still presents strong potential for new developments and solutions to address energy and environmental issues**, through so-called "energy positive buildings", using composite technologies, concentrating on insulation, ventilation and efficiency of heating and cooling systems or providing "intelligent" energy-producing façades and roofs. Both new and existing buildings should benefit from these new techniques and products.

Here again, steel shows its capacity to contribute to global challenges stemming from environment and energy concerns. That's why Arcelor supports multiple R&D initiatives in the Construction field, including a dedicated R&D lab in Belgium and a Foundation in France, together with Electricité de France, Gaz de France and Lafarge, with the goal to reduce the level of CO_2 emissions due to buildings by a factor of 4 by 2050.

New developments both for Automotive and for Construction demonstrate why, in the context of increasing scarcity of rare resources, the steel industry is convinced of its strong potential to contribute solutions, both directly and

indirectly. However, steel's properties are not the only asset required: to build solutions for a better world requires time as well as a citizen-minded attitude. Thus, steel can strongly contribute to reduce individual energy consumption and optimize the energy consumption profile of our developed societies, but efforts will require a coordinated approach over time.

6. Ambitious targets to meet global challenges require proactive, transversal collaboration

The steel industry assumes its role, not because it's mandatory, but because of its strong commitment to facing global challenges that require collective and anticipative answers. This is precisely why the steel industry has decided to launch a specific program focusing on the industry's own emissions (representing 6% of anthropogenic emissions in Europe, of which 2 Arcelor). The program is called **ULCOS**, for Ultra Low CO_2 Steelmaking, and it is part of a global initiative launched by IISI, the worldwide steel producers' federation. **ULCOS is the European program, aiming to reduce CO_2 emissions from steel production by 50% in the long run** (and 20% as an initial mid-term goal). This is an ambitious goal, considering past achievements: partially supported by the former European Steel and Coal Community, the steel industry has dedicated significant cash flow over an extended period of time to continuous technological improvement. We have been able to steadily decrease our energy needs by 48% and correlatively our CO_2 emissions by 62% over the last forty years. Trust us, this is a lot, so much so that, today, the steel industry is a victim of its own success!

As you might observe in the graph that we exhibited earlier, the trend in reductions achieved is leveling, illustrating the fact that we have come close to a physical limit, set by the fundamental constraints due to thermodynamics. It would therefore be vain to believe that it is possible to continue decreasing emissions at the same rate as in the past. Thus, breakthrough technologies need to be conceived and developed allowing for reduction of emissions over the next 20 years in line with society's expectations. It will be necessary to fundamentally rethink the use of reducing agents in the steel making process, with considerable impact on power generation and supply. This can only be conceived through very **long-term collaboration amongst various stakeholders**.

ULCOS is thus born. Arcelor leads the ULCOS project, but it involves a

large consortium of 48 partners that are not only steelmakers, but also research organizations and major suppliers of the steel industry. We consider this project to be one more example of strongly contributing to renew the steel industry and its energy profile on the long run.

Another positive example of transversal collaboration, to address the same context and with similar aims of sustainable development, is the recently launched **Steel Technology Platform**, supported by the European Commission. This Platform, part of the Commission's policy to promote European industrial development, involves the whole of the European steel sector as well as suppliers, customers, the R&D network, Member States and representatives of Trade Unions. The Platform will go far beyond the ULCOS project. Its goal is to promote and develop the unique advantages of steel in construction and transportation as well as in terms of recycling. This will involve not only developing new processes, but also **supplying new steel solutions and optimizing recycling and reuse**, including the powerful Life Cycle Assessment along the steel supply chain. Here again, Arcelor will of course play a big role.

Examples of initiatives such as ULCOS and the European STP illustrate the fact that **when speaking of energy and sustainable development, one must think long term, and one cannot limit the field to either the supply or the demand sides**. Consider that efficient automobiles and buildings could balance any increases in consumption by an **improved energy consumption profile of our developed societies**. To address climate change and energy challenges, we need to find eco-efficient solutions across markets, taking into account full life cycles. In all cases, Arcelor has the firm intention to be an active player over the very long run, as a clear commitment to promoting a modern and state-of-the-art industry in Europe. This battle will be shared in common with other European stakeholders including governments.

7. Europe needs to anticipate the structural changes of the worldwide energy market to sustainably develop competitiveness

Industries, consumers and states share an interest in sustainable European competitiveness and consequent development. This ideal is expressed through initiatives such as those Arcelor has detailed herein and has been formalized on the European level in the Lisbon agenda. Obviously, relying on a competitive, long-term, eco-efficient energy supply is part and party to

any progress. On the one hand, we observe a current focus on the market. Market liberalization can help to reach our shared competitiveness target, but only if we are able to **enlarge the scope to the whole European perimeter**, by developing interconnections and harmonizing rules on transport, balancing, etc…

Sure enough, this should help to reduce the market power of the major players while maintaining the economies of scale that are essential to long-term competitiveness.

However, **market rules have to be adjusted to an adequate market segmentation**: it makes no sense from any angle to apply the same rules to big industries competing on a global scale on the one side, and to the corner-store on the other side, especially if we take into account the "services" brought by big customers to the energy industry: long-term commitments, regular consumption patterns, peak shaving capabilities, etc…

Finally, to meet all our challenges, leaving it up to the market alone will not be enough, especially since Europe is and will remain an energy importer with increasing issues on security of supply.

As always, it is the EU Commission's duty to set the frame in which European companies can be competitive, and it is industry's obligation to proactively collaborate. To prepare the future, our shared challenge now is to **elaborate a real energy strategy for Europe**, taking into account short- and long-term, sustainable development needs.

This will require putting in place a pluri-annual investment process – exercised each year at the country level and coordinated at the European level – monitoring future supply / demand balance and taking into account the need for Europe to diversify its energy sources:

i) Present trends will inevitably increase our natural gas dependence, in a context of purchasing competition with faster growing areas (China, etc…)
   Therefore, we need to build an efficient "electric network" at the European level
ii) We also need alternative technologies achieving sustainable competitiveness with diversified and eco-efficient sources which cannot be limited to renewables: amongst other avenues to explore, if nuclear

energy cannot be the only solution to reduce our CO_2 emissions in the long run, it has probably an important role to play.

In setting this strategy, consumers will have to be involved.

Finally, shaping the future is also a question of acting on the demand side, and **all stakeholders need to be aware and contribute**:

- Industry has long demonstrated the ability to improve its energy efficiency and its flexibility: load management, peak shaving, interruptibility, etc…. Today, the potential for further optimization is limited
- Other sectors such as transport and housing show a much greater potential, which needs to be better promoted to make people aware of their role as citizens.

8. Conclusion

Today, most European energy consumers benefit from a high quality level of supply and all major suppliers have developed state-of-the-art technologies. But the growth of European consumption together with declining primary energy sources will increase our dependence on external energy sources, and this could prove a major weakness, sooner than might be expected, as competitor economies develop. At the same time, Europe must now prepare to face worldwide environmental challenges extending far into the future.

Promoting a real and efficient market on a truly European scale should help improve our competitiveness and prepare our sustainable development, but we are not there, yet. In the meantime, industrial segments facing global competition are concerned about the present market model, focused on the short-term and giving little visibility on sub-markets with limited competition. A market segmentation is necessary, acknowledging the specificities of big industrial consumers and providing long-term visibility in a competitive and transparent environment.

For products such as natural gas and electricity, which require major infrastructures and a perspective on the 20-year horizon, market liberalization cannot be the only answer to the upcoming challenges. **A coordinated strategy at both country and European levels is necessary** to:

- Anticipate growth
- Diversify our energy sources & technologies
- Reduce the necessary investments by promoting energy efficiency in sectors with bigger potential than industry, such as construction and transportation.

For all of the above points, a proactive and in-depth collaboration between industry and the state, with piloting at the European level, is key.

Major players such as Arcelor are willing and able to contribute. **The steel industry has demonstrated and continues to demonstrate its efficiency and its innovation capabilities** – both to improve our own energy consumption and environmental impact and to introduce new solutions that indirectly achieve similar goals. For the latter, consider our examples of weight-reduction for the Automotive industry and energy-efficient buildings in the Construction field.

Our objective is to further develop steel in Europe, and we understand that this is only possible while developing European competitiveness, within the framework of sustainable development. Therefore, Arcelor numbers itself amongst the necessary participants – interested parties to be found at the individual, industrial and state levels – who should and in fact do proactively address energy challenges. In a nutshell, we are promoting **transversal collaboration** with a **long-term perspective**, to elaborate a **true strategy** focused on both needs and impacts, **coordinated on a European scale**.