

# Energy, sustainability and European competitiveness

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There is a growing consensus on the lack of sustainability of the current world energy model, due mainly to three concerns:

- its environmental impact,
- the diminishing availability of lasting, dependable and affordable energy sources,
- and the lack of a reasonably fair universal access to modern forms of energy supply.

Although there may be answers to these problems, both from a technological and political perspective, the measures required may have a number of negative impacts on competitiveness, since they may rise the production and compliance costs of firms. These might even change their location to other countries with less strict environmental regulation and therefore increase the global environmental or social impact. Whereas some reports show that economic development is generally good for competitiveness and also the environment, and therefore these measures might go hand in hand, the problem of how to jointly meet environmental, social and economic objectives is still difficult to solve.

In order to provide some clues to address this problem, a group of international experts met in November 3<sup>rd</sup> and 4<sup>th</sup> in Chinchón, in a meeting organized by the BP chair on Sustainable Development of Universidad Pontificia Comillas, with the collaboration of the Spanish Energy Club. The major findings and conclusions of this meeting are presented below.

## **1. Sustainability problems of the present energy model and identification of plausible scenarios**

Both the “World Energy Outlook 2004” prepared by the International Energy Agency and the “Scenarios on key drivers” from the European Union DG TREN put forward serious concerns about the sustainability of the current world energy model. Global energy demand is expected to grow at about 1.7% annually, and most of this growth will be absorbed by natural gas, coal and oil. Therefore, the world will become more and more dependent on fossil fuels. Most of the growth (two thirds of it) will take place in developing countries. And due to the reliance on coal of these countries, growth in carbon emissions will outgrow the growth of energy. Carbon emissions will be by 2030 60% higher than in 2002. Only the European Union will be able to reduce them in the energy sector beyond 2030, thanks to the expected contribution of renewables. These

figures are clearly below the modest Kyoto objectives, which are meant to be only a first step, clearly insufficient, to manage climate change.

Oil prices will probably stabilise at 22\$/bbl, but will slowly increase due to rising oil demand, led by the transport sector (especially in the OECD), and the decrease in new oil discoveries. Oil trade will double, and most of it will have to go through vulnerable shipping lines, what may have implications for security of supply.

Coal will remain important; almost a 25% of the world energy needs (mostly in developing countries, China and India). And natural gas will grow fast to become the second most important fuel after oil. In addition, its markets will become increasingly linked through liquefied natural gas, LNG.

In Europe the panorama is also rather bleak: energy demand grows, although at a lower rate (about 1%), but primary energy production declines steadily, so imports of fossil fuels increase significantly. Oil remains the main fuel, although its consumption stabilises, and it becomes a sector-specific fuel, mostly used for transport. Gas becomes the key fuel, in that some 80% of the incremental energy consumption to 2030 will be met by natural gas, and it will represent more than 40% of the capacity of electricity generation. Renewables will also grow fast, but they will fail to achieve its targets (12% of the total primary energy demand by 2010). Indeed, biomass, which should play a predominant role, does not appear very much in any scenario (this may change with the new agricultural policy). Nuclear declines and coal comes back around 2020. Carbon emissions will stabilise around 2010, but they will increase again far beyond the current climate targets (14% higher in 2030 than in 1990<sup>1</sup>).

Alternative scenarios show that these trends may be softened with extensive support to renewable energy sources, standards and measures for energy efficiency, accepted advanced nuclear technologies for electricity generation, and new standards and fuels for transport. Then, import dependency might be reduced, as well as carbon emissions and transport problems. However, these strategies require large investments and imply more reliance on gas and significant stranded costs because of underutilised investments that have already been incurred.

So it seems clear that the current energy model is not sustainable. Uncertainty must be reduced, and markets have to be reconciled with long term public policy aspirations. More vigorous policies are needed, well beyond considered scenarios, with technology breakthroughs promoted by specific programmes. And these strong policies require a strong institutional capability, which has not been achieved yet.

Specifically, the key energy policy challenges for the EU are:

- Security of supply, due to the growing dependence of gas and oil imports, not only concerning volume but also their geographical concentration (Russia will play a key role in this aspect because of its large gas supplies).

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<sup>1</sup> In March 2005 new CO<sub>2</sub> emission targets have been set by the European Council: a reduction of 30% in 2020 with respect to the 1990 level.

- Escalation of carbon emissions, which cannot be reduced by the increasing utilization of renewables because of the still poor performance of the support policies.
- High uncertainty about the future of nuclear: a phaseout (proposed by relevant sectors of society) would have large negative effects on carbon emissions and import dependency.
- Continued growth of road and air transport, with their associated congestion and air quality problems.
- The gap between public policy aspirations and current market trends: markets invest in technologies with minimum capital cost, and do not internalise long term public policy objectives; on the contrary, they consider them a source of high uncertainty and prefer to delay the required investment actions.

In addition to all this, there is an additional challenge: to provide energy for poverty eradication. There are still more than 1.6 billion people without electricity, and when the access exists the quality of service is frequently very low. This is not only an energy problem, but also a water supply, biodiversity, agriculture and health problem, since all of them are related to energy, and therefore the problem cannot be solved in isolation. Power sector reforms have usually left this issue aside, and have had either neutral or quite negative impacts on this issue, by reducing access to the poorer segments of the population. Reforms have to include an explicit dimension in favour of the poor, so that their demand for electricity is considered and the required financing is guaranteed.

## **2. An assessment of the potential of alternative schemes and mitigation measures**

There are several answers to the problems mentioned above, from many different perspectives: technology improvements, measures to improve energy efficiency and savings, public education and awareness of the impending energy crisis, renewable energy support and integration of all the previous measures into a coherent energy regulation framework. In order to use these responses efficiently, they have to be integrated considering simultaneously the technology perspective, the socioeconomic trends and the economic consequences, both within countries and among countries and generations. Unfortunately, many energy policy decisions are usually made looking at the short term only, following routines or responding to emergencies, and without due consideration to all aspects concerned. On the other hand, we have to think mostly with a long-term perspective, because of the large inertia that is characteristic of energy systems. And we must also take the debate to less ideological grounds, by providing quantitative assessments of any proposals and decisions, as far as possible.

We should also agree on the solutions, because conflicts between countries and between levels of government are costly. And we must rely on the market, incorporating to it the incentives and correction measures that guarantee the achievement of public policy aspirations.

Concerning technological solutions, the obvious mitigation technologies are those that reduce energy consumption and environmental impact:

- Energy efficiency and rational use of energy.
- Renewable energies.
- Combined heat and power.
- Waste incineration and gasification.

The uncontrolled increase of energy demand due to economic growth and waste of energy may neutralise all the efforts in emissions reduction and introduction of clean energies. It is urgently required to decouple as possible the current almost-automatic association of energy demand and economic growth, through new technologies and measures for energy efficiency and savings, with the approval and cooperation of the society. Although there is no consensus on the specific amount of energy savings which might be achieved, different estimations conclude that they may be very significant, and therefore that the effort may be worthwhile. According to the European Union Green Paper on Energy, there is a savings potential of 18% of the current consumption. The European Environmental Agency estimates an economic potential of a 20% saving within the EU-15, and even larger with the enlargement.

Increasing efficiency in coal conversion for example is a very profitable measure: just an increment of 1% in efficiency reduces 3% in emissions. And coal is a very common technology. China for example is building 40 GW of coal power plants with old and dirty technology. A generalised improvement in this technology would reduce emissions significantly.

The potential of renewable energy sources varies a lot depending on the specific estimation, although most references judge that renewables may be an essential component of the future energy mix. However, even optimistic projections provide small future reductions in import dependency and carbon emissions. For example, all the renewable energy expected for 2030, if used to produce hydrogen, would only suffice to fuel 10% of the world's cars.

The nuclear option has to be seriously evaluated. Nuclear may be competitive, depending on the assumptions. But the real question is not the cost, but the financial risk (associated with building times and licenses required) and also many other problems it has to overcome: safety and proliferation (this issue may not be critical for developed countries), waste and, especially, public acceptance. The answer to waste and proliferation may be closed cycles. Deep geological storage is also an option -although there is no broad consensus about its advantages- if communities are involved into the process through education and transparency as is the case in Finland and France. Another issue is whether the large investments required by the nuclear technology may distract necessary funds from renewables, which may be a more promising alternative.

As for carbon sequestration and separation technologies, they are costly (costs are estimated at about 80-100\$/t of CO<sub>2</sub>) and they are capital intensive. There are also problems of availability and stability of storage. In addition, they are only a valid option for point sources, which are not the major carbon emitters.

Many of the problems related to some technologies might be solved with more R&D efforts. However, liberalisation is reducing private R&D and focusing it on short-term

objectives, such as internal combustion engines and gas turbines. Public R&D is also being reduced (with most of its budget going to nuclear). It seems then that there is an overall reduction in R&D at a time when innovation is clearly needed.

It also has to be remarked that many times the problem is not in developing the technology, but in implementing it correctly; a problem of social engineering. This requires regulatory measures, such as market mechanisms, fiscal measures, institutional programmes and social motivation measures. What has been proved by past energy crises is that the price system is much more powerful for technology changes and energy savings than other policies, such as information or education. Of course, this will vary depending on the country and its institutional and cultural framework.

All these measures will imply costs for the society. These costs will depend on timing and goals. Benefits may also arise, such as those coming from technology transfer.

### **3. The European energy policy**

The first thing to say is that there is not a European energy policy, but rather several policies which impact on the energy sector. They have been described in the Green Paper for energy, as well as in the White Paper on Transport. There are initiatives, directives, targets for cogeneration, for renewables and emissions trading; but frequently they are not fully consistent. Hopefully this may change with the approval of the European Charter, in which the European energy policy is firmly established.

What does exist, however, is a legal framework for the largest integrated energy market in the world, although still with some problems:

- Regional markets are not liquid or robust enough due to the lack of interconnections.
- The competition rules have not been applied always in the same way in all countries, what creates market distortions.
- Cooperation with neighbours has not always been appropriate: sometimes the EU seems more interested in keeping existing monopolies than in creating efficient markets.

The major energy policy objectives of the European Commission are:

- to increase fuel diversification in electricity generation and transport,
- to reduce the environmental impact of energy, mainly through energy savings, and
- to strengthen the role of the EU in the world, regarding energy matters.

It is generally agreed that these objectives -and European policy in general- are right the problem is the lack of strength of the policies. More efforts are needed to have a stronger institutional background and to involve the public. A constant dialogue among national governments and EU institutions is required to inform the public adequately. The Green Paper has been a valuable effort, and most of its conclusions are still valid,

although the rapidly changing situation may demand a quick update. However, we do need a White Paper on Energy.

#### **4. The US energy policy**

As the EU, the US do not have a true energy policy. Its goals are very similar to the European ones:

- to increase security and reliability of energy supply,
- to be consistent with environmental protection goals, and
- to promote international cooperation.

But the implementation of these goals has been episodic and in response to energy crises rather than sustained policy initiatives. There are regional conflicts (there are large differences between producing and consuming states), also between state and federal policy making. The federal government has relatively limited jurisdiction, and recently states have taken the lead in energy and environmental policies: they have some climate action plans, renewable promotion schemes, standards for vehicle emissions, etc. Also now energy policy is much more politically and ideologically driven. All these, together with the fact that policy goals are often unrealistic, usually end up with second or third-best policies which are costly and inefficient.

So the US faces significant challenges in the energy field:

- The most effective mechanisms for reducing demand (higher prices) are politically disadvantaged,
- Strong interest groups present powerful opposition to alternative policy options, such as
  - o tighter vehicle standards,
  - o expanded drilling for oil and gas in Alaska,
  - o expansion of renewables support and tax subsidies, or
  - o construction of new nuclear plants for electricity generation.
- Political support for serious controls on GHG emissions is growing, but still faces significant opposition. Still a cap and trade mechanism will probably be established in the next years.
- International cooperation initiatives have been undermined by recent developments in the Middle East.

#### **5. Implications of European energy policies on the industrial sector**

European energy and environmental policies may have a large impact on its industrial sector, by raising production and compliance costs of firms, and especially by affecting sectors with substantial export markets. This may be true even within Europe, for example with the recent Carbon Trading Directive, whose impact on different countries is not uniform. Therefore, there is a fear that companies may be forced to relocate their activities.

European industries are certainly worried about rising energy costs (or better, about higher-than-world-average costs). There are neither price reductions nor convergence of prices among EU countries. Many observers think that the market is not functioning

because there is not a real market (no interconnections, no real unbundling and the possibility for exerting market power). In addition, legislation in Europe is among the most stringent in the world, and legislation implies costs, as market distortions do.

European industries request that energy and environmental policies should be harmonised across Europe, and regulation should be improved, not extended. A wider use of market mechanisms and voluntary agreements should be sought.

Anyway, it seems that these fears may be excessive. Some studies show that the impact of environmental regulation on competitiveness may have been overstated, except for some specific industries (iron and steel, refineries or cement). In fact, the impact may be even smaller than that of the variation of exchange rates.

In addition, there is the growing realisation that strict discipline in environmental and energy issues may provide for competitive advantages by stimulating innovation. However, that has yet to be proved.

The key issues therefore concerning European industry competitiveness are related to the improvement in the functioning of the markets. Aspects such as market integration, better regulation of natural monopolies and market power, or the integration of environmental considerations through market mechanisms, should be the ones to be addressed by policy-makers in order to guarantee competitiveness.

## **6. Policy recommendations for a sustainable energy future**

We have seen in past sections that there is a need to change the current energy model and to make it more sustainable. This action must be quick and strong, and also capable of ensuring sustainability, while maintaining at the same time industry competitiveness, security of supply, and access to modern energy sources for the entire world population. However, current public policies are not strong enough, and they lack the internal consistency required to achieve such an ambitious objective. For example, the compromise embodied by the Kyoto Protocol, which is obviously a step in the right direction, is an order of magnitude lower than the one truly required.

Therefore, the first recommendation is to move up energy in the political agenda, to produce strong policies that are based on a solid institutional framework, and to integrate them as much as possible into the European and national legislative framework. To that end, clear strategic choices have to be made, public debates shall be opened in order to educate the population and set the guidelines to be followed in the most controversial issues, removing when possible the uncertainties, and using market mechanisms as much as possible for energy and environmental policy. More work is required on the European Green Book on Energy, to elaborate further these issues.

These strong policies require the involvement of all sectors of the society, and they also require a sense of direction. To that extent, a clear goal is required on which to concentrate efforts and wills. Currently this goal cannot be other than the fight against climate change, within which other partial goals may be incorporated, related to other factors that limit the sustainability of our model, such as the depletion of natural resources, security of supply, or lack of access to modern forms of energy.

In order not to affect competitiveness, this regulation should be as uniform as possible across Europe. To that end, those policies affecting the energy sector should be made consistent and harmonised at the national level. We need a common policy on energy and environment.

Therefore, the major lines of action of the European energy and environmental policy should be:

- Energy efficiency improvements, especially in buildings and transport: the decoupling of energy and economic growth has to be deepened.
- Increase of market integration and competition, re-establishing confidence in the ability of the market to internalise sustainability issues. This may provide an excuse to revisit some aspects of market liberalisation.
- Development of the appropriate generation technologies, with more public investment in R&D: uncertainties suggest a portfolio approach, diversifying risk and therefore not rejecting any technology beforehand.
- Increase of energy diversification, with its associated political cooperation programmes with energy producing countries.
- Better education and communication to society on the implications of energy consumption and prices.

In all these actions, governments should act as facilitators, setting clear goals and the appropriate institutional frameworks, bringing stakeholders together and helping them to organise. Then the market should be left to its own through a regulation which internalises social and environmental costs adequately, thus correcting market failures and reconciling liberalisation and sustainability.

Regarding the practical implementation of these policies, liberalisation may be considered a powerful instrument rather than a hindrance: liberalisation has opened up technology choices, supply opportunities, better linked gas and electricity markets, it has given more choice to consumers and it has increased transparency in the market. Liberalisation helps to achieve sustainability objectives at a lower cost by providing market mechanisms for implementing energy and environmental policies. These market mechanisms, and especially the price system, have proved much more powerful than other public policies for technology changes and energy savings. They should therefore be used extensively.

Also aid programmes for developing countries related to energy should be thought over again. Developing countries are faced with the double challenge of ensuring economic growth and at the same time improving living conditions for their population (facilitating among others a reasonable and dependable access to modern energy forms) and preserving the environment. Stronger, more sustained and more imaginative actions are needed, directly focused on attaining a global sustainable energy model. Social and environmental issues have to be looked at since the very beginning of the process. The promotion of universal access to electricity, the use of market mechanisms to internalise the use of natural resources, and the massive use, whenever possible, of renewable technologies should be part of this new approach. Optimal use of climate change

finance and clean development mechanisms should also be sought. Developed countries may contribute in several ways:

- Facilitating funds and political and regulatory support for the eradication of poverty and the increase of access to modern energy forms.
- Facilitating trade and investments to foster economic growth, in particular the expansion of energy production facilities.
- Translating the climate change prevention strategies into concrete actions to promote the availability of appropriate technologies and specific projects to facilitate sustainable development in those countries where there is more need for it.

Finally, since the problem of sustainability of the energy model is a global one, the approach for solving it should also be global, and therefore, while keeping or even strengthening the current European leadership in this issue, the US, transition economies and developing countries should be incorporated to the solution. We need to find ways to bring these countries aboard in a manner that benefits them. The US may be incorporated through international companies, whereas other countries may require some type of market mechanisms to get involved. It is required to incorporate explicitly the energy and global sustainability issues in the relevant international forums, and to create an adequate discussion platform from which advances may be made on the proposal of measures and on the collaboration for their implementation.