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**ROBERT SCHUMAN CENTRE FOR ADVANCED STUDIES**  
**Loyola de Palacio Programme on Energy Policy**

HOW THE EUROPEAN UNION IS PREPARING  
THE “THIRD INDUSTRIAL REVOLUTION” WITH AN  
INNOVATIVE ENERGY POLICY

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*How the European Union is preparing the “Third Industrial Revolution” with an innovative energy policy*

**ANDRIS PIEBALGS**

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The Loyola de Palacio Energy Policy Chair was created in October 2008 at the RSCAS in honor of Loyola de Palacio, former Vice President of the European Commission and Commissioner for Energy and Transportation in the Prodi Commission. It promotes research in the area of energy policy. It is funded by contributions from sponsoring companies and is directed by Professor Jean-Michel Glachant.

The Chair focuses on the connected fields of energy economics, energy law, energy regulation, energy geo-politics, and energy resources. It addresses topics including *achievement of the EU internal energy market; sustainable energy systems and the environment; energy security of supply; the EU model of energy regulation; the EU energy competition policy; the EU policy towards carbon free energy systems in 2050.*

This series of working papers aims at disseminating the work of scholars and practitioners on the above-mentioned energy policy issues.

#### *For further information*

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## **Abstract**

It is clear that we are at the beginning of what has correctly been called the "third industrial revolution" - the rapid development of an entirely new energy system. We can expect a massive shift towards a carbon-free electricity system, huge pressure to reduce energy consumption and transport on the basis of renewable electricity. To make this shift in a manner that maintains, and in fact increases the EU's competitiveness, means that stimulating rapid technological development in these areas has to be a central part of the EU's energy policy. Indeed, this is at the heart of the question: how can the EU turn the challenges of climate change and energy security into an opportunity?

## **Keywords**

European Energy Policy, Security of Supply, Climate Change, Low Carbon Economy, Strategic Energy Review, Technological Innovation





All human societies have faced energy challenges. No doubt each generation has felt that they have faced greater energy challenges than their forefathers. And yet today, few would deny that energy security and climate change represent the greatest challenges of this generation, together with poverty and peace. Were it needed, recent events have underlined the need for a European response to these energy challenges even more clearly. Over recent decades we have come to see cheap and plentiful energy almost as a right; practically an infinite resource. Right from the beginning of the industrial revolution energy has been cheap, and environmental issues resulting from energy use have essentially been local, not global problems.

In such a short time, how much has changed. The price volatility of oil over the last couple of years, with other energy sources following, have highlighted the fact that fossil fuels are a finite resource, and that much of them are becoming increasingly concentrated in few hands, a problem even for the EU that is situated within pipeline distance of over 70% of the world's gas resources. Indeed, the International Energy Agency has indicated that within a decade practically all the spare oil production capacity will be in the hands of a very limited number of suppliers. The recent price falls of oil cannot disguise the longer-term fact that we can no longer take for granted endless supplies of cheap oil and gas. The formation of a gas producer group underlines clearly a similar direction for gas as we have seen for oil.

### **Climate change as a threat and a barrier**

Climate change is a result of mankind's activity, and a threat to the wellbeing of practically all the world's population. Perhaps above all, we are realising that climate change is personal; it is a menace to the future quality of life of our own children and grandchildren.

But the real point is that these problems are just the very small tip of a very large iceberg. For hundreds of years human population has been growing exponentially, doubling around every 40 years. Until now the earth has been capable of supporting this growth, and our ever increasing demands on her resources. But with 6 billion people today we have already reached the point of quite literal non-sustainability today.

At the very beginning of the 21<sup>st</sup>. Century we have - for the first time in mankind's history - created a new geological age through our existence, what Nobel Prize winner Paul Cruzen has magnificently identified as the "Anthropocene". For the first time mankind's existence, the way we use the Earth's resources is having a fundamental and negative effect on the earth's basic physical cycles - the water cycle, the nitrogen cycle, the oxygen cycle and above all the carbon cycle. This, if we allow it to continue, will cause mankind to hit huge barriers that will cause enormous damage to our health, our wealth, and our ability to live in peace and prosperity.

And the fact that the way we live today is quite literally unsustainable is only the very beginning of the problem. The United Nations<sup>1</sup> predicts that global population will increase from 6.5 billion today by an additional 2.5 billion by 2050, with most of this growth coming from the developing world. With continually rising expectations of living standards across the globe, this means that to satisfy our demands we will have to produce a manifold increase in energy and goods in just a single generation. Somehow, we will have to do so in a manner that does not bring huge and irreparable damage to our planet, and prejudice the well-being of our children and grandchildren.

So, the first real challenge and responsibility of the European Union over the next decade is to face this challenge, to develop a society that is truly sustainable, to provide a model that the rest of the world can follow. We have to develop a society that uses the earth's resources in a manner that ensures the long-term survival of future generations and to do so in a manner that provides us increasing

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<sup>1</sup> Department of Economic and Social Affairs

health, peace and prosperity. This is a huge challenge; it will require major societal change; indeed, a third industrial revolution. But as we have seen with the debate on climate change, Europe is uniquely well-placed to take the initiative and to lead by example. Europe is in a unique position, historically, culturally, technologically and geographically, to set out a path for a long-term sustainable future.

### **A sustainable future for the EU includes a common energy security policy**

And recent events have also demonstrated so clearly the need for the European Union to develop a common energy security policy. It is impossible to overstate the importance of this. Guaranteeing secure and reliable supplies of energy for every EU citizen must be the highest of priorities at the national and European level.

It is, however, a simple fact that the gas and oil pipelines supplying the EU today have been constructed in the interests of energy companies, rather than with the guarantee of the EU's energy security in mind. Where energy security has been focussed upon, this has been at that the national, rather than Community level.

This must now change; the EU needs to ensure that infrastructure necessary to guarantee the short and long-term energy security of every single EU citizen is rapidly completed, together with that necessary to make competition for gas and electricity supplies a reality for everyone. The EU has to invest to protect its citizens, to promote their interests and rights, and to learn to truly "speak with one voice" on international energy issues.

Over the last 4 years the EU has begun the process of moving towards a sustainable, secure and competitive energy future. Indeed it has undergone an energy revolution. This can be seen not just in the policies that it has agreed, but the simple fact that for the first time in its history it has taken a conscious decision to collectively direct its own energy future, rather than simply leaving the market to provide its needs. I would like to take the opportunity today to reflect on what has already been achieved towards the creation of a new European Energy Policy and, probably more importantly, reflect on the direction that our energy policy will now need to take to meet the future, much greater, energy challenges that face us.

In fact the decision to begin this process began in earnest with the Hampton Court European Summit in 2005. The European Council, recognising the need to demonstrate that the EU's commitment to meet its Kyoto commitments is a practical and not a just paper one, and reacting to the fact that oil prices had risen to 70\$/barrel, called on the Commission to develop a new European Energy Policy with the three underlying goals of Sustainability, Security of Supply and Competitiveness. This has resulted in an unprecedented level of new Community measures, steered by the two Strategic Energy Reviews, the second one of which was tabled by the Commission in November last year, focussing on energy security.

### **The EU prepares its future with the 20-20-20 policy**

The first Strategic Energy Review focussed on what is now widely known as the "20-20-20 initiative" - that the EU should commit, by 2020, to: Firstly, reducing its greenhouse gas emissions by 20% compared to 1990 levels; Secondly, increasing the level of renewable energy from about 8% of its energy mix today to 20%; and Thirdly, making a 20% improvement in its energy efficiency levels - in other words, reduce its energy consumption by 13% compared to 2006.

In December 2008 the Council and Parliament succeeded in reaching agreement on concrete proposals to make this a reality, a remarkable achievement in a very short time.

Firstly, it has agreed a revision of the ETS Directive, providing clarity regarding the approach that will be followed for the period 2012-2020. The ETS mechanism is the foundation on which EU efforts

to reduce its greenhouse gas emissions is built; a trading scheme whereby industry has to acquire credits in order to emit CO<sub>2</sub>. This new proposal will provide a robust long-term approach, giving EU industry the transparency and predictability necessary to invest and lead over time to full auctioning of credits for the electricity industry. It provides a model for the rest of the world to follow; it is worth noting in this respect that the difference in GDP per capita between the poorest EU Member State and the richest is greater than the difference between China and the United States. If we can reach agreement on the concrete measures to address climate change, we should have confidence that a fair global agreement is equally possible.

Secondly, a new Renewable Energy Directive has been agreed, putting into effect the overall target of 20% renewable energy in the EU's energy mix and 10% of its transport fuel from biofuels by 2020 in the form of legally binding obligations on Member States.

It is worth reflecting on the level of ambition that this 20% target represents. Excluding large and medium-sized hydro electricity and biomass, all the efforts that EU countries have taken over the last decade to promote renewable energy - notably wind, solar and PV - has shifted the share of renewables in the EU's overall energy mix from 7% to approximately 8.5%. So in other words, to achieve the 20% target, the EU will need to install the same capacity of renewable energy that it has done in the last 10 years every single year for the next 12 years.

This is indeed ambitious, but it can be done; we know this seeing what Denmark, Germany and Spain have achieved in recent years. And at the end of the day the point is this; if we are serious about the 20% greenhouse gas reduction, if we are serious that we wish to increase our energy security, we have no option but to do this. This level of ambition will maintain the EU as the world's renewable energy leader. Already today, the push to renewable energy in Europe has created over 300,000 jobs in the EU in renewable energy. If we manage to maintain this momentum, and give real and committed support to technological deployment in this area, we can maintain our position as a world-leader in this area.

An additional element of the Renewable Directive concerns the need to support the development of alternative transport fuels. The Directive establishes a legal obligation on Member States to ensure that 10% of transport fuel comes from renewable energy sources. This has been widely understood to mean a 10% biofuel obligation, but in fact concerns either biofuel or, for example, electric-powered cars from renewable electricity. Achieving this will be a difficult but possible challenge. On the one hand, no single litre of biofuel sold in the EU should cause - directly or indirectly - hunger or rainforest destruction anywhere in the world. On the other hand, further strides are necessary regarding battery technology before electric vehicles are likely to gain widespread acceptance. I am committed to working on the basis of the sustainability criteria in the Directive to make this a reality.

The third pillar of the 20-20-20 initiative is energy efficiency. Although this is the least glamorous of the various instruments that make up the EU's new energy policy, it is surely the most important; a 20% improvement in the EU's energy efficiency by 2020 can be achieved through cost-effective saving measures and translates into a reduction in energy consumption by some 13% compared to 1990 levels. It will reduce energy imports, boost household incomes, increase the competitiveness of EU industry, and make a huge contribution to reducing our greenhouse gas emissions. Although there are so many energy priorities to address, I remain convinced that this must remain the highest.

This EU has therefore now adopted a whole series of rules to make a major change in these areas. It has agreed rules on Buildings, cars, energy labels, and adopted the "eco-design" Directive enabling the rapid adoption of minimum energy efficiency standards for a wide range of products, from TVs, to light bulbs, to washing machines, to motors. Concrete measures on public lighting and light bulbs have, for example, already been agreed under this new procedure. Finally, the Commission has tabled a revised, more ambitious Buildings Directive, reducing the size of buildings to which it applies, and reducing red-tape. Taken together, including the ETS mechanism, these measures have the potential to make a huge step towards meeting the 20% target.

And these measures should not be the limit of our ambition. Later this year I will table a revised Energy Efficiency Action Plan, focussing in particular on the progress that can be made through innovative financing mechanisms, together with the European Investment Bank and others, and benefiting from the "Covenant of Majors" which we launched last year. Already over 100 cities have joined the Covenant, committing to exceed the 20-20-20 objectives. As I said, energy efficiency will remain my highest priority.

These three initiatives, ETS, renewable energy and energy efficiency, represent the core of the 20-20-20 initiative. However, they are far from the whole of the EU's new energy policy. In particular, it is worth highlighting the completion of the Internal Energy Market and the new EU Energy Security Action Plan that has been tabled by the Commission in the Second Strategic Energy Review in November 2008.

### **The EU is still working to achieve its internal energy market**

Regarding the Internal Energy Market, I have no doubt that final agreement on the third package will rapidly be reached; before the end of the present European Parliament in Spring 2009. All, I think recognise the importance of this in terms of not just competitiveness, but also energy security - investments will not be made in an uncertain regulatory environment, and sustainability.

The real challenge is ensuring its implementation in a manner that provides rapid results in integrating existing national markets into regional and then a true European Internal Energy Market. In many respects the main responsibility for achieving these objectives now lies with the new Regulators' Agency and the new Transmission System Operators body ENTSO. They, and particularly the Agency, will need to drive forward the detailed work to establish common rules, making trade and market integration more effective. In this respect, I would like to congratulate the existing TSO bodies, particularly ENTSO and UCTE, in agreeing to create a single new body.

With the new Directive, we will finally have the rules, structures and stability necessary to make a real and decisive step towards a true Internal Energy Market. The responsibility is now on all of us, and particularly industry, to ensure that they result in rapid and concrete results.

### **The EU second Strategic Energy Review**

This brings me to the issue of energy security and infrastructure and the second Strategic Energy Review. The Review acknowledges that the EU has already taken huge steps forward in developing a new European Energy Policy with the goals of sustainability, security of supply and competitiveness by putting the 20-20-20 targets into practice. Indeed, as the Review states, the 20-20-20 package will reduce energy consumption in the EU in 2020 by as much as 15% compared to business-as-usual, and lead to a reduction of expected imports of energy by up to 26%. These are impressive figures indeed, but it is self-evident that the 20-20-20 initiative alone will not meet all the EU's energy security needs. The Second review therefore proposes a five-point EU Energy Security and Solidarity Action Plan, focusing on: Infrastructure needs and the diversification of energy supplies; External energy relations; Oil and gas stocks and crisis response mechanisms; Energy efficiency; Making the best use of the EU's indigenous energy resources.

I would like to focus on the first two of what is an integrated package of measures. As I mentioned earlier, the need for a European energy security dimension to be at the forefront of infrastructure development has been all but absent in the past. Recent experience demonstrates the need for change. The Review proposes this change. It identifies a list of six infrastructure priorities for the EU on which action is needed. These are: -the Southern gas corridor, -a diverse and adequate LNG supply for Europe, -effective interconnection of the Baltic region, -the Mediterranean Energy Ring, -the need for

adequate North-South gas and electricity interconnections within Central and South-East Europe, and - the North Sea Offshore Grid.

In 2009-2010 the Commission will identify the precise detailed actions necessary to ensure the realisation of these priorities as well as the measures necessary to achieve them. It is self-evident that progress on these issues is urgent, and the Commission has recently proposed that 1.5 billion Euros within the EU's current budget be redirected to infrastructure and in particular interconnection priorities. The Council will take a decision on this shortly, and I hope that its decision will signal a clear determination that the EU will now take its energy future into its own hands. Of course there are many reasons why infrastructure projects are often delayed; it is also these issues that the Commission will be identifying and seeking remedies, on a project-by-project basis, during the next two years.

With respect to external energy relations, the importance of "speaking with one voice" and the impossibility for a single Member State, no matter how large, to effectively deal with this issue unilaterally, has never been clearer. As the Review states, *"speaking with one voice does not mean a single Community representative for external issues, but effective planning and coordination to ensure a commonality of both action and message at Community and Member State level."* Again, recent events will give a new impetus to making this happen in practice. The next challenge is to now develop the concrete mechanisms necessary for ensuring transparency between Member States and the EU to better coordination on developments and intentions on international energy issues. This will be the task of the Commission this year. It has never been more urgent to succeed on this.

### **The needs for a European R&D push towards the "Third Industrial Revolution"**

Finally, I would like to focus on one of the main, but often overlooked elements of the new EU Energy Policy. Put quite simply, none of our energy objectives, let alone a change to a truly sustainable Europe by mid-century, will be possible without a step-change regarding research.

It is clear that we are at the beginning of what has correctly been called the "third industrial revolution" - the rapid development of an entirely new energy system. We can expect a massive shift towards a carbon-free electricity system, huge pressure to reduce energy consumption and transport on the basis of renewable electricity. To make this shift in a manner that maintains, and in fact increases the EU's competitiveness, means that stimulating rapid technological development in these areas has to be a central part of the EU's energy policy. Indeed, this is at the heart of the question: how can the EU turn the challenges of climate change and energy security into an opportunity?

The global market for windmills and solar/PV panels has already been exploding. This is but the tip of the iceberg. Imagine the level of investment in low-carbon energy and energy efficiency technologies and services that will result when the whole world follows the EU's initiative and commits to reducing greenhouse gases globally by between 50 and 80% by 2050.

Thus, the low carbon energy industry, including renewables, a smart electricity grid, carbon sequestration, next generation nuclear, electric and hydrogen vehicles, battery technology and energy efficient products and services will almost undoubtedly represent the greatest industrial growth sectors over the next decades. The EU already has a first-mover advantage in terms of installing renewables, and this has had an effect in promoting European companies, which are world leaders in renewable energy. The EU has to use this as a springboard in further efficiencies as well as in new generations of low-carbon technologies.

The European Council has recognised the importance of this challenge, welcoming the Strategic Energy Technology Plan that the Commission tabled together with the first Strategic Energy Review.

In essence the Technology Plan proposes to better coordinate the energy research money spent at Community and national level to ensure that every Euro is well-spent and to invest far more in low carbon energy innovation. In terms of funding, the Strategic Technology Plan notes the decline in

energy research spending in Europe since the 70's and 80's. If we had maintained our levels of technology investment at those levels, government investment in energy technology would be four times what they are today.

The actions necessary to address the first of these challenges, coordination of spending, are well under way, with the establishment of a new Energy research governance in Europe and the setting up of six European Industrial Initiatives: wind, solar, bio-energy, carbon capture and storage, smart electricity grids and sustainable nuclear fission. The initiatives are being developed in close cooperation with European industry, using existing Technology Platforms. In practical terms, this means integration of public efforts, European industry and researchers. These initiatives have to be targeted to achieve concrete results in a specified time-scale.

In addition to the better planning and the better use of the resources, it is clear that the EU needs to increase funding for energy technology, both publically and privately. This has been recommended in the most prominent reports published recently, like the Stern Report, the reports from the Inter-governmental Panel on Climate Change, and the International Energy Agency. As the Strategic Energy Technology Plan outlines, it is necessary to progressively increase resources over the next years to double the current public effort in research. This question will be central to the Technology Financing Plan, to be tabled by the Commission next year. I look forward to hearing today industry's expectations of this Plan.

Of course, increasing funding will not alone provide a complete solution; the Strategic Energy Technology Plan will also need to catalyse a substantial effort to incentivise our educational institutions to invest in this area, attracting more scientists and engineers to the field of energy. Furthermore, the decision to allocate an important part of the "new entrants reserve" of ETS credits post 2013 and the Commission's proposals to re-allocate 1.5 billion Euros of the existing EU budget to CCS demonstration plants and 500 million to offshore wind demonstration projects already this year will, if approved by Council and Parliament, give a massive and much needed boost to low-carbon energy research. The Technology Financing Plan will therefore need to address not only the issue of how much research funding is available, but how this can best catalyse private investment and spread the use of the resultant technology.

In summary, we need to acknowledge the vital and strategic role of energy technology for the EU, jointly plan our actions, effectively implement our current policies through a more targeted and powerful instruments, increase our financial and human resources and reinforce international cooperation.

### **Achieving the 20-20-20 energy policy will help changing our 2050 horizon**

The EU is clearly at the start of what will be a long, difficult, but tremendously exciting process. We have a unique opportunity. Although, it is true, the increasingly difficult global economic outlook makes the implementation of the 20-20-20 initiative and increased investment in energy technologies more difficult in the very short-term, they are truly vital. They represent a solidarity pact with future generations of European citizens and, I strongly believe, the basis of a huge economic opportunity for Europe. Furthermore, the banking crisis will cause significant difficulties for many of our citizens. Yet unabated climate change has the potential to cause far greater hardship and the need to invest to guarantee all of our citizens' real energy security has never been clearer.

Within a single generation we can give Europe a truly sustainable energy system, that is clean, and that provides us long-term energy security and a very large degree of energy independence. We can develop an energy industry in Europe that is the motor of our economy, producing jobs in Europe rather than exporting wealth to energy producers outside the EU. If we invest wisely in research and give European companies the right incentives to become world-leaders in renewable and other low-carbon energy technologies, we can put the EU at the forefront of the third industrial revolution in the same way as the US investment in computing put them at the forefront of the second.

And this can be, must be, the centrepiece of a wider European sustainability policy rather than an end in itself. Surely the EU is able to develop, over the next five to ten years, a road-map towards a truly sustainable Europe, committing the EU to live and work in a long-term sustainable way by 2050. This would need to cover agriculture, fisheries, transport, land-use, forestry, housing, and much more. It would need to catalyse changes in education, research, and the development of our cities. There are many grounds to believe that such a commitment would be truly welcomed by Europe's citizens, particularly the younger generation that will have to inherit the consequences of today's decisions.

If we invest strongly and wisely in technology, and if we recognise that the third industrial revolution means that research should be considered as a central pillar of our economic policy, there is also every reason that we can achieve a sustainable economy in a manner that will enhance our standards of living, welfare and happiness. There is also every reason why the EU is in a unique place to take the leadership in this challenge, as it has done with energy and climate change.

At the end of the day, it is climate change and the challenge of energy security that has led us to really begin debating such fundamental questions on a more practical level. There is indeed a silver lining in every cloud.

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