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Article

Green paper: A European strategy for sustainable, competitive and secure energy

CESifo Forum

Provided in Cooperation with:

Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

Suggested Citation: Piebalgs, Andris (2006) : Green paper: A European strategy for sustainable, competitive and secure energy, CESifo Forum, ISSN 2190-717X, ifo Institut für Wirtschaftsforschung an der Universität München, München, Vol. 07, Iss. 2, pp. 8-20

This Version is available at:

<http://hdl.handle.net/10419/166261>

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GREEN PAPER: A EUROPEAN STRATEGY FOR SUSTAINABLE, COMPETITIVE AND SECURE ENERGY*

AN ENERGY STRATEGY FOR EUROPE: BALANCING SUSTAINABLE DEVELOPMENT, COMPETITIVENESS AND SECURITY OF SUPPLY

Europe has entered into a new energy era.

- There is an urgent need for investment. In Europe alone, to meet expected energy demand and to replace ageing infrastructure, investments of around one trillion euros will be needed over the next 20 years.
- Our import dependency is rising. Unless we can make domestic energy more competitive, in the next 20 to 30 years around 70 percent of the Union's energy requirements, compared to 50 percent today, will be met by imported products – some from regions threatened by insecurity.
- Reserves are concentrated in a few countries. Today, roughly half of the EU's gas consumption comes from only three countries (Russia, Norway, Algeria). On current trends, gas imports would increase to 80 percent over the next 25 years.
- Global demand for energy is increasing. World energy demand – and CO₂ emissions – is expected to rise by some 60 percent by 2030. Global oil consumption has increased by 20 percent since 1994, and global oil demand is projected to grow by 1.6 percent per year.
- Oil and gas prices are rising. They have nearly doubled in the EU over the past two years, with electricity prices following. This is difficult for consumers. With increasing global demand for fossil fuels, stretched supply chains and increasing dependence on imports, high prices for oil and gas are probably here to stay. They may, however, trigger greater energy efficiency and innovation.

- Our climate is getting warmer. According to the Intergovernmental Panel on Climate Change (IPCC), greenhouse gas emissions have already made the world 0.6 degrees warmer. If no action is taken there will be an increase of between 1.4 and 5.8 degrees by the end of the century. All regions in the world – including the EU – will face serious consequences for their economies and ecosystems.
- Europe has not yet developed fully competitive internal energy markets. Only when such markets exist will EU citizens and businesses enjoy all the benefits of security of supply and lower prices. To achieve this aim, interconnections should be developed, effective legislative and regulatory frameworks must be in place and be fully applied in practice, and Community competition rules need to be rigorously enforced. Furthermore, the consolidation of the energy sector should be market driven if Europe is to respond successfully to the many challenges it faces and to invest properly for the future.

This is the new energy landscape of the 21st century. It is one in which the world's economic regions are dependent on each other for ensuring energy security and stable economic conditions, and for ensuring effective action against climate change.

The effects of this landscape are felt directly by everyone. Access to energy is fundamental to the daily lives of every European. Our citizens are affected by higher prices, threats to the security of energy supply and changes to Europe's climate. Sustainable, competitive and secure energy is one of the basic pillars of our daily life.

This landscape requires a common European response. Heads of State and Government, at their summits in October and December 2005, recognised this and asked the Commission to take this forward. Recent events have underlined that this challenge must be met. An approach based solely on 25 individual energy policies is not enough.

The EU has the tools to help. It is the world's second largest energy market, with over 450 million consumers. Acting together, it has the weight to protect

The energy landscape implies great inter-dependence of the world's regions and demand a common European strategy

* Commission of the European Communities, Brussels, March 2006.
Commissioner Andris Piebalgs, Energy.

and assert its interests. The EU has not just the scale but also the policy range to tackle the new energy landscape. The EU leads the world in demand management, in promoting new and renewable forms of energy, and in the development of low carbon technologies. If the EU backs up a new common policy with a common voice on energy questions, Europe can lead the global search for energy solutions.

Europe must act urgently: it takes many years to bring innovation on stream in the energy sector. It must also continue to promote diversity – of energy type, country of origin and transit. In this way it will create the conditions for growth, jobs, greater security and a better environment. Work has been progressing on these issues since the Commission's 2000 Green Paper on Security of Energy Supply, but given recent developments on energy markets, a new European impetus is needed.

This Green Paper puts forward suggestions and options that could form the basis for a new comprehensive European energy policy. The Spring European Council and the European Parliament are invited to react to this Paper, which should also spark a wide-ranging public debate. The Commission will then table concrete proposals for action.

This Green Paper identifies six key areas where action is necessary to address the challenges we face. The most fundamental question is whether there is agreement on the need to develop a new, common European strategy for energy, and whether sustainability, competitiveness and security should be the core principles to underpin the strategy.

From that flow the following questions:

1. Competitiveness and the internal energy market.

Is there agreement on the fundamental importance of a genuine single market to support a common European strategy for energy? How can barriers to implementing existing measures be removed? What new measures should be taken to achieve this goal? How can the EU stimulate the substantial investments necessary in the energy sector? How to ensure that all Europeans enjoy access to energy at reasonable prices, and that the internal energy market contributes to maintaining employment levels?

2. Diversification of the energy mix.

What should the EU do to ensure that Europe, taken as a whole, promotes the climate-friendly diversification of energy supplies?

3. Solidarity.

Which measures need to be taken at Community level to prevent energy supply crises developing, and to manage them if they do occur?

4. Sustainable development.

How can a common European energy strategy best address climate change, balancing the objectives of environmental protection, competitiveness and security of supply? What further action is required at Community level to achieve existing targets? Are further targets appropriate? How should we provide a longer term secure and predictable investment framework for the further development of clean and renewable energy sources in the EU?

5. Innovation and technology:

What action should be taken at both Community and national level to ensure that Europe remains a world leader in energy technologies? What instruments can best achieve this?

6. External policy.

Should there be a common external policy on energy, to enable the EU to speak with a common voice? How can the Community and Member States promote diversity of supply, especially for gas? Should the EU develop new partnerships with its neighbours, including Russia, and with the other main producer and consumer nations of the world?

Developing a European energy policy will be a long term challenge. This needs a clear but flexible framework: clear in that it represents a common approach endorsed at the highest level, flexible in that it needs periodic updating. As a foundation for this process the Commission therefore proposes that a *Strategic EU Energy Review* be presented to the Council and Parliament on a regular basis, covering the issues identified in this Green Paper. This would constitute a stocktaking and action plan for the Spring European Council, monitoring progress and identifying new challenges and responses on all aspects of energy policy.

SIX PRIORITY AREAS

Energy for growth and jobs in Europe: completing the internal European electricity and gas markets

Sustainable, competitive and secure energy will not be achieved without open and competitive energy markets, based on competition between companies

The Green Paper identifies six key areas for action

looking to become European-wide competitors rather than dominant national players. Open markets, not protectionism, will strengthen Europe and allow it to tackle its problems. A truly competitive single European electricity and gas market would bring down prices, improve security of supply¹ and boost competitiveness. It would also help the environment, as companies react to competition by closing energy inefficient plant.

In July 2007, with very few exceptions, every EU consumer will have the legal right to purchase electricity and gas from any supplier in the EU. This offers a major opportunity for Europe. But whilst much has been done to create a competitive market, work is not yet complete. Many markets remain largely national, and dominated by a few companies. Many differences remain between Member States' approaches to market opening, preventing the development of a truly competitive European market – including powers of regulators, level of independence of network operators from competitive activities, grid rules, balancing and gas storage regimes.

By the end of 2006, the second electricity and gas Directives will have been implemented by all Member States and the Commission will have completed its competition inquiry into the functioning of the European gas and electricity markets. A final decision, based on a full impact assessment, will then be made on any additional legislative measures needed: in particular to ensure non-discriminatory network access, adequate available network capacity, liquidity on gas and electricity markets and effective regulation. However, it is already clear that five core areas need particular attention:

(i) A European grid

Consumers need a single European grid for a real European electricity and gas market to develop. This can be done by ensuring common rules and standards on issues that affect cross-border trade. Progress is being made on these issues, but it is too slow.

A European grid code could encourage harmonised, or at least equivalent, grid access conditions. This would take the form of common rules on regulatory issues that affect cross-border trade. Experts are taking a first step forward on a regional basis, in particular energy regulators through the Council of Euro-

pean Energy Regulators and the European Regulators Group. But further and quicker progress is necessary before all business and private consumers will be able to purchase their electricity and gas from suppliers in other Member States. To this end, the Commission will examine (i) what needs to be done to address the differences between existing equivalent powers and independence for national regulators and (ii) whether existing forms of collaboration between national regulators and national grid operators are adequate, or whether a closer level of collaboration is needed – with for example a European energy regulator to look at cross-border issues. Such a regulator could have decision-making powers for common rules and approaches such as a European grid code and would work together with the network operators. A European Centre for Energy Networks could also bring the network operators together in a formal body to assist work on developing a European Grid Code.

(ii) A priority interconnection plan

At the Barcelona European Council in 2002, the Heads of State and Government agreed to increase minimum interconnection levels between Member States to 10 percent. Progress has not been satisfactory. There can be no truly competitive and single European market without additional physical capacity: this is particularly vital for countries such as Ireland and Malta or for the Baltic States, which remain an “energy island”, largely cut off from the rest of the Community. Equally, additional electricity interconnection capacity is necessary between many areas and in particular between France and Spain to permit real competition between these two countries to develop. Similarly there is a need for new investment in infrastructure in gas markets. In many Member States, action needs to be taken to free up capacity reserved for former incumbents under electricity and gas long term contracts. Interconnection is a crucial mechanism for solidarity.

Private and public investments in infrastructure need to be stimulated and authorisation procedures accelerated. The greater the interconnection in the European electricity grid, the lower the need for spare capacity and, in time, the lower the costs. This is important at a time when Europe's previous overcapacity is becoming history. The Commission will by the end of 2006 identify the individual measures that it considers important at the level of Member States. Further actions at Community level will also be

Companies must become Europe-wide competitors rather than dominant national players

¹ “Lessons from liberalised electricity markets”. IEA, 2005.

identified, such as more effective use of the Trans-European Network instruments.

Finally, relations with Switzerland are important in this respect, which is a major transit country for electricity.

(iii) Investment in generation capacity

To replace ageing electricity generation capacity and to meet demand, the EU will need substantial investment over the next 20 years. This includes capacity to deal with peaks. The necessary reserve must exist in order to prevent disruptions at times of high demand and to serve as back-up for intermittent renewable energy sources. For timely and sustainable investments, a properly functioning market is needed, giving the necessary price signals, incentives, regulatory stability and access to finance.

(iv) A level-playing field: the importance of unbundling

Significant differences persist in the level and effectiveness of unbundling of transmission and distribution from competitive activities. This means that in practice national markets are open to fair and free competition to differing degrees. The provisions of the second electricity and gas Directives on unbundling need to be fully implemented, not just in their letter but also in their spirit. If progress to a level playing field does not result, further measures at Community level should be considered.

(v) Boosting the competitiveness of European industry

One of the most important objectives of the internal energy market is to promote the competitiveness of EU industry and thus contribute to growth and jobs. Industrial competitiveness requires a well-designed, stable and predictable regulatory framework, respectful of market mechanisms. Energy policy therefore needs to favour cost-effective options and be based on a thorough economic analysis of different policy options and their impact on energy prices. Secure availability of energy at affordable prices is crucial.

Integrated and competitive electricity and gas markets with the minimum of disruption are essential. The new High-Level Group on Energy, Environment and Competitiveness will play an important role in identifying ways to promote the competitiveness of all sectors of affected industry.

This requires considering, for example, what is the best way to accommodate the legitimate needs of

energy intensive industry whilst, at the same time, respecting competition rules.

Conclusions on this issue should be contained in the report on the internal market scheduled for the end of 2006. In addition, consideration needs to be given on how best to ensure effective coordination between the Commission, national energy regulators and national competition authorities.

An Internal Energy Market that guarantees security of supply: solidarity between Member States

(i) Enhancing security of supply in the internal market

Liberalised and competitive markets help security of supply by sending the right investment signals to industry participants. But for this competition to work effectively, the market needs to be transparent and predictable.

The physical security of Europe's energy infrastructure against risks from natural catastrophe and terrorist threat, as well as security against political risks including interruption of supply is critical to predictability. The development of smart electricity networks, demand management and distributed energy generation could all help at times of sudden shortage.

This points to several areas for possible future action:

- The establishment of a European Energy Supply Observatory as soon as possible to monitor the demand and supply patterns on EU energy markets, identifying likely shortfalls in infrastructure and supply at an early stage and complementing on an EU level the work of the International Energy Agency.
- Improved network security through increased collaboration and exchange of information between transmission system operators in defining and agreeing common European security and reliability standards. A more formal grouping of transmission system operators, reporting to the EU energy regulators and to the Commission, could build on the work already started in the wake of the 2003 blackouts. This could develop into a European Centre for Energy Networks, with powers to collect, analyse and publish relevant information, as well as to implement

Security of energy supply calls for competitive markets, better exchange of information and solidarity among countries

schemes approved by the relevant regulatory institutions.

- With respect to the physical security of infrastructure, two main actions merit further consideration. Firstly, a mechanism could be developed to prepare for and ensure rapid solidarity and possible assistance to a country facing difficulties following damage to its essential infrastructure. Secondly, common standards or measures might be taken to protect infrastructure.

(ii) Rethinking the EU's approach to emergency oil and gas stocks and preventing disruptions

Oil is a global market and major supply disruptions, even if local or regional, require a global response. The release of emergency stocks organised by the IEA in response to Hurricane Katrina worked well. Any stronger Community action in this area should therefore be compatible with this global mechanism. This might still point to a more coordinated Community response in the event of an IEA decision to release stocks. In particular, this would be helped by a new Commission legislative proposal ensuring the publication on a more regular and transparent basis the state of Community oil stocks, to contribute improving transparency on oil markets.

Furthermore, the existing Directives on gas and electricity security of supply should be reexamined to ensure they can deal with potential supply disruptions. Recent experience has raised important questions, including whether Europe's gas stocks can meet the challenge of shorter term supply disruptions. This review should also consider whether the appropriate signals are being given to encourage the necessary investment in Europe's gas and electricity markets in the years ahead, including investments in security of supply and infrastructure to enable mutual assistance. This could, inter alia, include a new legislative proposal concerning gas stocks to ensure that the EU can react to shorter term emergency gas supply disruptions in a manner that ensures solidarity between Member States, whilst taking account of the different potential for storage in different parts of the EU.

Tackling security and competitiveness of energy supply: towards a more sustainable, efficient and diverse energy mix

Each Member State and energy company chooses its own energy mix. However, choices made by one

Member State inevitably have an impact on the energy security of its neighbours and of the Community as a whole, as well as on competitiveness and the environment. For example:

- decisions to rely largely or wholly on natural gas for power generation in any given Member State have significant effects on the security of supply of its neighbours in the event of a gas shortage;
- decisions by Member States relating to nuclear energy can also have very significant consequences on other Member States in terms of the EU's dependence on imported fossil fuels and CO₂ emissions.

The *Strategic EU Energy Review* would offer a clear European framework for national decisions on the energy mix. It should analyse all the advantages and drawbacks of different sources of energy, from indigenous renewable energy sources such as wind, biomass and biofuels, small hydro and energy efficiency to coal and nuclear, and the knock-on effects of these changes for the EU as a whole. This could be based on a standard methodology.

Coal and lignite, for example, presently account for around one-third of the EU's electricity production: climate change means that this is only sustainable if accompanied by commercialised carbon sequestration and clean coal technologies on an EU level.

The Review should also allow a transparent and objective debate on the future role of nuclear energy in the EU, for those Member States concerned. Nuclear power, at present, contributes roughly one-third of the EU's electricity production and, whilst careful attention needs to be given to the issues of nuclear waste and safety, represents at present the largest source of largely carbon free energy in Europe. The EU can play a useful role in ensuring that all costs, advantages and drawbacks of nuclear power are identified for a well-informed, objective and transparent debate.

Furthermore, it might be appropriate to agree an overall strategic objective, balancing the goals of sustainable energy use, competitiveness and security of supply. This would need to be developed on the basis of a thorough impact assessment and provide a benchmark on the basis of which the EU's developing energy mix could be judged and would help the EU to stem the increasing dependence on imports. For example, an objective might be to aim for a min-

The review of an EU energy strategy should discuss the framework for national decisions on the energy mix

imum level of the overall EU energy mix originating from secure and low-carbon energy sources. Such a benchmark would reflect the potential risks of import dependency, identify an overall aspiration for the long term development of low carbon energy sources and permit the identification of the essentially internal measures necessary to achieve these goals. It would combine the freedom of Member States to choose between different energy sources and the need for the EU as a whole to have an energy mix that, overall, meets its core energy objectives. The Strategic EU Energy Review could serve as the tool for the proposal and subsequent monitoring of any such objective agreed by the Council and Parliament.

An integrated approach to tackling climate change

Effective action to address climate change is urgent and the EU must continue to lead by example and, above all, work towards the widest possible international action. Europe needs to be ambitious and must act in an integrated manner that promotes the EU's Lisbon objectives.

The EU is already at the forefront of approaches to decouple economic growth from increasing energy consumption. Its action has combined robust legislative initiatives and energy efficiency programmes with encouragement to competitive and effective renewable energy. However, the EU's commitment to fighting climate change is a long-term one.

In order to limit the forthcoming rise of global temperatures at the agreed target of maximum of 2 degrees above pre-industrial levels, global greenhouse gas emissions should peak no later than 2025, and then be reduced by at least 15 percent, but perhaps as much as 50 percent compared to 1990 levels. This huge challenge means that Europe must act now, in particular on energy efficiency and renewable energy.

Action on renewables and energy efficiency, besides tackling climate change, will contribute to security of energy supply and help limit the EU's growing dependence on imported energy.

It could also create many high-quality jobs in Europe and maintain Europe's technological leadership in a rapidly growing global sector.

In this respect, the EU Emissions Trading Scheme creates a flexible and cost-efficient framework for more climate friendly energy production. The full review of the EU Emissions Trading Scheme gives an opportunity for expanding and further improving the functioning of the scheme. In addition, the EU Emissions Trading Scheme provides the nucleus for a gradually expanding global carbon market, hereby giving European business a head-start.

Making more from less: leading on energy efficiency

An effective energy efficiency policy does not mean sacrificing comfort or convenience. Nor does it mean reducing competitiveness. In fact an effective policy in this area means the opposite; making cost-effective investments in order to reduce the waste of energy, thereby increasing standards of living and saving money, and using price signals, that would lead to more responsible, economical and rational use of energy. Market-based instruments, including the Community energy tax framework, can be a very efficient tool in this respect.

Although Europe is already one of the world's most energy efficient regions, it can go much further. In its 2005 Green Paper on Energy Efficiency, the Commission showed that up to 20 percent of EU energy use could be saved: equivalent to spending as much as 60 billion less on energy, as well as making a major contribution to energy security and creating up to a million new jobs in the sectors directly concerned.

One useful instrument in this respect is the EU's cohesion policy, which identifies as objectives supporting energy efficiency, the development of renewable and alternative energy sources and investments in networks where there is evidence of market failure. The Commission calls upon Member States and regions, when preparing their National Strategic Reference Frameworks and operational programmes for 2007 to 2013, to make effective use of the possibilities provided for by cohesion policy in support of the present strategy.

The Commission will this year propose an Action Plan on Energy Efficiency to realise this potential. This effort needs consistent support and determination at the very highest political level throughout Europe. Many of the tools are in national hands, such as grants and tax incentives, and the national level holds the key to convincing the public that energy efficiency can bring them real savings. But the EU level can have a decisive impact and the Action Plan

Greater energy efficiency could save up to 20 percent of EU energy use

will propose concrete measures to reach this 20 percent potential by 2020.

Examples of possible action include:

- Long-term targeted energy efficiency campaigns, including efficiency in buildings, notably public buildings.
- A major effort to improve energy efficiency in the transport sector and in particular to improve rapidly urban public transport in Europe's major cities.
- Harnessing financial instruments to catalyze investments by commercial banks in energy-efficiency projects and companies providing energy services.
- Mechanisms to stimulate investment in energy efficiency projects and energy services companies.
- A Europe-wide "white certificates" system, tradable certificates, which would enable companies that exceed energy efficiency minimum standards to "sell" this success to others that have failed to meet these standards.
- To guide consumers and manufacturers, more focus will need to be put on rating and showing the energy performance of the most important energy-using products including appliances, vehicles, and industrial equipment. It may be appropriate to set minimum standards in this area.

Finally, energy efficiency needs to become a global priority. The Action Plan can serve as a "launch pad" to catalyse similar action worldwide, in close collaboration with the IEA and the World Bank. The EU should propose and promote an international agreement on energy efficiency, involving both developed and developing countries and the expansion of the Energy Star Agreement.

Increasing the use of renewable energy sources

Since 1990, the EU has been engaged in an ambitious and successful plan to become world leader in renewable energy. To take one example, the EU has now installed wind energy capacity equivalent to 50 coal fired power stations, with costs halved in the past 15 years. The EU's renewable energy market has an annual turnover of € 15 billion (half the world market), employs some 300,000 people, and is a major exporter. Renewable energy is now starting to compete on price with fossil fuels.

In 2001, the EU agreed that the share of electricity from renewable energy sources in the EU consump-

tion should reach 21 percent by 2010. In 2003, it agreed that at least 5.75 percent of all petrol and diesel should be bio-fuels by 2010. A number of countries are showing a rapid increase in renewable energy use through supportive national policy frameworks. But under current trends, the EU will miss both targets by 1 to 2 percentage points. If the EU is to meet its longer term climate change goals and reduce its dependence on fossil fuel imports, it will need to meet and indeed go beyond these targets. Renewable energy is already the third electricity generation source worldwide (after coal and gas) and has the potential to grow still further, with all the environmental and economic advantages that would follow.

For renewable energy to fulfil its potential, the policy framework needs to be supportive and in particular to stimulate increasing competitiveness of such energy sources while fully respecting the competition rules. While some sources of low-carbon indigenous energy are already viable, others, such as offshore wind, wave and tidal energy need positive encouragement to be realised.

The full potential of renewable energy will only be realised through a long-term commitment to develop and install renewable energy. In parallel to the Strategic EU Energy Review, the Commission will bring forward a Renewable Energy Road Map. This would cover key issues for an effective EU policy on renewables:

- an active programme with specific measures to ensure that existing targets are met;
- consideration of which targets or objectives beyond 2010 are necessary, and the nature of such targets, in order to provide long-term certainty for industry and investors, as well as the active programmes and measures needed to make this a reality. Any such targets could be complemented by extended operational targets on electricity, fuels and possibly heating;
- a new Community Directive on heating and cooling, complementing the Community energy saving framework;
- a detailed short, medium and long term plan to stabilise and gradually reduce the EU's dependence on imported oil. This should build on the existing Biomass Action Plan² and the Strategy for Biofuels³;

² Communication from the Commission – "Biomass Action Plan" – COM(2005) 628, 7.12.2005.

³ Communication from the Commission – "An EU Strategy for Biofuels" – COM(2006) 34, 8.2.2006.

- Research, demonstration and market replication initiatives to bring clean and renewable energy sources closer to markets.

The Road Map would be based on a thorough impact assessment, assessing renewable energy sources against the other options available.

Carbon capture and geological storage

Carbon capture and geological storage, in combination with clean fossil fuel technologies provides a third opportunity of near zero emission technology. Today it can already be economically used for enhanced oil or gas recovery. It can be particularly important for countries which choose to continue the use of coal as a secure and abundant energy source.

However, this technology needs a stimulus to create the necessary economic incentives, provide legal certainty for the private sector and ensure environmental integrity. R&D and large scale demonstration projects are needed to bring the technology towards reduced costs, and market-based incentives such as emissions trading can also make this a profitable option for the longer term.

Encouraging innovation: a strategic European energy technology plan

The development and deployment of new energy technologies is essential to deliver security of supply, sustainability and industrial competitiveness.

Energy related research has contributed strongly to energy efficiency (e.g. in car engines) and to energy diversity through renewable energy sources. However the magnitude of the challenges ahead requires increased efforts.

This necessitates a long term commitment. As an example research has allowed efficiency of coal power stations to be improved by 30 percent in the last thirty years. The Research Fund for Coal and Steel has contributed to funding this at EU level. Further technological developments would see significant reductions in CO₂ emissions.

Research can also bring commercial opportunities. Energy efficient and low carbon technologies constitute a rapidly growing international market that will be worth billions of Euros in the coming years.

Europe must ensure that its industries are world leaders in these new generations of technologies and processes.

The 7th Framework Programme recognises that there is no single solution to our energy problems, but deals with a wide portfolio of technologies: renewable energy technologies, making clean coal and carbon capture and sequestration an industrial reality, developing economically viable biofuels for transports, new energy vectors such as hydrogen and environmentally friendly energy usage (e.g. fuel cells) and energy efficiency; as well as advanced nuclear fission and the development of fusion through the implementation of the ITER Agreement.

The EU needs an appropriately resourced strategic energy technology plan. This should accelerate the development of promising energy technologies, but should also help to create the conditions to bring such technologies efficiently and effectively to the EU and the world markets. Research in areas of high energy use – housing, transport, agriculture, agroindustries, and materials – should also be addressed. The proposed European Institute of Technology (EIT) could play an important role in helping achieve this.

The plan should strengthen the European research effort to prevent overlaps in national technology and research programmes and to put the focus on agreed EU-level goals. Industry-led European technology platforms on biofuels, hydrogen and fuel cells, photovoltaics, clean coal and electricity networks help to develop commonly agreed research agendas and deployment strategies.

The EU needs to consider ways to finance a more strategic approach to energy research, taking further steps towards integrating and coordinating Community and national research and innovation programmes and budgets. Building upon the experience and output of European technology platforms, high-level stakeholders and decision-makers need to be mobilised to develop an EU vision for the transformation of the energy system and to maximise the efficiency of the overall research effort.

Where appropriate, particularly to develop “leading markets” for innovation, Europe should act through large-scale integrated actions with the necessary critical mass, mobilising private business, Member States

The EU needs to consider ways to finance a strategic approach to energy research

and the European Commission in public/private Partnerships or through the integration of National and Community Energy Research Programmes. The long-term energy-related ITER project and the internationally coordinated Generation IV initiative aiming at designing even safer and more sustainable reactors, are examples of concerted EU actions to achieve specific goals. Europe should also invest in other possible future forms of energy, such as hydrogen and fuel cells, carbon capture and storage, large-scale renewable technologies such as concentrated solar thermal, as well as even longer term prospects such as methane hydrates. Consideration should also be given on how to mobilise the resources of the European Investment Bank to promote close to market R&D in this area and how to enhance cooperation in areas of global concern.

Actions to accelerate technology development and drive down the costs of new energy technologies must be complemented by policy measures to open the market and to ensure the market penetration of existing technologies that are effective in addressing climate change.

Competing against entrenched technologies and huge locked-in investments in the current energy system, largely based on fossil fuels and centralised generation, new technologies face high entry barriers. The EU Emissions Trading Scheme, green certificates, feed-in tariffs and other measures can ensure that the implementation of environmentally friendly energy production, conversion and use is financially viable. Such measures can provide powerful policy signals to the market and create a stable climate in which industries can take the longterm investment decisions required. The Intelligent Energy-Europe Programme will also provide the necessary tools and mechanisms to overcome the non technical barriers to the take up of new and effective energy technologies.

Towards a coherent external energy policy

The energy challenges facing Europe need a coherent external policy to enable Europe to play a more effective international role in tackling common problems with energy partners worldwide. A coherent external policy is essential to deliver sustainable, competitive and secure energy. It would be a break from the past, and show Member States' commitment to common solutions to shared problems.

The first step is to agree at Community level on the aims of an External Energy Policy and on the actions needed at both Community and national level to achieve it. The effectiveness and coherence of the EU's external energy policy is dependent upon the progress with internal policies and, in particular, the creation of the internal market for energy. The abovementioned Strategic EU Energy Review would serve as the basis for establishing this common vision.

This would constitute a stocktaking and action plan for the European Council, monitoring progress and identifying new challenges and responses. Follow-up should take the form of regular formal political level discussions at Community level, involving Member States and the Commission in a manner to be developed. It would offer a single reference point, with an appropriate institutional format, for all actors in European energy at both Community and national level. This would permit not only the effective exchange of information but also a real co-ordination of approach: it would enable the EU, in effect, "to speak with the same voice".

The benefits of this approach for the external dimension would be particularly strong. It should cover a number of key goals and instruments:

A clear policy on securing and diversifying energy supplies

Such a policy is necessary both for the EU as a whole and for specific Member States or regions, and is especially appropriate for gas. To this end, the above mentioned Review could propose clearly identified priorities for the upgrading and construction of new infrastructure necessary for the security of EU energy supplies, notably new gas and oil pipelines and liquefied natural gas (LNG) terminals as well as the application of transit and third party access to existing pipelines. Examples include independent gas pipeline supplies from the Caspian region, North Africa and the Middle East into the heart of the EU, new LNG terminals serving markets that are presently characterised by a lack of competition between gas suppliers, and Central European oil pipelines aiming at facilitating Caspian oil supplies to the EU through Ukraine, Romania and Bulgaria. In addition, the Review could acknowledge the concrete political, financial and regulatory measures needed to actively support the undertaking of such projects by business. The new EU-Africa Strategy,

An external energy policy would enable the EU to speak with one voice

envisaging interconnections of energy systems as a priority area, could also help Europe to diversify its oil and gas supply sources.

Energy partnerships with producers, transit countries and other international actors

The EU and its energy partners are interdependent. This is reflected at bilateral and regional level in a number of specific EU energy dialogues with a number of producer and transit countries.⁴ Equally, energy issues are a growing feature of the EU's political dialogues with other major energy consumers (such as the US, China and India), including through multilateral fora like the G8. These dialogues should be set within the common vision offered by the Review.

Dialogue with major energy producers/suppliers:

The EU has an established pattern of relations with major international energy suppliers including OPEC and the Gulf Cooperation Council. A new initiative is particularly opportune with regard to Russia, the EU's most important energy supplier. The EU, as Russia's largest energy buyer, is an essential and equal partner in this relationship. The development of a common external energy policy should mark a step change in this energy partnership at both Community and national level. A true partnership would offer security and predictability for both sides, paving the way for the necessary long-term investments in new capacity. It would also mean fair and reciprocal access to markets and infrastructure including in particular third party access to pipelines. Work should start on an energy initiative based on these principles. Subsequently the results could be integrated into the framework of EURussia relations due to replace the current EU-Russia Partnership and Cooperation agreement in 2007. In addition, efforts should be intensified in the G8 to secure rapid ratification by Russia of the Energy Charter Treaty and conclusion of the negotiations on the Transit Protocol.

Developing a pan-European Energy Community:

In line with the European Neighbourhood Policy and its Action Plans (and in addition to the current work undertaken through Partnership and Cooperation Agreements and Association Agreements), the EU has for some time been engaged in widening its ener-

gy market to include its neighbours and to bring them progressively closer to the EU's internal market.

Creating a "common regulatory space" around Europe, would imply progressively developing common trade, transit and environmental rules, market harmonisation and integration. This would create a predictable and transparent market to stimulate investment and growth, as well as security of supply, for the EU and its neighbours. Existing political dialogues, trade relations and Community financing instruments can be further developed and, for other partners, there is potential for new agreements or other types of initiative.

For example, by building on the Energy Community Treaty with partners in South-East Europe, as well as the development of the EU-Maghreb electricity market and the EU-Mashrek gas market, a pan-European energy Community could be created both through a new Treaty, and through bilateral agreements. Certain essential strategic partners, including Turkey and Ukraine, could be encouraged to join the South East European Energy Community Treaty. The Caspian and Mediterranean countries are important gas suppliers and transit routes. Algeria's increasing importance as a gas supplier to the EU could point to a specific energy partnership.

In addition, as one of the EU's most important strategic energy partners, attention should be given to facilitating Norway's efforts to develop resources in the high north of Europe in a sustainable manner as well as facilitating its entry into the South East Europe Energy Community.

This framework would also offer a clearer framework to promote best long-term use of Community investment through Trans-European Energy Networks and their extensions to third country partners and to maximise the impact on energy security of EU resources devoted to the energy sector in third countries. This is of particular importance for the new Neighbourhood Instrument and for EIB and EBRD financing. In this context, twinning programmes and loan subsidies for external strategic energy infrastructure are essential.

Reacting effectively to external crisis situations

Consideration should be given on how best to react to external energy crises. Recent experiences with respect to both oil and gas have shown the need for the Community to be able to react quickly and in a

Creating a common regulatory space around Europe would stimulate supply security for the EU and its neighbours

⁴ Notably Russia, Norway, Ukraine, the Caspian basin, the Mediterranean countries, OPEC and the Gulf Co-operation Council.

fully co-ordinated manner to such events. The EU has no formal instrument dealing with external energy supplies. This could be addressed by a new more formal, targeted instrument to deal with emergency external supply events. This might involve, for example, a monitoring mechanism to provide early warning and to enhance response capabilities in the event of an external energy crisis.

Integrating energy into other policies with an external dimension

At the political level, a common European external energy policy will permit a better integration of energy objectives into broader relations with third countries and the policies which support them. That means increasing the focus in relations with global partners facing similar energy and environmental challenges – such as the US, Canada, China, Japan and India – on issues such as climate change, energy efficiency and renewable sources, research and development of new technologies, global market access and investment trends, with better results in multilateral fora such as the UN, the IEA and the G8. If these countries reduce the use of fossil fuels, it will also be beneficial for Europe's energy security.

The EU should widen the focus of foreign relations to include issues like climate change, energy efficiency and renewable energy

The EU could significantly step up bilateral and multi-lateral cooperation with these countries with the objective of encouraging the rational use of energy worldwide, of reducing pollution and encouraging industrial and technological cooperation on the development, demonstration and deployment of energy efficient technologies, renewable energy sources and clean fossil fuel technologies with carbon capture and geological storage. In particular, greater efforts need to be made towards widening the geographic scope of the EU Emissions Trading Scheme and, as mentioned above, as a first step the EU should propose and promote an international agreement on energy efficiency. In addition, more focus could be given to technological cooperation, in particular with other energy consuming countries.

Similarly, there is scope to make better use of trade policy tools to promote goals such as non-discriminatory energy transit and the development of a more secure investment climate. The EU should press for a better respect of existing WTO rules and principles in this field, and bilateral or regional initiatives should build on these. Such agreements can include provisions on market opening, investment,

regulatory convergence on issues such as transit and access to pipelines, and competition. Reinforced market-based provisions on energy and trade-related energy issues would thus be incorporated in the EU's existing and future agreements with third countries.

Energy to promote development

For developing countries, access to energy is a key priority, and Sub-Saharan Africa has the lowest access in the world to modern energy services. At the same time, only 7 percent of Africa's hydropower potential is tapped. The EU should promote a twin-track approach through the European Union Energy Initiative and through raising the profile of energy efficiency in development programmes. Focusing on developing renewable energy and micro-generation projects, for instance, could help many countries reduce reliance on imported oil and improve the lives of millions. The implementation of the Kyoto Protocol clean development mechanism could spur investment in such energy projects in developing countries.

CONCLUSIONS

This Green Paper has set out the new energy realities facing Europe, outlined questions for debate and suggested possible actions at the European level. In taking the debate forward, it is essential to act in an integrated way. Each Member State will make choices based on its own national preferences. However, in a world of global interdependence, energy policy necessarily has a European dimension.

Europe's energy policy should have three main objectives:

- Sustainability: (i) developing competitive renewable sources of energy and other low carbon energy sources and carriers, particularly alternative transport fuels, (ii) curbing energy demand within Europe, and (iii) leading global efforts to halt climate change and improve local air quality.
- Competitiveness: (i) ensuring that energy market opening brings benefits to consumers and to the economy as a whole, while stimulating investment in clean energy production and energy efficiency, (ii) mitigating the impact of higher international energy prices on the EU economy and its citizens and (iii) keeping Europe at the cutting edge of energy technologies.

- Security of supply: tackling the EU's rising dependence on imported energy through (i) an integrated approach – reducing demand, diversifying the EU's energy mix with greater use of competitive indigenous and renewable energy, and diversifying sources and routes of supply of imported energy, (ii) creating the framework which will stimulate adequate investments to meet growing energy demand, (iii) better equipping the EU to cope with emergencies, (iv) improving the conditions for European companies seeking access to global resources, and (v) making sure that all citizens and business have access to energy.

To achieve these objectives, it is important to put them in an overall framework, in the first Strategic EU Energy Review. This could be augmented with a strategic objective which balanced the goals of sustainable energy use, competitiveness and security of supply; for example, by aiming for a minimum level of the overall EU energy mix to come from secure and low-carbon energy sources. This would combine the freedom of Member States to choose between different energy sources and the need for the EU as a whole to have an energy mix that, overall, meets its three core energy objectives.

This Green Paper puts forward a number of concrete proposals to meet these three objectives.

1. The EU needs to complete the internal gas and electricity markets. Action could include the following measures:

- The development of a European Grid, including through a European grid code. A European regulator and a European Centre for Energy Networks should also be considered.
- Improved interconnections.
- Creating the framework to stimulate new investment.
- More effective unbundling.
- Boosting competitiveness, including through better coordination between regulators, competition authorities and the Commission.

These must be addressed as a priority; the Commission will reach final conclusions on any additional measures that need to be taken to ensure the rapid completion of genuinely competitive, European-wide electricity and gas markets, and present concrete proposals by the end of this year.

2. The EU needs to ensure that its internal energy market guarantees security of supply and solidarity between Member States. Concrete measures should include:

- A review of the existing Community legislation on oil and gas stocks, to focus them on today's challenges.
- A European energy supply observatory, enhancing transparency on security of energy supply issues within the EU.
- Improved network security through increased cooperation between network operators and possibly a formal European grouping of network operators.
- Greater physical security of infrastructure, possibly through common standards.
- Improved transparency on energy stocks at the European level.

3. The Community needs a real Community-wide debate on the different energy sources, including costs and contributions to climate change, to enable us to be sure that, overall, the EU's energy mix pursues the objectives of security of supply, competitiveness and sustainable development.

4. Europe needs to deal with the challenges of climate change in a manner compatible with its Lisbon objectives. The Commission could propose the following measures to the Council and Parliament:

(i) A clear goal to prioritise energy efficiency, with a goal of saving 20 percent of the energy that the EU would otherwise use by 2020 and agreeing a series of concrete measures to meet this objective, including:

- Efficiency campaigns, including on buildings.
- Harnessing financial instruments and mechanisms to stimulate investment.
- A renewed effort for transport.
- A Europe-wide "white certificates" trading system.
- Better information on the energy performance of some appliances, vehicles, and industrial equipment and possibly, minimum performance standards.

(ii) Adopt a long-term road-map for renewable energy sources, including:

- A renewed effort to meet existing targets.
- Consideration of which targets or objectives beyond 2010 are necessary.

The Green Paper puts forward a number of proposals to achieve the three objectives of: sustainability, competitiveness, and security of supply

- A new Community Directive on heating and cooling.
- A detailed plan to stabilise and gradually reduce the EU's dependence on imported oil.
- Initiatives to bring clean and renewable energy sources closer to markets.

5. A strategic energy technology plan, making best use of Europe's resources, building on European technology platforms and with the option of joint technology initiatives or joint undertakings to develop leading markets for energy innovation.

This should be presented as soon as possible to the European Council and Parliament for endorsement.

6. A common external energy policy. In order to react to the challenges of high and volatile energy prices, increasing import dependency, strongly growing global energy demand and global warming, the EU needs to have a clearly defined external energy policy and to pursue it, at the same time at both national and Community level, with a single voice. To this end the Commission proposes:

- Identifying European priorities for the construction of new infrastructure necessary for the security of EU energy supplies.
- Developing a pan-European Energy Community Treaty.
- A new energy partnership with Russia.
- A new Community mechanism to enable rapid and co-ordinated reaction to emergency external energy supply situations impacting EU supplies.
- Deepening energy relations with major producers and consumers.
- An international agreement on energy efficiency.