CENTRE FOR EUROPEAN REFORM

GREEN, SAFE, CHEAP

Where next for EU energy policy?

Christof van Agt, Václav Bartuška, Jonathan Gaventa, Connie Hedegaard, Dieter Helm, Nick Mabey, Günther Oettinger, Pernille Schiellerup, Stephen Tindale, Frank Umbach and Georg Zachmann. Edited by Katinka Barysch

about the CER

The Centre for European Reform is a think-tank devoted to making the European Union work better and strengthening its role in the world. The CER is pro-European but not uncritical. We regard European integration as largely beneficial but recognise that in many respects the Union does not work well. We also think that the EU should take on more responsibilities globally, in issues ranging from climate change to security. The CER aims to promote an open, outward-looking and effective European Union.

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Telephone +44 20 7233 1199, Facsimile +44 20 7233 1117, info@cer.org.uk, www.cer.org.uk

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Edited by Katinka Barysch

ABOUT THE AUTHORS

Christof van Agt is senior researcher for the international energy programme at the Netherlands Institute of International Relations (Clingendael) in The Hague.

Václav Bartuška is ambassador at large for energy security for the Czech Republic.

Katinka Barysch is deputy director of the Centre for European Reform (CER) in London.

Jonathan Gaventa is senoir policy advisor at E3G (Third Generation Environmentalism), a non-profit organisation dedicated to accelerating the transition to sustainable development.

Connie Hedegaard is the commissioner for climate action at the European Commission in Brussels.

Dieter Helm is professor for energy policy at the University of Oxford.

Maïté Jauréguy-Naudin manages the energy programme at the Institut Français des Relations Internationales (IFRI) in Paris.

Agata Łoskot-Strachota is energy policy research fellow at the Centre for Eastern Policy (OSW) in Warsaw.

Nick Mabey is chief executive and a founder director of E3G in London.

Günther Oettinger is the commissioner for energy at the European Commission in Brussels.

Pernille Schiellerup is head of climate change and energy programme at the Institute for European Environmental Policy (IEEP) in London.

Stephen Tindale is an associate fellow at the CER.

Frank Umbach is senior associate at the Centre for European Security Strategies (CESS) in Munich.

Georg Zachmann is research fellow at Bruegel, an economics think-tank in Brussels.

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Bayer

In formulating policies that affect future generations, it is vital to make decisions together and with an awareness of their wider impact. Energy is clearly one such area: the decisions we take and the policies we make in Europe today will mean a difference for the global environment.

Individual governments are making efforts to cut the effects of climate change, yet what we are seeing has yet to inspire confidence for global solutions. While the search for a coherent energy policy continues, companies such as Bayer MaterialScience are waiting for the political leadership that shines a guiding light.

Ironically, many innovative technologies and solutions that can directly help in energy efficiency already exist, but they remain largely unused because of this lack of enlightened leadership. Examples can be found in new technologies for chlorine production and cutting carbon dioxide emissions, and in long-established building insulation materials.

For interesting and significant progress we must look to America, where top-level government initiatives are bringing the private and public sectors together to make things happen, enabling these new energy efficient materials and techniques to be utilised effectively and widely.

The Bayer Group, of which my company is a part, regards climate change as a serious economic and environmental challenge. Within our operations, we have increased energy efficiency in recent years through technological innovations and have significantly reduced greenhouse gas emissions. Our products make a direct contribution to saving energy and conserving resources in our daily lives. We want to do more, and are ready to do so.

Bayer MaterialScience is pleased to support this CER report and looks forward to providing the technologies and materials that have a central and inevitable role to play in this crucial area.

Patrick Thomas

CEO, Bayer MaterialScience

Foreword

BG GROUP

Rarely has the debate about the future direction of energy policy in Europe been as congested a space as it is today. Rarely have the complexities of the solutions required to meet our twin requirements of combating climate change and safeguarding security of energy policy seemed so daunting.

After the 'certainties' of a period in which energy prices were largely low and energy markets appeared capable of delivering plentiful supplies ad infinitum, price volatility, security concerns post-9/11 and the increasingly pressing challenges of global warming have created the need for some urgent policy adjustments. Achieving some kind of consensus across the EU as to what those solutions might look like has been and will continue to be one of the toughest policy challenges on the European agenda.

As an international natural gas company working in around 25 countries across the globe, BG Group has sought to be a thoughtful contributor to the debate, recognising that workable solutions will be characterised by a diverse range of fuel types and energy sources and by subtle intervention in energy markets.

BG Group was eager to offer its support to this CER publication because of the calibre of the contributors contained in this report. Academics, energy analysts and policy-makers all offer their perspectives on the way forward for EU energy policy and we believe that there is much food for thought within the pages that follow.

There is an urgency about the need to move forward and agree solutions. It won't be easy to reach consensus but this report sets the scene. We now need to follow up with actions.

John Grant

Executive Vice-President – Policy & Corporate Affairs

BG Group

EUROPEAN ENERGY POLICY: A GLOSSARY

20-20-20 package – In 2007 EU leaders endorsed an energy and climate change package that included the following targets: reduce CO_2 emissions by 20 per cent; raise the share of Europe's energy coming from renewable sources to 20 per cent; and increase energy efficiency by 20 per cent; all by 2020. The first two targets are binding. The EU formally adopted the package in 2009.

2050 roadmap – In 2011 the Commission was working on a long-term strategy for EU energy and climate policy, to provide greater clarity beyond the 2020 target date. In March 2011, the directorate-general for climate action published its plan for how the EU should reduce CO_2 emissions by 85-90 per cent by 2050. Plans for the transport sector, energy savings and other areas were due to follow.

ACER – The Agency for the Co-operation of Energy Regulators was set up in 2010 to help national energy regulators co-ordinate their actions at EU level.

Carbon capture and storage/CCS – A relatively new technology designed to capture the carbon that is released whilst burning fossil fuels, such as coal and gas, and so prevent it from damaging the atmosphere. The carbon is then transported to storage sites and buried.

Decarbonisation – The process of removing carbon from the generation of energy, the production of goods, the movement of goods and people and other practices that produce CO_2.

Electricity grid – The power lines that link power stations and energy consumers such as households and factories. Technology can be used to upgrade a grid to a **'smart grid'** that allows the real-time collection of data and thus swift adjustment of supply and demand. A **'super grid'** is a transmission network for large flows of energy over a large area.

Energy 2020 – A Commission report from November 2010 that takes stock of progress towards the 20-20-20 objectives and lays out

the EU's priorities for the next ten years: energy savings, completing the single energy market, technological leadership and a coherent energy foreign policy.

Energy pathways – Scenarios for achieving a given policy target, such as the decarbonisation of the power sector.

ENTSO – Following the adoption of the third energy package, the EU set up two 'European networks for transmission system operators', one for gas (**ENTSO-G**) and one for electricity (**ENTSO-E**). These bodies bring together the companies that operate power grids and gas pipeline networks in Europe so that they can co-ordinate their actions, exchange market information and plan infrastructure developments.

EU ETS – The EU's emissions trading system, launched in 2005, is a Europe-wide cap-and-trade scheme designed to incentivise power stations and other heavily polluting industries to reduce their CO_2 emissions. In phases one and two (2005-12), each member-state decides its own cap, and permits to pollute are allocated to companies for free. In phase three, starting in 2013, the Commission will set the overall cap, and many of the sectors covered, including the power sector that is responsible for most CO_2 emissions, will buy permits in auctions. Companies that have bought too few or too many permits can buy or sell them on in a **carbon market**. The system was supposed to result in a price for carbon high enough to make cleaner technologies competitive. It has so far failed to do so.

Fuel mix/energy mix – The composition of different energy sources – gas, coal, renewables, nuclear and so forth – that each country uses. The EU has no formal powers to determine the energy mix of its member-states.

Fuel poverty – An individual or household is said to be in fuel poverty when more than 10 per cent of income has to be spent on fuel for heating, lighting and other needs.

Fracking – Hydraulic fracturing, or fracking, is a technology to produce unconventional gas, including shale gas. It involves blasting a mixture of water and chemicals into rock formations to release the gases trapped in them.

Generation – The generation, or production, of power can take place in various ways: at present, European countries generate most of their energy in big power plants that run on coal, gas or nuclear fuel. The large size of these plants tends to make them efficient but they are often placed far away from the point of use, which results in some electricity being lost during transmission. **Distributed generation** gets around this by placing solar panels, wind turbines or other small power-generators near houses and factories.

Interconnector – A cross-border link between national power grids or pipeline systems. Under new EU rules, all cross-border gas interconnectors will soon have to allow for flows in both directions.

Intermittence – The fact that some forms of renewable energy cannot supply power on a constant basis. Unlike, for example, a coal-fired power plant that can be run in perpetuity, photovoltaic cells need sun and wind turbines only turn when the wind blows (but not too strongly).

LNG – Liquefied natural gas is gas that is cooled down to liquid form and then transported on special tankers to consumer countries where it is turned back into gas in **re-gasification** terminals. LNG allows for a more flexible and global gas market than the traditional way of transporting gas in pipelines.

Load – A power plant usually generates a constant level of power (**base load**) to provide for the minimum demand of its industrial and household customers. The most efficient power plants are used to supply this base load. When demand rises (for example for heating in cold weather or air conditioning in hot weather) extra electricity is needed (**peak load**). Gas-fired power stations are better suited to supplying peak load than coal or nuclear plants.

Renewables policies – Policies to support the expansion of renewable energy include **feed-in tariffs**, under which producers of renewable electricity are paid higher rates per unit than producers of electricity from fossil fuels or nuclear, as well as **obligations** on energy companies that specify that a specific percentage of their electricity must come from renewable sources (sometimes also called **green certificates**).

Renewable sources – Electricity can be generated from the following renewable sources: hydroelectric power from either building dams or using smaller 'run-of-river' plants which use water flow to turn turbines; wind power from turbines installed on land (onshore) or in seas (offshore); solar power from photovoltaic cells installed on roofs or in large agglomerations (solar power plants); and energy from biomass, such as energy crops or waste wood. Renewable sources can also be used to generate heat (solar thermal technology) or gas (from manure or sewage).

Southern corridor – The EU is planning to add a southern corridor to its traditional gas import routes from Russia (via Ukraine, Belarus and, soon, the Nord Stream pipeline via the Baltic sea), Norway and the southern Mediterranean countries, such as Algeria. The proposed **Nabucco** pipeline through Turkey and the Balkans into Austria is widely considered as the flagship but the southern corridor also includes other potential projects such as the Trans-Adriatic Pipeline (**TAP**) and the Interconnector Turkey-Greece-Italy (**ITGI**).

System operator – Following the unbundling of the generation/import, transportation and sale of energy, system operators are those companies (or parts of companies) that manage the transport of power and gas. Under EU rules for **'third party access'** they are obliged to give equal access to the network to all suppliers of gas and power.

Ten year network development plan – In 2010 the ENTSOs for electricity and gas published long-term plans for the kind of

infrastructure that is deemed necessary to complete EU-wide markets for gas and power while allowing for a continuous reduction in carbon emissions.

Third energy package – In 2007 the EU adopted a set of legal measures designed to create a proper internal energy market. The previous two packages had turned out to be insufficient to create cross-border competition. The third package requires vertically integrated companies to **'unbundle'** their operations for the generation/import, transport and sale of gas and electricity. While the new law does not demand that all companies be broken up (**ownership unbundling**), they at least need to run their generation, transport and sale operations as different entities (**regulatory unbundling**).

Unconventional gas – Gas can be found in gas fields or in porous rock formations. The latter is referred to as unconventional gas and includes shale gas and coal-based methane. Technological breakthroughs made the large-scale commercial extraction of unconventional gas possible in the US over the last decade.

1 Introduction
by Katinka Barysch

Will Europe have to fight for its energy with emerging powers such as China? Is the emissions trading scheme enough to achieve European climate goals? Should the EU get involved in building cross-border gas and power lines? What does energy solidarity mean? Do we need a European policy on nuclear energy? Why do markets fail to deliver energy savings?

European energy policy has become an area of mind-boggling complexity. The interests of the various players – the European Commission, national governments and regulators, energy companies (from Europe, Russia and elsewhere), consumers and businesses – are not always aligned. EU energy policy has numerous objectives – energy is supposed to be secure, cheap and green – that are not easily reconciled. The tools employed to achieve one target can undermine another. Energy policy is torn between short-term imperatives and the need to set a long-term framework for companies and governments to act in. This report shows that the EU has reached a point where it has to make the critical decisions to put this long-term framework into place. It also shows how hard some of these choices will be.

The origins of EU energy policy

It is only since the adoption of the Lisbon treaty that the EU has acquired genuine competence in energy policy. Before that, it based its actions in this area on its power in other fields: the environment, competition and, most notably, the single market programme. Initially, Europeans regarded energy very much like other markets for, say, cars or telephone calls. The idea was that by opening up national

energy sectors, a pan-European market would emerge. Households and businesses would gain through more choice and cheaper prices. However, after two 'energy packages' (one in the late 1990s and one in 2003) it became clear that laws alone would not bring about integrated markets for gas and power. Former monopoly suppliers kept dragging their feet. Consumers were slow to switch suppliers, even when given that choice. The physical interconnections between national power grids and gas pipeline systems were missing.

The EU decided to step up its efforts, using its muscular competition policy to clamp down on collusion and force vertically integrated energy companies to 'unbundle' their supply, transport and distribution businesses. It put together yet another, tougher energy package. And it started to focus on getting physical networks built. In February 2011, a European summit promised to finish the single energy market in 2014.

While the EU struggled to create an internal energy market, European energy policy was also becoming more complex. After Dutch and French voters had rejected the EU's constitutional treaty in 2005, EU leaders were looking for ways to make Europeans love the Union again. They decided to shift the EU's focus from institutions, visions and treaties to 'deliverables': what the EU can do for you. Safe, cheap and green energy was such a deliverable (innovation, and consumer and social protection were others). At their informal Hampton Court summit in October 2005, EU prime ministers and presidents expanded the definition of EU energy policy to include climate action and energy security, alongside the traditional objective of creating a competitive energy market.

The fight against climate change quickly took priority as the industrialised nations got serious about implementing their Kyoto protocol obligations. The EU launched its pioneering emissions trading system in 2005, and in 2007 adopted more ambitious targets for cutting CO_2, using wind, solar and other renewable sources, and saving energy. A vast array of laws and policies, from limits on car

exhaust fumes to the construction of 'smart grids', are now part of the EU's climate action toolkit.

Energy security, too, has moved up the agenda. The first Russian-Ukrainian gas crisis at the start of 2006 made some EU countries painfully aware of how much they depended on energy coming from just one huge company: Russia's Gazprom. The second gas crisis, three years later, led to week-long energy shortages in some Central and East European member-states and added urgency to the objective of diversifying routes and sources of imports. A doubling in crude oil prices between 2005 and 2008 further fuelled energy security concerns. More recently, the uprisings in Northern Africa and the Middle East, and the Fukushima nuclear accident, had the same effect. Although the Lisbon treaty commits the EU (together with the member-state governments) "to secure the energy supplies of the Union", there is as yet no coherent European energy foreign policy.

Three objectives, one tool?

European officials like to argue that the EU's multiple energy policy objectives are compatible, even mutually reinforcing. And that an integrated European energy market is the best tool for achieving all energy policy objectives:

★ it will make it easier and cheaper to achieve climate change targets, for example by enabling the emissions trading scheme to work properly and because the costs of developing renewables drops in a bigger market;

★ it will create more competition and so enhance consumer choice and push down energy prices;

★ and it will enhance energy security, first by allowing energy to flow more freely around the EU in a supply crisis, and second by helping to align the interests of EU countries and so allow them to speak with one voice to outside suppliers.

Yet the articles in this report show that a single European energy market is a necessary but not sufficient condition for the EU to meet its energy policy objectives. The EU's market-based tool to reduce CO_2, the emissions trading scheme, has not delivered. The carbon price is far too low to make renewables (and even nuclear) competitive vis-à-vis coal and gas-fired power stations. More direct state action is needed. All EU countries now have national subsidy schemes for renewables and some are contemplating limits on the emissions of power plants or minimum prices for carbon.

Market liberalisation alone will not make Europe's energy supplies secure. The EU has started to adopt rules that force member-states to invest in new pipelines and storage tanks to survive the next gas crisis. The European Commission is thinking about directly financing strategic bits of infrastructure. It is trying to forge an energy foreign policy to secure new supplies from places such as Turkmenistan or Iraq. But many EU governments and energy companies are unhappy with the Commission's more assertive approach, which is why the energy security agenda is progressing only slowly.

The contributions to this report also show that the EU's energy and climate goals are not always easily compatible. The EU promises that a single energy market will deliver cheaper energy to consumers. But cheap energy does not spur companies and households to save energy (another EU priority), nor does it allow energy companies to recoup the massive investments that are needed to finish the single European energy market and meet the EU's ambitious climate change goals. Similarly, many of the measures needed to achieve the EU's climate goals, most notably renewables policies and energy savings measures, are adopted at a national, rather than an EU level. They therefore threaten to fragment the internal market and drive up the costs of decarbonising the economy unnecessarily.

Two silver bullets

The EU is vigorously moving ahead in two policy areas seen as

particularly promising for achieving energy and climate goals. The first is energy efficiency and savings. By using less energy, the EU will not only save money and boost growth, but also enhance its energy security (through lower demand for imported oil and gas) and reduce its output of CO_2 and other pollutants. The other is infrastructure. The EU is determined finally to get the interconnectors built that are needed for a pan-European energy market; it needs massive new investments to shift the power sector to low-carbon sources, for example 'super grids' to bring North Sea wind power and Mediterranean solar power to cities and industrial centres in the heart of Europe; and it needs new pipelines to diversify gas supplies away from Russia.

The authors of this report generally agree that energy savings measures and infrastructure have a crucial role to play in EU energy policy going forward. But they also highlight the complexity of the policy choices involved. If energy companies do not build interconnectors, should the EU (or individual governments) design and pay for new infrastructure? Would such an approach not stunt market signals – so vital for mobilising the enormous investments needed for the transition to a low-carbon economy? Surely the EU is right to set tough standards for the energy use of household appliances, cars, factories and houses. But would local initiatives that look at how people actually use energy not be more promising? The areas of infrastructure and energy efficiency illustrate clearly that the EU must strike a careful balance between top-down intervention and letting market forces play.

Urgency and uncertainty

Another theme that emerges from the contributions to this report is that the EU does not have much time to sort out these complex policy issues. At the moment, the EU has firm targets for renewables, CO_2 emissions and energy savings only to 2020. Beyond that, there is only a general commitment to reduce carbon emissions by 85-90 per cent by 2050. This leaves infrastructure companies, solar panel producers

and gas importers with a large degree of uncertainty: what will power markets looks like in 2030? Will the regulatory framework allow companies to earn enough from building new pipelines? How much gas will the EU want to import in 20 years time? Energy is a long-term business. Unless there is a clear and reliable policy framework for the longer term, companies will not even make the moves and investments needed to achieve the 2020 targets.

This report takes stock of how far EU energy policy has come since the adoption of the first market liberalisation laws. More importantly, it shows where there are contradictions and risks to declared policy goals, and where there is an urgent need for action.

Dieter Helm starts the report by throwing cold water on the EU's achievements. "European energy policy", he writes, "has been notable mostly by its absence." He observes that EU efforts to build a Europe-wide energy market have not so far succeeded (although many national energy markets have become more open). And that Europe's emission cuts since 1990 owed much to one-off factors, such as the collapse of Soviet-era industries in new member-states, the switch from coal to gas or, more recently, the 2008-09 economic crisis. He now sees an EU energy policy at risk of getting onto the wrong track. For example, the 2020 climate policy goals are distorting investment decisions, which makes the fulfilment of longer-term goals hugely more expensive. What matters now, he writes, is infrastructure: to finish the European energy market, to feed growing amounts of renewables into the power grid and to allow the spread of new technologies, such as electric cars.

Günther Oettinger is more sanguine about the EU's achievements to date but argues that the Union has no time to lose: soon, the EU will have to import 85 per cent of its oil and two-thirds of its gas. With emerging powers such as China using up an ever larger share of the world's resources, Europe could be heading for petrol shortages and power cuts. To make its energy secure, and achieve its ambitious climate change targets, the EU will have to invest a staggering €1

trillion in its energy systems over the next decade. In addition, writes Oettinger, the Europeans need to focus on five areas: saving energy, completing the European energy market (in particular through building physical networks), taking better care of consumer concerns, developing cutting-edge energy technologies and strengthening the EU's role in global negotiations about climate change.

Christof van Agt agrees with Helm and Oettinger that infrastructure is at the heart of the EU's energy and climate policies. He explains why EU market liberalisation laws and competition policy have not prompted national energy companies to build links between their power grids and gas pipelines. The third energy package could even slow down cross-border infrastructure developments if it resulted in further divergences among national regulatory regimes. Efforts to co-ordinate regulations and policies through the new EU bodies that bring together national regulators and infrastructure operators need to be reinforced. Pioneering top-down initiatives, such as direct EU financing of critical infrastructure, have a role to play. But, argues van Agt, the EU should not rush into enforcing a centrally determined map of power and gas lines: since the bulk of the €1 trillion energy investment will have to come from the private sector, the EU must give market forces room to work while providing more long-term certainty through regulation, information and harmonisation.

Connie Hedegaard switches the focus to EU climate action. She highlights the EU's considerable achievements in this area during a short period of time: the EU was first in the world to launch an emissions trading system and later impose on itself a binding target for emissions reduction. The EU has managed to cut its emissions considerably over the last two decades while its economy kept growing for most of the time – alleviating fears that climate action and economic growth are incompatible. The EU is now working on the implementation of its ambitious 20-20-20 package. But the Europeans cannot rest or relax. They have already decided to cut emission by 85-90 per cent by 2050. What is more, 90 per cent of the world's emissions are generated outside the EU. The EU needs to

use the strength of its example, its aid budget and its foreign policy to lead global efforts to get climate change under control.

Jonathan Gaventa and **Nick Mabey** take a critical look at an area that is at the heart of the EU's climate action: renewables policies. So far, these have mainly consisted of national subsidy schemes through which EU countries have supported 'their' green industries. These schemes have allowed the EU to burn less fossil fuel and to gain valuable experience with using solar, wind and other renewable sources at a growing scale. But the transformation of the European power sector from over 50 per cent fossil fuels to 100 per cent renewables and other low-carbon sources will require almost unprecedented technological progress and massive investments in new infrastructure. These will only happen if the EU creates the right framework – today. This framework must involve a long-term infrastructure development plan (wind turbines will not get built unless investors know that the power lines will be there to take the generated electricity); greater certainty about how power markets will operate in the future; and longer-term targets for CO_2 emissions and renewables that go beyond 2020. In short, renewables policies must move from national subsidies to a redesign of the entire European power sector.

Maïté Jauréguy-Naudin looks at one particular project that might help the EU to shift to green energy: the 'Desertec' plan to generate power from the winds and sun rays of the Sahara. Enthusiasts say that Desertec could one day supply 15 per cent of the EU's electricity needs. But Jauréguy-Naudin thinks the EU would be better off fostering renewables at home for now. Political instability in Northern Africa, economic uncertainties and the challenges of building massive power lines under the Mediterranean make Desertec too big a challenge.

Pernille Schiellerup explains why measures to achieve energy efficiency and savings are so central to the EU's energy and climate policies. They not only save money but also reduce emissions, lead

to better health, help to prevent catastrophic climate change and reduce 'fuel poverty'. Experts agree that the EU could save 20 per cent of its energy by 2020 while recouping all the investments needed to do this. Yet the EU is on course to miss this target by a wide margin. The reasons why governments, companies and consumers are failing to reap the benefits of energy savings are complex – and that is where energy efficiency and savings policy must start. The EU is adopting tougher energy efficiency standards not only for household appliances and cars but also for buildings, which is a lot more difficult. To define and implement such standards requires sound research and efficient administration. The EU should also look at how people use energy: sometimes incentives for certain behaviours might be as promising as setting standards for equipment.

Georg Zachmann looks at the future of the European electricity market. Today's energy sectors are so complex that governments or national monopolies cannot run them effectively. Only market price signals can match demand and supply and bring about the right kind of investments. Paradoxically, the EU electricity market is under threat from another EU policy target: that to increase the share of renewables in energy consumption to 20 per cent by 2020 (and towards 100 per cent in the long run). Many EU countries have been very successful in fostering their wind, solar or geothermal industries. But they have used vastly different policies and tools to do so, with the result that electricity generated from renewables is not traded across borders and the EU power market is becoming more, not less, fragmented. Zachman calls on the EU urgently to address this contradiction.

Not only solar, wind and biomass are needed to decarbonise the energy sector, but also nuclear power, argues **Stephen Tindale**. A nuclear power plant emits about one-tenth as much CO_2 as one running on coal. Unlike gas, much of the world's uranium comes from reliable partner countries. However, a budding 'nuclear renaissance' in Europe has been threatened by heightened safety

concerns following the Fukushima nuclear accident in the spring of 2011. Germany decided to switch off all its atomic power plants by 2022, and other EU countries are having second thoughts too. "The EU will not meet its climate change and energy security targets without nuclear power", warns Tindale. He explains what the EU could do to make nuclear power safer and more acceptable, including improving nuclear waste storage, ceasing to re-process fuel rods, supporting thorium reactors and making sure that the coal and gas-fired plants pay for the pollution they cause.

Like nuclear energy, natural gas is generally seen as a 'bridge' to the EU's carbon-free future. But, as **Frank Umbach** explains, gas is burdened by particular energy security concerns. Many Europeans see gas as the Achilles heel of the EU's energy sector: they fear that their dependence on Russia's Gazprom leaves them vulnerable to supply disruption (as in 2006 and 2009) and political manipulation (as repeatedly observed in Ukraine). While the EU should not take its dependence on Russia lightly, it now risks focusing on yesterday's problems while overlooking opportunities that come from radical shifts in global gas markets. Following the shale gas revolution in the US and the global recession, gas is plentiful, prices are falling and Russia will be forced to compromise. Umbach advises the EU to address energy security concerns directly by supporting the Nabucco pipeline, helping Ukraine to modernise its energy sector and building an integrated European gas market.

During the gas crises of 2006 and 2009, EU countries called on their neighbours' support in the name of 'energy solidarity'. Although that term also crops up in the Lisbon treaty, the EU has never defined what it means. **Agata Łoskot-Strachota** examines how the notion of solidarity became part of EU energy policy and what the EU has done to put it into practice. Although there are now concrete demands on member-states, for example to enable two-way flows of gas across their borders, Łoskot-Strachota thinks that the biggest obstacles to solidarity remain political.

In the final chapter, **Václav Bartuška** looks at EU energy policy in a global and long-term perspective. He sees a world where China, India and other emerging powers aspire to EU-style living standards, which implies an ever fiercer competition for resources. The majority of these resources are found under the soil of countries that do not necessarily subscribe to European standards of democracy and human rights. Yet the EU still likes to uphold the idea that it can secure its energy and spread European values at the same time. "When it comes to energy", writes Bartuška "Europe is the great procrastinator." In the coming battle for resources, the EU needs to be prepared to harness its economic and, if need be, military resources and clarify its thinking about values versus needs and interests. The EU also needs to put more effort and money into developing innovative technologies to make itself less dependent on imported energy.

2 What next for EU energy policy? *by Dieter Helm*

European energy policy has been notable mostly by its absence: to the extent that where Europe has had energy policies, these have largely been national, and there has not been much policy. To the extent that Europe has made progress, there have been two main pillars – the internal energy market and the climate change package.

Europe's virtual energy market

The internal energy market has been a core ambition of the European Commission for almost two decades. As the Commission pushed through the more general internal market proposals (the 1992 programme) there was an early attempt to extend the concept to energy. What followed was both conceptually flawed and politically undermined.

The conceptual flaw – which remains today – was the idea that a virtual competitive market in energy could be constructed before there was a physical infrastructure through which competitively provided supplies could flow. Europe's energy networks have been constructed bottom-up: first from local municipal utilities to national grids, and then towards international interconnectors. There never has been a top-down view of what a European electricity or gas network would look like.

The result is that interconnections across Europe have been developed on the basis of national interests. The dominant national incumbents (often publicly owned national champions) recognised that interconnections would allow competitive access, and they strove to keep control of access and tariffs. For much of the 1990s,

the Commission battled with incumbents over these access terms – striving eventually for regulated, as opposed to negotiated, third party access. Leaving the incumbents to set their own negotiated terms for grid access was never going to encourage third party entry.

Unsurprisingly, then, Europe's networks remain overwhelmingly national, with bilateral connections. This bilateralism has been carried to its limit with the Nord Stream pipeline – a German-Russian project bypassing the cheaper route through Poland. It is an explicit statement of the priority of national over European interests. Germany's reaction to the Japanese nuclear disaster is another example of the national approach.

In the absence of a European network, the internal energy market became a mechanism for forcing members to liberalise their own internal markets – and as a result it has been very much a national affair. Domestic initiatives – first in the UK and then more widely – superseded European efforts, with the Commission left to battle it out with recalcitrant members like France. As the gas crises in 2006 and 2009 demonstrated, the lack of physical interconnectivity limited the scope of markets, and with it the ability of member-states to support each other.

Leadership on climate change?

Having been forced into long drawn out trench warfare to get full liberalisation implemented – now scheduled for 2014 – the Commission subtly changed tack in the middle of the last decade, and put climate change at the centre of its initiatives. Europe decided to 'lead the world', adopting its own binding targets with the aim of persuading others to follow. Kyoto was the prime vehicle – a series of emissions targets that were set in a way that suited Europe well. Given the collapse of Soviet-era, energy-intensive industries that followed the end of central planning, 1990 provided a very convenient base year. As Europe de-industrialised, especially in respect of its energy-intensive industries, and as gas came to play a

bigger role in electricity generation, emissions fell back. The global economic crisis from 2008 onwards further reduced emissions.

Actual achievements were limited: whilst Europe reduced its production of carbon, the outsourcing of energy intensive industries from Europe to rapidly industrialising countries like China meant that the carbon footprint flowed back through imports (excluded from the Kyoto numbers). So whilst production of carbon in the EU fell, consumption of carbon did not. Unsurprisingly as a result, Kyoto made little difference to the ever upward emissions at the global level. In some cases, it may even have made matters worse.

Inside the EU, the targets got translated into the 20–20–20 climate change package – a 20 per cent reduction in emissions, a 20 per cent share of renewables in total energy, and a 20 per cent improvement in energy efficiency, all by 2020. This is very much a political package: the chances that the economically or environmentally right answers all happen to end up with the magic number 20 are close to zero.

Worse still, the short-term nature of the renewables target seriously distorts investment. In the British case, it means a ten-year crash programme in building offshore wind farms. It is hard to think of a more expensive way of making limited emissions reductions. Elsewhere in Europe the intensity of the challenge varies – very much according to access to hydro reserves. Thus Denmark can back up its system with Scandinavian hydro power, as Austria can use its mountain reservoirs.

Infrastructure takes centre stage

For both the internal market and the climate change policies, what matters is infrastructure. Building the physical European networks has multiple benefits. It increases security (and prevents further shocks – like the Ukrainian crisis – turning into crises). It reduces costs, since interconnection reduces the portfolio of spare plant

needed in each country to meet demand shocks. And finally, new networks offer big opportunities to manage energy demand better and back up intermittent generation.

Given these enormous advantages, it is perhaps surprising that it has taken so long to get round to investing in this infrastructure. The reasons are however all too familiar: the interconnections are not necessarily in the interests of the dominant national incumbents, since they threaten their market power. The benefits are also hard to capture for each country considered separately. The whole point of a European network is that it gives benefits to all of Europe – it is a European public good. Public goods are not optimally provided by markets – they need intervention to make them happen. Finally, the lack of a common European approach to planning leads to major delays and hurdles, and where these delays actually suit the national incumbents, there is little urgency.

Recognising this European dimension is a necessary step, but it is not sufficient. What is needed is the design of these European high-voltage and high-capacity networks, the identification of the priority interconnectors, and the investment to carry them through. There have already been lots of attempts to identify the key interconnectors. It is not difficult and they are fairly well known. Delivery has been the problem. That is where the planning comes in. But it is also where the EU could do more to use the European Investment Bank (EIB) as the finance vehicle. Then there needs to be a common regulatory framework which enables investors to recover their (largely fixed and sunk) costs, and most radical of all, gradual moves to a Europe-wide system operator function.

In this infrastructure space, it is also important to recognise that energy networks are at last having information technology applied to them. In place of passive grids, smart active grids and smart meters are the start of a revolution in network design. The implications have only just begun to be appreciated for both security and climate change investments. Smart systems bring the

communications and energy industries together, and they enable a much more active management of demand. As electric cars develop, and as battery technology advances, the core problem of electricity supply (the absence of storage) may gradually get 'solved'. Stored electricity enables systems to be balanced, and that, in turn, sharply reduces the need for excess capacity.

Transitional technologies and shale gas

If the problem with the internal energy market has been the focus on virtual rather than physical competition, and a lack of emphasis on networks, the climate change problem has been very much about picking short-term winners like wind generation to meet the renewables target. Recent developments have transformed fossil fuel markets, and in the process they have also made the short-term reductions in carbon much easier to achieve at much lower cost.

The primary cause of rising world carbon emissions is coal. Coal is dreadful stuff: it causes multiple emissions (not just carbon); and it causes lung and respiratory diseases not just to miners but to communities nearby. It is twice as carbon polluting as gas. So it might be thought that the priority in Europe ought to be to phase out coal. The obvious choice is gas. It is cheap, and gas power stations are quick to build. Replacing old coal stations with new gas ones is a close to zero cost option.

The problem with building lots of gas power stations is that it increases Europe's reliance on gas imports, especially from Russia's Gazprom. After the Ukrainian gas crises in 2006 and 2009, and given the deliberate routing of the Nord Stream pipeline, it is understandable that the Commission has been reluctant to see this dependency grow.

In this the Commission was right. But the facts have changed, and therefore so too should minds. There has been a profound and enormous change in gas reserves globally as a result of technical

progress: shale gas turns out to be super-abundant and the combination of new seismic technologies, horizontal drilling and fracturing has meant that in some areas shale gas now competes directly with natural (conventional) gas. In the US, it turns out to be so plentiful that the old LNG importing model has been turned on its head – with radical implications for global gas markets. Gas is suddenly plentiful, available from a diverse set of countries, and cheap.

In due course Europe may well have its own shale gas production (and coal bed methane too). Poland is particularly well placed – doubly fortunately since it is heavily coal dependent and because the Nord Stream pipeline has left it exposed to Russia. But even if shale gas takes time to come on stream in Europe, the security scares are much reduced. Europe could switch from coal to gas quickly, halving the emissions that coal produced, whilst bringing more flexible power plants onto the system, well suited for balancing intermittent renewables like wind. Take the British case as an example: if Britain, instead of building expensive offshore wind, quickly built enough gas fired power stations to displace existing coal ones, then the cost of achieving the 2020 targets might be reduced by as much as 90 per cent – roughly £10 billion compared with roughly £100 billion.

Towards a new European energy policy

Out of the weak foundations created by the internal energy market and the climate change package, the shape of a much better European energy policy is beginning to emerge. The Commission is finally taking infrastructure seriously. Properly shaped and managed in a pragmatic way, this has the prospect of being a thoroughly European project – a European grid, reducing the costs to all Europeans, and one which further integrates the peripheral member-states that can benefit from the European security it would provide.

A focus on infrastructure would improve competitiveness and allow the new technologies to help address the climate change challenge.

Smart grids, smart meters and electric cars have all the makings of an energy transformation.

To translate these ideas into concrete proposals, the Commission needs to do several things. The first is to come up with detailed delivery plans for implementing the existing policies on infrastructure. The second is to force through greater integration of the national and regional system operators. The third is to co-ordinate an innovation agenda around smart technologies, by co-ordinating research, bringing the communications and energy industries together and promoting a necessary element of standardisation.

These practical steps will in the process help to make the internal energy market a reality, and to reduce the costs of achieving the climate change package. Better still, a reconsideration of the renewables directive with a view to making greater emissions cuts at lower costs, rather than focusing on a short-term dash for wind, would be better for growth, competitiveness and the climate.

3 Towards an integrated European energy market
by Günther Oettinger

The financial crisis in 2008-09 and the tragic events in Japan and Libya in the spring of 2011 have again demonstrated that energy remains among the biggest challenges facing the EU. Our economic competitiveness and, more generally, our way of life depends on reliable energy supplies and the physical availability of energy products and services at affordable prices.

As such, growing EU dependence on imports from third countries represents a matter of great concern, in particular for oil (85 per cent) and gas (65 per cent). If this trend continues, it will be difficult to avoid a major energy crisis, with electricity cuts and petrol or gas shortages. Simultaneously, there is increasing competition at the global level, with emerging powers like India and China demanding a larger share of the world's energy resources and investing hugely in new energy technologies.

We therefore have to act now to shift gradually to a low-carbon society. But the economic recession, the lack of a proper global climate change agreement, fast-growing demand for energy in developing countries and the relatively high price of renewable energy technology make our task more difficult. Over the next decade, we need to invest around €1 trillion in energy, whatever happens. If we invest this money wisely, we can develop new energy sources, expand supply networks, boost renewable energy use and cut energy consumption significantly. To achieve these objectives, we will have to make bold decisions now.

A new energy strategy for the next decade

The EU has already committed itself to reducing greenhouse gas emissions, raising the share of renewables and increasing energy efficiency by 20 per cent by 2020. To achieve these goals, the Commission in November 2010 adopted an ambitious 'Energy 2020' strategy for the next ten years. The strategy will give backbone to the single European energy market and 'Europeanise' energy policies across the EU.

National policies are no longer sufficient to allow a strong economic recovery and maintain our welfare. Any decision taken by one member-state has an impact on the others. Fragmented markets undermine competition and security of supply, while our investments for the future will only be profitable and efficient within a continental market. We must therefore promote a common energy policy serving our joint policy objectives: competitiveness, sustainability and security of supply.

The 2020 energy strategy contains five pillars for action to the benefit of all member-states and citizens.

★ A spotlight on energy savings

We need further decisive and co-ordinated action on energy efficiency to meet our 2020 energy saving target. There is a vast amount of untapped potential for energy efficiency, which would save money for individuals and businesses alike. 'Smart energy' – achieving the same with lower energy use – will allow us to meet our immediate energy needs with the lowest environmental impact.

We included a series of best practices of how to use energy more efficiently in our new 'energy efficiency plan', adopted in March 2011. The plan clarifies our energy savings objective; it identifies innovative solutions for immediate as well as long-term measures for saving energy, notably in buildings and transport. The reduction of

energy demand can immediately save costs, reduce waste and help to maintain our competitiveness. Public authorities can lead by example and apply energy efficiency criteria in all public procurement of works, services or products.

★ Towards an integrated European energy single market

It is time for the energy single market to become fully integrated. A Europe-wide market offers the right scale to assure access to resources and to justify the huge investments which are needed. National barriers to energy flows can threaten the benefits of the single market, the competitiveness of our industries and the supply of basic needs to all our citizens. We should no longer tolerate them. Fair competition, quality of service and free access must be guaranteed. The full and proper application of EU legislation is a must. But the existence of the adequate infrastructure is a condition *sine qua non*: by 2015, no member-state should be isolated from the European internal energy market.

The outcome of the February 2011 EU summit in Brussels represents a real breakthrough for European energy policy. For the very first time, we have set ourselves a clear deadline for completing the common energy market. By 2014, power and gas should be transported as easily throughout Europe as goods and services. Nothing will do more to help us ensure security of supply in energy resources and affordable prices for consumers and industry alike than a real European marketplace in energy.

The EU's heads of state and government have shown support for the swift deployment of critical energy infrastructure by agreeing a further simplification of licensing requirements, as well as additional public financial support. We now have to concentrate our efforts on concrete projects to achieve greater solidarity, an inter-connected market, new power generation, an 'intelligent grid' and large-scale production of renewables available to all at competitive prices.

★ Citizens first

Energy policies have to be more consumer-friendly. I would like all the tools we have in this regard, like the 'consumer check list' (a new database that helps people around the EU to exercise their rights to switch suppliers and understand local power and gas markets), to be improved and applied more widely. All consumers enjoy the right to have their basic energy needs met at all times, including in a supply crisis.

EU energy policy aims to achieve more transparency, improved access to information, better functioning of the retail market, development of adequate infrastructure and safety nets for vulnerable consumers. The EU adds value for all citizens by ensuring that the highest standards are applied in all member-states for nuclear safety and security, offshore oil and gas extraction or the development of new energy technologies.

★ A technological shift

We must consolidate and extend Europe's lead in energy technology. New technologies, such as smart meters or new types of houses which produce more energy than they consume, no longer belong to the realm of science-fiction. The main challenge is to make these technologies accessible and cost-effective to the general public. I would therefore like to develop a European reference framework in which member-states and regions can support the spread of new technologies. Europe has some of the world's best renewable energy companies and research institutions. We need to keep this leadership.

★ Strengthening the EU's leadership in the world

The EU should be a favoured partner in international negotiations on energy and climate action. The present situation, where external partners can 'divide and rule', is untenable. The EU has the world's largest regional energy market – 500 million people. It accounts for

one fifth of the world's energy use. We import on average around 3 million tonnes of oil equivalent every day. The EU is also the world's biggest economic trading block. We should exploit the international weight of our single market. We also need a mechanism to co-ordinate our efforts and send coherent messages to our main partners. The integration of energy markets with our neighbours contributes to both our and their security. As stated by the February 2011 summit, the EU will now shift up a gear in international energy relations. The Council's decisions give us the momentum to ensure a strong representation of European energy interests in relations with our partners on the continent and beyond.

Time for action

The oil price volatility that accompanied the Arab spring and the Fukushima nuclear accident have once again shown us that the global energy system is entering a phase of unpredictable transition with potentially far-reaching implications for the next decades. The time for action is now. I strongly believe that our five-pillar strategy offers us the needed guidance for the years to come.

4 The energy infrastructure challenge
by Christof van Agt

Today, energy is not only driving EU market integration and competitiveness; it is also a key ingredient of EU policies for sustainability, foreign relations and security. Infrastructure is at the heart of the EU's energy policy. Timely investment in infrastructure is needed to link new power plants, wind farms and solar panels to consumers. Interconnections between national energy markets and pan-European pipeline and electricity networks are required to integrate the EU's internal energy market. Interconnectors, together with storage facilities, will also add to the flexibility and resilience of the EU energy market and therefore enhance security of supply. New and better power grids are needed for the EU-wide shift towards renewables. The application of carbon capture and storage technology to polluting power plants will require new infrastructure to transport and store carbon. New pipelines are needed to diversify imports of oil and gas from outside the EU.

The European Commission reckons that €1 trillion in investment will be required over the next decade to complete the EU's integrated energy market and set the EU on course to achieve its 2050 climate aims. Most of this money will have to come from private sources. The EU's main challenge will be to shape a policy framework for the energy sector that stimulates massive investment while at the same time fulfilling public policy goals. The right policy framework will support economic growth and innovation, enhance energy security, enable the EU to manage its increasing dependency on fossil fuel imports, reduce its carbon emissions and enhance energy efficiency.

Of the estimated €1 trillion, around half will have to go to infrastructure if the EU is to achieve its vision of a "Europeanisation" of the energy market (in the words of Energy Commissioner Oettinger). Recent EU communications on energy convey a sense of urgency: the infrastructure investment choices made today will set the pace and parameters for the EU's welfare and prosperity throughout the 21st century.

Energy policy takes a top-down view

To date, the main drivers for EU energy market liberalisation and integration have been laws (the three energy market packages) and competition policy. These measures have led to power and gas market liberalisation within many EU countries but they have not brought about an integrated European energy market. National integrated energy companies had little interest in building connections to neighbouring countries and so increase competition in their own markets. The fluid regulatory environment, with 27 independent regulators, did not incentivise companies to build pipelines or power lines through third countries. Although the EU has been drawing up plans for 'trans-European networks' (TENs) in energy since the late 1980s, the limited funds earmarked for these TENs in the EU budget were mainly spent on feasibility studies. Many in the EU concluded that new measures were needed to make the European market a reality.

The Lisbon treaty has added a new dimension to EU energy policy. The new article 194 on energy requires member-states to act "in a spirit of solidarity" to ensure the functioning of the internal market and security of supply, enhance energy savings and efficiency, promote the use of renewable energy and, last but not least, interconnect energy networks. The EU is now using this new clause to construct an EU-wide industrial energy policy, to complement the application of energy and competition law in individual member-states. The critical role that cross-border infrastructure (rather than just market opening) plays in the EU's policies for the

single energy market and the transition to a low-carbon economy could therefore undermine the subsidiarity principle (which demands that EU institutions only exercise those functions that member-states cannot perform).

The following proposals, currently under discussion in the EU, are part of the move towards this more top-down, solidarity-driven approach:

★ **Strategic TENs:** in the past, the list of TENs often reflected the needs and wishes of individual member-states, as well as an attempt to spread EU support evenly. The EU will now whittle down the list of infrastructure projects that receive EU support, guided by the idea that only projects of 'European interest' that cannot be funded by the market should get public support. For electricity infrastructure this means integrating renewables securely into the grid, building interconnections and making sufficient network capacity available through 'super grids' to transmit power to demand centres and storage facilities. For gas infrastructure it means diversifying sources and routes of supply while increasing interconnections within the EU to strengthen competition and resilience.

★ **Public financial support:** the EU is increasingly inclined to finance directly, or at least guarantee the finance of, infrastructure projects of 'European interest', where the market does not provide the necessary funds of its own. The EU, together with international lenders, is also exploring how to use public-private partnerships to leverage public funding. At the end of 2008, the EU earmarked €4 billion of its economic stimulus package for energy sector investments. In 2009, the European Investment Bank energy sector financing target was raised to €13 billion, which also includes financing for TEN projects. The Commission has proposed that the EU's next seven-year budget starting in 2014 should include a new infrastructure financing facility of €40 billion.

★ **Regulatory convergence:** the EU will encourage the construction of new infrastructure and energy facilities by streamlining licensing procedures in and among EU member-states. The European Council on energy of February 4th 2011 asked the Commission to draw up new legislative proposals to address obstacles – financial, regulatory and licensing – to infrastructure investment by the autumn of 2011.

★ **International frameworks:** the intergovernmental agreements that the EU signs with energy producing and transit states help to create legal stability, and thus mitigate geo-political and transit risks; this can help stimulate investment in major infrastructure projects for energy supplies from outside the EU.

★ **Larger markets:** the integration of national electricity and gas markets will make it easier to sell energy generated from renewable and fossil sources and thus allow energy companies to recoup high upfront investment costs. This principle applies equally to infrastructure investments related to the offshore wind farms in the North Sea, the solar energy facilities in the Mediterranean and the new pipelines planned to bring Caspian gas to the EU.

Bottom-up policies do not deliver

Although politicians and business people agree on the need for massive new investment in electricity, gas and other infrastructure facilities, commercial incentives are too weak to bring these about. The third energy package, which is currently being implemented across the EU, does not sufficiently encourage investment and, contrary to expectations, could even slow it down.

The third energy package forces integrated energy companies to 'unbundle' their production and/or import businesses from the transport and distribution of energy. Those companies, or parts of companies, that own and operate pipelined and power grids (system

operators) need to sell access to this infrastructure to other companies. Since the transport and supply of infrastructure is so central to each country's economy, the overall aim is to keep their costs (both in terms of investment and tariffs for transmission services) as low as possible. What the third energy package does not do is bring about a tariff structure that would make it worthwhile for companies to build the infrastructure required for a pan-European energy market. The aim of low energy prices can conflict with the need of companies to recoup their infrastructure investments.

Furthermore, respecting the subsidiarity principle, the EU offers integrated energy companies a menu of unbundling options: companies can either sell their networks into the hands of 'transmission system operators' (TSOs) (full ownership unbundling); keep infrastructure assets on their books but make sure they are managed independently through a designated 'independent system operator' (ISO); or, finally, allow the management and ownership of infrastructure assets to remain in the integrated company (called the independent transmission operator, or ITO).

The last two options, ISO and ITO, will require considerably more regulation and supervision to work. The need to comply with such heavy regulation could complicate the operation of integrated energy companies. Nevertheless, many of them will opt for the ISO or ITO option, as they still hope to exploit the considerable commercial value of keeping their networks on their books. This value depends on how national markets are regulated. National regulatory frameworks still differ hugely in how they set tariffs for energy transport, value networks and set performance criteria for capital and operational expenses. The third energy package does not change that, leaving national regulatory authorities with plenty of autonomy and – in cases where they have to deal with ISOs or ITOs – an added incentive to tighten regulation on a national basis. This is not the way forward.

The 'a la carte' mode of unbundling will entrench obstacles to cross-border investment, at least in the short term. However, if

national regulators acted fast to make it less worthwhile for companies to retain networks on their books, integrated companies (at least those that are not mollycoddled as 'national champions') would be more likely to sell off their networks and invest in opportunities that give them higher returns than running a network in a highly regulated environment. A strong regulatory push would thus lead to a widespread sale of network assets and bring about a level playing field among TSOs. This, in turn, would vastly facilitate cross-border investment. It would also attract capital from investors keen on long-term regulated returns, such as pension funds.

Horizontal approaches are needed

In addition to the (sluggish) bottom-up liberalisation and the new top-down measures, the EU also needs horizontal co-ordination. The EU has set up three new co-ordinating bodies: the Agency for the Co-operation of Energy Regulators (ACER), which will by default be the EU's primary energy market regulator since national regulatory agencies are ill-suited to sort out cross-border issues; and the two European Networks of Transmission System Operators for electricity and gas (ENTSO-E and ENTSO-G), which bring together the companies that own and manage energy infrastructure. The EU has asked the new bodies to draw up EU-wide 'ten year network development plans' (TYNDPs) that take a truly European view of future infrastructure needs. At least the TYNDPs will shed more light on what kind of infrastructures European energy markets require in the long term. ACER and the ENTSOs will also support the convergence of methodologies used to distribute the costs of cross-border infrastructure projects among owners, users and customers – or taxpayers for those projects of European interest that receive public funding.

However, ACER and the ENTSOs are only just beginning their consultation processes. These bodies still reflect the diverse regulatory and business cultures of their memberships, made up of

independently-minded national regulators and transmission companies that are to varying degrees unbundled. Their authority will ultimately depend on in how far they act collectively in the pursuit of EU-wide infrastructure investment and energy market reform.

Cohesion and consistency

In sum, the 'infrastructure challenge' for the EU and its member-states is the following: ensure that all three approaches – top-down, bottom-up and horizontal – to stimulating investment are compatible and eventually become mutually reinforcing. The EU should not rush into rigidly imposing a long-term policy vision. Legitimate commercial interests need to be taken into account. National energy policies and public-private consultations should be given sufficient time to deliver a functioning cross-border market model. Public acceptance of big infrastructure projects will increase only slowly.

Top-down visionary approaches look good in public announcements from politicians. They also help to focus minds on future market development and infrastructure investment needs. However, the EU must be cautious not to interfere too much in the allocation of infrastructure investments. Such interference would 'lock in' both a particular energy mix and selected technologies, which might saddle European energy markets with suboptimal solutions and high prices for years to come.

The third energy package will initially cause further delays in infrastructure investments – especially if regulatory decisions cannot be contested. However, as markets develop, ACER and the ENTSOs get into their stride and regional co-operation among EU countries deepens, a consensus will slowly emerge on cross-border infrastructure needs while tariffs, asset valuations and performance methodologies will converge. Such an approach stands a better chance of bringing about cross-border investments in line with actual market needs. If the EU tries to pre-judge such decisions, it

might hinder the effective and economically viable mobilisation of the €1 trillion needed for the EU's future energy needs.

Outlook and recommendations

The EU's institutions, governments and regulatory agencies should work with industry bodies to focus EU energy policy on the critical importance of infrastructure investment. Ill-co-ordinated, misguided or badly timed initiatives will destroy investment opportunities. The private sector will only fund the lion's share of the EU's €1 trillion energy investment needs if the EU resolutely implements existing and, where necessary, new legislation to allow markets to function properly. Industrial and financial players need to have certainty about the future risks and rewards of their investments. This means that the EU needs to find a better balance between consumer interests (cheap energy prices and tariffs) and investment incentives (sufficient yields on capital spending). Consistency, coherence and predictability are key to solving the EU's infrastructure challenge.

Firstly, therefore, EU member-states should build on the momentum created by the third energy package by making the new co-ordination bodies (ACER and the ENTSOs) work. The EU already has the ability to remove obstacles to investments that markets cannot overcome, for example, by providing the right level of support for investment in big infrastructure projects or building infrastructure where there is an obvious, if not quantifiable, benefit to EU society as a whole. The new bodies can take this work forward.

Secondly, national regulatory decisions need to be contestable to some degree. At present, national regulators exercise their wide but differing mandates largely without checks and balances – other than being asked to "take utmost account" of EU energy policy goals. ACER offers an opportunity to develop a system of reconciliation and dispute settlement for national decisions that do not support EU goals such as energy security and sustainability. Such a system

should allow for a better balance between investor and consumer interests, as well as between energy market integration and climate goals, in the EU's big push for infrastructure investments.

Thirdly, EU member-states should work together on a regional basis to ensure that accurate data and information is available to support regional infrastructure development while respecting commercial confidentiality.

Finally, innovative approaches at the EU level to boost major infrastructure investment projects are only useful to the extent that they strengthen established EU policy and practices, rather than adding uncertainty. The 'Caspian development corporation' – the idea to aggregate EU gas demand to offer large contracts to Turkmenistan and other Caspian gas producers – is a case in point. It might help to get the Nabucco pipeline off the ground but it would also undermine the market principles of the EU energy sector.

The EU needs to prevent taxpayers footing too big a share of the infrastructure investment bill. It therefore needs a clear definition of 'European interest' in terms of the wider opportunities that such investments open up to. Publicly supported investments could then create momentum for infrastructure development that should spur private investors to finance the bulk of new projects. If the EU pushes too hard for certain projects, markets will not be able to test the commercial viability of the many options that are still conceivable under the EU policy pathways beyond 2020. It is crucial that these options remain open at acceptable cost to consumers and fair returns to investors in order to achieve the EU's energy and climate vision to 2050.

5 The EU's role in fighting climate change
by Connie Hedegaard

The European Union has been in the vanguard of international action to combat climate change since this challenge forced itself onto the policy agenda in the early 1990s. We take industrialised countries' responsibility to lead this fight very seriously.

The EU contributes around 11 per cent of worldwide greenhouse gas emissions and our share is falling. We are still a major emitter, but the fact that nearly 90 per cent of emissions come from other parts of the world underlines the need for action on a global scale. All major emitters need to get on board.

In this context, a precondition for Europe to maximise its influence is leading by example. But we know that being at the forefront of the inevitable transition to a global low-carbon society is also squarely in the EU's own economic interests. That is one of the reasons why the EU's heads of state and government have committed to transforming Europe into a highly energy efficient, low-carbon economy.

To ensure that we meet our Kyoto protocol emission targets, we have developed a range of cost-effective policies and measures. Some of them have broken new ground, in particular the EU emissions trading system (EU ETS).

The world's pioneer

Launched in 2005, the EU ETS is the largest multi-country 'cap-and-trade' system in the world – Norway, Iceland and Liechtenstein

participate in addition to the 27 EU member-states – and the main driver of the international carbon market. By 2020, emissions from the sectors covered by the system – power generation, heavy industry and, from 2012, aviation – are expected to be 21 per cent lower than in 2005.

Even if the introduction of a federal system in the US seems to be off the agenda for the foreseeable future, international interest in emissions trading as a cost-effective way to reduce emissions remains high. New Zealand already has a domestic system up and running and South Korea is finalising plans for one. Cap-and-trade schemes remain under active discussion in Japan and Australia. And China's announced intention to set up a domestic emissions trading system under its new five-year plan is a significant step in the direction of a broader and more dynamic international carbon market.

Looking beyond the first commitment period of Kyoto, which expires at the end of 2012, EU leaders in 2007 endorsed the ambitious '20-20-20' set of climate and energy targets which have been influential in setting the pace for international action in the medium term. The targets call for EU greenhouse gas emissions to be cut by 20 per cent (compared to 1990 levels) and renewable sources' share of the EU energy mix to be increased to 20 per cent (more than double the level when the target was set), both by 2020. A further objective is to improve energy efficiency by 20 per cent by 2020 compared to 'business as usual' projections.

Since 80 per cent of the EU's greenhouse gas emissions are due to energy use, including fuel used in transport, this integrated approach to climate and energy policies and targets is essential. Also from a 'pure' energy policy perspective, the contribution of such an approach should not be underestimated: as a truly European policy, and based on increasingly harmonised rules, the EU ETS is an important driver for more integration in Europe's energy markets and policies; these are areas where progress on the ground sought by other means historically has been slow and difficult.

The EU was the first major international player to come forward with its 2020 targets – and the first to put in place binding measures to reach the ones for emissions and renewables. These targets have given Europe a head start in the race to build the low-carbon and energy-efficient global economy that will be needed to tame climate change.

The fact that many developed and developing countries followed us in announcing emission pledges in the run-up to the Copenhagen climate conference at the end of 2009 (which are now formally reflected in last December's UN agreements in Cancun) tells me that such leadership by example works. Even if collectively these pledges are not yet sufficiently ambitious, it is hard to imagine that so many would have been forthcoming if the EU had not moved first.

Climate action and economic growth

Some decision-makers and lobbies still argue that reducing emissions is bad for the economy. Europe's experience gives the lie to such claims.

Between 1990 and 2009, emissions from the 27 EU member-states combined fell by around 16 per cent while the economy expanded by 40 per cent. Emissions from the 15 'older' member-states which are bound by our 8 per cent reduction commitment under the Kyoto protocol stood 6.9 per cent lower in 2008, while their economies grew by 45 per cent over the same period. Part of the emissions reduction is due to the economic crisis, it is true, but even before that emissions were well into negative territory. We are showing the world that it is perfectly possible to cut emissions while growing the economy. By taking well thought-out climate action, we have successfully challenged the historical link between these two indicators.

The economic and social importance of cutting the EU's greenhouse gas emissions is reflected in the fact that the 20 per cent reduction is

one of the five headline targets of the 'Europe 2020' strategy for smart, sustainable and inclusive growth.

For the longer term, EU leaders have endorsed the objective of cutting our emissions by 80-95 per cent of 1990 levels. This is the scale of reductions needed from developed countries if global emissions are to be cut by at least half by the middle of this century. That, in turn, is what science says is necessary for the world to have a chance of keeping global warming below 2°C above the pre-industrial temperature, as the international community has agreed.

So how can we move from a 20 per cent emissions reduction by 2020 to an 80-95 per cent cut by mid-century? In March 2011 the European Commission published a 'roadmap' which sets out a cost-effective pathway to building a competitive, low-carbon EU economy by 2050. The roadmap gives direction to sectoral policies, national and regional low-carbon strategies and long-term investments. In addition, climate needs to be better 'mainstreamed' into the EU budget and into 'horizontal' EU policies that affect many sectors. One example could be to use cohesion funds to boost energy efficient renovation of buildings, and more generally to 'climate proof' any significant policies and projects receiving public funds.

The low-carbon transition will need considerable additional investment but our analysis shows this would be largely offset, or even overcompensated, by major reductions in the EU's oil and gas imports and big cost savings due to better air quality. As well as reducing our vulnerability to potential future oil price shocks, the added investment would stimulate new sources of growth, preserve many existing jobs and create new ones. There is potential to add up to 1.5 million new jobs in net terms by 2020.

China, India, Korea and others also see the low-carbon economy as a strategic priority and are investing heavily in it. As EU commissioner for climate action, I want to ensure that Europe stays in the lead of this transition so that we maximise the benefits for our economy.

Further improvements to energy efficiency should make the biggest contribution to building the low-carbon economy. At present, however, the EU is not on course to achieve the 20 per cent improvement it wants by 2020. This is why the Commission adopted a new 'energy efficiency plan' in March 2011 at the same time as the roadmap. If member-states reach the full 20 per cent energy efficiency improvement target, the EU will be able to reduce greenhouse gas emissions by 25 per cent in 2020 instead of 20 per cent. To achieve this, the interaction with the EU ETS must however be considered – again, the integrated approach is critical. The analysis underpinning the roadmap shows a 25 per cent cut through domestic measures alone is actually the most cost-effective solution for 2020, when they are seen as steps towards achieving the 2050 targets.

The other 90 per cent of emissions

At international level, the EU has long been a driving force for determined global action based on the scientific evidence of climate change. As the world's biggest provider of official development assistance we are increasingly making climate change – both the reduction of emissions and adaptation measures – a major focus of our aid to developing countries. The EU was instrumental in ensuring the entry into force of the Kyoto protocol and with it the 'clean developing mechanism' (through which richer countries help poorer ones to reduce emissions). We were prime movers behind the launch of UN negotiations on a global climate framework for the post-2012 era. And through a constant flow of ideas and proposals, combined with proactive outreach and diplomacy, Europe is shaping the future climate regime that is gradually emerging.

The goal of limiting global warming to 2°C, which the EU has been pushing for since 1996, has been universally accepted since the Copenhagen climate conference. The Cancun agreements struck at the end of 2010 carry the EU's fingerprints in other respects too. Not the least of these is that the emission pledges that countries made before and after Copenhagen are now firmly

anchored in a UN document, which also recognises that they are not enough to stay below the 2°C ceiling and will need to be ratcheted up. In fact, the Cancun outcome as a whole – a politically balanced package of decisions that allows immediate climate action to start in a number of fields while also laying the foundation for a future global framework – reflects the pragmatic, step-by-step approach to the international negotiations which the EU pioneered after Copenhagen.

The EU's goal remains an ambitious, comprehensive and legally binding global framework for climate action in which all major economies pull their weight. That provides the best hope for preventing climate change from reaching dangerous levels over the coming decades – levels that would almost certainly bring huge human and economic costs. Some of our partners are not yet ready to commit to a legally binding outcome. As we have done with success in other areas, Europe will continue to press the case for what we believe is necessary – while proving at home that being the world's most climate-friendly region is also a win-win strategy for European citizens and businesses.

6 Risk management, credible options and the future of European renewables policy *by Jonathan Gaventa and Nick Mabey*

All long-term scenarios for Europe's energy system involve considerable risks: the wrong decisions could jeopardise climate and energy security, damage human health and the environment, or lead to unacceptable costs for consumers. Recent events – including the sharp rises in fossil fuel prices accompanying the Arab spring, the nuclear crisis at Fukushima and the Deepwater Horizon oil spill – underline the profound unpredictability of future energy developments. At the same time, the opportunities associated with technological breakthroughs, such as distributed generation or thin film solar, could transform future energy outcomes.

When costs and potentials are not yet fully known, there is value in holding options open, to create a 'policy hedge' against future uncertainty. The European Union's renewable energy policy has quickly become a key element of Europe's strategy for managing the risks to the European economy associated with climate change and fossil fuel price swings. Though sometimes controversial, targets and subsidy mechanisms have served to drive development and deployment of key power technologies and widen the range of options available to deal with the challenges facing European energy systems. However, Europe is rapidly approaching the point where it must decide which potential energy pathways will be kept open and which will be foreclosed.

Renewables policy as risk management

The EU first adopted policies on renewable energy following the oil shocks of the 1970s. Since then, renewable energy policies have become increasingly sophisticated. All member-states now have financial support mechanisms in place, and the EU's 'renewable energy directive', adopted in 2009, for the first time sets a binding target for 20 per cent of energy consumption to come from renewable sources by 2020. These policies have played two important roles.

First, renewables deployment has created an important buffer against the risk that the volatility of fossil fuel prices poses to Europe's economy. Europe currently imports half of its primary energy and this figure is rising. Declining indigenous resources, combined with oil-linked pricing in the majority of Europe's gas supply contracts, makes Europe increasingly vulnerable to shifts in international fossil fuel prices – often driven by political, economic and geological uncertainties over which Europe has little foresight or control.

When the 20 per cent renewables target was proposed in 2007, it was estimated that the policies to achieve it would add €26 billion per year to the cost of electricity by 2020 – under the baseline assumption of an average oil price of $48 a barrel.[1] If the oil price averaged $78/bbl (the highest considered in the study), costs would drop to €0.2 billion per year. This suggests that if oil prices persist at current levels well above $100/bbl, the renewables targets may lead to net savings even without accounting for the carbon benefits.

[1] *Fraunhofer ISI, EEG and ECOFYS, 'Economic analysis of reaching a 20 per cent share of renewable energy sources in 2020', August 2006. http://ec.europa.eu/environment/enveco/others/pdf/res2020_executive_summary.pdf.*

The importance of this fuel price buffer is set to grow as Europe becomes more import-dependent and fossil fuel prices become more volatile. Analysis for the European Climate Foundation

found that low-carbon technology pathways (involving significant levels of renewables) would prevent the loss of €300 billion in GDP in the event of a fossil fuel price spike lasting three years from 2020.[2]

[2] *European Climate Foundation, 'Roadmap 2050: A practical guide to a prosperous, low-carbon Europe', 2010. www.roadmap2050.eu.*

Second, renewables policies have allowed EU countries to gain experience of how low-carbon technologies operate at larger scale. From a very low base, renewable energy consumption has doubled in the last decade and, according to national plans, is on course to nearly double again by 2020 in order to meet the 20 per cent target.

Key technologies have moved from being theoretical possibilities to realistic options for the decarbonisation of Europe's energy mix. As new technologies are deployed more widely, there is more solid evidence of their potentials and performance. In many cases the costs of technologies have also fallen. According to the European Commission, the costs of producing electricity from wind power have declined by 20 per cent over the nine years to 2006 and those of solar photovoltaic power by 57 per cent.[3] Costs are expected to fall considerably further as installed capacity increases.

[3] *European Commission, 'Renewable energy: Progressing towards the 2020 target', January 2011.*

The experience generated by current policies has also made it easier to foresee the risks facing renewable energy in future. For example, the case of Spain shows that overly generous subsidies for certain technologies can create investment bubbles. These can just as quickly burst if policy is then changed and applied retroactively, as was the case in Spain where subsidies for already installed photovoltaic cells were cut considerably. The lesson is that drastic policy changes can damage the prospects for the whole sector. Another interesting example is the development of offshore wind farms in the UK. Large cost reductions were expected from installing such significant volumes of renewables. But experience showed that these cost reductions are difficult to predict far in advance and depend on a

range of external factors, such as fluctuating exchange rates, the costs of steel and cement or the availability of cranes and ships. Greater understanding of these conditions will make risks easier to manage, but cannot remove them entirely.

The decision juncture

At low rates of penetration, renewable technologies can be incorporated into existing fossil based energy systems relatively easily. Existing grids can cope with the power flows; conventional generation can be ramped up or down to respond to intermittency. The key policies to facilitate the spread of renewables are subsidies for research and development and financial incentives for deployment.

To enable a move towards higher levels of renewables usage, however, the key policy challenge becomes one of adjusting the energy system as a whole rather than simply paying subsidies. Sufficient investment is unlikely to be forthcoming without confidence in the volume of future market opportunities; this in turn requires energy infrastructures, markets and longer-term policy frameworks conducive to renewable development. Europe faces key decisions in each of these areas over the next few years.

★ A strategic approach to infrastructure

The majority of existing power grids were built in an era in which electricity systems were predominately national, power generation was sited relatively close to the points of consumption, and power flows were uni-directional and more predictable. If the proportion of renewable electricity is to increase significantly, these conditions are unlikely to hold. Most of Europe's large-scale renewable energy resources are located at its periphery (including wind and wave power in the northern seas and solar power around the Mediterranean), away from centres of consumption. Making best use of this potential will require greater volumes of electricity crossing national borders.

It is availability rather than demand that largely determines the use of renewables: turbines only turn when the wind is blowing. When such technologies represent a higher proportion of generation, supply and demand must be balanced either across larger geographical areas (the 'super grid' approach) or through using new grid technologies to shift generation and consumption profiles (the 'smart grid'). Both options may offer associated benefits beyond renewables integration. Smart grids increase reliability and efficiency, and allow consumers to have greater control over their energy use. A super-grid could drive European market integration and increase security of supply.

However, such new grids will only be built if the EU adopts a more forward looking approach to planning and investment. Traditionally, investments in grids have followed the building of power plants and other generation, even though power lines take significantly longer to build than, say, wind turbines. This sequencing creates a vicious circle: delays in grid connection can undermine investment in new renewable generation; yet without the investment in new generation, the required grids will not be built. In Scotland for example, over 9 gigawatts (GW) of renewables is currently waiting for grid connection and much of this has a connection date later than 2018.[4] This circle can only be broken if grid planning becomes anticipatory rather than solely reacting to where generation is already under construction, and regulators and transmission operators accept the risk that some lines will be under-utilised until new generation is built.

[4] *House of Commons energy and climate change committee, 'The future of Britain's electricity networks', second report of session 2009-10.*

Some degree of predictability is provided by the new 'ten year network development plan' of the European Network of Transmission System Operators (ENTSO-E). The plan is an important starting point for providing more certainty for grid development. However, the current plan is insufficiently aligned with European decarbonisation goals and remains a collection of predominantly national plans. For future iterations, ENTSO-E must be empowered to address longer time horizons (say, 20 years rather

than ten) and to push forward long-term transformational projects that could unlock significant volumes of low-carbon investments such as a North Sea grid for offshore wind or a Mediterranean grid for linking large-scale solar generation.

Public investment must support the construction of these strategically important networks where existing funding mechanisms are insufficient. The majority of new lines are expected to be funded on a regulated tariff basis, whereby the investment costs are repaid through tariff revenue over time. But public financing mechanisms will need to be employed to lower the cost of capital, to fund projects that are innovative or difficult (for example, offshore hubs for connecting wind farms) or where a project has strategic importance for energy security or decarbonisation.

Under the 'energy infrastructure package', the European Commission is currently developing proposals for infrastructure finance, including insuring project bonds via the European Investment Bank. However the European Council conclusions from February 4th 2011 appeared to prioritise infrastructure designed to meet security of supply and solidarity concerns. The package must be expanded to include the key investments that ensure Europe is able to meet its climate change trajectories.

★ Reoriented power markets

Current power market arrangements are designed to drive competition mainly among conventional power plants running on gas and coal. Wholesale electricity prices tend to be based on short-run operational costs and are largely driven by changes in fossil fuel prices. Most renewable power generation, by contrast, has high upfront capital costs but low ongoing operational costs. As the proportion of renewable generation within the electricity market increases, wholesale power prices tend to fall, and it becomes increasingly difficult for any investments to earn back their fixed cost.

In several EU member-states, these challenges have led to calls for electricity market reform, including the introduction of 'capacity payments' (mechanisms to remunerate the provision of back up capacity rather than electricity sold) to cover fixed costs as well as operational costs. Unless a co-ordinated approach is taken, however, these proposals may sit uneasily alongside the goal of European power market integration, as Georg Zachmann explains elsewhere in this report.

The underlying issue behind these dilemmas is the deep uncertainty about how future power markets will operate, and the barriers this uncertainty places on investments in both renewable and conventional generation. To answer both the investment and the integration challenge, European governments will need to develop power market arrangements capable of limiting costs to consumers, managing risks during the low-carbon transition and enabling the emergence of a single European market. An extension of the status quo would fail on each of these counts.

★ A believable story about the future

The final criteria needed to ensure the high renewables pathway remains a credible option is a more believable narrative about the future of European energy policies. As currently framed, European renewables policy effectively ends in 2020, a mere nine years away. Post-2020, there are no further renewables targets and no binding decarbonisation targets other than a general ambition to achieve 80-95 per cent carbon reductions by 2050 if other countries take similar action. However, the significant levels of investments in long-lived renewables manufacturing and installation capacity needed to deliver the 2020 targets (for example, the testing facilities, factories and ships needed for offshore wind) is unlikely to materialise without greater certainty over what will happen to renewables policy after the 2020 target date.

The European Commission is set to produce a '2050 roadmap' for energy later in 2011, following on from the roadmap for a low-

carbon economy published in March. The roadmap is an opportunity to limit this uncertainty and ensure that the high renewables option remains viable. This implies establishing a clear date by which the power sector must be decarbonised;[5] developing new renewables targets for the 2025 or 2030 time horizon; or pushing forward plant-based emissions performance standards to ensure that more polluting coal or gas-fired power plants cannot crowd out cleaner energy from renewable sources.

[5] The UK's committee on climate change has proposed that power sector emissions should be no greater than 50g CO_2/kWh by 2030.

From subsidies to systemic change

Like all evolving technologies, those needed for the use of renewable energy sources entail risks and uncertainty. The financial support schemes that EU governments have put in place for renewables represent a strategic investment to expand available options by driving forward technological development and accumulating experience on risk and costs.

Keeping the high renewables option open, however, will require a widening of the debate from subsidising the use of wind and solar to adjusting the entire energy system to the widespread use of renewables. Investors in technologies and supply chains will require greater clarity on how big future demand for renewables will be. They need confidence that Europe's energy infrastructure will be up to the task, that market arrangements will work efficiently and that policy frameworks will deliver the required decarbonisation trajectory. This requires the EU and its member-states to institute a more strategic approach to infrastructure planning, to reform electricity markets and to adopt longer-term carbon and renewables targets. Unless these decisions are taken quickly, the option of a high renewables pathway to a low-carbon energy system will be effectively foreclosed.

The time for Desertec has not yet come
by Maïté Jauréguy-Naudin

Desertec is an EU-supported programme to use the sun and wind of deserts, notably in the Sahara, to generate renewable energy. The idea is to cover vast swathes of deserts with solar power plants and wind farms and to feed the generated electricity into both local markets and, via a high-voltage undersea cable, the European market. Supporters claim that Desertec could eventually cover 15 per cent of Europe's electricity needs.

The not-for-profit Desertec foundation started promoting the project in January 2009. A dozen major companies, mainly German, threw their weight behind the initiative early on, including big utilities such as EOn and RWE. The Desertec Industry Initiative (DII), launched in October 2009, has grown into an impressive consortium of not only German but also European, American, Japanese and North African companies. The DII intends to "create the legal, regulatory, economic and technical framework that will allow the Desertec vision to be realised".

Desertec's underlying idea of a renewable energy revolution in the Middle East and North Africa (MENA) is appealing because only one twentieth of the Sahara could in theory supply most of the world's energy needs. However, Desertec faces significant obstacles:

★ To garner the necessary political support in the MENA countries, Desertec would have to provide convincing arguments why it benefits all stakeholders involved, not just the big German companies driving it. However, electricity prices in the MENA countries are subsidised and significantly lower than in Europe, which makes it doubtful that much of the power generated by Desertec will end up being sold locally. Why would investors sacrifice profits in the European market to supply local consumers at regulated prices far below production costs?

★ It is not certain that Desertec is the best way to meet the MENA region's ever increasing energy demand. Wind and solar technologies are still heavily subsidised in western countries. Even though their cost is expected to decrease over time, there is still huge uncertainty about when, for example, photovoltaic solar power will become profitable. That applies even more to the areas around the Sahara, where sandstorms and water shortages might add to costs. The EU could subsidise Dersertec energy. But such subsidies would further add to European electricity bills which have already increased as a result of renewable support schemes within the EU countries. EU citizens might then start to question the EU renewables support more generally.

★ To benefit from Desertec, the countries likely to be involved (such as Morocco, Tunisia, Algeria, Libya and Egypt) would have to invest heavily in the expansion of their electricity grids and in linkages between national grids. Money shortages aside, existing disputes between the countries involved will complicate cross-border co-operation. The recent turmoil in the MENA region has reinforced concerns that shifting a significant share of European electricity production to Northern Africa would pose risks to energy security.

★ Another major challenge is the transmission of the Desertec energy to Europe, which would require massive undersea cables vulnerable to disruptions, delays and cost overruns. In addition, a host of other issues remain to be addressed, such as who owns and controls the installations; how much transfer of technology and tariff revenue to the MENA countries would be involved; and how to keep the installations safe from terrorist attacks and other disruptions.

Desertec would only work for the MENA countries if they became actively involved in finding solutions for issues that affect them, such as improving energy efficiency. Such efforts should then use local resources and promote local education and training so that the development and maintenance of new energy technologies benefits local communities. This is still a tall order.

The EU is not yet able to harvest the full potential of wind and solar power even within its borders. To do so, it will have to develop new grids and interconnections across Europe to cope with the intermittency of renewable sources of energy. Such grid development will be hugely expensive and will push up electricity prices further. From this perspective, Desertec should not be a priority project for the EU.

7 Energy saving is the key to EU energy and climate goals *by Pernille Schiellerup*

The EU has made the promotion of energy efficiency and savings a central objective of its energy policy, because it saves money and boosts growth, and because it contributes to other energy policy targets. By reducing the EU's dependence on oil and gas imports, energy efficiency and savings measures are crucial for EU energy security. They are equally central to EU climate policy goals, since the majority of carbon emissions are the result of energy production and consumption. This is why the EU has included a 20 per cent reduction in energy consumption (compared to projected levels) in its 2009 climate and energy package. It has since reiterated the central importance of energy efficiency and savings in a number of important policy statements, including the 'Europe 2020' economic strategy, the 'Energy 2020' strategy and the 'roadmap' for a competitive low-carbon economy by 2050. Energy efficiency (if not quite yet absolute energy savings) enjoys a level of political attention not seen since the oil price shocks of 1973 and 1979. Yet on current trends, the EU will miss its 20 per cent target by a wide margin.

What are the benefits from saving energy?

The EU's dependence on imported oil and gas leaves it vulnerable to swings in international commodity prices, instability in producer regions and the prospect of declining global resources. Saving energy can reduce such vulnerabilities. In more recent decades, growing political attention to climate change has strengthened the environmental motivation for energy efficiency and savings.

As energy efficiency has moved up the EU agenda, the debate has focused increasingly on its wider benefits: economic growth, competitiveness and job creation; a reduction in energy-related pollutants and associated health hazards; avoiding the costs of climate change (for example the damage that extreme weather does to infrastructure); and the prevention of 'fuel poverty' (as households save on their energy bills).

Such additional benefits matter because individual EU member-states have different economic and political concerns and priorities. Arguments about the additional benefits of energy efficiency and savings can play an important role in persuading decision-makers of the need for action.

Benefits in terms of job creation are a case in point – all the more important after the economic recession. Conservative estimates from the European Commission show that 2 million jobs could be created or retained as a result of the implementation of energy efficiency measures.[6] Some experts think that the employment effects could be much greater. One study shows that, depending on the level of ambition, a long-term renovation programme of residential and public buildings in Hungary could create between 75,000 and 185,000 jobs a year (with a peak in 2017).[7] The study appears to have made an important contribution to the decision of the Hungarian government to develop an ambitous building renovation programme.

[6] *European Commission, 'Impact assessment. Energy efficiency plan 2011', March 2011.*

[7] *Diana Ürge-Vorsatz and others, 'Co-benefits quantified: Employment, energy security and fuel poverty implications of the large-scale, deep retrofitting of the Hungarian building stock', proceedings from the 2011 Stockholm ECEEE summer study on energy efficiency in buildings, 2011.*

What is the potential for energy savings?

Although the EU economy is already relatively energy efficient compared with most other regions in the world, there is still lots of room for improvement – even in those countries that have been

leaders in energy efficiency such as Denmark and Germany. The Commission finds that there is potential for cost-effective energy savings in all areas of energy demand. The building sector (and associated services) has the biggest potential for energy efficiency improvements, followed by transport, industry and energy.[8]

[8] *European Commission, 'Impact assessment. Energy efficiency plan 2011', March 2011.*

Most experts agree that there is sufficient cost-effective potential for energy savings to achieve the EU's 20 per cent goal.[9] 'Cost-effective' are those measures that, over their lifetime, can be implemented at zero or negative net cost (the benefits in terms of energy saved compensate or outweigh the initial investment costs). The 'technical' potential for energy savings – relying on best available technology but not subject to cost constraints – is of course much higher.

[9] *Wolfgang Eichhammer, Robert Harmsen and Bart Wesserlink, 'Energy savings 2020. How to triple the impact of energy saving policies in Europe', September 2010. The study draws on Fraunhofer Institute and others, 'Study on the energy savings potentials in EU member-states, candidate countries and EEA countries', March 2009.*

All estimates of energy savings potential have to make certain assumptions about energy prices (higher energy prices mean that more measures become cost-effective) and the cost of capital (higher discount rates mean that fewer measures pass the cost-effectiveness test). However, calculations of the cost-effective energy savings potential usually do not include a quantification of additional benefits. It is easy to see how including say, health benefits, additional job creation or avoided climate change impacts would increase the amount of energy savings that can be justified from an overall welfare perspective.

Why is it not happening?

The puzzling question is why, if energy savings produce so many benefits, they are not happening automatically. It is important to consider the various perspectives on this question before formulating the right policy responses.

One reason is simply that energy efficiency measures lack political appeal: politicians get more applause for opening a new power plant than for implementing policies that make the need for a new plant redundant.

Another way of looking at the obstacles to energy savings is economics: here the debate is mostly framed in terms of market failures. For example, markets often fail to value a product correctly because they do not price in all the health and environmental costs associated with its production, distribution and consumption (externalities). In such cases, putting a monetary value on the additional benefits of energy efficiency and savings measures can help to make them look more cost effective.

However, while such calculations might convince economists and civil servants, they are unlikely to change the behaviour of the private actors who need to make the investment in such measures. A home-owner would, for example, still face the same, high upfront costs of insulating his house. Public policy can help here, for example by diverting subsidies from energy prices to building renovation programmes.

Another example of a barrier is the 'principal-agent split', which refers to the problem that the person who needs to make the investment is not necessarily the one reaping the benefits.[10] The landlord may be responsible for renovating a property, but the tenant for paying the energy bill. The tenant may not be planning to stay long enough to recoup important investments, such as insulation. On the other hand, it may be difficult for the landlord to persuade the tenant to help pay for such measures through savings made on the energy bill. The consequence is a lack of motivation on all sides. Again public policy can help, for example by providing an adequate framework for a market in energy services.[11]

[10] *Nigel Jollands, 'Mind the gap. Quantifying the principal-agent problem in energy efficiency', OECD/IEA, 2007.*

[11] *The energy services approach gets round the principal-agent dilemma. Instead of expecting tenants or owners to invest in energy savings measures, an energy savings company offers to do so. It is repaid through a share of the energy savings that accumulate as a result.*

Another approach to understanding why we fail to achieve cost-effective energy savings looks at how energy consumption is created. Such research may, for example, seek to understand how new technologies change social practices so that they become more energy intensive. Rather than focusing on the energy efficiency of specific products (engines, buildings and so on), it focuses on how we move around or heat and cool our houses. Based on such studies, public policy may encourage the kind of natural cooling practices (the location and design of building, the choice of materials) that has allowed generations of Portuguese, Italian, Spanish and French people to keep their homes cool without installing electricity-guzzling air-conditioning units.[12] Such studies tend to use theoretical models other than economics. They can nevertheless, often through empirical work, inform the design and implementation of policy in very concrete ways, for example by drawing attention to the many actors that need to be mobilised for a low-carbon renovation of the building stock.[13]

[12] *Harold Wilhite, 'New thinking on the agentive relationship between end-use technologies and energy-using practices', Journal of Energy Efficiency, February 2008.*

[13] *Gavin Killip, 'Can market transformation approaches apply to service markets? An investigation of innovation, learning, risk and reward in the case of low-carbon housing refurbishment in the UK', ECEEE 2011 (see footnote 7).*

Finally, some analysts highlight that the EU's objective of saving energy is not necessarily compatible with its other goals, in particular the growth objectives laid out in policy documents such as 'Europe 2020' (which, after all, also includes energy savings in its headline goals).

EU policy for energy savings

EU policy on energy efficiency and saving grew out of the oil price shocks of the 1970s. The first Community-level action programme was contained in the 1974 communication 'rational utilisation of energy' which set a target of reducing energy consumption by 15 per cent by 1985. Since then, the EU has adopted a series of

targets, action plans and programmes.[14] An early example of Community-level legislation was the 1979 directive on the labelling of the energy consumption of household appliances. The aim was to nudge the market for domestic appliances towards better energy performance by providing more information. The directive had limited impact and was replaced by the 1992 and then the 2010 energy labelling directives.

[14] *Pernille Schiellerup, 'EU policy on end-use energy efficiency of LAWH', appendix D to Brenda Boardman and others, 'Lower carbon futures for European households', April 2000.*

In 2005, the EU published a 'green paper on energy efficiency' which identified a 20 per cent energy saving potential. The 2006 'energy efficiency action plan' was drawn up to help realise this potential (see table for details). The Commission estimated that full implementation of the measures proposed for the period 2006-12 would lead to savings of 14 per cent by 2020 and that additional measures would be needed to achieve the full 20 per cent goal.

The latest available projections (the 2009 PRIMES energy efficiency scenario) show that on current trends the EU will reduce its energy consumption by about 9 per cent by 2020 – well short of the 20 per cent target, and even of the 14 per cent envisaged in the 2006 action plan. All the more reason, therefore, for the Commission to set out robust plans for how the 20 per cent goal can be met. The Commission outlined its new proposals in another 'energy efficiency plan' in March 2011. The Council endorsed the new plan and called on the Commission to come forward rapidly with consistent and ambitious initiatives. In June 2011, the Commission published its proposal for a new energy efficiency directive.[15]

[15] *The directive commits the EU to continue with its policies on appliances and buildings, and to tighten them progressively; to keep the 20 per cent target non-binding but decide after 2013 whether to make it binding; and to make combined heat and power mandatory if new power stations are close to a suitable user of the heat.*

Structure of the energy efficiency action plan 2006

85 (Sub) Measures	6 Priority areas	10 Priority actions
	Sectors	
Regulatory instruments Economic & market based instruments Information & support programmes Voluntary actions	Energy-using products Energy services	(1) Appliance and equipment and minimum energy performance standards
	Residential, commerical & public buildings	(2) Building performance requirements and very low energy buildings
	Energy transformation	(3) Making power generation and distribution more efficient
	Transport	(4) Achieving fuel efficiency of cars
	Horizontal issues	
	Financing Economic incentives Energy pricing	(5) Facilitating financing of energy efficiency investments for SME and energy services companies (6) Spurring energy efficiency in the new member-states (7) Coherent use of taxation
	Energy behaviour	(8) Raising energy efficiency awareness (9) Energy efficiency in cities
	International partnerships	(10) Foster energy efficiency worldwide

Source: European Commission, 'Progress report of the energy efficiency action plan 2006', March 2011.

What needs to be done?

The EU must raise its level of ambition considerably if it is to achieve its 20 per cent energy savings target. This will be a highly complex task that goes well beyond setting tougher standards for products and processes.

Saving energy is a complex, often highly technical, policy field, consisting of multiple interlinked areas of expertise and practice. It draws on various social sciences, including economics, as well as engineering, architecture and so on. In recent years, therefore, increasing attention has been paid to the 'governance' of energy efficiency and energy saving policy.[16]

[16] *International Energy Agency, 'Energy efficiency governance', OECD/IEA, 2010.*

Good governance requires the EU and its member-states to devote sufficient resources to developing, implementing, reviewing and adjusting policies in this area. Take the example of minimum energy performance standards for equipment or cars. The EU first needs to identify the (economic and technical) energy savings potential; decide which body or government should set the standards; how standards for different models should be defined; and how frequently these should be reviewed. The EU is including more, and more complex, 'products' – including buildings – in its energy efficiency policies. It must therefore make sure that it has a solid evidence base for policy decisions, especially in a context where industry will at times resist ambitious standards. Furthermore, EU governments need to put real effort and resources into drawing up their 'national energy efficiency action plans'.[17]

[17] *Ralf Schüle and others, 'Improving national energy efficiency strategies in the EU framework', March 2011.*

Once developed, the policy must be implemented. It is not enough to regulate and forget. To make energy labelling of equipment and buildings effective, for example, governments have to work with consumers and companies, who together will have to drive the market transformation towards greater energy efficiency. A label

must not only be accurate and in place, it must also be integrated into market practices. Here the role of 'intermediaries' such as retailers or property agents can be key.[18] Publically available information on energy performance, prices and other features help to ensure that markets take account of energy labelling. The accuracy of the information needs to be checked regularly, which can be resource intensive.

[18] *Pernille Schiellerup and Julie Gwilliam, 'Social production of desirable space: An exploration of the practice and role of property agents in the UK commercial property market', Environment and Planning C: Government and Policy, Vol 27, January 2009.*

The inclusion in EU energy efficiency policy of more complex products, or rather collection of products, such as buildings, requires the transformation of multiple markets at the same time. Various and diverse professional groups will have to be involved. The importance of functioning property markets (including the renovation cycle, the average time until the next renovation is due) for the final energy consumption of buildings is now increasingly acknowledged. The transformation of the EU's building stock towards low-carbon standards is a much more complex (and interesting!) task than transforming equipment markets. It will require new forms of co-ordination and governance.[19]

[19] *Adrien Bullier and others, 'Assessing green value: A key to investment in sustainable buildings', ECEEE, 2011 (see footnote 7).*

The debate about targets

The EU has adopted a number of directives and regulations to influence energy consumption[20], which will now be supplemented by a new energy efficiency directive. The question that is being increasingly posed, however, is whether this ensemble of instruments will be sufficient or whether some form of binding target for energy efficiency or energy saving is needed. Opinions are divided. Some suggests that the EU should not spend too much time arguing about whether the energy efficiency target

[20] *For example, the eco-design directive, the energy labelling directive, emission standards for passenger cars, the EU ETS directive, the energy services directive, the energy performance of buildings directive or the co-generation directive.*

should be made binding. Instead it should tighten up existing laws and spend more of its budget on energy efficiency programmes.[21] Others argue, persuasively, that a binding target would encourage a more ambitious implementation of existing measures, such as the energy performance of buildings directive. It would also provide a more formal check on whether the EU is making sufficient progress.[22]

[21] *Stephen Tindale, 'Delivering energy savings and efficiency', CER policy brief, January 2011.*

[22] *Wesserlink and others, see footnote 9.*

The 'energy efficiency plan 2011' suggested that if sufficient progress has not been made by the time existing indicative targets (set by the energy end-use and energy services directive) are reviewed, the Commission will propose legally binding targets for 2020. However, even if the Commission came to the conclusion in 2013-14 that binding targets were necessary, these would take at least a year or two to agree – assuming they could be agreed – and would thus be unlikely to have any significant effect on the 2020 objective. Therefore, the EU should continue its discussion about appropriate targets with a view to adopting them under the new energy efficiency directive[23] or, failing that, to moving towards a more meaningful time horizon such as 2025.

[23] *Such a proposal would have to come from the European Parliament since the Commission proposal already foresees a discussion about targets in 2014.*

Subsidiarity needs to be respected

The focus here has been on EU level policy, with some attention to the importance of addressing the challenges at the member-state level. However, the principle of subsidiarity requires the EU to consider what the Union can do and what it is less well equipped to do. For example, whereas the EU can, and must, push for ambitious legislation on the carbon (and energy) performance of vehicles, it is less well equipped to encourage people to leave their car at home, which requires investment in rail networks, cycling paths and broader issues of spatial planning. Similarly, the EU can push for

more energy efficient equipment (for example air conditioning units). But can it act to safeguard, encourage and spread existing building practices that can help prevent European countries from becoming as dependent on air conditioning as the US?

Innovation, and low-carbon innovation in particular, is a watchword in contemporary policy debates. It is an attempt to combine climate and economic goals. Innovation is certainly needed. But the necessary innovation is not just technological; it must also include different management and organisational approaches, as well as attention to more traditional practices (for example for cooling) which are worth keeping and spreading. Although it stops short of proposing binding targets, the Commission's June 2011 proposal for a common framework for promoting energy efficiency to 2020 and beyond includes many sensible proposals for making energy saving technologies and approaches more widespread. It should be taken forward as soon as possible.

8 Renewables in a single EU electricity market *by Georg Zachmann*

Renewable energy is high on the European political agenda. By 2020, Europe wants to generate 20 per cent of its energy from renewable sources such as water, wind, biomass and the sun.[24] This target from the 2009 'energy and climate package' has been reiterated in the 'Europe 2020' strategy. And it appears that the renewables target is among the few measurable objectives in this strategy document that can actually be reached. National support schemes incentivise the deployment of significant amounts of solar cells and wind turbines. Member-states transpose their national renewable energy targets into action plans that seem actually capable of reaching the goals set in Brussels. This is an impressive achievement that many observers did not deem possible.

[24] This chapter focuses on renewable sources of electricity, as these are supposed to make the largest contribution to the overall renewable energy targets (that also includes biofuels for transport and heating).

But the success of renewables policy is starting to affect other dimensions of European energy policy, including the long-standing objective of creating a single energy market. By combining 27 national energy systems, such an internal market should lead to more competition, as well as more efficient use of resources and lower greenhouse gas emissions. However, the various national approaches to deploying and integrating electricity from renewable sources (RES-E) in the existing electricity systems are often not market-based and they are incompatible between member-states. Thus, the continued implementation of national renewables policies might endanger the internal electricity market.

The success of renewables challenges the single market

The EU's renewable energy policy is in conflict with the internal market objective in at least four areas:

★ The absence of a single market for renewables

Each EU country has adopted a different set of policies to achieve its national renewable energy target. Policy tools include green certificates, feed-in tariffs, obligations, direct subsidies, preferential grid access regulations, tax breaks and so forth. The actual size of the different support schemes for renewables is difficult to assess because they often mix direct financial support with indirect subsidies and regulatory measures. The numbers that the EU's directorate-general for competition collects on state aid for environmental protection – an imperfect indicator for RES-E support, by many means – hint at large divergences inside the EU. In 2009, such state aid amounted to 1.1 per cent of GDP on average in the EU-27; but it was 2.4 per cent of GDP in Germany and only 0.12 per cent in Italy.

Consequently, the national systems for RES-E support in Europe differ both in structure and size. This is economically inefficient as it leads to different prices for the same good (electricity produced from renewable sources) within the Union. One striking illustration of the inefficiency of fragmented support schemes is that there are currently stronger incentives for installing solar cells in northern Germany than in southern Italy. This is one of the reasons why the European Commission has been pushing for a pan-European market for RES-E, for example through the obligation of any member-state's support scheme to accept foreign 'green' electricity. Such transferability should quickly lead to a harmonisation of the support schemes and prices for RES-E. Thus, a single market for electricity generated from renewable sources would develop.

However, the EU is still far from such a market. The current fragmentation reflects the political preferences of individual EU

countries. These would rather reduce their dependence on imported energy and support their home-grown renewables industries than subsidise the RES-E production in another member-state.

Economists might argue that this kind of 'institutional competition' between different RES-E support schemes can lead to the emergence of an optimal regime. However, it is by now evident that the fragmentation caused by national state aid and barriers to trade not only undermines the single market but also prevents Europe from reaching the renewable targets at least cost.

★ Congestion in European networks

Second, the deployment of renewables is one source for congestion in cross-border transmission lines and thus reduces the potential for intra-EU trade of electricity. RES-E are characterised by intermittence (their generation depends on wind, sun or water levels) and they are usually generated far from centres of electricity consumption. Current grids are built for a fairly steady flow of power from conventional power plants to mainly nearby centres of consumption. To accommodate more long-distance transmission of intermittent sources of power, conventional grids need to maintain more spare capacity. More spare capacity means that overall there is less capacity available for power trading. Consequently, the intra-EU trade of electricity – a cornerstone of the internal market – will decline unless the EU takes measures to counter this effect.

★ Lack of back-up capacity

Third, solar panels and wind farms are usually meant to replace conventional power plants that run on coal or gas. Yet many conventional power plants are still needed as back-up. Thus, member-states are contemplating mechanisms to remunerate the provision of back-up capacity. Those mechanisms risk being non-market based and incompatible across the Union.

In some countries, renewable support schemes have been remarkably successful: between 2005 and 2010 Germany deployed about 9 gigawatts (GW) of wind turbines and 14 GW of solar panels, amounting to about 18 per cent of the total installed electricity generation capacity. Spain deployed 10 GW of wind and 4 GW of solar, which represents 15 per cent of its total installed capacity. On course to meet its 2020 renewables target, the EU hopes that by 2050 it can generate all its power from renewable or carbon-free sources. This transition changes the nature of the power sector.

Coal or gas-fired power plants burn a valuable resource for producing electricity. By contrast, the input (or variable) costs of wind and solar power are zero. That means that wind and solar power installations typically run irrespective of the electricity price.[25] As the penetration of RES-E in European power markets increases, conventional power plants are often idle and median wholesale electricity prices drop. Yet some conventional plants are still needed when a cloudy, low-wind period coincides with high electricity demand. They provide the back-up capacity for intermittent renewables sources.

[25] *In countries that have fixed feed-in tariffs, the variable cost of RES-E generators is actually negative, as commercial operators would only accept curtailing production when the operator obtains more money for not supplying than he would obtain from supplying at the feed-in tariff.*

However, in the current system, coal and gas-fired plants will close unless they can recover their fixed (construction and maintenance) costs by charging very high prices in the few hours they are needed. To date there is no consensus whether such a system of highly volatile prices (very low prices when RES-E plants are sufficient to meet demand and very high prices if they are not) is politically acceptable; and whether it will incentivise the provision of back-up capacity needed to run the system securely. Consequently, member-states are contemplating alternative mechanisms to make it worthwhile for power companies to provide back-up capacity. Judging by current discussions around the EU, such incentives are likely to be non-market based and incompatible from one country to another.

★ The role of ancillary services

Fourth, and finally, the growing share of RES-E increases the need for so-called ancillary services. In simplified terms, such services are needed as in electricity systems demand and supply have to balance at any given moment at any point of the network. The ancillary services provider (usually the company that operates the network, the system operator) schedules electricity flows and provides electricity (or load) to the network at a certain location at short notice. In the case of RES-E, if the wind does not blow as expected in a certain region, the system operator has to balance the difference between demand and supply by either (i) bringing in electricity from another region, (ii) increasing conventional generation in this region or (iii) reducing demand in this region.

Electricity markets in Europe essentially evolved out of national systems built in the pre-liberalisation period. Electricity networks make money through regulated tariffs. Electricity generators make money from selling power at a profit in the market. Thus, in most European countries liberalisation mainly consisted of implementing one single market-based price signal – a wholesale electricity price. The idea was that this price signal would lead to the optimal scheduling of power plants (switch on only the cheapest plants to meet the demand), cross-border electricity trade (sell power to where prices are highest, irrespective of borders) and sufficient power plant investments (build a power plant that can create profit given the expected distribution of prices). The creation of a wholesale market was deemed sufficient for liberalisation as it represented the largest part of the non-regulated value in the electricity sector. Ancillary services – though essential to maintaining the reliability of the system – represented only a negligible share in consumers' electricity bills. Therefore, many EU countries allowed the network (or system) operators to procure these services and bill them to the customers as a part of their regulated tariffs.

Due to the limited predictability and intermittency of RES-E, however, system operators will have to provide significantly

higher volumes of these services than in the past. The procurement of ancillary services will account for an increasing share in the value of electricity. Unlike electricity, ancillary services are typically not traded across borders because market arrangements in the member-states are so different. Thus, a growing share of the electricity value chain risks being operated outside the single market.

The case for a European market

The EU can and should reconcile its renewable energy target with the objective to complete the internal energy market. Only in a functioning single electricity market can the feed-in of an increasing amount of renewable electricity be managed at reasonable cost. If intermittent generation and consumption are linked up over a wider geographical area (a European or regional market) there will be less need for expensive back-up capacities. If ancillary services are tradable across borders, system operators will have less market power and prices will drop. If transmission lines are managed well, electricity losses will be reduced.

The alternative to a single market would be to go back to national electricity systems that are more or less administered centrally. Before liberalisation, such systems ensured stable power supplies on the basis of each country's preference for the fuel mix. However, power prices were high and innovation was limited – which speaks against a return to national control.

Furthermore, electricity systems have become a lot more complex over the last decade: the choice of generation and storage technologies has increased significantly, real-time demand-side management has become technically feasible, fuel prices have become more volatile and carbon emissions are now priced. Under these circumstances, it is ever less likely that a centralised management of the electricity system would bring about efficient investment and operation decisions.

The cost, benefits and risks of power provision must have a monetary value; and power production, sale and consumption must be allocated via markets. Especially for smaller EU countries, the benefits from increasing the scale of their systems by joining a common market are significant. An optimal portfolio of power plants, as well as a reasonable level of competition between the market players in all segments, is only conceivable in a sufficiently large market.

The way forward

The EU must be careful not to take converging prices in the (shrinking) wholesale power market between member-states as a sign that the internal market is functioning. Instead, it should monitor more closely the development in the other – still nationally dominated – segments.

The EU's big challenge is to allow for the development of new market designs that do not end up being incompatible from one country to another. If individual EU countries try to find the optimal solution for increasing RES-E in their respective national markets, the legacy of their existing power pants and networks will almost invariably lead them into incompatible directions. For example, a country with decreasing electricity demand would not be interested in mechanisms to incentivise capacity. A country that has lots of old coal-fired power plants will favour a system that pays these plants to stay online. Countries may also fine-tune rules concerning service provision or network management to suit the interest of their domestic incumbents.

The only way out of this dilemma is for the EU to require all market designs to be compatible. To this end, the EU should upgrade the Agency for the Co-operation of Energy Regulators (ACER) from a co-ordinator for certain narrowly defined processes into an institution that has strong powers to enforce compatibility of national market designs. Only then would the hundreds of

stakeholders in the system (27 governments, 27 national regulatory authorities, 33 transmission system operators, a dozen power exchanges, hundreds of electricity traders, producers, large consumers and so on) have a strong enough incentive to co-operate.

EU member-states, meanwhile, should reconsider their opposition to allowing the cross-border trade of subsidised power from renewable sources. The general rule should be that all dimensions of the commodity electricity should be freely tradable inside the Union. The big advantage of linking electricity systems is that a joint system can be much more than the sum of its parts. But to make this happen the parts have to fit.

9 Europe needs nuclear power
by Stephen Tindale

In the aftermath of the Japanese nuclear incident in March 2011, countries around the world have started to reconsider their stance towards nuclear power – as was the case after the Chernobyl and Three Mile Island nuclear disasters. Another de facto nuclear moratorium would make the task of controlling climate change even more difficult. Nuclear power is not risk free, but the associated risks are lower and more manageable than the risks of uncontrolled climate change. Moreover, unlike with gas and oil, the EU does not need to rely on imports from unstable countries to produce nuclear power. Much of the world's uranium, the raw material used in atomic energy, comes from countries such as Canada, Australia and South Africa. Therefore, nuclear power enhances the EU's energy security.

Nuclear power stations produce very low levels of greenhouse gases. Emissions from other parts of the nuclear cycle, such as mining uranium, are higher. But even taking the full life-cycle into account, emissions per unit of electricity produced by nuclear power are only about a tenth of the emissions from coal stations, and a quarter of emissions from gas (until and unless such power plants are fitted with carbon capture and storage technology, or CCS).[26]

[26] *UK Energy Research Centre, 'Response to the Treasury consultation on carbon capture and storage', 2006.*

The EU should wherever possible encourage member-states to use nuclear power as a low-carbon bridge technology until they can be 100 per cent reliant on renewable energy, which will be several decades even for the most advanced countries.

In addition to generating electricity, nuclear power plants also produce heat that can be used for warming houses. Bulgaria, the Czech Republic, Hungary and Slovakia use some of the heat from nuclear power stations (although not as much as Switzerland, which covered 7.5 per cent of its entire heating demand from nuclear stations in 2008).

Nuclear power is not cheap. To build a nuclear plant costs several billion euros. Coal and gas power stations can produce cheaper electricity, unless they are required to capture and store the carbon, in which case the cost of coal and gas electricity would probably be higher than nuclear electricity. To get new nuclear power stations built, either regulation limiting greenhouse gas emissions or some form of public financial support, or both, will be needed.

Europe's nuclear renaissance

Following the Three Mile Island incident in 1979 and the Chernobyl incident in 1986, most European countries were unenthusiastic about nuclear power. In 1980, Swedes voted in a referendum to close their nuclear power stations (though only two of the 12 reactors were subsequently shut down). Spain adopted a moratorium on new nuclear construction. After Chernobyl, Italians voted to shut their four existing nuclear stations (and did so by 1990). Bulgaria, the Czech Republic, Finland, France and Romania were the only EU countries that permitted construction of new nuclear plants. All other member-states adopted either a de facto or a formal moratorium.

In recent years, however, support for nuclear power started to grow again across Europe. Mounting concerns about climate change fuelled this rethinking, as did worries about reliance on foreign supplies of gas and other fuels. Meanwhile, the memories of Chernobyl had started to fade. In 2005 the Dutch government abandoned a plan to close one nuclear reactor early and said that another could be built. The same year, the Hungarian government

extended the life of four reactors by 20 years. In 2006 the UK government announced a new policy supporting nuclear power. In 2007 Lithuania, which had been required to close its existing Chernobyl-style nuclear station as part of EU accession, agreed with Estonia, Latvia and Poland to construct a new nuclear plant at the same site. In 2008 the Slovak government allowed construction of two reactors that had been on hold for 16 years to re-commence. In 2009 the Swedish government announced that it would lift the ban on building new reactors to replace the ten still in operation. Also in 2009, Italy and France signed a co-operation agreement to build new nuclear reactors in Italy. And in 2010 German Chancellor Merkel reversed the 2001 decision of the then Social-Democrat/Green party coalition to decommission all nuclear stations by 2022. The amendment would have allowed them to remain open until the end of their design life.

In 2008, over one quarter of the electricity generated in the EU came from 143 operational nuclear power plants in 14 member-states.

After Fukushima

However, the Japanese tsunami in March 2011 has put Europe's 'nuclear renaissance' on hold, and probably into reverse. The German government shut down a number of older plants immediately and then in May announced that all 17 nuclear power plants would be phased out by 2022. Italy held a national referendum in June in which an overwhelming majority rejected the government's planned return to nuclear power. The Polish government has also suggested that it may hold a referendum.

These political obstacles will now compound the financial, regulatory and economic hurdles that would have held back the construction of new nuclear plants in Europe in any case. The capital costs of modern nuclear power station are enormous – and unpredictable. The plant currently being constructed in Finland will be at least 50 per cent over budget (originally set at

€3 billion). The cost overrun at France's new nuclear power plant may be €1 billion, on top of a €4 billion budget. In Romania, all potential builders of a new plant (GDF Suez, RWE and Iberdrola) have withdrawn, saying market uncertainty was too great.

No European government has promised subsidies for new nuclear power plants – indeed Germany and Finland are introducing taxes on nuclear fuel. Other low-carbon energy sources, such as CCS and renewables, receive extensive subsidies, either directly from government or indirectly via feed-in tariffs. But no government has so far followed the UK's shift to include nuclear power in a general support scheme for low-carbon energy technologies.

Country	Number of nuclear power stations	Percentage share of electricity from nuclear
France	58	76.5
UK	19	13.5
Germany	17	23.5
Sweden	10	42.5
Spain	8	19
Belgium	7	54
Czech Republic	6	32
Finland	4	29.5
Hungary	4	37
Slovakia	4	58
Bulgaria	2	35
Romania	2	17
The Netherlands	1	4
Slovenia	1	38
EU-27	143	28

Source: International Energy Agency statistics, 2008.

The EU's limited remit

The Japanese atomic accident highlighted the limited powers that the EU has in the area of nuclear energy. The Lisbon treaty gives the European Commission and Parliament greater involvement in energy policy. Nevertheless, member-states are entitled to decide their own energy mix, and the Commission regularly states that it is not seeking to interfere in this decision, including on nuclear.

The EU has adopted various policies and regulations that do influence the energy mix in its member countries. For example, the 2001 'large combustion plants directive' forced the closure of many of Europe's coal-fired power stations. The EU's emissions trading scheme (EU ETS) penalises polluting and inefficient power generation while rewarding greener, more efficient ones. The 2009 'renewables directive' is a clear attempt to alter the energy mix of member-states.

Nevertheless, the EU's direct powers over nuclear policy remain limited. The EU's 'nuclear safety directive' from 2009 established a common binding framework for nuclear safety, based on standards agreed by the International Atomic Energy Agency. The directive requires member-states to have independent regulatory authorities and to conduct regular safety assessments. The directive also encourages regulators to operate with a high level of transparency – which would be a welcome change from the nuclear industry's traditional culture of secrecy. However, this directive has had little practical effect.

Five steps to promote nuclear expansion in Europe

The EU will not meet its climate change and energy security targets without nuclear power.

It will take several decades for Europe to move to reliance on 100 per cent renewable energy, and the issue of storage from intermittent sources such as wind and solar power needs to be solved. So other low-carbon technologies are needed as bridge technologies. Carbon

capture and storage is one possible bridge, and would enable the EU to use its coal and gas reserves without missing its climate targets. But CCS has yet to be proven and demonstrated at scale. So the cost of CCS is unknown. So it would be unwise to rely solely on CCS as the low-carbon bridge. Nuclear power is also needed.

EU leaders and the European institutions should therefore take five steps to promote safe and sustainable nuclear energy in Europe:

★ **Re-write the proposed 'radioactive waste directive'.** In the first half of 2011, the European Commission, Council and Parliament were negotiating a 'radioactive waste directive'. There is no final repository for nuclear waste anywhere in Europe. Finland is planning to have one operational in 2020, Sweden in 2023 and France in 2025. The Commission's proposed directive supports burying nuclear waste deep underground, arguing that this approach would obviate the need for waste management in the future. The Commission is correct that there is a degree of scientific consensus favouring deep disposal. But there is no consensus among the general public that burying radioactive waste deep underground, then leaving it without any monitoring, is the best option. The most widespread public fear concerns leaks from such storage where waste will remain radioactive for up to 1,000 years.[27] Radioactive waste should be buried, as it will then be safer from theft or terrorist attack. But the disposal sites should be shallow rather than deep underground. In a shallow burial chamber the waste could be monitored, and, if necessary, managed or retrieved.

[27] *Eurobarometer, 'Europeans and radioactive waste', 2002.*

★ **Stop reprocessing spent nuclear fuel.** The purpose of reprocessing is to enable the fuel to be used again, to generate more electricity. This process is expensive, making the economics of nuclear power even worse. Reprocessing plants produce higher levels of radioactive pollution than nuclear power plants do. Reprocessing results in plutonium, from which

nuclear weapons can be made. And reprocessing is not necessary if nuclear power is to be used as a low-carbon bridge technology. Even if the switch to 100 per cent renewables takes six or seven decades – instead of the four that optimists assume – Europe will have enough uranium to keep its nuclear plants running.

★ **Improve the economics of nuclear.** It is clear that nuclear power is far from 'too cheap to metre' – the infamous promise made by the nuclear industry in the 1950s. The plants currently being built in France and Finland demonstrate that costs overruns are the rule rather than the exception. Cheap electricity can only be obtained by burning fossil fuels without pollution controls. The EU's objective must be to make fossil fuel electricity more expensive, not nuclear power cheaper. It could achieve this by setting a floor price for the ETS. This floor price would then gradually rise to make sure that the cost of carbon never again dropped to current lows. A higher carbon price would give nuclear energy a competitive boost compared with coal and gas without CCS.

Another way of improving the economics of nuclear power is to reduce the construction costs of nuclear power plants. This can be achieved by using the same technology design many times over rather than constantly altering it. The country with the most nuclear power plants, France, has essentially used only three designs over the last 50 years. The country with the second most plants, the UK, has used different designs for each reactor. Although it will always be power companies that choose the design of reactors and national governments that give regulatory consent, the Commission can encourage member-states to follow the French approach rather than the British one.

★ **Regulate fossil fuels.** As well as using market mechanisms to improve the economics of nuclear, the EU should use its regulatory powers to limit the combustion of fossil fuels

without CCS. California has an 'emissions performance standard' that limits the amount of carbon dioxide that can be emitted per unit of electricity produced. The British government is proposing to introduce a similar standard in the UK. Such a regulation would be much more effective if introduced EU-wide.

★ **Stop subsidising research into nuclear fusion.** The Commission has proposed that the EU should spend a total of €2.5 billion on nuclear research in 2012 and 2013. Of this, €2.2 billion would go on fusion research, mostly for the ITER project in France. The total cost of ITER is now expected to be around €15 billion. Fusion advocates argue that this technology could provide limitless sustainable energy. In theory, it could. But in reality, most observers now agree with the often-cited phrase: "Nuclear fusion is 30 years in the future – and always will be." Even if it works eventually (which is not certain), fusion will not provide energy soon enough to help Europe with the low-carbon transition.

The EU should therefore switch support to the continued use of established nuclear technology and research into reactors that run on liquid thorium rather than solid uranium.[28] Thorium reactors require much less weapons-grade material and can be more easily monitored. Once operating, they can burn up existing weapons-grade material and nuclear waste. They are therefore a way of spreading nuclear technology without increasing the risk of nuclear weapons proliferation. Since they run on liquid fuel, thorium reactors cannot 'melt down' (as happened in Chernobyl and Fukushima) and they produce less nuclear waste than uranium reactors. The US, China and India are actively researching thorium reactors. The EU should do the same.

[28] *Stephen Tindale, 'Thorium: How to save the Europe's nuclear revival', CER policy brief, June 2011.*

Nuclear power stations are not quick to build: it is unlikely that any plants started today would be operational before 2020. But even if

the EU met its – rather ambitious – targets, only 20 per cent of its energy would come from renewables by 2020. This would leave 80 per cent of the bridge still to cross. The EU must therefore continue to promote nuclear power.

10 Natural gas – From Achilles heel to stabiliser?
by Frank Umbach

For most Europeans, energy security means gas security. Coal is usually mined nearby, renewables are produced locally and oil is traded on open, international markets. By contrast, many EU countries have to import most or all of their gas. For the EU as a whole, the share of imported gas will continue to rise as North Sea resources are depleted. Already, over 40 per cent of the EU's gas imports come from Russia's Gazprom (18 per cent come from Algeria and a further 24 per cent from Norway, which is less associated with energy security concerns). Some EU countries, such as Latvia, Estonia, Finland and Slovakia, buy all their gas from Gazprom. In the case of Bulgaria, Lithuania and the Czech Republic, the dependence is over 80 per cent. What is more, most of the EU's gas imports arrive through pipeline systems that have proved inflexible for managing the consequences of supply disruptions.

Most Europeans recognise the need for a functioning political and energy partnership with Russia. However, many were alarmed after the 2006 and 2009 Russian-Ukrainian gas disputes led to supply interruptions in some EU member-states. Many are also concerned about the Kremlin's use of different gas prices to reward friendly neighbours, such as Armenia and Belarus, and punish others when they are seeking to gain more independence or move closer to the West, such as Georgia and Ukraine.

Policies for gas security

The European Commission has proposed a variety of strategies to

mitigate potential risks to Europe's energy security: a broadening of the energy mix to include more renewables (and at least keep a 'neutral' stance on nuclear power); an energy savings programme; a diversification of the sources of energy supplies and imports; and ambitious plans to build more interconnectors to link up national energy markets with the aim of enhancing gas supply security and preparedness for future supply crises.

Concretely, in October 2010 the Council adopted a gas directive as a legal framework "to safeguard security of gas supply and contribute to the proper functioning of the internal gas market in the case of supply disruptions". The Agency for the Co-operation of Energy Regulators (ACER) and the European Network of Transmission System Operators for Gas (ENTSO-G) will help to oversee the expansion of cross-border gas pipelines and the establishment of common standards for supply security and the proper functioning of the internal gas market in the case of supply disruptions. The Gas Co-ordination Group (set up in 2010 and consisting of regulators, officials and industry representatives from the EU countries) advises the European Commission on the co-ordination of measures in the event of a gas supply disruption, as well as on the formulation of future gas policies.

Although the EU's common energy policies have moved forward faster than many other policy fields, the member-states still often prefer national solutions to common challenges. As a result, EU energy policy has remained fragmented in many ways. Hence calls for the EU to 'speak with one voice' on energy or to diversify away from Russian supplies are still relevant and important for the future. But at the same time, the EU risks focusing on yesterday's problems while overlooking opportunities that arise from more recent developments and policy decisions.

Uncertainty over Europe's gas demand

Energy security concerns are closely linked to the expectation that

European gas demand will continue to grow and that a rising share of this gas will have to imported. Yet the outlook for European gas demand today is highly uncertain. On the one hand, there are factors that imply that gas demand will continue to grow, at least in the short to medium term. Gas is often seen as the 'bridge fuel' that Europe will burn as it moves towards a decarbonised energy system. Gas-fired power plants can be switched on and off rather quickly, which makes gas a good back-up fuel for an energy system increasingly relying on renewable sources of energy.

Others argue that gas is a 'fuel of choice'. Gas emits half as much CO_2 as coal when burnt for power generation. In the wake of the global gas glut (see below), gas is also cheap – and it would remain so if further unconventional gas resources were to be added to the global market in the near future. Moreover, with Germany (and maybe other countries) planning to phase out nuclear power in the aftermath of the Fukushima nuclear catastrophe, gas will look even more attractive.

On the other hand, the EU's 20-20-20 programme, with its ambitious targets for energy savings and for replacing CO_2 emitting fossil fuels with renewables, implies that Europe's demand for gas will decrease significantly. Previous forecasts that the EU's annual gas imports would rise from 300 billion cubic metres to 500 bcm by 2030-35 (as the IEA still maintains) no longer appear realistic. The latest forecasts assume that EU gas import demand should be around 400 bcm by 2030.

Even if import demand continues to grow, this does not necessarily constitute an energy security problem: while Russia currently sells 150 bcm of gas to the EU each year, the EU is in the process of adding up to 300 bcm of non-Russian gas to its import mix: gas coming from Norway, North Africa and the Caspian region (perhaps via the Nabucco pipeline); and in the form of LNG from Qatar and other countries, with the current re-

gasification capacity (terminals to turn LNG back into gas) of 130 bcm to be extended further by 2020. The EU would be even less dependent on Russian gas if member-states were able to exploit their domestic unconventional gas resources.

EU-27 outlook for gas, in billion cubic metres

	2005	2020 baseline* scenario oil price $88 bbl	2020 reference ** scenario oil price $88 bbl	2030 baseline* scenario oil price $106 bbl	2030 reference** scenario oil price $106 bbl
Demand	519	538	479	511	457
Production	219	130	129	88	87
Imports	299	408	349	423	370

Source: European Commission (internal), taken from Hugh Belin, 'To Russia with love', European Energy Review, September 2nd 2010.

** based on energy policy measures implemented by April 2009; ** based on energy policy measures implemented by April 2009 and assuming 20 per cent renewables in energy consumption, 20 per cent less CO_2 emissions, and additional energy efficiency measures.*

Unconventional gas: The game changer?

While many in the EU are still worrying about over-dependence on Russia, the dynamics of the global gas market are changing because of the 'silent revolution' brought about by the large-scale exploitation of unconventional gas resources such as shale gas.[29] In the US, the spread of new drilling technologies has led to a rapid expansion in the production of shale gas over the last five years. While the US had been on course to becoming the world's largest market for imported LNG, it is now producing all the gas it needs at home and is even becoming a net gas exporter. In 2009, the US overtook Russia as the world's largest gas producer.

[29] *Maximilian Kuhn and Frank Umbach, 'Strategic perspectives of unconventional gas: A game changer with implications for the EU's common energy security policies', EUCERS strategy papers, No 1, May 2011.*

The US shale gas boom coincided with two other developments – the global recession, which led to a drop in demand for gas, and the arrival of new LNG delivery capacity – to create a global 'gas glut'. Since LNG was suddenly so plentiful in a global market that had less demand, the spot price of gas (gas traded on short-term markets) fell sharply compared with gas delivered through pipelines on the basis of long-term contracts that link gas prices to that of oil. The long-standing link of gas and oil prices – one of the linchpins of the European gas markets – started to weaken. If this link breaks down permanently, Europe would face more competition and lower prices in its gas market. Such a scenario is quite likely because global unconventional gas resources are vast – probably around 900 trillion cubic metres, more than twice as much as estimated conventional gas resources of 404 tcm. On the assumption that at least 380 tcm of the unconventional gas resources are recoverable, the world would have nearly 800 tcm in recoverable gas resources – equivalent to about 250 years of current production.[30]

[30] *International Energy Agency, 'World energy outlook 2010', November 2010; German Federal Institute for Geosciences and Natural Resources, 'Reserves, resources and availability of energy resources', 2009; US Energy Information Administration, 'International energy outlook 2010', 2010, and 'World shale gas resources: An initial assessment of 14 regions outside the US', April 2011.*

Europe's unconventional gas resources are also significantly bigger than its conventional ones and might cover European gas demand for up to 60 years. However, the concrete prospects for unconventional gas production in Europe and other regions will remain uncertain until at least the middle of the decade. Among the main reasons are widespread concerns about the environmental impact of unconventional gas production. For example, in May 2011, France voted for a law to ban 'fracking' (blasting water and chemicals into rocks to release the gas), following widespread concerns about the damage that this procedure might have done in the US.[31] The development of more environmentally friendly drilling technologies will offer a way to cope with such issues. Moreover, in comparison with the US, European rock strata containing unconventional gas resources are generally located more deeply in the earth and beneath the groundwater. While this may raise the costs of exploration drilling, it also lowers any risks of groundwater contamination. Furthermore, the EU's stricter environmental regulations may open up new business opportunities for the development of techniques to cope with the environmental challenges of unconventional gas exploration worldwide.

[31] Groundwater contamination in the US is unlikely to have occurred due to fracking itself. The likely cause is spillage or leakage of drilling or fracturing fluids on the ground surface.

Towards a new European gas policy

Against this background of uncertain demand forecasts and a shifting global gas market, the EU's gas policy should be guided by the following considerations:

★ Prioritise the Nabucco pipeline

Even if gas demand increases more rapidly than foreseen in the aftermath of the Fukushima catastrophe, it is becoming clear that the EU will not need all the new pipelines and LNG import terminals which are currently being discussed. One project that looks unnecessary from an EU perspective is the Russia-driven South Stream pipeline that

would add 63 bcm of import capacity via Turkey and the Balkans (or the Black Sea). This tremendously expensive project looks unviable in light of cheaper options available for the European gas market, and it would further increase the EU's dependence on Gazprom.

One project that the EU should pursue, or even accelerate, is the Nabucco pipeline through Turkey and the Balkans into Austria. Although the EU has made Nabucco a priority project under its Trans-European Network programme, it has suffered from delays and setbacks. The economics of Nabucco are uncertain. However, this pipeline is at the core of the EU's strategy to diversify its energy imports away from Russia. It is the flagship project of the 'southern corridor' designed to gain access to gas reserves from the Caspian, Iraq and perhaps, in the long term, Iran and other countries. Nabucco is also needed to make a liberalised and diversified gas market a reality in Central and South Eastern Europe. Without Nabucco, the EU's gas market will remain divided: the eastern part will remain highly dependent on Russian energy supplies – and thus Russian goodwill; the western part will enjoy increasingly diversified sources of supply from Norway, North and Sub-Saharan Africa and through LNG.

Such a division would have grave consequences for the EU's objective to build a liberalised and integrated EU-wide gas market, for its ambition to establish a unified energy foreign policy and, more generally, the EU common foreign and security policy. Although Nabucco has seen some recent progress, the EU and its governments need to strengthen their engagement and support for it both politically and financially.[32]

[32] *Katinka Barysch, 'Should the Nabucco pipeline project be shelved?', CER policy brief, May 2010; Frank Umbach, 'The Black Sea region and the great energy game in Eurasia', in: Adam Balcer (editor), 'The Eastern Partnership in the Black Sea region: Towards a new synergy', demosEUROPA 2011.*

★ Recognise the strategic importance of Ukraine

Some 80 per cent of the gas that the EU imports from Russia comes via Ukraine – as became painfully evident when Russian-Ukrainian disputes in 2006 and 2009 resulted in disrupted supplies to many EU

countries. Ukraine's negotiating position vis-à-vis Russia has weakened once again when it agreed in April 2010 to extend basing rights for the Russian Black Sea Fleet in return for a 30 per cent reduction of gas prices. Ukraine is now once again beholden to Russia, given the dependence of Ukraine's heavy industries on cheap gas prices. Russia still sees the opportunity to achieve the ultimate goal of its (energy) foreign policy, namely the acquisition and control of the Ukrainian pipeline network and other strategic energy infrastructure.

Russia prefers putting pressure on Ukraine – including by threatening to bypass it altogether through the Nord and South Stream pipelines – to any co-operative solution. Prime Minister Vladimir Putin in the summer of 2010 rejected the idea of modernising Ukraine's ageing pipeline infrastructure jointly with Ukraine and the EU. Without perpetual financial support from the IMF and a much more active energy co-operation with the EU, Kyiv might have to hand over its critical infrastructure or even its entire energy sector to Russia. Ukraine would then find it much harder to integrate with the EU or co-operate with NATO.

The European Investment Bank and the European Bank for Reconstruction and Development have indicated that they might lend up to €300 million for the modernisation of the Ukrainian pipeline system – provided Kyiv gets serious about opening up and reforming its gas sector. This is a difficult but critical issue for European energy policy and it is important for the EU to persevere in strengthening its energy partnership with Ukraine. The EU and European energy companies should also back US initiatives for pilot projects in the exploration of unconventional gas resources in Ukraine. The exploitation of these resources would reduce Ukraine's dependence on Russia and provide new room for manoeuvre in foreign policy.

★ Implement the third energy market package

The continued liberalisation of the European energy market is essential not only for creating competition and consumer choice but

also for depoliticising pipeline projects and weakening Russia's ability to use its position as monopoly (or near monopoly) supplier to some EU countries for political influence or economic gain. The EU pursues energy market liberalisation through legislative means, most recently the third energy market package, and the Commission's antitrust measures which have forced some of European energy companies to unbundle.

Gazprom feels challenged by the EU's liberalisation drive. It would prefer to maintain control of transit pipelines and other critical infrastructure, such as gas storage sites, in the EU. And it wants to keep the traditional system of long-term supply contracts in place. Gazprom has tried to circumvent the EU's unbundling rules with the help of subsidiary companies, while the Russian government has sought exemptions from such rules, not just for the Nord Stream pipeline but for the proposed South Stream pipeline and for 'legacy contracts' in Poland and other EU member-states.

If Russia succeeded in maintaining control over pipelines and other infrastructure assets, the impact of the third energy market package on the liberalisation of gas markets in Central and Eastern Europe would be limited. Moreover, since Russia does not offer companies from the EU the opportunity to invest in its own pipeline network, this lack of reciprocity will deepen the asymmetric nature of the 'interdependent' EU-Russian energy relationship.

The EU will enhance its energy security through continued liberalisation of its internal energy market and the diversification of sources of supply, including LNG, new pipeline projects for non-Russian gas and perhaps soon unconventional gas. Russia, rather than trying to forestall such efforts, should focus on increasing energy efficiency at home and exploring its own unconventional gas resources (which may offer a cheaper option than investing in extremely costly new fields on the Yamal Peninsula and offshore fields such as Shtokman). Since Russia lacks the technologies, expertise and experience for unconventional gas production, it

would have to improve investment conditions for foreign companies and liberalise its own gas sector. Ultimately, the combination of these changes in the European and global gas markets will force Russia to define and implement an entirely different energy policy, both externally and at home. This would open the way towards more reciprocity and trust in the EU-Russian energy partnership.

If the EU supports the exploration of local unconventional gas, pushes for Nabucco, completes the liberalisation of its internal gas market and recognises the strategic importance of Ukraine, gas will no longer be the Achilles heel of European energy security. Instead, gas will become the most important stabiliser in the transformation of the EU's entire energy system from fossil fuels to renewables by 2050.

What does energy solidarity mean?
by Agata Łoskot-Strachota

The EU has been conducting an increasingly heated debate about 'energy solidarity' in recent years. The rationale for strengthening such solidarity is threefold:

★ the growing interdependence of energy markets, both within the EU and between the EU market and regiona/international ones;

★ the mounting risk of supply disruptions through gas crises, terrorism and other threats to energy security; and

★ the absence of an effective EU emergency response mechanism to energy crises. While reliable energy provision used to be regarded as a national security objective, it is increasingly seen also as a common good in the EU context.

All EU countries are vulnerable to some extent. But recent emergencies affected especially those heavily dependent on a single source of gas supplies. The supply interruptions that resulted from the Russian-Ukrainian gas disputes in 2006 and 2009 hit several Central and East European member-states such as Slovakia and Bulgaria hard. More recently, the political tensions in Northern Africa and the Middle East have made South European gas importers nervous. Vulnerabilities are not restricted to the gas sector. In 2006, a technical fault in the German electricity grid caused blackouts across Western Europe.

The Europeans have never precisely defined the term energy solidarity. Most would think of it in terms of an EU emergency response mechanism based on better functioning energy markets and upgraded infrastructure networks. The emergency response system for oil supply disruptions developed by the International Energy Agency has partly served as a model.

Some Europeans would add the need for stronger political commitments among EU countries to help each other in energy emergencies. Some proposals for energy solidarity mechanisms referred to defence communities such as the Western European Union and NATO, and to the European Coal and Steel Community.

Energy solidarity in practice

In recent years, the EU has considered the following steps to institutionalise the concept of energy solidarity:

★ **2006**: Following the first Russian-Ukrainian gas crisis, Poland proposed a 'European energy security treaty' which would *inter alia* lead to the creation of a common response mechanism for energy supply emergencies.[33] The treaty never materialised but the proposal added momentum to the energy security and solidarity debates.

[33] *Polish delegation to the transport and energy council, 'Proposal for a European energy security treaty', March 2006, http://register.consilium.eu.int/pdf/en/06/st07/st07160.en06.pdf.*

★ **2007**: EU countries adopted the Treaty of Lisbon which, for the first time, contained a solidarity clause that relates to energy.

★ **2008**: The European Commission's 'energy security and solidarity action plan' laid out a five-point agenda: priority infrastructure projects, such as a 'southern corridor' for gas imports or a North Sea offshore grid; intensified efforts to create an EU external energy policy; stronger rules for oil and gas stocks and emergency responses; improving energy efficiency; and harnessing technology to make better use of renewable and other indigenous energy sources.[34]

[34] *All official documents can be found on the website of the directorate-general for energy http://ec.europa.eu/energy/index_en.htm.*

★ **2009**: The EU started putting its action plan into practice by aligning rules for emergency oil stocks with IEA ones. Member-states had to raise their oil stocks equal to at least 90 days of average net imports or 61 days of average daily consumption (one third of which must be oil products). The Commission gained new powers to audit national oil stocks and authorise their use.

★ **2010**: The EU adopted the 'security of gas supply regulation' which required member-states to comply with new standards for emergency stocks and infrastructure, including making all cross-border gas links

reversible from 2013. The Commission was asked to act as a co-ordinator of emergency responses among the member-states and vis-à-vis third countries and facilitate information exchange. The regulation represented an attempt to create an EU response mechanism for gas supply interruptions. But the heated discussions preceding its adoption also illustrated that national sovereignty and cost consideration would limit collective mechanisms at the EU level.

★ **2010**: The Commission issued its 'Energy 2020' strategy to lay out priorities for the next decade. Although solidarity was not a central theme, the communication reiterated some of the concrete measures needed to fulfil "the obligation of solidarity among member-states" (as stated in the document), such as constructing the infrastructure needed to integrate markets, facilitating new import routes and co-ordinating external energy policy.

★ **2010**: The European Parliament discussed a call for a 'European energy community'[35] put forward by Jerzy Buzek, the president of the European Parliament, and former Commission President Jacques Delors.

[35] *Jacques Delors, 'Towards a European energy community: A policy proposal', Notre Europe, April 2010.*

The next steps

The debate surrounding a collective response system is still in its early stages, and it remains at risk of being highly politicised. 'Old' and 'new' member-states assess the risk of supply disruptions and the need for responses differently. Many of the large EU countries have a diversified portfolio of gas suppliers, while the smaller Central and East European countries tend to be over-dependent on Russia. The EU's internal energy market is not fully integrated, which creates challenges especially for countries at the EU's periphery. The new EU-level response system created by the security of supply regulation requires large investments and will have to prove its effectiveness in practice. It might not address the specific vulnerabilities of all EU countries, for example the small and (from an energy perspective) isolated Baltic countries. Some member-states are reluctant to transfer new powers to the EU level (especially with regard to energy relations with third countries) or share their infrastructure with their neighbours (for example, existing gas storage facilities). The role of Europe's incumbent energy companies needs to be taken into account. They can act as a motor for market integration and drive the construction of new

interconnectors. But they can also be an obstacle to making energy solidarity a reality if they seek to shield 'their' national or regional markets against increased competition.

The EU needs to make sure that the necessary financial, institutional and human resources are available to translate current energy security plans into reality. The EU needs to co-ordinate the actions taken by individual member-states and support those that struggle to fulfil their new obligations. A further institutionalisation of consultations between the Commission, EU governments and energy companies would help co-ordination. The integration of European gas and power markets needs to continue since the effectiveness of new instruments, such as the security of supply regulation, will depend on it. As long as the internal energy market and the new response mechanisms remain incomplete, the EU will have to play a stronger role in emergencies. It can do so only if the allocation of powers to EU institutions and member-states becomes clearer in both internal and external energy policy.

11 Energy for survival
by Václav Bartuška

How will Europe keep its pleasant lifestyle in the face of competition from China, India and the like? How can we secure our energy in an international market where not everyone plays by the same rules? And how can we square our belief in democracy and human rights with the unpleasant truth that much of the world does not share our values and often plays by different rules?

It is questions such as these that should underpin the development of an 'EU external energy policy'. To date, the EU's moves towards such a policy have been timid and piecemeal. The Union has proclaimed leadership in the global fight against climate change – only to be painfully sidelined at the Copenhagen summit in 2009. It has tried to develop an 'energy dialogue' with Russia and other major suppliers. Yet the gap in interests between supplier countries and consumers is as wide as ever. The EU has identified 'priority projects' to help it diversify energy supplies, such as the Nabucco pipeline designed to bring Caspian gas via Turkey and the Balkans into Europe. Yet the EU does not have the means and the money to make such projects a reality. The EU has sought to 'speak with one voice' on its energy needs. But turf battles between different parts of the EU institutions have only added to divisions among member-states when it comes to energy diplomacy.

Before the EU can address such institutional and programmatic issues, it should have a much more fundamental debate about its energy problems in a global context. The debate should start with a simple fact: more than 95 per cent of the world's known oil and gas resources are now controlled by the governments of nation states. Most of these states have no special reasons to like Europe and will

do us no favours. We like to see ourselves as a model for others, a benign giant loved by all. But much of the planet (and definitely many oil and gas producers) see us simply as rich and weak: ideal for blackmail.

Europe: The great procrastinator

Unlike the United States, which has often been prepared to use force even far away from its shores, most Europeans prefer 'soft power'. But words neither fill tankers nor protect pipelines. Unlike China, which is prepared to sign energy deals with any kind of government, we claim to shun dictators. In reality, we are only postponing difficult choices. When it comes to energy, Europe is the great procrastinator.

Mentally, we still live in the centuries when the Old Continent ruled everybody else. We got so used to having all the resources of the planet at our disposal that just contemplating not having them is awkward. It seems inconceivable, yet the change has already started. Some 30 years ago, one billion people – almost exclusively in the West – had everything and the rest nothing. Today, three more billion, from China and India to Brazil and Vietnam, are aspiring to our living standards: they want to have enough food and clean water, with electricity and controlled temperature in their homes, plus fridges, computers, cars and so on. Our record in spreading democracy is patchy, but success in proselytising consumerism is undeniable. At least in this aspect the West has won: the world measures its well-being in things it can buy, use, accumulate – and burn.

A quadrupling of the number of middle class consumers will change the world more than we can imagine. One statistic can illustrate this: the US has 842 cars per 1,000 inhabitants, the EU has 430, China 36 and India 13. It is solely because of this low ratio that China's oil consumption still lags that of the US: 1.3 billion Chinese consume 7.9 million barrels a day while roughly 310 million Americans need

20 million barrels. The Chinese want to drive their own cars, as do Indians and many, many others. Present capacity of oil production – around 90 million barrels a day – cannot, unlike the manufacturing of mobile phones, be multiplied in a few years. The International Energy Agency estimates that world oil demand grew by 2.7 million barrels a day in 2010 alone, but new reserves of oil are not discovered as readily. We are heading at full speed towards the moment when we either have to find fundamentally new technologies and resources, or reach global agreement on curtailing our demands. Otherwise we will fight for energy.

The emerging nations are driven by aspirations, hunger and a sense of historical injustice. Europe is heading into this contest largely unaware. If we want to sustain our standard of living and our security, we need to contemplate three options:

★ Use power

Today, Europe – once the sword-master of the world – is a military dwarf. To be taken seriously in any forthcoming battle over resources, Europe needs to increase its military muscle and change its attitude towards conflict. At the moment, Europe is at best divided over military matters, with only a few member-states willing and able to act. Without a direct threat or a major terrorist attack on our soil, public attitudes – and hence the politics – towards the use of force will not change.

But there is more to power than guns. Europe is an economic superpower, with half a billion mostly affluent citizens. This gives us an influence that we strangely do not use in energy matters. We are in a good position to make our standards global norms, as we did with the GSM standard for mobile phones or the REACH directive for chemicals. In energy, we tend to be divided – unless a crisis forces us to act together and then we can be surprisingly effective and tough. In the gas crisis of January 2009, for example, Russia and Ukraine simply expected the EU to stump up the money that

would allow them to resolve their bilateral squabbles over gas debts, prices and transit fees. Once both Moscow and Kyiv understood that the EU-27 were of one opinion, would not be drawn into their argument, and would not pay any additional money, the gas flow was swiftly restored.

As representative of the Czech EU presidency at the time, I happened to be involved in the preceding negotiations between Vladimir Putin, Yulia Tymoshenko and other players, so let me belittle my own achievement: it was relatively easy to enforce an already signed deal, when both the producer and transit country had no other customer to turn to. But the future global energy market will be different: producers and transit states will have more choice. The EU will have to harness its strength to get producing countries to sign – and fulfil – new supply deals in a tight energy market and in the face of stiff competition from the likes of China and India. In short, we need a long-term strategy for dealing with the coming energy crunch that is more conscious of global power shifts.

★ Get real

We need to ask ourselves what role human rights, democracy and freedom should play in our energy policy. Should we support and enforce these beliefs anywhere in the world? Or should we uphold them at home while neglecting them when we go shopping for energy abroad? Our record so far is mostly one of hypocrisy: we preach while making the deals needed to keep our houses warm and cars moving.

The choices will become more difficult in the future, as our energy needs clash with the needs of others. Autocratic supplier countries may ask us to send back prosecuted émigrés, sell them arms, or silence the criticism of their regimes in our own media. I know how difficult this choice will be. I was first detained at the age of 20, and by the time the revolution began in 1989, I faced the prospect of three to eight years in prison for ‘subversion of the state’.

Democracy means something to me. But I also realise that for most Europeans – including myself – personal comfort is more important than the well-being of people in far-away countries. Europe's self-delusion about being able to keep the cake and eat it – that is, to have all the energy we need without dealing with unpleasant regimes – is deeply rooted. Yet the EU needs to start a debate about how far it is prepared to prop up repulsive regimes in the name of energy security.

★ Innovate

If the world is to escape a major confrontation over energy, it will most likely be thanks to new technologies and scientific breakthroughs. Most governments and their voters agree with this. But the reality is different. We are enamoured of the high ideals of education and progress, as long as we do not have to pay too much for them.

We need to accept that innovation and research are an integral part of our energy security policy. We need a number of major projects that can ignite public imagination and allow concentrated research spending on a billion-euro scale. At least three technological breakthroughs are needed if we want to bequeath our living standard to our children. These are: new, reliable base load sources of electricity (some believe that nuclear fusion will play this role, while others hope for a totally new way of generating power); the ability to store electricity in large quantities (a problem that has eluded us for over a century); and new engines for moving vehicles. Europe will struggle to find the vast sums needed to achieve such breakthroughs, in particular in an environment where scarce budget resources mean cuts to welfare, pensions and subsidies. But given our continued inability or unwillingness to face the harsh realities of the coming energy crunch, technology looks like our best option.

The European economy needs affordable and reliable energy supplies. The EU is also at the forefront of the global fight against

climate change. A successful European energy policy is as critical as it is complex. In this report, ten experts and two EU commissioners look at various aspects of EU energy policy. They raise a number of critical questions, such as whether EU renewables policy could be unnecessarily expensive and even undermine the single market; whether EU support for critical pipelines and power lines could stunt market signals; or whether the EU's gas policy is too backward looking. They all agree that now is the time to formulate a more coherent and long-term European energy strategy.

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GREEN, SAFE, CHEAP

Where next for EU energy policy?

Edited by Katinka Barysch

The European economy needs affordable and reliable energy supplies. The EU is also at the forefront of the global fight against climate change. A successful European energy policy is as critical as it is complex. In this report, ten experts and two EU commissioners examine various aspects of EU energy policy. They raise a number of difficult questions, such as whether EU renewables policy could be unnecessarily expensive and even undermine the single market; whether EU support for selected pipelines and power lines could stunt market signals; and whether the EU's gas policy focuses too much on the 'Russia threat'. They all agree that now is the time to formulate a more coherent, long-term European energy strategy.

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