

REPORT

EUROPE'S POWER

RE-ENERGISING A PROGRESSIVE
CLIMATE AND ENERGY AGENDA

Joss Garman

September 2014
© IPPR 2014

ABOUT IPPR

IPPR, the Institute for Public Policy Research, is the UK's leading progressive thinktank. We are an independent charitable organisation with more than 40 staff members, paid interns and visiting fellows. Our main office is in London, with IPPR North, IPPR's dedicated thinktank for the North of England, operating out of offices in Newcastle and Manchester.

The purpose of our work is to conduct and publish the results of research into and promote public education in the economic, social and political sciences, and in science and technology, including the effect of moral, social, political and scientific factors on public policy and on the living standards of all sections of the community.

IPPR
4th Floor
14 Buckingham Street
London WC2N 6DF
T: +44 (0)20 7470 6100
E: info@ippr.org
www.ippr.org
Registered charity no. 800065

This paper was first published in September 2014. © 2014
The contents and opinions in this paper are the author(s) only.

POSITIVE IDEAS
for CHANGE

CONTENTS

Summary	3
Introduction	6
1. Keeping up with the G2	8
A foundation for progress.....	10
A new vision for 2030	11
Our policy recommendations	14
2. In the shadow of Ukraine: Achieving energy security by reducing fossil fuel imports	18
Dependence on Russia.....	19
Diversifying gas supply.....	19
Coal.....	20
Fracking	20
Energy efficiency.	22
Renewables.....	22
Policy recommendations.....	23
3. Waking the sleeping bear: A credible plan for Emissions Trading Scheme reform	25
Our policy recommendations	28
4. Raising ambition: A super-fund for clean energy infrastructure	30
The current approach	30
Our policy recommendations	31
Conclusion	33
References	35

ABOUT THE AUTHOR

Joss Garman is an associate fellow at IPPR, working on climate change and energy.

ACKNOWLEDGMENTS

Special thanks to Will Straw as well as Nick Mabey, Ruth Davis, Baroness Bryony Worthington, Damien Morris, Michael Jacobs and Damian Kahya for their invaluable thoughts that helped inform this research.

Thanks also to Keith Allott, Jonathan Gaventa, Charlotte Billingham, Graeme Cooke and Ben Stewart for their reflections on earlier drafts of this paper.

I'm also grateful to Martin Schoenberg, Christopher Poles, and Louisa Casson for evidence they sent me, and to all those who joined a roundtable discussion in Brussels when this project was at a very early stage.

Thanks too to officials at the UK Department of Energy and Climate Change and Foreign and Commonwealth Office for their insights and help in answering questions.

This report is part of IPPR Trading Ltd and FEPS' joint project on European progressive energy policy.

SUMMARY

Europe's strategy on climate change and energy policy is at a critical juncture. The political crisis in the Ukraine and the entire continent's significant dependence on imported fossil fuels from Russia has caused energy security to rise to the top of the European agenda. This juncture provides a renewed opportunity to develop a cooperative energy policy based on alternatives to fossil fuel imports. Simultaneously, the emergence of new clean energy policies in the US and China now means that an international climate change agreement could be reached at the UN summit in Paris in December 2015.

Observers have long recognised the pivotal role that a strong, ambitious and united Europe must play in any successful global negotiation. It is Europe that demonstrated to the world that greener growth is possible, and that a heavily polluting energy system is not a prerequisite for prosperity. The European economy has grown by 45 per cent since 1990, even as emissions have been cut by 20 per cent (EEA 2014). Yet despite having taken a lead at international talks on climate change for decades, European governments have failed to agree a climate and energy policy out to 2030. It is now the US and China, rather than Europe, that are making the running in global climate talks.

Renewed leadership from Europe on climate change could help to leverage greater effort on the part of other major economies, and make a successful outcome at next year's important international talks more likely. Given the grave security risks posed by global temperatures rising by more than 2°C, this is in our common interest. A key test of the new European strategy will be whether it does what is necessary to manage climate risks, and specifically whether it is consistent with building a carbon-neutral economy within a generation.

Europe must also act in order to protect its first-mover advantage in green industries, and to take full advantage of the economic opportunities available from the transition to a low-carbon economy. The global market in low-carbon and environmental goods and services is worth around €4 trillion a year, and is expected to grow to nearly €5 trillion by 2016 (Platt and Straw 2013). The EU has carved out a 22 per cent share of the current market, worth over €900 billion a year, compared with a 19 per cent share for the US and 13 per cent for China (ibid). Without new policies, the EU risks ceding jobs and industrial opportunities in clean technologies to other economies that are more committed to capturing these new markets. The EU's share of global clean energy investments is already falling rapidly, from 40 per cent in 2009 to just 25 per cent in 2012 (Green Growth Group 2014a).

Enormous savings are available by moving away from an energy system based on expensive fossil fuel imports, and towards one that is cleaner, more efficient and home-grown. Avoiding fossil fuel import costs and maximising the positive impact of clean investments within Europe will bring significant economic benefits, and aid economic recovery (EY 2014). Indeed, the available evidence suggests that a higher target for reducing European greenhouse gas emissions by 2030 – as the UK government has proposed in the event that there is an international climate agreement – would have a *net positive* effect on the economy.

As EY stated in a recent analysis:

'A GDP increase of 0.53 per cent is projected in the case of a 45 per cent GHG [greenhouse gas] target with complementary efficiency and renewables efforts. Long-range forecasts are difficult, but as with employment, avoided

spending on fossil fuels would also enable a reallocation of these monetary benefits within the EU economy and stimulated GDP growth.'

EY 2014

One study for the British government has found that a new target of halving greenhouse gas emissions by 2030 (relative to 1990 levels) would reduce GDP by less than 0.5 per cent in a context of anticipated growth of 25 per cent (Enerdata 2014). This analysis also found that deeper emission cuts, of 50 per cent by 2030, would represent a cheaper decarbonisation pathway to the EU's 2050 commitment¹ than pursuing a 40 per cent target by 2030, saving an estimated €170 billion (ibid). A target for cutting European emissions in half by 2030 should therefore be supported, if other major economies agree to a climate deal next year. As with the EU's 2020 energy and climate policy, each member state should have a clear greenhouse gas reduction target of its own.

In a departure from the 2020 approach, a new agreement should give EU member states the flexibility to pursue their overarching targets for cutting greenhouse gas pollution using whichever low-carbon technologies best suit their economies. However, any credible European energy strategy would encourage the continued growth of the renewables industry, given the potential for its proven, affordable clean technologies to generate new industrial opportunities and help reduce gas dependency. We therefore favour a new, binding European target to grow the share of the EU's energy provided from renewable sources to at least 30 per cent by 2030. Certainty about the likely economic attractiveness and size of the European clean energy market will be crucial for businesses making decisions about whether to invest in jobs and factories here. Each member state should then set out plans outlining their own pathway to carbon reduction by 2030, including the contribution that renewable energy will make. Access to European funding for energy projects should be conditional upon member states verifiably following a decarbonisation strategy aligned with the European 2030 targets.

In the shadow of the Ukrainian crisis, a decisive strategy for reducing European reliance on fossil fuels will also help to achieve the urgent strategic objective of cutting the EU's dependence on energy imports, particularly from Russia. Over half of Europe's energy is now imported, including 90 per cent of oil, 66 per cent of gas, and 62 per cent of coal (EC 2014a). The cost of these imports is expected to increase as global demand for energy rises (EC 2014b). Wholesale gas prices in Europe are already more than twice what they are in the US (ibid). Average oil prices have risen by more than 200 per cent since 2003, and by 2050 the European Commission estimates that Europe's total fuel bill could double (Green Growth Group 2014a).

Analysis for the European Commission has concluded that investing in an energy system that is more efficient and less dependent upon fossil fuels could achieve annual savings in Europe's fuel bill of over €500 billion. In our view, energy efficiency improvements should therefore be the centrepiece of Europe's strategy for slashing dependence on imports of Russian gas. We support a new target for improving Europe's energy efficiency by 35 per cent by 2030, since achieving energy savings on this scale would cut the EU's gas dependency by a third – equivalent to the proportion of the EU's gas demand currently met by Russia (EC 2014c). As with renewables, member states should set out what contribution energy efficiency will make to their overarching carbon reduction targets. The European Commission should address any differential between member states' ambition and the EU-wide target – for example, by developing new standards for vehicle efficiency.

¹ That is, to reduce greenhouse gas emissions by between 80 and 95 per cent, relative to 1990, by 2050.

In addition to reducing the overall cost of emissions reduction, providing certainty to businesses and reducing dependence on imported fossil fuels, there are distinct economic benefits to member states for choosing to cooperate on climate and energy policy at a European level rather than adopting unilateral approaches. For example, a harmonised carbon-pricing policy should be a more cost-effective and efficient approach than a patchwork of different carbon policies in different member states. The existing Emissions Trading Scheme (ETS) was designed for this very reason, and could still be effective if its flaws were addressed. Meaningful reform to the ETS is urgently required, both to make the policy fit for its purpose of reducing carbon pollution, and to prevent a renaissance in coal-fired power generation from derailing diplomatic efforts to secure a climate deal. European leaders can fix the problem of the 'bottomed out' carbon market by bringing forward the Commission's proposal for a market stability reserve to 2016, and tightening ETS budgets so that they are in line with the strengthened 2030 climate target. However, given the uncertainty that exists about the feasibility of such reforms, member states should also act to bring forward backstop measures, such as Emissions Performance Standards (EPS), that would ensure the closure or abatement (with carbon capture and storage technologies) of existing fossil fuel plants on a timetable that is consistent with achieving the 2030 European climate target at the lowest cost.

Building large-scale transformational energy projects and promoting new breakthroughs in clean technologies are expensive, and can benefit from European added-value through the pooling of resources and the sharing of expertise. Integrating low-carbon infrastructure planning can also enable billions in savings through smarter planning. Given the extraordinary sums that Europe must invest to replace ageing energy infrastructure and build a cleaner economy, existing budgets that support the low-carbon transition should be pooled to create a 'clean energy super-fund'. This should support a smaller number of larger, focussed projects that are clearly aligned with Europe's overarching energy objectives out to 2030. This would cover projects that would not happen if they were dependent upon a single member state, and projects that cross national borders. There should also be a greater role for the European Investment Bank in helping to leverage more clean energy investment.

This report offers further details on how the EU can and should reinvigorate its climate and energy strategy with a new package of progressive policies covering up to 2030.

Chapter 1 explains why strong and binding new 2030 targets are needed to provide investors and the international community with clarity over the direction of European climate and energy strategy. It also explains our view of what these targets should be and how they should be enforced.

Chapter 2 considers the different options for addressing Europe's energy security, and focuses on why energy efficiency should be the centrepiece of the EU's efforts to reduce its dependence on gas imports from Russia.

Chapter 3 examines the deep flaws in the ETS, Europe's flagship scheme for cutting greenhouse gas emissions. It is our view that a credible plan for urgently-needed reform of the ETS should be in place before next year's UN climate summit, and that EU member states should create backstop policies to prevent policy failure on decarbonisation, particularly concerning coal, from occurring should these reforms to the ETS fail.

Finally, chapter 4 outlines why European budgets that exist to support the low-carbon transition should be pooled to create a 'clean energy super-fund' that is clearly aligned with Europe's overarching energy objectives out to 2030.

INTRODUCTION

In April 2014, the Intergovernmental Panel on Climate Change published the most comprehensive report to date on the risks that climate change poses to global security, and the ways in which the world could manage those risks (IPCC 2014). The authors warned that levels of the polluting gases that are causing the climate crisis have grown nearly twice as fast in the past decade as in the previous 30 years. Without urgent action to reverse this trend and dramatic cut greenhouse gas emissions, there is a high risk that global temperature rises could put today's levels of prosperity at risk, and decades of progress in international development. A landmark report for the World Bank (Potsdam Institute 2012) warned that a 4°C rise in global temperatures is looking increasingly likely without radical action, and could result in extreme heatwaves, declining global food stocks, loss of ecosystems and biodiversity, and life-threatening sea-level rises.

In 2012 US emissions dropped to the lowest level for 20 years due to widespread switching from coal to natural gas and the more than doubling of renewable energy generation (Reuters 2014a, IEA 2012a). New plans announced by President Obama in June 2014 should lead to a further reduction in carbon pollution, and a redoubling of the amount of renewable energy that the country produces (White House 2013). His administration's introduction of tighter emissions standards for power stations has sent a clear message that the era of unabated coal-fired power generation in the US is ending. Meanwhile, his economic stimulus package included US\$90 billion of support for clean-energy investment (Plumer 2012).

US secretary of state John Kerry has been involved in bilateral talks with China, which has signalled that for the first time it is considering a cap on their emissions (Reuters 2014b). Twelve Chinese provinces have already pledged to cut their coal use. Assuming that these measures are enforced and not neutralised by rises in emissions elsewhere in the country, analysis by Greenpeace (Shuo 2014) suggests that these policies could put China on a pathway consistent with limiting global temperature rises to less than 2°C. The drop in carbon pollution that this would represent would be equivalent to the total emissions of Australia and Canada combined. China is also rapidly expanding its clean energy industry and invested \$56 billion in renewable energy last year alone – more than the whole of Europe (BNEF 2014a).

In September 2014 UN secretary general Ban Ki Moon will host a major summit in New York, at which it is expected that a number of world leaders – including President Obama – will outline their political commitment to managing risks from climate change (Darby 2014). Together, these developments have raised hopes that an international climate agreement is within reach.

Next December, France's President Hollande will host all the world's governments in Paris at the UN's 21st Conference of the Parties ('COP 21') Summit at Île-de-France, where it is hoped that a new, binding UN climate treaty will be agreed. Both the US and the BASIC group of emerging economies² have said that they are ready to commit to a new international climate deal in 2015.

In Europe, there is clear evidence that cooperation in climate and energy policy still enjoys widespread popular support, despite the recent surge in support for Eurosceptic political parties in some of its members. Eurobarometer polling this year found that 80 per cent of Europeans agree that fighting climate change and

2 That is, Brazil, South Africa, India and China.

using energy more efficiently can boost the European economy and create jobs; 70 per cent want to reduce fossil fuel imports to Europe; and 90 per cent favour new renewable energy targets (EC 2014d). A 2012 YouGov poll, conducted in six European countries, found that tackling climate change was one of only two issues from a list of 16 on which the respondents felt that EU member states should cooperate more closely (Straw 2012).

The political crisis in the Ukraine, and the continent's significant dependence on imported fossil fuels from Russia, has meant that energy security is dominating the European Council agenda. This provides a renewed opportunity to develop a cooperative energy policy. Since among the best routes to increasing energy security are the deployment of low-carbon generation (including renewables), energy efficiency, and interconnection, the situation in Ukraine should spur on the development of a cooperative climate policy.

Unfortunately, the acute pressure that rising energy costs are placing on both family budgets and the competitiveness of some important European businesses means that recently there has been a shift of emphasis in the debate over energy policy. Heads of government have not yet reached agreement on either the scale of Europe's ambition to cut carbon pollution, or on the degree of flexibility that different countries will have in how they achieve that goal.

In January, the European Commission set out their proposals for the new 2030 climate targets that member states should agree. Their plan centres on establishing two new binding targets. The first is to cut Europe's output of greenhouse gases by 40 per cent on 1990 levels by 2030, with commensurate targets for each member state. The second is to increase the share of energy that is provided by renewable sources to at least 27 per cent by the same date, but without binding targets for member states. These goals are supposed to reflect a 'cost-effective track' towards achieving Europe's commitment to reduce greenhouse gas emissions to between 80 and 95 per cent below 1990 levels by 2050.

It was hoped that a package would be adopted by the European Council in March 2014, and could then proceed to the European parliament. Unfortunately, at that meeting, a decision was postponed and heads of government said they would take a final decision on new 2030 climate targets by October 'at the latest' (EC 2014e). Even this later date is, at the time of writing, thought to be under threat due to the ongoing debate about the appointment of new European Commissioners.

It is frustrating that the EU is unlikely to have a formal, united position to take to Ban Ki Moon's summit in 2015. However, it means that now is an appropriate time to reconsider what a progressive package would look like.

1. KEEPING UP WITH THE G2

Clarity and direction towards 2030

Europe's leaders should establish clear climate and energy objectives out to 2030, in order to address a series of interconnected challenges that have yet to be resolved.

Managing climate risks

Deep cuts in the annual volume of greenhouse gas pollution from Europe are necessary if Europe is to play its part in global efforts to keep temperature rises below the 2°C threshold to which it is already committed. It must do so if we are to manage the risk that climate change poses to our security and prosperity. The EU has already agreed to cut greenhouse gas pollution by between 80 and 95 per cent by 2050. However, the European Commission expects that without new climate and energy policies, Europe will achieve only a 32 per cent cut in greenhouse gases by 2030 (EC 2014f), and just a 40 per cent cut by 2050 (EY 2014). This would be insufficient to put Europe on a pathway towards avoiding the severe risks associated with a rise in global temperatures of more than 2°C.

New targets should offer long-term clarity on the commitment of Europe as a whole to an agreed climate strategy. This is essential if businesses are to factor climate policies into their decision-making, and if Europe is to avoid becoming 'locked in' to highly polluting infrastructure that makes cutting emissions more expensive in later years. A strong 2030 target for cutting carbon pollution would also give other countries and regions confidence that Europe is not asking something of them that it is not prepared to do itself. This in turn would increase the likelihood that an international climate agreement can be reached at the UN summit in Paris next year. Observers have long recognised the pivotal role that a strong, ambitious and united Europe can play in any successful global negotiation, and it is expected that leadership from Europe on climate change could help leverage greater effort on the part of other major economies.

Reducing dependence on expensive energy imports

Europe's fuel bill is growing. The International Energy Agency project that by 2035 it could reach US\$615 billion (Green Growth Group 2014a). Since European fossil fuel production will halve between 2010 and 2050 (EY 2014), the continent risks becoming increasingly dependent on imports, including gas from Russia and the Middle East. The recent crisis in Ukraine underlines the geopolitical dangers of this outcome.

Meanwhile, most of the rising cost to consumers of electricity results from the rising cost of these fossil fuels, with a significant additional cost arising from the need to replace ageing and polluting energy infrastructure. The European Commission has projected that in a business-as-usual scenario, these factors will be responsible for a 43 per cent rise in the cost of power between 2005 and 2030 (ibid). In the same report, the Commission concluded that investing in an energy system that cuts the continent's dependence on fossil fuels could achieve annual savings in Europe's fuel bill of over €500 billion (ibid).

Encouraging investment, jobs and growth

Europe requires vast amount of new investment in energy infrastructure, irrespective of the carbon-intensity of the pathway it adopts. According to the European Commission, under a scenario in which there is no change to existing EU energy and climate policies, energy infrastructure investments across all sectors would

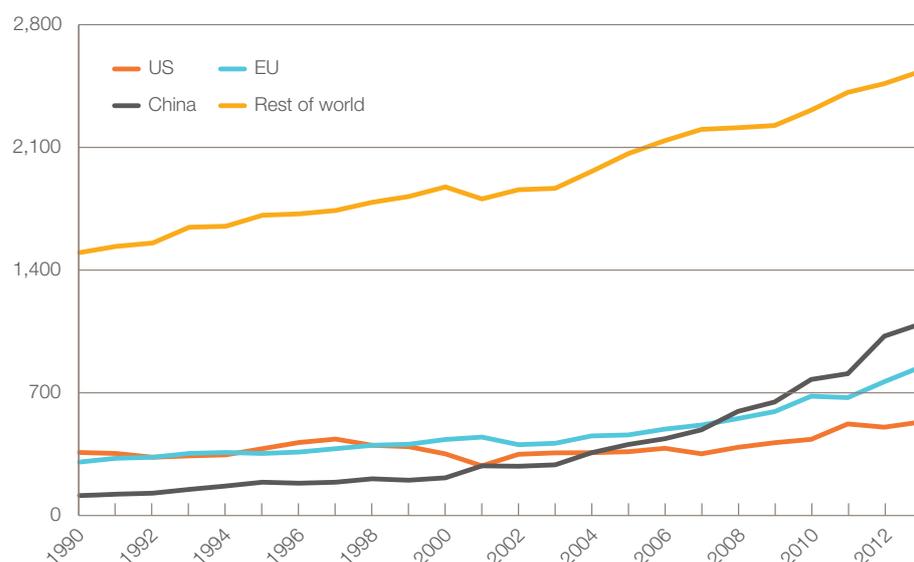
need to increase from around €800 billion per annum between 2010 and 2020 to €1,000 billion per annum between 2040 and 2050 (EY 2014).

Long-term, legally binding targets provide a loud and visible market signal, giving investors the necessary confidence to channel their support to new low-carbon energy infrastructure. Clear targets that establish a shared European strategy can also enable smarter, more efficient infrastructure planning. For example, one study suggested that integrating the European gas market could lead to savings of up to €30 billion (Booz 2013).

Choosing to replace fossil fuel energy imports with domestic investments in clean energy and energy efficiency would boost home-grown job creation (Neuhoff et al 2014). Incentivising research, development, and innovation in low-carbon technologies and their supply chains can also boost jobs and growth in advanced manufacturing and energy service industries. By contrast, mixed policy signals – and the associated perception that there could be sudden changes in the direction of energy policy – prompt investor uncertainty. This is likely to result in a fall in investment and an increase in the cost of the investment that goes ahead, which will have potentially damaging consequences for Europe’s competitiveness.

Without clear and unambiguous targets, Europe risks losing some of the economic advantages of its first-mover position in the \$250 billion global market in renewable energy technologies (Pew 2014). The EU’s share of global clean energy investments is already falling rapidly: in 2009 it accounted for 40 per cent, but this had fallen to just 25 per cent by 2012 (Green Growth Group 2014a). In 2013, China invested more in renewable sources of energy than Europe for the first time (BNEF 2014a) – indeed, China is on course to overtake Europe as the world leader in these technologies. Seven of the 10 largest solar companies in the world are Chinese, including the company in the top spot – Suntech (Hook and Crooks 2011). In 2012 the US became the world’s largest market for wind power, and an American company – GE Wind – overtook a European company – Vestas – to become the world’s largest supplier of wind turbines (Navigant Research 2013). Their two closest market rivals are Chinese (Hook and Crooks 2011).

Figure 1.1
Electricity production from renewable sources, 1990–2013 (TWh)



Source: BP Statistical Review of World Energy 2014, reproduced in Evans 2014

A foundation for progress

In 2008, European leaders signed up to a set of climate and energy targets for 2020. Specifically, they agreed that by 2020 Europe should generate 20 per cent of its energy from renewable sources, and achieve a 20 per cent reduction in the output of greenhouse gases against 1990 levels. They also agreed to reduce energy consumption by 20 per cent by 2020.

Europe is well on track to meet the first two of these three targets. The European Commission estimates that levels of greenhouse gas output are likely to be down by at least 24 per cent by 2020 (EC 2014b) – indeed, the 20 per cent target has been all but met seven years ahead of schedule. Ecofys expects Europe's emissions could be down by as much as 30 per cent by 2020 (Ecofys 2013b). This is largely the result of clean energy deployment, efficiency improvements, and the impact of the economic downturn. The European Commission estimates that the share of European energy coming from renewables will rise to 21 per cent by 2020 (EC 2014b).

Between 2008 and 2012, when Europe's GDP fell by 1.9 per cent, the continent's greenhouse gas emissions fell by 9.2 per cent (EEA 2014). Some analysts subsequently attributed between 30 and 50 per cent of the total drop in emissions during that period to the economic downturn (ibid). However, an industry analysis suggests that between 40 and 50 per cent of the emission reductions made in Europe between 2008 and 2012 can be attributed to the growth in renewables, which means that clean energy deployment has been the primary driver of reduced emissions over the period (CDC 2013).

While Europe is unlikely to meet its 2020 energy efficiency goal, energy consumption is likely to be at least 18 per cent lower than it was projected in 2007 that it would be had no policy action been taken (EC 2014b). Put simply, Europe is the most energy efficient economy in the world. Since 1990 Europe's economy grew by 45 per cent, while its emissions fell by 20 per cent (EEA 2014).

The European Commission estimates that achieving the 2020 efficiency target could reduce Europe's oil imports by 2.6 billion barrels a year, saving European consumers up to €200 billion annually (Green Growth Group 2014a). After the growth in renewables and the impact of the economic downturn, energy efficiency already represents the other main explanation for how Europe has reduced its emissions: 10–20 per cent of the drop in emissions between 2008 and 2012 has been attributed to efficiency improvements (CDC 2013).

The success of green industries has bolstered economic growth. The global low-carbon and environmental business market is worth around €4 trillion a year, and is expected to grow to nearly €5 trillion by 2016. The EU has carved out a 22 per cent share of this market, worth over €900 billion a year, compared with a 19 per cent share for the US and a 13 per cent for China (Platt and Straw 2013).

Over the last four years, Europe's low-carbon market has grown by over 10 per cent, or more than €100 billion (Green Growth Group 2014a), and investment in energy efficiency is expected to create up to 2 million new jobs by 2020 (EC 2012). A study by DIW Berlin suggests that 180,000 jobs in energy efficiency services will be created in Germany alone by the same date (Neuhoff et al 2014). By 2012, the last year for which data is available, there were around 1.2 million jobs in renewable energy in Europe (IRENA 2014). The data suggests that 60 per cent of these renewable energy jobs are in Germany, France, Spain and Italy, though the UK is the leader in offshore wind – an industry that employs 56,000 people throughout Europe (IRENA 2014). Some of the most dynamic low-carbon markets can now be found among member states in the Visegrád Group³ and the South-East European Cooperation Process,⁴

3 That is, the Czech Republic, Hungary, Poland and Slovakia.

4 Bulgaria, Greece, Romania and Slovenia.

where the market is growing at an average of over 6 per cent a year (IRENA 2014). The European Commission estimates that meeting the 2020 renewable energy target will lead to a net growth of nearly 2.5 million jobs (EC no date).

As a consequence of Europe's 2020 commitment to grow the share of renewable energy, Europe's wind energy capacity has already grown to more than 117 gigawatts – enough to power 8 per cent of Europe's power consumption – and its solar capacity to more than 70 gigawatts (Dallos G 2014). The share of renewables in final energy consumption increased from 9.7 per cent in 2007 to 13 per cent in 2011, and in electricity from 15.8 per cent to 21.7 per cent (Spencer et al 2014a).

Large-scale deployment of renewable energy technologies has brought dramatic cost reductions with it, meaning more clean energy generated for less money invested. This partly explains why, despite increased consumption of energy and electricity from renewables, there was a 44 per cent reduction in renewables investment in Europe between 2012 and 2013 (Walsh 2014). Between 2008 and 2012, the cost of solar has fallen by 80 per cent, and the cost of onshore wind by 30 per cent (Spencer et al 2014a). Earlier this year the first European solar farm able to compete with conventional power stations without any subsidies came online in Spain (Barrero 2013), and solar PV in Germany achieved cost reductions that European Commission models anticipated would only occur in 2035 (EY 2014). Deutsche Bank now project that by 2015 solar power should be able to compete with little or no subsidy in three quarters of the world's solar markets (Evans-Pritchard 2014). The bank says that there are already 19 regional markets, including Germany, where solar can now match or undercut conventional sources of residential power (ibid). Bloomberg New Energy Finance project that onshore wind and solar will be subsidy-free in Europe by the 2020s (Shankleman 2014).

While financial support schemes such as feed-in-tariffs, which governments put in place to enable the growth of clean energy, have raised the cost of energy, they have not been the main cause of rising energy prices across Europe. European Commission data suggests that between 2008 and 2012 renewables policies raised European household energy costs by 7 per cent, and industry energy costs by 9 per cent (EC 2014b). However, in 2010, European renewables allowed the EU to avoid €30 billion in imported fuel costs – approximately the same sum that Europe spent on renewable energy subsidies in the same year (EWEA et al 2014).

The 2020 climate and energy package is also thought to have brought health benefits to Europe, largely through improved air quality resulting from a cleaner energy system. It has been estimated that these health benefits are worth, in economic terms, between €13 and €52 billion (Holland 2008), representing savings from, for example, the avoidance of premature deaths and working days lost to poor health due to air pollution.

A new vision for 2030

A new target for reducing Europe's greenhouse gas pollution

The European Commission has proposed a new, binding Europe-wide binding target for reducing greenhouse gas emissions – a 40 per cent cut on 1990 levels by 2030 – and that this goal should be met 'through domestic measures alone' (EC 2014e). It argues that this would enable Europe to stay on track to achieve its agreed goal of 85–90 per cent cuts in emissions by 2050 (ibid). The Commission is resisting the adoption of a more ambitious carbon reduction target, saying it sees 'no merit in proposing, in addition, a higher conditional target ahead of the international negotiations' (EC 2014e).

Some member states, including the UK (Merrick 2013) and Germany (Council of the European Union 2014), have argued that Europe should go further and agree to a greater reduction in greenhouse gas output in the event of an international climate

agreement being reached in 2015. The UK is backing a 50 per cent cut by 2030 if the Paris conference succeeds (Merrick 2013). Analysis by the consultancy Ecofys concluded that an emissions cut of this scale is necessary if Europe is to make its fair contribution towards achieving its stated goal of keeping global temperature increases to 2°C or below by 2050 (Hohne 2014). For the same reasons, Lord Stern favours this more ambitious target (Shankleman 2013).

In February 2014 a clear majority in the European parliament voted for targets that are more ambitious than the European Commission's current proposals. They backed targets for cutting emissions by 'at least 40 per cent', for a 30 per cent share of all energy to come from renewables by 2030, and for reducing energy consumption by 40 per cent by the same date (European Parliament 2014). Ecofys calculated that these proposed targets would lead to a 54 per cent reduction in total emissions by 2030 (Ecofys 2014). The Polish government has argued that a 40 per cent greenhouse gas reduction target would itself be over-ambitious, and has threatened to veto new targets (Yeo 2014, Krukowska 2014). However, in March, ministers representing the 13 European governments that make up the Green Growth Group⁵ issued a joint statement backing 'a binding domestic greenhouse gas target of *at least* 40 per cent' (Green Growth Group 2014b).

Most member states have not yet expressed a public view on the exact level that any new greenhouse gas target should be set at, and the strongest influence on their positions is likely to be the anticipated economic impact of any new EU-wide goal. Two studies – one for the European Commission and another for the British government – have found that the overall cost to the European economy of a 40 per cent greenhouse gas reduction target would be minimal. The Commission's impact assessment concluded that the additional cost to the energy system would equate to between 0.1 and 0.45 per cent of EU GDP in 2030 (EC 2014f). Similarly, the Enerdata study commissioned by the British government found that it would cost 0.19 per cent of EU GDP in 2030 to achieve the same 40 per cent target (Enerdata 2014). This is against a backdrop of total EU growth to 2030 of more than 25 per cent, according to the IMF's projections (DECC 2014a). These headline cost figures do not take into account the likely economic co-benefits of decarbonisation, which could be considerable. For example, the UK study found that reduced reliance on fossil fuel electricity generation could reduce EU health costs due to respiratory illness by 0.1 per cent of GDP in 2030, and reduce the EU's energy import bill for fossil fuels in 2030 by over 0.4 per cent of GDP relative to costs if the 40 per cent cut is not made (ibid).

The European Commission's analysis projected that, irrespective of whether there is an international climate agreement, a stronger, 45 per cent greenhouse gas reduction target would lead to net *growth* in the EU's GDP, of 0.53 per cent in 2030 relative to a business-as-usual scenario (EC 2014f). The UK study also found that deeper emission cuts of 50 per cent by 2030 would represent a cheaper decarbonisation pathway to 2050, saving an estimated €170 billion (Enerdata 2014). This analysis found that a new target to halve greenhouse gas emissions by 2030 would reduce EU GDP by less than 0.5 per cent, in the context of anticipated growth of 25 per cent (ibid). EY also compared the macroeconomic impact in 2030 of a business-as-usual approach in Europe with scenarios in which energy is decarbonised in line with the EU's 2050 carbon reduction targets. They concluded that:

'For GDP, impacts of decarbonisation are limited but appear to remain net positive... [and] for employment, the impacts of decarbonisation appear to be modest but positive compared to business as usual.'

EY 2014

5 Germany, France, Italy, the UK, Spain, Estonia, Finland, Belgium, Denmark, the Netherlands, Sweden, Slovenia and Portugal.

The prospective economic benefits of deeper emission reductions stem largely from avoided fossil-fuel import costs, which would enable a reallocation of money within the EU economy that could stimulate growth (ibid).

There is broad agreement between member states that rising energy costs is challenging the competitiveness of a small number of energy-intensive industries in Europe. For example, energy accounts for more than a fifth of total production costs for Europe's cement, lime and plaster industries (EC 2014b). The Centre for European Policy Studies found that steel companies in Europe pay double the amount that American steel companies do for electricity, and four times as much for gas (Egenhofer et al 2013). While a report by the London School of Economics has concluded that, for the vast majority of European manufacturing businesses, energy prices are not a primary determinant of economic competitiveness, there are exceptions (Neuhoff et al 2014). Targeted policy solutions will be required to protect these companies, and ensure a just and politically sustainable transition to a lower-carbon economy (TUC 2012).

New target for growing the share of renewable energy

The Green Growth Group of governments has also backed a proposal from the European Commission to adopt a new target for generating at least 27 per cent of EU energy from renewable sources by 2030 (Green Growth Group 2014b). Analysis by the Commission indicates that 24 per cent of Europe's energy would be likely to come from renewable sources by 2030 without any new climate and energy policies, so the proposal to get to at least 27 per cent does not represent significant raising of current ambitions (EC 2014f). The Commission suggests that the adoption of a 40 per cent greenhouse-gas reduction target 'should by itself encourage a greater share of renewable energy in the EU of at least 27 per cent (ibid)'. The study by Enerdata for the British government agreed that the 40 per cent greenhouse gas target should lead to a higher level of renewables deployment, of about 30 per cent. However, it warned that this is uncertain, and would depend on factors like fossil fuel prices and technology costs (DECC 2014a).

Both the European Commission and some members of the Green Growth Group agree that a new EU-wide renewable energy target should not be binding on member states. The Commission's plan stated that:

'[W]hile binding on the EU, the [renewable energy] target would not be translated into national targets through EU legislation. This would give Member states flexibility to transform the energy system in a way that is adapted to their national preferences and circumstances.'

EC 2014e

This position was set out following a disagreement between eight countries, including Germany and France, that were supportive of a new renewable energy target (Mitterlehner et al 2013), and others, including the UK and the Czech Republic, that strongly opposed a binding new target. They did so on the grounds that it would be inflexible, unnecessary and too expensive, and that it would place a disproportionate cost on certain member states (Clark 2013a).

The current lack of agreement over any new, binding renewables target has been fiercely criticised by clean technology companies, who are lobbying for top-down, nationally binding renewable energy targets for 2030 (Gamesa 2013). On the opposite side is the European power company industry association, Eurelectric, which outright opposes a new renewable energy target, as do trade associations for other non-renewable low-carbon technology industries like the Carbon Capture and Storage Association, who argue that there should be a more level playing field for low-carbon technologies (Krukowska 2013).

A new target for improving energy efficiency

The crisis in Ukraine has reignited the debate in Europe over whether the energy package that the continent's leaders are aiming to agree in October should include a binding 2030 target on energy efficiency. This is because the countries that are most dependent on Russian gas are also the least fuel-efficient, and improvements in energy efficiency could vastly reduce the scale of existing gas imports (Mabey 2014).

The European Commission did not initially propose a 2030 energy efficiency target, but at least seven European governments – including not only Germany but crisis-hit countries such as Greece and Portugal – strongly favour setting one, as it is both the cheapest means of cutting carbon output, and essential for improving European energy security. The new Commission president, Jean-Claude Juncker, has also signalled that he favours a new, binding energy-saving target of reducing energy use by 30 per cent by 2030 (Reuters 2014c).

Consequently, the Commission reviewed its original position and returned with a proposal that Europe should adopt a goal to improve energy efficiency levels by 30 per cent by 2030, relative to the levels of energy consumption projected by the Commission when it adopted its climate and energy plans in 2007 (EC 2014g). It claimed that this would cut Europe's fuel bill by €53 billion annually by 2030 (ibid). This new target would be met by implementing new standards for vehicles and white goods, improving the energy efficiency of homes and other buildings, and upgrading in heating and electricity networks.

An analysis by the European Commission suggested that, by 2030, a target of improving energy efficiency by 27 per cent against 2007 projections would reduce EU gas imports by 16 per cent, while a 35 per cent target would cut gas imports by 33 per cent (McGrath 2014). As we will discuss in greater detail in chapter 2, the Commission's analysis concluded that a 40 per cent efficiency target would cut gas imports by 40 per cent by 2030 (EurActiv 2014a). According to the same Commission paper, this 40 per cent target for 2030 could also be expected to grow the economy by 4 per cent a year, and increase annual employment by 3.15 per cent a year (ibid).

A separate study by the Fraunhofer Institute found that a 40 per cent efficiency target would cut energy imports by 80 per cent, while also leading to economy-wide emission reductions of between 50 and 60 per cent, by 2030 (Fraunhofer ISI 2013).

Germany and Denmark are the main proponents of including a new energy efficiency target in October's package. Reports suggest that these countries favour a goal that would require Europe to burn 30–35 per cent less fuel in 2030 than it was expected to in the Commission's projections from 2007 (Oliver 2014).

The UK government is leading opposition to the inclusion of a binding energy efficiency target in any new agreement, arguing that it would not be cost-effective and could undermine the effectiveness of the European Emissions Trading Scheme (ETS). It cites a European Commission estimate that including a 40 per cent energy-saving target alongside a new 40 per cent greenhouse gas reduction target would lead to very slightly higher electricity prices than a package focussed solely on a standalone 40 per cent emissions target (EurActiv 2014a).

Our policy recommendations

As this report demonstrates, there is strong evidence that a target for reducing greenhouse gas pollution by 40 per cent by 2030 would boost net employment, reduce fossil fuel imports and offer other co-benefits –through improved air quality, for example – while only marginally reducing the EU's GDP (EY 2014). The available evidence suggests that a target for deeper reductions in emissions –of 50 per cent, for example – would have a greater net positive effect on the economy, offer a

higher chance of effectively managing climate-change risks, and be cheaper than delaying cuts in emissions to a later date. On this issue we therefore make the following recommendations.

- **European leaders should support the adoption of a new EU-wide, legally binding commitment of a 50 per cent cut in greenhouse gas pollution (relative to 1990 levels) by 2030, provided that other major economies also make sufficiently ambitious commitments to address climate change. As the European Commission proposes, this target should be translated into binding greenhouse gas targets for each member state.** The Commission's own analysis and other research from Enerdata and EY all suggest that a target of cutting emissions by 45 or 50 per cent would be beneficial for Europe's economy because of avoided fossil-fuel import costs and greater investment stimulating economic activity within the EU. In the event that there is no international agreement in Paris in 2015, Europe should still cut its greenhouse gas emissions by at least 40 per cent in order to avoid missing longer-term decarbonisation goals. More analysis should be done to investigate whether, in the absence of an international climate agreement, a greenhouse gas reduction target that is higher than 40 per cent would remain more economically favourable than a lower target.
- **European leaders should advocate an international agreement at the Paris summit that establishes emission reduction targets for every five-year period to 2050.** By setting the level of global ambition for cutting greenhouse gas pollution on a rolling five-year timetable, targets can best reflect the latest climate science, economic circumstances, and feasibility given the rapidly changing cost and nature of available low-carbon technologies. Setting these binding targets some time in advance (as the UK does in setting its five-yearly carbon budgets 10 years in advance) would give businesses and investors confidence that there is a clear, long-term and stable framework for agreeing a rolling programme of emission cuts for the long term. It would avoid the need for sudden unplanned change in targets, or a situation in which insufficient climate ambition is agreed and is then 'locked in' for lengthy periods without any agreed means of changing it. If an international agreement were reached in Paris in 2015 that contains five-year commitment periods like this, Europe should set binding greenhouse-gas emissions targets for both 2025 and 2030.

On the question of whether to adopt a new European renewable energy target for 2030, we believe that member states should have the flexibility to use other low-carbon technologies alongside renewable energy technologies in order to make the required cuts in carbon output. This flexibility can allow technology choices to be made that best reflect national circumstances. However, according to analysis from the International Energy Agency (IEA) and the European Commission, most member states need to significantly expand the role of renewable technologies regardless of the decarbonisation scenario. Certainty about the likely economic attractiveness and size of the European renewables market will be crucial to enable renewable energy businesses and their investors to make key decisions, including those concerning the scale of investment that they will make in new jobs and factories in Europe as opposed to other major markets. It will also be instrumental for the deployment of large-scale grid interconnection because the economic viability of different grid projects will be determined by the size of the renewables market. For these reasons we recommend that European leaders should do as follows.

- **Support the adoption of a new, binding EU-wide commitment to grow the share of the EU's energy that comes from renewable sources to at least 30 per cent by 2030.** This would be in line with the position of the European parliament and some member states, but more ambitious than the European Commission's proposal of 27 per cent. This higher target is necessary because, as analysis carried out for both the Commission and the British government

showed, a goal of 27 per cent would not raise existing levels of ambition for clean energy deployment.

- **Support member state flexibility over how, but not whether, they contribute towards the achievement of the Europe-wide goal on renewable energy generation.** For example, they may choose to enact a domestic renewable energy target or a power sector decarbonisation target.
- **Ensure that member states have the ability to contribute to the EU's overall goal by creating proposals for shared projects between member states.** Such flexibility would mean that, for example, the UK and Ireland could contribute towards the EU goal by cooperating with one another over interconnection and wind-energy projects. It would enable member states to decide which technologies are the most appropriate means for their countries to achieve the necessary reductions in emissions, while giving investors confidence that they can still count on there being a sizeable clean energy market.
- All proposals from member states on their contributions towards the EU-wide targets on renewable energy, efficiency and emissions reductions should be submitted to the European Commission, and there should be regular reviews to ensure that member states are following energy strategies that are consistent with the EU's stated goals. **Access to European Commission funding for energy projects should be conditional upon member states submitting to the Commission, and verifiably following, a credible decarbonisation strategy.** (See chapter 4 of this report, on creating a new clean energy super-fund). The Commission should also identify any gaps that need to be filled in order to achieve the EU-wide targets on renewables and efficiency, and make proposals regarding how best to close these gaps.
- **In the event of an international agreement that has the effect of increasing Europe's ambition to cut greenhouse gas emissions, Europe's renewable energy target for 2030 should be reviewed.** In this scenario, renewable energy would need to play a greater role to ensure that member states do not become locked in to a pathway that requires more expensive emission reductions to be made in the 2030–2050 period.

Energy efficiency should be seen as a major priority: it offers the opportunity to address all of Europe's energy challenges at once. Efficiency improvements create jobs and growth, cut fuel imports, reduce consumers' exposure to fossil fuel price shocks, reduce levels of carbon pollution and improve the competitiveness of the European economy relative to other major economies. It is the ultimate win-win policy. It is therefore disappointing that the European Commission chose not to put energy efficiency centre-stage in their 2030 proposals, but the fact that they reviewed this is to be welcomed.

In light of the Ukraine crisis, EU member states are right to call for a rethink on Europe's ambitions for energy efficiency. However, it is clear that any binding national targets imposed by Brussels would not be acceptable to a number of countries. There is therefore a strong argument for member states retaining powers over how to make efficiency improvements at a national level, since the policies and powers required to make them include decisions over taxation and spending which member states are best-placed to determine. On the other hand, the Commission should retain its mandate to make proposals for EU-wide efficiency regulations – on vehicle standards and white goods, for example – where cooperation is to Europe's collective benefit. We therefore make the following recommendation.

- **European leaders should adopt a new, binding EU-wide target for energy efficiency of 35 per cent by 2030.** This level of ambition would enable Europe to cut gas imports by a third (see above) – equivalent to the proportion of the EU's gas demand that is currently met by Russia (EC 2014c) While this goal

would be more ambitious than what the European Commission is currently proposing, the evidence shows that the fuel cost savings that it would bring – in the region of €500 billion through to 2030 – would more than offset the upfront cost of investment in energy efficiency improvements (ibid). The market stability reserve in the ETS can prevent any effect this has on the effectiveness of the carbon market, thereby addressing concerns that dramatic improvements in energy efficiency could crash the carbon price (see chapter 3).

Member states should have freedom to choose the policies they adopt at a national level in order to contribute towards this collective goal. National plans should be submitted to the Commission so that it can calculate what the combined national contributions will achieve and identify any shortfalls. Member states should have to demonstrate that they have credible delivery plans before they can access European funding for energy projects. The Commission should then put forward proposals for new regulatory standards that would, subject to the approval of the European Council, address any remaining shortfalls that would prevent the EU from meeting its overall goal.

Table 1.1
A summary of proposed targets

	Greenhouse gas target for 2030	Renewable target for 2030	Energy efficiency target for 2030
Commission proposal	40% (and no higher)	27%. Non-binding on member states but binding at EU level.	30% (non-binding)
Parliament proposal	At least 40%	30%	40%
Green Growth Group of member states	At least 40%. The UK, Germany and Sweden favour a higher target if there is an international climate agreement reached in 2015.	8 member states including France Germany and Italy favour a new renewable energy target. The UK has strongly opposed one, but signalled that it would not oppose a goal that is non-binding on member states.	Some member states like Germany and Denmark favour a new energy efficiency target; others, like the UK, are opposed.
Our proposal	50%, provided that there is an international climate agreement in 2015.	30%. Member states should have flexibility over how to contribute to the goal.	35%. Member states should have flexibility over how to contribute to the goal.

2. IN THE SHADOW OF UKRAINE: ACHIEVING ENERGY SECURITY BY REDUCING FOSSIL FUEL IMPORTS

While the precise nature of the risks to our energy security has changed since the crippling Arab oil embargo 40 years ago, Europe is still dangerously reliant upon fossil fuel imports.

Over half of Europe's energy is now imported, including 90 per cent of our oil, 66 per cent of our gas and 62 per cent of our coal (EC 2014a). In 2012 the cost of these imports came to €545 billion (EWEA et al 2014). This trade deficit in energy products amounts to 3.3 per cent of Europe's GDP – a four-fold increase since 2004 (EY 2014).

Figure 2.1

Price of crude oil, May 1997–May 2014 (US\$ per barrel)



Source: EIA 2014

Europe's own production of fossil fuel is expected to halve over the period 2010–2050 (EY 2014). Even when potential for European shale gas production is taken into account (this is explored in more detail below) the EU risks being increasingly dependent on fuel imports, including gas from Russia and the Middle East. The IEA project that without action more than 80 per cent of our gas will come from imports by 2035, and that these will increasingly come from riskier and more unstable parts of the world (Green Growth Group 2014a). The cost of these imports is expected to increase as global demand for energy rises (EC 2014b). Wholesale gas prices in Europe are already more than twice what they are in the US (ibid). Average oil prices are up by more than 200 per cent since 2003, and the European Commission estimates that by 2050 Europe's total fuel bill could double (Green Growth Group 2014a). The IEA project that Europe could be paying more than \$615 billion for these fuels annually by 2035 (ibid).

Dependence on Russia

Of the 28 EU member states, 24 import gas from Russia, and half of this gas flows through Ukraine (Oettinger 2014). Six member states are now completely reliant upon Russia for all of their gas, and 18 member states import between 10 per cent and 80 per cent of their gas from the country (ibid). In total, the EU is sending Russia around €31 billion a year for imported gas (Gazprom 2012).

In spite of the security concerns that were raised when Russia turned off gas supplies to Ukraine in 2006 and 2009, the proportion of European gas demand for heating and power that was met by Russia has actually risen, from 26 per cent of supplies in 2010 to 34 per cent in 2013 (Pehlivanova B and Cohen M 2014).

In June 2014, following violence and political tensions in the region, Russia cut off gas supplies to Ukraine for the third time in eight years, prompting another spike in gas prices (Farchy et al 2014). While on this occasion there was limited risk of an interruption in European energy supplies – both because it was summer and because the recent winter had been mild so sufficient gas was being held in storage – Europe may not be so fortunate if this happens again during the winter months.

In response to the latest crisis in Ukraine, and the consequent risks to Europe of fossil-fuel price shocks or even the disruption of fuel supplies, European leaders have agreed there action should be taken to improve our energy security by reducing gas imports, particularly from Russia (EC 2014a).

Governments are considering a number of options. In this report we shall address each of them in turn: diversification of gas supplies; increased reliance upon coal; the potential of fracking; the role of renewables; and the scope for reducing import dependency through energy efficiency.

Diversifying gas supply

Polish prime minister Donald Tusk has argued for an ‘Energy union’ in which a single European body would be tasked with buying all of Europe’s gas, and member states would assist one another with gas supplies in moments of crisis – for example, if supplies from Russia were to be disrupted again (Tusk 2014). Both Tusk and the European Commission have also advocated diversifying Europe’s sources of gas (EC 2014a). While most of the imported gas that Europe uses comes from Russia, it also relies on substantial amounts of imports from Libya, Algeria, Norway and Qatar. Tusk is among those who have asked whether Europe could simply replace some of the gas it imports from Russia with liquefied natural gas (LNG) supplies from other parts of the world such as the US or even as far away as Australia (Tusk 2014). In March 2014 the European Commission formally asked the US to agree to export gas to Europe to assist in reducing the amount it needs to import from Russia (Traynor 2014).

The evidence suggests that such a strategy of diversifying suppliers would be very costly. One industry analysis suggested that replacing Russian gas imports entirely could double the price of gas for Europeans (Shiryayevskaya and Strzelecki 2014). During the recent crisis in Ukraine, the German government noted that even at the height of the Cold War, Europe continued to rely upon gas imports from the then Soviet Union because of how difficult and expensive it would be to switch to other sources.

There are also practical problems that could at least delay any moves to switch to alternative gas suppliers. First, the US does not yet have terminals for exporting LNG,⁶ and some European countries, including Ukraine, do not have LNG import

6 This is changing, however. The US is passing legislation that would permit LNG exports to World Trade Organization countries. Two-dozen export permits are pending. (Platts 2014a, Economist 2014)

terminals (Rogers 2014). Second, there would be no guarantee that gas exported from the US would come to Europe, given that there is increasing demand from many Asian economies such as Japan that might be prepared to pay more (ibid).

Diversifying gas supplies would, therefore, do little to solve the problem of Europe's exposure to price volatility, and would not significantly help to address Europe's other major energy strategy objectives relating to affordability, carbon pollution, and growth.

Coal

Another proposal from Prime Minister Tusk is that Europe should simply use more coal for power generation instead of gas. 'Coal is synonymous with energy security,' he has written, and he has called for the 'rehabilitation' of coal as a valid energy source (Tusk 2014, Reuters 2014d).

In fact, Europe is already burning huge quantities of coal, and is running most of its coal-powered fleet at high capacity (Economist 2014). In Poland coal-fired generation is responsible for almost 90 per cent of electricity production (Cienski 2013). High gas prices, low coal prices, and a very low carbon price in the ETS have meant that coal burning has been very profitable across Europe in recent years (Garman and Kahya 2013). Consequently, there has been a spike in European coal consumption (Economist 2013) – over the last four years coal consumption has risen by 22 per cent in the UK, and by 13 per cent in Germany (Carr 2014).⁷ Analysis by BP and others has found that this is a result of gas-to-coal switching (BP 2014).

The primary problem with using coal unabated (that is, without carbon capture and storage technology fitted) is that it is the most polluting fuel available: it generates from each power plant roughly twice the level of climate-changing carbon pollution that natural gas emits (EPA 2000). The pre-eminent American climate scientist and former NASA director Professor James Hansen has written that, 'coal is the single greatest threat to civilization and all life on our planet' (Romm 2009).

Coal-fired generation also produces a number of noxious air pollutants. Research from the University of Stuttgart concluded that air pollution from the 300 largest coal plants in Europe is causing 22,000 premature deaths a year in the EU (Greenpeace 2013a).

Putting aside the irony that almost a third of Europe's coal also comes from Russia (Eurostat 2012), increasing levels of coal-burning in Europe would be completely inconsistent with any efforts to build a low-carbon economy and cut Europe's output of carbon pollution. A deliberate move to increase coal consumption would be extraordinarily damaging to global efforts to manage climate change as well as bad for public health. It should therefore be ruled out, as it is inconsistent with Europe's existing goals and wider interests.

Fracking

Only around a third of Europe's gas currently comes from within Europe itself, yet its technically recoverable shale gas resources are significant (Van Renssen 2014).

The US government's Energy Information Administration (EIA) has estimated that Europe holds 14.1 trillion cubic meters of technically recoverable reserves of shale gas – about a quarter of the size of US reserves, although estimates vary widely (Spencer et al 2014b; Economist 2014). For example, the European Commission's Joint Research Centre estimates that, at the bottom of its range of estimates, Europe may have just 2.3 trillion cubic meters (Spencer et al 2014b).

⁷ There is some evidence that this trend is changing. For example, after coal consumption in Europe rose by 9 per cent from 2010 to 2012, it then fell by 5 per cent in 2013 (Economist Intelligence Unit, 2014).

It is estimated that shale gas is present in 10 EU member states, and four other European countries (including Russia) (ibid). Three quarters of these reserves are located in just four countries: Ukraine, Poland, Russia and France (EY 2013).

Currently there is no commercial shale gas extraction occurring anywhere in the EU, although some limited exploratory work is going ahead (AEA 2012a). Five of the member states that have reserves, including Germany and France, have banned commercial fracking for shale gas in response to public concern about the possible environmental and health risks associated with the practice (Vasagar 2014, Patel and Viscusi 2014). A study conducted for the European Commission, and a risk assessment carried out for the UK Environment Agency, both identified risks that fracking could exacerbate droughts, especially as climate change impacts worsen, and that groundwater could be contaminated (AEA 2012a, UK Environment Agency 2013). They also indicated that it would be a challenge to ensure that spillages of chemicals and waste waters, and their potential environmental consequences, are avoided. The UK temporarily ordered a moratorium on shale gas exploration because the process triggered small earthquakes.

Despite these risks, the Ukrainian crisis prompted many to call for domestic shale gas production to play a bigger role in replacing Russian gas imports. British prime minister David Cameron and his Polish counterpart Donald Tusk have both recently made high-profile interventions arguing that fracking in Europe should contribute to reducing its dependency on imports from Russia (Charter 2014 and Elliott 2013).

The evidence suggests that it would be possible for fracking to play a role in reducing gas import dependency, but it is likely this could only ever be very marginal. As EY stated, 'only a fraction of this [European shale] resource base is likely to ever prove commercial' (EY 2013).

The European oil and gas industry commissioned the energy consultancy Pöyry to consider the impact that domestic shale production could have on Europe's gas import dependency. Their report, which assumed that Europe would adopt no new clean energy or climate targets, concluded – in its most optimistic scenario – that European shale gas production would take around a decade to come on-stream at scale, but that it could cut import dependency by 10–18 per cent by 2030 (Pöyry 2013). The IEA has projected that technically recoverable shale gas reserves in Europe could supply between 2 and 10 per cent of the EU's gas demand in 2030 (Lawson et al 2013). In other words, the EU would still be reliant on other sources, including imports, for at least 90 per cent of its gas.

The IEA anticipate that the extraction of shale gas in Europe is likely to be 50 per cent more expensive than it is in the US, due to factors that include more difficult geology, greater population density and stricter regulatory frameworks (IEA 2012b). The upshot of this is that the cost of shale gas produced within Europe would be comparable with the wholesale price of gas. A Cambridge Econometrics and Pöyry analysis conducted for an oil and gas industry association concluded, in its central scenario, that shale gas from Europe could reduce wholesale gas prices in the EU by 6 per cent between 2020 and 2050, although its assumptions about projected fossil fuel demand were not consistent with Europe's greenhouse gas emissions targets (Pöyry 2013).

The future cost of producing and consuming shale gas in terms of its effects on climate change remain disputed. There is little scientific consensus on the likely scale of the greenhouse gas emissions associated with shale gas exploration and production (Greenpeace 2013b). Evidence from some fracking sites in the US suggests that using shale gas could be as polluting as using coal because of high levels of leaking methane, a potent greenhouse gas (Tollefson 2013). Advocates of fracking argue that the enforcement of stringent regulations called 'green completions' can address these risks, and some scientific analyses have suggested

both that shale gas extracted in Europe would have lower associated emissions than coal, and that European shale gas could even be less polluting than imported LNG – particularly once transport emissions are taken into consideration (New Scientist 2013, AEA 2012b, MacKay and Stone 2013).

Ultimately, whether shale gas would increase or decrease emissions overall in Europe will largely depend on the strength of climate change laws, and on whether this gas ends up displacing cleaner energy sources or more polluting fuels like coal or potentially imported LNG.

As the British government's scientific advisers on these issues, Professor David MacKay and Dr Tim Stone, have written:

'If a country brings any additional fossil fuel reserve into production, then in the absence of strong climate policies we believe it is likely that this production would increase cumulative emissions in the long run. This increase would work against global efforts on climate change. This potential issue is not specific to shale gas and would apply to the exploitation of any new fossil fuel reserve.'

MacKay and Stone 2013

Energy efficiency.

Another way for Europe to cut gas imports is to simply use less gas. The European Commission estimates that every 1 per cent in energy savings will cut gas imports by 2.6 per cent (EC 2014g).

As outlined above, renewed energy security concerns means that at least seven European governments favour a new, binding EU-wide energy efficiency target for 2030 – one focussed on delivering energy savings of between 30 and 40 per cent against 2007 levels (Garside 2014).

The more energy efficient the European economy becomes, the more our gas dependency will be reduced. A European Commission analysis concluded that a target of making the EU 40 per cent more energy efficient by 2030 would reduce gas imports by 40 per cent and save more than €550 billion from the EU's fuel bill through to 2030 (EurActiv 2014a). A 25 per cent energy-saving target could be expected to reduce EU gas imports by 9 per cent, while a 35 per cent target would cut gas imports by 33 per cent by 2030 (ibid, Oliver 2014).

An analysis by thinktank E3G concluded that action to accelerate building retrofitting, build electricity-demand-reduction markets and incentivise industrial efficiency could, by 2030, reduce gas demand by a volume equivalent to over 170 per cent of Russian gas imports in 2011 (Holmes et al 2014).

Greater interconnection within the EU, using interconnector cables that allow power to pass between different countries and markets, could also improve the efficiency of the European energy sector. One study led by the European Climate Foundation found that integrating EU markets would lead to €426 billion of savings overall between 2020 and 2030 (ECF 2011). These were primarily savings made from operating expenditure – largely the cost of fuel, including gas – as well as reduced requirements for power plants, including gas-fired stations.

Renewables

Another means of reducing gas imports is through the greater use of low-carbon alternatives to fossil fuel imports, such as renewable gas that is captured from landfill sites and sewage networks, and power generated from renewable sources.

A UK study by National Grid indicated that by 2020 renewable gas captured from landfill sites and sewage networks could supply 5–18 per cent of the UK's gas needs (National Grid 2009). In nine European countries, including Germany, France, the UK and Austria, biogas (renewable gas) is already contributing to gas supplies for consumers (EBA 2013).

The European Commission estimates that existing renewable energy generation in Europe avoids €30 billion a year in fossil fuel import costs (EC 2014). An expansion of electricity generated from low-carbon sources, energy generated from ground source heat pumps, biomass, and renewable gas could all further eat into the share of the market that is currently served by imported gas.

It is expected that in 2020 Europe will be getting 21 per cent of its energy from renewable sources. In a scenario produced by the Ecofys consultancy for the environmental group WWF, it is envisaged that this share could double by 2030, in which case Europe would be getting more than 40 per cent of its total energy from renewable sources, including 65 per cent its electricity (Ecofys 2013a). Another piece of research by consultancy Energynautics, commissioned by Greenpeace, found that the European grid could handle up to 77 per cent of its power coming from renewables by 2030 – including 53 per cent from wind and solar power alone – if there big changes were made to the way the power network works: a much higher level of interconnection, and smarter grids with more effective demand management, would be required (Teske et al 2014). The 10-year plans published this year by European grid operator ENTSO-E outline plans for Europe to invest in 50,000km of extra-high-voltage power lines, and upgrade existing lines, to allow the EU to accommodate up to 60 per cent renewable electricity by 2030 (ENTSO-E 2014).

European Commission figures show that if Europe were to get 30 per cent of its energy from renewable energy sources in 2020 (instead of 27 per cent as the Commission proposes it should do) then – alongside the 30 per cent efficiency target and 40 per cent greenhouse gas reduction target being proposed by the Commission – this would reduce gas dependency by 27.4 per cent, instead of 13.2 per cent from just a standalone 40 per cent greenhouse gas reduction target (EC 2014c).

Policy recommendations

A strong energy efficiency strategy should be Europe's main focus in efforts to reduce gas imports, due to both the huge scale of the potential energy security benefits it could bring to Europe and its co-benefits in terms of boosting employment and cutting greenhouse gas emissions (see chapter 1).

As outlined in this report's previous chapter on 2030 targets, it is our view that **Europe should adopt a new, binding EU-wide target of 35 per cent energy efficiency savings by 2030. This would see gas imports cut by a third over the period, at a saving of €500 billion between 2011 and 2030 (EC 2014c).**

A huge part of the challenge that reducing fossil fuel imports represents lies in the transport sector, and **the Commission should develop new vehicle efficiency standards for the 2020s.** These could both help curb emissions from road transport and lessen fuel imports.

The European Commission should make proposals for new, harmonised regulatory standards that could, subject to the approval of the European Council, contribute towards the EU-wide energy efficiency target and make up for any shortfalls in national plans.

The Commission should also assist in sharing best-practice options for delivering large-scale energy efficiency improvements, including on policies for government-backed loans based on the KfW model.⁸

Member states should have flexibility over what policies they choose to adopt at a national level to contribute towards this goal, but national plans should be submitted to the European Commission. Member states should have to demonstrate that they have a credible delivery plan for efficiency savings before they can access European funding for energy projects.

As outlined in chapter 1, **we also advocate a new, binding EU-wide commitment to grow the share of the continent's energy that is provided from renewable sources to at least 30 per cent by 2030.** According to the European Commission's impact assessment, this level of ambition for clean energy would help to reduce gas import dependency even further. Equally, a bolder greenhouse gas target for 2030 – which we favour provided that an international climate agreement is reached – would also lead to reduced gas dependency.

⁸ For a greater understanding of this approach see IPPR's report *Help to heat: A solution to the affordability crisis in energy* (Platt et al 2013).

3.

WAKING THE SLEEPING BEAR: A CREDIBLE PLAN FOR EMISSIONS TRADING SCHEME REFORM

The Emissions Trading Scheme (ETS) is supposed to be the centrepiece of Europe's strategy for achieving its targets for cutting greenhouse gas pollution.

The world's first carbon trading scheme for reducing emissions, it was designed to be the most cost-effective means of cutting greenhouse gases through an efficient, market-based, and harmonised pan-European approach. Similar carbon trading schemes are now proliferating across many other parts of the world, including the US and China, where policymakers have drawn on Europe's leadership and experience.

The European scheme covers 31 countries (the 28 member states plus Iceland, Norway and Liechtenstein) and approximately 45 per cent of total EU greenhouse gas emissions, including emissions from 12,000 power plants and manufacturing installations (Platt and Straw 2013).

The scheme is supposed to drive emissions reductions across the sectors it covers by making polluters pay for every tonne of carbon dioxide they emit. The intention is that this will incentivise them to change their practises and investment decisions to emit less pollution and so avoid incurring higher costs. High carbon prices were, in turn, meant to incentivise research and development into new, clean technologies.

Despite being Europe's flagship policy for cutting carbon output, the majority of emissions cuts delivered in Europe have not in fact stemmed from the ETS. Instead they have come from the deployment of clean energy, improvements in energy efficiency, and the economic downturn (EEA 2014).

The primary problem has been that for long periods the price of carbon in the European market has been stuck at a level far below that which is required to trigger fuel-switching away from the dirtiest fuels, and to incentivise low-carbon investment.

Since mid-2011 the carbon price has fallen by 70 per cent, and today remains so low as to be virtually irrelevant to the decision-making of heavily polluting companies (Clark 2013b). A number of energy companies suggest a carbon price in excess of €30 per tonne would be required to trigger switching away from coal (the dirtiest fuel), yet carbon is currently trading at around €5 per tonne (Garman and Kahya 2013).

The reason for this 'bottoming out' of the carbon market is that it has been oversupplied with pollution 'allowances'. This oversupply is the result of multiple factors, including an overgenerous distribution of pollution permits (partly as a result of successful industry lobbying), the creation of new offset mechanisms that have flooded the market with even more allowances, and a weakening in demand due to the global financial crisis (Morris 2012, Murray 2013).

Figure 3.1

Spot price of EUA carbon allowances, 2005–14 (€)



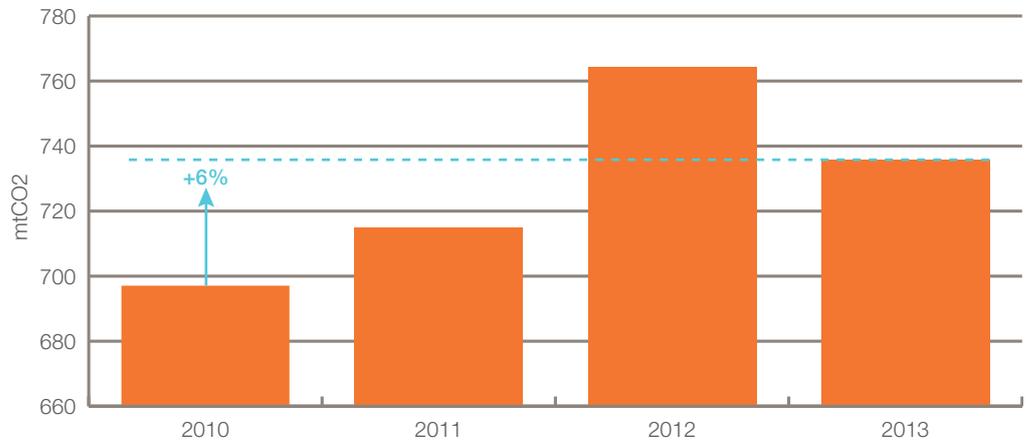
Sources: The Intercontinental Exchange with calculations from Sandbag Climate Campaign; IEA 2013

The consequence has been that ETS carbon budgets are not in line with Europe's stated emissions reductions target for 2020. The European Commission concedes there are at least 2 billion surplus allowances (EC 2014). Just one country, Poland, has pollution allowances through to 2020 equivalent to almost double their existing national emissions (Morris and Elsworth 2014). In fact, Sandbag's analysis suggests that the ETS is so seriously oversupplied with allowances that without reform it would allow domestic greenhouse gas pollution levels in the EU to grow back to near-1990 levels by 2020, reversing decades of progress (Sandbag 2013, 2014b). They estimate that this excess of allowances is now effectively cancelling out the 700 million tonnes of emissions reductions that have resulted from other, more successful European climate policies (Morris et al 2012).

The failure of the ETS to drive fuel-switching away from coal-fired power plants has meant that there has been no policy barrier to prevent European coal consumption from rising, sending greenhouse gas emissions in the wrong direction. Overall levels of coal consumption in Europe are not significantly lower now than they were when the EU adopted its climate change policies in 2008 (Economist Intelligence Unit 2014). The failure of the ETS has created a perverse situation wherein the dirtiest fossil fuel – lignite coal – is more profitable to burn than gas in many EU countries (Allan 2013). This has resulted in a 13 per cent growth in coal consumption in Germany over the past four years, and a 22 per cent rise in the UK, with a corresponding rise in emissions (Carr 2014). Between 2010 and 2013, emissions from coal burning across Europe rose by 6 per cent, and emissions from coal-fired power generation now amount to 18 per cent of the total EU greenhouse gas output (Jones and Worthington 2014).

Figure 3.2

Coal consumption in Europe, 2010–13 (mtCO₂)



Source: Jones and Worthington 2014

Recent research by Merrill Lynch projects that coal will consolidate its position as a more profitable fuel than gas in Europe this year, and the situation could be worsened by capacity market payments being made available to existing coal plant operators, thereby improving the profitability of coal-burning further still and increasing carbon pollution (ibid, Wynn 2014). This underlines the need for governments to urgently intervene to avoid the risk of policy failure on cutting greenhouse gas output.

In spite of these problems, all European governments say that they are still relying on the ETS as their primary tool for making emission reductions, believing it can still be made the most cost-effective and efficient means of curbing greenhouse gas output. The failure of politicians to address the scheme's inbuilt structural problems has prompted investors and parts of the international community to question their political commitment to their stated goals on climate change. A proposal known as 'back loading' was brought forward in order to offer a temporary solution to the problems with the ETS, by withdrawing 900 million surplus allowances from the scheme on the basis that they could be reintroduced at a later date when the EU's economy improved. The proposal was initially rejected by the European parliament, which later approved a watered-down version of the plan (McGrath 2013). After these plans were passed, the carbon price continued to languish at around €5 per tonne (EurActiv 2013c). These developments only heightened concern about Europe's commitment to cutting emissions.

A new proposal for fixing the ETS was set out by the European Commission in January 2014, with the aim of rectifying this lack of confidence in Europe's climate strategy by empowering the ETS to respond to demand shocks. It would see a market stability reserve (MSR) established, with the remit of addressing any oversupply of allowances by withholding them in reserve if major drops in emissions were to lead to a major fall in the price of carbon. It is intended that the MSR will be free from political interference, and will make the carbon price more predictable. Under these proposals, the supply of allowances would be cut if there was a surplus of 833 million metric tons, but if this figure fell below 400 million they would be returned from the reserve to the market (EC 2014h).

Modelling suggests that the MSR could enable carbon prices to reach €50 per tonne (in today's prices) by 2030 (EC 2014i). However, these reforms are not

expected to have a significant impact on the carbon price in the short term, as even if they are approved they are not scheduled to take effect until 2021. Bloomberg New Energy Finance has suggested that this delay in introducing the MSR means that the ETS would contribute very little towards meeting a new 2030 greenhouse gas target. This would create a strong risk of 'lock in' to high carbon infrastructure in the short term (BNEF 2014b). Similarly, Reuters Point Carbon suggest that, unless the MSR was able to take effect earlier, the proposal would not cause the carbon price to rise above €30 per tonne until after 2026 (EC 2014i).

Our policy recommendations

To maximise the chances of achieving an international climate treaty at the UN summit in Paris in December 2015, Europe needs a credible plan in place to build a cleaner economy and deliver on its 2030 decarbonisation targets before it attends the conference.

A temporary removal of pollution allowances from the ETS could help raise the carbon price, but ultimately this would only defer action to genuinely address the problem of excess allowances. Ecofys has concluded that if the surplus allowances are not removed from the ETS market altogether, but instead simply carried forward and allowed into the next phase, a 40 per cent greenhouse gas reduction target for 2030 would effectively become only a 33 per cent target (Ecofys 2013).

For the scheme to be fit for purpose, a one-off and permanent removal of allowances is required to tighten ETS carbon budgets so that they are in line with the EU's targets for greenhouse gas reduction. We recommend that if an international agreement is achieved in Paris next year, the ETS budgets should be aligned with a target for a 50 per cent cut in European greenhouse gas pollution (on 1990 levels) by 2030.

To restore the scheme's credibility, the ETS requires wider structural reform to ensure that the issues that are currently undermining it can never recur.

IPPR has previously recommend the creation of a new 'carbon market policy committee', based on the 'goal-dependence, instrument-independence' model of the Bank of England's monetary policy committee (Platt and Straw 2013). This committee should have the clearly defined goal of reducing emissions at the lowest cost, but also have flexibility to intervene in the supply of allowances in the ETS in pursuit of this goal. The European Commission has opted to have the MSR fulfil this function. In light of this we make the following recommendation.

The MSR should not be delayed, and should take effect by 2016. It should be accompanied by a tightening of the ETS budget in line with newly established and strengthened greenhouse gas targets.

If the current political obstacles that are preventing reforms like these can be overcome, the ETS could yet become a central pillar of Europe's emissions reductions plan.

Poland's opposition to new efforts on clean energy and emissions reduction has been the primary obstacle to progress for climate change policy in Europe. The advancement of climate reforms will, in our view, require member states to end their concessionary approach to the Polish government. Poland receives more funding from European budgets than any other member state (Morris and Elsworth 2014). Other member states should leverage pressure by making access to these funding streams, including ETS auction revenues, conditional on support for the necessary reforms. A concessionary approach to Poland that enabled the coal industry in Europe to expand – for example, through allowing state aid for coal, or increased coal burn through so-called 'ETS holidays' – could send a hugely

damaging signal to emerging economies ahead of the international talks in Paris (Aldridge 2014 forthcoming).

Given that so much uncertainty exists around the political feasibility of passing effective reforms to the ETS, member states should introduce backstop measures for unabated fossil fuel power plants, such as emissions performance standards. These should prevent the construction of any new coal-fired plant that is not equipped with CCS, and ensure the closure of any existing unabated fossil fuel plant on a timeframe that is consistent with Europe achieving its 2030 greenhouse gas target.

Emissions performance standards (EPS) would guarantee that greenhouse gas output could not get so high as to throw Europe off a pathway towards becoming an almost carbon-neutral economy by 2050. They would also send an important signal to investors and the international community that the era of unabated coal-fired generation in Europe is ending.

If the ETS is reformed so that it functions effectively, these EPS measures should be effectively redundant, and the MSR would ensure they didn't interfere with the functioning of the carbon market. However, if ETS reforms were to fail then they would provide a crucial backstop to prevent policy failure on decarbonisation objectives. One advantage of using an EPS in Europe is that monitoring and enforcement arrangements that have been established for the ETS could be used, and there would be no requirement for duplication.

The UK has already acted to put an EPS in place to work alongside the ETS, so there is a precedent that could be replicated in other member states (DECC 2012). Equally, the Obama administration is now promoting an EPS policy alongside support for regional carbon trading schemes and renewable energy policies across America (EPA 2014).

Any capacity payments made available by member states should assist in reducing the carbon intensity of the energy sector, and be consistent with the EU's 2030 climate and energy targets.

There is a risk that member states that are introducing capacity payment schemes in order to ensure that there is flexible back-up capacity to accommodate for the growth of renewables in European energy systems are inadvertently helping to improve the economics of unabated coal generation. In the absence of an EPS, capacity payments – together with a low carbon price and favourable market conditions – could grow the share of coal (the dirtiest fuel) at the expense of cleaner generating capacity (Jones and Worthington 2014). It is therefore necessary that European rules on state aid policy towards capacity payments be aligned with climate policies.

4.

RAISING AMBITION: A SUPER-FUND FOR CLEAN ENERGY INFRASTRUCTURE

Over the coming decades, ageing energy infrastructure must be replaced, and this will require large amounts of investment irrespective of the technology.

According to the European Commission, under a scenario in which there is no change to existing EU energy and climate policies, energy infrastructure investments across the European heat, power and transport sectors would increase from around €800 billion per annum between 2010 and 2020 to €1,000 billion per annum between 2040 and 2050 (EY 2014).

A recent estimate found that €628 billion would need to be mobilized from 2010 to 2020 (ECF 2011). Most of this investment is required for new low-carbon generation capacity, but €15 billion is needed for back-up capacity and €46 billion for the expansion and modernisation of transmission networks.

The report projects that in the period 2020–2030, the figure will almost double to €1,153 billion of capital expenditure, and estimates that during this period €1,028 billion will be needed for generation, €57 billion for back-up capacity and €68 billion for transmission (ibid). ENTSO-E, the organisation that represents European grid operators, put the figure needed for grid networks much higher, at €150 billion by 2030 (Platts 2014b).

Transmission networks must be modernised to accommodate an increasingly dominant role for clean technologies, and because greater interconnection can deliver large cost savings by enabling smarter use of the energy system and reducing the need for so much new generation capacity and imported fuel.

The current approach

EU member states currently make key energy infrastructure decisions from an almost entirely national perspective. This is causing opportunities to be missed: cost savings and technology breakthroughs could be achieved if member states were to agree and adopt a more integrated European strategy. This could involve pooling resources, cooperating on projects, and factoring in this wider approach when making choices about energy at a national level.

There are numerous areas of energy investment where a shared approach could work to the common interests of many member states. For example, projects aimed at achieving higher levels of interconnection, large-scale energy efficiency improvements in housing stock, and projects aimed at researching, demonstrating and developing new low-carbon technologies.

Proposed examples include the North Sea grid proposal to enable an expansion of offshore wind; a regional grid designed to accommodate large-scale solar deployment across the Mediterranean; and a major energy-efficiency push across buildings in the Visegrád Group countries.

The commercialisation of carbon capture and storage (CCS) technology is another important shared project. The Intergovernmental Panel on Climate Change has concluded that it could be very difficult to keep global levels of greenhouse gases within safe levels without commercial deployment of CCS technology, and they estimate that the cost of keeping global temperature rises to less than two degrees of global warming could rise by up to 138 per cent without the commercial deployment of CCS (IPCC 2014).

Despite these examples, pooled funding for clean energy projects is currently disbursed as relatively small grants from a range of different budget headings. These tend to be on an ad hoc basis according to the national preferences of individual member states, and funding is not focussed but instead spread thinly across different types of project.

There is a 'Horizon 2020' fund that allocates €5.9 billion for innovation and research into energy efficiency and competitive low-carbon (but non-nuclear) energy sources (EC 2014j).

Separately, revenues raised from selling 300 million pollution allowances in the new entrants reserve of the ETS have been channelled into the European 'NER 300' fund, which is worth €2.2 billion (EC 2014k). This funding, now largely spent, has been used to support dozens of different small-scale low-carbon energy demonstration projects across the EU, rather than being pooled into a smaller number of strategically important projects. The first round of NER 300 funding saw €1.2 billion spent on 23 different projects around Europe; the second saw €1 billion spent on a further 19 projects (ibid). This disjointed and un-strategic approach has seen small levels of financial assistance given to, for examples, a floating wind power project in Spain, a biomass project in Latvia, a relatively small CCS project in the UK, a bio-ethanol project in Poland, a smart-grid project in Cyprus and a solar project in Italy (ibid).

The European Regional Development Fund has earmarked €23 billion from the EU cohesion budgets for the period 2014–2020 to support renewable energy, energy efficiency and sustainable urban transport projects across Europe (EC 2014l). Again, it is expected that these funds will be awarded to projects on the basis of national, rather than the EU-wide or regional, energy strategies. The European Court of Auditors recently concluded that spending from cohesion funds on renewable projects has not delivered value for money (EurActiv 2014b). They believe that some projects would have taken place without EU support, and some did not contribute to overarching EU energy objectives.

Another scheme called the 'Connecting Europe Facility' allows regional groupings to agree energy 'projects of common interest,' which can access European finance worth €5.85 billion between 2014 and 2020 (EC 2014m). The first decisions on spending allocation from this facility are expected this autumn. Unfortunately, this funding stream does not appear to be aligned with Europe's headline strategic targets either. For example, the list of potential projects that were initially earmarked as contenders for support included a number of gas network infrastructure projects that are predicated on European gas consumption reaching levels that are inconsistent with the European Commission's own proposed targets on decarbonisation (Gaventa 2013).

Our policy recommendations

While relatively small-scale grants and individual national projects may have strong merit in themselves, **we believe that a better approach would be to pool the remaining European funds available until 2020 for clean energy deployment, low-carbon infrastructure and energy efficiency. These pooled funds should create a 'European clean energy super-fund' to support a smaller number of much larger, shared projects.** This approach would utilise European cooperation

to enable large-scale projects that would not have proceeded if they were dependent upon a single member state.

This would not prevent smaller projects from going ahead, with the support of individual member states. However, the focus for the European ‘super-fund’ should be to act as a driver of European energy cooperation – assisting where member states want to work together on a big transformational energy project in their common interests, or where an energy project is literally crossing borders.

The projects that benefit from support should all be verifiably aligned with either shared innovation priorities or the regional delivery plans proposed by clusters of member states in pursuit of the overarching EU-wide climate and energy objectives for 2030. This would complement this report’s proposal (in chapter 1) for member states to have the flexibility to make joined-up, bottom-up contributions towards the shared clean energy and greenhouse gas targets.

Access to any European funding for energy should be conditional on member states showing that the projects they are seeking assistance for are consistent with credible and deliverable regional plans, and are proven to be the most cost-effective means of achieving 2030 targets. This would enable best-value investment across different infrastructure types – meaning, for example, that where a big efficiency investment is more beneficial to security than a new gas pipeline, it would receive priority.

In the EU budget for 2014–2020, a minimum of €38 billion in the EU’s Structural and Investment Funds is set aside for the low-carbon economy (EuraActiv 2014d). After 2020, there is scope to also direct further revenues from the sale of ETS allowances into clean energy schemes. Indeed, the European Commission is already rumoured to be examining new NER 300-type arrangements for using ETS revenues for increasing clean energy support.

The European Investment Bank and the European Bank of Reconstruction and Development should leverage greater sums for clean energy investment that could assist the low-carbon transition (Cozzi and Griffith-Jones 2014).

CONCLUSION

The climate and energy decisions that Europe will make over the next 12 months will shape how we use and generate energy for decades to come. They have huge implications for our fuel bills, the security of our energy supplies, our industrial opportunities, and global efforts to manage the risks posed by climate change. European heads of government must now stop delaying these big decisions, end their dithering, and offer renewed international leadership through a reinvigorated and progressive climate and energy agenda.

The ideas put forward in this report set out the policies that IPPR believes they should adopt.

We recommend the following.

- Europe should advocate for an international climate agreement at the Paris summit that establishes emission reduction targets set for every five-year period to 2050.
- Europe should adopt a new, EU-wide, legally binding commitment to cutting greenhouse gas pollution by 50 per cent (on 1990 levels) by 2030, provided that other major economies also make sufficiently ambitious commitments to address climate change. This target should be translated into binding greenhouse gas targets for each member state.
- Europe should adopt a new, EU-wide binding commitment to grow the share its energy that is provided from renewable sources to at least 30 per cent by 2030. Member states should have flexibility over how, but not whether, they contribute towards the achievement of the Europe-wide goal on renewable energy generation. In the event of an international agreement that triggers an increase in Europe's ambition to cut greenhouse gases, Europe's renewable energy target for 2030 should be reviewed.
- Europe should adopt a new, binding EU-wide target of achieving 35 per cent efficiency savings by 2030, in order to cut gas imports to Europe by a third and save €500 billion. Member states should have flexibility over what policies they choose to adopt at a national level to contribute towards this goal, but the European Commission should also make proposals for new, harmonised regulatory standards that could – subject to the approval of the European Council – contribute towards the EU-wide target and make up any remaining gap left by the national plans. The Commission should also assist in sharing best-practice options for delivering large-scale energy efficiency improvements, including on policies for government-backed loans based on the KfW model.
- Member state access to European Commission funding for energy projects should be conditional upon member states submitting to the Commission, and verifiably following, a credible decarbonisation strategy.
- There should be a one-off and permanent removal of 'pollution allowances' in the ETS, to tighten the scheme's carbon budgets so that they are in line with the EU's newly established and strengthened targets for greenhouse gas reduction. The MSR should take effect by 2016, and should not be delayed.
- Member states should introduce backstop measures, such as emissions performance standards, for dealing with carbon pollution from unabated fossil fuel power plants. These should prevent the construction of any new coal-fired plants that are not equipped with carbon capture and storage (CCS) technology, and ensure the closure of any existing unabated fossil-fuel plants

on a timeframe that is consistent with Europe achieving its 2030 greenhouse gas target. Any capacity payments made available by member states should contribute towards reducing the carbon intensity of the energy sector, and be consistent with the EU's 2030 climate and energy targets.

- Remaining European funds available until 2020 for clean energy deployment, low-carbon infrastructure and energy efficiency should be pooled to create a 'European clean energy super-fund' to support a smaller number of much larger, shared projects. This would utilise European cooperation to enable large-scale projects aligned with EU climate and energy goals that would not have proceeded if they were dependent upon a single member state.
- The European Investment Bank and the European Bank of Reconstruction and Development should leverage greater sums for clean energy investment that could assist the low-carbon transition.

REFERENCES

- AEA (2012a) *Support to the identification of potential risks for the environment and human health arising from hydrocarbons operations involving hydraulic fracturing in Europe*, Didcot. <http://ec.europa.eu/environment/integration/energy/pdf/fracking%20study.pdf>
- AEA (2012b) *Climate Impact of shale gas production in the EU*, Didcot. http://ec.europa.eu/clima/policies/eccp/docs/120815_final_report_en.pdf
- Aldridge J (2014 forthcoming) *Polish coal and the EU 2030 climate and energy package*, London: Greenpeace
- Allan A and Gloystein H (2013) 'Lignite power revenues boosted by cheap carbon prices', Reuters, 12 August 2013. <http://uk.reuters.com/article/2013/08/12/energy-coal-power-co-idUSL6NOGD2BJ20130812>
- Barrero F A (2013) 'The first solar plant without premiums', *Renewable Energy Magazine*, 2 December 2013. http://www.energias-renovables.com/articulo/la-primera-planta-fotovoltaica-de-espana-sin-20131129/?goback=.gde_4570098_member_5812985795614638083 (in Spanish)
- Bloomberg New Energy Finance [BNEF] (2014a) *Global Trends In Renewable Energy Investment 2014*. http://fs-unep-centre.org/sites/default/files/attachments/14008nef_visual_12_key_findings.pdf
- Bloomberg New Energy Finance [BNEF] (2014b) 'EU ETS Market Stability Reserve', slidepack, European Commission expert meeting, Brussels, 24 June 2014. http://ec.europa.eu/clima/events/docs/0094/bloomberg_new_energy_finance_en.pdf
- Booz and Co (2013) *Benefits of an integrated European energy market* http://ec.europa.eu/energy/infrastructure/studies/doc/20130902_energy_integration_benefits.pdf
- BP (2014) *Statistical Review of World Energy*, London. <http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy.html>
- Carr M (2014) 'Rising German coal use imperils European emissions deal', Bloomberg, 20 June 2014. <http://www.bloomberg.com/news/2014-06-19/rising-german-coal-use-imperils-european-emissions-deal.html>
- CDC Climat Research (2013) 'Tendances Carbone: The Monthly Bulletin on the European Carbon Market', No. 84, October 2013, Paris. http://www.cdcclimat.com/IMG/pdf/cdc_climat_recherche_tendances_carbone_no_84_eng.pdf
- Charter D (2014) 'Start fracking now, EU urges Merkel', *The Times*, 23 April 2014. <http://www.thetimes.co.uk/tto/news/world/europe/article4070000.ece>
- Ciensi (2013) 'Poland struggles to break its dependency on coal power', *Financial Times*, 10 November 2013. <http://www.ft.com/cms/s/0/ce65ff3c-484e-11e3-8237-00144feabdc0.html>
- Clark P (2013a) 'Ed Davey says UK will oppose EU renewable energy target', *Financial Times*, 25 May 2013. <http://www.ft.com/cms/s/0/904121cc-c569-11e2-af7a-00144feab7de.html>

- Clark P (2013b) 'EU Emissions Trading faces crisis', *Financial Times*, 21 January 2013. <http://www.ft.com/cms/s/0/42e719c0-63f0-11e2-84d8-00144feab49a.html>
- Council of the European Union (2014) 'Communication from the Commission on "A policy framework for climate and energy in the period from 2020 to 2030": Policy debate: Delegations' replies', 10 June 2014. <http://register.consilium.europa.eu/doc/srv?l=EN&f=ST%2010766%202014%20INIT>
- Cozzi G and Griffith-Jones S (2014) *Bringing Europe back to life using investment*, Brussels: Foundation for European Progressive Studies. http://www.feps-europe.eu/assets/5ab4d17c-819f-47d7-9e65-3d9b4356387d/epv%234_sgj%20gc_europe%20investment.pdf
- Dallos G (2014) *Locked in the past: Why Europe's big energy companies fear change*, Hamburg: Greenpeace <http://www.greenpeace.org/eu-unit/Global/eu-unit/reports-briefings/2011%20pubs/2014%20Jan-April/20140227%20RP%20LOCKED%20IN%20THE%20PAST%20-%20Why%20Europe%27s%20big%20energy%20companies%20fear%20change.pdf>
- Darby M (2014) 'China and US Presidents to attend Ban Ki Moon climate summit', Responding to Climate Change blog, 15 August 2014. <http://www.rtcc.org/2014/07/23/china-and-us-presidents-to-attend-ban-ki-moon-climate-summit/>
- Department of Energy and Climate Change (UK) [DECC] (2012) *Emissions Performance Standard*, London. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48367/5315-aide-memoire-on-emissions-performance-standard.pdf
- Department of Energy and Climate Change (UK) [DECC] (2014a) *Policy Summary of UK analysis on EU 2030 targets*, London. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/285533/policy_summary_uk_analysis_eu_2030_targets.pdf
- Department of Energy and Climate Change (UK) [DECC] (2014b) *Energy Trends: June 2014*, London. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/326368/ET_June_2014.pdf
- Ecofys (2013a) *Renewable energy: A 2030 scenario for the EU*, London. <http://www.ecofys.com/en/publication/renewable-energy-a-2030-scenario-for-the-eu/>
- Ecofys (2013b) *The next step in Europe's climate action: Setting targets for 2030: Reviving the EU emissions trading system and bringing EU greenhouse gas emissions on a 2°C track*, London. <http://www.ecofys.com/files/files/greenpeace-ecofys-2013-next-step-in-eu-climate-action.pdf>
- Ecofys (2014a) *The EU Parliament's 2030 resolution could achieve emissions reductions of up to 54%*. <http://www.ecofys.com/files/files/ecofys-2014-ghg-emissions-2030-in-view-of-ep-30-40-target.pdf>
- Economist (2013) 'The unwelcome renaissance', 3 January 2013. <http://www.economist.com/news/briefing/21569039-europes-energy-policy-delivers-worst-all-possible-worlds-unwelcome-renaissance>
- Economist (2014) 'Conscious uncoupling: Reducing Europe's dependence on Russian gas is possible—but it will take time, money and sustained political will', 5 April 2014. <http://www.economist.com/news/briefing/21600111-reducing-europes-dependence-russian-gas-possible-but-it-will-take-time-money-and-sustained>
- Economist Intelligence Unit (2014) 'Coal's last gasp in Europe', 9 July 2014. <http://www.eiu.com/industry/article/741997658/coins-last-gasp-in-europe/2014-07-09> (subscription required; also available here: <https://globalconnections.hsbc.com/united-kingdom/en/articles/coins-last-gasp-europe>)

- Egenhofer C, Schrefler L, Genoese F, Luchetta G, Mustilli F, Colantoni L, Timini J and Wieczorkiewicz J (2013) *The steel industry in the EU: Composition and drivers of energy prices and costs*, Brussels: Centre for European Policy Studies. <http://www.ceps.eu/book/steel-industry-european-union-composition-and-drivers-energy-prices-and-costs>
- Elliott F (2013) 'Cameron attacks EU over threat to fracking', *The Times*, 17 December 2013. <http://www.thetimes.co.uk/tto/business/industries/naturalresources/article3951158.ece>
- Enerdata (2014) *Costs and benefits to EU member states of 2030 climate and energy targets*, London. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/285505/costs_benefits_eu_states_2030_climate_and_energy_targets_enerdata_report.pdf
- Energy Information Administration (US) [EIA] (2014) 'Europe Brent Spot Price FOB', online data table. <http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RB RTE&f=D>
- Environment Agency (UK) (2013) *An environmental risk assessment for shale gas exploratory operations in England*, Bristol. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296949/LIT_8474_fbb1d4.pdf
- Environmental Protection Agency [EPA] (2000) 'Electricity from Natural Gas', webpage. <http://www.epa.gov/cleanenergy/energy-and-you/affect/natural-gas.html>
- Environmental Protection Agency [EPA] (2014) *Developing carbon pollution standards under the Clean Air Act*, Washington DC. <http://www2.epa.gov/carbon-pollution-standards/what-epa-doing#developing>
- EurActiv (2013) 'Zombie carbon markets to be shocked back to life', 2 July 2013. <http://www.euractiv.com/energy/zombie-carbon-market-shocked-back-news-529013>
- EurActiv (2014a) 'EU's energy efficiency review puts high target on the agenda', 17 June 2014. <http://www.euractiv.com/sections/energy/eus-energy-efficiency-review-puts-high-target-agenda-302836>
- EurActiv (2014b) 'EU needs more cost effective renewables projects, auditors say', 10 July 2014. <http://www.euractiv.com/sections/energy/eu-needs-more-cost-effective-renewables-projects-auditors-say-303372>
- EurActiv (2014c) 'EU figures show carbon credit glut persists, but offset data withheld', 19 May 2014. <http://www.euractiv.com/sections/energy/eu-figures-show-carbon-credit-glut-persists-offset-data-withheld-302197>
- EurActiv (2014d) '38 billion money pot could unlock 2030 clean energy deal,' 3 July 2014. <http://www.euractiv.com/sections/energy/eu38-billion-money-pot-could-unlock-2030-clean-energy-deal-303255>
- European Biogas Association [EBA] (2013) *Biogas: Simply the best*, Brussels. <http://european-biogas.eu/wp-content/uploads/files/2013/10/EBA-brochure-2011.pdf>
- European Climate Foundation [ECF] (2011) *Power Perspectives 2030*, The Hague. <http://www.roadmap2050.eu/project/power-perspective-2030>
- European Commission [EC] (no date) *Meeting the targets and putting renewables to work*, Brussels. http://www.esha.be/fileadmin/esha_files/documents/publications/others/MITRE_Overview_Report.pdf

- European Commission [EC] (2012) 'European Commission presents new measures and employment opportunities for the green economy', statement, European Commission website, 18 April 2012. http://ec.europa.eu/commission_2010-2014/hedegaard/headlines/news/2012-04-18_01_en.htm
- European Commission [EC] (2013) *Quarterly Report on European Gas Markets*, Brussels. http://ec.europa.eu/energy/observatory/gas/doc/20130814_q2_quarterly_report_on_european_gas_markets.pdf
- European Commission [EC] (2014a) *In depth study of EU energy security*, Brussels. http://ec.europa.eu/energy/doc/20140528_energy_security_study.pdf
- European Commission [EC] (2014b) 'Climate and energy priorities for Europe: the way forward', presentation. http://ec.europa.eu/clima/policies/2030/docs/climate_energy_priorities_en.pdf
- European Commission [EC] (2014c) *Impact Assessment: Accompanying the policy framework for climate and energy in the period from 2020 up to 2030*, Brussels. http://ec.europa.eu/clima/policies/2030/docs/swd_2014_xxx_en.pdf and <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014SC0015>
- European Commission [EC] (2014d) *Special Eurobarometer 409 Climate Change*, Brussels. http://ec.europa.eu/public_opinion/archives/ebs/ebs_409_en.pdf
- European Commission [EC] (2014e) *2030 Framework for climate and energy policies*, Brussels. http://ec.europa.eu/clima/policies/2030/index_en.htm
- European Commission [EC] (2014f) *Executive Summary of the Impact Assessment for climate and energy in the period 2020–2030*, Brussels. http://ec.europa.eu/energy/doc/2030/20140122_impact_assessment_summary.pdf
- European Commission (2014g) 'Energy Efficiency Communication', Brussels. http://ec.europa.eu/energy/efficiency/events/2014_energy_efficiency_communication_en.htm
- European Commission [EC] (2014h) *Structural reform of the European carbon market*, Brussels. http://ec.europa.eu/clima/policies/ets/reform/index_en.htm
- European Commission [EC] (2014i) 'Expert meeting on EU ETS Structural Reform', Brussels. http://ec.europa.eu/clima/events/articles/0094_en.htm
- European Commission [EC] (2014j) *Horizon 2020: the energy challenge*, Brussels. <http://ec.europa.eu/programmes/horizon2020/en/h2020-section/secure-clean-and-efficient-energy>
- European Commission [EC] (2014k) 'NER 300', webpages. http://ec.europa.eu/clima/policies/lowcarbon/ner300/index_en.htm
- European Commission [EC] (2014l) *EU Cohesion Policy 2014–2020*, Brussels. http://ec.europa.eu/regional_policy/sources/docgener/informat/2014/fiche_low_carbon_en.pdf
- European Commission [EC] (2014m) *Connecting Europe Facility*, webpages. <http://inea.ec.europa.eu/en/cef/cef.htm>
- European Environment Agency [EEA] (2014) 'EU policies deliver greenhouse gas reductions', Copenhagen. <http://www.eea.europa.eu/articles/eu-policies-deliver-greenhouse-gas>
- European Network of Transmission System Operators for Electricity [ENTSO-E] (2014) 'Consultation Open on the Ten-Year Network Development Plan 2014', press release, 10 July 2014. <https://www.entsoe.eu/news-events/announcements/announcements-archive/Pages/News/Ten-Year-Network-Development-Plan-2014-for-Public-Consultation.aspx>

- European Parliament (2014) 'MEPs want binding 2030 goals for CO2 emissions, renewables, and energy efficiency', press release, 5 February 2014. <http://www.europarl.europa.eu/news/en/news-room/content/20140203IPR34510/html/MEPs-want-binding-2030-goals-for-CO2-emissions-renewables-and-energy-efficiency>
- Eurostat (2012) 'Main origin of primary energy imports', data table. [http://epp.eurostat.ec.europa.eu/statistics_explained/index.php?title=File:Main_origin_of_primary_energy_imports,_EU-27,_2002-2010_\(%25_of_extra_EU-27_imports\).png&filetimestamp=20121012131852](http://epp.eurostat.ec.europa.eu/statistics_explained/index.php?title=File:Main_origin_of_primary_energy_imports,_EU-27,_2002-2010_(%25_of_extra_EU-27_imports).png&filetimestamp=20121012131852)
- European Wind Energy Association [EWEA] et al (2014) 'Open letter to President Barroso', 13 May 2014. <http://origin.library.constantcontact.com/download/get/file/1101564579153-1468/Energy+Security+Strategy+-+letter+to+President+Barroso.pdf>
- Evans S (2014) 'Why we're going to be breaking renewable records for the foreseeable future, and what that means', Carbon Brief blog, 28 August 2014. <http://www.carbonbrief.org/blog/2014/08/why-were-going-to-be-breaking-renewable-records-for-the-foreseeable-future-and-what-that-means/>
- Evans-Pritchard A (2014) 'Global solar dominance in sight as science trumps fossil fuels', *Telegraph*, 9 April 2014. http://www.telegraph.co.uk/finance/comment/ambroseevans_pritchard/10755598/Global-solar-dominance-in-sight-as-science-trumps-fossil-fuels.html
- EY (2013) 'Shale gas in Europe: evolution or revolution?', webpage <http://www.ey.com/GL/en/Industries/Oil---Gas/Shale-gas-in-Europe--revolution-or-evolution>
- EY (2014) *Macroeconomic impacts of the low-carbon transition*. http://europeanclimate.org/wp-content/uploads/2014/06/EY_ECF_Macro-economic-impacts-of-the-low-carbon-transition_Report_2014-06-05.pdf
- E3G (2013) 'Options for 2030 infrastructure targets: Infrastructure and the EU 2030 climate and energy framework: Discussion paper: December 2013', London and Brussels. http://www.e3g.org/docs/E3G_Infrastructure_and_the_EU_2030_climate_and_energy_framework.pdf
- Farchy J, Hille K, Olearchyk R and Oliver C (2014) 'Russia cuts off gas supplies to Ukraine', *Financial Times*, 16 June 2014. <http://www.ft.com/cms/s/0/db64d8f8-f522-11e3-afd3-00144feabdc0.html#axzz34t6O9Eix>
- Fraunhofer Institute for Systems and Innovation Research [Fraunhofer ISI] (2013) *Analysis of a European reference target system for 2030*, Karlsruhe. http://energycoalition.eu/sites/default/files/Fraunhofer%20ISI_ReferenceTargetSystemReport.pdf
- Gamesa (2013) 'Gamesa and seven other European companies call for 2030 EU renewable energy target of more than 30%', press release, 13 November 2013. <http://www.gamesacorp.com/en/communication/news/gamesa-and-seven-other-european-companies-call-for-2030-eu-renewable-energy-target-of-more-than-30.html?idCategoria=0&fechaDesde=&especifica=0&texto=&idSeccion=0&fechaHasta=>
- Garman J and Kahya D (2013) 'Why is Europe burning more coal?' *Energydesk*, 25 January 2013. <http://www.greenpeace.org.uk/newsdesk/energy/analysis/why-europe-burning-more-coal>
- Garside B (2014) 'Ministers from 7 EU nations call for binding energy saving goal', Reuters, 17 June 2014. <http://uk.reuters.com/article/2014/06/17/eu-energy-efficiency-idUKL5N0OY4KQ20140617>
- Gazprom (2012) 'Gas Export and Enhancing Reliability of Gas Supply to Europe', presentation, 20 June 2014. <http://www.gazprom.com/f/posts/76/899346/2012-06-20-presentation-en.pdf>

- Green Growth Group (2014a) *Going for Green Growth: The case for ambitious and immediate EU low carbon action*, London: Department of Energy and Climate Change. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/253029/Green_Growth_Group_Joint_Pamphlet.pdf
- Green Growth Group (2014b) 'Green Growth Group Ministers' statement on climate and energy framework for 2030', statement, 3 March 2014, Department of Energy and Climate Change website. <https://www.gov.uk/government/news/green-growth-group-ministers-statement-on-climate-and-energy-framework-for-2030>
- Greenpeace (2013a) *Silent Killers Why Europe must replace coal power with green energy*, Amsterdam. <http://www.greenpeace.org/international/Global/international/publications/climate/2013/Silent-Killers.pdf>
- Greenpeace (2013b) 'Fracking – what's the evidence?'. https://docs.google.com/document/d/15OLSUrTHsk4KmDXJN_BQISn9YjAqHEvxqP3nynJGoGA/edit
- Höhne N (2014) 'What is a fair contribution of the EU to the 2C limit?', Ecofys blog, 21 January 2014. <http://www.ecofys.com/en/blog/what-is-a-fair-contribution-of-the-eu-to-the-2c-limit/>
- Holland MR (2008) *Co-benefits to health of a strong EU climate policy*, Belgium: Health and Environment Alliance. http://www.env-health.org/IMG/pdf/Co-benefits_to_health_report_-september_2008.pdf
- Holmes I, Bergamaschi L and Mabey N (2014) 'Energy efficiency as Europe's first response to energy security', London and Brussels: E3G. http://www.e3g.org/docs/E3G_Briefing_June_2014_Energy_efficiency_as_Europe%E2%80%99s_first_response_to_energy_security.pdf
- Hook L and Crooks E (2011) 'China's rush into renewables: the way the world turns', *Financial Times*, 28 November 2011. <http://www.ft.com/cms/s/0/0502a28a-15c9-11e1-a691-00144feabdc0.html>
- Intergovernmental Panel on Climate Change [IPCC] (2014) *Climate Change 2013: The Physical Science Basis*, Geneva. <https://www.ipcc.ch/report/ar5/wg1/>
- International Energy Agency [IEA] (2012a) 'Global carbon dioxide emissions increase by 1 gigatone in 2011 to record high', press release, 24 May 2012. <http://www.iea.org/newsroomandevents/news/2012/may/name,27216,en.html>
- International Energy Agency [IEA] (2012b) *Golden Rules for a Golden Age of Gas: World Energy Outlook Special Report on Unconventional Gas*, Paris. http://www.worldenergyoutlook.org/media/weowebbsite/2012/goldenrules/WEO2012_GoldenRulesReport.pdf
- International Energy Agency [IEA] (2013) *Tracking Clean Energy Progress 2013*, Paris. <http://www.iea.org/etp/tracking2013/>
- International Renewable Energy Agency [IRENA] (2014) *Renewable energy and jobs annual review*, Abu Dhabi. <http://www.irena.org/Publications/rejobs-annual-review-2014.pdf>
- Jones D and Worthington B (2014) *Europe's failure to tackle coal: Risks for the EU low-carbon transition*, London: Sandbag. http://www.sandbag.org.uk/site_media/pdfs/reports/Europes_failure_to_tackle_coal.pdf
- Krukowska E (2013) 'EU Needs Single Carbon Goal for 2030, EON's Teyssen Says', Bloomberg, 3 December 2013. <http://www.bloomberg.com/news/2013-12-03/eu-needs-single-carbon-goal-for-2030-eon-s-teyssen-says.html>

- Krukowska E (2014) 'EU leaders said to delay decision over 2030 carbon target', Bloomberg, 17 February 2014. <http://www.bloomberg.com/news/2014-02-17/eu-leaders-said-to-delay-decision-on-2030-carbon-target.html>
- Lawson R, Bergamaschi L, Holmes I and Burke T (2014) '*Shale gas: four myths and a truth*', London and Brussels: E3G. http://www.e3g.org/docs/E3G-_Shale_gas-_four_myths_and_a_truth.pdf
- Mabey N (2014) 'An EU energy union demands responsibilities as well as rights', EurActiv, 12 June 2014. <http://www.euractiv.com/sections/energy/eu-energy-union-demands-responsibilities-well-rights-302735>
- MacKay and Stone (2013) *Potential greenhouse gas emissions associated with shale gas production and use*, London: Department of Energy and Climate Change. <https://www.gov.uk/government/publications/potential-greenhouse-gas-emissions-associated-with-shale-gas-production-and-use>
- McGrath M (2013) 'EU rejects plan to boost carbon trading', BBC News, 16 April 2013. <http://www.bbc.co.uk/news/science-environment-22167675>
- McGrath M (2014) 'Dispute over "bonkers" EU energy savings plan', BBC News, 23 July 2014. <http://www.bbc.co.uk/news/science-environment-28420527>
- Merrick J (2013) 'Britain calls for EU target to halve emissions by 2030', *Independent*, 26 May 2013. <http://www.independent.co.uk/environment/climate-change/britain-calls-for-eu-target-to-halve-emissions-by-2030-8632395.html>
- Mitterlehner R, Wathelet M, Lidegaard M, Martin P, Gabriel S, Rabbitte P, Orlando A and da Silva J M (2013) 'Call for a renewable energy target in EU's 2030 climate and energy framework', letter to European Commissioners Connie Hedegaard and Günther Oettinger, 23 December 2013. <https://docs.google.com/file/d/0B3Tt3iwiid6uJMmxzcTRCbWlwdVk/edit>
- Morris D with Crow L, Elsworth R, MacDonald P and Watson L (2012) *Drifting toward disaster? The ETS adrift in Europe's climate efforts*, London: Sandbag. http://www.sandbag.org.uk/site_media/pdfs/reports/Drifting_Towards_Disaster_Amended_30.6.2012.pdf
- Morris D with Elsworth R (2014) *Sharing the load: Poland's coming of age on climate policy*, London: Sandbag. http://www.sandbag.org.uk/site_media/pdfs/reports/Sharing_The_Load.pdf
- Murray J (2013) 'Carbon traders deliver record activity during 2012 but market value plummets', *Business Green*, 3 January 2013. <http://www.businessgreen.com/bg/news/2233574/carbon-traders-deliver-record-activity-during-2012-but-market-value-plummets>
- National Grid (2009) *The potential for renewable gas in the UK*, London. <http://www.nationalgrid.com/NR/rdonlyres/9122AEBA-5E50-43CA-81E5-8FD98C2CA4EC/32182/renewablegasWPfinal2.pdf>
- Natural Gas Europe (2014) 'European Gas Strategy Could Support Coal Usage In Short Term', 20 June 2014. <http://www.naturalgaseurope.com/european-gas-strategy-coal-usage-short-term>
- Navigant Research (2013) *A BTM Wind Report: World Market Update 2012*. <http://www.navigantresearch.com/wp-assets/uploads/2013/03/WWMU-13-Executive-Summary.pdf>

- Neuhoff K, Acworth W, Dechezleprêtre A, Dröge S, Sartor O, Sato M, Schleicher S and Schopp A (2014) *Staying with the leaders: Europe's pathway to a successful low-carbon economy*, London: Grantham Research Institute on climate change and the environment. <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/Staying-with-the-leaders.pdf>
- Oettinger G (2014) 'The European energy policy for 2020 and beyond', Erasmus Energy Forum, Rotterdam School of Management, 19 June 2014. http://europa.eu/rapid/press-release_SPEECH-14-478_en.htm
- Oliver C (2014) 'Germany backs EU energy target to ease dependence on Russia gas', *Financial Times*, 16 June 2014. <http://www.ft.com/cms/s/0/c32fbebef555-11e3-91a8-00144feabdc0.html>
- Patel T and Viscusi G (2014) 'France's fracking ban 'absolute' after Court upholds law', 11th October 2014. <http://www.bloomberg.com/news/2013-10-11/fracking-ban-upheld-by-french-court-as-constitutional.html>
- Pearce F (2013) 'Fracking could accelerate global warming', *New Scientist*, 12 August 2013. <http://www.newscientist.com/article/dn24029-fracking-could-accelerate-global-warming.html#.U8AxSY1dVGA>
- Pehlivanova B and Cohen M (2014) 'The Russia-Ukraine Crisis: Natural gas and oil market risks', London: Barclays. <http://www.ourenergypolicy.org/wp-content/uploads/2014/03/barclyas.pdf>
- Pew Charitable Trusts (2014) *Who's winning the clean energy race?*, Philadelphia. <http://www.pewtrusts.org/en/research-and-analysis/reports/2014/04/03/whos-winning-the-clean-energy-race-2013>
- Platt R and Straw W, with Aldridge J and Cowdrey E (2013) *Up in smoke: How the EU's faltering climate policy is undermining the City of London*, London: IPPR. <http://www.ippr.org/publications/up-in-smoke-how-the-eus-faltering-climate-policy-is-undermining-the-city-of-london>
- Platt R, Aldridge J and Washan P, with Price D (2014) *Help to heat: A solution to the affordability crisis in energy*, London: IPPR. <http://www.ippr.org/publications/help-to-heat-a-solution-to-the-affordability-crisis-in-energy>
- Platts (2014a) 'US House passes bill to expedite approval of LNG export permits', 25 June 2014. <http://www.platts.com/latest-news/natural-gas/washington/us-house-passes-bill-to-expedite-approval-of-21815464>
- Platts (2014b) 'Europe must invest EUR150 Billion in power grids by 2030', 10 July 2014. <http://www.platts.com/latest-news/electric-power/emea/europe-must-invest-eur150-billion-in-power-grids-26831152>
- Plumer B (2012) 'A closer look at Obama's \$90 billion for clean energy', *Wonkblog, Washington Post*, 4 October 2012. <http://www.washingtonpost.com/blogs/wonkblog/wp/2012/10/04/a-closer-look-at-obamas-90-billion-for-clean-energy/>
- Potsdam Institute for Climate Impact Research and Climate Analytics (2012) *Turn down the heat: Why a 4°C warmer world must be avoided*, Washington DC: World Bank. <http://documents.worldbank.org/curated/en/2012/11/17097815/turn-down-heat-4%C2%B0c-warmer-world-must-avoided>
- Pöyry (2013) *The macro economic effects of European shale gas production: A report to the International Association of Oil and Gas Producers (OGP)*, Oxford. <http://www.poyry.co.uk/news/poyry-study-investigates-macroeconomic-effects-european-shale-gas-production>

- Reuters (2014a) 'Rich nations' greenhouse gas emissions fall in 2012, led by United States', 29 April 2014. <http://uk.reuters.com/article/2014/04/29/uk-climatechange-carbon-idUKKBN0DE0S220140429>
- Reuters (2014b) 'China plan to cap CO2 emissions seen as turning point in climate talks', 3 June 2014. <http://uk.reuters.com/article/2014/06/03/china-climatechange-idUKL3N0OK1VH20140603>
- Reuters (2014c) 'Europe mulling energy efficiency target below Juncker's 30% minimum', *Guardian*, 16 July 2014. <http://www.theguardian.com/environment/2014/jul/16/europe-mulling-energy-efficiency-target-below-junckers-30-minimum>
- Reuters (2014d) 'Polish PM: EU should form energy union to secure supplies'. <http://uk.reuters.com/article/2014/03/29/poland-energy-idUKL5N0MQ05X20140329>
- Rogers A (2014) 'US eyes natural gas exports to weaken Putin', *Time*, 24 March 2014. <http://time.com/35046/russia-crimea-ukraine-putin-natural-gas/>
- Romm J (2009) 'James Hansen: "Coal is single greatest threat to civilization and all life on our planet"', blog, Thinkprogress.org, 19 February 2009. <http://thinkprogress.org/climate/2009/02/16/203701/james-hansen-coal-greatest-threat-civilization-all-life-on-our-planet/>
- Sandbag (2013) 'EU's 2020 targets allow massive growth in emissions', press release, 10 December 2013. http://www.sandbag.org.uk/site_media/pdfs/press_releases/Press_Release_2020_Confidence_Trick_101213_1.pdf
- Sandbag (2014a) 'Poland gets best deal under past carbon targets, report finds', press release, 20 March 2014. http://www.sandbag.org.uk/site_media/pdfs/press_releases/Press_Release_Poland_gets_best_deal_under_past_carbon_targets.pdf
- Sandbag (2014b) 'Carbon budgets vs. GHG targets', London. http://www.sandbag.org.uk/site_media/pdfs/reports/Carbon_budgets_vs_GHG_targets_1.pdf
- Shankleman J (2013) 'Lord Stern: EU must halve emissions by 2030', *Business Green*, 20 September 2013. <http://www.businessgreen.com/bg/news/2296548/lord-stern-eu-must-halve-emissions-by-2030>
- Shankleman J (2014) 'Bloomberg: renewable to win two thirds of new energy investment by 2030', *Business Green*, 2 July 2014. <http://www.businessgreen.com/bg/analysis/2353031/bloomberg-renewables-to-win-two-thirds-of-new-energy-investment-by-2030>
- Shiryayevskaya A and Strzelecki M (2014) 'Europe seen paying twice as much to replace Russian gas', 28 March 2014. <http://www.bloomberg.com/news/2014-03-28/europe-seen-paying-twice-as-much-to-replace-russian-gas.html>
- Shuo I (2014) 'How China's coal caps may mean it is doing more to tackle climate change than the EU and US', *Greenpeace*, 10 April 2014. <http://www.greenpeace.org.uk/newsdesk/energy/analysis/how-china%E2%80%99s-coal-caps-mean-it-may-be-doing-more-tackle-climate-change-eu-and-us>
- Spencer T, Sartor O and Mathieu M (Spencer et al 2014a) 'Unconventional wisdom: an economic analysis of US shale gas and implications for the EU', Paris: Institut du développement durable et des relations internationales (IDDRI). http://www.iddri.org/Publications/Collections/Analyses/Study0214_TS%20et%20al._shale%20gas.pdf

- Spencer T, Colombier M and Ribera T (Spencer et al 2014b) 'Issues and options with regard to the EU renewables target in the context of the 2030 EU climate and energy package', Paris: Institut du développement durable et des relations internationales (IDDRI). http://www.iddri.org/Publications/Collections/Syntheses/PB0414_TS%20MC%20TR_EU%20package_EnR_web.pdf
- Straw W (2012) *Staying in: A reform plan for Britain and Europe*, London: IPPR. <http://www.ippr.org/publications/staying-in-a-reform-plan-for-britain-and-europe>
- Teske S, Brown T, Tröster E, Schierhorn P-P and Ackermann T (2014) *PowE(R) 2030: A European Grid for 3/4 Renewable Electricity by 2030*, Hamburg: Greenpeace. <http://www.greenpeace.org.uk/media/reports/power-2030-european-grid-3/4-renewable-energy-2030>
- Tollefson J (2013) 'Methane leaks erode green credentials of natural gas', *Nature*, 2 January 2013. <http://www.nature.com/news/methane-leaks-erode-green-credentials-of-natural-gas-1.12123>
- Trades Union Congress [TUC] (2012) *A Green and Fair Future for a Just Transition to a Low Carbon Economy*, London. <http://www.tuc.org.uk/sites/default/files/documents/greenfuture.pdf>
- Traynor I (2014) 'European leaders ask Obama to allow increased exports of US shale gas', *Guardian*, 26 March 2014. <http://www.theguardian.com/world/2014/mar/26/europe-asks-obama-increased-exports-shale-gas>
- Tusk D (2014) 'A united Europe can end Russia's stranglehold', *Financial Times*, 21 April 2014. <http://www.ft.com/cms/s/0/91508464-c661-11e3-ba0e-00144feabdc0.html#axzz3503lZCs3> (subscription required)
- Van Renssen S (2014) '10 take home messages from the new European energy security strategy', *Energy Post*, 30 May 2014 <http://www.energypost.eu/ten-take-home-messages-new-european-energy-security-strategy/>
- Vasagar (2014) 'Berlin prepares to allow fracking', *Financial Times*, 4 June 2014. <http://www.ft.com/cms/s/0/312ec3c6-ebf4-11e3-8cef-00144feabdc0.html>
- Walsh B (2014) 'Renewable energy investment is down – and that's OK', *Time*, 7 April 2014. <http://time.com/51834/renewable-energy-investment/>
- White House (2013) *The President's Climate Action Plan*, Washington DC. <http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf>
- Wynn G (2014) "'Maximum coal burn" to continue in Europe, says Bank of AML reports', *Responding to Climate Change*, 21 March 2014. <http://www.rtcc.org/2014/03/21/maximum-coal-burn-to-continue-in-europe-says-merrill-lynch/>
- Yeo S (2014) 'EU climate deal in the balance as row simmers over 40% target', *Responding to Climate Change*, 7 June 2014. <http://www.rtcc.org/2014/06/06/eu-climate-deal-in-balance-as-row-breeds-over-40-target/>