



Federal Ministry
for Economic Affairs
and Energy



The New Economic Rationale for an Ambitious EU Climate and Energy Framework

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Imprint

Published by
Federal Ministry of Economic Affairs and Energy
Berlin
www.bmwi.de

In cooperation with
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Bonn and Eschborn
www.giz.de

Layout and design
ergo Unternehmenskommunikation GmbH & Co. KG
Berlin

2020

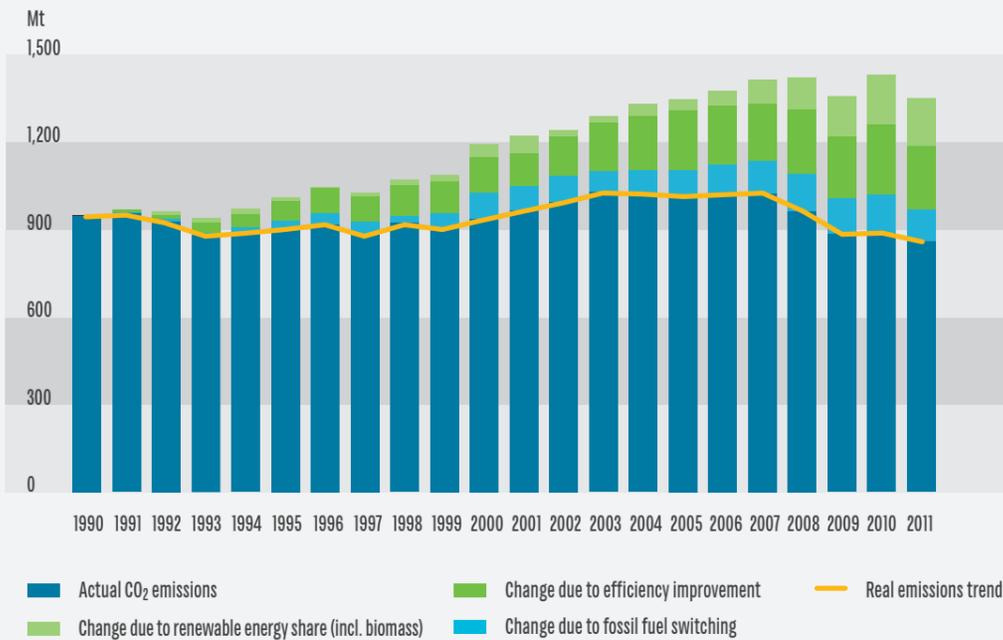
2030

POWER UPGRADE 2030 THE KEY MESSAGES

1. The upcoming decision on the 2030 climate and energy framework means the EU is on the verge of setting the course that will determine its future competitiveness. Finding a compromise between the diverging interests involved will allow Europe to send an important signal to the international climate negotiations in Paris.
2. Member States have different starting points, resources and preferences. At the same time, Europe has to invest in modernising its energy system:
 - With the existing energy system, Europe is set to fail to achieve its long-term goal of reducing greenhouse gas (GHG) emissions by 80-95% by 2050.
 - Over 70% of Europe's conventional power plants are more than 30 years old.
 - Europe is more dependent on imported fossil fuels than most industrialised regions, and its dependency is even likely to increase.
3. This puts Europe at a crossroads. The 2030 framework should choose the most cost-efficient pathway that offers the highest return on investment. Renewable energy and energy efficiency offer much better prospects in this regard today than they did in 2007, the year Europe decided on the 2020 framework:
 - Energy efficiency and renewable energy have become the most cost-efficient options with respect to new low carbon investments. Facilitating the necessary learning curves came at high costs, but these are costs of the past. Europe now needs to take advantage of efforts being made.
 - Setting three targets that aim for a 40% GHG reduction, 30% energy efficiency and a 30% share of renewable energy would create 568,000 more jobs and save €260 billion more on fossil fuel imports than a single target that aims only for a 40% GHG reduction.
4. The Energy Roadmap 2050 has identified energy efficiency and renewable energy as “no-regret” options. Energy efficiency and the share of renewable energy both need to rise significantly in all scenarios in all Member States by 2030 and beyond. Postponing these investments will lead to higher costs in the long run and less time to adapt.
5. With this in mind, Europe should take advantage of the synergies offered by a framework that promotes energy efficiency and renewable energy. The question is: what would be the most cost-efficient framework for doing so?
6. The Emissions Trading Scheme (ETS), which is the EU's main climate policy instrument, must be urgently strengthened and reformed to provide continuous overall decarbonisation signals. Effective measures preventing carbon leakage affecting especially energy-intensive industries also remain key.
7. The ETS is most efficient and effective if complemented by tailored measures. This is because the ETS alone cannot overcome the non-economic barriers to exploiting large energy efficiency potentials. Moreover, it is not currently designed to attract early investments in new, innovative technologies. Most importantly, the risks associated with fluctuating certificate prices can significantly increase the cost of capital.
8. A combined and well-balanced approach of three targets, together with a strengthened ETS and tailored instruments will send clear market signals for investing early in innovative technologies. It will provide predictability for all actors and improve consistency between instruments at the EU and Member State level. In turn, this will raise investor certainty and greatly reduce the costs of capital and thus overall system costs.
9. In line with this, new analyses from PRIMES and Fraunhofer show that an EU framework with ambitious targets for GHG reduction, renewable energy and energy efficiency can be as cost-efficient as, or even more cost-efficient than, a GHG-only approach.
10. Increasing challenges, different starting points, and variations in energy mix priorities among Member States all call for more flexibility. The 2030 framework thus has to find the right balance between responding to this need and ensuring sufficient reliability to reduce investor risk.

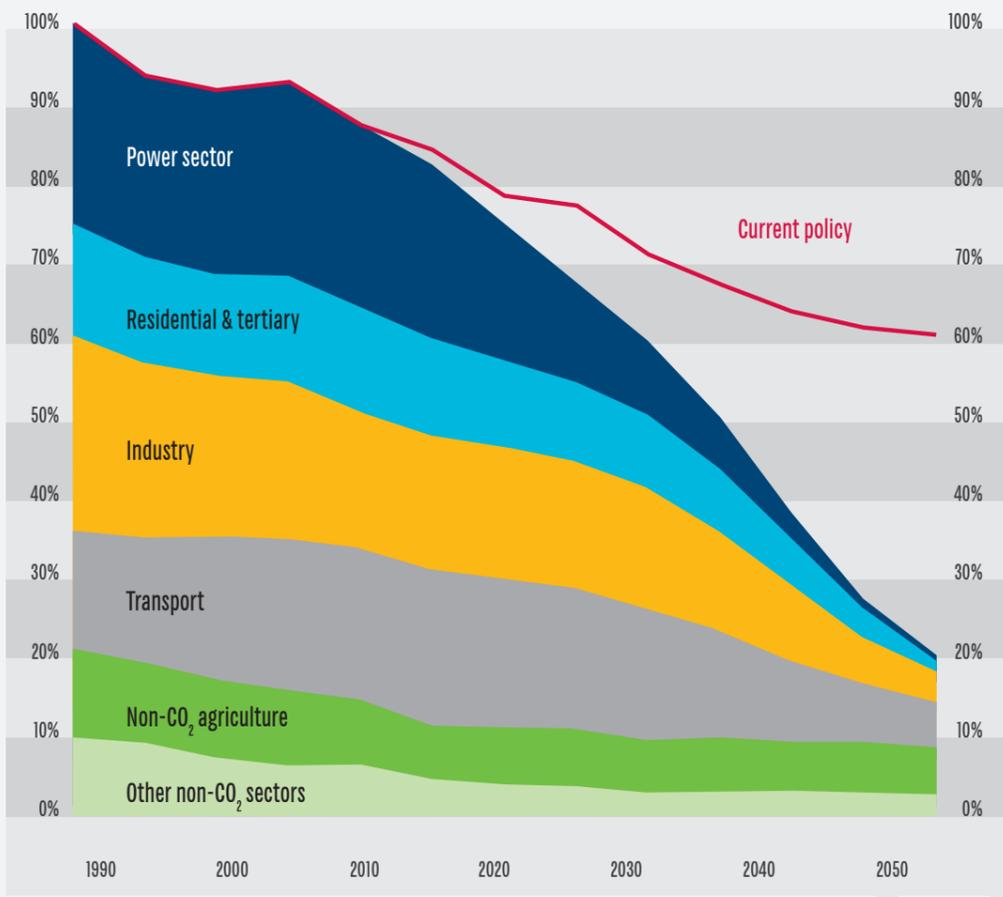
Efficiency gains, fuel switching and renewable energy have already reduced Europe's CO₂ emissions

Estimated impact on CO₂ emissions savings in electricity and heat production from 1990 to 2011, EU-15 in million tonnes



However, with its current policy, the EU will fail to meet its 80-95% emission reduction goal

Emission reduction pathways by sector vs. trend based on current policies until 2050



1. THE NEED FOR INVESTING IN A NEW ENERGY SYSTEM

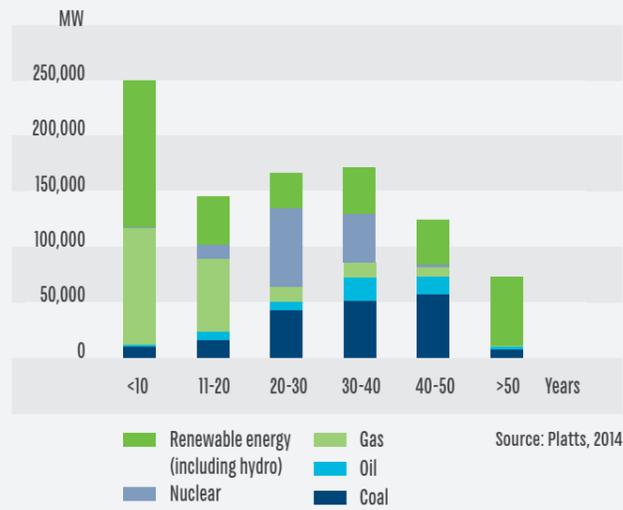
Protecting the climate

Each of the past three decades has been warmer than the previous one. Twelve of the 14 warmest years on record since 1880 have occurred since the year 2000. In order to prevent irreversible climate change, the international community has committed itself to limiting the global temperature increase to 2 °C above preindustrial levels. In line with this objective, the EU has set itself the target of reducing greenhouse gas (GHG) emissions by 80–95 % by 2050. This requires early action: today's emissions will irreversibly lead to further global warming.

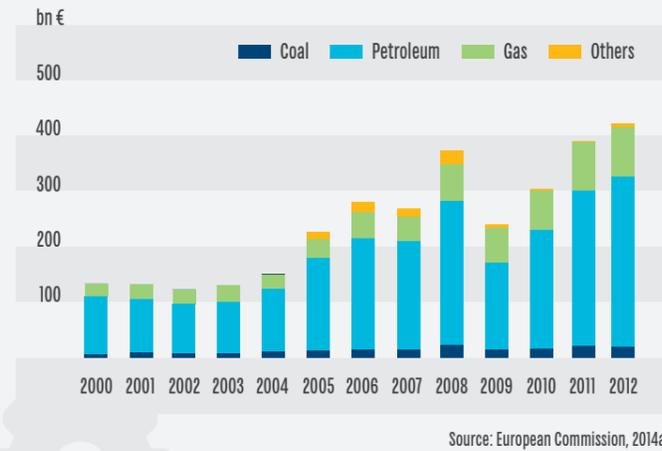
The energy system remains the single largest source of emissions in the EU. It produces around 80% of GHG emissions, with the energy sector itself taking the largest share (31 % of all emissions) followed by transport (22%), industry (11%), and heating for housing (11%). Most of the energy emissions are CO₂ emissions, which account for 83 % of all EU emissions.

If the EU is to reduce its GHG emissions by 80–95% by 2050, it will have to put particular emphasis on changing its energy system. Staying with its existing energy system would prevent it from achieving its long-term climate goals. Current investment frameworks and policies are projected to help reduce emissions by about 20% by 2020, 30% by 2030 and around 40% by 2050 [European Commission, 2011a]. In view of the long lifetimes and investment cycles of energy assets, the International Energy Agency (IEA) has warned on various occasions that early investments in low carbon technologies are needed.

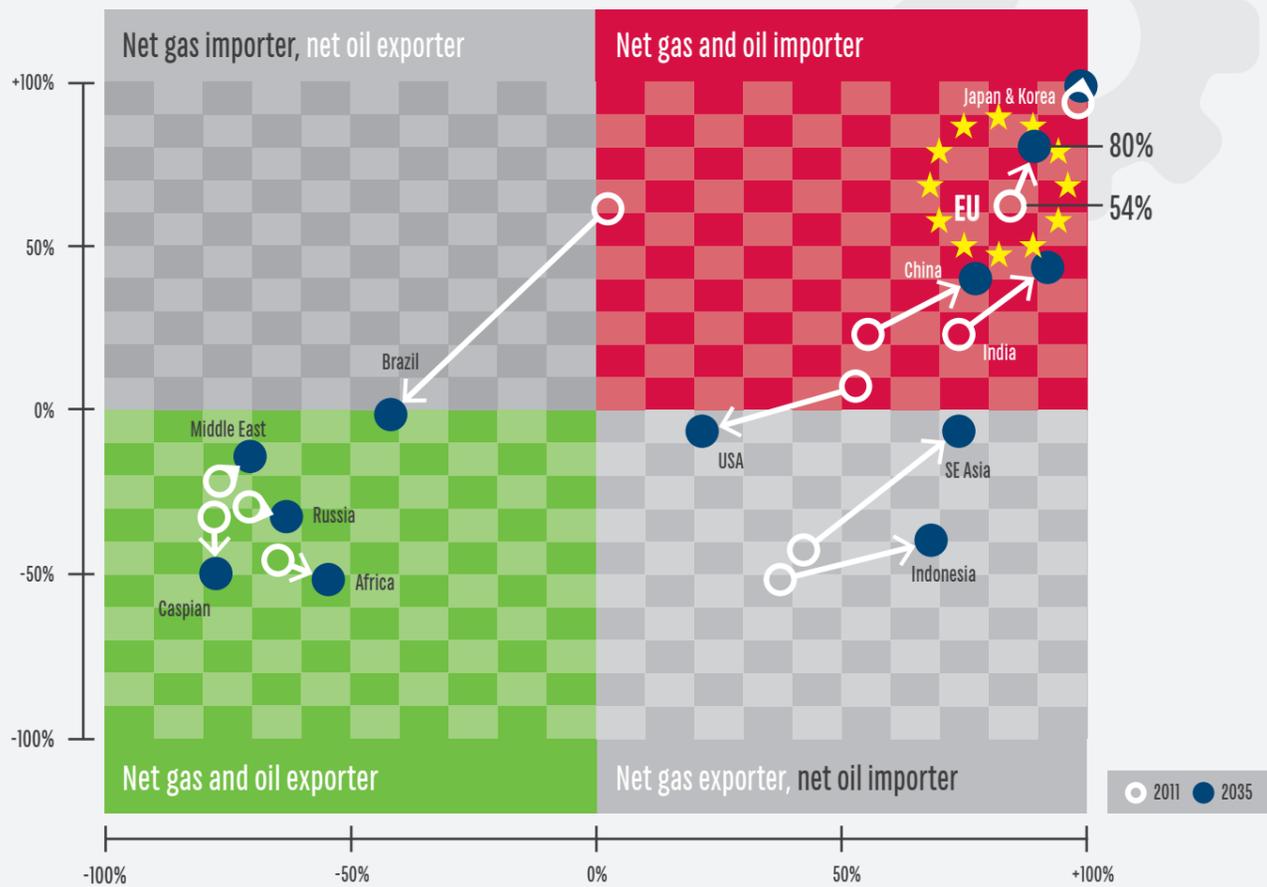
Half of Europe's power capacity is overaged
Age of European power generation capacities in Europe in 2013



Europe has a € 420 billion energy trade deficit
Europe's trade deficit by energy resource from 2000 to 2012



Europe faces growing dependency on fossil fuel imports
Net oil and gas import/export shares in 2011, and projection for 2035



1. THE NEED FOR INVESTING IN A NEW ENERGY SYSTEM

Modernising an ageing energy system and securing energy supply

The European Union has an ageing energy system: 45% of its total power generation capacity and over 70% of its conventional power fleet are more than 30 years old [Platts, 2014; Eurelectric, 2012]. An increasing number of power plants – about 3 to 5 gigawatts (GW) annually – are reaching an age where it makes more economic sense for operators to decommission their assets than to invest in refurbishing them.

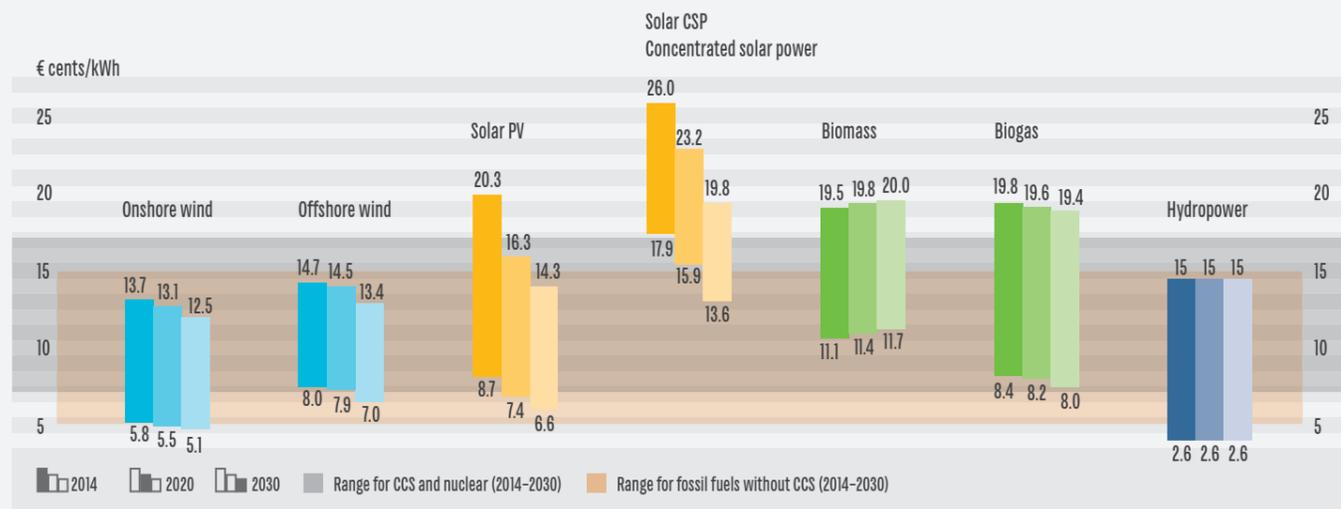
According to the European Commission, some 350 GW of new power capacity needs to be built in the coming years. This is mainly to replace retired plants, though it will also help meet rising electricity demand. The 350 GW corresponds to 39% of current installed capacity [European Commission, 2011a].

This puts Europe at a crossroads. Investments in new power plants will define Europe's carbon footprint for decades to come. They will either set the course for achieving the long-term climate goals in an economically sound and beneficial way, or lock Europe into a high carbon economy that will make it impossible to stay below the 2°C limit. The EU's 2030 framework for climate and energy is key to determining investment decisions taken today.

Issues connected to energy security and the stability of energy prices have also become increasingly important. With the exception of Japan and Korea, Europe is more dependent on imported fossil fuels than any other industrialised country or region. This makes it highly vulnerable to price increases, price fluctuations and political instability in the exporting regions. Its dependency is also expected to increase in the coming years. Projections see it growing from about 54% today to 80% in 2035 if no further action is taken on fuel switching to renewable energy and on increasing energy efficiency [Eurostat, 2014c; IEA, 2013].

The growing need for fossil fuel imports is reflected in Europe's trade deficit in energy products. Standing at € 150 billion in 2004, the deficit nearly tripled to reach a record high of € 421 billion in 2012. This cost every European citizen over € 2 per day and represented 3.3% of the region's GDP [European Commission, 2014a]. Furthermore, as globally traded, finite commodities, fossil fuels are linked to uncertain, fluctuating prices that can have a major impact on societal costs. Crises such as those in Ukraine and the Middle East add to the uncertainty. High investment risks and high capital costs are the result.

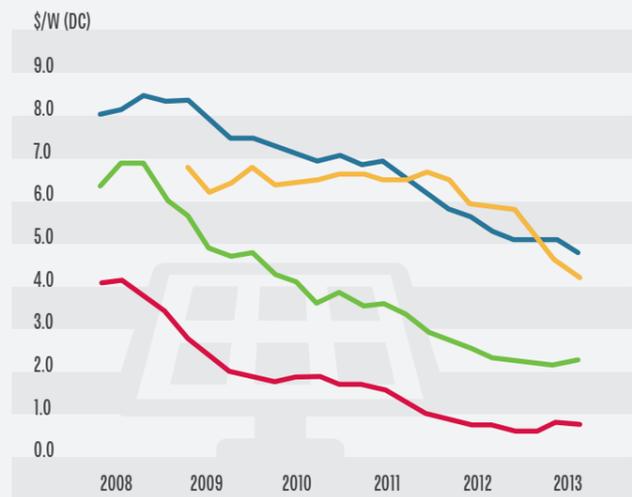
Renewable energy has become the most cost-efficient new low-carbon option
 Levelised cost of electricity ranges for new power capacities in Europe in 2014, 2020 and 2030 in € cents/kWh



Source: Fraunhofer ISI, 2014a

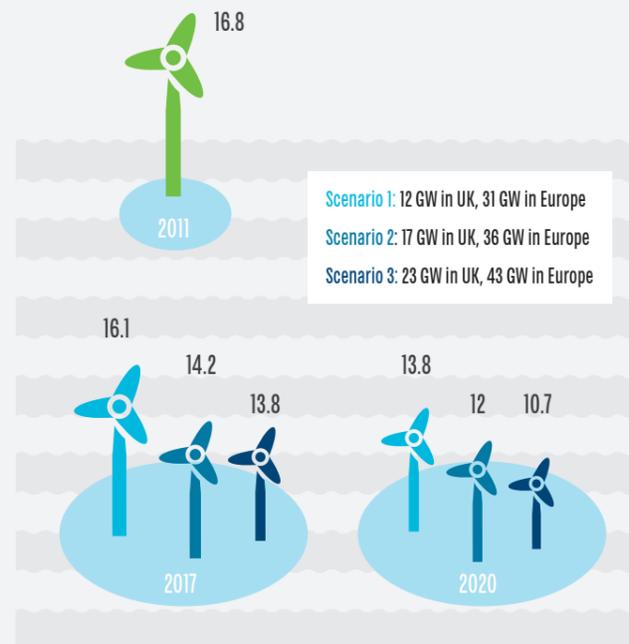
PV system costs have fallen by up to 70% in six years
 Development of PV system costs in the main markets in \$/Watt

- Average sub-10kW German system cost
- Average California residential system cost
- Japanese residential system cost average
- Chinese multicrystalline silicon module price



Source: Bloomberg New Energy Finance, 2013

Cost of offshore wind could halve within a decade
 Levelised cost of electricity at point of final investment decision, including grid connection to shore in € cents/kWh



Source: The Crown Estate, 2012

2. THE NEW REALITY OF COST EFFICIENCY

Choosing the most cost-efficient solutions

Given the large amount of investment needed to modernise Europe's energy system, the EU 2030 framework should set the signals for the most cost-efficient and effective pathway for achieving the 80–95% emission reduction target by 2050. Europe cannot achieve its goals for the climate and energy security solely by improving the efficiency of existing coal power plants; the focus has to be on new, safe and sustainable low carbon solutions.

Thanks to the structural and technological changes unfolding in the global economy, and the numerous opportunities for improving economic efficiency, it is now possible to achieve growth with better climate outcomes.

In terms of technology costs for new investments, Europe is in a much better position today than it was in 2007 when deciding on the current 2020 climate and energy framework. The levelised cost of electricity (LCOE) for renewable energy technologies, and the costs associated with energy efficiency have decreased significantly over the last few years.

Of all renewable energy technologies, photovoltaic (PV) has seen the sharpest decline in costs, with module prices falling 80% since 2008 [IEA, 2014a]. This has made it possible for countries across Europe to significantly reduce their support for PV deployment. In Germany, the cost of PV support has fallen from between €0.43 and €0.32/kWh to between €0.13 and €0.09/kWh in less than five years. This is developing into a global trend, with, for instance, PV systems on commercial buildings becoming competitive with retail electricity prices in several countries.

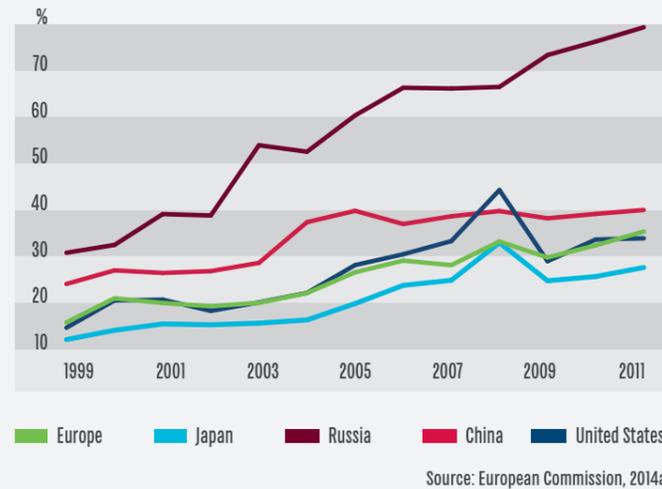
Certainly, facilitating these technology learning curves has come at a high cost – both in terms of the efforts required to help the technology take off, and with regard to lessons learned in designing and adapting policy instruments. The result is the currently high renewable energy support surcharges in several EU countries, which are the main reason

for Member States' sensitivity to setting new targets. However, the current surcharge levels reflect the financial efforts of the past. Europe is now facing a new reality of cost efficiency: energy efficiency and renewable energy have become the most cost-efficient of the new low carbon investments. LCOE for new onshore wind is now between €0.058/kWh and €0.137/kWh, while nuclear comes in at between €0.083/kWh and €0.112/kWh [Fraunhofer ISI, 2014a].

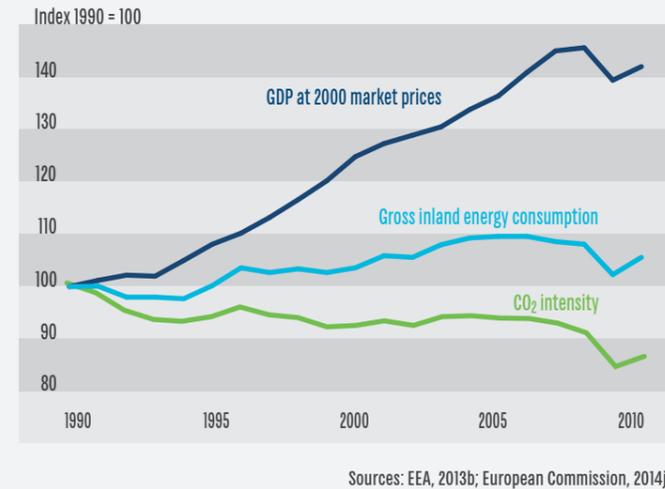
Further reductions in costs for renewable energy and energy efficiency measures are expected in the coming years. Studies show, for instance, that a balanced policy mix can achieve cost competitiveness for offshore wind as early as within the next decade [Prognos/Fichtner, 2013; The Crown Estate, 2012]. In contrast, costs for fossil fuels and nuclear energy are expected to increase over the next few years, particularly in the case of new investments. By 2030, LCOE for PV is expected to be between €0.066/kWh and €0.143/kWh, while costs for CCS will be between €0.077/kWh and €0.177/kWh [Fraunhofer ISI, 2014a].

Europe should now take advantage of the technology learning curve that all Member States have already financed in the framework of the 2020 climate and energy package.

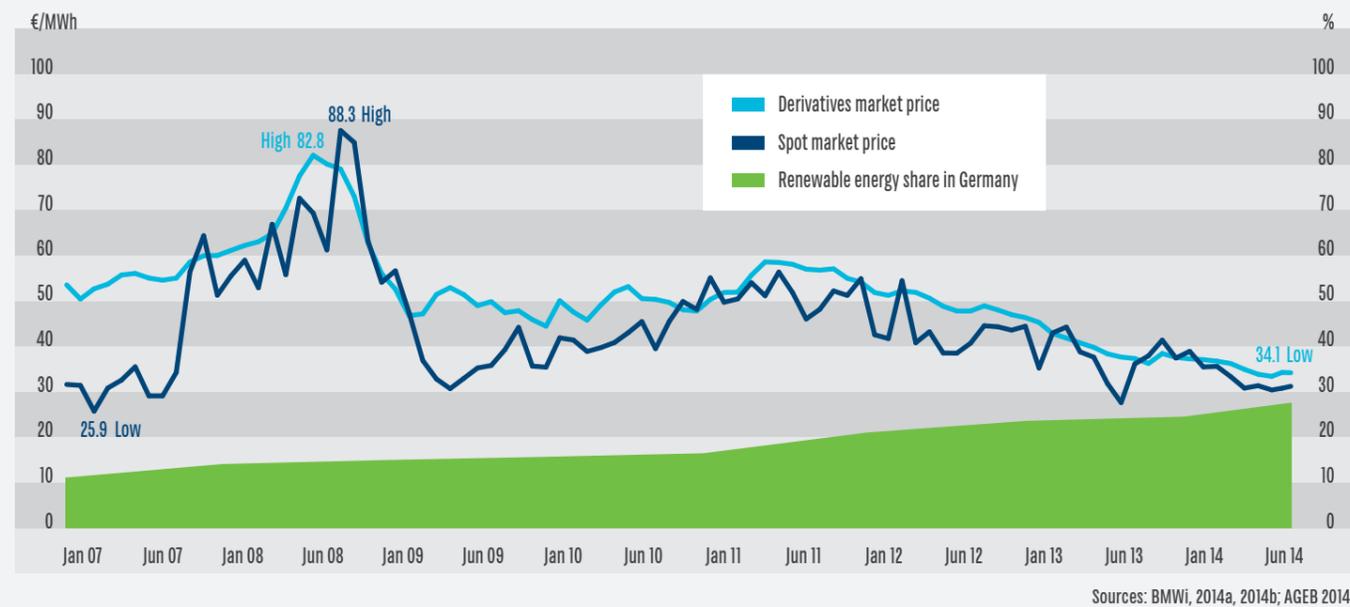
Europe's industry remains competitive despite increasing energy costs
Real unit energy costs as % of value added in the manufacturing sector



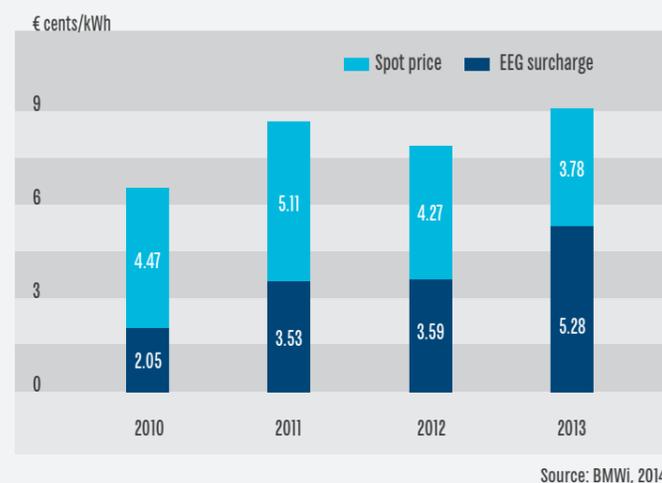
Europe shows steady growth with reduced energy consumption
Decoupling of GDP, energy consumption, energy intensity and CO₂ emissions since 1990



Power exchange prices have been steadily declining
Mid-month data for EEX spot market and derivatives market in €/MWh, share of renewable energy in German gross electricity consumption



Renewable energy surcharge and spot market prices
Average spot price and EEG surcharge in Germany since 2010



Europe's wind industry surplus is growing
Exports and imports of wind components from outside EU



3. THE GREATEST RETURN ON INVESTMENT

Strengthening competitiveness

In the past 20 years, the EU has successfully decoupled economic growth from energy consumption and GHG emissions. While its gross domestic product (GDP) has grown by roughly 45%, actual energy consumption has risen by just 3.2% and GHG emissions have fallen by 17%. This has led to a 25% drop in the energy intensity of the European economy.

European businesses have been instrumental in making Europe one of the world's most energy efficient regions. Their contribution was early supported by EU initiatives [European Commission, 2000]. Today, various sectors of industry produce more efficiently than their competitors in other regions. EU industry improved its energy intensity by almost 19% between 2001 and 2011, compared with just 9% in the US [European Commission, 2014e]. Despite higher energy prices, five EU countries currently rank among the world's ten most competitive economies [WEF, 2014].

Furthermore, the increasing share of renewable energy in the power sector has put downward pressure on spot market prices for electricity. Renewable energy technologies involve high capital expenditure (CAPEX) but low operating expenditure (OPEX). As a result they are replacing high-OPEX fossil fuel generation on the energy-only market (merit-order effect). This financial benefit starts to pay off for consumers in Europe. The trend is supposed to increase even further with the removal of regulated prices and with electricity markets adjusting to the new system flexibility required [European Commission, 2014d].

Higher energy efficiency and well-balanced, targeted exemptions for industry from carbon pricing and renewable support surcharges have been and will continue to be necessary to keep Europe's industry highly competitive, especially since global fuel costs have increased steadily [European Commission, 2014a]. Although various factors influence spot market prices, the downward pressure from the growing share of renewable energy has helped industrial competitiveness and may do so increasingly in the future. As energy costs will increasingly determine future compet-

itiveness, Europe will increasingly benefit if it can reduce its energy bills by bringing down energy demand and using generation technologies with a very low OPEX.

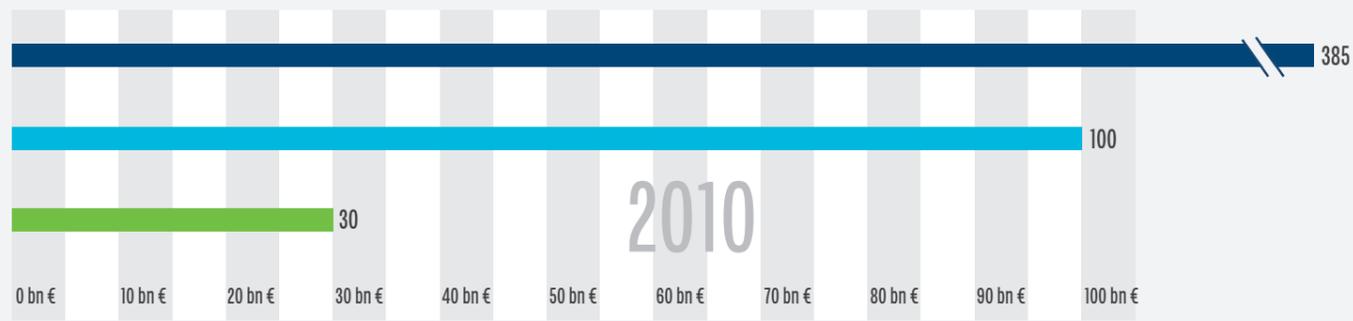
European and national policies, including the 2020 climate and energy framework, helped Europe specialise early on in innovative energy efficiency and renewable energy technologies. This made it a frontrunner in these fields. EU firms are playing a leading role in the global energy efficiency market, which was worth € 720 billion in 2010. This segment is by far the largest in the overall market for clean-tech and resource efficiency, and is expected to increase by 3.9% per year to € 1,240 billion by 2025 [BMU, 2012]. At the same time, the renewable energy industry contributes € 92 billion per year, which equates to 0.8% of European GDP [Fraunhofer ISI, 2014c]. This is more than the clothing industry (0.62%) and comparable to the furniture industry (0.99%) [Eurostat, 2014d].

Obviously, in a globalised world, this pattern of job creation and business expansion is replicated further afield and benefits other actors and regions. This is especially true of new production sites for renewable energy technologies in Asia, which can produce technologies and components at competitive prices. However, this has accelerated the technology learning curve through economies of scale and has helped to reduce support expenditures in Europe, too.

However, if the EU does not provide an attractive investment framework and retain its position as a key market for renewable energy and energy efficiency, then capital and companies will move to other regions in the world where demand is rising and markets are growing [UNEP, BNEF, 2014]. For Europe's growth prospects and future competitiveness it therefore remains crucial to keep the momentum it built up as the cradle of innovation in renewable energy and energy efficiency.

Renewable energy and energy efficiency reduce Europe's fossil fuel costs

Total energy import costs and avoided costs via renewable energy use and efficiency measures in 2010*



* 2010 figures for renewable energy, average annual savings until 2020 for energy efficiency
Sources: Eurostat, 2014a; European Commission, 2006, 2014a



Invest in youth employment instead of energy imports

21 bn €
Estimated annual cost of setting up Youth Guarantees for 7.5 million young people in the EU Member States

Source: ILO, 2012

European employment and education initiatives

6 bn €
Budget of the European Youth Employment Initiative (2014-2020)

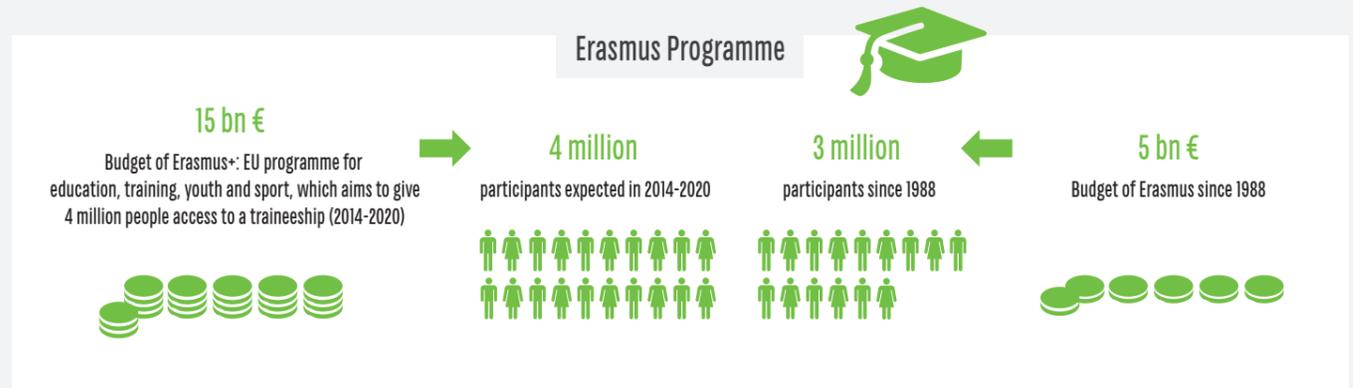
Source: European Commission, 2014h

Youth unemployment in the EU

7.5 million (<25) are not employed, not in education and not in training
153 bn € Estimated annual cost of having 7.5 million young people in the EU out of work, education and training



Source: European Commission, 2014h



Source: European Commission, 2012, 2014h, 2014i

3. THE GREATEST RETURN ON INVESTMENT

Turning costs into investments and enhancing energy security

Making efficiency improvements to coal-fired power plants is currently one of the most cost-efficient CO₂ mitigation options. However, focusing only on short-term cost efficiency comprises the risk of failing to invest in the new technologies that are needed for achieving long-term decarbonisation. In its Energy Roadmap 2050, the European Commission thus describes renewable energy, energy efficiency and infrastructure as “no-regret” options – they are critical components of every scenario already up to 2030 and especially for the long-term decarbonisation of Europe’s economy up to 2050.

Postponing investments in new energy technologies will lead to higher costs because the whole energy system will have to be adapted in a shorter timeframe (building renovations, more flexibility, grid reinforcement, storage, etc.). It also creates the risk of sunk costs and stranded investments in fossil fuels and in high carbon assets.

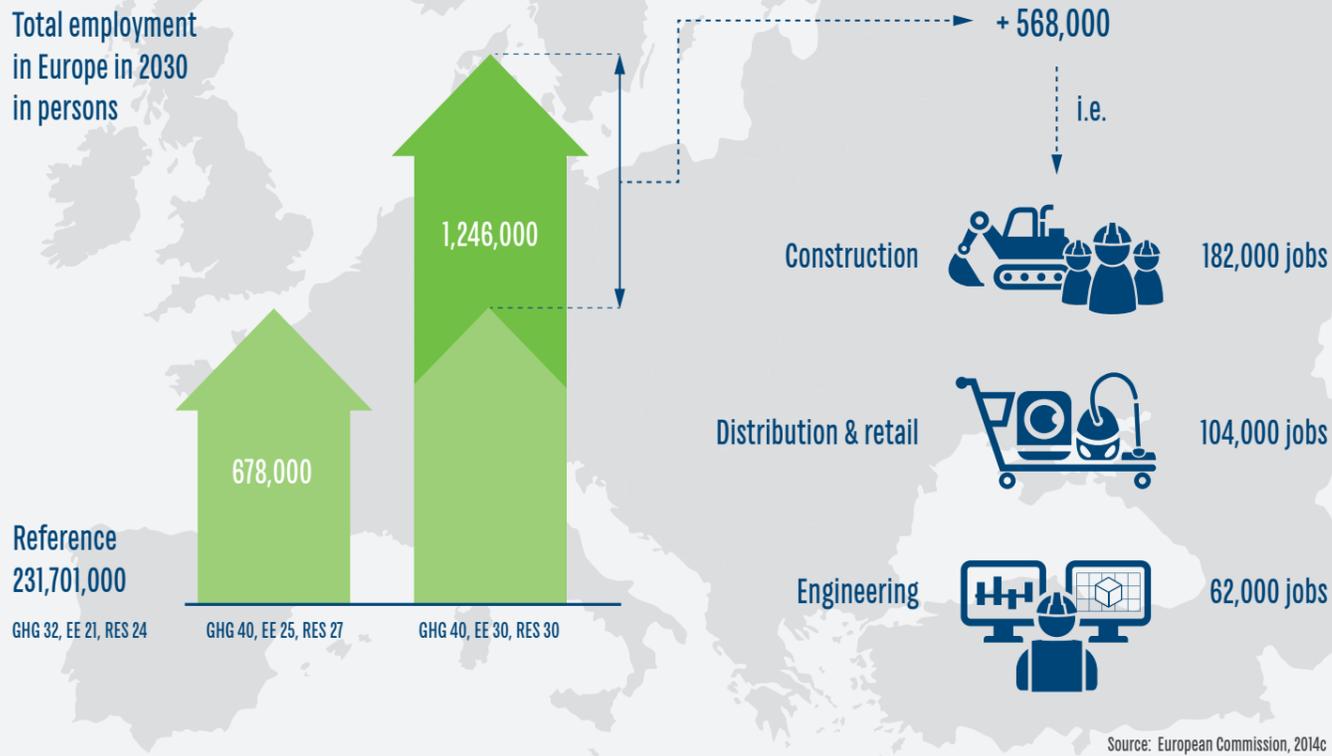
In addition, Europe can significantly reduce the amount it spends on fossil fuels by improving energy efficiency and increasing the share of renewable energy. Both of these measures are already saving the economy billions, with avoided fuel costs amounting to some € 130 billion per year at the European level. Renewable energy alone avoided € 30 billion in imported fossil fuel in 2010 [European Commission, 2014a]. IEA estimates indicate that the support costs for renewable energy in the EU were € 26 billion the same year, which means they were offset by the avoided costs of importing fossil fuels [IEA, 2011b].

The European Commission’s 2030 Impact Assessment found that the GHG40 scenario, which reduces GHG emissions by 40% and leads to a 27% share for renewable energy and energy savings of 25%, would reduce gas imports by just 9% and save € 190 billion on fossil fuel imports. In contrast, it found that the scenario with a 30% renewable energy target and more ambitious efficiency policies achieving a 30% decline in energy consumption would reduce gas imports by 26% and achieve an extra € 260 billion in fossil fuel savings, thus saving a total of € 450 billion by 2030 [European Commission, 2014c].

The EU economy can channel the resources it would have spent on fossil fuels into more innovation, more technology learning, new assets and grid modernisation. It could also use the funds to tackle youth unemployment. To give an example: the additional € 260 billion of savings is 43 times higher than the EU’s current spending on the Youth Employment Initiative (total budget of € 6 billion in 2014-2020) [European Commission, 2014h].

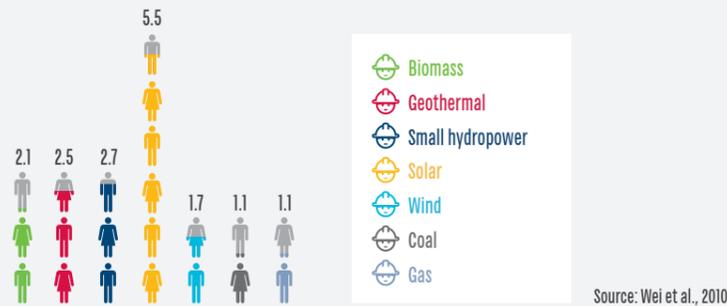
Energy efficiency and renewable energy will increase innovative jobs in Europe

Projected impacts on employment for 2030, compared to reference and GHG-only scenario



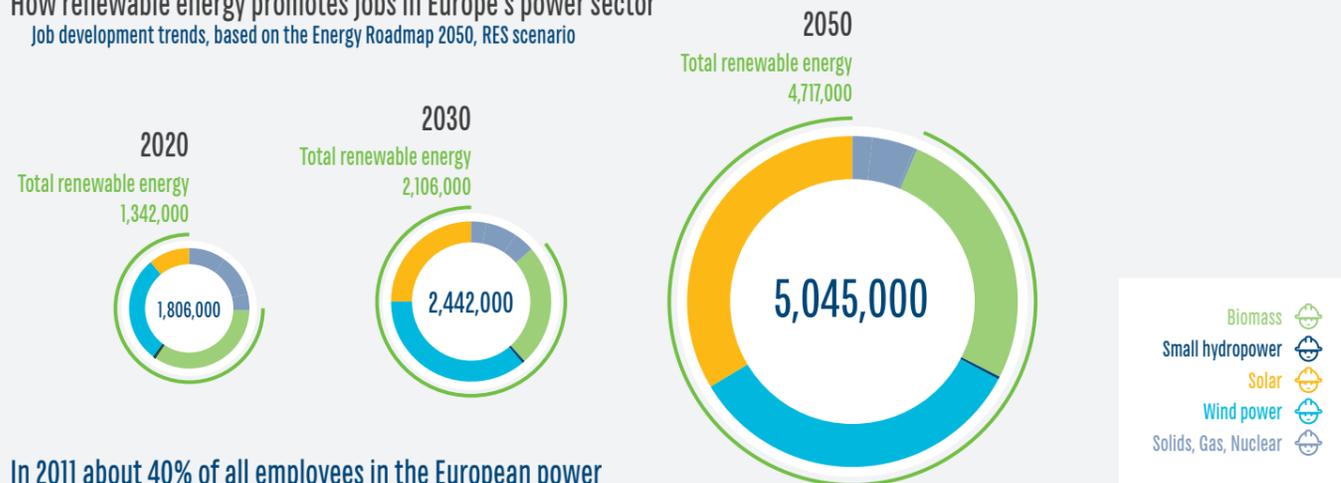
Renewable energy is labour intensive

No of people who can work for one year for 10 gigawatt hours of electricity



How renewable energy promotes jobs in Europe's power sector

Job development trends, based on the Energy Roadmap 2050, RES scenario



In 2011 about 40% of all employees in the European power sector worked in jobs related to renewable energy.

3. THE GREATEST RETURN ON INVESTMENT

Defining a new job agenda for Europe

Improvements in energy efficiency and the deployment of renewable energy have helped build a whole new industry and have created numerous jobs throughout Europe. Some two million people work in the various branches and related sub-branches of the renewable energy industry, making Europe the second biggest renewable energy employer in the world [IRENA, 2014].

Given that renewable energy technologies are typically more labour intensive than fossil-based ones, they can create more jobs per unit of generation capacity [Wei et.al, 2010; CEPS, 2014]. Energy efficiency measures are also labour intensive, especially in the buildings sector, where implementing them requires local capacities and so creates new jobs at the local level. On average, 17 jobs are created for every € 1 million invested [Ürge-Vorsatz, 2010].

The European Commission's Impact Assessment shows that dedicated energy efficiency policies corresponding to a 30% reduction in energy demand and a renewable energy target of 30% would result in 568,000 more jobs across the EU than with the scenario that envisages achieving energy savings of 25% and proposes a 27% share for renewable energy [European Commission, 2014c].

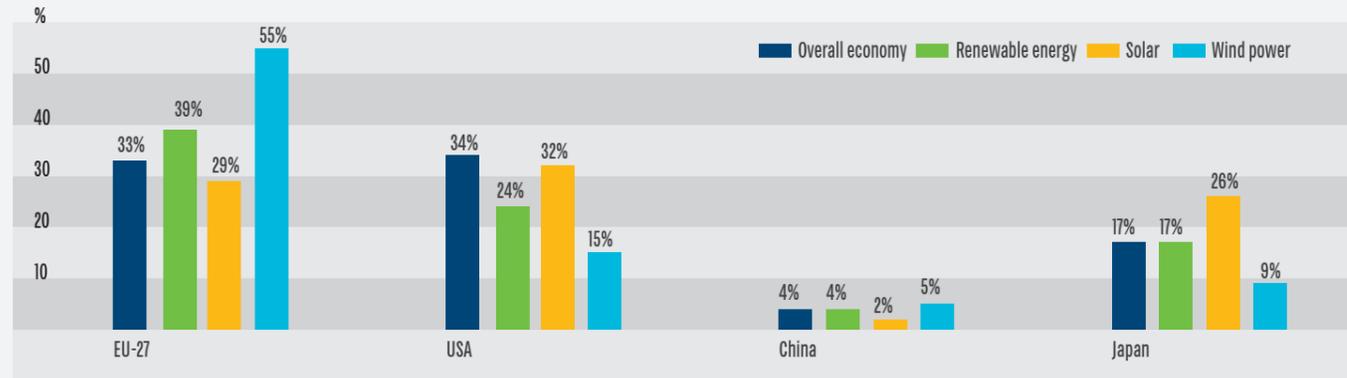
In view of the unsustainably high levels of unemployment in many European countries, particularly among young people, the job-creation potential of energy efficiency and renewable energy must be a key driver of the EU's 2030 framework.

Promoting education in Europe
University courses on renewable energy and energy efficiency in Europe



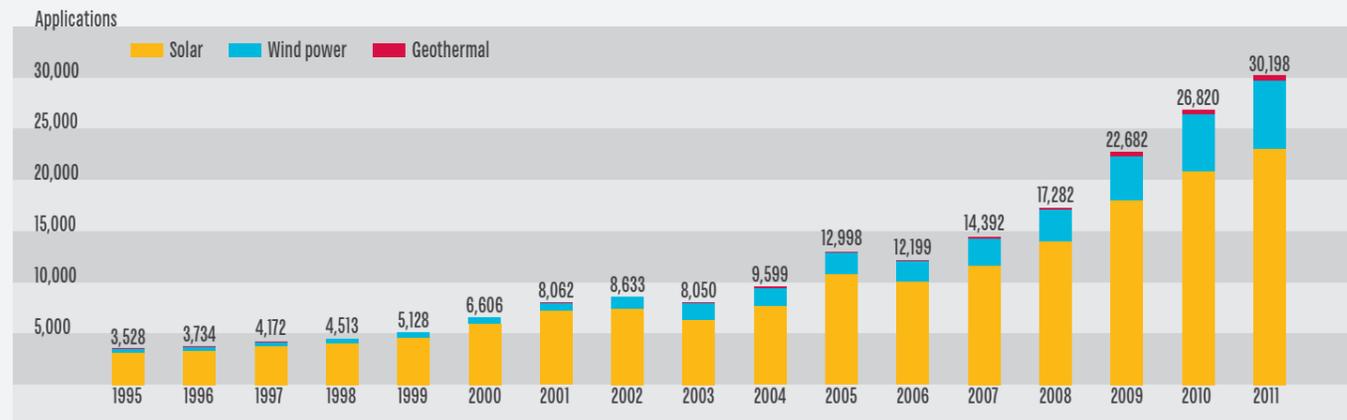
Source: Budig et al., 2014

Europe is number 1 for renewable energy patent applications
Share of worldwide annual patent applications for wind, solar and geothermal from 2000 to 2011



Source: European Commission, 2014a

Number of renewable energy patent applications is constantly growing
Worldwide annual patent applications for wind, solar and geothermal technologies



Source: WIPO, 2013

3. THE GREATEST RETURN ON INVESTMENT

Promoting know-how and innovation

Transforming Europe's energy system into one that is clean, safe and sustainable is not merely about producing and deploying new technologies. Promoting know-how and innovation for a complete system change will enhance competitiveness throughout the entire value chain. Modernising the energy system will lead to a new "system intelligence" based on innovative, smart technology solutions and their flexible and intelligent interaction throughout the supply and demand chain. This will generate significant innovation spillover effects in forward and backward linked sectors. There is growing evidence that research and development (R&D) of clean-tech has particularly high spillover benefits that are comparable to those created by robotics, information technology and nanotechnologies [Dechezleprêtre et al. 2013].

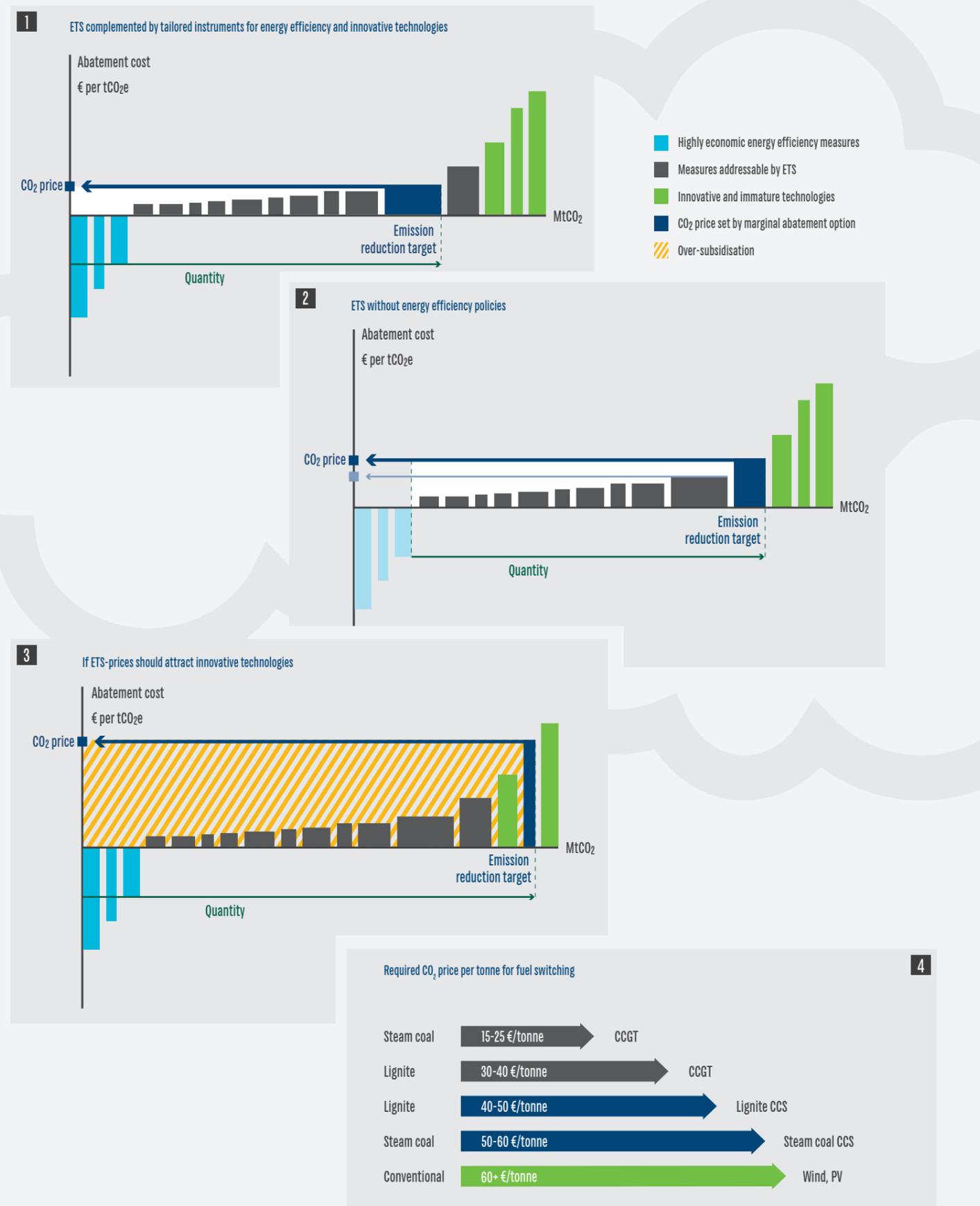
Statistics from the OECD and the World Intellectual Property Organization (WIPO) already prove that the energy transition has enormous potential for innovation. Annual patent applications for renewable energy, energy efficiency and climate change mitigation technologies have doubled within ten years, with global figures climbing from 87,000 in 1999 to 170,000 in 2010 [OECD, 2014].

Japan used to be the leading nation for renewable energy patents, with most of them focusing on solar technologies. However, Europe began strengthening its position in 2000 and has since become an innovation leader. As a result, Europe now files the most patent applications for renewable energy, and wind is the dominant technology [European Commission, 2014a].

The rapid increase in applications connected to energy efficiency and renewable energy has also transformed the education system. More than 1,000 study programmes on renewable energy and energy efficiency are now available across Europe, with Germany and the UK leading the field [Budig et al., 2014]. There is still a need for more courses, though, to meet the increasing demand for highly skilled engineers. These training and innovation hubs will form the bedrock of Europe's future competitiveness.

How the ETS needs to be complemented to be most cost-efficient

Stylised curve of emission reduction measures



4. THE MOST EFFICIENT AND EFFECTIVE POLICY MIX

Strengthening the ETS

The EU Emissions Trading Scheme (ETS) is the EU's main climate policy instrument and the most cost-efficient approach to incentivising short-term decarbonisation options in particular. It also provides the necessary overall innovation signal for low carbon investments in Europe.

However, since the surplus of allowances has brought down prices, the ETS cannot send the signals needed to encourage investment in further decarbonisation. Therefore, the proposed Market Stability Reserve (MSR) is an important step towards providing a robust and continuous carbon price signal. However, the MSR should already be introduced in 2017 so that it can have an early effect on the carbon market and avoid a steep rise in CO₂ prices at a later stage. For the same reason, the backloading allowances (900 Mt of CO₂) should be transferred directly into the reserve.

Preventing carbon leakage

Effective provisions that prevent carbon leakage are also key to ensuring Europe's competitiveness during the decarbonisation process. As long as other major economies do not undertake comparable efforts to reduce emissions, adequate carbon leakage measures for energy-intensive industries that compete on the global stage will be needed to ensure a level playing field. Therefore, the existing rules designed to avoid carbon leakage, which address both the direct and indirect costs of the ETS, should be adequately continued post-2020.

Complementing needs

For the ETS to be most effective and efficient, it needs to be complemented by a well-balanced mix of tailored instruments.

Non-economic barriers, such as administrative procedures and planning and building requirements, which are particularly relevant to exploiting Europe's energy efficiency potential, cannot be tackled by carbon pricing

alone [European Commission, 2014f]. It should also be noted that the ETS only covers part of the economy. It does not include emissions from small-scale heating plants and the transport sector, where there is a great deal of scope for increasing energy efficiency.

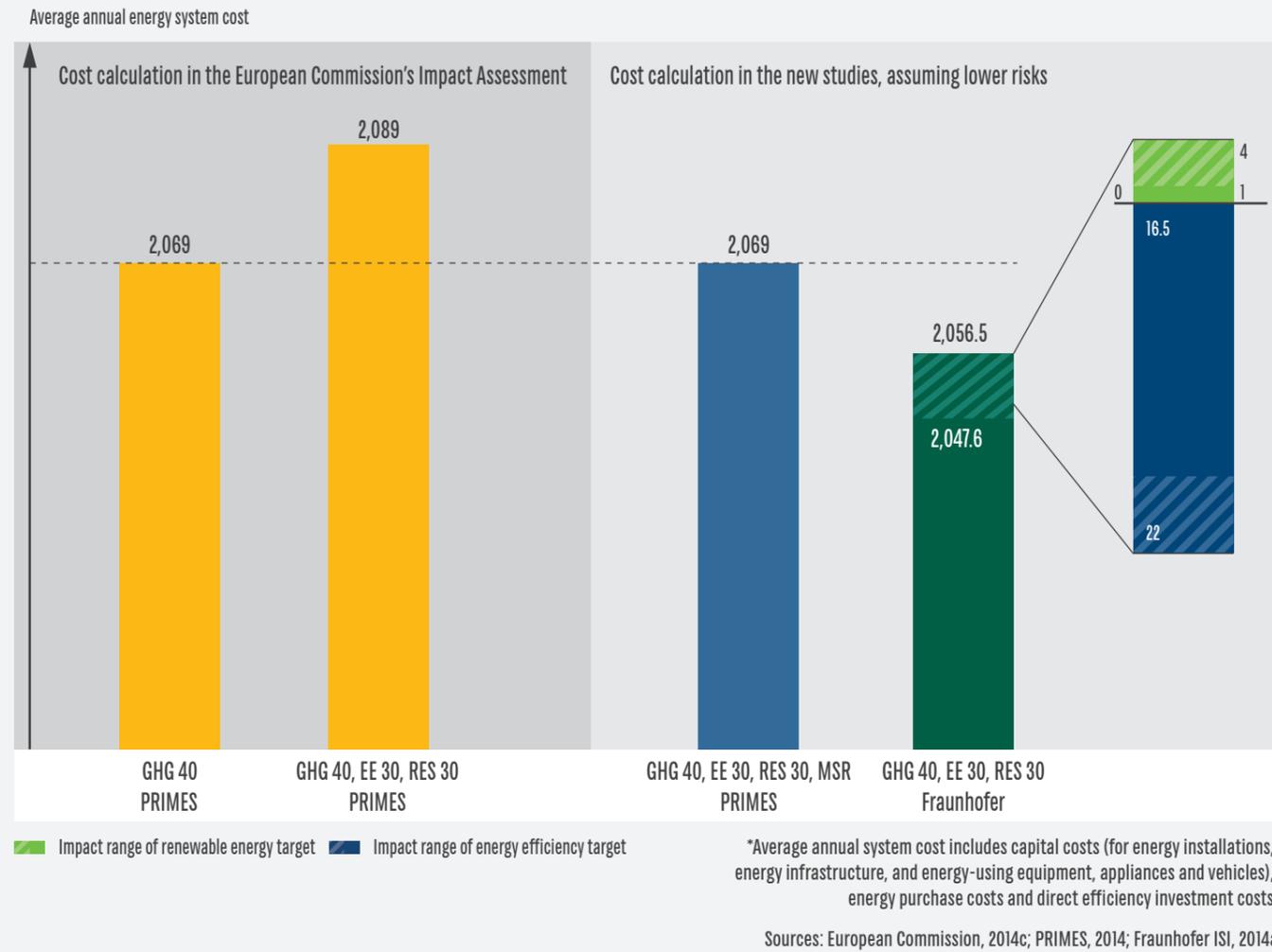
Moreover, as the ETS incentivises the most cost-efficient short-term mitigation options, it is not designed to attract early investments in innovative technologies. These investments are, however, crucial to long-term cost-efficient decarbonisation. Their technology learning curves should start early so that they can benefit from cost reductions before they need to be deployed on a large scale [European Commission, 2011a]. Furthermore, discussions about a possible new market design illustrate that changing the complex energy system of one of the most industrialised regions in the world cannot be achieved overnight. Predictability and continuity are essential to ensuring that all actors have sufficient time to adapt.

If the ETS was designed to stimulate today the whole range from the most cost-efficient measures to new, innovative technologies, the result would be significantly higher carbon prices. This would also lead to windfall profits for the most cost-efficient abatement options, since in the ETS the marginal technology sets the price for all abatement options.

Most importantly, the fluctuations inherent in the price of ETS allowances would lead to higher risk premiums for investors, higher financing costs, and may ultimately result in considerably higher system costs in an ETS-only approach.

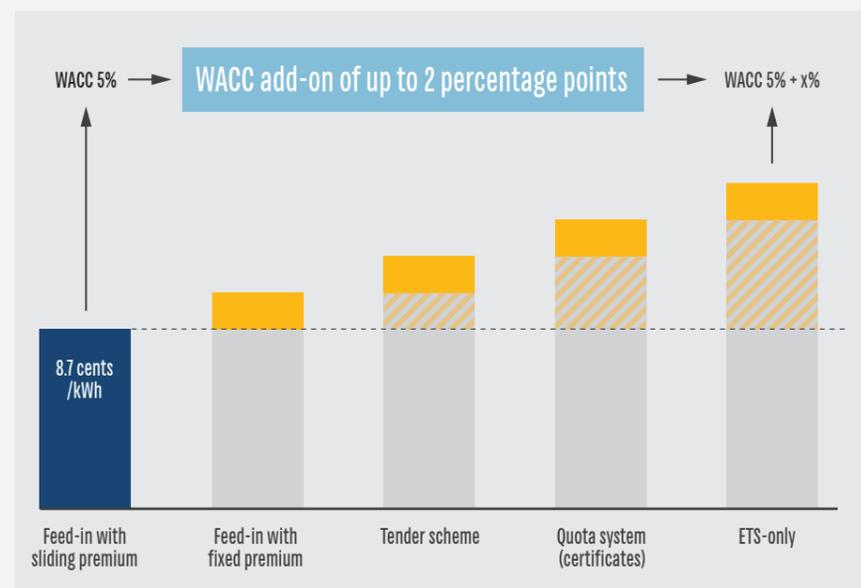
A three-target approach is cost-efficient

Estimated average annual energy system cost* in Europe (2011–2030) for various scenarios and using different assumptions on risks and financing costs, in bn €



How different support schemes increase investor risk

Changes in levelised cost of electricity for utility-scale PV in southern Germany for various support schemes and differing weighted average capital costs (WACC)



Source: Prognos, 2013

4. THE MOST EFFICIENT AND EFFECTIVE POLICY MIX

Reducing the cost of financing

An overarching, enabling policy framework, including dedicated GHG, renewable energy and energy efficiency targets and accompanied by a set of tailored instruments, can reduce investment risks significantly while also allowing for important innovation signals from the market (e.g. market premiums). It ensures predictability and increases confidence for all market actors. In turn, this reduces the cost of capital and helps to unlock private investments, which is particularly important for financing innovative, capital intensive technologies.

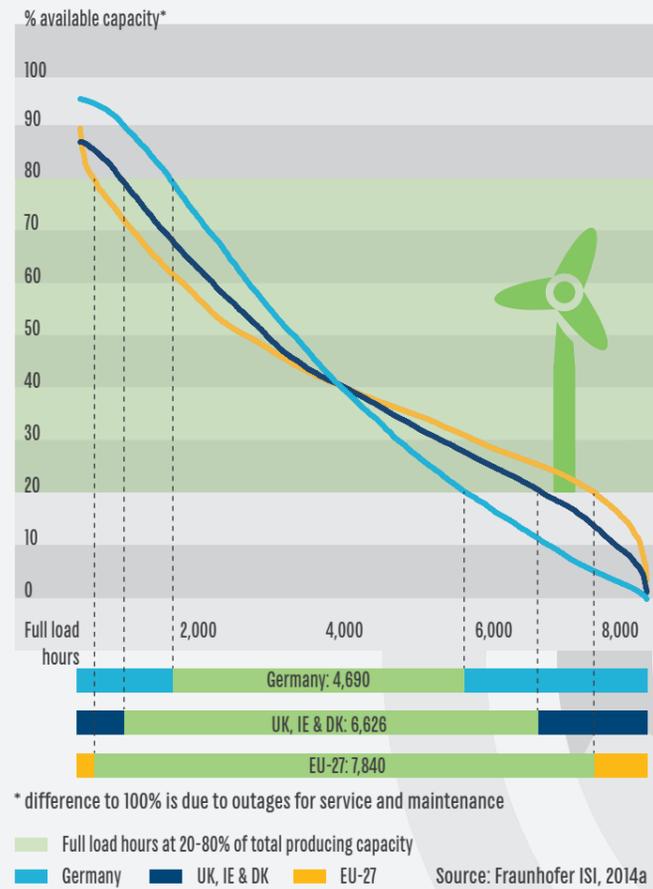
With a single GHG target and an ETS-only approach, the cost of capital for renewable energy is estimated to be 2% higher than in a market premium approach [Prognos, 2014]. Cost reductions for new and innovative technologies can thus be achieved in a much more cost-efficient way with a tailored instrument than with carbon pricing only [Imperial College, 2012].

In line with this, a new PRIMES scenario based on the European Commission's 2030 Impact Assessment assumes that dedicated targets and tailored measures will result in significantly lower financing risk and cost of capital than a single GHG target and an ETS-only approach [PRIMES, 2014]. This new scenario thus differs from the 2030 scenarios in the Impact Assessment, in that it assumes significantly lower risk premiums and costs of capital for renewable energy and energy efficiency. In the new PRIMES scenario, which sets a GHG target of 40% and a 30% target for both renewable energy and energy efficiency, total system costs are € 20 billion lower than in the GHG40/RES30/EE30 scenario in the European Commission's 2030 Impact Assessment. Notably, the total system costs are the same as the European Commission's most cost-efficient GHG40 scenario, which leads to a renewable energy share of 27% and increases energy efficiency by 25%. Overall electricity expenditures for final consumers are even lower in this new scenario than in all other scenarios, due to increased energy efficiency and reduced cost of capital.

This finding is supported by a new Fraunhofer study, which found that combining a 40% GHG target with a 30% energy efficiency target and a 30% renewable energy target could reduce total energy system costs by up to € 21 billion per year in 2030 in comparison to a GHG40 approach [Fraunhofer ISI, 2014a]. The main reasons for this finding are, again, lower risk premiums and cost of capital, as well as broader technology diffusion across Europe. In addition to the new PRIMES scenario, the Fraunhofer study provides a more detailed analysis of potentials for renewable energy (e.g. available cost-efficient wind sites across Europe) and energy efficiency.

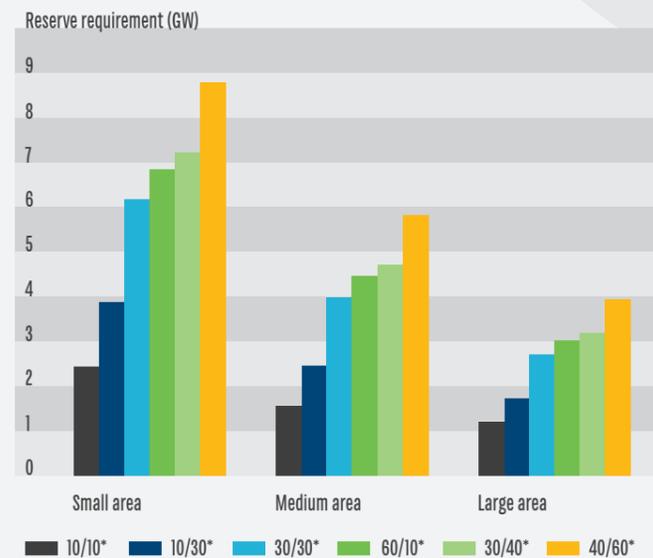
Diversified wind power development reduces fluctuation

Full load hours from producing wind power capacity in individual markets and the EU-27



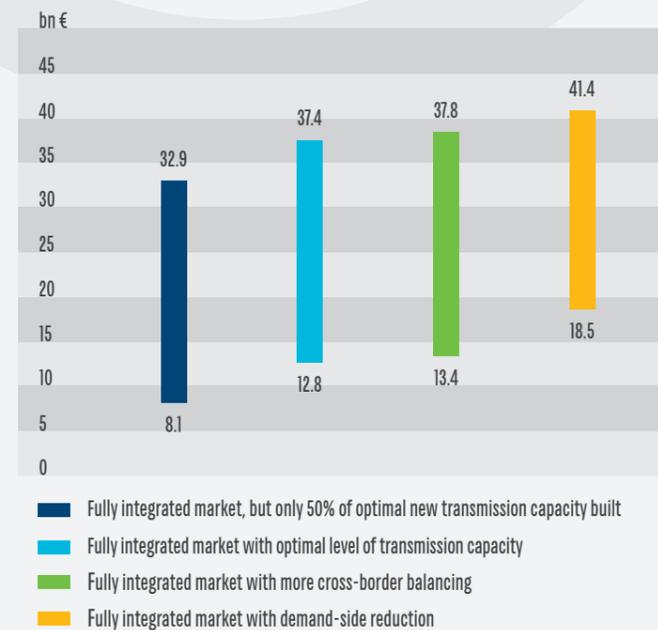
Large balancing area halves need for back-up capacity

Modelling results for western United States



Save billions through improved market integration

Annual cost savings range in integration services in 2030 with 66% electricity from renewable energy in Europe in bn €



4. THE MOST EFFICIENT AND EFFECTIVE POLICY MIX

Using diversification to lower overall system costs

A well-balanced, target-led policy mix that includes dedicated policies for GHG mitigation, renewable energy and energy efficiency will facilitate greater coordination, diversification of technology deployment and increased market integration between EU Member States and thus help reduce overall system costs even further.

With a GHG-only approach only those renewable energy sites would be developed that are most cost-efficient with respect to their LCOE. However, with a growing share of variable electricity generation from renewable energy, a diversified deployment of renewable energy across Europe becomes increasingly important.

Firstly, there is less need for grid reinforcement when renewable energy technologies are deployed across Europe in a diversified manner [EWI, 2011].

Secondly, a diversified deployment of renewable energy at many sites across Europe would make the system less vulnerable to weather conditions and variability since wind availability is much more balanced across the whole of Europe. If, for instance, wind technology is deployed across multiple sites, the share of electricity generation that can be regarded as secured available capacity increases from 9% to over 14% [TradeWind, 2009]. An analysis of operating hours at 20% to 80% of total generation capacity shows that aggregating wind power at the European level results in many more operating hours (7,840) than at the national (4,690) or regional (6,626) level [Fraunhofer ISI, 2014a]. Adding solar technologies in multiple locations across Europe will make the overall generation capacity available from renewable energy even more balanced [IEA, 2014b].

Thirdly, integrating renewable energy into large areas is also key to making the most efficient use of flexibility options across Europe. Higher transmission capacity, which would increase cross-border balancing and market integration, can save about €38–€41 billion on annual system service costs [Booz & Co, 2013].

Moreover, a balanced EU framework with clear targets will improve the coordination of Member State policies. It will create a predictable deployment corridor for the whole of the EU – something that has become particularly important for the overall system change in the electricity sector, both from the perspective of private investors and operators and in terms of coordination between neighbouring countries.

Furthermore, a coordinated EU framework will also have a key role to play in energy efficiency measures, by helping to avoid barriers to market entry, e.g. different efficiency requirements for products and industries in different European countries.

50% of Europeans think that climate change is one of the most serious problems in the world.



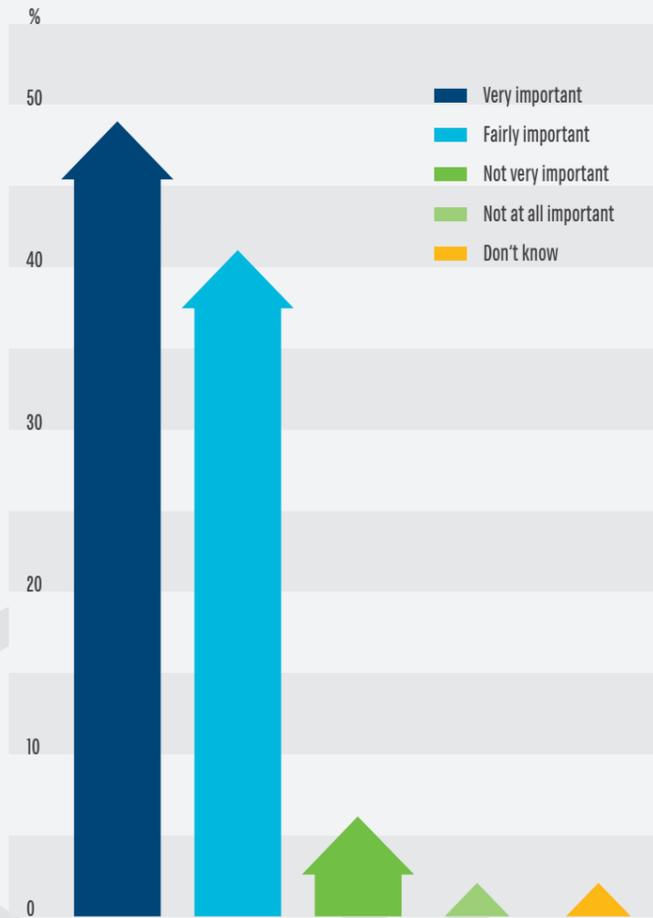
90% of Europeans want national renewable energy targets.



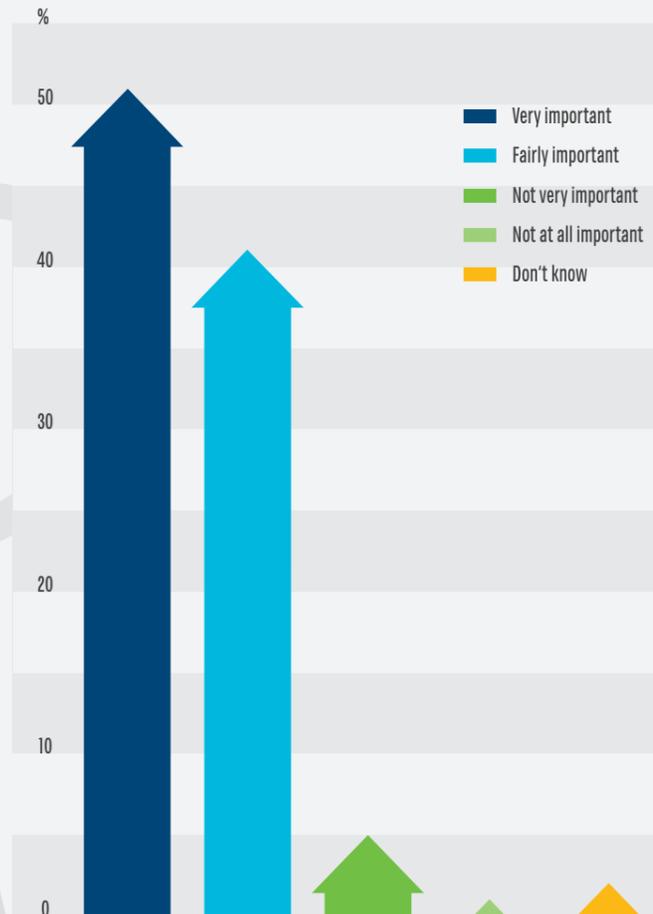
92% of Europeans are in favour of national efficiency measures.



Question: How important do you think it is that your national government sets targets to increase the amount of renewable energy used, such as wind or solar power, by 2030?



Question: How important do you think it is that your national government provides support for improving energy efficiency by 2030?



Source: European Commission, 2014g

5. THE PEOPLE'S VOICE

Acting in line with Europe's citizens

The European Commission has been conducting surveys on people's attitudes to climate change, renewable energy and energy efficiency in all EU Member States since 2008.

The most recent survey asked in total more than 27,900 Europeans in all 28 Member States about their attitudes to the 2030 climate and energy framework [European Commission, 2014g].

Ninety percent of respondents feel it is important that their national government sets targets for increasing the share of renewable energy, with around half (49%) saying that it is "very important". Only a small minority (8%) think it is not important for their government to set such targets.

More than nine out of ten respondents (92%) say that support from national governments for improving energy efficiency is important, with half (51%) saying that it is "very important". Only a very small minority (6%) think it is not important for their government to provide such support.

Overall, the findings of the most recent survey clearly show that four out of five Europeans (80%) believe efforts to fight climate change can help boost growth and jobs within the EU. In other words, while most Europeans see the economy as a more immediate concern, the majority agrees that tackling climate issues, reducing fossil fuel imports, increasing the share of renewable energy and improving energy efficiency can bring important economic benefits.

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