The International Energy Agency (IEA), an autonomous agency, was established in November 1974. Its primary mandate was—and is—two-fold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply, and provide authoritative research and analysis on ways to ensure reliable, affordable and clean energy for its 29 member countries and beyond. The IEA carries out a comprehensive programme of energy co-operation among its member countries, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports. The Agency’s aims include the following objectives:

- Secure member countries’ access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.
- Promote sustainable energy policies that spur economic growth and environmental protection in a global context—particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
- Improve transparency of international markets through collection and analysis of energy data.
- Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
- Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations and other stakeholders.

IEA member countries:

Australia
Austria
Belgium
Canada
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Japan
Korea (Republic of)
Luxembourg
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
Switzerland
Turkey
United Kingdom
United States

The European Commission also participates in the work of the IEA.

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1. EXECUTIVE SUMMARY AND KEY RECOMMENDATIONS

EXECUTIVE SUMMARY

Since the first International Energy Agency (IEA) in-depth review in 2008 of the energy policy of the European Union (EU), the European Union has taken significant steps towards reaching its energy and climate objectives for 2020 and integrating the fragmented electricity and natural gas markets into a single energy market. As the current report shows, progress is evident in many areas of EU energy policy since 2008, but challenges also abound.

Energy policy in the European Union aims to address the three objectives of economic competitiveness, security of supply and environmental sustainability. In 2008, sustainability – notably, mitigating climate change – was the key driver for EU energy policies. However, the context for EU energy policy has changed dramatically. Today, concerns of energy security and industrial competitiveness have become more pressing.

Domestically, the European Union has been suffering from a major economic and financial crisis, which led to a reduction in energy demand. Indigenous oil and gas production and refining capacity have been declining even faster than the fall in EU demand. Imports continue to rise with implications for energy security. The outlook for unconventional gas and oil exploration in the European Union remains uncertain.

During 2008 to 2013, the European Union has been directly feeling the impact of global energy developments: the vast increase in energy demand in emerging economies; the turmoil in North Africa, Middle East and Ukraine, threatening oil and gas production or supplies; the surge of unconventional oil and gas production in North America; ample and low-cost international coal supplies; and the nuclear accident in Fukushima Daiichi, bringing back concerns about the use of nuclear power, while at the same time, leading to increased pressure on the global liquefied natural gas (LNG) supplies.

PROGRESS AND CHALLENGES TOWARDS 2020

At the time of the first review in 2008, the European Union had embarked on two major reforms in energy and climate policy: first, the progressive liberalisation of the internal electricity and gas markets through the third internal energy market package, the so-called “Third Package”; and second, ambitious climate and energy targets and policy measures as part of the so-called “2020 Climate and Energy Package”.

THE INTERNAL ENERGY MARKET

The implementation of the Third Package led to three main achievements: 1) more harmonised cross-border trade and network rules; 2) greater independence of national regulators and transmission system operators and their co-operation through newly created European bodies – the Agency for the Cooperation of Energy Regulators (ACER)
and the European Networks for Transmission System Operators – Gas and Electricity; and 3) the enforcement of competition in the energy sector, following the sector inquiry of 2006, supporting further market opening.

Since 2008, energy markets in the European Union have become more integrated with increasing trade flows. Gas markets in Western Europe saw higher liquidity at larger gas trading hubs, thanks to ample gas supplies, new gas import and storage capacity and shorter-term contracts, partly mitigating the pressure from the oil price link. In electricity, an integrated day-ahead market is now set up across the European Union through price coupling of the regions: the Nordic and Baltic markets, Central Europe, North West Europe, and recently South West Europe (Portugal and Spain).

However, the European Union has yet to create a fully integrated EU energy network and energy market. Both gas and electricity markets suffer from low cross-border capacity at many interconnections and from congestion. Large parts of the market in Eastern and Southern Europe remain isolated. The European Union is addressing these challenges by harmonising network rules and speeding up investments in priority energy infrastructure projects, the so-called “projects of common interest”. The process has recently started, and continued implementation will be needed in the years to come. Another challenge relates to the transformation of the energy system to accommodate higher shares of variable renewable energies. In electricity, harmonising rules for trade and network operation has been difficult, as system operation remains largely confined to national grids. Further, despite increasing cross-border trade and decreasing wholesale prices, retail prices are on the rise. Wholesale market opening has not favoured the retail market level, which remain national in scope, as the fall in wholesale prices has been largely compensated by higher green levies, taxes and network cost. Consumers do not feel the benefits from switching suppliers. Indeed, regulated prices and market power exercised by the historic incumbent persist in many member states.

**CLIMATE AND ENERGY TARGETS FOR 2020**

In 2009, as part of the 2020 climate and energy package, the European Union adopted three unilateral targets for 2020: 1) reduce its greenhouse gases (GHG) emissions by 20% in 2020 below 1990 levels, 2) increase the share of renewable energies to 20% in its gross final energy consumption and to 10% in transport, and 3) reduce its total primary energy consumption by 20% in 2020, relative to the 2007 projections of energy consumption in 2020.

Strong progress has already been strong towards a low-carbon economy, and the European Union leads efforts among IEA member countries, but further efforts will still be needed to achieve the expected outcomes by 2020.

First, the European Union is on track towards achieving its GHG emissions reduction goals. In 2012, GHG emissions had decreased by 19.2% compared to the level of 1990, as a result of lower demand during the economic crisis, fuel switching, the growing deployment of renewable energies and energy efficiency action.

Second, the European Union’s share of renewables in final energy consumption increased to 14.1% in 2012 from 8.7% in 2005, thanks to renewable support schemes encouraging investment, in particular in solar photovoltaic (PV) and onshore wind. Trends to 2020 will lead to a continuing growth in electricity generation from renewable sources. IEA analysis based on current national ambitions) suggests, however, that there may be a shortfall in meeting the 2020 target, unless policy initiatives are taken to stimulate the market in some countries and for some technologies.
Third, the European Commission estimates that the European Union could achieve 18% to 19% of energy savings up to 2020, with measures in place today, notably the Energy Performance of Buildings Directive, Eco-design and Labelling Directives, the Energy Efficiency Directive, and EU funds with a focus on energy efficiency. A third of the savings will result from lower demand amid the economic crisis. Progress towards the 20% target will depend on further implementation of energy efficiency policies by the member states and the scaling-up of energy efficiency investments to finance retrofits in existing buildings and encourage demand-side management by consumers through smart meters and grids. In this context, to achieve the 20% energy efficiency target by 2020 remains a challenge.

At the same time, the variety of EU-wide and national instruments employed to meet climate and energy objectives has brought about challenges and unintended results. Increased electricity generation by renewables and reduced electricity demand, arising in part from energy efficiency policies and the economic crisis, has reduced the need for allowances to meet the carbon emissions limits set under the EU-Emissions Trading Scheme (EU ETS).

Since 2008, the EU ETS has been plagued by a surplus of allowances, resulting in the collapse of the carbon price from EUR 30 per tonne of carbon dioxide (tCO₂) in 2008 to EUR 6 per tCO₂ in 2014. The system was not designed flexibly enough to adapt to lower demand. As a result, the EU carbon market did not stimulate investment in the decarbonisation of the power generation or other sectors and only contributed to a small extent to meeting GHG targets. In 2012, the power sector remained the largest emitter (38%) when comparing total EU CO₂ emissions per sector.

Instead, national support policies and subsidies for energy efficiency and renewable energies have been driving decarbonisation. The IEA World Energy Outlook 2014 estimated the total value of subsidies to renewable energy in the European Union of around USD 70 billion or EUR 52 billion in 2013, which equals 57% of the global subsidies to renewable energy, with solar PV accounting for over USD 30 billion or EUR 22 billion, followed by wind with over USD 15 billion or EUR 11 billion. The support schemes had a strong impact on the wholesale electricity market, pushing down prices and reducing operating hours for conventional thermal plants. Together with changes in the relative international commodity prices, power generation moved towards coal, away from natural gas, amid changing economics of power plant dispatch.

The European Union saw a revival of coal use in power generation, at a time of cheap international coal prices and high EU natural gas prices, while gas-fired power plants are being mothballed in several countries. Since 2008, prices for natural gas increased, while coal and carbon prices turned out lower than expected. The growth of solar PV was much quicker than expected. Taken together, this has led to falling wholesale electricity prices, lower utilisation and low revenues from thermal plants, notably gas-fired power plants. At the same time, increasing deployment of supported renewable technologies continues to push up electricity retail prices, as support is charged to end users through green surcharges or taxes.

As the examples illustrate, there has been a lack of integration of climate and energy policies at EU level and between EU and national energy policy decisions, which could not address the interplay and trade-offs between different targets and policy measures.

**RECONCILING CLIMATE AND ENERGY OBJECTIVES**

While sustainability and climate change were the drivers of EU energy policies in 2008, the competitiveness of the Union’s industry has more recently gained prominence.
Energy security concerns have also come to the fore following the disruption of Libyan supplies and the Russia-Ukraine crisis.

While the European Union continues its efforts towards meeting the 2020 targets and completing the internal energy market, maintaining the balance among the three goals of the EU energy policy – competitiveness, energy security and environmental sustainability in the longer term – in the new global context is more important than ever before.

COMPETITIVENESS

The relative competitiveness of the European Union vis-à-vis its trade partners has changed as a result of the shale gas revolution in North America and energy demand growth in Asia. Structural price differences between the European Union and its trading partners are growing. The United States is experiencing an era of cheap gas as a result of booming unconventional gas production, while Asian countries’ rising demand drives up global import prices for LNG.

During 2013, EU gas import prices at major hubs (in Germany, the Netherlands, and the United Kingdom) were around USD 9 to 10 per million British thermal units (MBtu), compared to gas prices of USD 4 per MBtu in the United States and Asian average LNG prices of around USD 12 to 15 per MBtu. Despite the overall decrease in EU wholesale electricity prices since 2008 (around 35%-45%), however, according to IEA and Eurostat data, in 2013, EU electricity prices for industry remained 40% above the United States prices; although they are only two-thirds of Japanese industry prices. These differences are likely to persist, despite the recent convergence of international gas prices in mid-2014, with EU spot gas prices falling to a seasonal record low of USD 7 per MBtu. Price differentials matter greatly for the energy-intensive industries, using gas as feed stock, or consuming large amounts of electricity and facing international competition.

The European Union is experiencing the restructuring of its refining capacity and manufacturing base. This is set to continue in the coming years. The EU refinery sector is challenged by falling oil demand and chemical production, declining local crude production and shrinking export markets for gasoline. Over the period 2007 to 2013, 15 refineries have closed in the Union and further restructuring is expected. The impacts of restructuring are felt differently across the European Union, with some member states successfully emerging from the restructuring thanks to process innovation, access to cheap feedstock and global commodity markets. Experience in IEA member countries shows that where the refining industry has invested in energy efficiency and process innovation, and where it is well integrated with the petrochemical sector, it can remain competitive.

The IEA World Energy Outlook 2013 underlined that the EU share in the global export market for energy-intensive goods, especially for chemicals, is expected to fall (by around 10% across all energy-intensive goods, i.e. cement, chemicals, pulp and paper, iron and steel), more than Japan (-3%), while United States and emerging economies are expected to be able to increase their shares in the export markets.

To stimulate the growth of the EU economy, the competitiveness of its industry is a key priority on the strategic agenda. In the current economic context, cost-effective action is an essential. Energy-intensive industrial sectors which are exposed to carbon leakage and international competition can under the EU ETS receive free allowances or be compensated by other means for the associated cost up to 2020; nevertheless, global
competition is increasing and margins are tight, thus costs of operation, including from environmental compliance, can have an important impact.

First, the European Union has to reduce compliance costs through a more integrated energy and climate policy at EU level which balances economic, environmental and security of supply goals. Investment in energy technology innovation is a crucial component for reducing the cost of capital and operations, thus helping the competitiveness of the European Union’s industry.

Second, a fully functioning internal energy market with a single energy network can bring substantial economies of scale, welfare benefits and incentives for market-driven investment in the energy sector. The European Union should give priority to completing the internal energy market and investing in energy infrastructure.

The price reductions in the wholesale market should be transferred to consumers at retail level by abolishing regulated prices and activating consumers to manage their demand. The distortion of the markets should be reduced by making public interventions, including energy support schemes, more cost-effective. The trade-off between competitive markets and the need for public intervention, in the pursuit of climate and energy policies, should be reconciled in the future. The European Commission decided to address the issue through new guidelines for energy and environmental state aid which came into force in July 2014.

STRENGTHENING EU ENERGY SECURITY

The European Union is the largest energy importer in the world, importing 53% of the energy it consumes. As domestic fossil fuel production continues to decline, gas imports are expected to increase between 2020 and 2030, while oil imports are projected to remain stable, even in a decarbonisation scenario.

Indeed, energy security concerns have increased for gas, oil and electricity, since the last in-depth review.

Security of gas supply

Perceptions in the European Union of the security of gas supply changed with the 2009 gas dispute between Russia and Ukraine which caused a disruption of gas supplies to the European Union. During 2014, a renewed conflict has been threatening winter gas deliveries to Europe and brought EU gas security again to the forefront, as roughly 15% of EU gas imports arrive through Ukraine. On 30 October 2014, an agreement between Russia and Ukraine was brokered by the European Commission to secure winter gas supplies to the EU.

In the aftermath of the 2009 crisis, the European Union already reformed its gas emergency policies and today benefits from new gas pipelines and reverse flows, higher LNG import and gas storage capacity. Storage sites are filled above historic levels in winter 2014-15. Hence, the resilience of the EU gas market to short-term disruptions has partly improved. However, several shortcomings remain.

First, reverse flows are not available at all interconnections between market areas, and access across borders to storage and LNG is hampered. Many interconnection points remain congested due to long-term bookings under existing contracts.
1. Executive summary and key recommendations

Second, despite investment made in new LNG terminals, the European Union depends on imports of pipeline gas, notably from Russia. This is linked to the fact that LNG supplies to Europe are re-exported to Asia, while EU LNG supplies saw a record low. This is the result of project delays in global LNG investment, strong Asian gas demand, pushing up import prices and reverting LNG to Asia and the unavailability of supplies from North Africa. The return of LNG supplies to Europe will depend on future price differentials and new liquefaction development in supplier countries. New US LNG is largely contracted by Asian markets and has limited swing capacity or market incentive to serve EU markets in the medium term.

Third, the Union has seen a fast decline of its indigenous gas production, notably in the Netherlands and Denmark. As a consequence, it is losing swing production capacity in the Netherlands, which limits its resilience in the short term. However, in the medium term, indigenous resources from unconventional gas could contribute to meeting the energy security goals of the member states. The World Energy Outlook 2012 Special Report Golden Rules for a Golden Age of Gas estimated that the European resource base is capable of producing up to 80 bcm per year of unconventional gas by the 2030s; in comparison, EU annual gas demand was 477 bcm in 2012. There are many above-ground regulatory and political reasons why even the 80 bcm production is unlikely to materialise in practice. Several member states have decided to ban the exploration and production of shale gas, citing environmental concerns. The European Union has been cautious on the matter and provided guidelines for best practice. However, technology innovation and environmental performance are evolving with growing experience in North America which should be harnessed and shared across the European Union.

The European Union will continue to depend on Russian pipeline gas imports for the foreseeable future. It therefore remains important to diversify gas supplies, particularly for those countries dependent on a single supplier and/or a single supply route. Reducing dependence will require policy action across different sectors: to complete the gas market liberalisation; to re-evaluate the potential of natural gas production in the European Union; and even to reduce the role of gas, where possible, by continuing the deployment of low-carbon technologies, including renewable energies; and to promote energy efficiency. Energy efficiency can partly mitigate import dependence, by fostering efficient district heating in cities, fuel-switching capabilities in power generation, and energy-efficient retrofits in existing buildings and more efficient appliances.

LNG imports are essential for the European Union to ensure diversified gas supplies. By enhancing gas market integration, the European Union can ensure the efficient use of current LNG import capacities.

Increasing competition and gas market integration in Eastern and Southern Europe could be achieved by scaling up pipeline supplies through the Southern gas corridor beyond 2019. Importantly, the European Union has to boost its engagement in international co-operation, in the dialogue with producer, transit and consumer regions, and be fast to adapt to changing global markets. To be successful, the European Union needs to achieve greater negotiating power and consistency in its external energy policy.

Security of oil supply

Indigenous crude oil production in the European Union has been falling markedly, declining by more than 50% during the last decade, at a faster rate than the decline in
EU demand. With regard to security of oil supply, the European Union is increasingly reliant on oil product imports, notably diesel and kerosene, while EU refining capacity is declining. Since 2008, EU crude processing capacity has decreased by around 8% with 15 refineries closing and three reducing their output. This increases the exposure of the European Union to global supply disruptions in product markets. In addition, over one-third of crude oil supplies to the European Union is supplied by Russia via pipeline and some EU members are highly dependent on these imports.

To address oil security concerns, the European Union has revised its oil emergency and stockholding policy and relies on the co-operation with the IEA. Despite the overall alignment of EU and IEA rules, with the entry into force of the Oil Stocks Directive, the oil stock monitoring carried out by the European Union and the IEA will need to be closely co-ordinated to ensure an effective action under any possible IEA collective action.

As further restructuring of the refining industry is under way, unnecessary burden on its competitiveness should be avoided. The swift adoption of the proposed energy taxation directive would bring excise duties for diesel and gasoline closer to each other and help mitigate the imbalance of demand for these fuels. There should be greater political will to adopt important energy taxation measures by the member states with a view to ensure greater levels of oil supply security.

**Electricity security**

Electricity security in Europe will largely depend on the way the European Union can: 1) accommodate the integration of variable renewable energy, 2) support investment in the transformation of the electricity system in the longer term, while 3) ensuring generation adequacy in the medium term.

Decarbonising the energy system involves a major transformation. Ensuring generation adequacy in a system with high shares of variable renewable energy and very low marginal operating costs is uncharted territory. As demand growth in the European Union is expected to remain flat, higher shares of low-carbon electricity reduce the total utilisation of fossil fuel power plants, but require more back-up generation. In an integrated electricity market the effects of the variability of generation are felt across national borders at the level of interconnected systems. Electricity trade flows have increased. The assessments of system adequacy need to review the system as a whole and to cover both domestic demand-side response and interconnections. Close co-ordination of system security and adequacy across the European Union and its regions will be needed.

Power plants in the European Union are ageing and almost half the electricity generating capacity is likely to be shut down in the coming decades, notably the plants using coal and nuclear, which today provide base-load electricity supply, with shares of 28% and 27% in 2012, respectively. There is a risk for Europe of losing the diversity of its electricity generating capacity. Investments are needed to modernise the power fleet in the longer term, while maintaining diversity from coal and nuclear in power generation in the transition, amid gas security and electricity adequacy concerns.

This is an opportunity for Europe to further decarbonise its power sector in the longer term, however, current market design may fall short of providing appropriate signals for investment. In any low-carbon scenario, the European Union will still need substantial dispatchable electricity capacity, which variable renewables will not provide. The EU electricity market design will need to be adapted. In an electricity system with high
shares of renewables, the overall value that power plants (dispatchable or not) provide to the system is crucial. In this context, generation investment can be encouraged by rewarding electricity generation depending on the time, the location and their contribution to the energy system services (e.g. balancing energy).

Half of the European Union’s 131 nuclear power plants have been operating for more than 29 years. The ageing of the EU reactor fleet requires immediate decisions regarding new plant construction, safety, upgrades and uprates, licence extensions, retirements, and decommissioning as well as spent nuclear fuel and radioactive waste management. Given the significant role that nuclear plays in the electricity system, an EU policy is important to support these decisions, including addressing safety and security concerns, notably linked to nuclear waste management.

In the longer term, Europe is likely to see a decrease of its coal capacity, as the outlook for carbon capture and storage (CCS) remains gloomy, and as there are no strong incentives from the EU carbon price or enhanced oil recovery in the European Union. Promoting the transition of Europe’s coal sector towards clean coal technologies is crucial. It will require further research development and demonstration (RD&D) support, including to CCS, and the adoption of even more stringent environmental performance standards. While coal has a limited outlook under any ambitious climate policy, it has security benefits, given the abundance of the resources and diversified global coal markets. While ensuring the closure of inefficient old plants under the Large Combustion Plant Directive, as a temporary measure, the extended use of older plants as reserve capacity in those countries which face external gas supply risks might need to be examined.

ENVIRONMENTAL SUSTAINABILITY IN THE LONGER TERM

In 2008, the European Union had agreed on its climate and energy targets for 2020, but detailed proposals were yet to be adopted. In 2014, the European Commission proposed a Policy Framework for Climate and Energy in the period from 2020 to 2030. EU heads of state and government have endorsed these proposals in the conclusions on the 2030 Climate and Energy Policy Framework at the October 2014 European Council. However, the governance and legislative frameworks are yet to be developed.

In the conclusions the European Council of October 2014 agreed to an EU-wide domestic GHG reduction target of at least 40% below 1990 levels, an EU-wide target of at least 27% of renewables in energy consumption, and an EU-wide indicative, non-binding ambition of at least 27% energy efficiency by 2030, based on 2007 projections of future consumption, with an option to review the target towards 30% by 2020, which was the originally proposed target by the European Commission. By 2030, sectors covered by the EU-ETS would be required to cut emissions by 43% and non-ETS sectors by 30% from 2005 levels.

These are the key pillars of the 2030 Climate and Energy Framework. The energy efficiency target is broadly in line with the energy consumption reduction of 25%, consistent with cost-effectively meeting the 40% greenhouse gas target. The European Commission estimate that a 27% energy efficiency target could be delivered at no additional EU energy system cost, while maintaining a strong EU-ETS carbon price and increasing security benefits, reducing gas imports.

A governance framework on the basis of national GHG reduction, renewable and energy efficiency ambitions is envisaged, but questions remain as to how EU-wide targets can be delivered in absence of national targets, and how energy markets and public support can work together to deliver these goals.
Experience from the 2020 climate and energy package has shown that meeting multiple EU-wide targets with different national and EU instruments requires co-ordination of national policies and alignment with the EU internal energy market, competition and industry policies, but also between the member states and the European Union. The forthcoming 2030 Climate and Energy Policy Framework needs to strike the balance between sustainability, competitiveness and security of supply. The IEA sees the need to strengthen the market-based measures to deliver the expected outcomes for 2030, including a strong EU-ETS and a competitive electricity market as well as stable regulatory framework for low-carbon technologies.

The October 2014 Council conclusions refer to domestic action alone. EU heads of state and government have kept the option open to review the minimum targets for 2030 in the light of the possible global climate commitments at the Conference of the Parties in 2015. The EU will consider whether to increase the energy efficiency target to 30% in 2020. A review in 2020 would be welcome, having in mind a 30% target, given that 1) technological and economic conditions are likely to change, and 2) there are multiple benefits associated with energy efficiency that are not always factored in to energy system modelling (e.g. health benefits). The EU should aim to quantify the multiple benefits of energy efficiency at EU level to support a higher target level. It will be important to prove to consumers and other energy market decision makers that energy efficiency policies are more than just a way to improve energy security or to mitigate climate change – they are also crucial to delivering economic and social outcomes to consumers and to the economy as a whole.

One clear benefit is energy security. Strengthening the energy efficiency target could contribute to reducing concerns about the security of gas supply that have increased, particularly in the wake of the Russia-Ukraine gas crisis. The European Commission considers that an additional 1% in energy savings can reduce EU gas imports by 2.6%. There is large potential to reduce gas consumption in heating and buildings. Around 40% of natural gas is consumed for heating in the European Union. Therefore, a priority objective should be energy efficiency in buildings, through effective renovation.

The proposed EU-wide renewables target of at least 27% of renewable energy in total final consumption in 2030 could help further the deployment of renewable energy in the European Union. The proposed target is neither binding, nor national, and is not backed up by any specific sectoral targets in heat and transport sectors. However, any EU-wide target has to be based on bottom-up ambitions. This raises questions about the responsibility for the delivery of the target and how renewable energies will develop in the transport and heat sectors. For instance, there is a large potential in improving the energy efficiency of the heat sector by using renewables, primarily bioenergy, but also solar heat collectors and geothermal systems and heat pumps.

The swift start of the EU-ETS reform, to make it flexible to account for varying economic developments, remains crucial to ensure a strong CO₂ price signal. The proposed back-loading of allowances and the market stability reserve should be swiftly introduced. This can encourage support investment in the modernisation of the power sector, the switch from coal to natural gas and can partly enable renewables energies to compete without support. The strength of energy efficiency and renewables targets has a direct impact on the carbon price and the functioning of the EU-ETS will need to be aligned to the target.

Strong interim CO₂ targets and robust carbon prices are necessary, but not sufficient alone. Experience of global carbon markets shows that short-term markets are not enough to encourage investment in low-carbon technologies. Efficient carbon markets
need to be complemented by sector- and technology-specific regulation and by support to
energy research, development, demonstration and deployment (RDD&D). This is particularly
important for new renewable technologies, nuclear and CCS. The forthcoming 2030 Climate
and Energy Framework has to deliver an investment policy for low-carbon technologies,
consistent with the European Union’s long-term decarbonisation pathway to achieve
80% to 95% GHG emission reductions by 2050, according to the Energy Roadmap 2050,
and the global climate change agenda.

The IEA applauds the increase in the funding of energy RDD&D in the new framework
programme, the Horizon 2020. This represents progress compared to the previous
seventh framework programme. The European Investment Bank (EIB) plays a role in the
financing of projects and the leverage of EU funds; new financial instruments are
envisaged under the EU budget 2014-20.

However, the challenge remains of co-ordinating and raising significant EU funding for
energy RDD&D projects among the EU institutions, member states and industry. The
experience with new EU demonstration and deployment funding, such as the New
Entrants Reserve (NER300) or the European Energy Programme for Recovery (EEPR), to
fund a small number of capital-intensive projects, has illustrated the need to leverage
large-scale funding at EU level, to increase risk guarantees and to design appropriate
policy instruments to remove technology barriers and risks, including new financial
instruments, and other tools for encouraging private and public co-financing, as well as
the monitoring of the contribution of EU RDD&D efforts to competitiveness, innovation
and European Union’s energy and climate goals. These elements are even more
important in the light of the stated ambitions by EU leaders to create new EU funding
mechanisms, using the revenues of EU-ETS auctions.

In 2014, the European Union is entering a new institutional cycle, with the start of the
new European Parliament and the five-year term under Commission President Jean-
Claude Juncker and Donald Tusk as the President of the European Council. Among the
key priorities of the EU’s Strategic Agenda is the work towards an Energy Union with a
forward-looking climate policy towards 2030.

At the heart of this Energy Union, the core priorities should focus on enhancing energy
security, by the completion of the internal energy market, ensuring competitive and
affordable energy prices for business and consumers, as well as the reduction of GHG
emissions and improvements in energy efficiency, while promoting the leadership of the
EU in low-carbon technologies.

**KEY RECOMMENDATIONS**

The European Union should:

- Re-confirm the commitment to a fully functioning EU internal energy market and the
  implementation of EU rules through actions to:
  - Further integrate EU electricity markets across borders (in particular intra-day and
    balancing markets) in order to enable more effective accommodation of variable
    renewable energy and to enhance the adequacy of generation. Enlarge co-ordination
    of system operation and adequacy assessments to the level of regionally interconnected
    systems. Ensure that under market rules the value to the system of the time and
    location of the electricity generated is reflected in the level at which it is remunerated.
1. Executive summary and key recommendations

- Secure effective use of natural gas storage and LNG capacity across borders, develop (un-)conventional gas production potential in the European Union, and diversify gas supplies, in dialogue with consumer and producer countries.

- Boost the level of interconnectivity of the EU energy network by implementing infrastructure investment into projects of common interest.

- Phase out regulated retail prices and create more competitive retail markets, with stronger consumer engagement in energy markets through demand-side response, smart meters and grids, and greater choice of products and tariffs.

- Set out the legal and governance structures for the 2030 Climate and Energy Framework as a milestone towards reaching a low-carbon economy by 2050 and give priority to market-based instruments.

- Periodically strengthen and expand requirements for cost-effective energy-efficient buildings (including renovations), appliances, lighting, equipment, transport and district heating and cooling systems in cities, ensuring that these are enforced by member states. Quantify the multiple benefits of energy efficiency for social and economic purposes.

- Track all energy subsidies and reduce distortive impacts of public intervention.

- Swiftly reform the EU-ETS to reduce the surplus in allowances, enhance its responsiveness to ensure a consistent carbon price signal under varying economic conditions and varying abatement from other policies.

- Complement the EU-ETS with policies to attract critical investment in low-carbon technologies, including renewable energies, nuclear and CCS, through sector-specific measures to enhance technology innovation and address non-economic barriers.

- Regularly evaluate social and economic outcomes while tracking the progress of the European Union with regard to competitiveness, security and sustainability objectives towards 2020 and beyond.

- Enhance EU-wide co-operation on uprates, safety upgrades, and extensions of the lifetimes of European Union’s existing nuclear power plants to ensure highest safety standards and regulatory stability, while ensuring appropriate incentives can be used in those member states who wish to maintain the nuclear option as part of the energy supply diversity and security.

- Ensure co-ordination among member states to consider the disposal of all forms of radioactive waste, particularly high-level waste, including the possible creation of regional repositories.

- Ensure adequate energy RD&D funding to meet EU energy policy goals. Regularly monitor and assess outcomes of energy RD&D programmes based on a set of indicators on competitiveness and innovation.
In October 2014, the European Union (EU) set ambitious climate and energy targets for 2030, confirming its global leadership on climate change. But while the targets are in place, the legal framework to implement them is yet to be developed. *Energy Policies of IEA Countries: European Union – 2014* provides recommendations on how the targets can be reached in a cost-effective and integrated way, while fostering the competitiveness and energy security of the European Union. The recommendations build on the lessons learned since the first IEA in-depth review of the European Union in 2008.

Since then, EU energy policy has been driving energy market integration, cross-border trade and the implementation of energy and climate targets by 2020. The European Union is a global leader in transitioning towards a low-carbon economy: Europe’s unprecedented renewable energy boom, its action on energy efficiency and the economic downturn have all contributed to a drop in greenhouse gas emissions. However, energy security concerns have increased. Ageing nuclear and coal plants will be shut, and EU energy systems and markets must accommodate growing shares of variable renewable energy. The European Union seeks to foster access to diversified gas and oil supplies to reduce dependence on single suppliers.

Making the most of its diversity, the European Union must strengthen the internal energy market to enhance both its energy security and the competitiveness of its industry. Yet, important interconnections are missing, and, despite the opening of the wholesale market and decreasing prices, concentrated and regulated retail markets do not deliver benefits to consumers. As member states adopt different decarbonisation pathways and energy policy choices, a strong “Energy Union” is needed with effective energy market rules and policies that support the development of low-carbon technologies, within the new energy and climate policy framework for 2030.