International Energy Agency

Energy Policies of IEA Countries

Ireland

2012 Review

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Ireland has suffered a significant economic downturn, but remains committed to its ambitious energy targets to bring the country towards a low-carbon economy. Ireland's location at the edge of the Atlantic Ocean ensures one of the best wind and ocean resources in Europe, and Ireland has set the ambitious target of producing 40% of its electricity from renewable sources by 2020.

Ireland is highly dependent on imported oil and gas. While the push to develop renewable energies is commendable, this will result in an increased reliance on natural gas, as gas-fired power plants will be required to provide flexibility in electricity supply when wind power is unavailable. With two-thirds of Ireland's electricity already coming from gas-fired generation, this poses concerns with regard to gas security, particularly as 93% of its gas supplies come from a single transit point in Scotland. In order to meet Ireland's ambitious renewable targets and improve the island's level of energy security, the country must successfully develop a range of gas and electricity infrastructure projects and market solutions while continuing to integrate its energy markets with regional neighbours.

Ireland also has a pro-active energy efficiency policy, including a detailed National Energy Efficiency Action Plan outlining 90 measures and actions to be implemented in order to achieve the target of 20% energy savings in 2020.

This review analyses the energy-policy challenges currently facing Ireland, and provides sectoral studies and recommendations for the further policy improvements. It is intended to help guide the country towards a more secure and sustainable energy future.

(61 2012 03 1P1)
978-92-64-17146-6 €75

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INTERNATIONAL ENERGY AGENCY

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 28 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
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.

International Energy Agency

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TABLE OF CONTENTS

List of figures, tables and boxes

FIGURES

TABLES

BOXES

1. EXECUTIVE SUMMARY AND KEY RECOMMENDATIONS

EXECUTIVE SUMMARY

Ireland has implemented some significant changes since the last IEA in-depth review of its energy policies in 2007, and commendably, reforms have continued at a regular pace despite the disruptive effects of the financial crisis on its economy. Reform of the electricity and natural gas markets has continued – the Single Electricity Market (SEM) has been implemented, retail markets are open to competition, investment in infrastructure has continued and a significant smart-metering study has been completed. Nevertheless, the progressive market liberalisation of the gas and electricity markets has not displaced the market power of the traditional state-owned incumbents, and concerns linger with regard to the level of state involvement in these two sectors. Renewable energy capacity has continued to expand, a new procedure to integrate wind power has been introduced, and there has been a large increase in investment in energy-related research and development. Ireland has a very proactive energy efficiency policy, which is helping to reduce its carbon footprint in line with the European Union binding target to reduce greenhouse gas (GHG) emissions by 20% (relative to 1990) by 2020. So far, GHG emissions have fallen in line with Ireland's present obligations.

DECARBONISING THE ECONOMY

A focal point of Ireland's energy policy framework is the push to a low-carbon economy. This reduction in emissions calls for a fundamental shift in energy production and consumption habits, and the vectors for this shift have been a strong emphasis on the development of renewable energy and the promotion of energy efficiency and smart grid technologies.

Ireland has set the ambitious target of producing 40% of its electricity from renewable sources by 2020, one of the most demanding in the world. Ireland's location at the edge of the Atlantic Ocean ensures one of the best wind and ocean resources in Europe, and the government is encouraging the development of electricity generated from renewable sources by means of a renewable energy feed-in tariff (REFIT) programme. Feed-in tariffs have until now tended to favour the development of technologically mature wind power. There has also been a growing interest in biomass, notably for co-firing with, and ultimately replacing, Ireland's indigenous peat. The European Commission's approval in 2012 of the expansion of Ireland's REFIT programme into other renewable sectors, including biomass technologies, should favour this development. The government's diversification of renewable sources is commendable, notably in terms of energy security and economic efficiency and development.

The second pillar of Ireland's decarbonisation strategy is demand-driven, and relies on the development and optimisation of energy efficiency and research and development into "demand-side management" technologies. Ireland has a very proactive energy

efficiency policy and a national target of 20% energy savings in 2020 (relative to the 2001-05 average), complemented by an ambition to reduce energy consumption in the public sector by 33% in 2020. In its highly detailed National Energy Efficiency Action Plan, Ireland has outlined 90 measures and actions, across all sectors of the economy, that are to be implemented in order to achieve its ambitious targets.

Public funding on energy-focused research and development has roughly quintupled between 2005 and 2008, and pre-crisis 2008 levels of spending have since been maintained throughout the financial crisis. Thanks to its proven record of engaging with information and communications technology companies and to its strong research infrastructure, Ireland has become a world leader for smart grid deployment. Smart grid technology is key to supporting the ambitious targets in the deployment of clean generation and end-use technologies, such as variable renewable energies and electric vehicles.

CONSOLIDATING ENERGY SECURITY

Ireland has limited indigenous fossil fuel resources – the country remains dependent on imported oil and gas and will remain so in the long term. While the push to develop renewable energies is commendable, this will also result in an increased reliance on natural gas, as gas-fired power plants will be required to provide flexibility in electricity supply when wind power is unavailable. With some two-thirds of Ireland's electricity already coming from gas-fired generation, the push for renewable energies poses certain concerns with regard to gas security.

Ireland's gas market is characterised by its very high dependence on imports, and 93% of its gas supplies comes through a single transit point in Scotland, Moffat. Ireland is thus vulnerable to a gas supply disruption, and would benefit significantly if there were a greater diversification and flexibility of supply in terms of entry points and sources. In this regard, the development of upstream gas fields, such as Corrib, and the proposal to build a liquefied natural gas (LNG) terminal in the Shannon Estuary, would be highly beneficial to Ireland's security of supply.

Imported oil remains the single largest source of energy, and is a major source of GHG emissions. The sector is undergoing a major restructuring at present and its future configuration is uncertain. There is uncertainty regarding the future of Ireland's only oil refinery in Whitegate after 2016. It could be argued, however, that the high level of liquidity in the north-west European oil product market means that the potential absence of a refinery should not pose a significant risk to Ireland in terms of security of oil supply and competition. Efforts to increase levels of oil stocks in Ireland, such as the 2009 regulatory decision to oblige baseload gas-fired generators to hold five days of secondary fuel stocks (generally gasoil) on site and the push by the national stockholding agency (NORA) to increase the amount of wholly owned stocks located on the island of Ireland, are laudable steps for improving Ireland's energy resilience.

IMPROVING INFRASTRUCTURE PLANNING

In order to meet Ireland's ambitious renewable targets and improve the island's level of energy security, the country will need to successfully develop a range of large infrastructure projects. In the electricity market, key projects are the development of new wind farms (close to 4 000 megawatt [MW] of additional wind generation capacity is required to meet renewable energy targets), their integration in the network by

means of the improved connection procedure, the construction of transmission and distribution lines to bring wind-generated electricity from the Atlantic seaboard to key demand centres, and the completion of additional transmission capacity between the Republic of Ireland and Northern Ireland. In the gas market, steps must be taken to ensure the development of the Corrib gas field and explore prospective shale gas reserves, and encourage the development of the proposed LNG terminal in the Shannon estuary. Commendably, the government and the regulator are taking steps to address regulatory hurdles and uncertainties that are affecting investment decisions.

Yet as is the case in numerous OECD countries, there are also recurrent challenges associated with gaining local community acceptance for large-scale energy infrastructure projects such as the delivery of indigenous gas (*e.g.* the Corrib gas field) and the construction of renewable energy capacity and transmission infrastructure. Social acceptance and understanding of the need for new infrastructure is critical. It is important for the government to enhance public awareness in relation to the fundamental benefits in terms of security of energy supply, environmental sustainability and economic and regional development, as well as improving energy cost competitiveness. A more integrated approach by project developers to early engagement and consultation with all stakeholders will ensure a more balanced public debate and a more timely delivery of projects. The planning and consenting process needs to ensure timely, sustainable and reliable decisions for all stakeholders, and the government should review the effectiveness of the consultation processes at local level as well as the Strategic Infrastructure Act in delivering the desired outcomes. At an international level, the government should continue to work with the European Union and IEA on the shared challenge of ensuring the delivery of large-scale infrastructure projects.

DEEPENING REGIONAL INTEGRATION

Ireland has successfully implemented the all-island Single Electricity Market (SEM) with Northern Ireland, which has made a positive impact on market entry, and alongside changes to the manner in which the retail markets are regulated, has allowed genuine competition between suppliers to emerge. Nevertheless, the electricity incumbent, state-owned Electricity Supply Board (ESB), continues to maintain almost half of total dispatchable generating capacity and most of the price-setting generation assets in the SEM, obliging the regulatory authority to implement specific bidding rules and a market monitor to regulate market behaviour. A further divestment of some of ESB's non-core generation assets, currently under consideration by the Irish government, could allow for a relaxation of the rules on bidding, thus allowing for greater flexibility and competition among market participants. In the context of ongoing electricity market reform, it is important that the energy regulator is sufficiently empowered to ensure that market and competition rules are strictly adhered to, and that the interests of consumers are protected.

The SEM will be further strengthened when key infrastructure projects currently under way are implemented, notably allowing for generators in Ireland to export their wind resources to the island of Great Britain and further afield in the future. Yet concerns remain with regard to the future of the SEM within a regional electricity market. The United Kingdom is at present reforming its electricity market and introducing a carbon price floor, which poses a number of opportunities but also risks for the Irish consumers. The two islands will be further integrated when the East-West Interconnector is commissioned by late 2012, giving generators in Ireland better access to the United Kingdom

market and vice versa. The changes being planned to the existing gross mandatory pool model in Ireland should take account of the need to ensure that the Irish consumers pay appropriate prices for electricity in the future. The two governments should continue and enhance their structured and formal engagement, so as to ensure a strong and mutually beneficial level of co-ordination between the two countries, in working towards their integration into the European Union target model in the medium term.

In the gas market, the governments of Ireland and Northern Ireland are working to develop a Common Arrangements for Gas (CAG) framework, replicating the success of the all-island Single Electricity Market. CAG has the potential to bring benefits to all consumers, both in terms of security of supply and cost reductions, through increased competition. Furthermore, the project has the capability of providing for further regional integration beyond the island of Ireland and contributing to achieving the 2014 single market goal set by the European Council. Specific attention must be given however to ensuring that this significant regulatory development delivers optimal results in terms of competition, economic efficiency and end-user prices, and the design of CAG should also be aligned with emerging EU Framework Guidelines and Network Codes. More generally, Ireland should continue to co-operate with the United Kingdom and the European Commission, in order to ensure that regulatory decisions beyond Ireland's border do not negatively impact its gas market.

KEY RECOMMENDATIONS

The government of Ireland should:

- ☐ *Continue to encourage greater diversification and flexibility of gas supply, in light of the country's high level of reliance on the fuel.*
- ☐ *Maintain funding support to develop and deploy new low-carbon technologies in which Ireland possesses a comparative advantage, including wind, biomass, ocean and smart grids.*
- ☐ *Further enhance the consultation, planning and consenting process for critical energy infrastructure projects, with an emphasis on balancing the concerns of local communities with the economic, social and energy security benefits of the proposed projects.*
- ☐ *Ensure that participation in regional energy markets brings benefits to Irish consumers and certainty for investors in the energy market, by working closely with regional partners and the European Union.*
- ☐ *Ensure that the powers of the energy regulator are enhanced as necessary in order to ensure that market and competition rules are strictly adhered to and that the interests of consumers are protected.*

PART I
POLICY ANALYSIS

Figure 1. **Map of Ireland**

This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

2. GENERAL ENERGY POLICY

Key data (2010)

TPES: 14.4 Mtoe (oil 48%, natural gas 33%, coal 9%, peat 6%, renewables 4.6%) +4.9% since 2000

TPES per capita: 3.2 toe (IEA average: 4.7 toe)

TPES per GDP: 0.09 toe per 1 000 USD GDP (IEA average: 0.15 toe per 1 000 USD GDP)

Electricity generation: 28.4 TWh (natural gas 62%, coal 15%, wind 10%, peat 8%, hydro 2%, oil 2%)

Inland energy production: 2 Mtoe, representing 14% of total energy supply

OVERVIEW

Ireland has a population of 4.6 million of which slightly more than 1.8 million reside in the greater Dublin area. Outside Dublin and the central eastern region of Leinster, the country is sparsely populated, with the major centres being Cork on the southern coast, Limerick and Galway on the western coast. The island is shared between (the Republic of) Ireland and Northern Ireland which is part of the United Kingdom. Ireland is bounded on the west and south by the Atlantic Ocean, on the east by the Irish Sea and on the north by Northern Ireland.

Total land area is slightly below 70 000 km^2. The climate is temperate maritime, strongly influenced by the North Atlantic Current. It consists of mild winters and cool summers with a relatively high degree of humidity throughout the year. Snowfall is rare, and temperatures rarely drop below freezing point.

The Irish economy was severely affected by the financial crisis in 2008 – and notably affected by a property market crash – after more than a decade of sustained growth that had propelled Ireland to among the highest level of GDP per capita in the OECD. In November 2010, Ireland received a EUR 85 billion rescue package from the European Union and the International Monetary Fund, but it has not required further financial aid.

The government is a coalition of Fine Gael (centre-right) and the Labour Party (centre-left), and has been in office since the March 2011 general election.

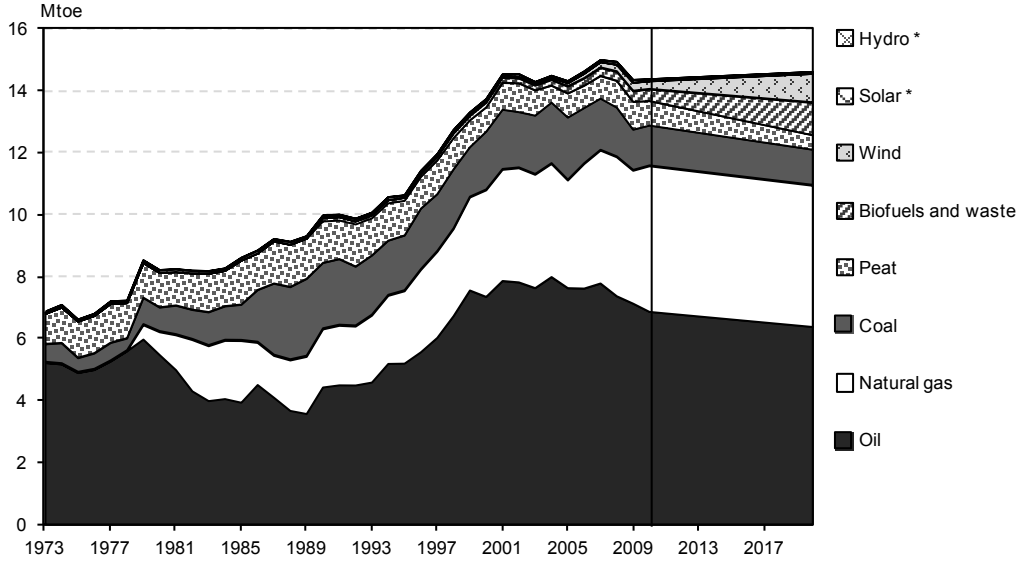
SUPPLY AND DEMAND

SUPPLY

Total primary energy supply (TPES) in Ireland was 14.4 Mtoe in 2010, 5% lower than in 2007 as a result of the financial crisis. Over a longer time-frame, however, the average annual growth of TPES since 2000 stands at around 0.5%, while the

economy has grown on average by 2.4% per year over the same period. According to government forecasts, TPES is expected to remain stable over the next decade.

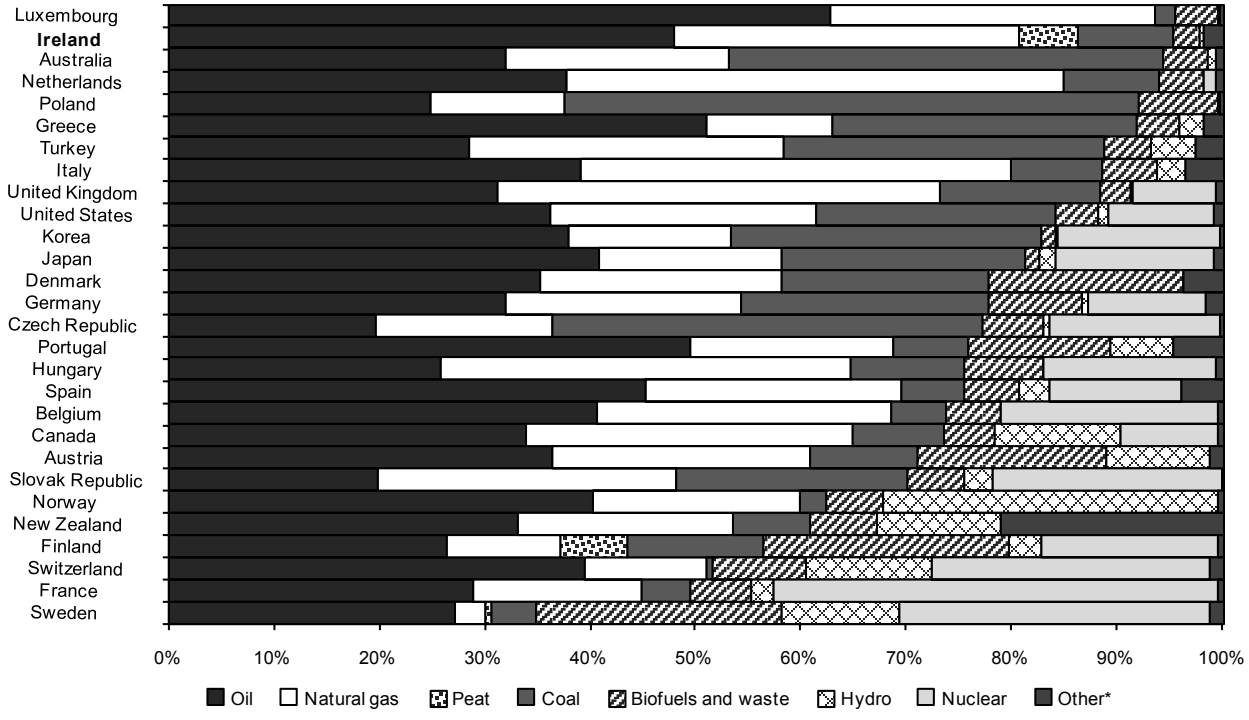
Figure 2. **Total primary energy supply, 1973 to 2020**



* Negligible.

Sources: IEA (2011a), and data submitted by the government of Ireland to the IEA.

Figure 3. **Breakdown of total primary energy supply in IEA member countries, 2010**



* Other includes geothermal, solar, wind, and ambient heat production.

Source: IEA (2011a).

In terms of fuels, oil is the largest energy source in TPES, representing almost half of TPES. Ireland has the third-highest share of oil in the energy mix among IEA member countries, with only Luxembourg and Greece having an even higher share in their fuel mix. Natural gas is the second-largest energy source. Gas supply has increased rapidly, by 3% per year over the last decade, and amounted to 4.7 Mtoe or 33% of TPES in 2010. Ireland has the fifth-largest share of gas in its TPES among IEA member countries, behind the Netherlands, the United Kingdom, Italy and Hungary.

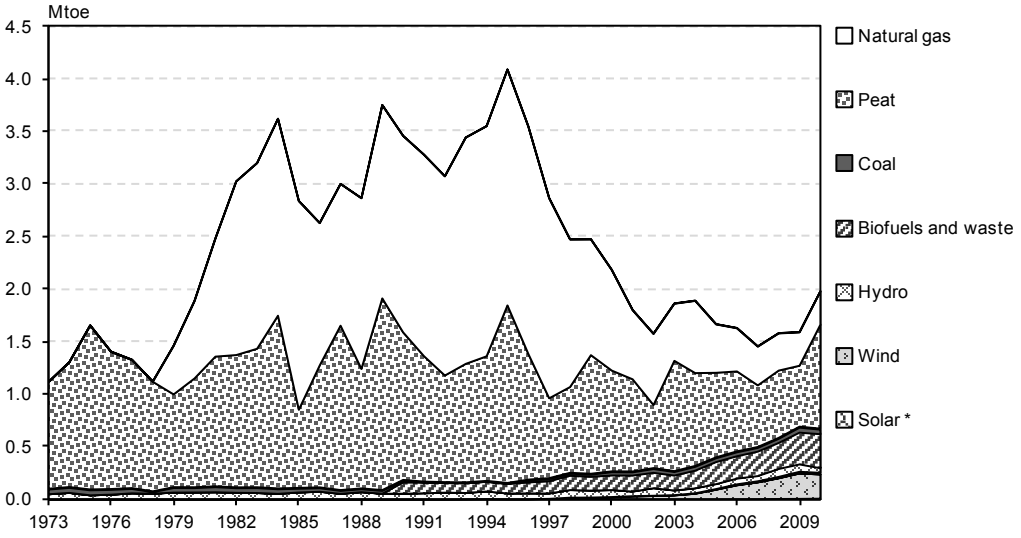
Coal is the third-largest energy source in Ireland, accounting for 9% of TPES in 2010, and peat the fourth-largest with around 6%. Therefore, the total share of fossil fuels sums up to 95% in TPES in 2010, the second-highest share among all IEA member countries. Renewable energy sources represent 4.6% of TPES, constituted mainly of wind with biofuels and waste.

Ireland imports nearly all of its energy needs, as indigenous energy production only amounts to 2 Mtoe, covering 14% of TPES. The largest indigenous energy source is peat, representing half of total inland production in 2010, while natural gas, biofuels and wind each roughly represented 0.3 Mtoe, or 16% of production.

Compared to other IEA countries, wind plays an important role in Ireland's energy mix. Ireland has the fourth-highest share of wind in TPES and in electricity generation, after Denmark, Spain and Portugal. Wind represents 16% of indigenous energy production, the highest share among all IEA member countries.

Other renewable energy sources like solar and hydro do not play a large role in Ireland, mainly because of its geographic and topographic situation.

Figure 4. **Energy production by source, 1973 to 2010**



* Negligible.

Source: IEA (2011a).

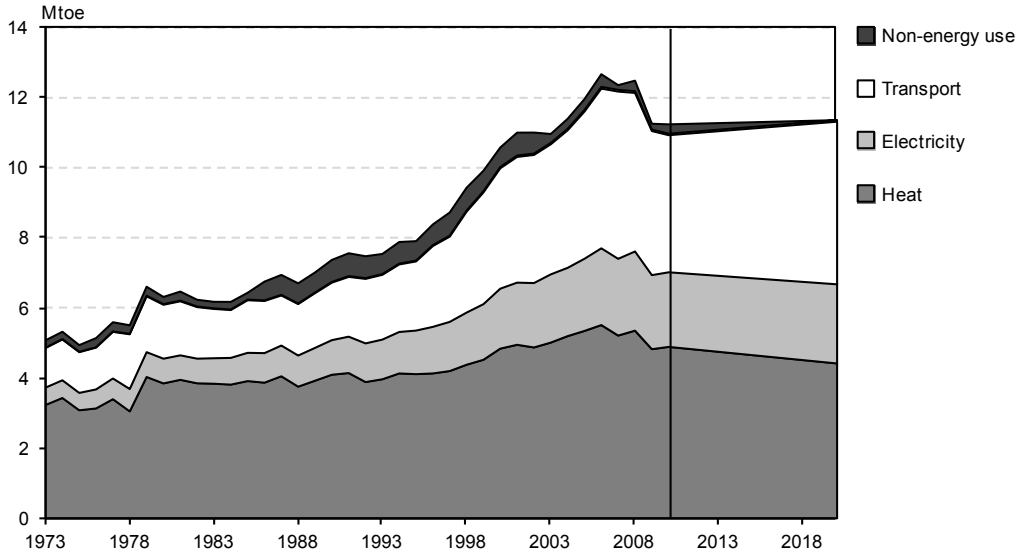
DEMAND

Total final energy consumption (TFC) amounted to 11.2 Mtoe in 2010, comparable to 2009 levels, but 11% lower than the all-time high reached in 2006. The government expects final consumption to remain at around current levels over the coming decade.

Transport is the largest final energy-consuming sector, representing 35% of TFC in 2010, and demand in the sector is expected to increase by more than 40% by 2020. Industry accounted for 19% of final energy consumption in 2010, significantly lower than the IEA average of 32%. Ireland's industry has the second-lowest share of energy consumption in TFC among IEA member countries, after Denmark, where industry's share accounts for just 18% of TFC. On the other hand, energy consumption in the residential sector accounted for 28% of TFC in 2010, well above the IEA average of 20%. The commercial, public service and agriculture sectors together accounted for 17% of TFC in 2010.

Overall, the share of primary energy converted into heat in Ireland was 44% in 2010. This share has decreased, but remains higher than the IEA average (37% in 2010). The energy used for transport, which is growing, is also higher than the IEA average. In contrast, energy use in form of electricity was 19% of TFC, lower than IEA average of 22% but at similar levels to countries like the United Kingdom, Germany and Austria.

Figure 5. **Final energy use in Ireland, 1973 to 2020**



Sources: IEA (2011a), and data submitted by the government of Ireland to the IEA.

INSTITUTIONS

Three main bodies are responsible for the formulation and delivery of the government's energy policy – the Department of Communications, Energy and Natural Resources (DCENR) at central government level, the independent Commission for Energy Regulation (CER) and the Sustainable Energy Authority of Ireland (SEAI), which advises the government on a range of energy and sustainability issues and delivers a number of relevant Energy Efficiency, Renewable Energy and R&D programmes.

The **Department of Communications, Energy and Natural Resources (DCENR)** is the lead government department with responsibility for setting overall energy policy. The department determines overall policy to safeguard security of energy supply, develop a sustainable energy future and competitive, efficient and properly regulated energy markets. The Energy Policy section of the department is divided into six divisions:

- Energy Planning and Electricity Corporate Division;
- Electricity and Gas Regulation Division;
- Oil Security and Energy Corporate Governance Division;
- Renewable and Sustainable Energy Division;
- Energy Efficiency and Affordability Division; and
- Office of Chief Technical Advisor.

The **Commission for Energy Regulation (CER)** was established under the Electricity Regulation Act in 1999 to oversee an open, transparent and accountable regulatory process for Ireland's electricity industry. The 2002 Gas (Interim) Regulation Act expanded the CER's jurisdiction to include both gas and electricity. The CER facilitates competition in the energy sector by authorising the construction of certain energy infrastructure and licensing energy undertakings. The CER has a regulatory role in relation to the operation, maintenance and licensing of the transmission and distribution networks. It approves terms and conditions (including tariffs) for third-party access to electricity and gas networks and facilities. It is legally independent in the performance of its functions. It is funded by means of a levy on energy undertakings and income from licensing fees.

The stated functions of the CER are the following:

- ensuring sufficient capacity in the electricity and gas systems to meet reasonable demands for supply of natural gas and electricity;
- protecting the interests of final customers, including the disadvantaged, the elderly and those residing in rural areas;
- promoting competition in supply of electricity and natural gas and electricity generation;
- ensuring no unfair discrimination between applicants for or holders of licences, consents and authorisations or between them and state-owned operators;
- promoting the continuity, security and quality of supplies and encouraging safety and efficiency in undertakings and by end-users;
- monitoring security of electricity and gas supplies and taking appropriate action to ensure satisfactory margins between supply and demand;
- ensuring that licence and authorisation holders are capable of financing their activities;
- setting standards, enforcing compliance, settling disputes, controlling and monitoring performance and reporting regularly on these activities;
- promoting research and the use of sustainable forms of energy that reduce or are free of greenhouse gas emissions as well as adopting measures to protect the natural environment in all the sectors' activities;
- advising government on the development and regulation of the gas and electricity sectors;
- regulating the activities of electrical contractors with respect to safety;
- regulating the activities of natural gas undertakings and natural gas installers with respect to safety;
- promoting the safety of natural gas customers and the public generally as respects the supply storage, transmission, distribution and use of natural gas;

- establishing and implementing a natural gas safety framework; and
- establishing and implementing a risk-based petroleum safety framework.

The **Sustainable Energy Authority of Ireland (SEAI)** was established under the 2002 Sustainable Energy Act in 2002, and is responsible for advising government on policies and measures on sustainable and renewable energy (including energy efficiency), implementing programmes agreed by government and stimulating sustainable energy policies and actions by public bodies, the business sector, local communities and individual consumers. Its stated principal functions are:

- supporting government decision making through advocacy, analysis and evidence;
- driving demand reduction and providing advice to all users of energy;
- driving the decarbonisation of energy supply;
- raising standards in sustainable energy products and services;
- building markets based on quality, confidence and proven performance;
- fostering innovation and entrepreneurship; and
- improving the coherence of Irish energy research and development.

The **Competition Authority** is an independent, statutory body, which was established in 1991. Its functions, as set out in the 2002 Competition Act, include the enforcement of competition law, the review of mergers and competition advocacy. The 2002 Competition Act also clarifies the relationship between the Competition Authority and the sectoral regulatory authorities. It provides for a co-operation agreement between the Competition Authority and the sectoral regulator on the sharing of information and consultation to avoid duplication of efforts.

The **Environmental Protection Agency (EPA)** is responsible for licensing all activities with a significant pollution potential, through the Integrated Pollution Control licensing system. The Agency is also responsible for implementing the Emissions Trading Directive in Ireland. It is overseen by the Department of the Environment.

KEY POLICIES

Ireland's very limited indigenous energy resources shape government policy to exploit its existing peat and renewable energy resources, particularly wind, to as great an extent as possible. Irish energy policy acknowledges the high level of import dependence and supports measures to strengthen the competitiveness and integration of international energy markets. Recent increases in oil and gas prices and volatility in the geographical regions of supplier countries are seen as a threat to maintaining secure energy supplies at competitive prices. Ireland's relative geographical isolation within the European Union has led the government to support measures to increase the integration of European energy markets, including stronger UK-Ireland interconnections and stronger north and south interconnections within the island of Ireland.

2007 ENERGY POLICY FRAMEWORK

Ireland last formally outlined its energy policy in a 2007 White Paper entitled "Delivering a Sustainable Energy Future for Ireland", which set out the then government's Energy Policy Framework over the 2007-20 period. It set targets and actions out to 2020 for

meeting the government's goals of ensuring safe and secure energy supplies, promoting a sustainable energy future, and supporting competitiveness, and takes account of the evolving European Union framework, IEA developments and the push for regional integration, both on the island of Ireland and with its neighbouring European countries.

Actions to ensure security of energy supply

So as to meet the policy objective to ensure that energy is consistently available at competitive prices with minimal risk of supply disruption, the Energy Policy Framework outlined the following strategic goals:

- ensuring that electricity supply consistently meets demand;
- ensuring the physical security and reliability of gas supplies to Ireland;
- enhancing the diversity of fuels used for power generation;
- delivering electricity and gas to homes and businesses by means of efficient, reliable and secure networks;
- creating a stable attractive environment for hydrocarbon exploration and production; and
- being prepared for energy supply disruptions.

Actions to promote the sustainability of energy supply and use

So as to ensure that a sustainable energy future is being met, the following strategic goals were set:

- addressing climate change by reducing energy-related greenhouse gas emissions;
- accelerating the growth of renewable energy sources;
- promoting the sustainable use of energy in transport;
- delivering an integrated approach to the sustainable development and use of bioenergy resources;
- maximising energy efficiency and energy savings across the economy; and
- accelerating energy research development and innovation programmes in support of sustainable energy goals.

Actions to enhance the competitiveness of energy supply

A key policy objective is to ensure a reliable and competitively priced energy supply and competition in energy markets in support of economic growth and national competitiveness. The following underpinning strategic goals were set:

- delivering competition and consumer choice in the energy market;
- delivering the all-island energy market Framework;
- ensuring that the regulatory framework meets the evolving energy policy challenges;
- ensuring a sustainable future for semi-state energy enterprises;
- ensuring affordable energy for everyone; and
- creating jobs, growth and innovation in the energy sector.

POLICY DEVELOPMENTS SINCE 2007

Ireland has experienced huge changes to its economic outlook since 2007, as it was particularly affected by the world financial crisis. While Ireland has remained committed to the objectives laid out in the 2007 Energy Strategy, the worsened financial and economic climate has affected some aspects of its energy policy, notably in terms of demand, investments and priorities. Ireland received a EUR 85 billion package of financial support from member states of the European Union through the European Financial Stability Fund (EFSF) in November 2010. As a condition for the financial assistance, Ireland will undertake fiscal policy and structural reforms, some of which pertain to the energy sector. Ireland was notably requested to undertake "an independent assessment of the electricity and gas sectors, taking due account of the European Union regulatory context for these sectors", which was conducted by the International Energy Agency in late 2011.

The government intends to publish a new *Energy Policy Framework 2012-2030* in 2012, taking account of developments over the past few years since the publication of the 2007 White Paper, as well as European Union and international developments. The government indicates that the overriding objectives of Irish energy policy will remain consistent – security of supply, competitiveness and environmental sustainability will continue to be the pillars of energy policy.

With regard to its European Union commitments, Ireland has also published a National Energy Efficiency Action Plan (NEEAP) in May 2009, and a National Renewable Energy Action Plan (NREAP) in July 2010. These actions plans are described in further detail in Chapters 4 and 6.

Ireland published a Renewable Energy Strategy in May 2012. The government is also launching a second updated National Energy Efficiency Action Plan in July 2012.

NEWERA SHAREHOLDER EXECUTIVE

In September 2011, the government announced the establishment of the New Economic and Recovery Authority (NewERA), under the National Treasury Management Agency. NewERA is to carry out the corporate governance functions from a shareholder perspective and to assess and reform the state's management and shareholding arrangements in the companies in which the state has a majority stake, initially including ESB, Bord Gáis, EirGrid, Bord na Móna, and Coillte. NewERA will carry out the corporate governance function for these companies, and will have responsibility for reviewing capital investment plans, and potential synergies between companies, taking a portfolio approach to managing the government's shareholdings.

The financial crisis has had an important impact on Ireland's finances, and the government has agreed to an asset divestment programme as part of the EU/ECB/IMF programme. In this regard, the NewERA shareholder executive is tasked with advising on, and if appropriate oversee, any restructuring of state companies, in co-ordination with the Minister for Public Expenditure and Reform, on the disposal of state assets.

The NewERA shareholder executive reports to the Minister for Energy for matters concerning capital investment and other financial decisions taken by the energy semi-state companies. The Minister for Energy retains oversight for the government's overall energy policy objectives and related framework for the energy state companies.

TAXATION

All taxation matters, including indirect taxes such as VAT and excise duty, are the responsibility of the Department of Finance. This includes energy taxation.

Taxation or excise duty on the main energy fuels have been increased since 2006 and a carbon tax was introduced in the 2010 budget. Excise on petrol and automotive diesel was increased in the 2009 emergency budget and the supplementary budgets and in the 2011 budget.

A carbon tax, at a rate of EUR 15 per tonne of carbon dioxide (CO_2) emitted, was applied to petrol and auto-diesel with effect from 10 December 2009, and was extended to other mineral oils with effect from 1 May 2010. A natural gas carbon tax was also introduced on 1 May 2010 (see Chapter 3 for further details). A solid fuel carbon tax is provided for in the Finance Act 2010, subject to a ministerial commencement order. The current mineral oil tax on coal will be abolished simultaneously with the commencement of the new provisions on solid fuels.

Fuel used for electricity generation is exempt from excise duty, including the carbon tax. Relief from carbon charge also applies to mineral oil and natural gas used in installations covered by the Emissions Trading Scheme (ETS) subject to the fuels being liable to, at least, the relevant European Union minimum rate.

Substitute fuels that are intended or suitable for use as a propellant in a motor vehicle for which petrol can also be used are liable to mineral oil tax at the petrol rate. Other substitute fuels intended or suitable for use as a propellant in a motor vehicle are liable at the automotive diesel rate.

Substitute fuels that are biofuels qualify for relief from the carbon charge component of the mineral oil tax. In the case of blends of biofuels and other fuels, the relief only applies to the biofuel portion of the blend.

CRITIQUE

The government's Energy White Paper, published in 2007, articulated the then government's vision for a national energy-policy framework up to 2020. The document established a roadmap towards meeting the government's goals of ensuring safe and secure energy supplies, promoting a sustainable energy future, and supporting competitiveness. However, Ireland's economic circumstances have changed dramatically since 2007 – as have the world economy and particularly the energy sector – and a reconfiguration of energy policy is needed if Ireland is to adapt to its present position. The government indicates that it is currently developing a new energy strategy that will take these new circumstances into full account. This revised strategy framework must outline concrete milestones and roadmaps for achieving its ambitious renewable energy and climate change targets, and critically assess the feasibility of current policies in meeting these targets. Costs and competitiveness should remain a key focus of the new energy policy strategy, notably with regard to subsidies (*e.g.* REFIT tariffs for renewables, and the public service obligation), bearing in mind the potential for tension at times between the two objectives of promoting the transition to a low-carbon economy and ensuring that Irish consumers are provided with reliable and cost-efficient energy sources.

The recent economic crisis and the resulting structural changes in the underlying economy had a positive impact on Ireland's emission profile. Notwithstanding this, Ireland has

adopted a range of policies that have also facilitated this reduction. The Irish government introduced a carbon tax on oil products in 2008 and it is expected that behavioural changes will emerge if the price moves toward EUR 30 per tonne in 2014. The carbon tax has yielded substantial revenues to the government, and the stated objectives of the use of this tax revenue are noted. Yet despite the visible progress, the future of emissions reduction schemes post-Kyoto remains uncertain. Ireland's unique emission profile in Europe means that the range of options available is limited, and the government must provide a clear signal to stakeholders as to the shape of the post-2012 regime.

Energy is a cornerstone of the modern economy and delivering an efficiently functioning and organised energy system should be a priority for the government if it is to meet its commitments to sustainable economic growth. The government's announcement of the NewERA shareholder executive in September 2011 to oversee and reform the state's stake in energy companies is a welcome development in terms of promoting competitiveness, efficiency and transparency in the gas and electricity markets. Enhanced governance in the energy sector is an objective that was highlighted under the EU/IMF Programme of Financial Support for Ireland.

As part of the established NewERA shareholder executive, it is timely for the government to reassess the state's role in the energy sector, and notably with regard to the level of state ownership of energy companies operating in Ireland, and particularly in the gas and electricity markets, which remain dominated by state-owned companies such as ESB, BGÉ, Bord na Móna and Coillte. The expansion of the gas and electricity incumbents, BGÉ and ESB respectively, into other energy sectors admittedly adds a significant element of competition, but it also ultimately only further consolidates the dominance of state-owned companies in the retail market. It is not clear that having multiple wholly state-owned participants in the energy sector leads to the optimal outcome for the consumer. The government's stated intentions to retain the gas and electricity networks as key strategic infrastructure in majority state ownership is noted. In February 2012, the government announced that it would proceed with the sale of BG Energy, BGÉ's retail division, and some of ESB non-strategic generation assets. Reducing government participation in these sectors is a welcome move. In undergoing its restructuring, Ireland must ensure that its energy sector is compliant with EU Energy Third Package legislation.

RECOMMENDATIONS

The government of Ireland should:

- ☐ *Publish a new Energy Policy Framework this year that articulates the government's vision for post-2012 national energy policy framework up to 2020 and beyond, taking account of European Union and IEA developments.*
- ☐ *Outline a clear plan for emissions reduction targets and the future of the carbon tax in Ireland, so as to allow industry and market players to adapt accordingly.*
- ☐ *Continue to review the competitive landscape of the non-regulated gas and electricity sectors, with a focus on the appropriateness and depth of state activity in these sectors and in line with European Union legislation.*
- ☐ *Ensure that NewERA, in its new Shareholder Executive capacity, has a strong focus on driving cost efficiencies in the companies and within the network businesses, with a view to meeting or exceeding the CER's efficiency measures and targets.*

3. CLIMATE CHANGE

Key data (2010)

Total GHG emissions (excluding LULUCF, 2009): 62.4 Mt CO_2-eq, +13.8% from 1990 base year[1]

2008-12 target: +13% from base year

CO_2 emissions from fuel combustion: 38.7 Mt, -5.4% since 2000

Emissions by fuel: oil 52%, natural gas 28%, coal and peat 20%

Emissions by sector: electricity and heat generation 34%, transport 30%, households 19%, manufacturing industry 9%, other 10%

GHG EMISSIONS AND TARGETS

Ireland is a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and a party to the Kyoto Protocol. Its international commitment under the Kyoto Protocol is to limit its greenhouse gas (GHG) emissions to 13% above 1990 levels in the five-year compliance period 2008-12. Beyond 2012, Ireland has committed, as part of the "20/20/20" targets at the European level, to reduce its GHG emissions by 20% in the sectors of the economy outside the scope of the European Union Emissions Trading Scheme (EU-ETS). In the case of installations covered by the EU-ETS, a single EU-wide target to reduce emissions by 21% below 2005 levels by 2020 applies.

Latest GHG emission projections published by the Environmental Protection Agency (EPA) show that as a result of mitigation measures adopted and the impact of the economic downturn, Ireland is on track to meet its commitments, the total distance to target for the Kyoto Protocol period standing at between 4.1 and 5.1 million tonnes of CO_2 equivalent (Mt CO_2-eq).[2] This distance to target is significantly lower than what was forecast in the *National Climate Change Strategy* published in 2007. It was estimated that up to 18 million carbon credits would be required to ensure compliance over the five-year commitment period under the Kyoto Protocol, at an estimated cost of EUR 270 million.

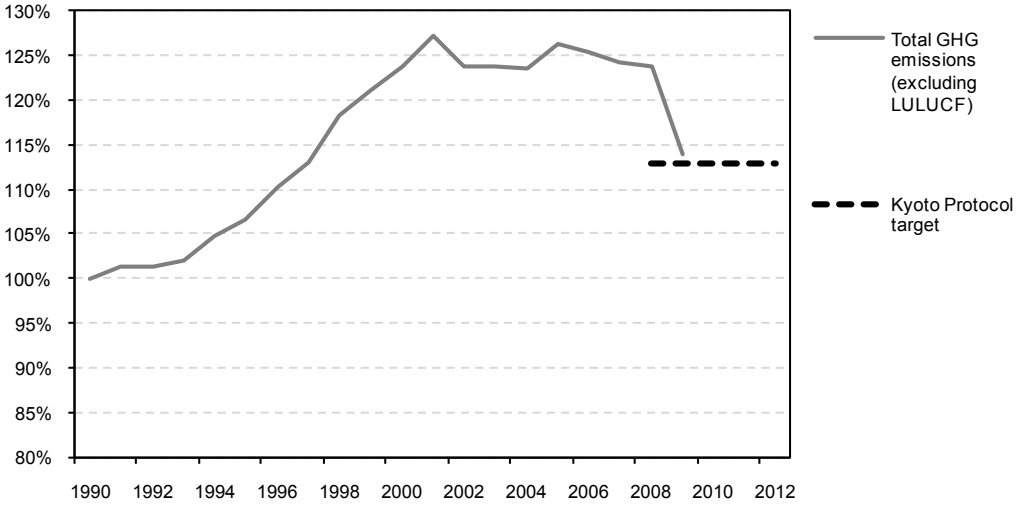
In Ireland, the energy sector accounts for 66% of total GHG emissions from fuels. The agriculture sector is the second-largest sector, producing 28% of total emissions, while industrial processes account for 3% and waste 2%. This distribution is significantly different from the EU-27 average, where the energy sector accounts for 79% and the agriculture sector for only 10%, while industrial processes and wastes respectively represent 7% and 3% of total GHG emissions. This difference is also reflected in shares of gases in emissions. In Ireland carbon dioxide (CO_2) represented 68% of total emissions, methane (CH_4) 20%, nitrous oxide (N_2O) 11% and others (hydrofluorocarbons, perfluorocarbons and sulphur

1. Ireland's base year data for the Kyoto Protocol is made up of data for the 1995 for F-gases and 1990 for all other gases.
2. EPA (2012).

hexafluoride) accounted for 1% of GHG emissions in 2009. On average in the EU-27, these shares were respectively 82% of CO_2, 9% of CH_4, 8% of N_2O and 2% of others.

Ireland's GHG emissions represented 1.4% of total European Union emissions and 0.4% of total IEA emissions in 2009.

Figure 6. **Evolution of GHG emissions, 1990 to 2010**



Source: UNFCCC.

CO_2 EMISSIONS FROM FUEL COMBUSTION

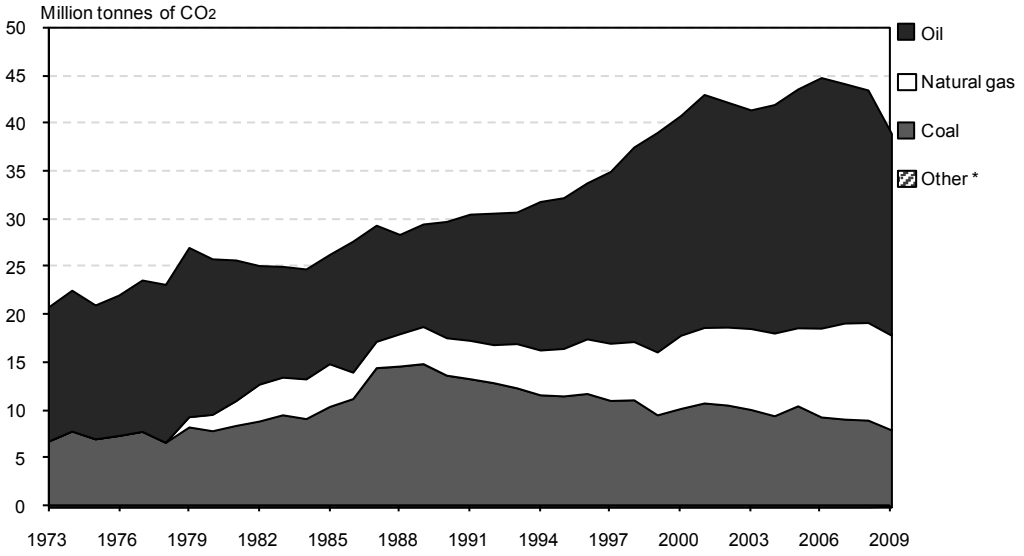
SOURCES OF CO_2 EMISSIONS

CO_2 emissions from fuel combustion represented around 65% of total GHG emissions in Ireland. They amounted to 38.7 Mt in 2010, some 1% lower than in 2009 and 13.7% lower than the all-time high that was reached in 2006. This decrease is mainly due to the economic slowdown.

Oil is by far the largest source of CO_2 emissions in Ireland, and more than half of all energy-related CO_2 emissions come from oil. These emissions amounted to 20.0 Mt of CO_2 in 2010 but are declining, dropping by almost 24% compared to 2006 and by 5% compared to 2009. Natural gas is the second-largest energy source in terms of emissions, with 10.8 Mt, or 28%, while coal and peat combustion together accounted for 7.9 Mt of emissions, or 20% of total CO_2 emissions in 2009. Over the last decade, emissions from oil and coal have decreased while emissions from gas have increased; this trend is expected to continue over the next decade.

In terms of sectors, electricity generation is the largest CO_2 emitting sector in Ireland, accounting for 34% of total CO_2 emissions from fuel combustion in 2010. Transport, the second-largest sector accounted for 30%, while the residential, commercial and agriculture sectors added up to 27%. The manufacturing industry represented only 9% of the total. Since 2000, CO_2 emissions have increased by 23% in residential sector and 11% in the transport sector, but have decreased by 14% in the electricity generation sector and by 41% in the industry sector.

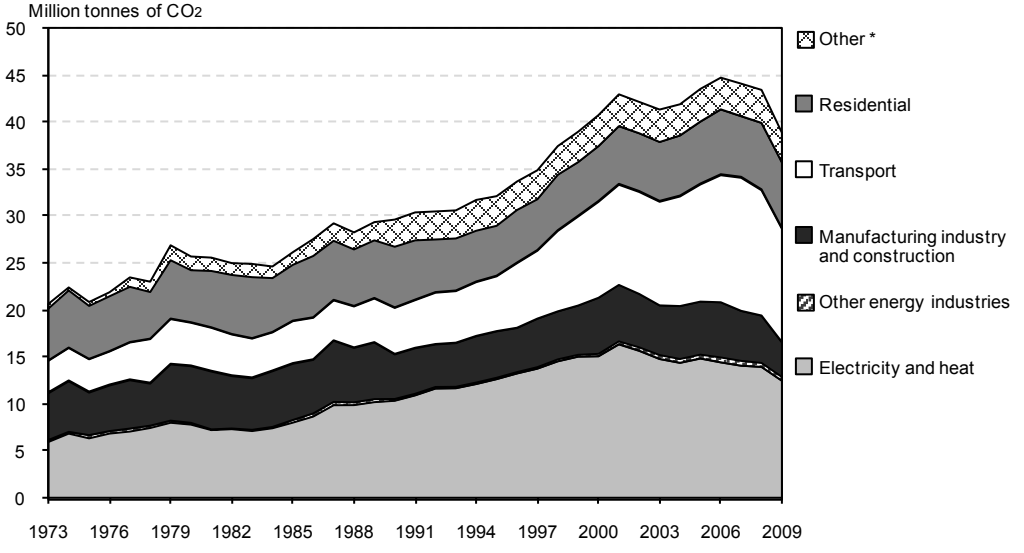
Figure 7. **CO_2 emissions by fuel*, 1973 to 2010**



* *Other* includes industrial waste and non-renewable municipal waste (negligible).

Source: IEA (2011b).

Figure 8. **CO_2 emissions by sector, 1973 to 2010**



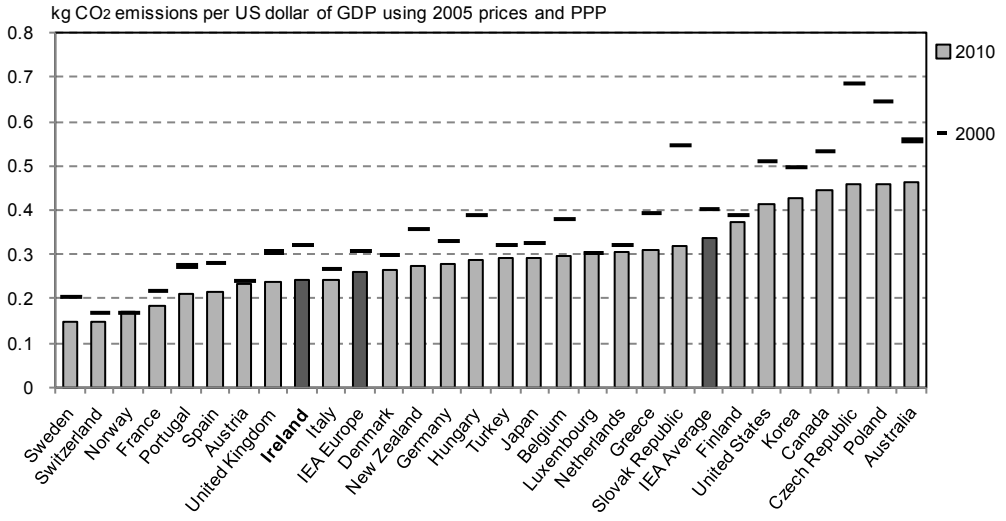
* *Other* includes emissions from commercial and public services, agriculture/forestry and fishing.

Source: IEA (2011b).

CARBON INTENSITY

The CO_2 intensity of Ireland's economy, measured as the amount of CO_2 emissions divided by the GDP, was 0.24 kg of CO_2 per US dollar of GDP in purchasing power parity (PPP). This is slightly lower than the IEA Europe average of 0.26 kg CO_2 per unit of GDP. Ireland's figure has decreased by 25% since 2000, as a consequence of the large increase in GDP and the decoupling with CO_2 emissions.

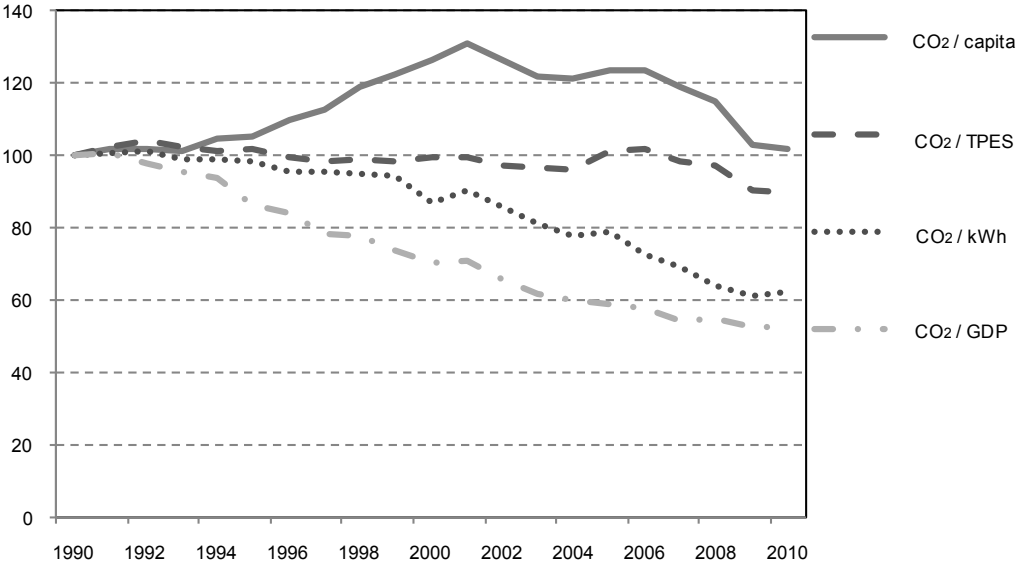
Figure 9. **Energy-related CO_2 emissions per GDP in IEA member countries, 1990 and 2010**



Sources: IEA (2011a), and OECD (2011).

Electricity generation is the largest sector in terms of emissions, and on average 458 g CO_2 were emitted per kilowatt-hour generated in 2010. Ireland's electricity generation, which remains primarily based on fossil fuels, is above the IEA Europe average of only 318 g CO_2 per kilowatt-hour. Ireland has the fifth most CO_2-intense electricity generation among IEA European countries, after Greece, Poland, the Czech Republic and Turkey. However, electricity consumption per capita is rather low in Ireland, standing at 5.6 megawatt-hours (MWh) per capita compared to an IEA average of 8.2 MWh per capita, but it has been increasing by an average rate of 5% per year over the last decade.

Figure 10. **Evolution of emissions indicators, 1990 to 2010**



Sources: IEA (2011a), and OECD (2011).

In total, CO_2 emissions per capita stand at 8.6 tonnes per inhabitant. Although emissions per capita have declined by 20% over the last decade in Ireland, they remain significantly higher than the IEA Europe average of 7.0 tonnes per capita.

INSTITUTIONS

The **Department of the Environment, Community and Local Government** has responsibility for co-ordinating national climate policy. The following departments have responsibility for implementing emissions mitigation policies in their respective sectors:

- Foreign Affairs and Trade;
- Agriculture, Fisheries and Food;
- Communications, Energy and Natural Resources;
- Transport, Tourism and Sport;
- Environment, Community and Local Government (residential and waste sector);
- Finance;
- Public Expenditure and Reform; and
- Jobs, Enterprise and Innovation.

The **Environmental Protection Agency (EPA)** is the statutory body for the protection and management of the environment. It has responsibilities for numerous licensing, enforcement, monitoring and assessment activities associated with environmental protection.

POLICIES AND MEASURES

OVERVIEW

The overall context for energy-related environmental policy is provided in the *National Climate Change Strategy (NCCS) 2007-2012* and *Sustainable Development – A strategy for Ireland* (1997). A renewed *National Sustainable Development Strategy* has been prepared by the Department of the Environment, Community and Local Government. The report was released in June 2012.

The *National Climate Change Strategy 2007-2012* draws on the first strategy published in 2000. The Strategy provides a framework for action to reduce Ireland's greenhouse gas emissions. It sets out a range of measures, building on those already in place under the first strategy to ensure compliance with Ireland's mitigation target under the Kyoto Protocol. The focus of the Strategy is domestic emissions reductions (including participation by Irish installations in the EU Emissions Trading Scheme) supplemented as necessary by the use of the flexible mechanisms provided for in the Protocol.

In November 2011, the Department of the Environment, Community and Local Government published a *Review of National Climate Policy,* assessing the effectiveness of Irish climate policy to date. The Environmental Protection Agency (EPA)'s longer-term projections based on existing and planned policies suggest that Ireland will struggle to be compliant with its commitments regarding the post-2012 climate mitigation agenda, even in the immediate 2013-20 period unless all additional measures are implemented in full and on time.

EUROPEAN UNION EMISSIONS TRADING SCHEME (EU-ETS)

The EU-ETS is the mandatory cap-and-trade system established by the European Union in 2003 (Directive 2003/87/EC). A significant contribution to the achievement of the national greenhouse gas emissions reduction target for the purposes of the Kyoto Protocol will be made by firms in the energy and industry sectors that are covered by the EU-ETS. Collectively these firms accounted for some 28% of total national greenhouse gas emissions in 2009. The effective participation by over 100 Irish installations in the EU-ETS has been a policy priority since the system commenced in 2005. The EU-ETS will contribute to achieving the European Union-wide target of reducing emissions by 21% relative to 2005 over the eight-year 2013-20 period.

The EU-ETS was launched in 2005, and its first commitment period ran until the end of 2007. During the second commitment period, 2008-12, Ireland may allocate for free a total of 20.24 Mt of CO_2 allowances to participating installations. This is 6.6% less than during the first commitment period.

The revised EU-ETS Directive 2009/29/EC broadened the scope of the EU-ETS for the third trading period – from 2013 to 2020 – as it will include aviation and the production of aluminium and chemicals, and it will also cover the emissions of perfluorocarbons and nitrous oxide in certain industries. One of the major changes for the third period is also that the cap is European Union-wide instead of national. In addition, all allowances for the power sector will have to be auctioned with temporary exemptions for some new European Union member states, whereas process industries may receive part or, if subject to carbon leakage, all of their allowances for free at the level of the benchmark of industry best practice. The Commission Decision 2011/278/EU adopted on 27 April 2011 sets out the rules for the number of allowances to be allocated per installation and how they are to be calculated by the member states' competent authorities.

DOMESTIC MEASURES OUTSIDE THE EU-ETS

The non-ETS sector represents 58% of total CO_2 emissions in 2009 (72% of total GHG emissions), which is among the highest shares in the European Union, with only Luxembourg, France, Lithuania and Latvia having a larger non-ETS sector. Therefore measures to mitigate emissions in these sectors (transport, agriculture, small industry, waste and buildings) are of foremost importance in Ireland. Under the EU Effort Sharing Decision (ESD), Ireland's non-ETS emissions must be reduced by 20% relative to 2005 by 2020. The main measures to reach this target are outlined below and in the *National Climate Change Strategy*, which was published in 2007.

Carbon tax

The most significant national policy development since the Strategy was issued in April 2007 was the extension of a direct carbon price to energy consumption outside the EU-ETS by way of a carbon levy. The levy was introduced in the government's 2010 budget at EUR 15 per tonne of CO_2 emitted, and has been implemented gradually on a fuel-by-fuel basis.

The carbon tax, at a rate of EUR 15 per tonne of CO_2 emitted, was applied to petrol and automotive diesel with effect from 10 December 2009, and was extended to other mineral oils with effect from 1 May 2010 (see Table 1). In addition, a carbon tax on natural gas was introduced on 1 May 2010 (see Table 2). A carbon tax on solid fuels was also considered but has not yet been signed into law.

Table 1. **Mineral oil tax**

Description of mineral oil	MOT rate in EUR (per 1 000 litres) in 2006 (no separate carbon charge component)	Components of MOT rate in EUR from 2011		MOT rate in EUR (per 1 000 litres) 2011 (sum of figures in previous two columns)
		Non-carbon component of MOT rate in euros (per 1 000 litres).	Carbon charge component of MOT rate in euros (per 1 000 litres)	
Light oil				
Petrol	442.68	541.84	34.38	576.22
Aviation gasoline	276.52	541.84	34.38	576.22
Heavy oil				
Used as a propellant (auto-diesel)	368.05	425.72	39.98	465.70
Kerosene used other than as a propellant	16.00	0.00	38.02	38.02
Fuel oil	14.78	14.78	45.95	60.73
Other heavy oil including marked gas oil	47.36	47.36	41.30	88.66
Liquefied petroleum gas				
Used as a propellant	63.59	63.59	24.64	88.23
Other liquefied petroleum gas	10.00	0.00	24.64	24.64
Substitute fuel				
Used as a propellant	368.05	541.84 (petrol substitute)	34.38 (petrol substitute)	576.22 (petrol substitute)
		425.72 (diesel substitute)	39.98 (diesel substitute)	465.70 (diesel substitute)
For use other than as a propellant	47.35	47.36	41.30	88.66

Source: data submitted by the government of Ireland to the IEA.

Table 2. **Carbon tax on natural gas**

2006	2011
Not liable to excise tax	EUR 3.07 per megawatt-hour based on net calorific value or EUR 2.77 per megawatt-hour based on gross calorific value

Source: data submitted by the government of Ireland to the IEA.

Fuel used for electricity generation is exempt from excise duty, including the carbon tax. Relief from carbon charge also applies to mineral oil and natural gas used in installations covered by the Emissions Trading Scheme subject to the fuels being liable to at least the relevant European Union minimum rate.

Substitute fuels that are biofuels qualify for relief from the carbon charge component of the mineral oil tax. In the case of blends of biofuel and other fuel, the relief only applies to the biofuel portion of the blend.

In the government's 2012 budget, the carbon tax was increased by EUR 15 to EUR 20 per tonne of CO_2 emitted. This increase applies to petrol and automotive diesel from 6 December 2011 and from 1 May 2012 to kerosene, marked gas oil, liquefied petroleum gas (LPG), fuel oil and natural gas.

Transport sector

In addition to the carbon tax, the government has set up other measures targeting the transport sector. These measures include investment in infrastructure and public transport to promote a modal shift (Transport 21), the restructuring of vehicle registration and motor taxes, and the introduction of biofuels. According to estimates published in the *National Climate Change Strategy*, the cumulative measures in the transport sector are expected to reduce emissions by 2.3 Mt per year. The most recent EPA projections suggest that emissions in this sector will be largely stable between now and 2020 if all additional measures are implemented in full and on time.

Building sector

Despite its temperate climate and efficiency improvements, in 2009 Ireland had the third highest emissions per capita in the residential sector among IEA member countries, after Luxembourg and Belgium. Consequently, buildings constitute an important target for emissions reductions. Ireland's building regulations are recurrently amended in order to enhance the thermal performance standards of new and refurbished buildings. According to the government roadmap, near zero-energy houses should be the objective between 2013 and 2016. The government expects the additional measures concerning Regulations for residential and commercial buildings to save up to 0.5Mt of CO_2 per year by 2020 whilst further and larger savings are available in the area of retrofitting existing buildings.

Other measures

Measures in other sectors – as in the public sector, agriculture, waste and small industries – are expected to deliver savings of about 2.6 Mt per year according to the National Climate Change Strategy. Examples of measures are the combined heat and power (CHP) deployment programme, providing grants for CHP installation, the common agricultural policy reform and a bioenergy scheme supporting production of energy crops throughout their lifetime.

INTERNATIONAL MEASURES

The flexible mechanisms available under the Kyoto Protocol allow the government to acquire allowances arising from emissions reduction initiatives elsewhere in the world. The government recognises that greenhouse gas emissions are not limited by national boundaries; the effect is global rather than local.

The *National Climate Change Strategy* signalled the possibility of supplementing GHG emissions reductions with the purchase of up to 3.6 million carbon units on average each year in the five-year Kyoto Protocol commitment period (2008-12), or 18 million units in total.

Under the Carbon Fund Act 2007, the National Treasury Management Agency has been designated as purchasing agent for the Irish state. In 2008, the Agency purchased 3.455 million certified emissions reduction units. In 2009, they purchased 1.8 million units. These units were generated under the Clean Development Mechanism provided for in Article 12 of the Kyoto Protocol.

In December 2006, Ireland entered into an agreement with the European Bank for Reconstruction and Development (EBRD) to invest in the Multilateral Carbon Credit Fund. Ireland also committed to the Carbon Fund for Europe and the BioCarbon Fund operated by the World Bank. These investments are expected to yield some 3 million credits over the five-year Kyoto Protocol commitment period 2008-12.

The economic downturn has implications for the purchasing programme and recent projections suggest that purchasing requirements are now significantly less than originally signalled in the *National Climate Change Strategy*. In these circumstances, the National Treasury Management Agency has been asked to put its purchasing programme on hold for the foreseeable future. Purchasing requirements to ensure Kyoto compliance are being kept under review and will be revised as necessary in the light of future projections.

CRITIQUE

Overall GHG emissions, which had increased by 21% between 1990 and 2000, were reduced by 3% over between 2011 and 2008, and then dropped by another 8% in 2009 as a result of the global economic recession. Ireland has binding goals under the EU Climate and Energy package to reduce GHG emissions in the non-ETS sectors by 20% relative to 2005 by 2020, whilst ETS emissions for all member states should fall by 21% relative to 2005 by 2020. For the 2008-12 compliance period of the Kyoto Protocol, Ireland committed to reduce its GHG emissions to 13% above its baseline, which is based on 1990 emissions for all gases except F-gases where the reference year is 1995.

The Irish climate change policy is directed by the *National Climate Change Strategy 2007-2012*, which is co-ordinated by the Department of the Environment, Community and Local Government. The government has yet to provide an updated outlook and strategy beyond 2012. However, the government's *Review of National Climate Policy* in November 2011 highlighted the fact that existing and planned policies were likely to be insufficient for Ireland to meet its emission target results, even in the immediate 2013-20 period. The possibility of a further tightening of European Union targets beyond (or even before) 2020 could make it impossible for Ireland to meet its commitments unless significant new mitigation policies and measures are adopted. The Secretariat of the National Economic and Social Council (NESC), a subsidiary body of the Department of

the Taoiseach[3] was recently tasked with identifying policies and measures to address this gap in the period to 2020, and to outline a vision for a longer term strategy to 2050. Ireland must push for additional policy development, emphasising the importance of a long-term perspective.

A focus of the EU Emissions Trading Scheme during the third period (2013-20) will be to adopt a European Union-wide cap on emissions, instead of the national cap approach in the first and second phases. More importantly, an auctioning system will gradually replace the free allocation mechanism of emission permits. In the Irish context, that will have a considerable impact on carbon-intensive coal- and peat-fired power plants.

The government introduced a carbon tax in the sectors not covered by the EU-ETS. The tax was introduced gradually on kerosene, marked gas oil, liquid petroleum gas, fuel oil, and natural gas. Natural gas is exempted from taxation if used for electricity generation, chemical reduction, or electrolytic or metallurgical processes. The carbon tax was levied in the government's 2010 budget at a price of EUR 15 per tonne, and subsequently increased in the 2012 budget to EUR 20 per tonne.

The IEA commends the progressive roll-out of the carbon tax, which is an effective tool to reduce emissions in the non-ETS sector, which is very large in Ireland. However, clarity around carbon price levels is important for investors, and it remains unclear how the carbon price is fixed and how it could evolve in the longer term. The use of carbon revenue, which is collected by the Treasury, is also an important issue. To improve their cost-effectiveness in the short and long term, price-based measures such as carbon taxes need to be complemented by energy efficiency and technology policies, and the carbon tax revenue provides a potential means of funding these complementary policies. Yet a transparent budget to reinvest the carbon revenue in carbon abatement solutions is not currently in place.

GHG emissions in transport grew significantly since the 1990's although this growth has reversed since the economic downturn. The main drivers of this growth were the increasing distances travelled, the growth in freight transport and the rise in car ownership. Road transport accounts for 97% of all transport emissions. Ireland has taken the commendable step of indexing its vehicle registration and annual motor (road) tax on the specific GHG emissions (fuel consumption) of a given vehicle, rather than measuring engine size. A notable increase in the fleet efficiency has been recorded since the amendment of this tax. Further curtailment of emissions in the transport sector can be achieved with the development of a nascent biofuels sector and the push for the electrification of vehicles (see Chapter 6 for details on these measures).

Regarding buildings, the migration of consumption from solid to liquid fuels has decreased since 1990. Of note, electric heating, heat pumps and the use of thermal storage for electricity could potentially reduce GHG emissions, but must be assessed on a life-cycle basis.

The agricultural sector – primarily dairy and beef – accounted for 28% of GHG emissions in 2010 and is the highest in European Union countries (the average within the European Union is 10%). Although the sector is more efficient on a GHG-per-GDP basis than its European peers, decarbonising the agricultural sector should remain a high priority, and bioenergy could create synergies between the energy and agricultural sectors by reducing GHG emissions.

3. Prime Minister's Office.

The United Kingdom is taking steps to strengthen its climate policy measures and encourage investments in low-carbon generation by imposing a carbon price floor for emissions, tentatively set at around GBP 16 per tonne of CO_2 in 2013 and rising to around GPB 30 per tonne in 2020 and to GBP 70 per tonne in 2030. Because of the increased interlinkage of the islands of Great Britain and Ireland following the completion of the East-West Interconnector in 2012, this change to the UK carbon pricing mechanism could have significant implications for Irish energy policy.

RECOMMENDATIONS

The government of Ireland should:

- ☐ *Publish an updated national policy position in response to the commitment in the 2010 Cancun Accords to develop low-carbon development strategies or plans.*
- ☐ *Determine a vision for the carbon tax to facilitate long-term planning, guaranteeing more transparency and with a view to clarifying how it will feed directly back into publicly supported GHG reduction programmes.*
- ☐ *Explore synergies between the energy and agricultural sectors that would, inter alia, contribute to reducing GHG emissions.*
- ☐ *Actively engage with the British government in order to ensure that a potential change to the UK carbon pricing mechanism is implemented in a manner which minimises the implications for Irish policy.*

4. ENERGY EFFICIENCY

Key data (2010)

Energy supply per capita: 3.2 toe (IEA average: 4.7), -13.4% since 2000

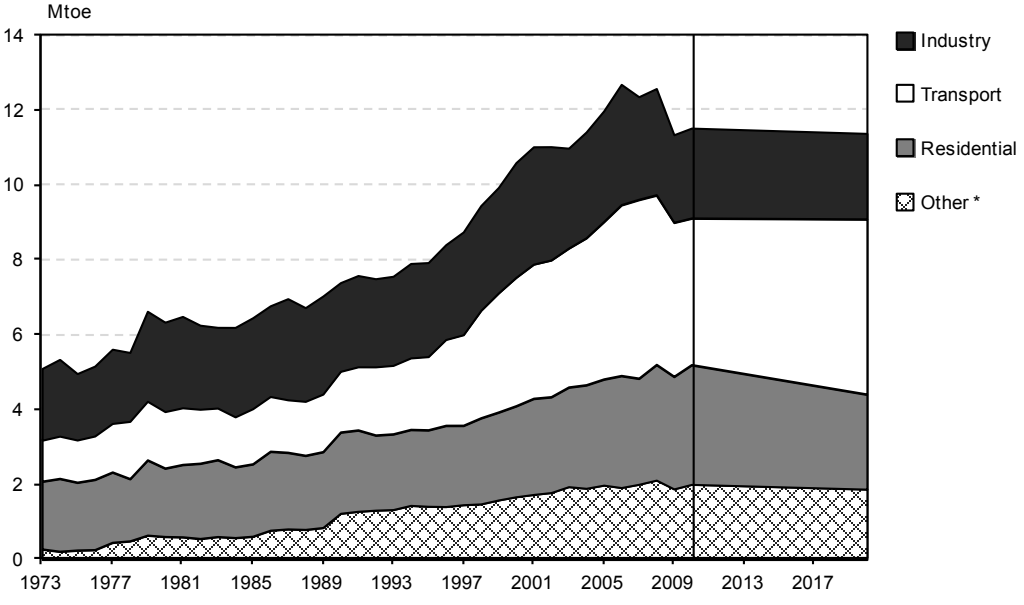
Energy intensity: 0.09 toe per 1 000 USD (IEA average: 0.15), -18.6% since 2000

Total final consumption: transport 35%, residential 28%, industry 19%, services and agriculture 17% (IEA average: transport 32%, residential 20%, industry 31%, other 16%)

OVERVIEW: FINAL CONSUMPTION BY SECTOR

In 2010, Ireland's total final energy consumption (TFC) of energy was 11.2 million tonnes of oil equivalent (Mtoe), on par with consumption in 2009, but 11% lower than in 2006, when TFC peaked at 12.7 Mtoe. On average, TFC grew by 0.8% per year over the last decade on average, whereas TFC declined by 0.1% per year on average for the IEA as a whole over the same period. The strong growth in TFC in Ireland over this period relative to its peers can be primarily attributed to the exceptionally strong economic growth that Ireland experienced until 2006-07.

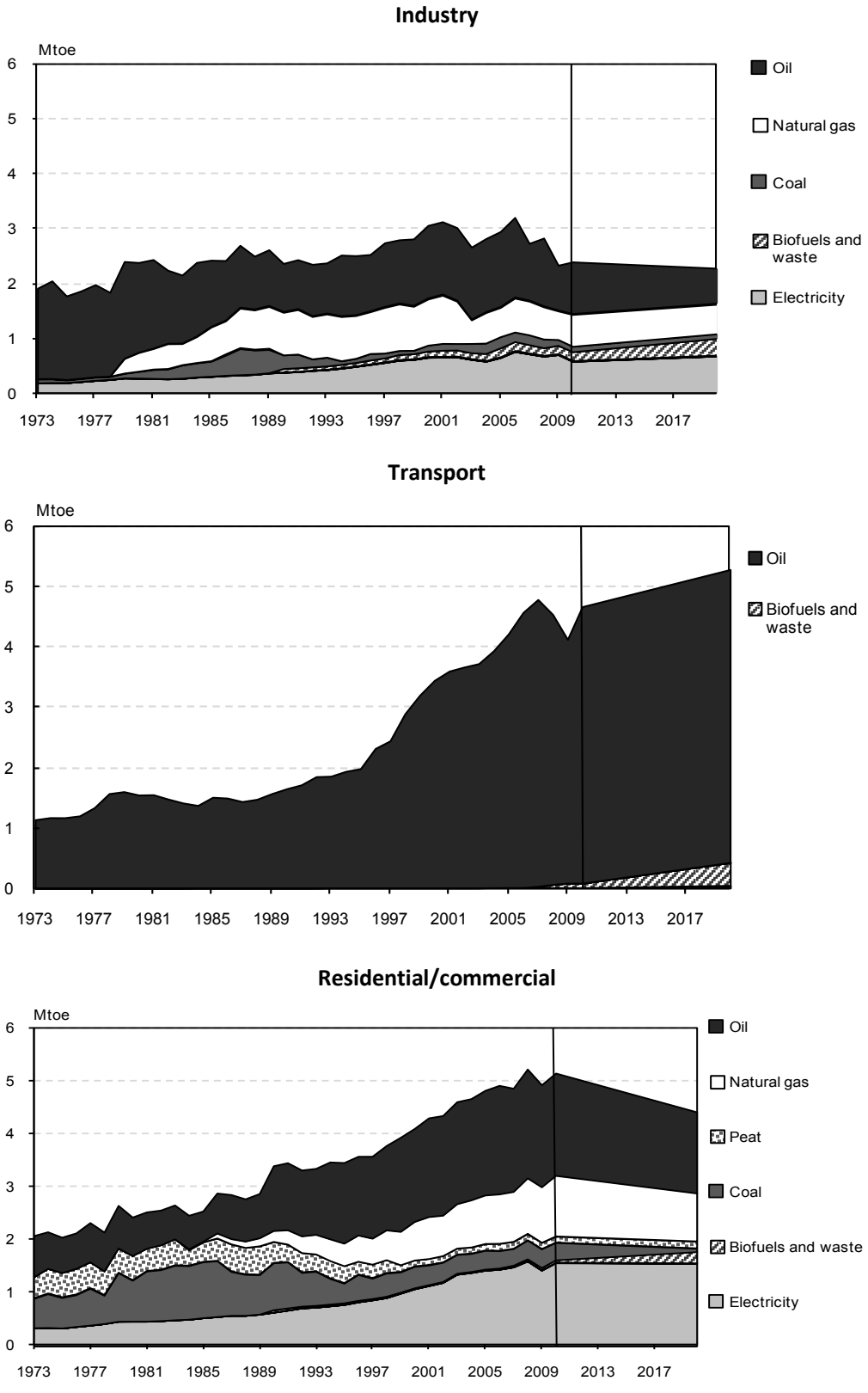
Figure 11. **Total final consumption by sector, 1973 to 2020**



* *Other* includes commercial, public service, agricultural, fishing and other non-specified sectors.

Sources: IEA (2011a), and data submitted by the government of Ireland to the IEA.

Figure 12. **Total final consumption by sector and by source, 1973 to 2020**



Source: IEA (2011a).

The transport sector accounted for 35% of this total, the residential sector for 28%, industry for 19% and services and agriculture for 17%. Compared to IEA member countries, Ireland has the second-lowest share of energy consumption in industry after Denmark.

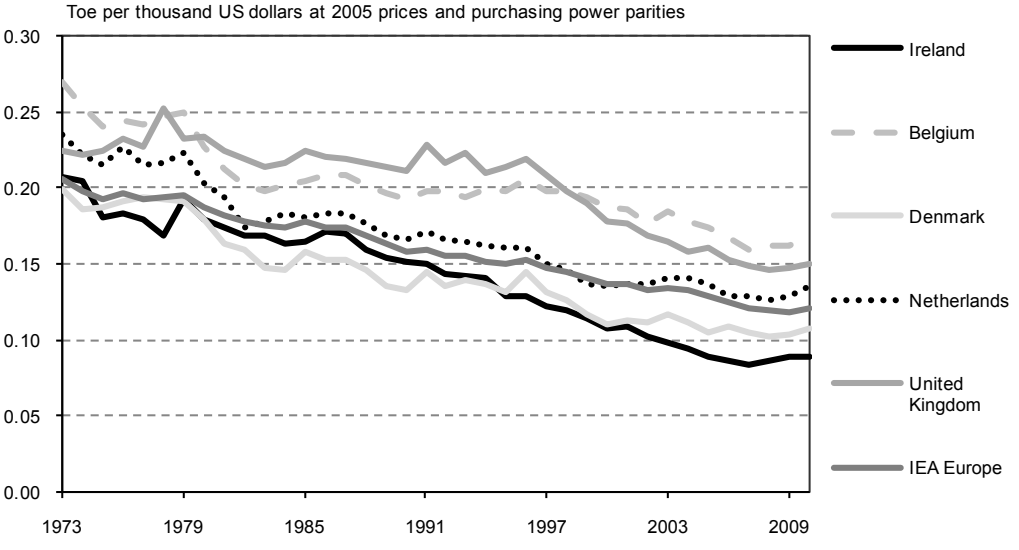
In the transport sector, final energy consumption amounted to 3.9 Mtoe in 2010, oil representing 98% of this amount, biofuels 2% and electricity a negligible amount. The government forecasts an increase in energy consumption in the transport sector, indicating that in 2020 it could reach 2006 levels again, implying an average increase of 2.0% per year over the coming decade. This total increase would be accompanied by a surge in biofuels, which are expected to represent 8% of total transport consumption in 2020.

In the meantime, energy consumption in industry is expected to grow marginally (by 0.4% per year) through to 2020. Consumption is expected to drop by 20% in the residential sector and 4.5% in the commercial sector. In the residential sector, oil is expected to remain as the largest final energy source, followed by electricity and gas, to 2020 as the impact of national energy efficiency programmes takes effect. Electricity demand dominates the commercial sector and this is expected to remain the case until 2020.

Ireland's energy intensity,[4] adjusted for PPP, is now the lowest in the IEA and has been declining steadily since 1990 at an average rate of 2.5% per year. This compares very favourably to the average decline rate in IEA member countries of just 1.3% per year. Ireland's energy intensity now stands some 26% lower than the IEA Europe average.

The declining trend in energy intensity has reflected the changing structure of the Irish economy over the past two decades. Ireland has largely moved away from heavy energy-consuming sectors and towards the services sector. Energy intensity is expected to continue to show a decreasing trend as this process continues, although recent economic difficulties, combined with colder weather, has temporarily masked this transformation.

Figure 13. **Energy intensity in Ireland and in other selected IEA member countries, 1973 to 2010**



Sources: IEA (2011a), and OECD (2011).

4. The amount of primary energy used in a country per unit of GDP.

INSTITUTIONS

The **Department of Communications, Energy and Natural Resources (DCENR)** is the lead ministry with responsibility for the formulation and development of energy efficiency policy, which is implemented through the National Energy Efficiency Action Plan (NEEAP). The NEEAP covers all sectors of the economy. The department is also responsible for co-ordinating energy efficiency policy across other institutions, drafting legal proposals and acts as the lead department for the transposition of European Union energy labelling legislation. The department is the market surveillance authority for the purposes of the Ecodesign and Energy Labelling Directives, as well as a leader in affordable energy policy development and implementation.

The **Sustainable Energy Authority of Ireland (SEAI)** was set up in 2002 as Ireland's national energy agency with a mission to promote and assist with the development of sustainable energy. It is responsible for advising government on policies and measures which include energy efficiency, and implementing programmes agreed by government and stimulating sustainable energy policies and actions by public bodies, the business sector, local communities and individual consumers.

The **Buildings Standards Unit,** within the **Department of the Environment, Community and Local Government (DECLG)**, has lead responsibility for ensuring good quality housing in sustainable communities and reducing carbon dioxide emissions in the built environment. Specifically it is responsible for updating and improving the energy efficiency requirements for domestic and non-domestic buildings under the Building Regulations.

The **Climate Policy Unit**, within the **Department of the Environment, Community and Local Government,** has lead responsibility for co-ordinating progressive development of national policy and legislation in response to climate change, including the pursuit of early and effective transition to a low-carbon, climate-resilient future. It manages and supports Ireland's engagement in climate policy development at European Union level, and at a wider international level under the UN Framework Convention on Climate Change. It also takes responsibility for overseeing, monitoring, reporting and verifying action at national level.

The **Competiveness and Climate Change Unit**, within the **Department of Enterprise, Jobs and Innovation (DEJI)**, is responsible for monitoring economic and policy developments – including in relation to climate change and sustainable development – at national, European Union and wider international levels that may impact on the competitiveness of enterprises in Ireland. It provides input to the formulation of Ireland's position on relevant climate change issues at European level which impact on business. It also ensures that European Union legislation concerning the ecodesign of products is given effect in Irish law, and informs industry and the general public of the implications of this legislation.

POLICIES AND MEASURES

Ireland has a very proactive energy efficiency policy, with a national target of 20% energy savings in 2020 – and a 33% target for the public sector.

A carbon tax introduced in January 2010 at EUR 15 a tonne provides, with the EU Emissions Trading Scheme (EU-ETS), an incentive for energy efficiency in all sectors. Budget 2012 saw the carbon tax increased to EUR 20 a tonne, with planned increases scheduled to bring the carbon tax to EUR 30 per tonne by 2014.

Capital funding of EUR 76 million was allocated for energy efficiency initiatives in the 2012 budget, on top of EUR 90 million allocated for the Better Energy programme in 2011.

NATIONAL ENERGY EFFICIENCY ACTION PLAN

According to Article 14(2) of the EU Directive, member states were required to submit their first National Energy Efficiency Action Plan (NEEAP) to the European Commission by 30 June 2007. In the framework of this Action Plan, member states must adopt and achieve an indicative energy saving target of 9% by 2016. The NEEAP is also required to describe how member states intend to comply with the provisions on the exemplary role of the public sector and the provision of information and advice to final consumers.

Ireland's first National Energy Efficiency Action Plan was published in May 2009, and set out 90 actions that Ireland planned to roll out across the public, business, residential and transport sectors, with a view to reducing CO_2 emissions by approximately 5.7 million tonnes and meeting the energy efficiency target of achieving 20% energy savings across the economy by 2020. The savings identified in the Action Plan represent an estimated EUR 1.6 billion in avoided energy costs for the economy in 2020.

Ireland's second NEEAP, to be launched in mid-2012, updates the 2009 Action Plan submitted to the European Commission (EC). Savings achieved to the end of 2010 account for 25% (over 8 000 gigawatt-hours [GWh]) of the 2020 target, representing a reduction in energy spending of almost EUR 460 million per year. An estimated reduction in CO_2 emissions of almost 2 million tonnes has also been achieved. Should all measures detailed in the Action Plan reach their full potential by 2020, it is estimated that energy savings totalling over 33 660 GWh per year will have been achieved, leading to a reduction in annual emissions of around 7.6 Mt. This represents a potential reduction in energy use across all sectors of approximately EUR 2.25 billion (2010 values) as a result of the savings.

The Department of Communications, Energy and Natural Resources intends to establish a cross-departmental implementation steering group to oversee and report to government on delivery of the actions set out in the NEEAP.

PUBLIC SECTOR

Under the Action Plan, the public sector is required to act as exemplar and demonstrate improvements in energy efficiency of 33% by 2020. In order to ensure that this target is met the DCENR and the Sustainable Energy Authority of Ireland (SEAI) have embarked on an extensive project to measure energy consumption in the public sector and track performance on an annual basis. This project will provide vital data on patterns of public sector energy usage and form the basis on which public sector energy saving targets will be allocated. A comprehensive suite of measures and actions are planned for implementation between now and 2020 in order to support the delivery of the public sector energy saving target.

The Public Sector Energy Efficiency Programme is designed as the main delivery mechanism for co-ordinating and encouraging energy efficiency actions by Ireland's public sector bodies. It provides professional advice on energy management and energy efficiency improvement measures. In 2010, free energy assessments were undertaken in 283 public buildings and 14 major public sector bodies formally committed to Energy Efficiency Partnerships. Energy savings of 1 300 GWh are anticipated to arise from this programme by 2020.

In June 2010, a EUR 9 million Energy Efficiency Fund was launched, with the aim of supporting exemplar projects which achieve significant and verifiable energy savings and provide key lessons for other businesses and public sector bodies. As of early 2012, it has resulted in funding of EUR 6 million in grant offers for 36 public sector projects (out of 66 projects in total), with projected annual savings of at least EUR 2.5 million and emissions reductions of approximately 15 000 tonnes of CO_2.

In March 2011, EU Energy Efficient Public Procurement Regulations were introduced that oblige public bodies to only purchase equipment and vehicles from the Triple E register. This means that they are required to purchase products that are leaders in their class in respect of energy efficiency. This register is maintained by the SEAI.

A Green Public Procurement Action Plan (Green Tenders) was published in January 2012 by the Department of the Environment and sets out the framework to integrate environmental considerations into all public sector contracts to procure goods, services and works.

TRANSPORT

Measures to improve transport sector efficiency are contained in the Smarter Travel Policy, for which the Department of Transport has the lead role, and is the framework under which energy savings and emissions reductions will be achieved in the transport sector. The overall vision is contained in five key goals which are: to reduce overall travel demand; to maximise the efficiency of the transport network; to reduce reliance on fossil fuels; to reduce transport emissions; and to improve accessibility to transport. There are 49 detailed actions set out in the policy to achieve the five key goals, and they can be grouped into four broad categories of action: i) actions to reduce travel demand and distances travelled; ii) actions to ensure modal shift; iii) actions to improve efficiency through technology implementation, and iv) actions aimed at strengthening institutional arrangements to deliver the policy objectives.

With regard to how energy efficiency is integrated into transport project appraisal, the "Guidelines on Common Appraisal Framework for Transport Projects and Programmes", which were updated in June 2009, include, among others, economic, environmental and integration criteria. Vehicle operating costs, of which fuel costs are an integral element, are included as an element of the economic criteria. The environmental criteria include the monetised cost of CO_2 and non-CO_2 transport emissions. The integration criteria are assessed at two levels, in terms of integration with land use policies and of integration with regional and local land use plans. These three criteria serve to integrate the broad area of energy efficiency into the appraisal process.

Promoting alternatives to cars and improving efficiency of car travel

A national Sustainable Transport and Travel Action Plan was drawn up in 2009. It included a range of energy-efficient actions. These actions centred on reducing the distance travelled by private cars and on encouraging smarter travel, including focusing population growth in areas of employment and to encourage people to live in close proximity to places of employment and the use of pricing mechanisms or fiscal measures to encourage behavioural change. It also included actions aimed at ensuring that alternatives to cars are more widely available, mainly through improved public transport services and investment in cycling and walking. The plan also included car-specific actions aimed at improving the fuel efficiency of motorised transport through improved

fleet structure, energy-efficient driving and alternative technologies. This has, perhaps, been the most successful area in terms of energy savings, with the energy efficiency of new cars entering the fleet improving by over 20% in recent years.

Several new and improved rail lines have been opened, rolling stock on all of the major inter-city rail routes has been renewed, 3 LUAS light rail (tram) extensions have opened, capacity has been extended on both existing LUAS lines, and the public transport fleets of the semi-state bus companies have been substantially modernised. Progress has also continued on various public transport programmes including railway safety, traffic management, bus priority and public transport accessibility.

Vehicle taxation and grant supports

In 2008 the vehicle registration tax and motor taxation rates were rebalanced on the basis of GHG emissions, thereby encouraging the purchase of lower emissions/more energy-efficient cars. The net result is that the average car entering the national fleet is now almost 20% more energy-efficient than was the case before the rebalancing of vehicle taxation.

On top of the imposition of a carbon tax, there has also been significant excise increases, resulting in a 30% increase in taxation on transport fuels. As a result of these changes, fuel tax in Ireland is now around European Union average levels.

A relief scheme which provided for the remission or repayment of 50% vehicle registration tax (VRT) payable upon registration was first introduced in January 2001 for certain hybrid electric vehicles, and then extended to all forms of electric cars in January 2007.

Under the Finance Act 2011, battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) registered as of May 2011 (until end-2012) receive a remission or repayment of VRT up to a maximum amount of EUR 5 000 upon registration. Similarly, PHEVs can receive VRT repayment of up to EUR 2 500.

In addition, in April 2011, Ireland introduced a two-year grant scheme for all vehicles with CO_2 emissions of less than 75 g CO_2 per kilometre (CO_2/km) (mostly BEVs and PHEVs). Qualifying vehicles sold after 1 January 2011 are eligible for a purchase subsidy of up to EUR 5 000. EUR 1.5 million has been allocated in 2012 for this purpose.

Ireland aims to have 10% of vehicles (approximately 220 000) powered or partially powered by electricity from the grid by 2020. ESB, the state-owned electricity incumbent, is supporting the deployment of electric vehicles by rolling out, subject to the uptake of electric vehicles during the pilot scheme period, 1 500 publicly accessible charge points for electric vehicles. These will be located in every city and town with a population of more than 1 500. Two thousand domestic charge points will also be installed. Besides the above, 30 fast chargers will be built 60 km apart along all major inter-urban routes.

Developments in electric mobility have opened up a range of new avenues of approach around both energy efficiency and renewable energy in transport. Ecœdriving has been included in the new syllabus for learner driver training.

Biofuels

The state introduced an obligation scheme in mid-2010, which obliges all suppliers of transport fuels to include a proportion of biofuels in their sales in any given year. As of

2012, this rate is set at 4%, but it is likely that this will rise sequentially over time to 10.5% in 2020, to assist in meeting Ireland's European Union obligation of achieving 10% of renewable energy in the transport sector by 2020.

BUILDINGS

The European Union's recast Energy Performance of Buildings Directive (EPBD), adopted in May 2010, clearly states that reduction of energy consumption and the use of energy from renewable sources in the buildings sector constitute important measures needed to reduce the European Union's energy dependence and greenhouse gas emissions. Ireland has until July 2012 to transpose this directive into law. Ireland has already implemented significant policies in the buildings sector.

The Better Energy programme

In May 2011, the government launched "Better Energy: the National Upgrade Programme", which is designed to meet the energy savings gap identified in the first Action Plan. The target for the first three years is 2 000 GWh, with approximately half to be met by energy suppliers. There are four strands to the Better Energy programme which encompass energy efficiency in the domestic sector, energy saving targets for energy suppliers, energy poverty alleviation and energy efficiency in the non-domestic sector.

The first strand, "Better Energy: Homes", replaces three domestic energy efficiency and renewable energy programmes: the Home Energy Savings Scheme (HES), the Warmer Homes Scheme (WHS) and the Greener Homes Scheme (GHS). Better Energy: Homes allows domestic customers to apply for an Exchequer-supported incentive, as a grant or upfront discount, to install approved energy-saving measures. Measures supported under this strand include roof and wall insulation, high-efficiency boilers, heating control upgrades and solar thermal. Since 2009, 301 000 energy-saving measures have been implemented in over 120 000 homes, resulting in annual energy savings of 660 GWh being realised. Over EUR 130 million has been paid out under the programme to date.

The second strand involves energy suppliers, net-bound and non-net-bound, signing up to voluntary agreements which are expected to deliver approximately 900 GWh of energy savings over the period 2011 to 2013. Energy companies can meet their target by directly offering upgrade services, or by subcontracting the work to third parties. Annual targets, eligible measures and savings credits have been finalised. All large energy supply companies have signed voluntary agreements, with a number of smaller energy supply companies to follow. Energy suppliers are free to work in any sector of the economy, including in support of the 33% public sector energy saving target.

The third Better Energy strand replaces the Warmer Homes Scheme (WHS), and focuses on alleviating energy poverty by providing support for energy efficiency upgrades in low-income private housing. Applications are centrally managed with referrals coming via a network of community-based organisations that also deliver retrofit work free of charge to the home-owner. Since the start of the programme in 2000, over 80 000 homes have been upgraded and EUR 80 million spent on retrofitting low-income homes. Estimated energy savings for these measures amount to 171 GWh.

The fourth Better Energy strand supports energy efficiency upgrades in commercial and public buildings. Projects are selected on their energy-saving potential, combined with their ability to prove and disseminate widely applicable technical solutions and also new

business models, such as energy performance contracting. There is huge potential for new business and financing models, in the public sector for example, where the savings pay for the work and so organisations can have upgrades carried out at no initial cost. In the three years of operation to date, energy savings of 552 GWh have been realised, with a 2012 focus on energy performance contracting.

The programme, which is providing EUR 76 million for energy efficiency initiatives in 2012, marks an important milestone in the achievement of Ireland's national energy efficiency targets. The 2012 budget allocation will support the creation and retention of over 4 500 jobs. The Better Energy programme is expected to generate additional energy savings of 450 GWH in 2012, worth up to EUR 30 million per year. While the government has committed to continue to provide a significant level of support in 2012 and 2013, the Programme for Government seeks to move to a non-Exchequer based funding model no later than the start of 2014 (see below PAYS scheme, under "Other housing measures").

Other housing measures

Ireland's Low Carbon Homes programme, launched in 2008, supported very low-energy/ low-carbon buildings as a precursor to revisions in building regulations. Irish mandatory minimum energy efficiency requirements for buildings are now among the most stringent in Europe. There are plans to further strengthen the standards for both housing and non-residential buildings and to implement a low-energy/low-carbon standard in 2013, but there has been no policy change since 2009. Measures are in place to monitor and enforce compliance.

Ireland's Building Energy Rating (BER) certification scheme was introduced for new domestic housing in 2007 and for existing dwellings in 2009. Under this scheme, the energy certification of a dwelling is mandatory whenever a dwelling is commissioned or offered for sale or rent. The BER certificate is accompanied by an advisory report, with recommendations for cost-effective improvements to energy performance, allowing householders to plan for further improving the energy performance of their dwelling and saving money on their energy bills. In June 2010, the BER was made a mandatory component of the Better Energy: Homes scheme wherein home-owners must undertake a BER after works to demonstrate energy savings estimates. Close to 300 000 BER certificates for domestic dwellings are in place and almost 8 500 for non-domestic dwellings.

The Minister of the Environment, Community and Local Government signed the Building Regulations in 2011,[5] which aim to achieve a 60% aggregate improvement (relative to the 2005 regulatory requirements) in the energy performance and carbon dioxide emissions for new dwellings as of 1 December 2011 (subject to the prescribed transitional arrangements which may allow exemption until no later than 30 November 2013).

A Code of Practice (COP) is currently being developed by an inter-Departmental/Agency team for works relating to the retrofitting of energy efficiency measures into existing dwellings in Ireland. The project involves the identification, review of relevant data, analysis of measures and the development of a suitable draft COP which is fully fit for the intended purpose of providing guidance to designers, retrofitting contractors, energy consultants, energy agencies, utility companies, etc.

5. (Part L Amendment) Regulations 2011 – S.I. No. 259 of 2011.

The Programme for Government includes a commitment to roll out a pay-as-you-save (PAYS) energy retrofit scheme for domestic buildings in early 2014, substituting Exchequer funding currently being provided to the Better Energy programme. The PAYS concept is an innovative financing mechanism that would allow consumers to finance upgrades directly through the energy savings generated. It is also envisaged at this time that such a scheme would encourage energy efficiency measures in non-domestic buildings and premises. DCENR has established a project team to undertake the necessary technical and financial analysis of a PAYS model in the Irish context, drawing on international experience of such schemes. This policy is still in the early stages and there are considerable complexities involved in the development of the PAYS scheme. It is anticipated that a steering group will be charged with the technical, legislative and financial aspects of the scheme design.

To promote improved energy efficiency in windows and other glazed areas, an independent energy rating assessment scheme has been developed by the National Standards Authority of Ireland. The scheme is voluntary in nature, although, according to early indications, it has proved popular among manufacturers.

Affordable Energy Strategy

In November 2011, the *Affordable Energy Strategy* was published, providing the framework for building upon the many measures already in place to protect households at risk from the effects of energy poverty, which include the thermal efficiency-based measures delivered through the Better Energy: Warmer Homes programme.

An Inter-Departmental/Agency Group on Affordable Energy (IDGAE), which represents all key departments, agencies and energy suppliers as well as the Energy Regulator and non-governmental organisations, has been charged with monitoring implementation. The *Affordable Energy Strategy* has identified 48 short-, medium- and long-term actions that can be taken to tackle energy poverty, with five priority work streams tackling issues around the role of energy suppliers, introducing an area-based approach to the delivery of energy efficiency measures, data and information, and communications.

APPLIANCES, EQUIPMENT AND LIGHTING

European Union regulations have to a large extent harmonised national measures relating to the publication of information on the consumption of energy and of other essential resources by household appliances, thereby empowering consumers to choose appliances on the basis of their energy efficiency. The European Commission published a series of delegated regulations which entered into force in 2011. The aim of energy labelling is to provide incentives for industry to develop further improved products and innovations beyond the minimum mandatory energy efficiency levels.

These regulations will require manufacturers to declare the energy efficiency of televisions, refrigerators, dishwashers and washing machines, using an A to G scale, with A being the highest rating. The new labelling system allows up to three classes (A+ to A+++) to be added on top of class A so as to provide consumers with more differentiation between products. Energy labels are mandatory for all appliances placed on the European Union market and they must be clearly displayed on each appliance at the point of sale.

Significant progress has been made in implementing policies related to energy-efficient appliances and equipment. A major component of Irish policy on appliances and equipment entails transposition and implementation of the Ecodesign Directive. As a

result, there have been improvements in market surveillance of products and the stand-by 1 W limit has applied to products covered under this Directive since January 2010. Televisions and settop boxes are required to meet minimum efficiency performance standards and the most efficient products are promoted through the labelling and various marketing activities undertaken by the SEAI.

Market surveillance of the Ecodesign Directive primarily entails having the various products falling within the scope of the directive tested by accredited laboratories to verify their actual energy efficiency in various operational modes. Where testing does not support the claimed efficiency of the product, the DCENR is required to take enforcement action, including ordering the manufacturer to rework the product or banning the product from the market. Other member states and the Commission must also be advised of a test failure.

To fulfil its obligations under the Energy Labelling Directive, the market surveillance authority will outsource inspection functions to a suitably qualified market actor who will then be appointed as an authorised officer. This officer will carry out in-store visual inspections of energy labels to verify the manufacturer's declaration. The market surveillance regime should assist in ensuring compliance with the Ecodesign and Energy Labelling Directives, assisting in the creation of awareness of and a market for these products.

In the area of lighting, Ireland was one of the first countries to announce a ban on incandescent light bulbs in 2007 and has, like other European Union countries, removed incandescent light bulbs from the market.

INDUSTRY

Ireland is among the leading countries in implementing industrial energy efficiency policy. A formal energy management policy is in place for large industry and SMEs. In particular, the SEAI Energy Agreements Programme helps companies analyse their energy use and opportunities for savings, and advises on appropriate monitoring and management. The Energy Agreements Programme captures 11% of national primary energy. The SEAI also implements other effective measures to stimulate industrial energy efficiency, such as providing high-quality information on energy efficiency best practices. Minimum energy performance requirements for certain kinds of electric motors have been adopted under European Commission Regulation No 640/2009 that came into force in 2011. Tax allowances are available for companies that purchase approved energy-efficient products, further promoting the market for best-in-class energy -using equipment across ten different equipment categories and 49 associated technologies.

LIEN

The LIEN (Large Industry Energy Network) and the Energy Agreements Programme are well-established networking and information programmes for large energy users. In operation since 1995, it engages 160 of the largest energy users in ongoing relationships, including site visits, workshops and annual performance reporting. LIEN members share information on energy-saving technologies and techniques to maximise savings and maintain competitiveness. Energy spending across the LIEN is almost EUR 1 billion. It accounts for 60% of Irish industrial energy usage, but it also includes non-industrial sectors that extend the network by an additional 15%. The LIEN accounts for over 14% of the national primary energy requirement. The Energy Agreements Programme supports

the implementation and operation of an energy management system through the ISO 50001 standard. It develops initiatives and resources to stimulate activity and that can be replicated within the LIEN. In the first five years since the introduction of the energy management standard to Ireland, the LIEN has lowered energy intensity by 18% with an avoided energy expenditure of EUR 150 million.

Small and medium-sized enterprises

SMEs are facilitated through the Energy Agreements Programme, with a specific process designed to support them and to reduce energy consumption. Grant support is made available through the Better Energy: Workplaces programme, with 21 of the 85 projects supported in 2012 relating to SMEs.

Accelerated Capital Allowance (ACA) for energy-efficient equipment

The Accelerated Capital Allowances[6] scheme allows companies to write off the full capital cost of registered energy-efficient equipment and machinery against corporation tax in the year of purchase, unlike non-ACA equipment which is typically written off over eight years.

Box 1. **IEA 25 energy efficiency policy recommendations**

To support governments with their implementation of energy efficiency, the IEA recommended the adoption of specific energy efficiency policy measures to the G8 summits in 2006, 2007 and 2008. The consolidated set of recommendations to these summits covers 25 fields of action across seven priority areas: cross-sectoral activity, buildings, appliances, lighting, transport, industry and power utilities. The fields of action are outlined below.

1. The IEA recommends action on *energy efficiency* across sectors. In particular, the IEA calls for action on:

- data collection and indicators;
- strategies and action plans;
- competitive energy markets, with appropriate regulation;
- private investment in energy efficiency; and
- monitoring, enforcement and evaluation.

2. *Buildings* account for about 40% of energy used in most countries. To save a significant portion of this energy, the IEA recommends action on:

- mandatory buildings codes and minimum energy performance requirements:
- net-zero energy consumption in buildings;
- improved energy efficiency in existing buildings;
- building energy labels or certificates; and
- energy performance of building components and systems.

6. Section 46 of the Finance Act 2008.

Box 1. **IEA 25 energy efficiency policy recommendations** (continued)

3. *Appliances and equipment* represent one of the fastest growing energy loads in most countries. The IEA recommends action on:

- mandatory minimum energy performance standards and labels;
- test standards and measurement protocols; and
- market transformation policies.

4. Saving energy by adopting efficient *lighting technology* is very cost-effective. The IEA recommends action on:

- phase-out of inefficient lighting products; and
- energy-efficient lighting systems.

5. To achieve significant savings in the *transport sector,* the IEA recommends action on:

- mandatory vehicle fuel-efficiency standards;
- measures to improve vehicle fuel efficiency;
- fuel-efficiency non-engine components; and
- transport system efficiency.

6. In order to improve energy efficiency in *industry*, action is needed on:

- energy management;
- high-efficiency industrial equipment and systems;
- energy efficiency services for small and medium-sized enterprises; and
- complementary policies to support industrial energy efficiency.

7. *Energy utilities* can play an important role in promoting energy efficiency. Action is needed to promote:

- utility end-use energy efficiency schemes.

Implementation of IEA energy efficiency recommendations can lead to huge cost-effective energy and CO_2 savings. The IEA estimates that, if implemented globally without delay, the proposed actions could save around 7.6 gigatonnes of CO_2 per year by 2030. In 2010 this corresponded to 17% of annual worldwide energy consumption. Taken together, these measures set out an ambitious road-map for improving energy efficiency on a global scale.

The purpose of the ACA scheme, introduced in October 2008, is to encourage businesses to purchase plant and machinery that are highly energy-efficient and thus to make significant savings on energy costs and reduce carbon emissions. It provides procurement assurance and guidance by way of its comprehensive register of verified products that are proven to be more energy-efficient (and hence have lower running costs) than average equipment.

Since its introduction, the ACA scheme has expanded (from five initial technologies) to 52 different technologies and has now more than 8 000 products on its register, including information technology software solutions, refrigeration and cooling systems,

electro-mechanical systems and catering and hospitality equipment. Considering that most of the eligible technologies have been only recently introduced, it is to be noted that there is only around 30% awareness of the ACA among companies investing in new equipment (measured by independent survey research).

The scheme was extended in the 2011 budget beyond its initial three-year lifespan, and will now run until October 2014. With energy cost savings worth EUR 3 million (54 GWh) already attributed to the scheme at this early stage, it is estimated that the ACA will save business a total of EUR 43 million (700 GWh) to EUR 62 million (975 GWh) between now and 2020. It will also deliver cumulative CO_2 reductions of 200 000 tonnes. The ACA scheme aims to save 800 GWh by 2020 under the National Energy Efficiency Action Plan (NEEAP).

CRITIQUE

Ireland has made considerable progress in improving energy efficiency over the last decade. Energy efficiency measures can – when implemented correctly – contribute significantly to Ireland's targets in reducing CO_2 emissions and can even reduce its strong dependence on energy imports.

Ireland has a very proactive energy efficiency policy and a national target of 20% energy savings in 2020. This is complemented by an ambition to reduce energy consumption in the public sector by 33% in 2020. These targets, along with the measures and actions necessary to achieve them, are detailed in the National Energy Efficiency Action Plan which contains over 90 measures and actions, targeting all sectors of the economy.

In order to meet its commitment to a 20% reduction target in energy efficiency by 2020, ambitious progress in all energy-consuming sectors will be needed, particularly in the building and transport sectors where more than 60% of primary energy is consumed. Constant and transparent monitoring would allow (sector-tailored) adaptations and improvements to the existing energy-saving plans and ensure a full and timely achievement of Ireland's targets.

Furthermore, Ireland has set itself an ambitious national target in the public sector of achieving 33% energy savings by 2020. Ireland remains committed to this objective, despite the challenges posed by the ongoing global economic recession. To achieve this target, an intelligent mix of different instruments is needed. These include the retrofitting of public buildings, behavioural changes, replacing energy-intensive equipment with energy-efficient equipment, and public procurement taking due account of energy efficiency aspects. In this respect, Ireland should ensure a balance between costlier measures that are more beneficial in the longer term, and cheaper, shorter-term measures.

The Sustainable Energy Authority of Ireland (SEAI) was set up in 2002 as Ireland's National Energy Agency, with a mission to promote and assist with the development of sustainable energy. The Authority manages programmes aimed at supporting government decision making through advocacy, analysis and evidence; driving demand reduction and providing advice to all users of energy; driving the decarbonisation of energy supply; raising standards in sustainable energy products and services; building markets based on quality, confidence and proven performance; fostering innovation and entrepreneurship; and improving the coherence of Irish energy research and development. At present, Ireland has developed a wide range of programmes for improving energy efficiency, using different instruments, for addressing different sectors and consumers. To ensure coherence between the programmes and schemes, an integrated strategy for energy efficiency should be put in place, embedded in the forthcoming general energy strategy for Ireland.

In the area of lighting, Ireland was one of the first countries to announce a ban on incandescent light bulbs in 2007 and has, like other European Union countries, removed them from the market. Lighting accounts for a significant proportion of electricity use in the public sector, and is one of the key measures for attaining energy-saving objectives in the public sector. Ireland should consider supporting international efforts to stimulate the adoption of higher-efficiency alternatives to fuel -based lighting in off-grid communities in developing countries.

Ireland has implemented sound policies in the buildings sector, an important sector for energy savings. The Home Energy Savings Scheme (HES), the Warmer Homes Scheme (WHS) and the Greener Homes Scheme (GHS), now replaced by the Better Energy programme, have triggered retrofitting of buildings in Ireland to a significant degree. The new framework offers grants for singular energy efficiency measures (instead of deep retrofitting) and allows consumers with rather small budgets to benefit from the programme, although energy suppliers receive additional energy-saving "credits" for undertaking multiple measures in one house. Of note, Irish mandatory minimum energy efficiency requirements for buildings are now among the most stringent in Europe. There are plans to further strengthen the standards for both housing and non-residential buildings and to implement a low-energy/low-carbon standard in 2013.

The economic crisis is having a deep impact on energy efficiency policy in Ireland as the government is reviewing its system of public financing of efficiency measures. Scarcity of public funding in general and lack of private capital for investments are severe problems for improving energy efficiency and a danger for the 20% target for 2020. Although energy-saving measures should always be cost-efficient (and economically viable), under certain circumstances financial incentives have proven to be indispensable (for instance the retrofitting of domestic buildings with long payback periods, or energy-saving schemes in SMEs). Alternative financing solutions should be considered, notably with regard to the role that energy suppliers could play in providing energy saving measures for their customer (such as energy audits, installing of smart meters, and providing equipment for heating storage). Furthermore, Ireland should ensure that the visibility of energy service companies (ESCOs) is increased and should pay particular attention to assisting in the development of the ESCO market. So far, the market for ESCOs in Ireland is limited.

One of the key sectors for improving energy efficiency in Ireland, and probably the most severe challenge, remains the transport sector. The transport sector continues to be the weakest in terms of energy efficiency policy implementation. The government has addressed this fact in the "Smarter Travel" policy which contains 49 measures to raise saving potentials. It is crucial that the policy is implemented fully and in a timely manner, and is developed further, with the perspective of 2050 in mind. Ireland has introduced a grant scheme for all vehicles with CO_2 emissions of less than 75 g CO_2/km, and eco-driving has been included in the new syllabus for learner driver training. In parallel, Ireland is also implementing European Union regulations to lower rolling resistance, maintain appropriate tyre inflation pressure through mandatory fitting of a tire pressure monitoring system (TPMS), and require average emissions from new passenger vehicles sold in Ireland, and other European Union member states, to reach the 130 g CO_2/km target by 2015. To further support energy efficiency in the transport sector, Ireland should support the development of mandatory fuel efficiency standards for heavy-duty vehicles at the European Union level.

The introduction of a new taxation system based on CO_2 emissions of vehicles and an incentive programme for purchasing energy-efficient cars have resulted in a significant change in the Irish vehicle fleet. Yet further action will be required if Ireland is to meet its ambitious target of increasing the share of electric vehicles to 10% by 2020. Ireland needs to develop an integrated strategy for meeting this target, defining sub-targets and a schedule, providing incentives for buyers and developing the necessary infrastructure.

Across all sectors, Ireland must persevere in its efforts to develop and implement policies, and publicise common energy savings and verification measures, in order to encourage a boost in private sector investment in energy efficiency. Such efforts need to be supported by optimal procedures for compliance, monitoring and evaluation of energy efficiency policies and by reliable legislative and institutional infrastructure for enforcement. In this regard, the need for collective engagement on the energy efficiency agenda across government, agencies and utilities is of paramount importance.

RECOMMENDATIONS

The government of Ireland should:

- ☐ *Continue to develop its already competent NEEAP into a consistent medium- and long-term strategy for improving energy efficiency, containing transparent targets and sub-targets across all energy-consuming sectors, including monitoring, based on reliable data and allowing adaptations, embedded in an integrated energy strategy for Ireland. The IEA 25 energy efficiency policy recommendations provide an effective portfolio of cost-effective policies on which to evaluate or base the NEEAP.*
- ☐ *Ensure that a comprehensive monitoring and evaluation system is implemented by the SEAI to account for the social and economic outcomes to consumers and government from the NEEAP.*
- ☐ *Ensure that necessary and sufficient funding for cost-efficient energy-saving measures for private households and SMEs is available, alongside instruments and incentives that promote the development of a market for energy services.*
- ☐ *Define concrete steps (buying incentives, providing infrastructure) for achieving energy savings in the transport sector, including the 10% target for electric vehicles in 2020.*
- ☐ *Ensure that the public sector is seen as exemplary in respect of energy efficiency, both from the perspective of implementation of new and innovative measures and actions, as well as monitoring and verification of energy savings.*
- ☐ *Ensure that the necessary resources are provided to support the implementation of the* Affordable Energy Strategy.
- ☐ *Ensure that the Sustainable Energy Authority of Ireland is adequately resourced in order to ensure the continued delivery of energy efficiency programmes, as well as the monitoring and verification of energy-saving targets.*

PART II
SECTOR ANALYSIS

5. ELECTRICITY

Key data (2010)

Installed capacity: 8.5 GW

Total electricity generation: 28.4 TWh, +20.1% from 2000

Peak demand: 5.1 GW

Electricity generation mix: natural gas 62%, coal 15%, wind 10%, peat 8%, oil 2%, hydro 2%, biofuels and waste 1%

SUPPLY AND DEMAND

SUPPLY

Total electricity generation in Ireland was 28.4 terawatt-hours (TWh) in 2010, 1.3% more than in 2009 but 5.4% less than the record peak of 29.9 TWh recorded in 2008 (see Figure 14). Between 2000 and 2010, electricity generation grew by an average rate of 1.8% per year. Ireland succeeded in decoupling its GDP growth from its electricity consumption, as the country's GDP grew by 2.4% over the same 2000-10 period. Interestingly, the growth in electricity generation has mirrored the population growth over the 2000-10 period, which also stood at an average of 1.8% per year.

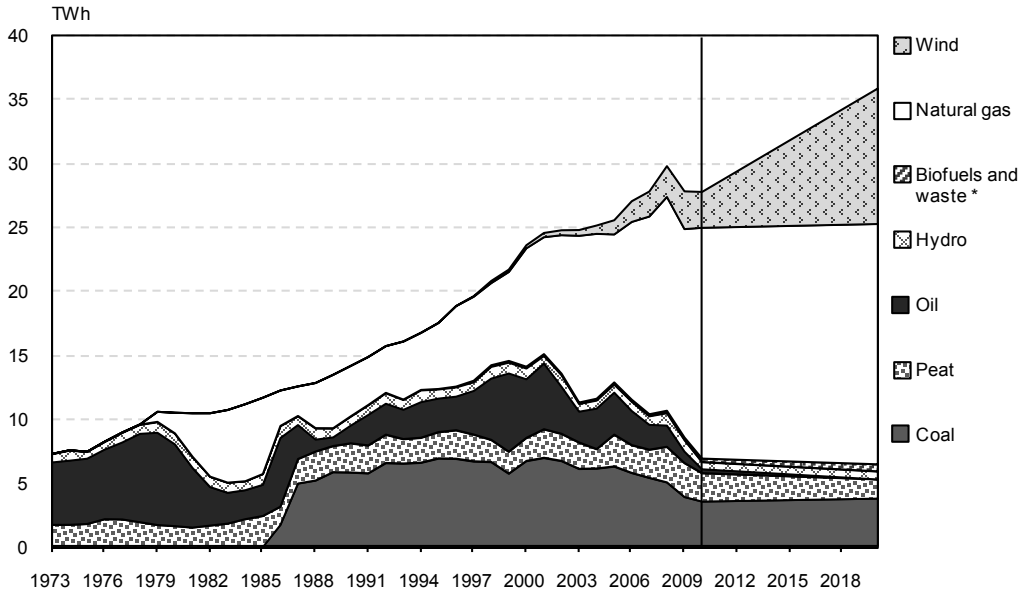
Despite the drop in electricity generation output in 2009, owing to the economic slowdown, the government forecasts electricity supply to continue to grow at approximately 2.7% per year reaching 36 TWh in 2020.

Since 1999, natural gas has been the dominant fuel for power generation in Ireland. In 1999, it contributed 32% of total electricity generation while oil, the second-largest source, provided 28%. Since then, the share of natural gas has increased significantly, and in 2010, gas-fired power plants generated 17.5 TWh (62.3%) of electricity output. Over the last decade, oil-fired power generation has been gradually displaced by gas-fired power. In 2010, oil contributed 2.1% (0.5 TWh) of total generation output.

In 2010, coal was the second-largest source for power generation, representing 14.5%, followed by wind (9.9%), peat (7.9%), and hydro (2%). Electricity generated from biofuels and wastes represented 0.2 TWh or 1.1% of total output. Since 1990, electricity generation from coal, peat and hydro has remained roughly constant in volume as incremental demand for electricity was met by an increase in gas-fired capacity, accompanied in recent years by a strong increase in generation from wind.

Ireland's future electricity mix is expected to shift more towards wind generation. In 2020, wind is expected to contribute 30% of electricity consumption while other fuels are expected to remain roughly at the same level in percentage terms as in 2010.

Figure 14. **Electricity generation output by source, 1973 to 2020**



* Negligible.

Note: this graph shows historical data until 2010 and the government's projections from 2011 to 2020.

Sources: IEA (2011a), and data submitted by the government of Ireland to the IEA.

Compared to other IEA member countries, Ireland has a very high share of gas in its electricity generation mix, the third-highest after Luxembourg (90%) and the Netherlands (62%), the IEA average being 23% in 2010. Electricity generated from fossil fuels (gas, coal, peat and oil) was 87% in Ireland; the fourth-largest share among IEA member countries, lower than Luxembourg, Australia and Poland. Conversely, Ireland also has the fourth-largest share of wind in its electricity mix; only Denmark, Portugal and Spain have a larger share.

Ireland has been a net electricity importer since 2002; around 500 GWh were imported in 2010, four times less than in 2005 or 2006. The Moyle Interconnector (500 MW), which connects Scotland and Northern Ireland, is the only interconnection at present. A second interconnector, between Ireland and Wales in the United Kingdom, is to be completed on schedule in 2012.

DEMAND

Final electricity consumption was 25 TWh in 2010; a similar level to 2009 and 6% less than the historical peak in 2008 (see Figure 15). Between 2000 and 2008, electricity consumption increased by 31.5%, in line with the fast expansion of the Irish economy.

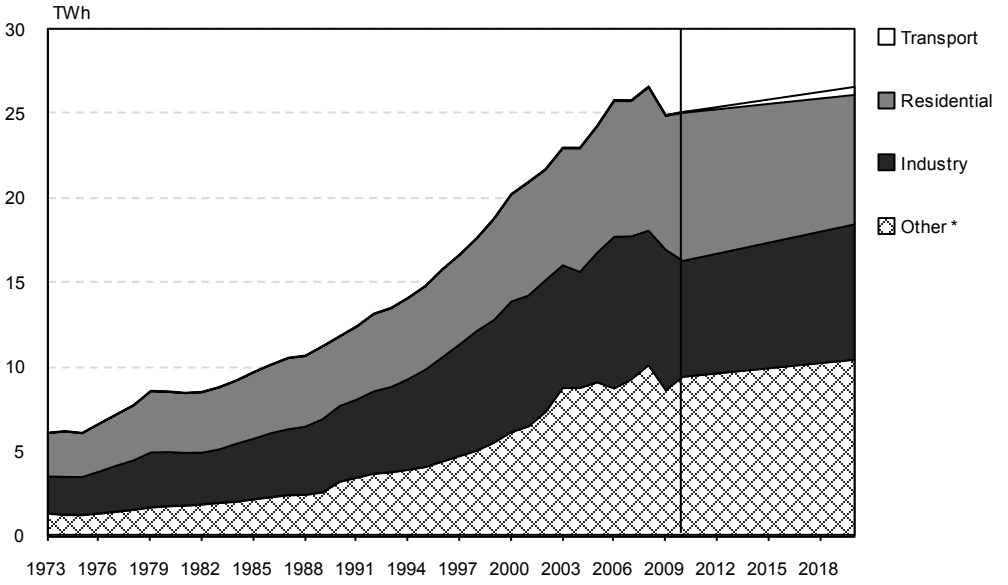
Forecasts for future electricity requirements are highly dependent on economic developments. EirGrid forecasts a total electricity requirement of 34 TWh in 2020 in the high-growth scenario and less than 31 TWh in the low-growth scenario.

The residential sector is the largest consuming sector, accounting for 35% of final consumption. The commercial and services sector represented 34% of consumption in

2010 and the industry sector 27%. Only 3% of electricity was consumed in the agriculture sector. The current trend indicates a slow reduction in residential sector demand and an increase in demand from the commercial and public services sector, which is expected to continue until 2020.

Compared to other IEA member countries, Ireland has low electricity consumption per capita. In 2010, it was 6.5 MWh per inhabitant ranking Ireland in nineteenth position among 28 IEA member countries, between Czech Republic and Spain with the IEA average being 9.5 MWh.

Figure 15. **Electricity consumption by sector, 1973 to 2020**



* *Other* includes commercial, public service, agricultural, fishing and other non-specified sectors.

Note: this graph shows historical data until 2010 and the government's projections from 2011 to 2020.

Sources: IEA (2011a), and data submitted by the government of Ireland to the IEA.

In Ireland, electricity demand typically peaks during winter and is at its minimum in summer (see Figure 16). On 21 December 2010, around 18:00, an all-time peak of 5 090 MW was observed. This record was caused by exceptionally cold weather conditions.

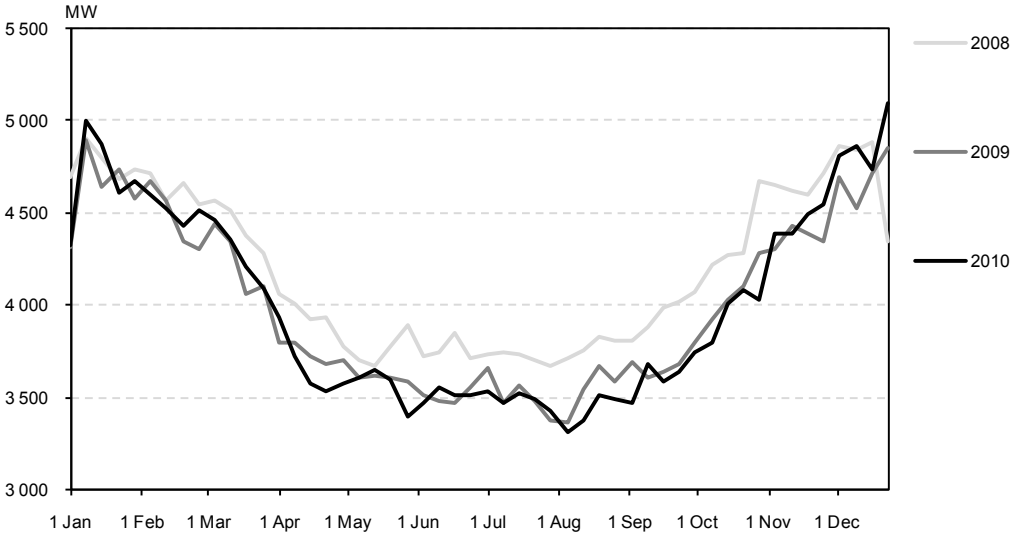
INSTITUTIONS

The **Department of Communications, Energy and Natural Resources (DCENR)** is the lead government department (or ministry) with responsibility for energy policy. In the electricity sector, the department determines policy in relation to security of energy supply and the functioning of the market. The department is responsible for transposing European Union electricity directives into national law and is responsible for the financial oversight and corporate governance of the state-owned energy companies including ESB, EirGrid, Bord Gáis and Bord na Móna.

The **Commission for Energy Regulation (CER)** is the independent body responsible for overseeing the liberalisation of Ireland's natural gas and electricity markets and the day-

to-day operation of those markets. The CER was established in 1999 and its role and functions have expanded over time. It works to promote competition in the electricity and natural gas sectors and to ensure that the benefits of competitive pressures on prices and services flow to consumers. Also, in an electricity or natural gas emergency, the CER is vested with the authority to take the necessary decisions.

Figure 16. **Weekly peak demand, 2008 to 2010**



Source: EirGrid.

The **SEM (Single Electricity Market) Committee** is the decision-making authority on all matters relating to the Single Electricity Market. The committee consists of three representatives from the Northern Ireland Utility Regulator, three from the CER, and two independent members. The Committee Secretariat is operated from an office in the CER.

The **Competition Authority (CA)** is the government body responsible for enforcing Irish and European Union competition laws in Ireland. Generally, it looks to the CER (there is a Memorandum of Understanding between the two) for matters relating to the electricity and natural gas sectors.

MARKET STRUCTURE

OVERVIEW

Managing the state's interests in the electricity sector while ensuring that policy adapts to the impact of Ireland's financial and fiscal crisis and supports economic recovery has come to the fore (Fitzgerald, 2011).

The Single Electricity Market has created one wholesale market spanning two jurisdictions and two member states, enabling small markets to develop the scale required to foster increased competition, notably at the retail level. The Irish market now has a high level of consumers switching their electricity supplier, giving Ireland among the highest switching rates in Europe.

Ireland has the potential to benefit from Europe's internal market. The ESRI published a paper in 2011 presenting the real benefits to consumers and market participants in Ireland from enabling within-day trade with the island of Great Britain. A wider market can increase competition, and also help manage the impact of realising the potential for wind generation in Ireland, which brings with it the challenge of meeting demand during periods when there is no wind. This will require new infrastructure and market rules which allow the exchange of electricity to take place (Goercki, 2011).

Box 2. **The Public Service Obligation levy**

The Public Service Obligation (PSO) levy, established by the Electricity Regulation Act 1999, is designed to support certain peat, gas and renewable generation plants as mandated by the government and approved by the European Commission. It has been put in place to ensure that electricity is being generated from indigenous fuels, in order to increase security of supply and to help protect the environment.

All final customers, regardless of the supplier, are paying this levy, and it is displayed as a separate item on consumers' electricity bills.

The PSO levy currently covers the following items:

- the peat PSO, to support power generation based on this indigenous fuel source for security of supply purposes;
- the renewable PSOs, the Alternative Energy Requirement (AER)[7] and the renewable energy feed-in tariff (REFIT[8] schemes, to support sustainable and renewable generation; and
- the Capacity 2005 Security of Supply PSO to underwrite the costs of new generating capacity prior to the launch of the SEM.

The amount of the PSO levy is calculated annually by the CER. The transmission system operator (TSO) and distribution system operator (DSO) are responsible for collecting the levy from suppliers, who in turn are responsible for collecting the levy from their customers. The TSO is then responsible for ensuring that payments from the PSO fund are distributed correctly.

The proceeds of the levy are used to recoup the additional costs incurred by ESB and other suppliers in having to source a proportion of their electricity supplies from generators in the PSO scheme.

These shares and the total amount of the PSO can vary significantly depending notably on fuel prices. For instance, if imported fossil fuel prices are very high, indigenous resources can become more competitive, and PSO-supported generation, including peat-fired and other power plants, together with REFIT-supported wind generation, require lower compensation. In past years, the levy was also further offset by the contribution from certain AER wind contracts, and the PSO levy then amounted in net terms to zero.

7. The AER programme was launched in 1996 to provide market support for generation of electricity from renewable resources (notably wind), tendering contracts of certain fixed amounts of capacity by potential renewable energy generators. The last tender was in 2005.

8. The REFIT programme was launched in 2006, and provides investor certainty for renewable energy projects by ensuring a 15-year feed-in tariff guarantee.

Box 2. **The Public Service Obligation levy** (continued)

For the 2011/12 period the total PSO is estimated at EUR 92.1 million, this means that customers are levied the following amounts:

- domestic customers: EUR 19.33/year or EUR 1.61/month;
- small commercial customers (maximum import capacity less than 30 kVA, or 24 kW): EUR 57.22/year or EUR 4.77/month; and
- medium and large customers (maximum import capacity equal to or greater than 30kVA): EUR 8.58/kVA/year or EUR 0.71/kVA/month.

In terms of breakdown per item in 2011, around 38% of the PSO was for peat, 33% for the REFIT scheme, 29% for Capacity 2005, and 1% for the AER scheme.

NETWORK OWNERSHIP AND OPERATION

The Irish electricity transmission and distribution networks are owned by ESB, a state-owned company created by statute. Previously, ESB was the monopoly electricity generator and supplier; however, in line with successive European Union liberalisation packages this position has changed and competition is now fully provided (see below for a description of competition in supply and generation). ESB remains a vertically integrated undertaking, active in electricity production and supply as well as in networks.[9] The government has reaffirmed its commitment to retain ESB as a vertically integrated utility.

Transmission

The transmission system forms the platform on which competition in the electricity market can take place. Under European Union policy, unbundling of the monopoly activity of network operation from the competitive activities of electricity production and supply is vital for effective competition (see Box 4 on unbundling options provided for under European Union legislation).

Irish government policy, announced in July 2011, is to maintain existing arrangements for unbundling in transmission system operation, as per Article 9.9 of the Electricity Directive (see Box 4 for details). The necessary certification under this Article is now a matter for the regulatory authorities and the European Commission in accordance with the provisions of the directive. It is necessary under Article 9.9 that these arrangements provide sufficient independence to the transmission system operator. The decision to retain existing arrangements represents a change from the policy to transfer ownership of all transmission assets to EirGrid set out in the previous government's 2007 energy policy White Paper and in the current Programme for Government, and reflects changed financial circumstances.

9. All networks are owned by ESB. To comply with European Union legislation, a legally separate company, ESB Networks, has been established to carry functions relating to the operation of networks.

Box 3. **The Electricity Supply Board (ESB)**

The Electricity Supply Board (ESB), a state-owned utility, was the monopoly producer and supplier of electricity until the market was progressively opened up as of 2000. In order to comply with deregulation objectives as set by the European Commission, the ESB has been broken down into separate and ring-fenced legal entities. The main businesses of ESB are:

- *ESB Networks*: the transmission asset owner for Ireland. Following its acquisition of Northern Ireland Electricity, ESB Networks is now the transmission asset owner for the island of Ireland. The transmission system operator is an independent state-owned company, EirGrid, which is not owned by the ESB Group.
- *ESB Networks Ltd* is a legally unbundled subsidiary of ESB which holds the Distribution System Operator licence. It is the decision maker in relation to the distribution system and manages its operation, maintenance and development through agreements and contracts with ESB Networks. It also has responsibility for the operational management of the transmission and distribution asset owner functions on behalf of ESB.
- *ESB Power Generation* owns and operates 54.8% of dispatchable capacity in the Ireland, and 47% of dispatchable capacity on the island of Ireland. This capacity includes one of the island's two coal-fired power plants (Moneypoint), and two of the three peat-fired power plants.
- *Electric Ireland* (as of 2012; previously two businesses: ESB Independent Energy and ESB Customer Supply) is the largest supplier of electricity, with around 50% of overall sales in 2010. Electric Ireland also sells natural gas to consumers.
- *ESB International* is an independent entity that manages ESB's foreign assets and consulting services.
- *Hibernian Wind Power* manages, operates and maintains ESB's portfolio of wind farms throughout Ireland. At present the company owns approximately 200 MW of capacity and has around 300 MW of capacity under development.

Box 4. **EU Electricity Directive and unbundling of transmission system operation**

Unbundling refers to the separation of the monopoly activity of network operation and the competitive activities of electricity production and supply. The EU Electricity Directive sets out three standard models of unbundling for transmission system operation. Each model should deliver effective unbundling, albeit with a different mix of structural and regulatory solutions. The three models are:

- Full ownership unbundling, under which an undertaking which does not have production or supply interests owns and operates the transmission system. This entity carries out all the functions of a transmission system operator.
- The independent system operator (ISO) model, under which an undertaking with production or supply interests continues to own the transmission system, but appoints an independent entity to carry out all the functions of the transmission system operator and undertakes to finance the development of the transmission system.

Box 4. EU Electricity Directive and unbundling of transmission system operation (continued)

- The independent transmission operator (ITO) model under which an undertaking with production or supply interests may continue to own the transmission system, but with stringent ring-fencing provisions based on a pillar of organisational measures and a pillar of measures related to investment. These are complemented by cooling-off periods governing the movement of staff between the transmission system operator and the production or supply functions of the vertically integrated undertaking.

Article 9(9) of the Electricity Directive provides that member states may choose not to apply any of the three models described above, as of 3 September 2009, when:

- the transmission system belonged to a vertically integrated undertaking; and
- arrangements were already in place which guarantee more effective independence of the TSO than the specific provisions concerning the ITO model of Articles 17 to 23 of the directives.

Under the certification procedure of Article 10 of the Electricity and Gas Directives, the European Commission must verify that the arrangements in place clearly guarantee more effective independence of the TSO than the provisions of the ITO model. Only if that is the case can the TSO be certified.

SINGLE ELECTRICITY MARKET (SEM)

Market design

Although network infrastructure bottlenecks exist between the Northern Irish and Irish systems, Ireland operates a single electricity market (SEM) with Northern Ireland. Integrated system planning and operation has also been enhanced following EirGrid's acquisition of SONI, the Northern Ireland TSO, and ESB's acquisition of NIE, the Northern Ireland transmission asset owner (TAO).

SEM is organised as a gross mandatory pool. This means that all generators over 10 MW must sell all their output through the pool and all suppliers/consumers must buy all their electricity from the pool. The market operator, SEMO, receives bids from all generators in the market from which it calculates the system marginal price (SMP). The SMP is a single island-wide price for each half-hour trading period. Under these arrangements, all generators receive, and all suppliers pay, the same energy component or SMP of price in a trading period for electricity.

SMP is set at a level that is sufficient for participants to recover full costs of production and is based on the marginal cost of producing or consuming electricity, plus an uplift component which represents the cost of starting up the generation unit. From a market perspective, SEM does not take account of system constraints.

The SMP is calculated *ex post* for each half-hour period of the day, which is then paid to all generators who were in the market schedule established by the market operator to reflect least-cost production.

The design of SEM differs in a number of important ways from the standard approach taken in other European Union markets. In most European markets, producers are

responsible for their own commitment and dispatch decisions, but retain a responsibility to remain in balance – that is, to have found a buyer for their electricity or conversely to have found a producer for electricity they have sold. Likewise, in other European countries, markets are based on self-commitment and dispatch, therefore prices are established *ex ante*, generally day-ahead.

In SEM, these two elements are combined in one market as a result of *ex-post* pricing. In SEM, market participants do not know in advance what price they will receive or pay for electricity. However, set against this, they are not exposed to the risk of having to use the balancing market to meet their commitments. This is perhaps the most important difference between SEM and the way other European markets operate.

Capacity markets and constraint costs

SEM includes an explicit capacity payment mechanism. Under this mechanism, all generators that are available for dispatch receive a share of the allocated funds for remunerating available generating capacity, calculated *ex ante* by the regulatory authorities. The calculation of this pot is based on the assessed total generating capacity required and the costs of a best-new-entrant peaking plant. Capacity payments do not account for either reliability or for flexibility. This has led to concerns that it rewards depreciated and out-dated plants (Competition Authority, 2010).

SEM is also organised as a central commitment and central dispatch market. The TSO chooses the most efficient overall actual dispatch *ex ante* to meet demand based on bids for individual generation units. However, EirGrid along with SONI in Northern Ireland must take network constraints into account. This means that generation dispatched by the TSO will differ from the ex-ante market schedule. In the absence of the second connection between Ireland and Northern Ireland, there are generally constraints on moving power between the two parts of Ireland. This leads to constraint costs,[10] as all generators who were in the market schedule must receive the system marginal price, plus the generators who are actually called on to run must be compensated.[11] These costs are for the most part related to the redispatch of initially dispatched power plants in the merit order, because their geographical location and associated network constraints do not allow for physical delivery. These costs are entirely managed and collected by the SEM. As these costs are treated as pass-through costs from the network operator's and owner's perspective, both stakeholders do not have any incentive to reduce them.

Ancillary services

In the SEM, costs for ancillary services[12] are managed by EirGrid and recovered from end-users via the transmission tariffs. The need for ancillary services will increase progressively in the future, as the expected level of variable renewable generation is set

10. Mostly redispatch of initially dispatched power plants in the merit order, as their geographical location and associated network constraints do not allow for physical delivery.

11. For various reasons, including the need to ensure markets are sufficiently large to allow for effective competition, basing markets on theoretically unconstrained systems is common across Europe. The resulting redispatching costs can be significant. The size of redispatching costs gives a clear indication of the potential benefits of new transmission infrastructure to relieve constraints. However, if it is not possible to realise such infrastructure, it can become necessary to create separate price zones within a single market.

12. Ancillary services primarily refer to reserve, black start and reactive power.

to increase. Since February 2010, ancillary services are governed by the All-Island Arrangements for Harmonised Ancillary Services and Other System Charges, which is designed to stimulate good generator performance and to deliver cost efficiency.

The Irish system includes no incentive for the TSO to reduce these costs. However it is intended that incentives would be put in place after the review of ancillary services which is being carried out as part of the DS3 programme (Delivering a Secure, Sustainable Power System). Between the previous and the current regulatory periods, allowances for ancillary services have risen by EUR 60.9 million, to reach EUR 244 million, or an estimated 4% of total network costs, representing a significant cost block which rests outside any efficiency evaluation. It should be noted that ancillary services are treated as a pass-through cost at present. Therefore, any over- or under-recovery of ancillary services against the forecast allowed cost is recovered in the following year. Of note, the lack of incentive or proposed incentive for the TSO to reduce costs is also true for network losses. However, a review of the treatment of transmission losses in the SEM is ongoing, which is considering the impact of various policy options on the volume of losses.

Effective competition

SEM is characterised by very strict rules designed to mitigate market power. It is fair to characterise the market as highly controlled competition. This is a reflection of concerns relating to the dominant position of ESB, as well as other features of the market. These features include:

- All market participants are constrained to bid at short run marginal cost (SRMC), which is defined in a SEM Bidding Code of Practice (All Island Project, 2007).
- ESB's supply arm is ring-fenced from its generation arm and has an economic purchasing obligation.
- Generators who are dominant (such as ESB) are required to enter into contracts for differences (CfD) at a price determined by the regulatory authorities in order to remove incentives to manipulate the market. This is done until the Herfindahl-Hirschman index[13] is brought down to a predetermined level.
- Finally, the SEM is overseen by a market monitoring unit established by, and within the regulatory authorities, namely the Commission for Energy Regulation and the Northern Ireland Authority for Utility Regulation.

Cambridge Economic Policy Associates (CEPA) carried out a report for the Commission for Energy Regulation and the Northern Ireland Authority for Utility Regulation on market power and liquidity in SEM (CEPA, 2010). In this report, they indicate that the bidding code of practice has been very effective at preventing the abuse of market power. Nonetheless, the report recognises that there is a good case for the market monitoring unit to be strengthened so that it can become more proactive. The report also recognises that there should be more transparency in the operation of the market monitoring unit. The unit has not published a public report since 2009[14] and market participants have indicated that the unit was under-resourced and that its staff was being used for other tasks within the regulatory authorities.

13. The Herfindahl-Hirschman index is a tool for measuring competition in a market, taking the sum of the squares of the market shares of the firms. This index is widely used in competition law and economics.

14. SEM Committee (2009).

The requirement to bid in line with a code reduces the scope of market participants to develop their own asset utilisation strategy but also includes potential for abuse of information asymmetry. For example, market participants can (within a certain range) increase their operation and thus their revenues by submitting higher start-up costs in their bids. This is interpreted by the market operator as making them too expensive to shut down and restart. This was confirmed in a 2008 inquiry by the SEM Committee into bidding practices.[15] The ring-fencing of ESB's customer supply arm from generation restricts the ability of ESB to develop an integrated strategy in this regard.

Regional market integration

When the East-West Interconnector is operational, Ireland will become less isolated from European markets. Links with neighbouring markets and effectively using interconnection infrastructure will facilitate the management of high volumes of variable renewables, as well as increasing liquidity and competition levels in the Irish market.

Market coupling was developed as the key element in the target model[16] for capacity allocation and congestion management. Market coupling means that the cross-border flows at the day-ahead stage are determined by using the price signals in day-ahead spot markets in each member state. This enables an efficient Europe-wide price formation mechanism and optimised use of the transmission grid through a strong interaction between price zones (the island of Ireland forms one price zone). The European Union's target date is 2014 for a fully functioning electricity market, as reinforced by the European Council at its meeting in February 2011.[17] The European Union Agency for the Co-operation of Energy Regulators agreed to the congestion management and capacity allocation framework guideline in July 2011, which will form the basis for a legally binding network code. This code, along with other European Union network codes yet to be drafted and agreed, will implement the electricity target model across the European Union. Island systems with central dispatch, like Ireland's, under certain conditions, have been given until 2016 to comply and thereby ensure that SEM is linked with the wider European market.

Since early 2011, the two regulatory authorities have been examining potential changes needed to SEM as a result of implementing market coupling (Pöyry, 2011). This prospect has raised concerns among market participants and others that further changes will impose higher costs on market participants and increase regulatory uncertainty (Fitzgerald, 2011). The SEM Committee launched its market integration project in August 2011 and formed a project team to develop options for the implementation of the European Union "target model" by 2016. The options chosen should be available at least cost with maximum benefit to Ireland in order to achieve complete compliance. The SEM Committee Project Team involves system operators/market operators, the Department of Enterprise Trade and Investment (DETI) and DCENR to explore all options for SEM to meet the target model by 2016.

A consultation paper was published on 24 January 2012 with a three-month window for contributions. The consultation closed on 20 April and the project team received a number of industry responses. Following the conclusion of the consultation process, the

15. SEM Committee (2008).

16. The electricity market target model includes the day-ahead market coupling, the intra-day, balancing and cross-border forward markets.

17. http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/119175.pdf

SEM Committee will make recommendations to governments on the next appropriate steps. In addition, the project team has consulted extensively with the electricity industry, holding bilateral meetings and hosting a series of workshops in October 2011, November 2011 and February 2012. This work is welcome as it will allow the identification of means to preserve the benefits of SEM while also gaining from enhanced integration with other markets. Such an approach gives all stakeholders the maximum opportunity for full engagement in the market restructuring that is necessary for Ireland to fully participate in European Union electricity market integration and achieve the associated benefits.

The regulatory authorities are particularly mindful of forthcoming changes to the market arrangements in the United Kingdom. Moving to low-carbon and secure electricity generation across the European Union will require increased co-operation and co-ordination among member states. An example is the impact that recent proposals on electricity market reform in the United Kingdom will undoubtedly have on Ireland. It will be important for Ireland to maintain engagement with its regional and European partners regarding the development of electricity markets. The establishment by the European Commission of the new Electricity Co-ordination Group is important in this regard. Ireland should continue its engagement with this and other forums to the maximum extent possible.

GENERATING CAPACITY

Total dispatchable capacity on the island of Ireland was around 9 gigawatt (GW) in 2010, of which 6.8 GW was located in the Republic of Ireland (see Table 3). In addition, around 1.4 GW of wind generation capacity is available, which brings total installed capacity to 8.2 GW.

Among the installed dispatchable capacity, 63% is gas-fired, while coal represents 16%, oil 10%, and peat 4%. Ireland is currently renewing its generation portfolio by phasing out all the heavy fuel oil (HFO)-fired plants between 2013 and 2016. Around 900 MW of new capacity was added in 2010, and an additional 300 MW is planned over the 2011 to 2015 period.

The Electricity Supply Board (ESB), the incumbent vertically integrated undertaking, owns 47% of total dispatchable generating capacity on an all-island basis. In 2008, Endesa, the Spanish-Italian utility, entered the Irish market by purchasing just over 1 GW of capacity from ESB. It became the second-largest company with 12% of total dispatchable capacity. Viridian is the third-largest player with 8% of total dispatchable capacity, composed of two contiguous gas-fired power plants. The other companies each own less than 5% of the dispatchable generating capacity.

Wind power generation – much of it owned by incumbent Irish state-owned companies such as ESB, BGÉ and Bord na Móna – plays an important role in Ireland's energy policy in order to reach the renewable energy targets. In June 2011, around 1.4 GW of wind capacity was connected to the grid, of which 54% is connected to the transmission system and the rest directly to the distribution system. The amount of wind power is expected to increase dramatically over the next ten years; around 3 GW of additional wind capacity will be installed in Ireland.

In 2010, the average load factor for wind was 24%. In comparison, peat-fired power plants had a capacity factor of 69%, for gas-fired power plants it was 55% on average and for coal 46%. The average load factor was higher in the previous years, averaging 32.3% for the years 2002 to 2009.

Table 3. **Thermal and large-scale hydro capacity by fuel type* and ownership in 2010 (MW)**

Owner	Gas	Coal	Oil (HFO)	Oil (Distillate)	Peat	Hydro	Pumped storage hydro	Total
Republic of Ireland								
ESB Group	2206	915			250	182	292	3845
Endesa			860	208				1068
Bord Gáis Energy	445							445
Viridian	747							747
Tynagh Energy	404							404
Bord na Mona (Edenderry Power)					120			120
Aughinish Alumina (CHP)	161							161
Northern Ireland								
ESB Coolkeeragh	400							400
AES kilroot		520						520
Premier Power Ballylumford	1246							1246
Total	5609	1435	860	208	370	182	292	8956

* Does not include wind and other variable renewable energies.

Source: data submitted by the government of Ireland to the IEA.

NETWORKS

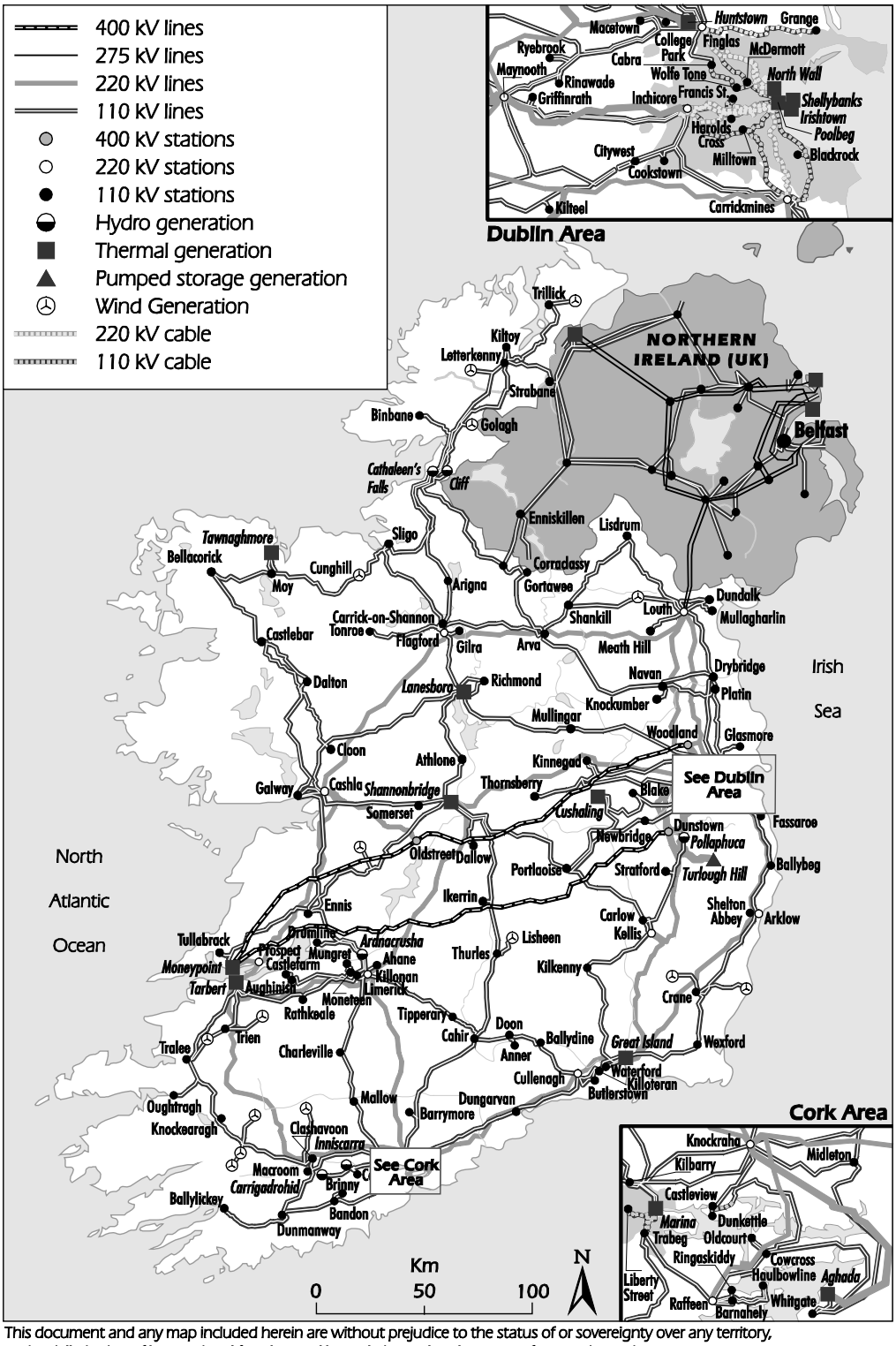
TRANSMISSION

Overview

The transmission network on the island of Ireland consists of approximately 6 600 km of 400 kilovolt (kV), 220 kV and 110 kV (predominantly overhead) high-voltage lines, and over one hundred 38 kV transmission stations that provide the physical link to the distribution network. The Dublin area is the exception to this rule, as 100 kV lines and cables and some 220/110 kV transformer stations in this area belong to the distribution network.

The tasks of the transmission system operator are split. ESB Networks, the transmission asset owner (TAO), is responsible for carrying out new investments, undertaking works necessary to connect new users and for maintenance. Meanwhile, a separate company, EirGrid, acts as the transmission system operator (TSO) and market operator (MO) in the wholesale trading system in Ireland. This split accountability model was introduced in 2006 as part of the liberalisation process. An Infrastructure Agreement (IA) between ESB and EirGrid governs the way these activities are carried out.

Figure 17. **All-Island electricity transmission system**



This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Source: EirGrid; map submitted by the government of Ireland to the IEA.

EirGrid is also the owner of the System Operator Northern Ireland (SONI Ltd), the licensed TSO and market operator in Northern Ireland. The Single Electricity Market Operator (SEMO) is part of the EirGrid Group, and operates the Single Electricity Market on the island of Ireland. EirGrid is responsible for the day-to-day operation, system planning and management of the all-Island, and offers regulated third-party access (TPA) to market participants for connection to and use of the transmission system. These conditions are regulated by the CER.

Interconnections

Ireland and Northern Ireland operate as a single synchronous system, but the connection between the two jurisdictions/systems is currently limited to a single 400 MW line (275 kV double circuit connection and two 110 kV transmission connections). Plans are under way to build a second connection (400 kV), which would ensure greater N-1[18] system security, but the project has encountered significant delays owing to opposition from local communities in both jurisdictions, and completion is not expected before 2015 at the earliest. Until this line is complete, it is not considered appropriate to base system adequacy studies on a single all-island model.[19]

On the whole, the island of Ireland is relatively isolated compared to electricity systems in mainland Europe and even the United Kingdom. The islands of Ireland and Great Britain currently only share one asynchronous link, the 500 MW[20] Moyle interconnection connecting Northern Ireland and Scotland. EirGrid is building a second interconnector between the two islands, the 500 MW East-West Interconnector connecting Ireland and Wales, which is on schedule to be delivered in 2012. Once the East-West Interconnector is completed, total interconnection on an all-island basis will then be significantly above the European Union target of 10%.

Regulation and investment

Network systems are considered a natural monopoly and are subject to economic regulation. The Irish regulatory approach is to ensure overall cost-efficiency for the existing transmission system and its forthcoming expansion, by applying effective cost regulation. The CER establishes a five-year expenditure forecast, based upon a bottom-up techno-economical assessment, which determines the allowed revenues that the transmission business can earn from its TSO/TAO customers to cover the costs of the transmission system operator (EirGrid) and the transmission asset owner (ESB Networks).[21] [22] [23]

18. Power system security is based on application of the N-1 standard. A power system is considered N-1 secure when it is capable of maintaining normal operations in the event of a single credible contingency event, like the loss of a transmission line, generator or transformer. This standard is used to inform real-time operational contingency planning and system operation, and to guide emergency responses to return power systems to a secure and stable operating condition within a prescribed period, typically 15 to 30 minutes in most power systems. IEA member countries typically apply the N-1 standard to manage all credible contingencies, reflecting operational resource constraints and system operator judgement and experience.

19. EirGrid, SONI (2010b), p.27.

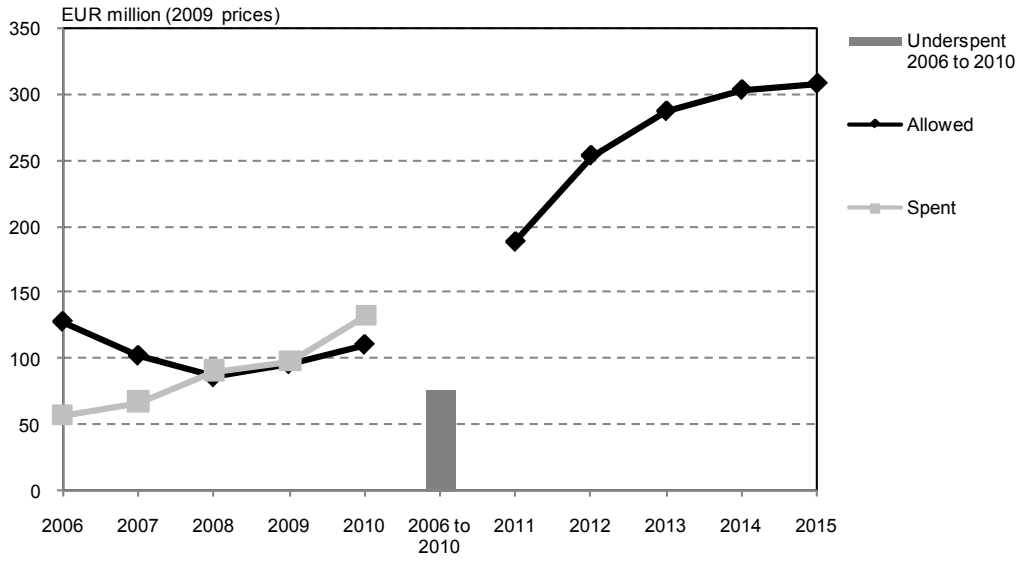
20. Maximum technical capacity. Around 450 MW is commercially available.

21. The assessment is done by an external consulting firm called Sinclair Knight Merz, among various fields also specialised in asset management and cost reduction and performance improvement.

22. This kind of system is quite common and successfully used in the United Kingdom, while other jurisdictions use a single-project approach without a long-term expenditure forecast.

23. As the Irish transmission system is managed and operated by two entities, the transmission system operator and the transmission asset owner, the regulatory authority splits the allowed revenues for these two entities.

Figure 18. **Regulated capital expenditures for TAO**



Sources: CER (2011a), CER (2011b), and IEA analysis.

The CER undertakes price reviews which are carried out every five years and adjusted annually. These price reviews include economic incentives for increasing the quality of supply by reducing power cuts (system minutes lost and system frequency).[24] CER has also developed and implemented financial incentives to ensure greater cost efficiency and speedy progress during the planning and licensing processes.

The latest five-year Price Review III (PR3) covers the period 2011 to 2015. Allowed total expenditures (TOTEX) for the TSO and TAO are EUR 1.63 billion for the 2011 to 2015 period, broadly comparable to the previous regulatory period allowed TOTEX of EUR 1.65 billion.

Each year the allowed revenue is adjusted to update a range of market developments. These adjusted revenues determine the revenue that the regulated businesses are allowed to earn each year. These allowances are then used to calculate tariffs and charges to users of the transmission system. These transmission use of system (TUoS) charges are charged to consumers on the basis of a mixture of network capacity required and energy throughput, with the level of tariff depending on the customers' voltage-level connection.

The charges generators pay to connect to the transmission system are based on plant capacity and are site-specific, differing according to the geographical location of the generator and the available network capacity at each location.

Of note, the TAO (ESB Networks) accounts for around 90% of total expenditure (TOTEX), as expenditure for the TSO (EirGrid) is primarily related to salaries and office costs. In contrast, the TAO is responsible for physical infrastructure, which requires significant investments for maintenance and restructuring.

There are currently 13 significant infrastructure projects under way for the TAO, largely comprising grid connection, reinforcement and expansion following the integration of renewables, and the East-West Interconnector. Over the review period, allowed capital

24. CER (2011b).

expenditure (CAPEX) will represent approximately 90% of allowed total expenditures. These capital costs are almost three times higher when compared to final capital expenditures incurred in the previous regulatory period. CAPEX is expected to increase progressively over the 2011-15 period.

The final outcome, however, may vary with several input price deviations and investment delays, notably triggered by public acceptance difficulties, uncertainty around defined roles and composition of the Infrastructure Agreement (IA) at the time of IA introduction and non-utilisation.[25] During the 2006 to 2010 period, the TSO/TAO underspent approximately EUR 90 million; representing around 15% of the allowed CAPEX, resulting in lower network charges in 2009 and 2010.[26]

RENEWABLE INTEGRATION (GRID 25)

EirGrid has identified that a major expansion of the transmission network is needed to facilitate Ireland's ambitious renewable (largely wind) generation, both onshore and offshore. Expansion is also required to meet higher demand for flexible conventional generation, as well as the emergence of new market structures and networks that encourage competition and efficient investment in new generation technologies.

Accordingly, EirGrid has produced a EUR 3.2 billion investment plan, entitled Grid 25. Infrastructure investments related to the Grid 25 plan represent a capital investment until 2025, including 1 150 km of new power lines and upgrading another 2 300 km of existing lines. This also includes the deployment of 400 kV transmission networks rather than 220 kV, as higher voltage levels are more efficient and provide greater power carrying capability. Doing so avoids the need for building a multiplicity of 220 kV lines and has less long-term impact on the environment, but will increase the overall network length of the transmission network by around 18%. Grid 25 also seeks to balance affordability, social acceptance and environmental performance.

Grid 25 also aims at enabling the island of Ireland to be linked more closely to the island of Great Britain and thereby further interconnect Ireland's electricity market at a regional level, in order to enhance its export and import potential and to increase its system flexibility.

To meet Grid 25's ambitious goals regarding the construction of new transmission lines, a speedy, streamlined and transparent consenting process – including community acceptance – is required. The Irish infrastructure consenting regime for electricity transmission lines is the Strategic Infrastructure Act, which determines responsibilities for the project developer and gives the independent An Bord Pleanála (ABP or planning board) decision-making responsibility in the approval process of strategic infrastructure (see Box 9 in Chapter 7).[27]

25. Because of the structural split between the ownership and the operation of the transmission system, an infrastructure agreement has been drawn up between the TSO and the TAO to govern the ongoing relationship between the two organisations. The agreement has been approved by CER and came into effect on 1 July 2006; the same date as the legal establishment of EirGrid as the TSO.

26. Under- or overspends are subject to the application of an adequate interest rate, which is reflected by a three-month EURIBOR rate.

27. The Strategic Infrastructure Act also defines the new electricity transmission lines to be treated under this act. Other transmission infrastructure not to be treated under this act will be treated by local councils.

Box 5. **Gate 3**

Gate 3 refers to the third round of connection offers that were issued to generators under the group processing approach (GPA). It was introduced by the CER in 2004 to allow for strategic processing of generation applications for grid connection. It allows applications to be processed by the system operators (EirGrid and ESB Networks) in groups or batches, referred to as "gates".

The Gate 3 project involves offers for connection to approximately 3 900 MW of wind generation and 1 700 MW of conventional generation. The 3 900 MW of wind developments that have received an offer as part of Gate 3 should enable Ireland to meet its 40% renewable generation target. The issuance of offers occurred between December 2009 and June 2011.

Source: EirGrid website.

DISTRIBUTION

Overview

The distribution network is the medium- and low-voltage electricity network used to deliver electricity to connection points such as houses, offices, shops, and street lights. The electricity distribution network contains approximately 160 000 km of predominantly overhead lines and some cables.

The distribution system is operated by ESB Networks and is owned by ESB. Both are licence holders from the regulator CER. ESB Networks is responsible for the operation, development and maintenance of the Irish distribution system, including the Northern Ireland market. The distribution system consists of network operating at 110 kV (within Dublin), 38 kV, 10 kV and low-voltage network.

The development, maintenance and operation of the distribution network is carried out by two licensable activities – the distribution asset owner (DAO-ESB) and the distribution system operator (ESB Networks Ltd), which is responsible for building, maintaining and operating the infrastructure including all overhead electricity lines, poles and underground cables used to bring power to local customers.

The distribution network will need to be expanded in the coming years. Significant amounts of renewables are already connected directly to the distribution network, and over the 2011-20 period, an estimated 80% of new wind connections by number, and 50% by capacity are expected to be integrated directly into the distribution network. In addition, ESB Networks must take into account the connection of new customers to the grid, as well as ongoing technical efforts to reduce the risk of supply interruptions and network losses, and to improve the quality of low voltage.

Regulation and investment

There is one distribution network in Ireland which, like the transmission network, is considered a natural monopoly and is subject to regulatory review every five years. Because of the higher costs inherent to a distribution network, the expected investments

and costs for the DSO are higher than the expected investments and costs for the TSO (by a factor of 2.1, or EUR 1.0 billion higher).

The DSO's CAPEX as a share of TOTEX is expected to increase from around 56% during the last regulatory period to around 68% until 2015. The allowed CAPEX is expected to grow steadily during the period to EUR 2.3 billion, as a result of a national roll-out of smart meters, and investments in reducing supply interruption risks, network losses and low-voltage quality improvements, the connection of new customers and the integration of a significant amount of new renewable generation capacity.

As a result, allowed TOTEX is expected to rise to EUR 3.4 billion, an increase of 18% relative to the two previous regulatory periods. According to CER, the elimination of inefficient OPEX (mostly labour costs) will lead to a reduction of around EUR 172 million to allowed OPEX of EUR 1.1 billion in a period-on-period comparison.[28] [29]

The expected increase in TOTEX allowances will ultimately result in higher network charges, especially from 2013 onwards.

As indicated above, the allowed CAPEX shows an increasing need for investment finance. This, and the increase in the risk premium due to the deterioration of the general economic climate, has led to an increase in allowed weighted average costs on capital (WACC) to 5.95%.[30] The regulator has proposed a reassessment by the middle of the current regulatory period, if market conditions were to change again significantly.

In addition, CER has maintained incentives and targets to further increase security of supply and has also introduced new incentives for improved meter-reading services. However, financial incentives for improving the amount of network losses, connecting renewable generators to the grid and delivering the expected CAPEX investments during the current regulatory period have only been discussed, but not implemented so far.

System stability and smart grids

Ireland's electricity system is composed of a single generation market on the island, and is characterised by high penetration of variable renewable energies (mainly wind). Together with the country's relatively small geographical size, its proven record to engage with international multinational information and communications technology (ICT) companies (IBM, Cisco, Ericsson, Google) and its strong research infrastructure (UCD's Electricity Research Centre, EPRI, ITOBO, Clarity), Ireland provides unique opportunities in smart grid research, development, demonstration and deployment.

Smart grids are supporting the ambitious targets in the deployment of variable wind power generation by providing operators with real-time system information that enables them to manage generation, demand and power quality, thus increasing system flexibility and maintaining stability and balance (IEA 2011c).

Ireland's transmission system operator, EirGrid, is deploying system stability and smart grid technologies, including high-temperature, low-sag conductors and dynamic line rating special protection schemes, to manage the high proportion of wind energy on its system and maximise infrastructure effectiveness. The operation of the system is being improved

28. CER, 2011b, Decision on 2011 to 2015 distribution revenue for ESB Networks Ltd.

29. Calculated as the difference between the allowed OPEX for the second and the third review period.

30. Real and pre-tax.

through state-of-the-art modelling and decision support tools that provide real-time system stability analysis, wind farm dispatch capability and improved wind forecasting, as well as contingency analysis. System flexibility and smart grid approaches are estimated to facilitate real-time penetrations of wind up to 75% by 2020 (EirGrid and SONI, 2010a).

Demand-side management (DSM) allows for an increase in flexibility to reduce or increase electricity demand, and is therefore important for a system largely depending on variable renewable energy sources. Smart meters and time-of-use pricing are considered essential for effective DSM. The Commission for Energy Regulation and ESB Networks have carried out a smart meter trial involving nearly 10 000 smart meters in homes and businesses across Ireland between 2009 and 2010. The electricity use changed among 82% of participants thanks to the trial. The deployment of a range of time-of-use tariffs in conjunction with demand-side management incentives are found on average to reduce overall electricity usage by 2.5% and peak usage by 8.8%. The participants' main motivation to adapt usage was the fact that they realised the potentially positive impact of the tariffs on their bills. The results of this trial, which is unique by the number of customers involved, were fed in directly into a cost-benefit analysis on future deployment. The analysis estimates that smart meter technologies potentially provide a net benefit to customers and to Ireland of up to about EUR 174 million over the next 15 to 20 years (CER, 2011a).

In an effort to decarbonise passenger car transport, electric vehicles (EVs) are a very promising option. Grid integration of electric vehicles is a key enabler for the successful launch of EVs. Ireland is putting in place a charging infrastructure and partners with the research community to prepare a successful integration.

SUPPLY AND RETAIL

RETAIL MARKET STRUCTURE

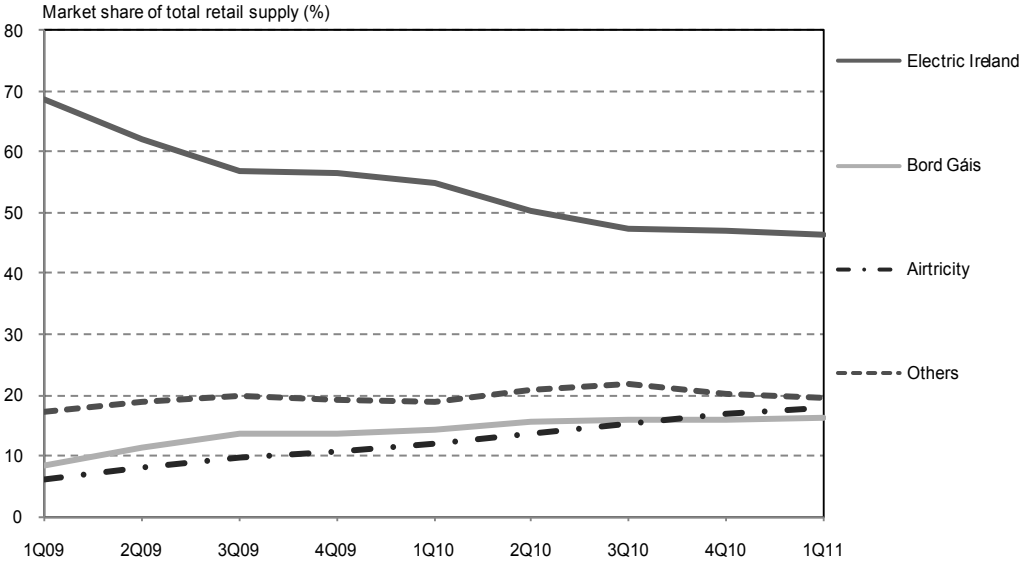
There are eight suppliers in the retail market. Since the last IEA in-depth review in 2007, there has been restructuring at the state-owned companies Bord Gáis (Bord Gáis Energy Supply) and ESB (from 2012 onwards Electric Ireland, henceforth referred to as EI) and one supplier (CHP Supply) has exited the market. Airtricity, Viridian Power & Energy (Energia) and Waterpower Engineering remain in the market, and two new suppliers have entered the market – Vayu and PrePayPower.

In terms of market shares, the state-owned ESB (Electric Ireland, EI, as of 2012) remains the largest supplier in terms of customer numbers. According to CER data, in 2010 EI had an average annual share in supplied electricity to all customers of 50%, equalling almost 12.4 TWh of annual delivery. However, EI's share is continuously declining, as its average annual share during 2009 was at 61%, starting from 68% at the beginning of 2009 and from 95.5% in 2000. EI's current market share after the first quarter 2011 was at around 46%.

Since 2009, ESB's (EI as of 2012) largest losses in customers were in the domestic market segment, where switching rates significantly increased in the first quarter of 2009, peaked during the second quarter of 2009 and since continued on an average level of around 5.25% per quarter. This development was driven by visible marketing campaigns which accompanied the entry of Energia, Bord Gáis and Airtricity into this specific segment. However, EI's market share in that specific customer group, at 58%, is still above its share in other customer groups.

Since 2009, ESB (EI as of 2012) has not lost any market share in the section of large energy customers, where EI accounted for some 30% of electricity supplied in 2010. The development in the customer group of large-scale customers indicates a stop of the switch in this market segment, which has been the first segment of competition in the early years of full market opening.

Figure 19. **Development in the electricity market share of the retail supply, 2009 and 2010**



Sources: CER (2011a) and IEA analysis.

Other main suppliers are Airtricity, which accounted for 17.7% of electricity sold to retail customers during the first quarter of 2011, and the state-owned Bord Gáis, with roughly 16%. Together, the three leading companies make up for around 80% of the total retail electricity market supply. Non-ESB suppliers currently have a share of the total market at around 37%, coming from 23% at the beginning of 2009.

DEREGULATION OF RETAIL MARKETS

With the reduction of EI's market share in the various customer groups and the evolvement of other suppliers, CER decided to deregulate the prices for the business customer group by October 2010 and the domestic customer group by April 2011. This means that EI now is able to offer electricity at prices without prior consultation and approval by the regulator.

The overall trend towards a reduced market share of state-owned suppliers has been significant. This development was mostly triggered by the regulator overseeing a reliable and transparent customer switching process,[31] as well as the formerly existing price regulation for ESB Customer Supply (now part of EI) as the dominant market player. While there was a minimum tariff EI could charge, existing competitive suppliers often offered lower prices.

31. Switching between suppliers in the domestic retail market is straightforward in Ireland and can be done over the phone or online. In addition, the CER requires electricity suppliers to have Codes of Practice and Customer Charters setting out their processes and commitments to their customers.

The focus of the CER retail market regulation has now moved from managing dominance and encouraging new entry to ensuring that competition is working for the benefit of consumers.

In 2011, the CER published a ruling on customer protection, taking account of recent market changes such as deregulation and EU Energy Third Package-related legislation on customer protection.[32] This decision sets out a number of new measures addressing customer education and information, codes of practice for suppliers, accessibility and protection measures for vulnerable customers. Such measures include an obligation for suppliers to ensure that vulnerable customers are on the most economic tariff for their chosen payment method, and a framework for accrediting tariff comparison facilities/websites.

In addition, the CER also reduced (more than halved) the regulated reconnection cost for disconnected customers. The amount of disconnections increased significantly in 2010 owing to the deteriorating economic circumstances. The CER has also established guidelines for disconnection decisions, stating that disconnection of a customer should only be carried out as a last resort by a supplier and customers must be given the opportunity to enter a payment plan first.

It appears that some consumers use their ability to easily switch supplier as a way of escaping owed payments on their energy bills. Some market participants argue that they should be prevented from doing so. The CER has argued that a customer's outstanding debt does not provide grounds for a removal of their right to switch suppliers, and doing so would lock consumers into more expensive contracts when they are already under financial duress.

TARIFFS AND PRICES

TARIFFS

Before 2011, the CER regulated retail prices for customers supplied by ESB, which accounted for the majority of domestic and small consumers of electricity. Price regulation was designed to set cost-reflective tariffs and to promote competition by ensuring that no cross-subsidisation of customer categories was permitted. As retail competition developed, with new market entrants and significant numbers of consumers switching supplier, the CER progressively ended retail price regulation.

In 2010, the CER published its *Roadmap to Deregulation,* which set out the milestones for the end of retail price regulation.[33] The decision ended the regulation of electricity prices for domestic (*i.e.* residential) customers and enabled Electric Ireland, subject to some conditions, to determine its own electricity prices for domestic customers from April 2011, without prior CER approval. It followed a similar decision by CER to deregulate prices for business customers in October 2010. The decision allows ESB (EI) to compete for customers for the first time.

The electricity generation costs for the incumbent, as set by the CER are shown in Table 4. The largest component is generation costs, representing 72% in 2009 and 56% of the final cost in 2010. The second-largest price component is the network costs (transmission and distribution) which, taken together, roughly represent one-third of the price. The other components have a much smaller impact on the final price.

32. CER (2011c).

33. CER (2011d).

Table 4. **Breakdown of ESB costs for regulated tariffs, 2002 to 2010**

	2002	2003	2004	2005	2006	2007	2008	2009*	2010**
Generation	58%	53%	53%	58%	66%	68%	65%	72%	56%
Transmission	8%	8%	8%	7%	6%	6%	4%	-5%	5%
Distribution	28%	28%	28%	26%	23%	21%	24%	22%	29%
Supply	6%	9%	7%	5%	4%	5%	7%	11%	10%
PSO	0%	2%	3%	4%	2%	0%	0%	0%	0%

* Data for Q1-Q3 2009.

** Data for Q4 2009 to Q3 2010.

Source: CER (2011a).

The CER is responsible for regulating the level of revenue that the monopoly electricity transmission system operator (TSO) EirGrid, the monopoly transmission asset owner (TAO) ESB Networks, and the monopoly distribution system operator (DSO) ESB Networks can recover from its customers to cover its costs.

Every five years, the CER puts in place a revenue control that sets the transmission and distribution revenue that can be collected. This transmission revenue is collected by the TSO and distributed between the TSO and the TAO. This revenue is set at a level that would allow an efficient business to finance its activities and is determined by a combination of benchmarking against organisations in other countries and examining the specific underlying costs of the TSO and TAO. The allowed distribution revenue is collected from suppliers via a distribution use of system (DUoS) charge which is then recovered from final customers.

The current five-year period from 2011 to 2015 will require significant new investment in the transmission and distribution systems. The government target of ensuring 40% of Ireland's electricity generated from renewable sources by 2020 means a major expansion of the network. This will allow these new renewable generators to connect to the system. The network also needs ongoing investment to ensure it operates securely and effectively. This investment will mean that the overall revenues to be recovered by the TSO, TAO and DSO over the period of the review will rise from their current levels.

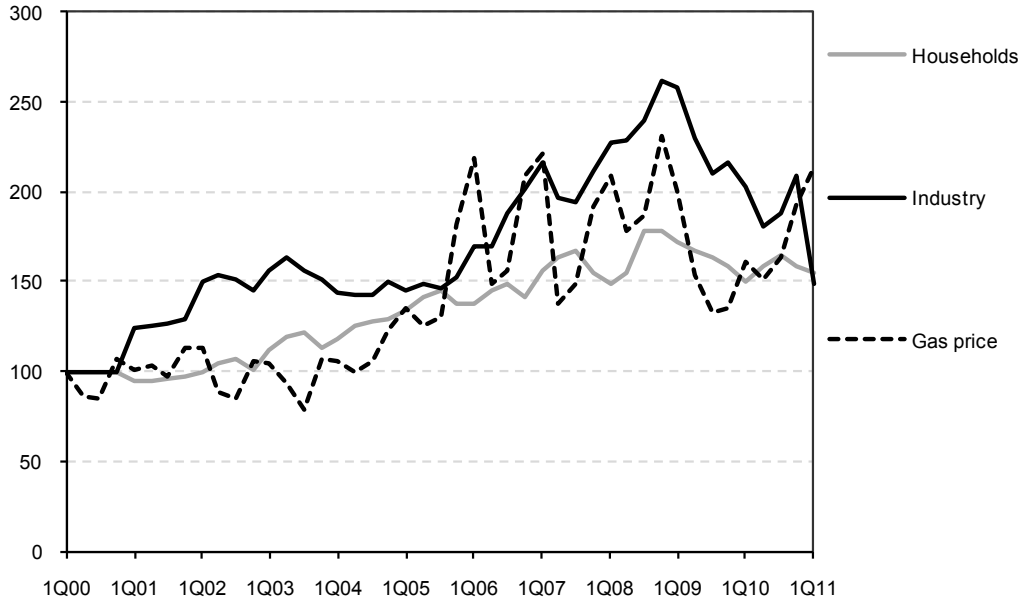
As the transmission and generation costs, as well as the PSO levy (see Box 2), are set by the CER, electricity suppliers only compete with ESB by having lower generation and supply costs.

RETAIL PRICES

Over the last ten years, end-user electricity prices (including taxes) in Ireland have increased by more than half. With about 80% of electricity generation from imported fossil fuel sources, international fuel prices are the key driver of generation costs. Since gas plants are the price-setting plants most of the time, the increase in volatility in commodity prices for gas has been in line with electricity price evolution (see Figure 20).

Compared to IEA member countries, Ireland's end-user electricity prices are comparatively high. In 2010, industry prices in Ireland were the sixth-highest among IEA member countries, and prices for households were the fifth-highest (see Figure 21). Nevertheless, it is worth noting that VAT-exclusive industrial electricity prices have converged on the European Union average from 2008 to 2010 in most consumption categories.

Figure 20. **Evolution of electricity and gas prices, excluding taxes (1Q2000=100)**



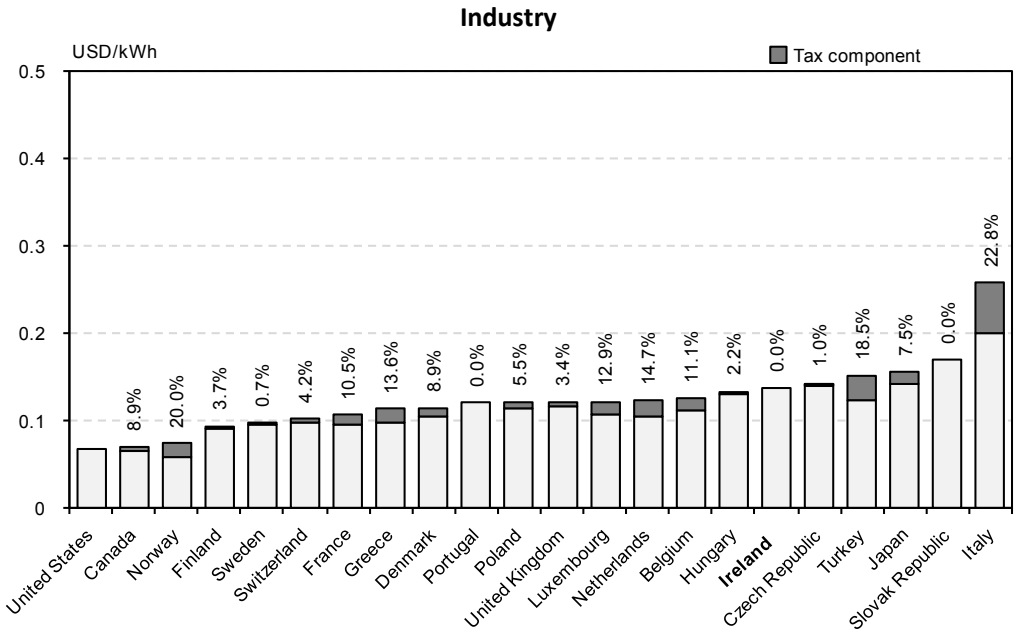
Source: IEA (2011d).

The countries having the most similar electricity mix to the one in Ireland are the Netherlands (gas 62%, coal 22% of electricity generation), the United Kingdom (gas 46% and coal 29%) and Italy (gas 52% and coal 14%). End-user electricity prices in these comparable countries were also higher than the IEA average, and followed a similar trend over the last two decades (see Figure 22).

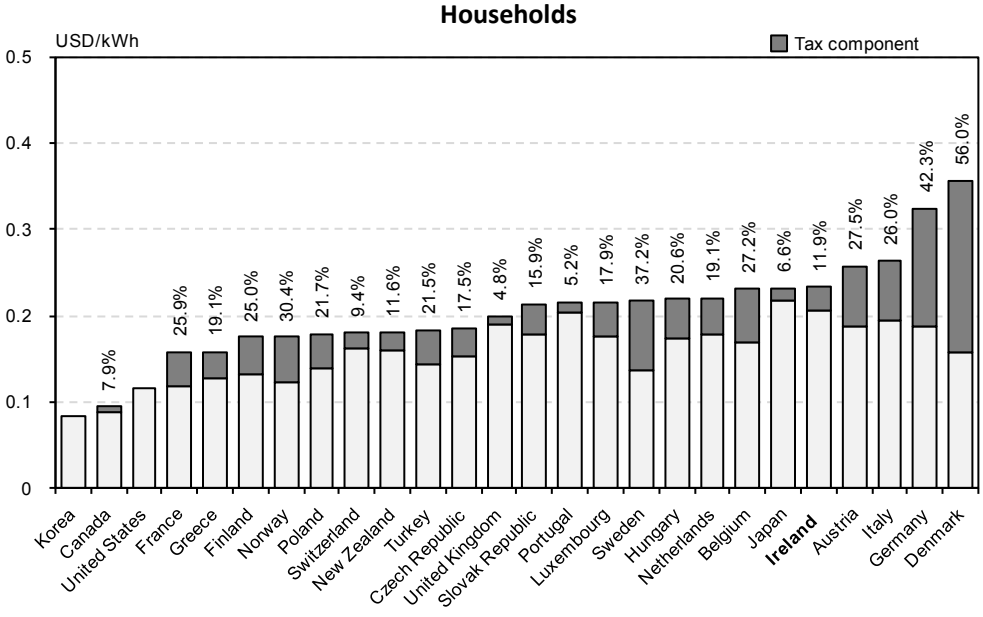
However, compared to these countries, Ireland has additional factors that impact on electricity prices, notably the small size of the market, population dispersal and the geographical location. Indeed, with 28.4 TWh generated in 2010, Ireland is the third-smallest IEA country in terms of generation. It has low hydro capacity and a high reliance on imported gas for power generation, and only one interconnector to the United Kingdom representing 10% of demand. A smaller market and smaller generation plants induce higher costs as only lower economies of scale are possible. Furthermore, fuel transportation costs are higher than in the United Kingdom for instance. Increasing the electricity interconnection capacity should have a positive impact on end-user prices as it will increase the possibility of importing cheaper electricity.

The high levels of electricity prices remain a concern and Irish electricity prices have been above the OECD average throughout the past decade. An analysis by the Economic and Social Research Institute (ESRI) indicates that differences in generation technology – notably Ireland's reliance on expensive imported fossil fuels and costly renewable investments – can explain the price difference to some degree, and that prices in Ireland reflect the long-run marginal cost of production, whereas prices on the island of Great Britain (and further afield on the European continent) do not fully take account of longer-term costs, thereby putting Irish generators at a comparative competitive disadvantage.

Figure 21. **Electricity prices in IEA member countries, 2010**



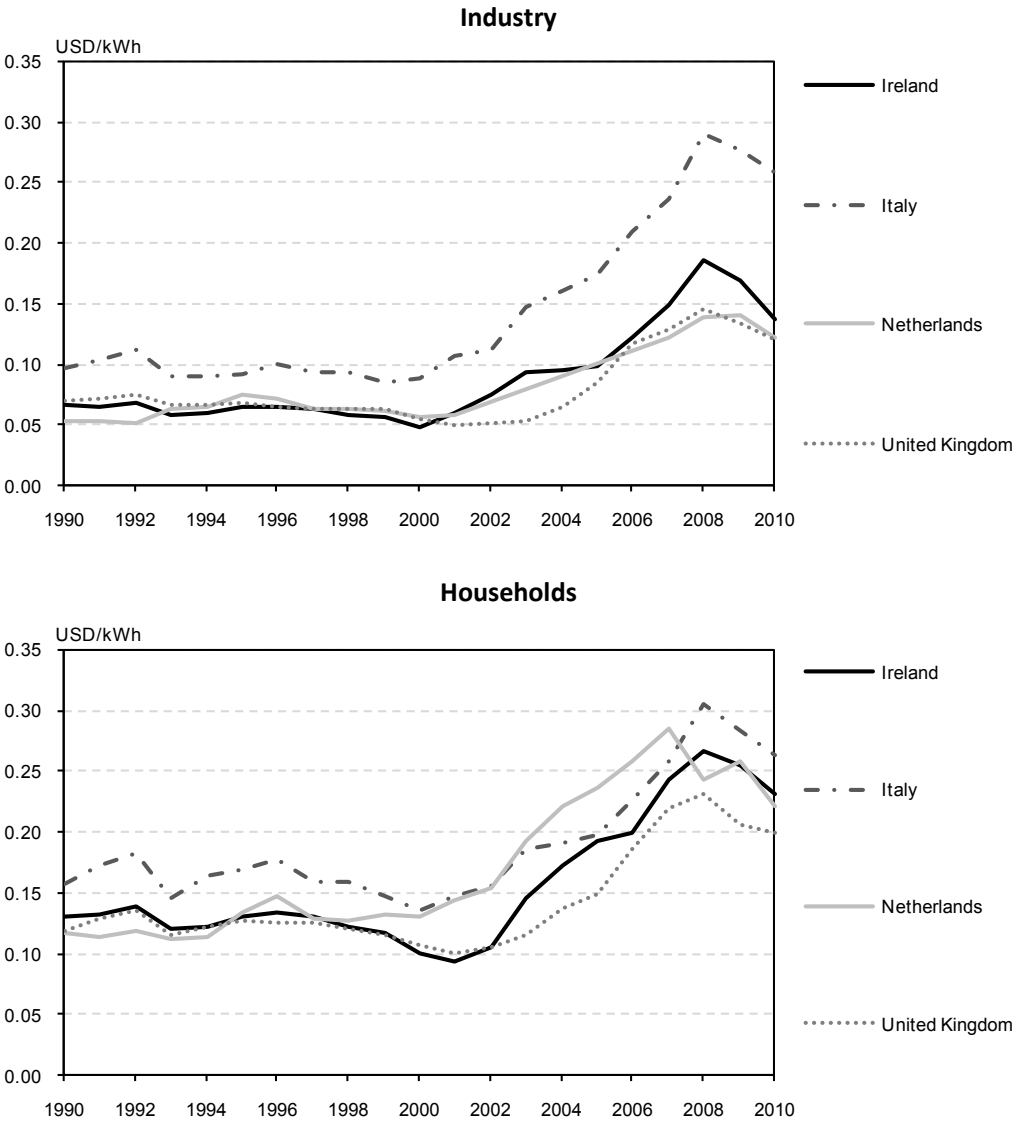
Note: tax information not available for the United States. Data not available for Australia, Austria, Germany, Korea, New Zealand and Spain.



Note: tax information not available for Korea and the United States. Data not available for Australia and Spain.

Source: IEA (2011d).

Figure 22. **Evolution of electricity prices, 1990 to 2010**



Source: IEA (2011d).

CRITIQUE

There have been significant developments in the electricity sector in recent years, among them the strong push to develop wind energy, the increasing reliance on gas-fired power generation, the government's recently announced plans to pursue the disposal of some of ESB's non-strategic power generation capacity and the Bord Gáis Energy Business, the introduction of the all-island Single Electricity Market (SEM), and greater interconnection with the United Kingdom.

ASSESSING THE GENERATION OUTLOOK

Ireland has witnessed significant investment in wind energy, and it now stands ahead of most OECD countries in terms of wind integration and ambitions for the deployment of

wind energy. Wind now accounts for 15% of total electricity production and Ireland has a target to develop 40% of electricity generated from renewable sources (primarily onshore wind) by 2020. Nevertheless, there remain shortfalls in the consenting process for integrating new wind projects (described in further detail in Chapter 6), and this creates uncertainty about whether Ireland can meet its renewable energy targets.

Ireland has modernised its electricity generation portfolio with the addition of over 1 000 MW of new gas-fired generation in 2010 and another 300 MW are scheduled to be added over the next four years. This will result in a cleaner, more efficient, more reliable electricity generation fleet, which is now achieving consistent availability rates of over 80%. The continued preference for gas is all the more necessary because of the inherent variability of wind and other renewable energies, which means that the electricity system will need the flexible, reactive power that gas can provide.

The electricity market currently provides generators with a capacity payments mechanism, which rewards generation availability but not flexibility. Yet in the context of increasing integration of variable renewables, the market must provide sufficient flexibility. Redefining the criteria for capacity payments based on flexibility, and pursuing the review of the regulatory framework to ensure the development of a well-functioning ancillary services market, would ensure that the investment in the development of additional flexibility in the electricity market is forthcoming. Of note, work is already under way on reviewing the arrangements for system services for completion over the next 12 months, which would appear to be of high priority in order to tackle structural inefficiencies in the all-island arrangements. The focus in this work should be on cost minimisation to the end-consumer, while moving towards accommodating a more flexible system.

ENSURING ADEQUATE NETWORK INVESTMENTS

Long-term strategies for transmission networks have been developed, particularly as the transmission and distribution network infrastructure will need to be strengthened and expanded to facilitate the expected growth in electricity demand and the integration of large volumes of variable renewable energies. A particular challenge is the integration of direct wind connections into the distribution network. Present transmission and distribution infrastructure is considered to be insufficient for future needs.

A 500 MW East-West sub-sea electricity interconnector between Ireland and Wales is under construction and on schedule to be delivered in 2012. It will be operational by the end of the year. Its commissioning will bring significant benefits to Ireland, improving security of supply as well as increasing competition and helping to achieve Ireland's renewable energy targets. The new East-West interconnector, combined with the existing interconnection to the island of Great Britain through Moyle in Northern Ireland, will increase Ireland's interconnection capacity to 15% of demand, higher than the European Union target of 10%. This will end the relative isolation of the Irish electricity system, and facilitate the integration of wind generation and meeting Ireland's 2020 targets. An additional electricity link with Northern Ireland is planned, but since it encountered significant planning problems with local communities, the project remains unfinished. The completion of this project is vital in order to improve supply adequacy on the island of Ireland and ensure the effective operation of the Single Electricity Market.

At present, the planning and consenting regime appears unable to meet Ireland's existing network development targets, particularly regarding grid connections and transmission infrastructure. Delays in building the necessary infrastructure are likely to

result in wind curtailment, in unnecessarily increased balancing challenges and costs, and also in a potential non-compliance of the national renewable targets for the electricity sector. The planning, consenting and local consultation process will need to ensure that it is able to take fast and reliable decisions for all stakeholders. Only through better planning and co-ordination, including with the local planning authorities and local communities, will Ireland ensure that it will meet its ambitions and targets.

REVISITING THE INDUSTRY STRUCTURE

The electricity system is undergoing a transformation as a result of the growing integration of wind. In some cases, the responsibilities of the TSO and the DSO are overlapping, and it is likely that in the future the responsibilities of each entity will become less distinct. For example, 80% of wind connections by number, and 50% by capacity, will be connected directly to the distribution system. The current "split accountability" model,[34] if unchanged, could come under increased pressure as the network expands. Integrated planning leads to cost optimisation, and the EU Energy Third Package legislation allows for close collaboration between transmission and distribution system operators, and even the establishment of a combined, overarching network owner and operator.

"Split accountability" is already an issue for the transmission network under existing arrangements. This increases the difficulty for the regulator to give appropriate incentives to the TSO. In the absence of change, developing incentives-based regulation may become more difficult as the transmission and distribution networks become more interlinked.

Numerous stakeholders expressed criticism of the decision to retain the existing split accountability model and consider that this will complicate ensuring the effective planning of the development of the transmission system and cause delays in progressing network connections. The construction of the East-West Interconnector would arguably have been more difficult if EirGrid had not had full statutory responsibility for the project and ownership of the Interconnector asset. Managing the transmission investment process and construction when procurement and planning are split will be a challenge, as ideally this should be an iterative approach within one entity by which potential costs and benefits are identified.

An important advantage of full ownership unbundling of a transmission system is that it would guarantee the independence of transmission system operation, which is beneficial for fostering further competition. The effectiveness of current arrangements between EirGrid and ESB in ensuring sufficient independence of the transmission system operator will be subject to detailed assessment by the regulatory authorities and eventually by the European Commission under Article 9.9 of the Electricity Directive. The IEA understands that the rationale for not realising the benefits of full ownership unbundling in the transmission system is primarily related to concerns about financing, namely the costs faced by the government as the shareholder of ESB and by ESB itself.

Given the comparative importance of the distribution network in Ireland, particularly in the context of connecting large amounts of renewables (where the distribution network is in many respects akin to the transmission system), ensuring the independence of the distribution system operator is an appropriate aim. In this context, the establishment of a fully ownership-unbundled combined operator – or close institutionalised co-operation between an independent TSO and an independent DSO – would facilitate the mitigation

34. Whereby EirGrid is the TSO and ESB Networks is the TAO.

of any concerns regarding the financial strength of EirGrid or ESB (as distribution system operator). Such an approach would most likely involve separation of ESB production and supply interests from its network assets, but this is not the government's intention, having made clear that ESB will be retained as a vertically integrated undertaking (VIU).

Given that the present arrangements are to be maintained, consumers should not be faced with higher costs as a result of the government decision not to implement full ownership unbundling. Accordingly, it may be appropriate for the CER to include the savings from full ownership unbundling in its estimates of the costs of an efficient transmission system operator when approving tariffs. Capital costs provided for in regulatory approved tariffs should continue to be based on an efficient capital structure calculated separately from how ESB or EirGrid are actually funded, in line with standard regulatory practice.

In February 2012, the Irish government decided not to proceed with a sale of a minority stake in ESB as previously signalled, following detailed analysis which identified a range of complex regulatory and legislative issues. It decided to pursue the sale of "some of ESB's non-strategic power generation capacity" (along with BGE's energy business which, in this context, is relevant as it includes power generation and electricity supply – see Chapter 7). The divestiture of some further non-core generation assets – and in particular price-setting assets – would help to address the inherent structural issue of ESB's market dominance in the Irish electricity market, which is still viewed by many market participants and potential entrants as a barrier to entry and impediment to sustainable long-term competition.

The all-island Single Electricity Market (SEM) is generally considered to be a transparent and competitive market. Nonetheless, under existing arrangements it appears difficult for market participants to develop long-term competitive strategies or to decide how to optimise the use of their asset mix. Despite the previously mentioned divestment of some ESB assets to new-entrant Endesa, thereby making Endesa the second-largest owner of generating capacity in the market, the main barrier to allowing for the creation of a more competitive market on the island of Ireland remains market dominance. ESB continues to control over 47% of dispatchable generating capacity on the island of Ireland, and most notably key, price-setting generation assets. A further reduction of market concentration through the divestment of some non-core ESB generation assets, including some price setting capacity, as part of the programme of structural reform is a necessary step for strengthening the competitive environment.

DEVELOPING A COMPETITIVE ELECTRICITY MARKET

The Single Electricity Market (SEM), which began in 2007, has resulted in the establishment a one wholesale market on the island of Ireland, allowing for greater economies of scale and improved security and reliability of supply. Integrated system planning and operation has been enhanced following the acquisition of the Northern Ireland TSO (SONI) and TAO (NIE) by Ireland's TSO (EirGrid) and TAO (ESB) respectively.

Given the challenges of managing large-scale wind penetration, Ireland will have to ensure that the market rewards flexibility and facilitates widespread participation. It is not clear that SEM currently achieves this, particularly in relation to flexibility. In its current form, the capacity payments system's primary focus is on ensuring adequate generating capacity and security of supply, and is thus not related to a generator's ability to deliver electricity when the system needs it.

The SEM was developed in a market with a high concentration of market power in generation. As a consequence, the regulators established bidding rules to bring about outcomes in line with effective competition. In order to manage ESB's continued dominance, there are obligations on ESB to offer a number of forward products in the form of directed contracts. A further divestment of ESB's generation assets would reduce its position of market dominance, thereby allowing for a relaxation of the rules on bidding, which in turn would have positive effects resulting from the increase in flexibility for market participants. In particular, it may ensure that remuneration for generation becomes more efficient, allowing generators to bid at lower-than-SRMC (short-run marginal cost) prices, and thus result in lower prices for consumers.

Liquidity in the SEM is restricted to the spot market. This means that few hedging products are available, leading to non-vertically integrated suppliers ("gentailers"[35] who own generation and supply businesses) being unable to sufficiently mitigate risks, which may constitute a barrier to entry. In this regard, the SEM project is to some extent still incomplete. Across Europe, forward and futures markets, which allow for the efficient management of risk, have been essential to the development of effective competition. In particular, new entrants require access to forward and futures markets to manage their risks. As price volatility increases owing to the impact of wind, this will become more important. Enhanced integration with the United Kingdom and other European markets, and the possibility to have access to longer-term contracts in other markets, could help support the development of a liquid futures market for the SEM, perhaps as an extension of existing markets elsewhere. The completion of the 500 MW East-West Interconnector to Wales in late 2012 will improve liquidity somewhat by linking the Irish market to the comparatively liquid electricity market of England and Wales.

PAVING THE WAY FOR SUCCESSFUL REGIONAL INTEGRATION

Enhanced market integration in Europe should indeed allow for the best use of the entire electricity system, ultimately bringing benefits to consumers. The reason for this is efficient use of interconnection and least-cost cross-border trade. Further interconnection will alleviate some of the problems of managing a system where up to 75% of Ireland's generation could be produced by using wind at certain moments, allowing excess production to be sold and meeting demand at least-cost when little wind is available. Irish retail customers could also benefit from lower wholesale market prices during times when costly domestic gas-fired plants are fully replaced by less expensive imports. This should deliver a potential increase of competition in the wholesale market, and help mitigate increased price volatility. Understanding physical interconnectors as part of the reserve margin would also reduce the need to build more conventional capacity to meet peaks and troughs in demand. Ireland must co-operate with its regional partners to develop projects of common European interest.

Yet as the European Commission moves ahead with plans to develop an integrated North-West European (and ultimately pan-European) common electricity market (or "target model", by 2014 under current arrangements but noting the longer period for Ireland up to 2016), Ireland should ensure that increased integration will occur in a manner that is beneficial for Irish investors and consumers. Indeed, ESRI points out that such developments could involve substantial transactions costs (notably regarding software) that would impact on end-user bills because of the small size of the Irish market (Fitzgerald, 2011).

35. A term for "generator and retailer".

Moreover, further integration with British and European markets is likely to have a direct impact on the manner in which the SEM currently operates. Ireland must seek to ensure that the essential elements of SEM are retained (all-island market, pool market, capacity payment) while being flexible in relation to non-essential aspects (for example gate closure times, or even *ex-ante* vs. *ex-post* pricing).

The United Kingdom is currently undergoing a wide-ranging policy review of its energy sector, notably including the level of support for the deployment of renewables, the outlook for nuclear energy and the implementation of a carbon tax. Because of the increased interconnection with the island of Ireland following the completion of the East-West Interconnector in 2012, British policy developments are likely to have a strong impact on the Irish market, and thus create an element of uncertainty that could negatively impact the investment climate in Ireland.

Ireland will need to maintain its structured, formal dialogue with the British authorities to ensure a coherent, co-ordinated approach to issues which affect market developments on the islands of Ireland and Great Britain, with a view to ensuring that the benefits of existing markets and infrastructure are retained by Irish consumers. Likewise, Ireland must also continue to work proactively to help develop European rules – which under the EU Third Package can cater for particular regional circumstances – that achieve benefits at least cost. The Electricity and Gas Regional Initiatives and the North Seas Offshore Grids Initiative provide a good framework for the work.

EMPOWERING THE REGULATOR

Downstream, the Irish government has successfully improved the competitive environment in recent years, and as a result the CER has taken progressive steps to deregulate ESB's retail tariffs. Irish consumers have benefited from intense competition among suppliers by actively engaging in the market, leading to some of the highest switching rates in the world.

Yet in terms of networks, the Irish government should ensure that the regulator has the necessary resources needed to change or implement required regulatory measures to tackle network losses, improve grid connection of renewables and facilitate investments. Indeed, structural inefficiencies may also form an element of higher electricity costs in Ireland, compared to other European countries. It is within the authority of the regulator to ensure cost-efficiency and to maximise the efficiency potential of the network businesses, including any costs incurred in restructuring.

Although there is no evidence of abuse of ESB's dominant position to date, a range of sanctions are available to the CER. The CER has general powers to bring prosecutions for breach of licence conditions. In addition to powers to revoke licences, it has powers to give directions to discontinue or refrain from contravention of licence conditions and to make determinations that a licence holder has committed a specified breach of a licence condition. The CER may apply to the High Court for a compliance order to ensure compliance with a direction. It is a matter for the Court to stipulate the time-frame within which compliance must be achieved and/or to impose financial penalties aimed at achieving compliance. Furthermore, in relation to sanctions for network businesses, Ireland has transposed Third Package sanction provisions to provide, in regard to breach of unbundling rules, that the CER, in making application to the High Court for a compliance order, may recommend the imposition of a fine up to 10% of the annual turnover of the owner or operator of a networks business, as appropriate. In light of the government's planned disposal of Bord Gáis Energy and some non-strategic power

generation assets of ESB, it is recommended that the powers of the CER are enhanced as necessary in order to ensure that market rules and competition rules are strictly adhered to and that the interests of energy consumers are also protected.

Likewise, the Competition Authority has not taken on any case in relation to the electricity or natural gas market. The 2011 *OECD Economic Review of Ireland* indicates that competition law continues to be hampered because of the emphasis on criminal rather than civil law. The ensuing very high standard of proof implies that, in practice, sanctions can only be imposed in case of blatant cartel behaviour. The OECD concludes that civil fines with a lower standard of proof should be introduced to deter infringements, such as vertical restraints or abuse of a dominant position, as this promotes stronger competition.

RECOMMENDATIONS

The government of Ireland should:

- ☐ *Encourage the development of additional flexibility in the single electricity market by, for example, refining the criteria for capacity payments and undertaking a review of the regulatory framework of the ancillary services market.*
- ☐ *Keep under review the planning and consenting process for critical energy infrastructure to ensure that it delivers an effective, transparent and streamlined planning and consenting process.*
- ☐ *Continue to review the competitive landscape of the electricity sector, with a focus on the appropriateness of the depth of state activity in the sector and the unbundling of incumbents' vertically integrated assets, in line with European Union legislation. In addition to selling Bord Gáis Energy, the government should pursue its plans for disposal of some of ESB's non-strategic power generating plants.*
- ☐ *Support the process of developing rules for the practical implementation of a common pan-European electricity market, ensuring that the benefits which the Single Electricity Market delivers are retained.*
- ☐ *Engage in co-operation with regional partners, including through existing forums, to develop a common and mutually beneficial approach to electricity infrastructure and markets.*
- ☐ *Ensure that in the five-year network review process, the CER focuses on scrutinising past and future performance to ascertain that relevant expenditure is efficient, with strict cost control and appropriate incentives in place.*
- ☐ *Ensure that the powers of the CER are enhanced as necessary in order to ensure that market and competition rules are strictly adhered to and that the interests of consumers are protected.*

6. RENEWABLE ENERGY

Key data (2010)

Share of renewable energy: 4.6% in TPES and 13.1% in electricity generation (IEA average: 8.0% and 18.0%), up from 1.7% and 5% in 2000

Biofuels and waste: 2.5% of TPES and 1.1% of total electricity generation

Wind: 1.7% of TPES and 10% of total electricity generation

Hydropower: 0.4% of TPES and 2.1% of total electricity generation

SUPPLY AND DEMAND

RENEWABLE ENERGY SUPPLY

Total renewable energy supply in Ireland stood at 0.7 Mtoe in 2010, accounting for 4.6% of total primary energy supply. The share of renewable energy in the country's energy mix has increased significantly over the last decade, up from only 0.2 Mtoe, or 1.7% of TPES, in 2000. Yet despite this increase in recent years, Ireland ranks as the fifth-lowest among IEA member countries in terms of share of renewable energy in its primary energy supply. Renewable energy can be broadly classified into two distinct categories – combustible renewable energies and non-combustible, electricity-generating renewable energies.

Combustible renewable energies are the largest source of renewable energy in Ireland, with biofuels and waste accounting for 0.37 Mtoe, or 2.5% of TPES in 2010. Industrial and municipal wastes only represent 0.1% of TPES and play a minor role in Ireland. The bulk of combustible renewables comes from primary solid biofuels (wood and vegetal waste) with 1.5% of TPES, liquid biofuels with 0.5% and biogases with 0.3% of TPES. According to government forecasts, biofuels supply is expected to increase threefold over the next decade, and will represent slightly more than 7% of TPES in 2020.

Wind, the second-largest renewable energy source in Ireland, represented 1.7% of TPES in 2010. It grew at an average rate of 29% per year between 2000 and 2010, and is expected to account for 6.5% of TPES in 2020. Ireland has limited hydro and solar potential. In 2010 these sources accounted for just 0.4% and 0.04% of TPES respectively.

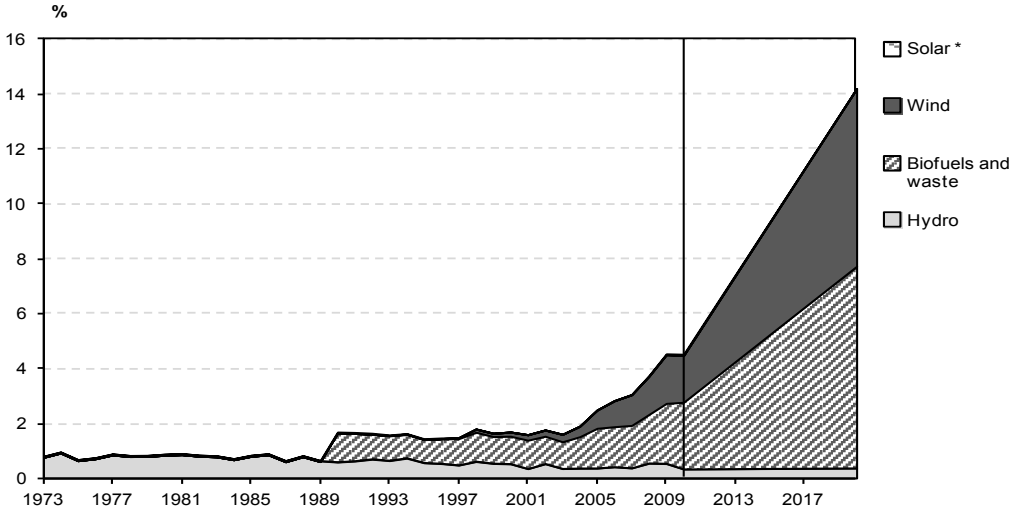
ELECTRICITY GENERATION

Electricity generated from renewable energy sources represented 13.1% of total electricity, with the vast majority coming from wind energy, which alone accounted for 10% of total electricity generation. Hydro accounted for 2.1% and biomass for 1.1% of total electricity generation in 2010. Electricity generated from wind has grown quickly over the last years, growing from 0.2 TWh in 2000 to 2.8 TWh in 2010. This increase in

wind energy has been the third-largest among IEA member countries, with only Portugal and Spain having seen their share of wind in electricity generation increasing at a faster pace during this time period.

According to government forecasts, wind is expected to increase almost fourfold and reach 30% of total generation, by 2020. This would make Ireland a world leader in terms of share of wind in its power generation mix. As a point of comparison, a world leader today in terms of wind power is Denmark, where wind accounted for 20% of electricity generation in 2010.

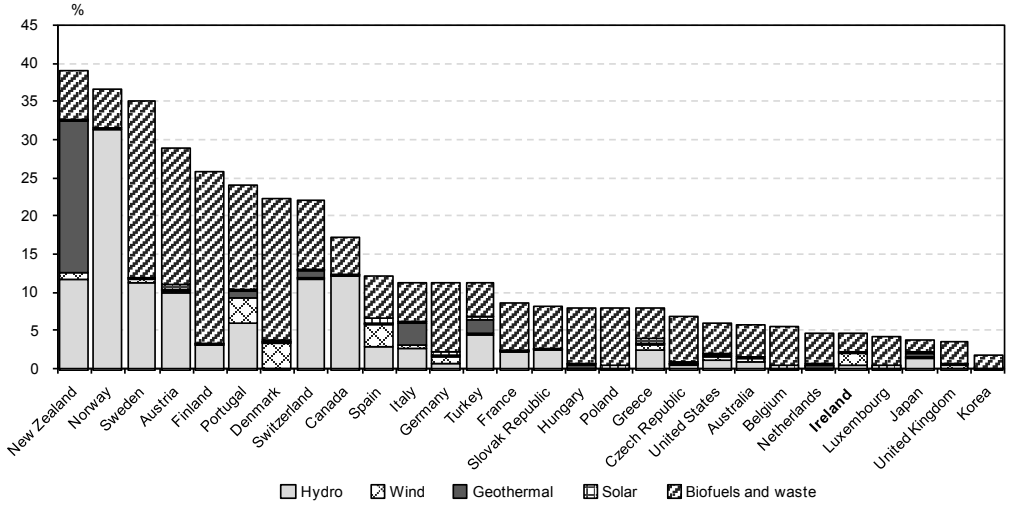
Figure 23. **Renewable energy as a percentage of total primary energy supply, 1973 to 2020**



* Negligible.

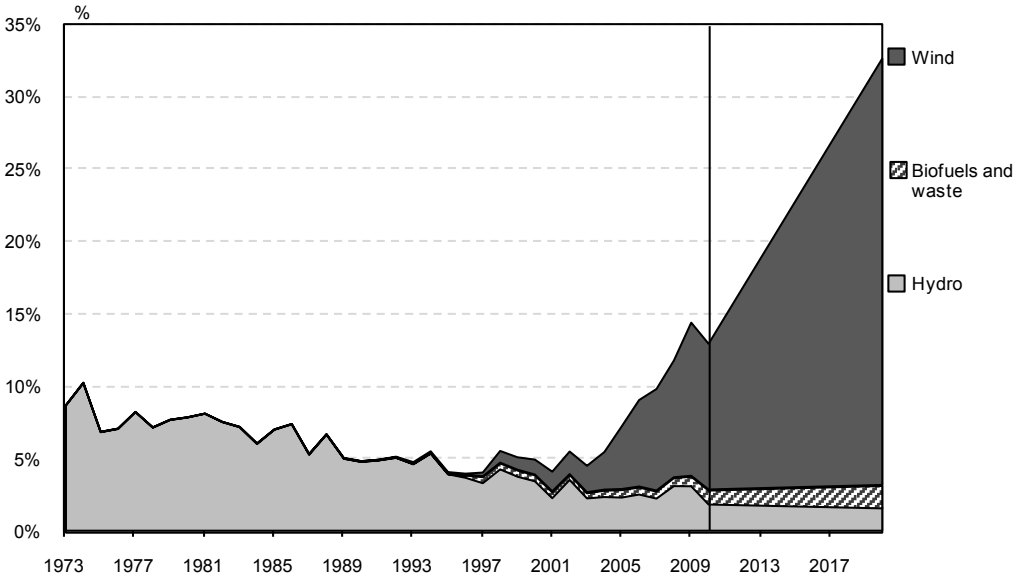
Source: IEA (2011a).

Figure 24. **Renewable energy as a percentage of total primary energy supply in IEA member countries, 2010**



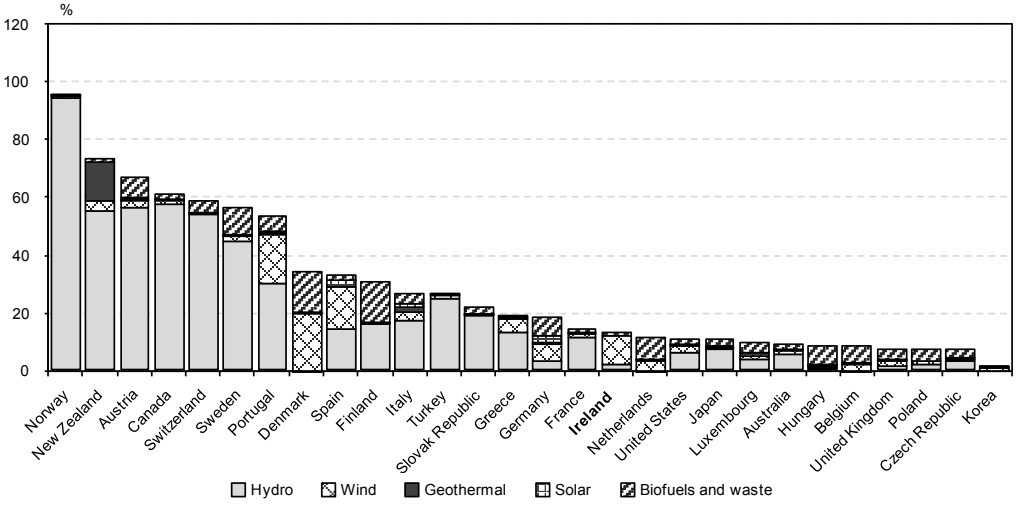
Source: IEA (2011a).

Figure 25. **Share of electricity generation from renewable energy sources in Ireland, 1973 to 2020**



Sources: IEA (2011a), and data submitted by the government of Ireland to the IEA.

Figure 26. **Electricity generation from renewable energy sources as a percentage of all generation in IEA member countries, 2010**



Source: IEA (2011a).

INSTITUTIONS

The **Department of Communications, Energy and Natural Resources (DCENR)** is the lead ministry with responsibility for the development of renewable energy policy, energy agreements, legislation and regulations. The ministry and its agencies represent Ireland at international forums and energy-related regional co-operation.

The **Sustainable Energy Authority of Ireland (SEAI)** manages programmes aimed at supporting government decision making through advocacy, analysis and evidence. Detailed information on renewable energy can be found on the website of the SEAI.

The **Commission for Energy Regulation (CER)** is the statutorily independent regulator for the electricity and natural gas sectors in Ireland. It is responsible for the grant of authorisations to construct or reconstruct a generating station, and of licences to generate electricity. Other responsibilities include the grid connection process, and calculating and certifying PSO (Public Service Obligation) payments for the electricity sector.

EirGrid plc, a state-owned commercial company, is the national transmission system operator in the electricity sector on the island of Ireland.[36] It puts in place the grid infrastructure needed to support competition in energy, to promote economic growth, to facilitate more renewable energy, and to provide essential services. A partnership of SONI and EirGrid acts as the Single Energy Market Operator (SEMO) and operates the Single Electricity Market on the island of Ireland.

POLICIES AND MEASURES

OVERVIEW AND TARGETS

The development of renewable energy is central to the government's overall energy policy. Renewable energy reduces dependence on fossil fuels, improves security of supply, and reduces greenhouse gas emissions. Renewable energies thus provide environmental benefits while delivering green jobs to the economy.

Ireland's ambitions for renewable energy and the related national targets are in line with the European Union's energy policy objectives and the targets set for Ireland under the Renewable Energy Directive.[37] The government has recently published (May 2012) a Renewable Energy Strategy which reinforces the commitment to renewable energy, and sets out a number of concrete actions to develop renewable energy in the domestic market and for export.

DOMESTIC MEASURES

The 2007 Energy White Paper described the actions and target for the energy policy framework out to 2020. The White Paper notably outlined strategic goals, the second of which is "Accelerating the Growth of Renewable Energy Sources".

Ambitious targets for expanding the role of renewable energy were set, notably the 2020 targets of renewable sources attaining some 33%[38] of electricity consumption, 12% of heat, and 10% of motor fuels consumption.

At this time, the government introduced a range of measures to encourage the development and deployment of renewable sources of energy, including the REFIT scheme, the biofuels obligation and grants for energy crops.

36. Eirgrid operates the transmission grid in Northern Ireland through its ownership of System Operator Northern Ireland (SONI).

37. Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources, amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (text with EEA relevance).

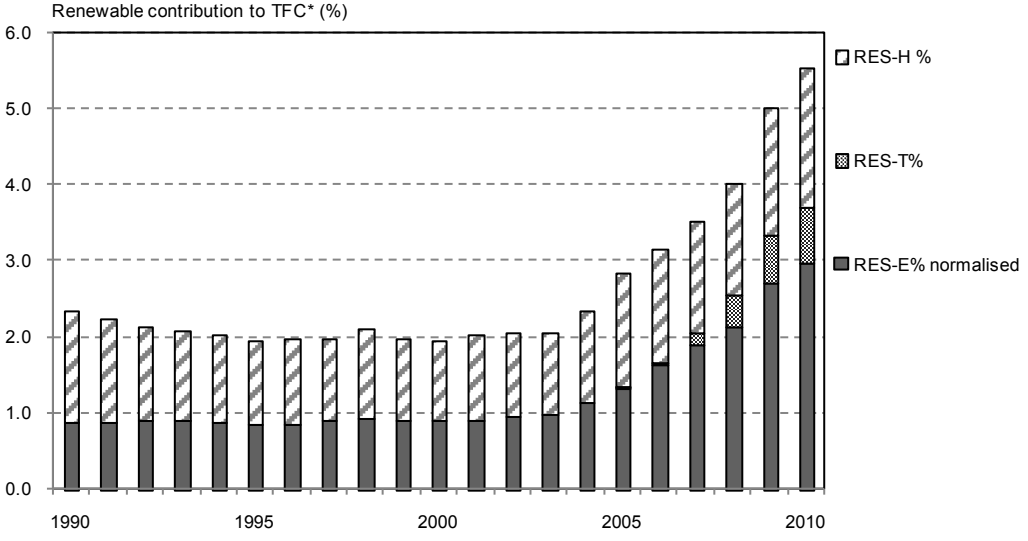
38. This target, set in 2007, was subsequently increased to 40% in the 2008 Carbon Budget. This is in line with the way in which Ireland intends to reach its overall 16% under Directive 2009/28/EC, *i.e.* 40% renewable energy sources-electricity (RES-E), 10% transport (RES-T) and 12% heat (RES-H).

Sector-specific capacity objectives for 2020 include the deployment of at least 800 MW of combined heat and power (CHP) capacity, and at least 500 MW of installed ocean energy capacity.

EUROPEAN UNION MEASURES

Renewable energy policy in Ireland is also guided by European Union requirements. The Renewable Energy Directive (2009/28/EC) sets targets for all member states, so that the European Union will reach a 20% share of energy from renewable sources by 2020 and a 10% share of renewable energy specifically in the transport sector. Previous non-binding targets for 2010 for biofuels and electricity from renewable sources have been replaced by a binding target to increase the share of renewable energy in gross final energy consumption by 2020. Under the Renewable Energy Directive, Ireland must increase this share from 3.1% in 2005 to 16% in 2020. In 2010, gross final energy use from renewable energy stood at 5.5%, up from 5% in 2009. Ireland transposed the obligations under Directive 2009/28/EC into law through a series of legislative measures including statutory instruments S.I. 322 of 2010;[39] S.I. 147 of 2011;[40] S.I. 148 of 2011;[41] and S.I. 33 of 2012.[42]

Figure 27. **Contribution of renewable sources to heat, transport and electricity generation, 1990 to 2010**



* Total final consumption.

Source: SEAI (2011); data submitted by the government of Ireland to the IEA.

Article 4 of the Renewable Energy Directive required each member state to submit a National Renewable Energy Action Plan (NREAP) by 30 June 2010. These plans, to be prepared in accordance with the template published by the Commission, provide detailed

39. Energy (Biofuel Obligation and Miscellaneous Provisions) Act 2010.

40. European Communities (Renewable Energy) Regulations 2011.

41. Sustainable Energy Act 2002, Section 8(2) (Conferral of Additional Functions — Renewable Energy) Order 2011.

42. European Union (Biofuel Sustainability Criteria) Regulations 2012.

roadmaps of how each member state expects to reach its legally binding 2020 target for the share of renewable energy in its final energy consumption. The first progress report on the NREAP was submitted to the European Commission in January 2012.

Ireland's National Renewable Energy Action Plan (NREAP) sets out how it intends to achieve the 16% overall across the electricity, heat and transport sectors. The directive imposed a minimum 10% target in the transport sector; however, otherwise there is flexibility for the member states to achieve the target as it so chooses across the three sectors. The NREAP also shows the technology mix that is expected to be used, the measures and reforms required to overcome the barriers to developing renewable energy, and how the national energy efficiency savings are factored in to national energy projections to 2020.

Ireland indicates that the overall 16% renewable energy target is to be achieved from around 40% renewable electricity (RES-E), 12% renewable heat (RES-H) and 10% renewable transport (RES-T). Ireland intends to meet the target domestically.

As of 2010, Ireland continues to make progress in increasing its level of renewables in the sectors of heat, transport and electricity generation, with RES-H at 4.4%, RES-E at 14.8% and RES-T at 2.4% of their respective sectoral totals.[43]

ELECTRICITY FROM RENEWABLE ENERGY SOURCES

Ireland has made big strides in recent years in accelerating renewable generation. Under Directive 2001/77/EC, Ireland was set a target of moving from 3.6% of its electricity produced from renewable sources to 13.2% by 2010. Ireland has achieved its 2010 target, with some 14.8% of its electricity coming from renewable sources in 2010.[44]

SUPPORT MECHANISMS

The "renewable energy feed-in tariff (REFIT) is the main instrument for encouraging the development of renewable energy in Ireland. The REFIT scheme provides investor certainty by ensuring a 15-year feed-in tariff guarantee.

The first REFIT scheme (REFIT 1) was announced in 2006 and obtained state aid clearance from the European Commission in September 2007. The scheme was open to small- and large-scale onshore wind categories, biomass landfill gas, other biomass and small hydro projects.

The REFIT 1 scheme was open for applications until end-2009, after which date no new applications have been accepted. However, projects accepted into the scheme before end-2009, which under the relevant legislation were granted an extension of time to become operational, continue to be developed.

Eligible, notified costs associated with the REFIT scheme are borne by all final electricity consumers in Ireland through the PSO levy (see Box 2 in Chapter 5). The Commission for Energy Regulation is responsible for the calculation, certification and supervision of the PSO levy. The PSO levy in 2011/12 contains EUR 35.78 million associated with the REFIT scheme. Some 1 242 MW of REFIT 1 renewable generation capacity received support in the 2011/12 PSO decision.

43. National Renewable Energy Action Plan (NREAP) First Progress Report, submitted to the European Commission in January 2012.

44. Normalised wind and hydro figures calculated according to the directive annexes.

Table 5. **Historical table of REFIT reference prices, 2005 to 2012**

(EUR/MWh)	2005	2006	2007	2008	2009	2010	2011	2012
Large wind	57.0	58.4	60.8	63.7	66.4	66.4	66.4	68.1
Small wind	59.0	60.5	62.9	66.0	68.7	68.7	68.7	70.5
Hydro	72.0	73.8	76.8	80.5	83.8	83.8	83.8	86.0
Biomass and landfill gas	70.0	71.8	74.6	78.3	81.5	81.5	81.5	83.6
Other biomass	72.0	73.8	76.8	80.5	83.8	83.8	83.8	86.0

Source: data submitted by the government of Ireland to the IEA.

REFIT 2 covers large- and small-scale onshore wind, biomass landfill gas and small hydro, while REFIT 3 covers biomass technologies such as anaerobic digestion (CHP and non-CHP), other biomass CHP and biomass combustion and co-firing (including where biomass is to be co-fired with peat). State aid approval was received from the European Commission in early 2012 for these two new REFIT schemes, which opened for applications in February 2012 and March 2012.

The REFIT 3 tariffs are now set (see Table 6).

Table 6. **REFIT 3 Tariffs**

	Capacity (kW)	2010 (EUR/MWh)	2012 (EUR/MWh)
Anaerobic digestion (CHP)	≤500	150	154
	>500	150	133
Anaerobic digestion (non-CHP)	≤500	110	113
	>500	100	103
Biomass CHP	≤1500	140	144
	>1500	120	123
Biomass combustible		85	87
Biomass combustion (energy crops)		95	97

Source: data submitted by the government of Ireland to the IEA.

WIND POWER

Ireland's location at the edge of the Atlantic Ocean ensures one of the best wind and wave resources in Europe, providing significant potential for using these resources to generate renewable electricity for the island of Ireland, and potentially to export electricity to Great Britain and even continental Europe. Ireland's considerable potential for wind power is undeniable, but the development of this renewable energy source must be addressed in an economically viable and environmentally acceptable way. Under the current legislation, the increased wind power penetration is offsetting almost all of its cost to consumers thanks to the "merit order effect". This effect refers to the reduction in wholesale prices thanks to more wind power. Analysis has shown that this effect is comparable to the premiums that wind generators receive (E. Clifford and M. Clancy, 2011).

As of April 2012, a total of 157 wind farms were energised, bringing Ireland's total installed capacity for wind to 1 627 MW. All existing wind farms are onshore apart from one offshore wind farm of 25 MW.

In order to achieve Ireland's ambitious targets for renewable electricity by 2020, the latest figures in SEAI's Energy Forecasts to 2020 (2011 report) that have been incorporated into Ireland's first progress report on the National Renewable Energy Action Plan (NREAP) indicate that 3 968 MW of grid-connected renewable electricity generation capacity will be needed to achieve Ireland's 40% RES-E target. The breakdown consists of 3 521 MW of wind, 75 MW of wave, 234 MW of hydro and 274 MW of biomass plant.

The government has stated that the development of offshore wind will be focused on its export potential.

ELECTRICITY FROM BIOMASS

There has been considerable use of biomass co-fired with peat on an experimental or proof-of-concept basis (over 100 000 tonnes in 2010 alone). The introduction of REFIT 3 should facilitate a longer-term approach to this issue, and should in turn facilitate the development of supply chains for the extraction and supply of existing biomass material.

Similarly, there is a significant number of anaerobic digestion and biomass CHP plant projects under way, many of which have secured planning permission and await REFIT 3 to begin construction.

The tariff for anaerobic digestion is designed to specifically make use of animal manure and other wastes from secondary processing of agricultural products, such as slaughterhouse waste. Similarly, the biomass tariff is designed to encourage and support the use of available materials from the forestry sector, such as thinning and waste from sawmills. Grant support for the planting of perennial biomass crops (willow and miscanthus) has also been introduced.

The supply chains built as a consequence of both co-firing and biomass CHP plants will, in time, be a critical element of the supply infrastructure for the renewable heat sector.

POWER GENERATION FROM HYDRO RESOURCES

Hydro resources in Ireland are limited. As of September 2011, the total installed hydro capacity stood at 237 MW. There have been no large-scale hydro developments in recent years, and the authorities estimate that the large-scale resource potential is fully utilised; however, several small-scale hydro developments have been supported under REFIT 1 and small hydro projects of 5 MW or below are eligible for support under REFIT 2.

OCEAN AND WAVE ENERGY

Ireland has a sea area that is around ten times the size of its land area. Its geographic location at the edge of the Atlantic Ocean ensures one of the best wind and wave resource potentials in Europe. There is significant potential in utilising these resources to generate carbon-free renewable electricity initially to provide electricity to the island of Ireland, but also in time to export electricity to Great Britain and potentially to continental Europe. The imperative is to do so in an economically viable and environmentally acceptable way.

A strategic environmental assessment (SEA) on the draft offshore renewable energy development plan shows that Irish waters are more likely to be suited to wind and wave technologies, while the better tidal resource was likely to be in the waters around Northern Ireland. The SEA Environmental Report illustrates the long term potential to develop several times the amount of electricity required for Ireland's needs.

The Ocean Energy Development Unit (OEDU) was established in the Sustainable Energy Authority of Ireland (SEAI) to drive the ocean energy sector. It administers a Prototype Development Fund providing grants to industry. A grid-connected wave test facility for full-scale devices is being developed, and a quarter-scale test site already exists in Galway Bay, operated by the Marine Institute.

Ireland is an active participant in the British-Irish Council (BIC), and its Energy Marine Renewables Sub-Group is an important forum for sharing best practice around research and development, policy design and support, and marine environment activities. The BIC sub-group is working closely with the EU Ocean Energy Association to meet their shared goals of increasing the profile of marine technologies with the European Commission, and in seeking their adoption within the Strategic Energy Technology (SET) Plan.

Ireland is also a member country of the North Seas Countries Offshore Grid Initiative.

RENEWABLE INTEGRATION INTO THE ELECTRICITY SYSTEM

Renewable sources of energy, and particularly wind, bring variability and uncertainty to power systems. This has potential impacts on power system reliability and efficiency. These impacts can be either positive or negative; however, integrating large amounts of wind power becomes a significant challenge at some level of penetration, potentially raising the cost of integration (IEA, 2009a) High penetration of wind power has impacts that have to be managed through proper utilisation of all power system flexibility resources: interconnection, flexible generation, storage and demand-side management. In addition system and market operations need to be such that the resources are available when needed.

The predominance of gas-fired generation in Ireland's power mix already provides an important level of system flexibility, and current levels of wind penetration suggest that wind power can make a substantial contribution to electricity capacity without significant reconfiguration of the electricity system. Nonetheless, Ireland's ambitious targets for 2020 and beyond will require the integration of even higher volumes of wind power, some of which offshore, and this will create a whole series of new challenges for policy makers and stakeholders. The integration challenge in Ireland is particularly large, as it is a relatively small island with currently little interconnection.

The latest SEAI forecast is that approximately 4 000 MW of renewable generation would be required, depending on economic growth assumptions and demand projections, to ensure 40% of electricity consumption from renewable sources by 2020. Ireland will have to review the design and operation of the electricity system, grid connection policies and mechanisms, network infrastructure expansion and market rules. In this regard, EirGrid published a "Facilitation of Renewables" study in 2010, with a view to better understanding how to manage power systems with increasingly high levels of renewable generation, particularly wind power.

For Ireland's policy makers to achieve the 2020 objectives, detailed consideration will have to be given to all measures to increase system flexibility. Accurate wind forecasting

combined with complementary market rules, for example short gate-closure times, can to some extent reduce the need for additional reserve capacity at higher levels of wind penetration. Greater use can be made of conventional plants, notably the existing gas-fired open-cycle gas turbine (OCGT) or combined-cycle gas turbine (CCGT) plants. Higher interconnector capacity will also allow sharing of reserves and ancillary services with other markets.

EirGrid, as the national state-owned transmission system operator, has identified that a major expansion of the transmission network is needed to facilitate Ireland's ambitious renewable – largely wind – generation, both onshore and offshore, to meet higher demand for flexible conventional generation, as well as the emergence of new market structures and networks that encourage competition and efficient investment in new generation technologies.

Box 6. **Key recommendations of the IEA *Wind Energy* roadmap**

- Set long-term targets, supported by predictable market-based mechanisms to drive investment, while pursuing cost reductions; set mechanisms for appropriate carbon pricing;
- advance planning of new plants to attract investment, taking account of other power system needs and competing land/sea usage;
- appoint lead agencies to co-ordinate advance planning of transmission infrastructure to harvest resource-rich areas and interconnect power systems; set incentives to build transmission; assess power system flexibility; and
- increase social acceptance by raising public awareness of the benefits of wind power (including CO_2 emissions reductions, security of supply and economic growth), and of the accompanying need for additional transmission.

Source: IEA (2009b).

EirGrid has produced a EUR 3.2 billion investment strategy, entitled Grid 25, to ensure that electricity transmission and distribution networks can accommodate targets for renewable generation on the island to 2020 and beyond. The transmission capacity assumptions behind this grid development strategy are based on the high-level principles of ensuring network safety, security of supply and economic transmission development, while delivering on Ireland's 2020 renewable target in the years ahead. It provides a foundation for more detailed work on specific reinforcements in coming years and will lead to plans for particular projects which will be delivered in consultation with the public and in line with planning legislation.

Infrastructure investments related to Grid 25 represent a capital investment of EUR 3 billion until 2025, including 1 150 km of new power lines and upgrading another 2 300 km of existing ones, thereby increasing the overall network length of the transmission system by around 18%. This also includes the deployment of 400 kV transmission networks rather than 220 kV, as higher voltage levels are more efficient and provide greater power-carrying capability. Doing so avoids the need for building a multiplicity of 220 kV lines and has less long-term impact on the environment. The Grid 25 study also seeks to balance affordability, social acceptance and environmental sustainability.

The study also aims at enabling the island of Ireland to be linked to the island of Great Britain and thereby further interconnect Ireland's electricity market at regional level, in order to enhance its export and import potential and to increase its system flexibility.

In order to meet Grid 25's ambitious goals regarding the construction of new transmission lines, a speedy, streamlined and transparent consenting process is required. The Irish infrastructure consenting regime for electricity transmission lines is the Strategic Infrastructure Act, which determines responsibilities for the project developer and gives the independent An Bord Pleanála (ABP or planning board) decision-making responsibility in the approval process of strategic infrastructure. Grid 25 follows the "gate" process for the connection of renewable energy, which is a group processing approach (GPA) towards the processing and issuance of grid connection offers to renewable generators. Under the GPA or 'Gate' process, applications for connections are processed in batches rather than sequentially. Within these gates, applications are further divided into groups and sub-groups based on the optimal network required to connect them. This approach is considered a more efficient process than dealing with applications on an individual basis, where projects which are the subject of such applications interact with each other electrically, and where large volumes of such applications exist. The group processing approach allows for a more strategic view to be taken of network requirements and serves to put in place efficient connection solutions to cater for large numbers of applications and to ensure optimum network development, minimising network costs and, where possible, avoidance of network bottlenecks.

To date, there have been three "gates" Under Gate 1 and Gate 2, 1 755 MW of connection offers were made and accepted. The Gate 3 direction was published by the energy regulator in December 2008. Under Gate 3, 3 900 MW of offers have been issued to renewable generators. A Gate 3 liaison group involving the TSO, DSO, regulator and industry representatives meets on a regular basis (see Box 5 in Chapter 5).

Of note, the Commission for Energy Regulation published a decision in 2009 (CER 09/099) that allows for certain renewable, small and low-carbon generators to connect to the transmission and distribution grids without going through the full rigours of the gate process. This includes small projects, research and development projects and those that are deemed to provide benefits of a public nature that merit qualification.

The roll-out of the build programme under the Grid 25 strategy will be critical to the delivery of new renewable generation under Gate 3. Societal acceptance of the need for new infrastructure to support renewable generation will be critical and local support will be needed for infrastructure of local, regional and national importance.

As a follow on to the Facilitation of Renewables study and earlier work on integrating renewables, EirGrid and SONI have established a programme of work entitled "Delivering a Secure Sustainable Electricity System (DS3)" to manage the achievement of Ireland's renewable electricity target from a grid perspective over the coming years. This work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves, particularly as the amount of renewables connected increases. An advisory council which includes industry representatives has been established and is overseeing the project.

In December 2011, the Single Electricity Market (SEM) Committee published a decision with regard to constraint and curtailment restrictions. Constraints occur because of

technical problems, when a transmission or distribution line is down for maintenance or out of operation, whereas curtailment is a balancing tool, occurring when there is significant wind at times of low system demand (*e.g.* middle of the night).

The SEM Committee's decision imposing constraint and curtailment restrictions on new wind projects is based on grandfathering rights, in that fully connected wind projects with "firm access" receive market compensation at all times for electricity generated, whereas new projects without firm access can be constrained or curtailed, and do not receive market compensation in such a situation. However, following representations on the decision in this regard, the SEM Committee has decided to reopen that question for further consultation and to withdraw that part of the decision until the matter has been further considered.

Box 7. **Harnessing variable renewables**

The IEA publication *Harnessing Variable Renewables: A Guide to the Balancing Challenge*, released in 2011, addressed the impacts of variable renewable energy sources on the balancing of electricity supply and demand, and provides a number of recommendations to policy makers:

- Policy makers should look to the specific resource mix in their jurisdictions when considering the flexible resource portfolio.
- A balanced approach to increasing flexibility is needed as variable power plant capacity grows.
- Adjacent power markets should collaborate to share their portfolios of flexible resources, using the whole more efficiently to balance increasing shares of variable renewables.
- The latest generation forecasting techniques should be taken up in areas targeting significant deployment, and these should have material impact on the commitment of power plants in the system. Markets should feature short gate-closure times, allowing trading of electricity to continue up to within the hour before time of operation, to minimise the "lock-in" of valuable flexible resources.
- Policy makers should assess the adequacy of economic incentives presented by the market (through fluctuating prices) for provision of the flexibility services.
- Policy should remove (unnecessary) regulatory barriers to the provision of flexibility services, such as non-electrical constraints on the use of hydro plants for balancing.
- Policy makers should encourage holistic, early planning of energy system development. Variable renewable energy power plants should be dispersed as widely as possible within the bounds of high-quality resources (*e.g.* strong winds) to maximise the smoothing of their aggregated output.
- Policy makers should therefore urgently ascertain where grid weaknesses exist, and where congestion is likely therefore to occur, and commence planning and remedial measures as soon as possible. Smart grid technologies such as dynamic line temperature monitoring may be of significant benefit in this regard.
- Areas with more ambitious plans for variable renewables deployment may need immediately to start planning how they will increase their flexible resources (when the availability of existing resources has been optimised).

Box 7. Harnessing variable renewables (continued)

- Policy makers should consider the operational costs of greater wear and tear resulting from increased cycling of existing and new dispatchable plants due to increasing variability in the net load.
- In future, it is possible that quickly dispatchable generation capacity will cease to be the primary driver of flexibility. New storage technologies may emerge that are less dependent on geographically limited resources like rainfall, or geological features.
- Policy makers are encouraged to view the electricity system as only a part of a wider energy system including heat and transport sectors. Technologies such as electric vehicles and increased electrical heating (in effect the storage of electricity in car batteries or as heat) are becoming increasingly significant. Thus policy initiatives in the electricity sector have important implications for the other two sectors, and vice versa, and should take them into account.

Source: IEA (2011e).

HEATING

Ireland indicates that its 2020 European Union target will include 12% of its heat from renewable sources. The share of heat from renewable sources has grown in recent years, reaching 4.2% in 2009 and 4.6% in 2010, but significant steps will need to be taken to meet the 2020 objective.

Of the three capital grant aid programmes for renewable heat, two closed at the end of 2010. These programmes ("Reheat" and the CHP Grant Aid Programme) focused on industrial and institutional heat users, and had a combined annual cost of the order of EUR 4 million. The third programme, the "Greener Homes Scheme" (GHS) was aimed at domestic heat users, but was integrated into the energy efficiency grant aid scheme in May 2011, on a reduced basis (support for solar thermal only). The full year costs of GHS stood at around EUR 6.5 million.

Heat is mainly being encouraged indirectly at present, through the REFIT scheme which is offering REFIT for electricity exported to the grid from high-efficiency combined heat and power plants, with significantly higher rates of REFIT available for high-efficiency CHP plants than for other technologies such as wind farms, hydro or biomass combustion.

TRANSPORT FUELS

Ireland indicates that its 2020 European Union target of 10% will be met through a combination of a biofuel obligation for transport fuels and an increase in the electrification of the transport fleet.

BIOFUEL OBLIGATION SCHEME

Biofuels accounted for 2.4% (in energy terms) of road transport energy in 2010, up from 1.9% in 2009 and just 0.1% in 2006. Biofuels account for an estimated 4.4% of motor fuels by volume, or 3.4% in terms of energy content.

The Biofuel Obligation Scheme was introduced in July 2010, and is specifically designed to provide a "predictable and stable long-term incentive" to industry, while prioritising the efficiency with which binding European Union targets are achieved. As such, the scheme uses a system of tradable certificates, combined with a buy-out charge mechanism, to balance the additional cost associated with biofuels across the fuel supply system, and to provide a safety valve for consumers in the event of price increases in biofuels.

The Biofuel Obligation Scheme obliges transport fuel suppliers to include a specific amount of biofuel in their overall sales in any given year – currently set at 4% – and sets certain conditions regarding the type and origins of the biofuels which can be counted towards that target. There is no obligation on suppliers to blend fuel to a specific mix. This policy measure is designed to provide the market with the long-term price stability required to support investment in supply chains and production facilities.

Certificates are awarded for each litre of biofuel brought to the market and these are included in the 4% requirement mentioned above. In cases where a supplier has a surplus of certificates, these surplus certificates can be traded. Over time, the 4% requirement will be increased, so that by 2020, biofuels – combined with electric vehicles – will ensure that 10% of transport energy comes from renewable sources.

The Biofuel Obligation Scheme does not incur any cost for the taxpayer.

ELECTRIC VEHICLES GRANT SCHEME

The government has ambitious plans for the large-scale deployment of electric vehicles. Ireland has set a target of 10% of all vehicles to be powered by electricity by 2020 and the government is working to ensure that the necessary policies and infrastructure are in place to meet this target. If this policy is successfully implemented, it will position Ireland at the forefront in terms of electric vehicle deployment.

As an incentive, a grant support scheme was launched in January 2011, with a pre-established two-year time-frame, in order to assist the purchase of battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs). Grants of up to EUR 5 000 will be available towards the purchase of BEVs and PHEVS. These grants will be in addition to the vehicle registration tax (VRT) reliefs which currently apply to the purchase of new electric vehicles.

CRITIQUE

The share of renewable energy has increased significantly in Ireland's energy mix in recent years. The largest increase was recorded in renewable electricity, and in particular in onshore wind. These developments are commendable. In committing to the EU Renewable Energy Directive, Ireland has agreed to a legally binding 16% target of energy consumption from renewable sources in gross final consumption by 2020. This overall 16% renewable energy target is to be achieved from 40% renewable electricity, 12% renewable heat and 10% renewable transport. Of note, the renewable electricity target is one of the most demanding in the world. Ireland submitted the first progress report of its National Renewable Energy Action Plan to the European Commission in January 2012, indicating that it continues to make good progress in working towards its ambitious 2020 objectives.

Ireland has strongly supported electricity generated from renewable sources by means of a renewable energy feed-in tariff (REFIT) programme since 2006. It is a differentiated

feed-in tariff system, taking into account the difference between the various types of renewable energy technologies. The latest SEAI forecast is that just under 4 000 MW of renewable generation would be required, depending on economic growth assumptions and demand projections, in order to ensure 40% of electricity consumption from renewable sources in 2020. Together with existing renewable generation capacity, the gate process is expected to provide the required additional renewable generation capacity to meet the target.

The government should decrease incentives for specific technologies over time, so as to move them towards market competitiveness and reduce potential financial commitments from the government. On the other hand, a stable, predictable and transparent framework with a clear time-frame of support schemes should be maintained in order to continue to attract investments in producing new technologies. The cost-effectiveness of REFIT and other support mechanisms should be carefully monitored and evaluated in order to ensure that the overall renewable energy objectives are met without putting an excessive burden on consumers through taxes or tariffs. Wherever possible, wind generators should fully participate in the market, and face incentives to ensure that their operation supports the secure functioning of the system.

Because most renewable electricity in Ireland is likely to be produced by wind, problems related to system integration could pose a potential risk in the future. It is very important to analyse the implications of the large-scale penetration of variable renewable electricity in the overall power system, as regards overall cost efficiency and system reliability. It is worth noting that Ireland has already taken highly commendable steps – the All-Island Grid studies, EirGrid's Grid 25, the Facilitation of Renewables studies, a comprehensive analysis of the long-term needs of the power system, and the ongoing DS3 programme – to deal with this concern effectively, so as to ensure better generation planning and co-ordination of necessary infrastructure investments.

Social acceptance of the need for new infrastructure to support renewable generation will be critical, and local support will be needed. In order to further stimulate the deployment of renewable energy, it is important to enhance public awareness about its various benefits, such as security of energy supply, environmental sustainability and development of new industries. Furthermore, the planning and consenting regime add to the challenges for meeting Ireland's existing network development targets, particularly regarding grid connections and transmission infrastructure. Delays in building necessary infrastructure are likely to result in wind curtailment, unnecessarily increased balancing challenges and costs, and also in a potential non-compliance of the national renewable targets for the electricity sector.

The Single Electricity Market Committee's December 2011 decision to impose constraints and curtailment restrictions on new wind projects without firm access to the network will provide the system operator with greater flexibility in terms of balancing abilities, in light of the continued growth in wind generation on the grid. However, because most wind farms are connected to the grid system a few years before they are given a firm connection date, this decision may have a negative impact on the financial viability of many wind projects. This in turn could jeopardise Ireland's ambitious wind targets for 2020. This part of the SEM decision has since been reopened to consultation.

In light of Ireland's landscape, another renewable energy sector with notable potential is biomass energy. Yet the share of biomass in Ireland's energy mix is significantly lower than in most OECD countries. In some countries, supply chain concerns are a critical element for efficient use of biomass. In this regard, Ireland has made good progress in

developing and deploying a nascent biomass energy industry, notably thanks to support grants for the planting of biomass crops, thereby contributing to building the supply chains of biomass energies. The recently opened REFIT 3 scheme also will underpin the development of a robust and sustainable biomass supply sector in Ireland as it will, by offering long-term support over 15 years, provide a stable demand for biomass. Nevertheless, stakeholders have expressed concern with regard to the environmental restrictions that are currently hampering the rapid development of biomass energy. A clear strategy for evaluating and developing Ireland's bioenergy potential needs to be urgently finalised, taking into account the potential impact of the environmental and agricultural sectors.

The Biofuel Obligation Scheme was introduced in July 2010. It obliges transport fuel suppliers to include 4% of biofuel in their overall volume sales. Over time, the 4% requirement should be increased progressively, with a view to meeting the European Union requirement that 10% of energy in transport be from renewable sources by 2020.

Ireland has significant potential resources in offshore renewable energies (wind, wave and tide) and could export the generated electricity to Great Britain and further afield in the future. At the June 2011 British-Irish Council summit, Ireland and Great Britain agreed to explore the potential for renewable trade between the jurisdictions. A cost benefit analysis of various export scenarios is also currently under way and SEAI, CER, EirGrid and DCENR are on the project committee. However, considering the ambitious targets for the introduction of renewables by 2020 and beyond, a more comprehensive strategy for domestic supplies and exports should be developed, notably through existing forums such as the British-Irish Council's Marine Energy Group, the North Seas Countries Offshore Grid Initiative and the EU Ocean Energy Association. It should clarify policy priorities and roadmaps, taking into account the comparative advantages of Irish energy industries, the merits for the Irish economy as well as financial constraints for support mechanisms. This work has been noted in the government's Renewable Energy Strategy, which was published in May 2012.

RECOMMENDATIONS

The government of Ireland should:

- ☐ *Implement a clear strategy for evaluating and developing Ireland's renewable energy and meeting its 2020 targets, taking into account the implications for the overall economy and in particular for the environmental and agricultural sectors.*
- ☐ *Continue to address potential impediments to the further development of biomass energy, and develop cost-effective support mechanisms through closer alignment between energy policies and agriculture policies.*
- ☐ *Keep under review the conditions of REFIT programmes and other support mechanisms in order to optimise the overall cost-effectiveness of these policies in deploying renewable energies and implement appropriate risk- sharing.*
- ☐ *Review the shortcomings of the Gate 3 procedure regarding the delivery of incremental renewable sources, with a view to improving and enhancing the outcomes of gate procedures in the future.*
- ☐ *Take steps to increase public awareness of the benefits of renewable energy sources and of the supporting policy framework, so as to encourage their deployment and the provision of the necessary infrastructure.*

7. NATURAL GAS

Key data (2010)

Production: 387 mcm (-1.0% from 2009)

Share of natural gas: 33% of TPES and 62% of electricity generation

Net imports: 93% of supply, 5.1 bcm (100% from the United Kingdom)

Inland consumption: 5.5 bcm (power and heat generation 64%, residential 15%, industry 10%, commercial 9%, other 2%)

SUPPLY AND DEMAND

Natural gas accounts for 33% of total primary energy supply (TPES) in Ireland, placing it in the top quartile of IEA countries in terms of reliance on gas for energy supply. The IEA average is 24%.

Ireland's indigenous supplies come from the declining Kinsale gas field which supplies approximately 7% of demand at present. Great Britain is Ireland's single source of natural gas imports. In 2010, Ireland imported approximately 5.1 billion cubic metres (bcm) of natural gas via two sub-sea interconnectors, which covered up to around 95% of total demand at certain points during the year.

SUPPLY

There has been little successful oil and gas exploration in Ireland to date, and there are large areas that are unexplored for oil and gas resources. The high dependence on imports of fossil fuels makes further exploration for oil and gas particularly attractive.

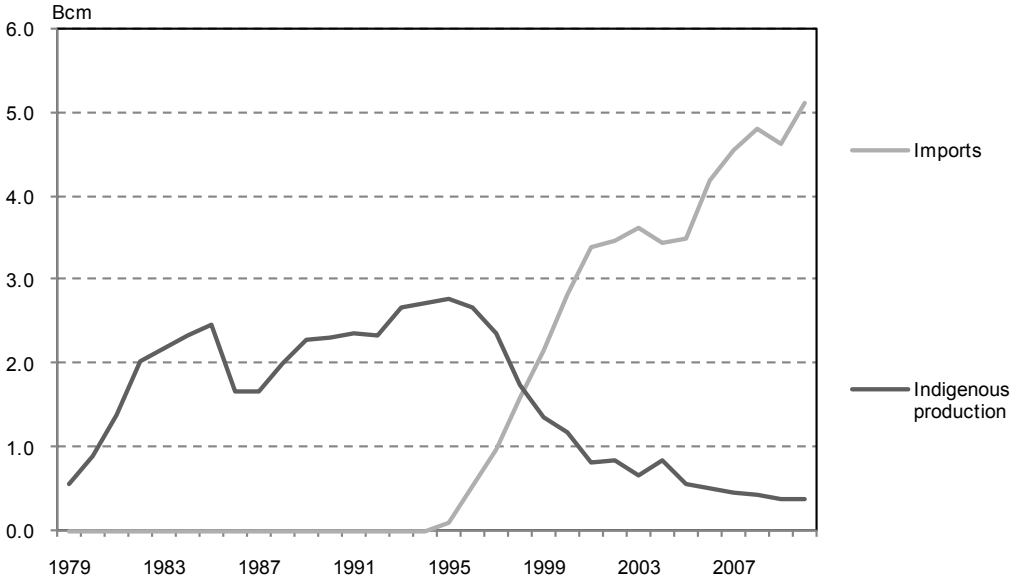
Ireland's proven natural gas reserves are believed to be relatively small. According to Cedigaz data, Ireland possessed 25 bcm of proven gas reserves at the end of 2010, which was equivalent to 0.01% of world total reserves and 64 years of current production (IEA, 2011f).

Indigenous gas production started in 1979, and peaked in the middle of the 1990s at 2.8 bcm. During the last decade, the country's gas production significantly decreased, though a temporary boost was seen in 2004 because of contributions from the Seven Heads field, which started production in December 2003. Ireland's natural gas production in 2010 was roughly 0.4 bcm or 7% of domestic gas demand. Natural gas is produced in the Kinsale field and satellite Ballycotton and Seven Heads fields in the North Celtic Sea basin. However, gas supply from these fields is in decline, and there is a possibility that production from these fields might cease in 2013/14. Malaysia's Petronas acquired the Kinsale assets from Marathon Oil in 2009, which are now regrouped under the name PSE Kinsale Energy.

There are several indigenous exploration and production projects in Ireland, which have the potential to reduce gas import dependence. The most important upstream project is the Corrib gas field, in the Atlantic Ocean, located off the north-west coast and currently under

development. Shell (45%), Statoil (36.5%) and Vermillion Energy Trust (18.5%) are the equity owners of the Corrib gas project. Gas production from the field could meet up to 60% of annual demand, or 40% of demand on the coldest day once in every 50 years, based on current estimates. Initial peak production of Corrib is forecast to reach 3.7 bcm per year (bcm/yr) (10 million cubic metres/day), but it has a short production profile and is expected to decline relatively quickly to 1.1 bcm/yr (3.1 mcm per day [mcm/d]) after four years of production. Production, which was originally expected to start in 2007, has been affected by persistent planning and permission delays and is not expected to start before 2014 at the earliest.

Figure 28. **Ireland's gas production and imports, 1979 to 2010**



Sources: IEA (2011a), and IEA (2011f).

Island Oil & Gas, an Irish independent oil exploration and production company, has confirmed the presence of proven gas reserves in the Old Head of Kinsale and Schull prospects in the Celtic Sea to the south of Ireland. The company is currently conducting technical studies to evaluate the commercial viability of these prospects. Further potential prospects have also been identified to the north-west of the Corrib gas field.

Ireland has potential shale gas resources, but no proven reserves and exploration is still in its infancy. In 2011, three exploration companies were granted two-year licensing options over areas in the west and north-west of Ireland. The work being undertaken primarily involves desktop studies of existing data and will not include exploration drilling, which would be necessary to establish the existence of shale gas reserves.

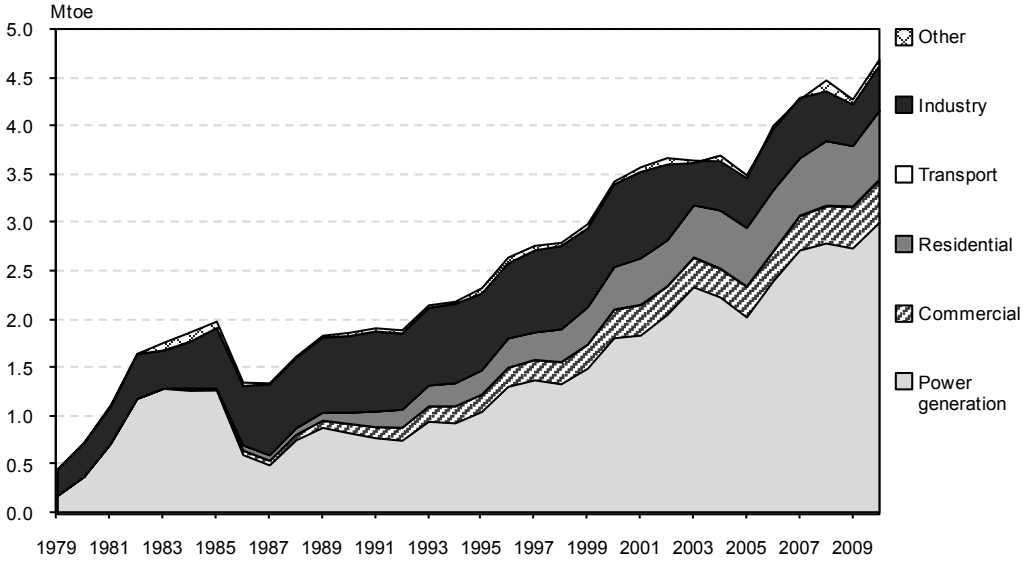
DEMAND

Since 1979, when indigenous production of natural gas started, the demand for natural gas has steadily risen from 0.6 bcm in 1979 to 2.3 bcm in 1989, 3.5 bcm in 1999 and reaching 5.5 bcm (15.1 mcm/d) in 2010, notably owing to the unusually cold 2009/10 winter.

The steady increase in demand for natural gas is largely driven by growth in electricity demand and the construction of new gas-fired power stations. Electricity production accounted

for 64% of gas consumption in 2010, and 62% of electricity is produced from gas. The two sectors are strongly linked and interdependent. The residential sector accounted for 15% of gas demand in 2010, followed by the industry sector (10%) and the commercial sector (9%).

Figure 29. **Total gas consumption by sector, 1979 to 2010**



Sources: IEA (2011a), and IEA (2011f).

Ireland has ambitious plans to increase the share of renewable energy (mainly wind) to 40% of annual electricity output by 2020. Thus, reliance on gas is set to increase, as gas-fired power plants will be required to provide flexibility in electricity supply when wind power is unavailable. Annual demand is expected to grow incrementally and will reach 5.8 bcm (15.9 mcm/day) in 2015. The ratio of demand from power generation in the total annual demand is projected to remain dominant at around 65% in 2015, and 68% in 2020.

According to Gaslink, the gas system operator, the historical daily peak demand of 22.8 mcm/d (252.9 GWh per day) was reached on 7 January 2010.

INSTITUTIONS

The **Department of Communications, Energy and Natural Resources (DCENR)** is the lead government department (or ministry) with responsibility for energy policy. In the natural gas sector, the department determines policy in relation to security of energy supply and the functioning of the market. It is responsible for transposing European Union gas directives into national law and for the financial oversight and corporate governance of the state-owned energy companies.

The **Commission for Energy Regulation (CER)** is the independent body responsible for overseeing the liberalisation of Ireland's natural gas and electricity markets and their day-to-day operation. The CER was established in 1999 and its role and functions have expanded over time. It works to promote competition in the electricity and natural gas sectors and to ensure that the benefits of competitive pressures on prices and services flow to consumers. Also, in an electricity or natural gas emergency the CER is vested with the authority to take the necessary decisions.

The Competition Authority (CA) is the government body responsible for enforcing Irish and European competition law in Ireland. Generally, it looks to the CER (there is a Memorandum of Understanding between the two) for matters relating to the electricity and natural gas sectors.

MARKET STRUCTURE

OVERVIEW

The Irish gas market has undergone a number of regulatory changes in recent years. Competition has continued to develop and the government has adopted the independent transmission system operator (ITO) unbundling model for gas. Work is under way to unbundle the operation of Bord Gáis Éireann's (BGÉ) transmission and distribution systems, in line with the EU Gas Market Directive 2003/55/EC. In addition, the government has sought to facilitate the creation of an all-island gas market with Northern Ireland, under the "Common Arrangements for Gas" (CAG).

The EU Energy Third Package for electricity and gas markets (2009) requires member states to further unbundle the gas transmission businesses of a vertically integrated undertaking, such as the state-owned Bord Gáis Éireann (BGÉ), in order to ensure non-discriminatory access to the transmission system.

BGÉ is the primary transporter of natural gas in Ireland, with an extensive pipeline network. The company is composed of various independent subsidiaries, in line with European Union unbundling requirements.

Bord Gáis Networks (BGN), a separately licensed part of BGÉ, is the owner of both the gas transmission system and the gas distribution system, and is responsible for building, operating and maintaining the natural gas network. BGN is also the owner of gas transmission infrastructure in Northern Ireland.

Gaslink, an independent subsidiary of BGÉ, holds the transmission system operator (TSO) licence and distribution system operator (DSO) licence, and ensures non-discriminatory access to the network. Gaslink was established in July 2008, in compliance with the unbundling requirements of EU Directive 2003/55/EC. It is the independent system operator entrusted with the responsibility for developing, maintaining and operating the natural gas transportation system, and is also responsible for the planning and development of the gas network.

The government decision to adopt the independent transmission system operator (ITO) as the preferred unbundling model for gas means that the operation (Gaslink) and ownership (BGÉ) of the transmission system will be merged within a legally independent ITO subsidiary of BGÉ. The merged entity will be subject to stringent requirements to ensure it is ring-fenced from the supply business of BGÉ. Ireland's ITO model must ensure that it is compliant with the unbundling and ring-fencing requirements of the regulator and the European Commission. The announcement by the government of the planned sale of BG Energy Business means that BGE would be fully unbundled following a sale. This development is being taken into account in upholding the ITO model.

All natural gas customers have been free to choose their supplier since July 2007. At present, four companies are licensed to supply the residential market and eight licensed

suppliers provide gas to industrial and commercial customers. Ireland's natural gas and electricity incumbents, BGÉ and ESB respectively, are the largest shippers of natural gas.

COMMON ARRANGEMENTS FOR GAS (CAG)

The ultimate goal is for gas markets in both Ireland and Northern Ireland to move towards full liberalisation. The current market structures and arrangements in both jurisdictions remain, however, somewhat different. Gas markets have been liberalised in all sectors in Ireland. As of May 2012, tariff regulation applies only to the residential customer segment that is supplied by BGÉ with tariff regulation for business customers either never having applied, or been ended in October 2011. In Northern Ireland, the market is also open with competition in the retail sector still evolving. The relevant authorities in both jurisdictions are seeking to establish an all-island Common Arrangements for Gas (CAG), whereby all market participants can buy, sell, transport, operate, develop and plan a common natural gas market north and south of the border.

In April 2008, a Memorandum of Understanding (MOU) on CAG was published, followed by a cost-benefit analysis in 2009. The two governments and both regulators have continued to develop structural arrangements for system operation, tariffing and other market arrangements, and the two governments are drafting the required legislation to underpin the CAG regime. The CAG project is envisaged to dovetail with the European Union's ambitious goal of a single internal energy market by 2014, including a single pan-European Union gas market. The European goal was reinforced by the European Council as recently as February 2011. The CAG project is being shaped in structured alignment with the intensive process of developing European Union rules and codes designed to underpin the achievement of the single European Union gas market.

The European Union's Gas Regional Initiatives (see Box 8) are playing an important role in implementing and coordinating work between its members to achieve the internal gas market 2014 goal, as well as ongoing co-operation on gas matters.

As part of the CAG, an all-island Joint Gas Capacity Statement is prepared on an annual basis by the CER and the Northern Ireland Authority for Utility Regulation (UR), providing analysis of the capacity of the gas network to accommodate forecast levels of gas supply and demand, and signalling reinforcements to the network that may be required as a result. To bring their analysis into line with the European Ten-Year Network Development Plan, the regulatory authorities have extended the scope of their analysis from seven years to ten.

The EU Third Energy Package allows for the tailoring of the rules and codes aimed at facilitating the internal market to national and regional circumstances and this can be pursued at regional and/or national level. In this regard, CAG envisages that an entry-exit tariff regime will be developed as part of market arrangements on the island of Ireland. To date, the regulators have concluded that there will be two exit points, one in Northern Ireland and the other in Ireland.

The CAG objective of delivering uniform transportation arrangements across the island and allowing for the commercial free flow of gas is similar to the goal for the European Union's single gas market, and in line with European Union objectives and the development of rules and codes to underpin market integration. CAG is also to be

extended to distribution and retail activities, with the stated ambition of creating a more competitive gas market, resulting in benefits for customers in both jurisdictions, similar to those already seen in the all-island electricity market.

Box 8. **Gas Regional Initiatives (GRI)**

In early 2006, the European Regulators' Group for Electricity and Gas (ERGEG) held a public consultation on the creation of a single, competitive, pan-European gas market. As an interim step, and with the support of the European Commission, the Gas Regional Initiatives (GRI) was created. Work is under way in the three designated gas regions (north-west; south-south-east; and south regions) to remove internal barriers to competition by improving interconnection, transparency and balancing tools, as well as bolster security of supply.

In July 2011, ERGEG was dissolved. The Agency for the Co-operation of Energy Regulators (ACER) has taken over ERGEG work in regard to the regional initiatives. ACER is working closely with the European Commission and national regulators to ensure the convergence and coherence of the regions towards the ultimate goal – a single, pan-European gas market.

The entry into force of the EU Energy Third Package in September 2009 and the strong commitment of the European Council in February 2011 to complete the internal energy market by 2014 sets a firm regulatory, institutional and political background to the putting in place of framework guidelines and network codes to achieve this goal.

Source: ACER and CEER websites.

INFRASTRUCTURE

TRANSMISSION AND DISTRIBUTION

Natural gas is supplied in Ireland through a well-integrated network of almost 13 200 km of pipelines. The supply network consists of around 2 300 km of high-pressure sub-sea and cross-country transmission pipelines and 10 856 km of lower-pressure distribution pipelines throughout the country. The network delivers gas to around 641 500 premises.

The onshore transmission system of Ireland is composed of a ring-main system that connects Dublin, Galway and Limerick, with cross-country pipelines connecting the ring-main system to Cork, Waterford, Dundalk and the Corrib Bellanaboy terminal in Mayo. The main Cork-to-Dublin trunk pipeline (built in 1982) and the completion of a pipeline to the west (in 2002/03) have allowed for the establishment of the ring-main system. Investments continue to be made in order to facilitate connections of new power stations, large industrial and commercial loads and new towns to the transmission system.

The Inch entry point, located in Cork, connects the Kinsale Head gas field (and previously the Seven Heads gas field) and the Kinsale storage facility to the onshore network. The connecting sub-sea pipeline is owned and operated by PSE Kinsale Energy Ltd. The only compressor station on the Irish onshore gas system is located in the south of Ireland, at Midleton, County Cork, to compress the gas to flow north towards Dublin. There are two other compressor stations in the Irish network, but these are located in Moffat (Scotland).

New gas flows from Corrib and the potential Shannon liquefied natural gas (LNG) terminal could significantly change the direction of flows on the transmission network. At present, gas flows from the east (through the interconnectors) and from the south coast (through the Inch entry point) to Dublin, Cork and the west. New gas flows from Corrib and the Shannon LNG terminal could displace imports from the United Kingdom, and gas could flow increasingly from the west to the east and the south. This will have a number of implications for the operation of the transmission system.

Figure 30. **Map of the all-island natural gas infrastructure**

This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Source: IEA (2011f).

Box 9. **Planning and consenting**

An Bord Pleanála (ABP) was established in 1977 under the Local Government (Planning and Development) Act 1976 and is responsible for the determination of appeals and certain other matters under the Planning and Development Acts 2000 to 2010, and the determination of applications for strategic infrastructure development.

Strategic infrastructure development can be described as development which is of strategic economic or social importance to the state or a region, and includes projects which would have a notable effect on the area of more than one planning authority.

The infrastructure consenting regime for strategic (*i.e.* major) energy infrastructure is based on the Planning and Development (Strategic Infrastructure) Act 2006, which determines responsibilities for the project developer and gives the independent ABP decision-making responsibility in the approval process of strategic infrastructure.

Section 4 of the Act includes specific provisions and procedures for electricity transmission lines and for strategic gas infrastructure development. The latter includes both upstream and downstream developments. The more general provisions and procedures in relation to all strategic infrastructures are set out in Section 3 of the Act. Features of these procedures which are different from the normal planning process with local authorities include:

- pre-consultation between developers and planners to ensure that the application is in line with requirements and to make necessary adjustments to the application or the project in advance so as to avoid resubmissions and delays;
- time-frames for consultations/decisions to ensure a thorough but efficient process;
- a single decision-making entity for strategic projects, rather than having to go to several local planning authorities (*e.g*. pipelines and transmission infrastructure);
- avoidance of "project-splitting" (*e.g.* for the East-West Interconnector project, consideration included both above-ground installations and underground cables); and
- bringing underground infrastructure, such as pipelines and electricity cables, within the planning process for the first time.

There is a list of the different types of infrastructure developments (including environmental, transport and energy infrastructure projects) that may apply to the Strategic Infrastructure Board. However, in principle it is for the Board to determine whether the projects are "strategic" and whether the projects will be considered under this section of the Planning Acts or whether they should go through the normal planning process. In the case of Energy Infrastructure (*i.e.* not electricity transmission lines or strategic gas developments), a list of projects which can apply for consideration under this section are set out. In assessing consequences to sustainable development and the effects on the environment, views from local authorities and other involved stakeholders are taken into account. The assessment of environmental impacts is an integral part of the ABP planning process. ABP decisions, including decisions relating to any potential appeals, are made public and fully transparent. Its decisions are final but can be subject to judicial review.

Sources: An Bord Pleanála and other sources.

INTERNATIONAL CONNECTIONS

The Moffat entry point is Ireland's only international connection. It links the Irish transmission network to the national transmission system of Great Britain, enabling Ireland to import natural gas.

This interconnector system is comprised of two sub-sea pipelines between north of Dublin and Scotland (Interconnectors 1 and 2, or IC1 and IC2), two compressor stations at Beattock and Brighouse Bay in Scotland, and 110 km of onshore pipeline between Brighouse and Moffat. The Brighouse Bay compressor station, which compresses the imported gas from Great Britain into the two sub-sea interconnectors, has a maximum capacity of 8.4 bcm (23 mcm/d). This is the limiting factor in the volume of gas that can be transported in the interconnectors, which have the combined capacity of 14.6 bcm (40 mcm/d). The current combined capacity of IC1 and IC2 is limited by the capacity of the Brighouse Bay compressor station (23.9 mcm/d). There is a sub-sea spur connection to the Isle of Man from Interconnector 2.

Table 7. **Ireland's sub-sea interconnectors**

	Route	Sub-sea pipeline length	Designed capacity	Operational since
Interconnector1 (IC1)	Loughshinny, North County Dublin to Moffat, Scotland	206 km	17 mcm/d	1993
Interconnector2 (IC2)	Gormanston, County Meath to Moffat, Scotland	195 km	23 mcm/d	January 2003

Source: data submitted by the government of Ireland to the IEA.

Interconnectors IC1 and IC2 are part of BGÉ's Regulated Asset Base (RAB), and are financed by an interconnector-specific entry tariff. The annual revenue derived from this tariff stands at around EUR 50 million for the 2011/12 gas year, with 90% recovered through capacity charges and 10% recovered through commodity charges levied on users of the system.

An off-take station at Twynholm in Scotland, located en route to the Brighouse Bay compressor station, supplies gas from Great Britain to Northern Ireland through the Scotland-Northern Ireland pipeline (SNIP) owned by Premier Transmission Limited.

The system operator charges a CER-approved entry and exit tariff on all gas transported through the transmission network. The entry tariff is applied to volumes transiting the interconnectors, which constitute the vast majority of gas in the Irish network.

With 93% of gas consumed in Ireland currently coming through them, the interconnectors are paid for directly by shippers booking interconnector capacity. In the current situation, the interconnectors provide the marginal source of gas to Ireland (the British NBP price, plus carriage from NBP through the marginal entry point, known as the Irish Balancing Point or IBP), and thus set the price of gas on the island.

If a new gas field (such as Corrib) or a new LNG terminal (Shannon LNG) were to be built, flows through the interconnectors would decrease as some shippers would use the new entry point, thereby increasing the interconnector tariff on a volume basis, in order to cover the same operational costs. This issue has been the subject of several rounds of consultation by the CER in the last year, the most recent being a Proposed Decision Paper circulated in February 2012.

As part of this consultation exercise, BGÉ has argued that all shippers would continue to benefit from the availability of the interconnectors' capacity. Furthermore, BGÉ points out that since the interconnectors would be likely to continue supplying the marginal volume of gas to the Irish market; a higher interconnector tariff would result in a higher gas price for all consumers in Ireland with consequential higher revenues accruing to producers/suppliers.

The CER has indicated to date that it does not intend to strand, or partly strand, BGE's investment in Interconnector 2, noting that BGÉ was originally requested by the government to build it for reasons of security of supply, and that the infrastructure provides an essential service to consumers in times of crisis. It is also important to note that this infrastructure has been and will remain in place for the long term, while other supply sources (such as new discoveries and LNG) may only last a relatively short period and/or react to market developments. However, the CER does not intend to leave the current tariff regime in place because of the potentially significant upward pressure on end-user prices once new sources of gas come on stream on a significant scale. In its February Proposed Decision Paper, the CER proposed significant changes to the current tariff regime. In essence, it proposed that, in future, tariffs for each entry point to the system be determined by reference to its estimated long-run marginal cost (LRMC). The interconnectors to Great Britain would be treated, for tariff purposes, as part of the underwritten transmission system no different from onshore pipelines so that the entry point to the system would be taken as Moffat in Scotland. Gas from a new entry point with a lower long-run marginal cost to Moffat could therefore enjoy a competitive tariff advantage. The CER's rationale behind this proposal is to encourage efficient new entry while recognising the important role and underwritten status of the interconnectors.

This proposed reform of the tariff regime could reduce the potential financial returns to the entities developing new projects facilitating new supply sources, given that they receive increased returns if current arrangements remain in place and gas prices to consumers are allowed to rise. It could therefore have implications for a number of projects under consideration (*e.g.* a gas field, storage facility or an LNG terminal). While new supply sources would provide security of supply benefits, such benefits can be only temporary because of the finite nature of offshore reserves. Competition for LNG supplies to meet demand can also result in deliveries being diverted to alternative regions.

LNG TERMINAL

Ireland has no LNG import facilities. There is a commercial proposal to construct the country's first LNG regasification terminal on the Shannon Estuary, located on the south-west coast of the island, near Ballylongford in County Kerry. Shannon LNG, which is a wholly-owned Irish subsidiary of Hess LNG Limited, received planning permission in 2008. If the project goes ahead, the company does not envisage commencing operations before 2015/16.

Shannon LNG plans to develop the proposed terminal in phases. The maximum Phase I send-out capacity is estimated to increase from 1.9 bcm/yr (5.3 mcm/d) in 2013/14 to 6.2 bcm/yr (17 mcm/d) by 2016/17. The Shannon LNG terminal is designed to expand its capacity at a later stage by installing additional LNG storage tanks and regasification facilities, depending on market demand. The maximum Phase II send-out capacity would be 10.2 bcm/yr (28 mcm/d).

As well as planning permission, this project has also received the requisite consents from the CER, including for a gas pipeline linking the LNG terminal to the transmission network,[45] but separate issues remain with regard to interconnector tariffing (as discussed above).

As of May 2012, no investment decision has yet been notified to the CER or the government regarding the construction of the terminal.

STORAGE

Ireland has very limited gas storage capacity, only a 230 mcm working capacity facility at the depleted Kinsale gas field. The Kinsale gas storage and production facility is operated on a commercial basis by PSE Kinsale Energy Ltd. Maximum storage send-out capacity (2.6 mcm/d) accounts for only 11% of historical peak demand (22.8 mcm/d), well below levels in other OECD countries. The maximum injection rate is 1.7 mcm/d. The site is expected to close in 2016, when production from the associated gas field becomes uneconomical owing to reduced volumes. PSE Kinsale Energy has made a proposal to expand the capacity of the existing gas field, thereby prolonging the life of the storage site, but the advancement of this project is uncertain.

There are two gas storage projects near Larne (Northern Ireland) under consideration. These facilities would be a fast-release salt cavern storage facility, with withdrawal rates significantly higher than those from the existing depleted gas field site at Kinsale. The development of these salt caverns would bring significant benefits in terms of security of supply to the island of Ireland. Islandmagee Storage Limited is considering the development of a facility which would have a total working capacity of around 500 mcm and a maximum withdrawal rate of 24 mcm/d. BGÉ, in conjunction with GDF Suez's subsidiary Storengy, is considering a similar project, with a storage capacity of 300 mcm and withdrawal rates of up to 15 mcm/d.

There are no LNG storage tanks in Ireland. However, if the Shannon LNG terminal project were to go ahead, the project includes plans to construct up to four LNG storage tanks, with a capacity of 0.2 mcm.[46]Licences to operate gas storage facilities are issued by the CER under section 16 of the Gas Interim Regulation Act of 2002 and are issued subject to a number of conditions to ensure that access is non-discriminatory and that it operates in a safe manner.

SECURITY OF SUPPLY

Ireland is vulnerable to a supply disruption, as 93% of gas supplies come from the island of Great Britain via sub-sea interconnectors, and all imports transit through a single point in Scotland, Moffat. The interconnectors are critical to the gas supply for Ireland.

Furthermore, Ireland has very limited gas storage capacity, with a maximum send-out capacity accounting for only 11% of historical peak demand.

45. See sub-section below on tariffs.

46. 0.2 mcm of LNG storage is equivalent to 1 200 mcm of non-liquefied gas storage.

GAS SECURITY POLICY

Diversification of supply, the development of commercial gas storage, the enhancement of emergency policy with the United Kingdom (and particularly Northern Ireland) and the Common Arrangements for Gas (CAG) platform are the basis of Ireland's gas security policy.

Statutory Instrument (SI) 697 of 2007 was implemented as a result of European Directive 2004/67/EC concerning measures to safeguard security of natural gas supply. It enhances the role and responsibilities of the Irish regulator (CER) with regard to the security of natural gas supply.

The security of supply responsibilities of the CER include:

- protecting the security of supply of natural gas;
- establishing policies to ensure adequate levels of security of supply;
- monitoring the security of supply and publishing a Gas Capacity Statement annually;
- protecting the supply of natural gas to specific categories of customers;
- ensuring that security of supply measures and provisions do not place an unreasonable burden on energy undertakings and are compatible with a competitive internal gas market; and
- approving the Natural Gas Emergency Plan (NGEP) and appointing the National Gas Emergency Manager (NGEM).

Under Statutory Instrument 697 of 2007, Gaslink, the transmission system operator, has been appointed by the regulator as the NGEM, which is responsible for the implementation of the NGEP in the event of an emergency. The NGEP describes the arrangements for the appointment of its manager, the management of a natural gas emergency, the safe management of gas supply and demand during an emergency, and the interaction with industry and relevant authorities in the event of an emergency. It also provides for arrangements which give flexibility and discretion to the emergency manager in the event of a natural gas emergency.

Concerning the Common Arrangements for Gas (CAG), an all-island working group was set up to establish co-ordinated procedures for managing a gas emergency on an all-island basis as well as to harmonise security of supply standards. The two regulators issued a consultation paper in December 2008, highlighting the following areas as relevant to security of supply harmonisation under the CAG:

- emergency procedures;
- network security of supply standards (1-in-50 or 1-in-20);
- shipper/supplier obligations with regard to security of supply;
- gas storage facilities, strategic and commercial; and
- gas quality.

Core elements of the CAG will have to be approved by 2014 by both Energy Ministers and backed by legislation in both jurisdictions.

Structured emergency exercises are conducted annually among representatives from relevant market participants from Ireland, the United Kingdom, Northern Ireland and the Isle of Man. Meanwhile, work on emergency procedures and supply standards is proceeding with the on-schedule implementation of EU Regulation 994/2010 concerning security of natural gas supply.

EMERGENCY RESPONSE MEASURES

In the event of a gas emergency, the operator of the Kinsale commercial storage facility, PSE Kinsale Energy Ltd. (a subsidiary of Petronas) would be required to release gas from its facility if instructed to do so by the NGEM. In a similar way, large gas users would be instructed by the NGEM to cease using gas. Large industrial customers would be one of the first to be cut off, after the power generation sector. CER has legal powers to enforce load shedding, while EirGrid, the electricity transmission system operator, is responsible for implementing the load-shedding plan which has been in place, and tested, for the last three decades to mitigate the risk of a gas supply emergency causing an electricity supply emergency.

Regional arrangements are also in place to respond to a gas supply emergency. In the event of a gas supply disruption originating in the island of Great Britain, then Ireland, Northern Ireland and the island of Great Britain would apply load shedding on a pro-rata basis. Households in all the jurisdictions have equal priority, and gas supply would continue at Moffat compressor station until supplies to the households in the island of Great Britain could no longer be maintained. The South-North pipeline (SNP) which connects Ireland to Northern Ireland (via IC2) would be used if a gas emergency were to arise in Northern Ireland. There is an all-island emergency forum which meets to discuss emergency arrangements and to plan for dealing with emergencies on either or both sides of the island. Some work has also been carried out in the CAG project work streams and as part of the wider UK-Ireland security of supply forum which meets regularly. Work is also proceeding as part of regional co-operation on the implementation of EU Regulation 994/2010 concerning security of natural gas supply.

Gas-fired power generators in Ireland are required to be able to run on a secondary fuel. Under a CER directive published in January 2009, baseload gas-fired generators are required to hold five days of secondary fuel stocks on site (or in close proximity to site).[47] In addition, they must be able to run at 90% load factor or that period during a gas emergency and be able to switch fuel within five hours of an emergency being declared. Mid-merit generating units are required to have three days of secondary fuel stocks on site and also to maintain a 90% load factor.

EirGrid is responsible for verifying compliance with the stockholding obligation, and can perform up to two tests per year on each generating unit. CER Decision 10/104 sets out the compensation arrangements for the testing of compliance with secondary fuelling obligations.[48] The CER and NORA (the National Oil Reserves Agency) have been in discussion about co-ordination of their emergency plans for disruptions, including the availability of strategic oil stocks for fuel switching in the event of a gas emergency.

47. CER (2011e).

48. ibid.

SUPPLY AND RETAIL

RETAIL MARKET STRUCTURE

The natural gas market in Ireland has been progressively opened to competition since 1997. Since 2004, all non-domestic customers have been free to choose their supplier. The market was fully opened to competition in July 2007.

There are eight suppliers currently active in the Irish retail gas market, including the incumbent BG Energy (part of BGÉ) and seven independent suppliers that are not affiliated in any way with the incumbent BG Energy (Airtricity, Energia, Electric Ireland, Flogas, Gazprom, Phoenix and Vayu). BG Energy, the incumbent, continues to supply over 30% of the market measured by volume.

As of September 2011, there were 650 403 registered gas points in the residential gas market. CER's analysis indicates that in the first nine months of 2011, customer switching in the gas market stood at 88 975 customer moves across all sectors, of which 85 512 customer switches were in the residential sector.

TARIFFS

The CER is responsible for the regulation of gas transmission and distribution tariffs. Network costs are reviewed every five years and used to establish maximum allowed revenues for BGÉ's transmission and distribution activities for a given year of the five-year period. The allowed revenues are used to determine the network tariff for each year. The latest five-year review covers the period 2007/08 to 2011/12 and sets out the total allowed revenues for BGN and Gaslink over that period.

The CER intends to commence a review of the allowed revenue for transmission and distribution for the period 2012/13 to 2016/17, known as Price Control 3 (PC3). The PC3 project will review and set the operating expenditure, capital expenditure, weighted average cost of capital (WACC), regulatory asset bases (RABs) and financial performance incentives for the PC3 period relating to the activities of the transmission and distribution asset owner (BGÉ). This also relates to the operations of the transmission and distribution system operator (Gaslink) and to the operations of Bord Gáis Networks (BGN) that carry out certain activities on behalf of Gaslink.

Transmission and distribution account for approximately 44% of the supply tariff, with supply costs, capital expenditure and profit making up the balance. The IEA understands that transmission tariffs in Ireland are higher than elsewhere because of substantial investment in Ireland's natural gas network in recent years and because of gas transportation costs through the interconnectors.

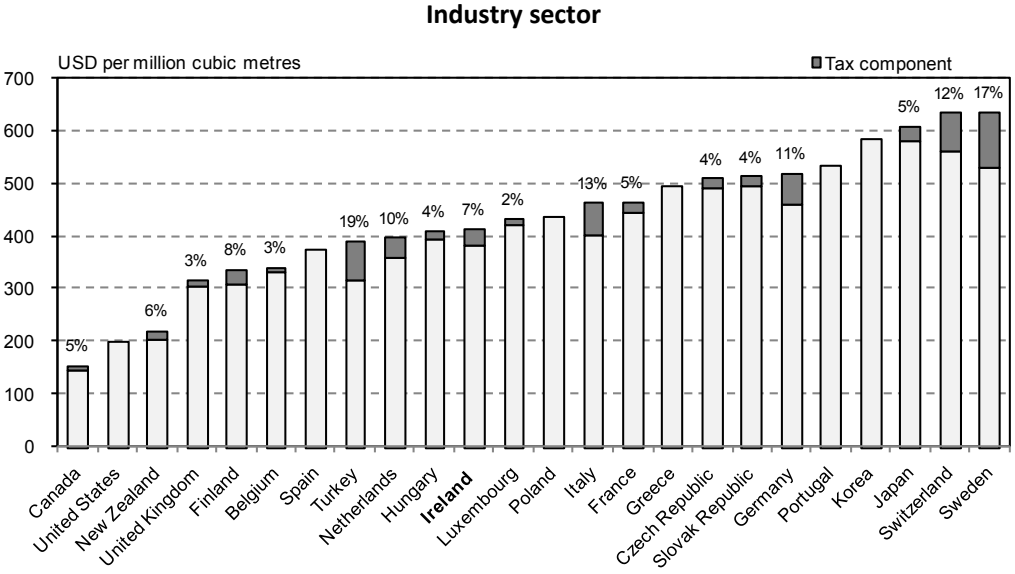
A number of Common Arrangements for Gas (CAG) consultations relating to transmission tariffs have been undertaken, with further consultations expected to follow. CAG envisages that an entry-exit tariff regime will be developed for Ireland and Northern Ireland as part of all-island market arrangements. To date, the regulators have concluded that there will be two exit points, one in Northern Ireland and the other in Ireland.

RETAIL PRICES

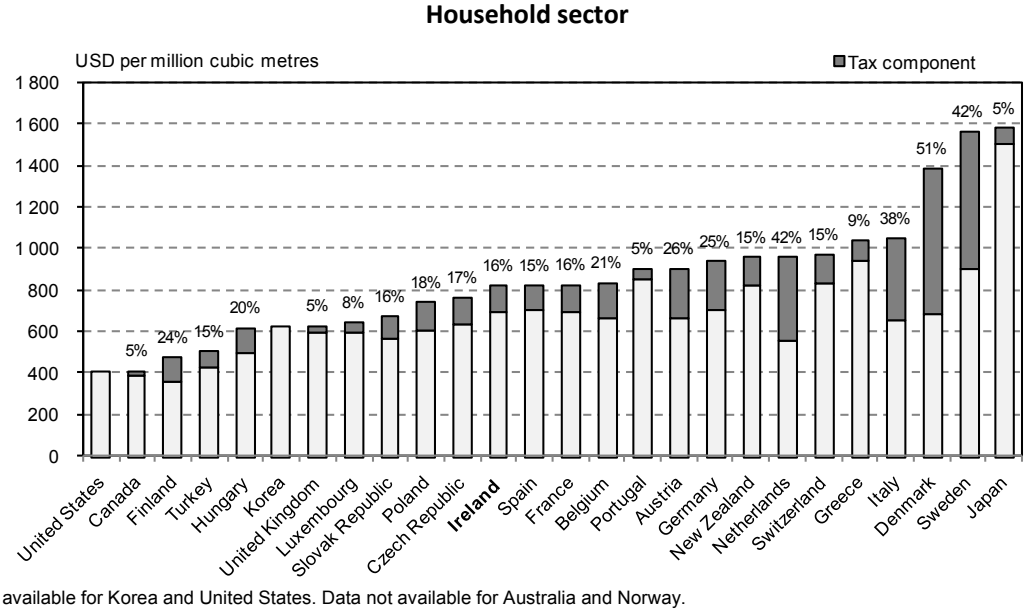
The largest component of gas prices is the wholesale cost of gas, which, in Ireland is derived from the United Kingdom's highly liquid National Balancing Point (NBP) price.

Decisions by the CER in relation to gas prices involve reviewing all the controllable cost inputs and forecasting the likely wholesale gas costs. The purpose of regulation is to drive improved efficiencies and lower costs in areas that are under regulatory control. This is designed to benefit customers first and foremost.

Figure 31. **Gas prices in IEA member countries, 2010**

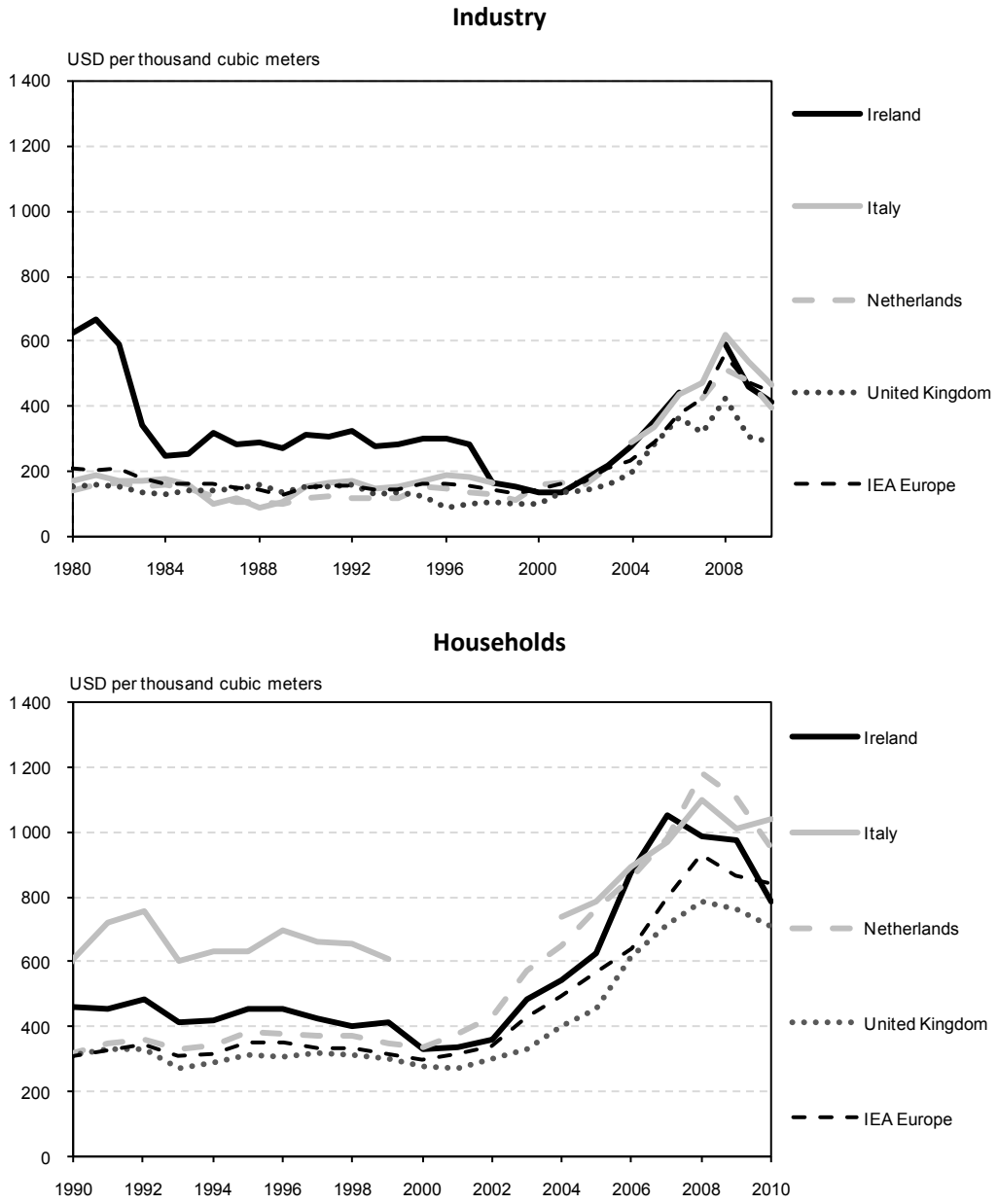


Note: tax information not available for Greece, Korea, Poland, Portugal, Spain and United States. Data not available for Australia, Austria, Denmark and Norway.



Note: tax information not available for Korea and United States. Data not available for Australia and Norway.

Figure 32. **Gas prices in Ireland and in other selected IEA member countries, 1980 to 2010**



Note: IEA Europe is calculated as the mathematical average on the available IEA Europe price data.

Source: IEA (2011d).

Domestic consumers supplied by BG Energy remain the only customer segment where supply tariffs continue to be regulated by the CER. The regulator has deemed that an adequate level of competition has developed in all other market segments. Compared to IEA member countries, natural gas prices (including taxes) for industry and households in Ireland were around average in 2010 (see Figure 31), and these prices have followed similar trends over the last decade. In Ireland, gas prices for industry have grown on average by 11.5% per year since 2000, and by 9% per year on average for households. These growth rates were similar in the United Kingdom, where they stood at 11.2% per

year for industry and 9.8% for households over the same period. In the two and a half years from the beginning of 2008 to mid-2011, Ireland's European Union ranking for industrial gas (excluding VAT) prices improved in all consumption categories and, in addition, for many industrial consumers, their ex-VAT gas prices fell below European Union and Euro-zone averages for much of that period.

The largest users of gas are the power generating stations and a small number of industrial customers who account for approximately 70% of total demand. This segment has never been regulated by the CER. Below that group sit large commercial and industrial customers who account for a further 9% of the market in volume terms. There are about 245 customers in this category. The regime of regulation in this sector is known as the regulated tariff formula (RTF) regime. The RTF is based on the market prices of the gas, transmission and distribution costs, plus margin. This regime was introduced as an interim measure in 2003 to encourage competition in this sector at a time when BG Energy had 100% of the market of this sector. In volume terms, BG Energy now has about 35% of this sector, with the independents holding the balance.

In October 2010, the CER deregulated the RTF market but continued to monitor competiveness of this segment. Should clear evidence emerge that competition between suppliers for RTF customers was eroding, or that BG Energy was engaging in practices that are not in the long-term interests of the market (when targeting RTF customers with below-cost tariffs or unsustainable margins), the CER would take appropriate remedial measures and, if necessary, restore the RTF regime. Below the RTF regime sits the fuel variation tariff segment (FVT), accounting for about 4% in volume terms of the market. This segment is also regulated by means of a price-regulated mechanism. With regard to domestic customers, the CER continues to review the costs underlying the BG Energy tariffs annually, and the CER approves revenues for BG Energy.

FVT and the non-daily metered industrial and commercial (NDM I&C) market sectors were deregulated with effect from 1 October 2011. The CER has decided that the residential sector is some way from reaching the criteria for deregulation, and competition in this market segment continues to be kept under review.

A CER market study indicated that at the end of third-quarter 2011, BG Energy had a 74.9% market share in the residential sector, 49% market share of the non-daily metered industrial and commercial sector, 54% market share of the fuel variation tariff sector and 35% market share of the regulated tariff formula sector (in which regulation ceased in October 2010).

CRITIQUE

Largely driven by increased demand for electricity and the construction of new gas-fired power stations, demand for natural gas has continued to grow, even amid the economic difficulties that Ireland is now facing. There have been a number of positive developments in the natural gas market in recent years, the most notable of which are the proposal to build an LNG terminal and the ongoing work to develop Common Arrangements for Gas on an all-island basis with Northern Ireland.

In the retail market, competition has increased in recent years and the CER has taken progressive steps to deregulate BG Energy's (BGÉ) tariffs in all retail customer categories except domestic customers. As in the electricity sector, consumers are adapting to market changes and benefiting from increasing competition among suppliers, resulting in high switching rates.

On a less positive note, the Corrib field is still not on stream, reliance on gas for power generation has grown, and Ireland's reliance on Great Britain as a single source of imports has increased.

Ireland has decided to adopt the independent transmission system operator (ITO) as the preferred unbundling model for gas, in line with European Union legislation. As such, the operation (Gaslink) and ownership (BGÉ) of the transmission system are expected to be merged within a legally independent ITO, a subsidiary of BGÉ, subject to stringent requirements to ensure it is ring-fenced from the supply business of BGÉ. The ITO model represents an efficient and low-cost model and is conducive to continued efficient cost delivery. While this represents a positive step in terms of Ireland's regulatory obligations and value for consumers, the planned sale of BG Energy in 2013 will in practice deliver full unbundling.

The primary activities of the state-owned BGÉ are the transmission, distribution and supply of natural gas. In recent years, the company has broadened its presence in the energy sector and has become a major player in the electricity market with ownership of generation assets and significant investments in the renewable energy sector. The government decided in February 2012 that it would pursue alternative asset disposal options, to include the sale of BGÉ's energy business including BGÉ's retail, trading and assets division – but not including its gas transmission or distribution systems or the two gas interconnectors, which will remain in state ownership. In addition to providing the greater clarity needed about the future of the group, reducing government participation in the sector is a welcome move, particularly as a well-planned divestment of BGÉ's retail assets could bring about increased competition in the retail market, thereby allowing for the subsequent deregulation, or ending of retail tariff regulation, of the market for household consumers.

Over the past decade, Irish gas prices have been higher than average compared to OECD European peers. Some of these high prices have been driven by the cost of imported fossil fuels, but structural inefficiencies may also have contributed to higher gas costs. In the past two years, prices have dropped below OECD European peers. The regulator will shortly be commencing a review of the costs of BGE's network businesses, which represent a significant portion of the costs faced by consumers. The government must ensure that the regulator has adequate resources at its disposal to complete this task so as to ensure that potential efficiency gains and cost reductions are maximised.

Ireland's gas market is characterised by its very high dependence on gas imports and the specificities of its geographical location. The island of Ireland is vulnerable to a supply disruption, as all gas supplies from Great Britain, accounting for 93% of demand, transit through a single point in Scotland, Moffat. Accordingly, Ireland would benefit significantly if there were a greater diversification and flexibility of supply both in terms of entry points and in terms of sources of gas. In this regard, the development of upstream gas fields, such as Corrib, and the proposal to build an LNG terminal in the Shannon Estuary, would be beneficial to Ireland's security of supply.

As is the case in numerous OECD countries, there are challenges associated with gaining local community acceptance for large-scale energy infrastructure projects. A good example is the delays that have been preventing the development of the Corrib gas field to date. The government needs to review the effectiveness of the existing Strategic Infrastructure Act in delivering the desired outcomes, and should continue to work with its European Union counterparts in assessing how to bring about a more streamlined, efficient and finite decision-making process that involves all stakeholders.

Clear and effective regulation is at the core of the establishment of a well-functioning and diversified gas market. In this regard, an important concern for the Irish gas market is the regulatory status of the sub-sea interconnectors from Moffat should Shannon LNG or the Corrib field be developed and brought to market. There is no certainty as to how the costs of maintaining these interconnectors will be allocated if new entry points such as the Corrib gas field or the Shannon LNG terminal were to bring alternative supplies to the Irish market. At present, the future costs of delivering natural gas to consumers, particularly for the potential LNG terminal in Shannon, remain uncertain. Depending on the outcome of the regulator's deliberations, there could be a potential impact on Ireland's competitive environment and end-user gas prices. It is important that the regulator gives direction on this matter, also taking into consideration the benefits of diversifying Ireland's supply sources and of having enhanced security of supply from existing infrastructure in the long term and the impact on prices and competitiveness. The present lack of regulatory certainty could be having a negative impact on the perception of Ireland as a location to invest in energy infrastructure.

Another means of improving supply diversity is to encourage the development of indigenous production. Yet, despite efforts to promote exploration opportunities, such as the establishment of a favourable fiscal and licensing regime, interest in exploration does not fulfil the aspirations of the government. Of particular concern is the Corrib field, an important indigenous source of natural gas, which has yet to come on stream despite having all the necessary authorisations and its offshore development and onshore terminal infrastructure being nearly completed. The uncertainty surrounding the delay in the Corrib field development may to some degree be contributing to the lack of interest of upstream companies in exploring Ireland's offshore potential. The government should continue to encourage the expeditious development of the Corrib gas field, and thereby ensure a predictable and reliable environment for all stakeholders in order to pave the way for further exploration.

Another important tool to strengthen energy security is the development of gas storage. Gas storage capacity is currently very low relative to gas consumption, and the development of additional storage sites would provide an essential emergency policy tool for dealing with a supply crisis. The summer-winter price spread for spot gas in Europe has fallen in recent years, as producers increasingly tailor volume flows to the seasonal needs. As a result, this reduces the economic viability of gas storage projects. Government policy is to facilitate, wherever possible, the commercial development of offshore gas storage facilities, and the government is currently developing legislative proposals to provide a regulatory regime for offshore storage. In addition to reviewing the current regulatory arrangements at sites where gas extraction activities are taking place, proposals will also be developed to provide for storage at depleted gas wells and at virgin sites. Given the paucity of available storage locations in Ireland, the government needs to ensure that an appropriate legislative and cost-effective fiscal framework is in place, if it wishes to ensure that storage projects in Ireland are forthcoming. In this regard, the government should also pursue funding options and other supports available under the recently announced EU Infrastructure Package for suitable projects that have the potential to contribute to improved security and diversity of supply and better infrastructural resilience in north-west Europe.

The governments of Ireland and Northern Ireland are working on developing a Common Arrangements for Gas (CAG) framework, building on the success of the all-island Single Electricity Market. CAG has the potential to bring benefits to consumers in both parts of Ireland, in terms of security of supply and cost reductions through increased competition.

The project has the capability of providing for further regional integration and contributing to achieving the 2014 single market goal set by the European Council. Specific attention must be given, however, to ensuring that this significant regulatory development delivers optimal results in terms of competition, economic efficiency and end-user prices. The CAG framework also needs optimal governance and project planning, and should ensure provisions are made for full consultation with stakeholders, for the evaluation of costs and benefits, and for adherence to project management issues such as scoping and cost control. A point of attention is the current restructuring under way at BGÉ, with a view to creating an independent transmission system operator (ITO) model for Ireland, in compliance with the EU Energy Third Package for an internal European Union gas and electricity market.[49] In this regard, the announcement of the sale of BG Energy, which will result in full unbundling, is a relevant factor in the development of the CAG process. The design of CAG should be aligned with emerging EU Framework Guidelines and Network Codes. More generally, Ireland should continue to co-operate with neighbours such as the United Kingdom and with the European Commission, in order to ensure that regulatory decisions beyond Ireland's border do not negatively impact its gas market.

RECOMMENDATIONS

The government of Ireland should:

- ☐ *Follow through with the orderly sale of BG Energy, ensuring all legislative, financial and other issues are addressed.*
- ☐ *Ensure that the regulatory authority continues to focus on requiring cost control and efficiencies in the forthcoming five-year price review for gas networks, including in the areas of infrastructural investment, operational expenditure and any costs incurred in restructuring.*
- ☐ *Keep under review the Strategic Infrastructure planning process for identifying critical energy infrastructure, including upstream developments, and ensure that it delivers an effective, transparent and streamlined planning and consenting process under the supervision of An Bord Pleanála.*
- ☐ *Ensure that the regulator determines the future status of the two interconnectors in relation to the tariff charges for the use of the onshore transmission network, given the potential impact that this could have on consumer costs and competitiveness, as well as on security of supply and on the development and use of alternative supply entry points to Ireland.*
- ☐ *Consider a cost-effective fiscal investment framework to facilitate the commercial development of offshore gas storage facilities, recognising the benefits to Ireland's security of supply concerns, and put in place the necessary legislative framework.*
- ☐ *Continue working with the government of Northern Ireland to develop the Common Arrangements for Gas framework to best effect for consumers in both jurisdictions, taking into account the EU 2014 goal for market integration, regional co-operation on gas in the gas north-west region and the economic costs and benefits of investments required to achieve flows of gas across the island.*

49. Adopted on 19 September 2007.

8. COAL AND PEAT

Key data (2010)

Coal

Hard coal production: 0.07 Mt (0.04 Mtoe)

Net coal imports: 1.6 Mt (1.0 Mtoe) from: Colombia 74%, Poland 18%, United Kingdom 2%

Share: 9% in TPES, 15% of electricity generation

Coal use by sector: electricity and heat generation 67%, residential sector 26%, industry sector 7%

Peat

Peat production: 5.0 Mt (1.0 Mtoe)

Share: 5.5% of TPES, 8.0% of electricity generation

Peat use by sector: electricity and heat generation 63%, other transformation 20%, residential sector 14%, other 3%

COAL

Coal plays a rather small role in Ireland's energy mix compared to many other IEA member countries. In 2010, coal represented around 9.0% of total primary energy supply (TPES) and total coal supply was 1.9 Mt (1.29 Mtoe), some 31% less than in 2000 and 18% less than in 2008.

In 2010, Ireland imported 1.57 Mt of hard coal and 0.02 Mt of brown coal. The largest share of Ireland's coal imports came from Colombia, which accounted for almost three-quarters of total coal imports. Poland is also a significant supplier, with 18% of total coal imports. Ireland also received smaller volumes from the United Kingdom (2%), South Africa (2%) and Germany (1%).

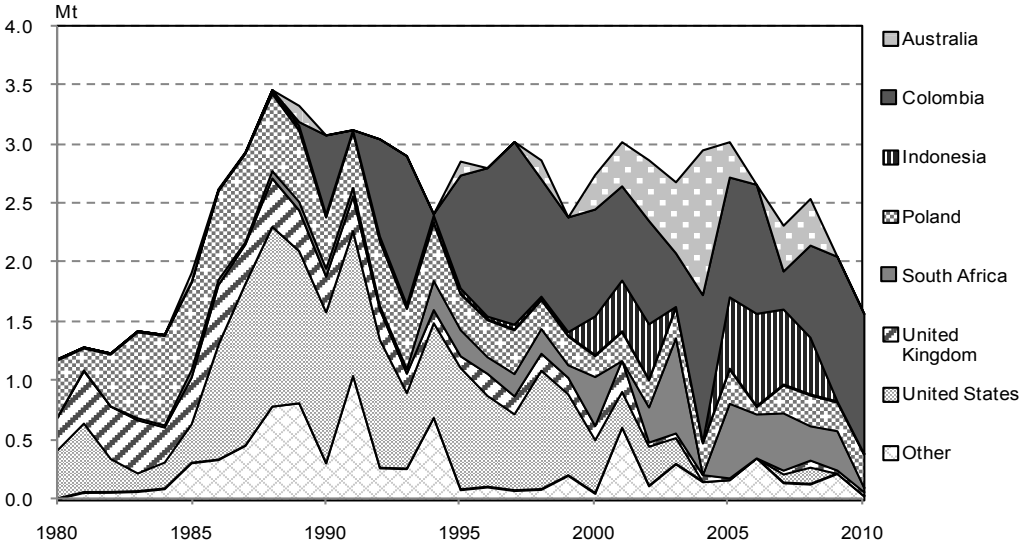
In terms of production, the Kish Bank basin, offshore of Dublin, is thought to contain significant quantities of bituminous coal. However, an extensive programme of exploration is required to quantify resources. A Geological Survey of Ireland report in 1986 considered the potential for exploiting this coal. Currently, however, there are no exploration licences covering the area.

As Ireland does not have a large heavy industry sector, only 7% of total coal supply is used in the industry sector, and the residential sector accounted for a further 26% of coal use. Coal is primarily used in the electricity generation sector, accounting for 67% of total coal supply (see Figure 34).

Ireland has only one large coal-fired power plant, Moneypoint, which is owned by ESB, with a capacity of 900 MW. It was refurbished in 2008-09 so as to meet stricter emissions requirements regarding nitrogen oxide (NOx) and sulphur oxide (SOx). These investments have permitted to expand the lifetime of the plant by ten years, up to 2025.

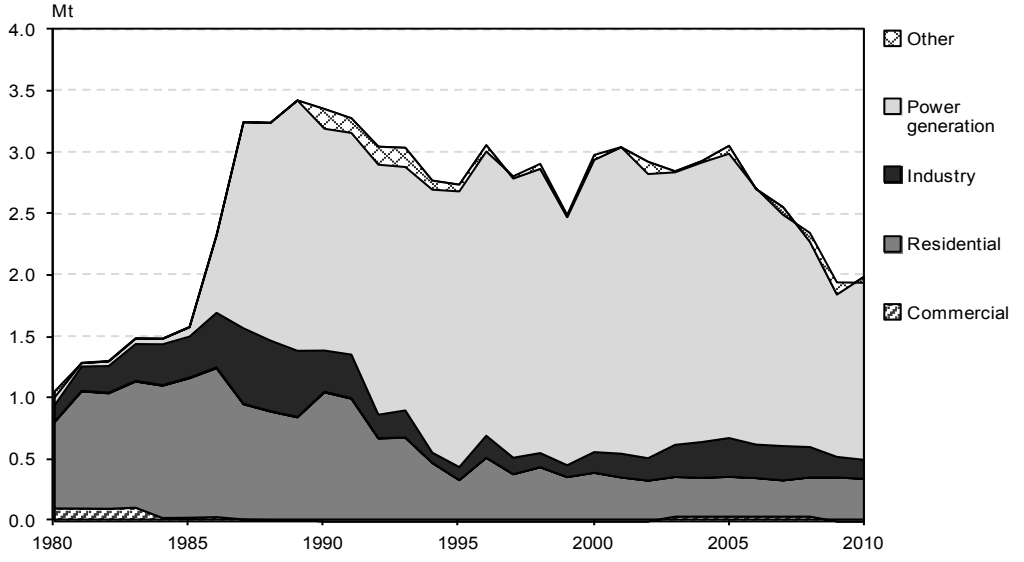
Coal is expected to remain in Ireland's energy and electricity mix at least until 2020. A decision about the future of coal-fired generation in Ireland beyond 2020 has not been taken.

Figure 33. **Ireland's hard coal imports by country of origin, 1980 to 2010**



Source: IEA (2011g).

Figure 34. **Coal supply by sector*, 1980 to 2010**



* TPES by consuming sector. *Other* includes other transformation and energy sector consumption. *Industry* includes non-energy use. *Commercial* includes residential, commercial, public services, agriculture/forestry, fishing and other final consumption.

Source: IEA (2011a).

PEAT

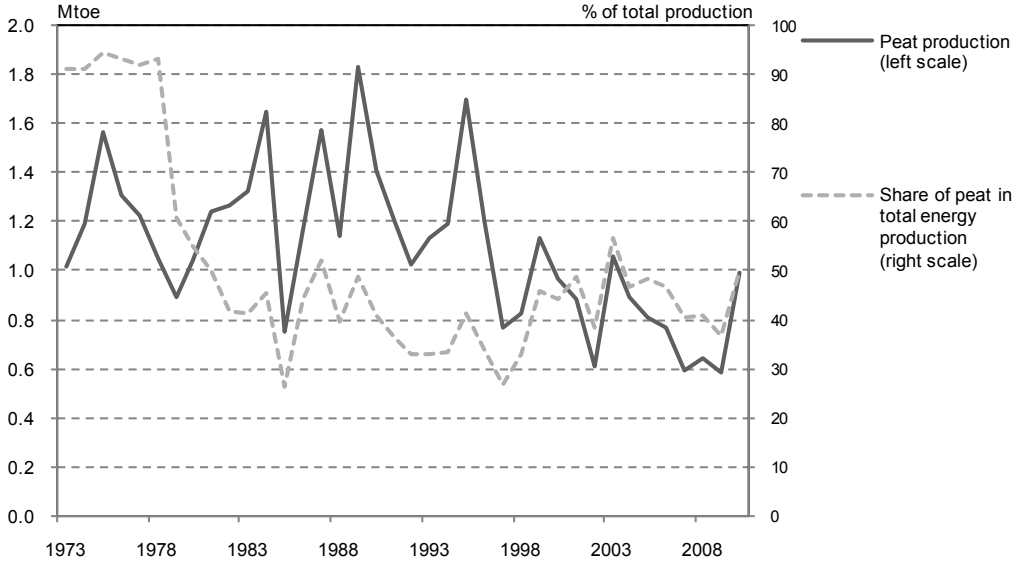
SUPPLY AND DEMAND

Peatlands cover around 1 million hectares of Ireland, and approximately 25 000 hectares, or 8% of the area once classified as raised bogs, is currently actively harvested. Bord na Móna (BnM), the state agency responsible for peat harvesting, has not acquired any new bogs in the last 20 years. Peat is a historical energy source in Ireland. Since 2000 and the progressive decline in gas production, peat has now become the largest indigenous energy source.

Peat production has varied over the years, representing between 38% and 57% of total inland energy production over the last decade. The amount of peat produced in a given year is heavily depending on weather conditions, with production being significantly higher in drier years than in rainy years.

In 2010, peat production amounted to 5 Mt (1 Mtoe), equivalent to production levels in 2000 but some 70% higher than in 2009. Over the years, however, the general trend has been of a progressive decrease in peat production, and the government's projections estimate that peat production will on average be halved in 2020.

Figure 35. **Peat production, 1973 to 2010**



Source: IEA (2011a).

Almost three-quarters of total peat supply is used for the electricity generation and other transformation, with the remaining being used in households in the form of peat briquettes.

Ireland has three peat-fired power plants, with a total generating capacity of 370 MW. These plants currently have a lifespan until 2030. Two of these plants are owned by ESB (Lough Ree and West Offaly), and the third one by Bord na Móna (Edenderry).

In 2010, the three peat fired power plants generated 2.4 TWh or 8.3% of total electricity generation in Ireland.

PEAT SUPPORT POLICIES

Peat PSO

Peat as an indigenous energy source continues to provide a degree of additional energy security for Ireland. The Electricity Regulation Act 1999 established a support scheme for the three remaining new-build peat-fired electricity generation, under the public service obligation (PSO, see Box 2 in Chapter 5).

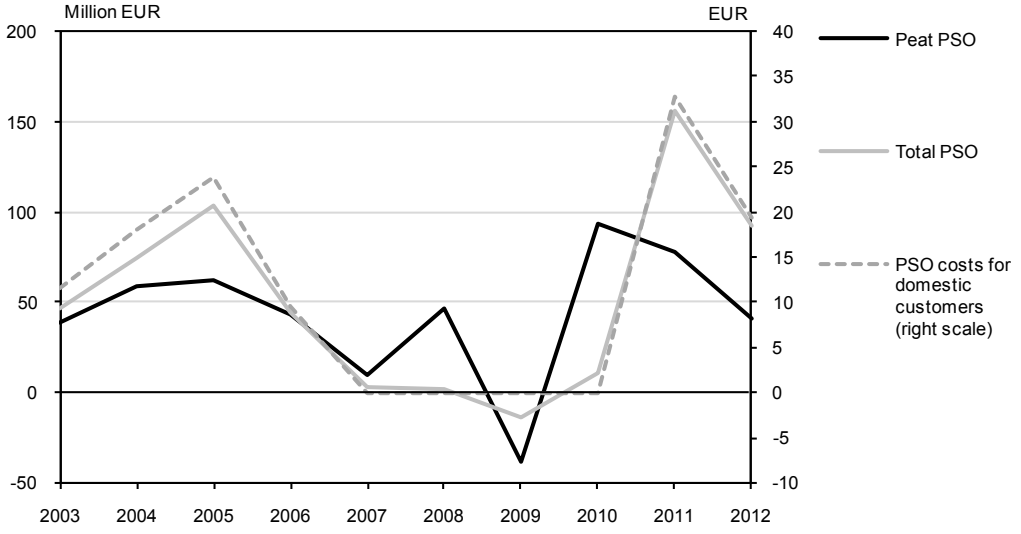
All three peat generation stations fall within the ambit of the public service obligation levy. The levy is paid by all electricity consumers in Ireland, and the proceeds are used to recover the additional costs incurred in producing a proportion of electricity from such generators.

Every year, the CER calculates the level of the PSO levy, according to price and volume forecasts. The electricity generated in these power plants is sold at market prices, and if the revenues received do not cover production costs, the plants recover the difference from the PSO scheme. Similarly, if a plant over-recovers from the market, the difference is returned to the PSO fund.

Between 2007 and 2010, the PSO levy was zero as the market conditions were such that electricity generation from peat was competitive with gas-fired power plants without any support.

The peat PSO is set to end in 2015 for the plant owned by Bord na Móna, and in 2019 for the two plants owned by ESB.

Figure 36. **Evolution of the public service obligation, 2003 to 2012**



Source: CER (2012).

REFIT biomass co-firing

As the peat PSO is limited in time, all three peat-fired stations are either actively testing or developing their co-firing capabilities with biomass.

At the Edenderry power plant, owned by Bord na Móna, co-firing started as a pilot project in 2008, and over the years the amount of biomass replacing peat has increased, from 2% in 2008, to 7.8% in 2009 and now almost 15% in 2010.

In 2010, a total of more than 130 000 tonnes of peat were displaced with carbon-neutral alternatives. Additional work on co-firing has also commenced in the two ESB peat-fired plants.

The renewable energy feed-in tariff scheme (REFIT) is the existing support scheme for renewable electricity generation. REFIT 2 covers large- and small-scale onshore wind, biomass landfill gas and small hydro while REFIT 3 covers anaerobic digestion, other biomass, CHP and biomass combustion, including where biomass is to be co-fired with peat. The introduction of REFIT 3 will facilitate a longer-term approach to biomass and peat co-firing, and will in turn facilitate the development of supply chains for the extraction and supply of existing biomass material.

CARBON CAPTURE AND STORAGE

Carbon capture and storage (CCS) is being considered by the Irish government for potential adoption in 2025. Increased attention has been paid to emissions in the power sector, as Moneypoint power station is the country's largest single-point emitter of carbon dioxide and of certain other gases and particulates.

On the assumption that Ireland would continue to require coal-fired generation after 2025, an Interdepartmental Committee on CCS is chaired by the Department of Energy. Part of the committee's terms of reference is to identify all the technical, legal, regulatory, planning and permitting issues that require to be addressed in order to implement CCS in Ireland including compliance with the EU Directive on Geological Storage of CO_2. That work will be ongoing over the next three years.

A study of the national potential for CO_2 storage (both on- and offshore) has been undertaken and published. (*Assessment of the Potential for Geological Storage of CO_2 for the Island of Ireland*, September 2008, SEI/EPA). Two major potential sites have been identified. An onshore structure near Moneypoint power station has been the subject of detailed site investigations, including sonar, and was rejected as unsuitable. An offshore depleted gas structure remains potentially viable, but requires further assessment.

CRITIQUE

COAL

Compared to most OECD countries, Ireland has a rather small share of coal in its energy mix. Nevertheless, Ireland's sole coal-fired power plant (Moneypoint) accounts for around 15% of total electricity generation. As such, coal thus makes an important contribution to the diversification of the electricity mix and to Ireland's energy security.

The decision to refurbish and prolong the life of the Moneypoint power station without switching it to gas will ensure that coal continues to be used in electricity generation for the next decade or more. There is currently no clear outlook for the role of coal in Ireland beyond 2025.

This needs to be addressed in the interests of Ireland's energy security in the long term. Indeed, maintaining a share of clean coal in Ireland's energy mix would allow for reliable and affordable diversity in its energy inputs, and closer attention should be given to clean coal technologies in this regard. There has been limited interest and investment in carbon capture and storage (CCS) projects to date, noting that Ireland needs to take account of European Union and international developments in CCS and will be a technology taker. While some interest has been shown for the use of depleted gas fields (*e.g.* Kinsale) to that effect, further technical analysis is needed before investment decisions could be taken.

PEAT

Peat has been Ireland's largest indigenous resource, and is a long-standing element of Ireland's energy mix. Its widespread domestic availability in the past made it a valuable element in terms of security of supply. It is used for residential open-fire heating and particularly for electricity production.

As an indigenous resource, and because it employs many people in the midlands, the government has traditionally supported electricity generation from peat by aiding (via the public service obligation, PSO) peat-fired power plants when they are less competitive than the other market players, providing for the recoupment of the additional costs incurred by the generator. The peat PSO is set to expire in 2015 for Bord na Móna's plant, and in 2019 for the two ESB-owned plants, raising questions as to the long-term outlook for peat as part of the energy mix.

The three peat-fired power plants have already planned to engage in diversifying their fuel inputs, co-firing peat with biomass, with Edenderry some distance ahead of the other two plants. As peat is even more carbon-intensive than coal, this diversification strategy seems to be economically rational, particularly as from 2013 onwards, EU-ETS allowances are to be auctioned off.

The gradual shift from peat- to biomass-fired power generation has two main benefits for Ireland's energy: it will maintain levels of energy security with an indigenous and easily dispatchable renewable source, and it will reduce carbon intensity.

RECOMMENDATIONS

The government of Ireland should:

- ☐ *Take a decision regarding the future of clean coal in Ireland's energy mix (the future of Moneypoint), and the development of carbon capture and storage opportunities for coal-fired emissions in line with the European Union and international developments.*
- ☐ *Encourage ESB and Bord na Móna to increase progressively the amount of biomass co-firing in peat-fired power plants.*

9. OIL

Key data (2010)

Crude oil production: nil

Net crude oil imports: 60 kb/d (3 Mt), +0.3% compared to 2000

Oil products: refinery output 60 kb/d, imports 122 kb/d, exports 26.5 kb/d

Share of oil: 48% of TPES and 2% of electricity generation

Inland consumption: 158 kb/d (7.5 Mt): transport 55%, residential 18%, industry 13%, other sectors 14%

Consumption per capita: 1.5 t per capita (OECD average: 1.7)

SUPPLY, DEMAND AND IMPORTS

Oil remains the primary energy source in Ireland, representing 48% of the country's total primary energy supply (TPES).

EXPLORATION AND PRODUCTION

There is no production of oil in Ireland at present, despite there being a number of petroleum discoveries. Exploration is undertaken by private industry and the companies involved include a mix of majors and medium- and small-sized companies. There has been an increase in the number of exploration licences over the past decade, which should lead to an increase in drilling levels in the next few years.

The government encourages investment in exploration and production through a range of measures, including licensing terms, the regulatory framework and one-off initiatives. Incentives include a low corporate tax rate, with a basic rate of 25% for petroleum production rising to 40% for more profitable producing fields; 100% write-off of the capital cost of exploration and development, with the possibility of writing off the cost of unsuccessful exploration in one area against profits from future successful exploration; keeping licence application and rental fees at a low level; and offering licences with attractive conditions in terms of matching the requirement of exploration companies.

OIL IMPORTS

Ireland is entirely dependent on imports for its oil supply. Crude oil only accounts for 35% of the total oil imported in Ireland in 2009, meaning that 65% of the oil imported into Ireland is in its final product form.

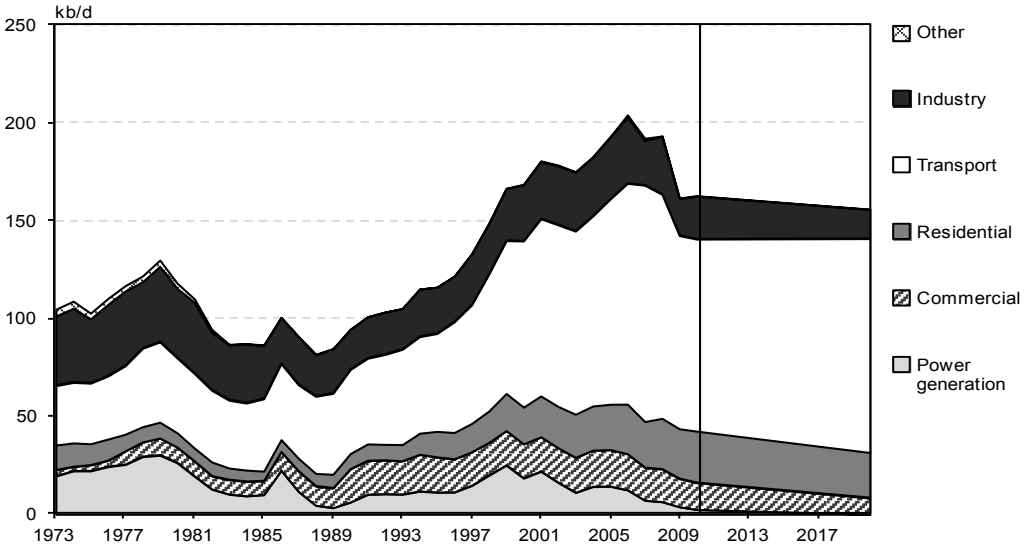
In 2010, crude oil imports amounted to 60 thousand barrels per day (kb/d) or 3 Mt, coming mainly from Norway (57% of imports), Libya (24%), Denmark (14%), and the United Kingdom (5%).

Ireland imported 122 kb/d (5.8 Mt) of oil products, some 89% of which come from the neighbouring United Kingdom.

OIL CONSUMPTION

Demand has almost doubled since 1990, the consequence of a large increase in the transport sector. But since 2007, total oil demand has progressively decreased, and in 2010 it was 14% lower than in 2007. The decline in oil consumption is to a large extent linked to the financial crisis that severely affected Ireland's economic activity. For example, oil consumption by the road freight category declined by 30% in 2009. Yet the government expects oil consumption to decline further, by another 5% by 2020, notably thanks to efficiency gains and the advent of vehicles powered by alternative fuels.

Figure 37. **Oil supply by sector*, 1973 to 2020**



* TPES by consuming sector. *Other* includes other transformation and energy sector consumption. *Industry* includes non-energy use. *Commercial* includes commercial, public services, agriculture/ forestry, fishing and other final consumption.

Source: IEA (2011a).

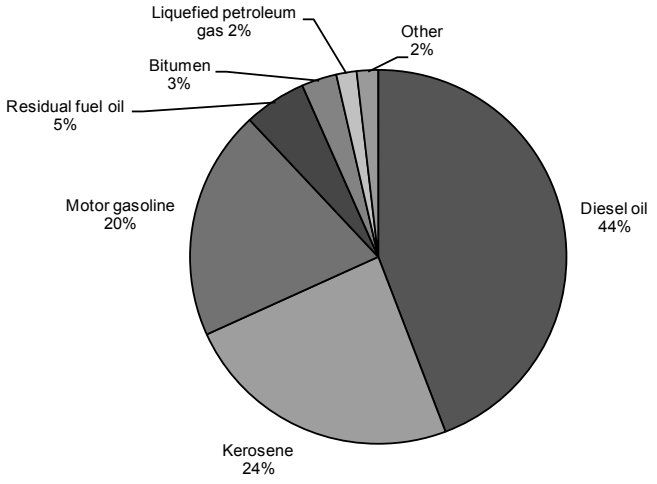
The transport sector is the largest oil-consuming sector, with 55% of total oil supply. Oil supply in this sector has increased by 11% since 2000, and the government forecasts similar growth through to 2020.

There is also significant use in residential heating and in the industrial sector. Oil consumption in the residential and commercial sectors amounted to 40 kb/d (1.9 Mt) in 2010, or 25% of total oil supply. This is expected to drop by some 24% by 2020.

The only sector in which oil consumption has declined significantly is electricity generation. In 2010, only 2% of total oil supply was used for electricity generation, down significantly from a decade before (2000), when electricity generation accounted for 14% of total oil supply.

Diesel oil represents 44% of total oil products consumed in Ireland, kerosene 24% and gasoline 20%.

Figure 38. **Oil consumption by product, 2010**



Source: IEA (2011h).

INFRASTRUCTURE

Ireland is overwhelmingly dependent on oil supplies from the North Sea via refining infrastructure located primarily on the west coast of Great Britain and Ireland's sole refinery at Whitegate in Cork. Ireland is completely dependent on shipping for access to its oil supplies.

Distribution inland from ports is dependent on road transport, given that there is no inland pipeline distribution. It is worth noting that road transport distribution has improved significantly in recent years with the development of the motorway network.

REFINING

There is one oil hydroskimming refinery in Ireland, operated by ConocoPhillips at Whitegate, Midleton, County Cork, with a distillation capacity of 75 kb/d.

In 2001, the government sold the Whitegate refinery and Bantry terminal under an agreement which required that the refinery and terminal must remain in operation until 2016. This obligation applies to current owners ConocoPhillips (now Phillips 66), and any subsequent potential owners.

The Whitegate refinery is small and non-complex by international standards and is one of the smallest, non-speciality refineries in Northern Europe. It supplies roughly a quarter of the Irish market's refined product requirements. A number of factors limit the Whitegate refinery's profitable operation, including its size and its refining complexity. One-third of the product yields from the refinery is exported for further refining.

The Whitegate refinery was put up for sale by ConocoPhillips in early 2007 but the sale was cancelled in November of the same year. Since then, ConocoPhillips has announced a rationalisation process, which includes the sale of EUR 10 billion of assets and more recently has split its downstream activities (which would include the entire Irish operation) into a separate refining and marketing company (Phillips 66).

ConocoPhillips (now Phillips 66) is under an obligation to maintain the refinery until 2016, but it is not certain if the company will continue its operation thereafter. In the context of international developments which have seen significant divestments and shut-downs in European refineries since 2008, there is the possibility that the refining operations could be commercially shut down after 2016, and the facilities potentially turned into a product import terminal and storage facility.

PORTS

All oil requirements are based on sea-borne imports. There are six ports in Ireland with oil terminals that can accept imported refined products for commercial distribution – Dublin, Whitegate, Cork (Marina), Foynes, Limerick and Galway. Dublin Port is the country's biggest port, through which 45% of the transport and heating fuels are imported. Dublin Port can handle larger size cargoes than many other ports. A disruption to Dublin Port would be a key risk to access and distribution of oil supplies in the country.

Around 26% of the country's demand is supplied from the Whitegate refinery, of which 85% is produced on site, while 15% is imported in the form of refined products. Slightly less than half of Whitegate's output is shipped to Dublin and to the smaller ports. Galway Port is the supply access route for 12% of the national product demand. Two ports with oil terminals in Derry and Belfast, Northern Ireland, also supply refined products to Ireland.

STORAGE

Ireland's main storage facilities are located at the Whiddy Island oil terminal (Bantry, County Cork), the Whitegate oil refinery (County Cork), and oil company depots in Dublin Port, Cork, Foynes, Limerick and Galway. Ireland's total storage capacity as of early 2012 was 18.8 million barrels (2.5 Mt).

Around 40% of Ireland's storage capacities exist at Bantry on Whiddy Island. ConocoPhillips possesses the oil storage facilities there, with a total capacity of 1 030 kilotonnes (kt), which can be used for all products and crude storage. About half of the facilities on Whiddy Island are rented and used by the Irish stockholding agency NORA (see Box 10). ConocoPhillips has a commercial storage contract to provide strategic storage at Whitegate to NORA until 2016. NORA has commenced a project to develop long-term (20 years) storage plans, with a view to developing additional storage capacity in Ireland.

RETAIL MARKET STRUCTURE

Ireland's downstream oil industry is fully privatised, liberalised and deregulated. The market is comparatively small.

The Irish retail market has seen numerous changes in recent years. The withdrawal of Statoil and Shell from the Irish market has allowed for a new local player, Topaz Energy, and a hypermarket retailer, Tesco, to enter the market.

The total share of integrated oil companies is relatively low. Only Esso (ExxonMobil) and Texaco (Valero – acquired from Chevron in 2011) remain active in the retail sector, together supplying just over a quarter of end-user fuels, while ConocoPhillips, owner of the Whitegate refinery, is active in the wholesale and reseller market. Other major

integrated oil companies have withdrawn from Ireland, in line with the general trend across Europe of withdrawal from downstream markets. As of early 2012, the market is currently composed of the two fully integrated companies, ConocoPhillips and seven independently owned Irish oil importers.

EMERGENCY RESPONSE POLICY AND RESERVES

The Fuels (Control of Supplies) Acts 1971 and 1982 confer on the Minister for Communications, Energy and Natural Resources the statutory power to deal with emergency measures in supply crises. The National Oil Reserves Agency Act 2007 and its subsequent amendments provide the legal basis for the Irish stockholding regime.

EMERGENCY RESPONSE POLICY

Box 10. **National Oil Reserves Agency (NORA)**

The stockholding agency NORA was originally established in 1995 as a subsidiary of the Irish National Petroleum Corporation Limited (INPC). The National Oil Reserves Agency Act 2007, which came into full effect on 1 August 2007, provides for the transfer of the share held by the INPC in the National Oil Reserves Agency (NORA) Limited to the Minister for Communications, Energy and Natural Resources.

Under the National Oil Reserves Agency Act 2007, NORA is responsible for ensuring that sufficient stocks are in place to meet its stockholding obligations. The Minister for Communications, Energy and Natural Resources is required to keep NORA informed of the volume of oil stocks that NORA should maintain. NORA is not required by the minister to hold all of the 90-day stocks itself because account is taken of the stocks held by industry.

The main provisions of the NORA Act 2007 are:

- to establish NORA as a stand-alone non-commercial state body with responsibility for the maintenance of strategic supplies of oil in line with the state's oil stockholding obligations to the European Union and the IEA;
- to make provision for the continuation of a variable levy imposed on oil companies and its collection by NORA; such a levy has operated since 1995; and
- to make provision for the furnishing to the Department of Communications, Energy and Natural Resources of regular returns by oil companies, oil consumers and NORA regarding, *inter alia*, oil purchases, sales, consumption, imports and exports.

Source: NORA website and information provided by the Irish government.

The use of stocks held by NORA is central to Ireland's emergency response policy, which would be complemented by demand restraint measures if a supply disruption, whether international or domestic, were to become protracted and the introduction of demand restraint measures were considered appropriate.

In international supply disruptions that would call for IEA collective actions, Ireland would likely release agency stocks held domestically or abroad by tender, and/or use ticketed

stocks. In case of a major national supply shortage of oil, the Department of Communications, Energy and Natural Resources (DCENR) would undertake an initial countrywide assessment of the situation, in consultation with the domestic oil industry and NORA, in order to judge whether the Irish oil industry could adequately respond to it through normal company and inter-company arrangements. If NORA stocks were considered necessary and approved by the minister, they would be allocated to marketing companies on the basis of their market share for the product or products concerned. During an emergency, the department would liaise with the IEA and the European Union as required.

EMERGENCY OIL RESERVES

Ireland meets its stockholding obligation to the IEA and the European Union through a combination of stocks owned by NORA and stored in Ireland and in other European Union member states, stocks held by NORA under short-term commercial contracts ("stock tickets") in Ireland and/or other European Union member states,[50] and operational stocks held in Ireland by industry.

As of end-2011, Ireland had 99 days of stocks in terms of net imports, as per IEA stockholding calculations.[51] Some two-thirds days of stocks are publicly held (by NORA), while the remaining third is held by industry in Ireland.

NORA's total public stocks in February 2012 stood at over 12 million barrels (1.578 Mt). Roughly 72% (551 thousand tonnes) of NORA's stocks in Ireland are stored on Whiddy Island. There is no pipeline connection to the mainland, so in the event of an oil supply disruption, NORA stocks have to be loaded into vessels and shipped to one of the oil ports in Ireland.

As NORA does not possess its own storage facilities, the agency rents storage tanks from oil and electricity companies. NORA has secured most of the significant storage in Ireland that was available in recent years. Currently NORA has some 6 million barrels (769 thousand tonnes) of storage capacity under contract in Ireland, which could store up to some 40% of the stockholding obligation of Ireland.[52] Storage facilities are also leased by NORA at Ringsend in Dublin (65 thousand tonnes) and Tarbert (130 thousand tonnes).[53] NORA also has agreements for storage capacity in Northern Ireland.

The use of stocks held by NORA is central to Ireland's emergency response policy. In line with the strategic goals set out in the 2007 White Paper, Ireland is pursuing a policy of rebalancing the strategic oil reserve by increasing NORA's wholly owned stocks of oil and the level of stocks held on the island of Ireland. As of February 2012, some 609 412 tonnes of stocks (equivalent to 34 days of IEA emergency stocks, as of end 2011) are held abroad. NORA has embarked on a programme of increasing the amount of its wholly owned stocks located on the island and procuring storage facilities. Nevertheless, NORA has indicated that, from a practical perspective, it will seek to retain a non-binding minimum level of 10% stocks in the form of tickets for the sake of flexibility.

50. Ticketed stocks accounted for around 200 thousand tonnes as of early 2012.

51. http://www.iea.org/netimports.asp

52. These figures exclude NORA's 145 thousand tonnes of stocks held in Northern Ireland.

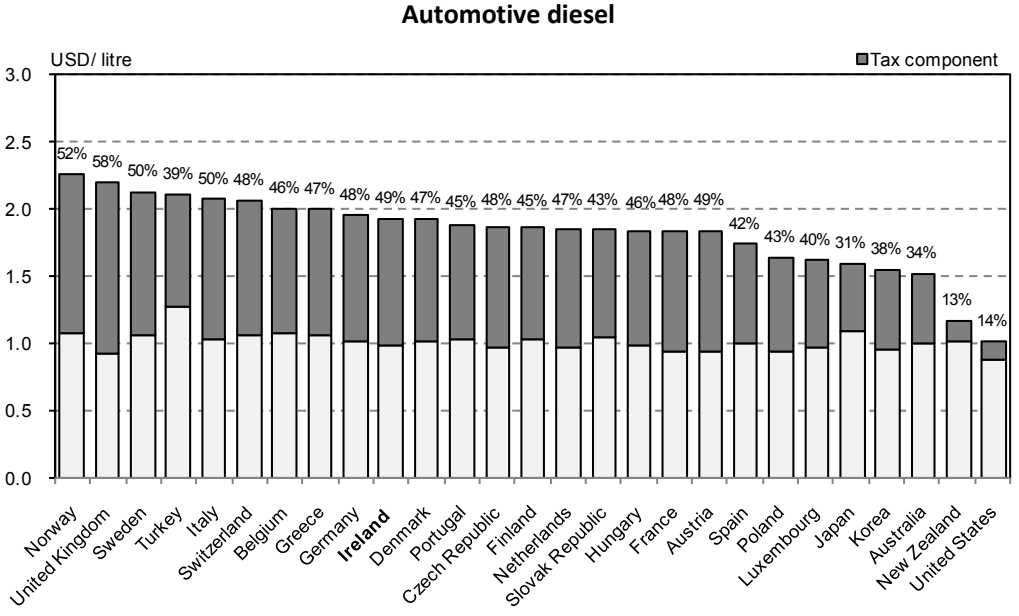
53. As of February 2012, the Tarbert facility is currently under refurbishment, and holds no stocks.

PRICES AND TAXES

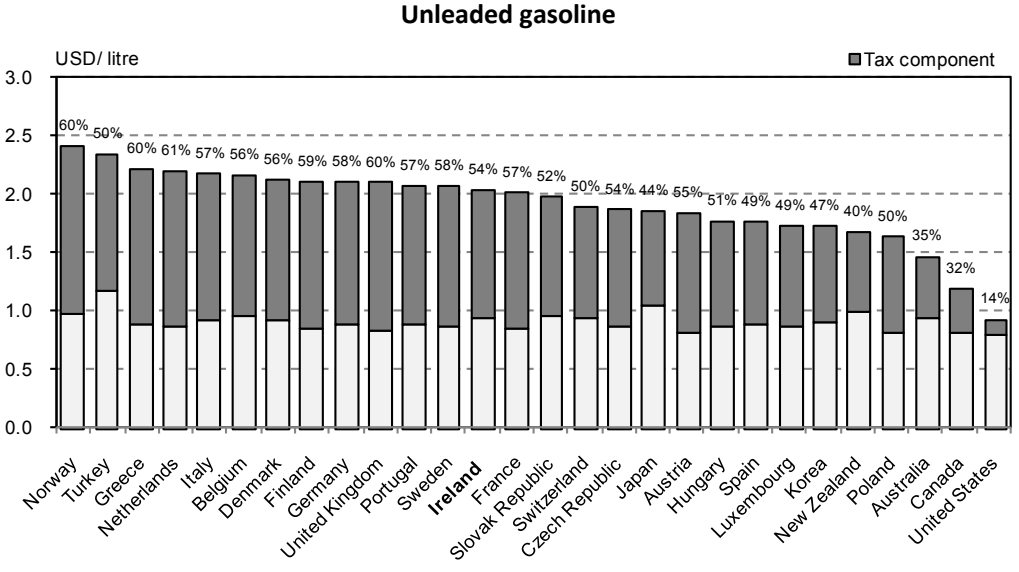
Ireland's diesel and gasoline prices are around IEA average. Taxation or excise duty on the main energy fuels have been increased progressively over the last years and a carbon tax was introduced in budget 2010. Excise on petrol and auto-diesel was increased in the 2009 emergency budget and the supplementary budgets and in the 2011 national budget.

The carbon tax, at a rate of EUR 15 per tonne of CO_2 emitted, was applied to petrol and automotive diesel with effect as of 10 December 2009, and was extended to other mineral oils with effect as of 1 May 2010.

Figure 39. **IEA fuel prices and taxes, fourth quarter 2011**

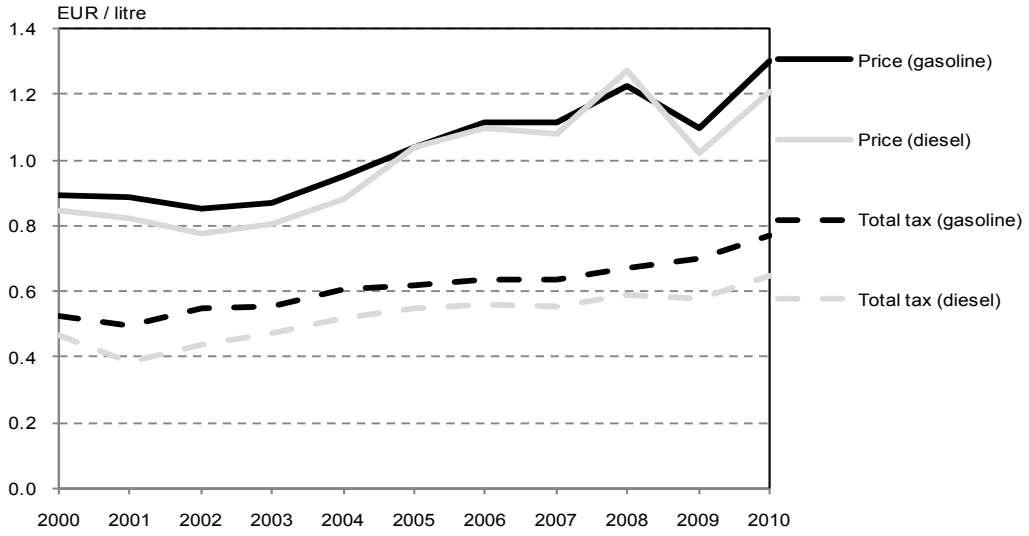


Note: data not available for Canada.



Source: IEA (2011d).

Figure 40. **Average gasoline and diesel prices and taxes in Ireland, 2000 to 2010**



Source: IEA (2011d).

CRITIQUE

There has been little successful oil and gas exploration in Ireland, and there are large areas that are unexplored. The high dependence on imports of fossil fuels makes further exploration for oil and gas particularly attractive. The government has made considerable efforts in promoting exploration opportunities in Ireland and has managed to attract some new companies. However, the current interest in exploration in Ireland does not meet the aspirations of the government, which has established a fiscal and licensing regime aimed to attract new interest in exploration. The government should continue to actively promote the exploration opportunities and ensure a predictable and reliable framework for investors in order to pave the way for further exploration for oil and gas resources.

ConocoPhillips (now Phillips 66) owns and operates Ireland's only refinery at Whitegate, a simple hydroskimming plant with a crude oil processing capacity of 75 kb/d. The refinery is capable of supplying around a third of the Irish oil product market. Phillips 66 has an obligation to keep the refinery open until 2016. Thereafter, its future is uncertain, in light of excess refining capacity in north-west Europe and poor margins. In the absence of a refinery, Ireland would then import 100% of its oil requirements in the form of refined product. The government should assess the strategic impact of future scenarios for the country's sole refinery on Ireland's security of supply. In this regard, the government's commissioning of a study in 2012 on the strategic case for oil refining requirements on the island of Ireland is commendable (Purvin & Gertz and Byrne Ó Cléirigh, 2012).

Ireland meets its stockholding obligation to the IEA and the European Union through a combination of stocks owned domestically and abroad by the Irish stockholding agency NORA and operational stocks held in Ireland by industry. The government has been pursuing the commendable policy of rebalancing its emergency oil reserve by maximising NORA's stocks held in Ireland. The use of stocks held by NORA is central to Ireland's emergency response policy.

RECOMMENDATIONS

The government of Ireland should:

- ☐ *Continue to promote exploration opportunities in Ireland by ensuring a stable investment framework.*
- ☐ *Review the strategic implications of future scenarios for the Whitegate refinery, and take appropriate measures to underpin security of supply within such a context.*
- ☐ *Continue to take appropriate measures via the National Oil Reserves Agency with regard to storage and strategic stocks to ensure that Ireland maintains its current levels of security of oil supply.*
- ☐ *Continue with NORA's programme to increase stockholding levels on the island of Ireland.*
- ☐ *Continue to promote policies that promote energy efficiency and sustainability, so as to reduce Ireland's dependence on oil.*

PART III
ENERGY TECHNOLOGY

10. ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION

Key data (2010)

Government energy RD&D spending: EUR 64.9 million

Share in GDP: 0.41 per 1 000 units of GDP (IEA median 0.40)

RD&D per capita: USD 18.9 (IEA median: USD 15.3)

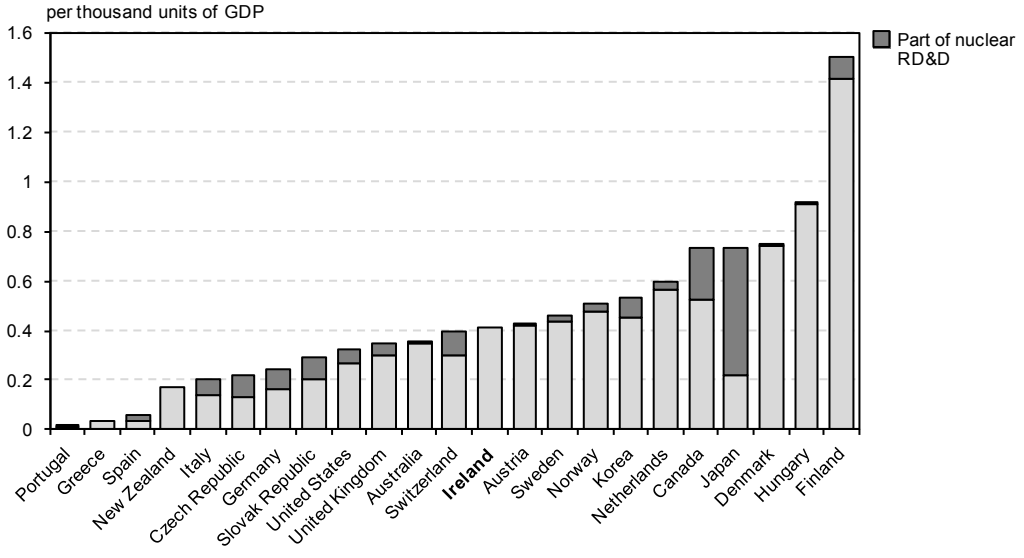
OVERVIEW

Ireland has been increasing its public spending in research, development and demonstration (RD&D) over the last five years, and energy research spending in per capita terms has moved above the IEA average (Figure 41).

Ireland has intensified its focus on energy research and development (R&D) and emerges as an innovation and research leader in several crucial clean energy technologies. In total, Ireland has spent more than EUR 200 million in energy R&D between 2007 and 2010 (Figure 42). Despite economic difficulties, Ireland has continued to fund energy RD&D throughout the financial crisis. On a public level, roughly 10% of the national RD&D budget is invested in energy.

This strong increase in RD&D research is the result of a coherent strategy to decarbonise the power sector, in recognition of the associated long-term benefits for Irish society.

Figure 41. **Government RD&D budgets in IEA member countries, 2010**



Note: data are not available for Belgium, France, Luxembourg, Poland and Turkey.

Sources: OECD (2011), and data submitted by the government of Ireland to the IEA.

INSTITUTIONAL FRAMEWORK

Research and innovation policy and funding are under the responsibility of the central government. Energy research and innovation policy is set by the **Department of Communications, Energy and Natural Resources (DCENR)**, working with the **Sustainable Energy Authority of Ireland (SEAI)** and communicated to other government departments and agencies. Energy RD&D is a cross-cutting field that touches upon various sectors and thus affects various government departments and agencies, including:

- the Department of Communications, Energy and Natural Resources;
- the Sustainable Energy Authority of Ireland;
- the Department of Environment, Community and Local Government;
- the Environmental Protection Agency;
- the Department of Transport, Tourism and Sport;
- the Department of Agriculture, Food and Marine Resources;
- the Marine Institute;
- the Department of Enterprise, Jobs and Innovation; and
- the Department of Education, Skills and Science.

Research policy is aligned with the objectives of other related government policies, in particular those regarding enterprise, environment and science/innovation. Continuous co-ordination between all involved departments is important in order to ensure the consistency of RD&D policies and effective funding allocations.

With this in mind, Ireland has set up a more co-ordinated approach to develop its energy-related RD&D activities among relevant departments and state agencies. The Irish Energy Research Council advised in 2008 on national energy research strategy.

The remit of the Science Foundation Ireland (SFI) was extended to sustainable energy and energy-efficient technologies in 2008. SFI supports basic research, where SEAI deals with applied research, development and demonstration, and barriers to implementation. The Foundation is reviewing ways to increase the research capacity in key sustainable energy areas.

SEAI and the Environmental Protection Agency (EPA), in conjunction with University College Cork, have developed long-term modelling capacities and capabilities to support the development of energy strategies and policies.

SEAI uses a broad range of modelling tools, including results from third-party scenarios, to develop insights into current and future energy policy analysis. These include a combination of proprietary and bespoken models of the following families: techno-economic (*e.g.* HERMES); least-cost optimisation models (TIMES/MARKAL); simulation models (as PLEXOS); stock- and physics-based models (such as the bioenergy analysis model); and combined models.

On the basis of these modelling skills, SEAI is publishing national technology roadmaps that provide a clear vision about the future role of sustainable energy technologies in Ireland. Currently, the following roadmaps have been published: Wind Energy, Smart Grid, Electric Vehicle, Ocean Energy, Bioenergy and Residential Energy.

POLICIES AND PROGRAMMES

OVERVIEW OF PROGRAMMES

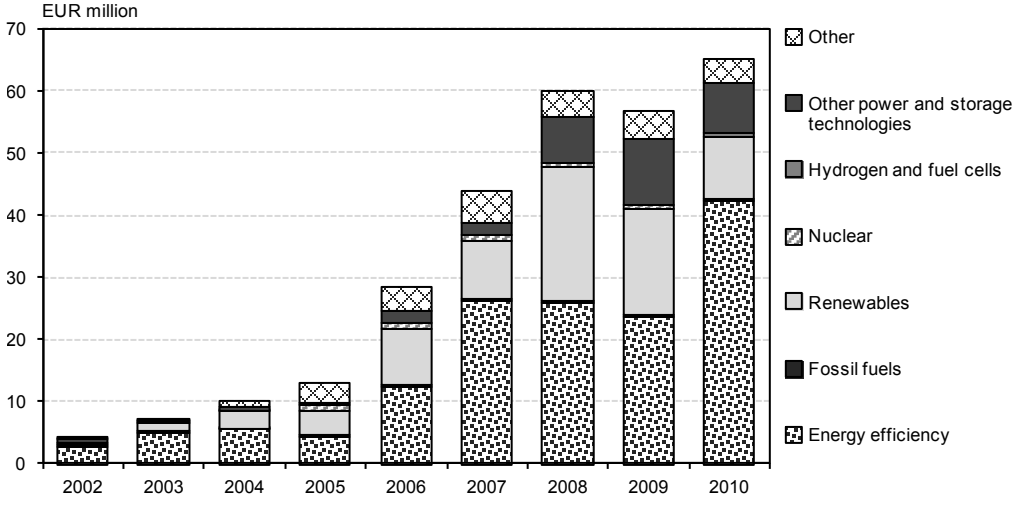
The Irish Energy Research Council in 2008 set out the following research priorities for the short and medium term:

- development of research capacity for energy systems modelling and analysis;
- fundamental frontier and multi-disciplinary research which has the potential to benefit the energy sector;
- energy RD&D in a limited number of sector-specific fields, namely: ocean energy; grid/infrastructure; energy in buildings; energy in transport; and sustainable bioenergy;
- research support in identifying and mapping Ireland's energy resources;
- maintain a "watching brief" for technologies of potential application in Ireland.

A national overall research prioritisation study has been published this year (Research Prioritisation Steering Group, 2012). It identifies marine renewable energy and smart grids and smart cities as key pillars of Irish research priority areas. The prioritisation of the key research areas is based on the following criteria:

- relevance of research field in supporting Ireland to meet its demand needs;
- relevance in addressing challenges of Ireland and similar countries;
- potential to build meaningful programme of further research in a given field from proven research strengths in Ireland; and
- potential of the energy research field to transform public funding into value and to strengthen the competitiveness of Irish energy RD&D on a global market.

Figure 42. **Government RD&D spending on energy, 2002 to 2010**



Sources: government sources.

Irish RD&D policies and programmes are targeting sectors which are crucial in a future sustainable energy system and draw on local resources. In 2010, Ireland allocated more than 90% of its funding to energy efficiency (including smart meters and electric vehicle infrastructure), renewable energies and other power and storage technologies (including transmission and distribution technologies, grid communication, control systems and integration) (Figure 42). Ireland's strategy is aiming to rapidly decarbonise its power and transport sectors while focusing on bioenergy (via a renewable energy feed-in tariff), marine energy, electricity networks and smart grids (via R&D and commercialisation programmes).

Electricity and smart grids

Ireland has a unique electricity system with a single market, transmission and distribution operator, and high penetration of variable renewable energies (mainly wind). Complemented with its relatively small geographical size, its proven record of engaging with international multinational information and communications technology companies (IBM, Cisco, Ericsson, Google), and its strong research infrastructure (University College Dublin's Electricity Research Centre, EPRI, ITOBO, Clarity), Ireland provides unique opportunities for smart grid research, development, demonstration and deployment. Smart grids are supporting the ambitious targets in the deployment of clean generation and end-use technologies, such as variable renewable energies and electric vehicles (Box 11).

Box 11. **What are smart grids?**

A smart grid is an electricity network that uses digital and other advanced technologies to monitor and manage the transport of electricity from all generation sources to meet the varying electricity demands of end-users. Smart grids co-ordinate the needs and capabilities of all generators, grid operators, end-users and electricity market stakeholders to operate all parts of the system as efficiently as possible, minimising costs and environmental impacts while maximising system reliability, resilience and stability.

Ireland is aiming to generate 40% from variable renewable energy sources (mainly wind) by 2020, and is preparing its transmission and distribution networks to accommodate high shares of renewable energies. The *All-Island Grid Study*, undertaken by DCENR and the Department of Enterprise, Trade and Investment in Northern Ireland, demonstrated that such high share of variable renewable energies can be accommodated without compromising security of supply (DCENR and DETI, 2008). The study provided the "public good" evidence which has enabled more specific technical and market studies to be carried out by other stakeholders, and has paved the way for the development of smarter energy infrastructure on the island. Ireland's transmission system operator, EirGrid, is deploying smart grid technologies, including high-temperature, low-sag conductors and dynamic line rating special protection schemes, to manage the high proportion of wind energy on its system and maximise infrastructure effectiveness. The operation of the system is being improved through state-of-the-art modelling and decision support tools that provide real-time system stability analysis, wind farm dispatch capability and improved wind forecasting, and contingency analysis. System flexibility and smart grid approaches are estimated to facilitate real-time penetrations of wind of up to 75% by 2020 (EirGrid and SONI, 2010a).

Extensive investment in Ireland's transmission and distribution system is taking place with a view to providing a solid backbone for an intelligent network system. ESB Networks has announced a EUR 22 billion investment programme in sustainable networks business to 2020. Half of the investments are in renewable energy projects, smart metering and smart networks.

Eirgrid's Grid 25 project outlines the TSO's EUR 3.2 billion plan to improve and "smarten" Ireland's transmission system (EirGrid, 2010). Grid25, as well as offshore grids and other interconnection plans, are exploring possibilities to deliver Irish renewable resources to the European market.

Demand-side management (DSM) enhances system flexibility by enabling operators and consumers to reduce or increase electricity demand and is important for a system largely dependent on variable renewable energy sources. Smart meters and time-of-use pricing are considered essential to achieve DSM. In 2010, ESB Networks launched the pilot phase of the National Smart Metering Programme. The programme encompasses a customer behaviour trial and a technology trial in electricity and gas. The technology trials tested a number of advanced metering systems and their associated information technology and communications infrastructure. The customer trail involves 6 300 users and is one of the largest worldwide. It is designed to determine the potential of smart meters to achieve measurable change in consumer behaviour. The electricity use changed among 82% of participants as a result of the trial. The deployment of a range of time-of-use tariffs in conjunction with demand-side management incentives is found on average to reduce overall electricity use by 2.5% and peak usage by 8.8%. The participants' main motivation to adapt usage was the fact that they realised the potentially positive impact of the tariffs on their bills. The results of this trial, which is unique by the number of customers involved, were fed in directly into a cost-benefit analysis on future deployment. The analysis estimates that smart meter technologies potentially provide a net benefit to customers and to Ireland of up to about EUR 220 million over the next 15 to 20 years. The estimated cost of a national roll-out is currently put in the region of EUR 700 million with the cost to the consumer (via network charges) spread over 20 years. A government decision on a national roll-out of smart metering is expected in 2012 after the consultation process is completed, and a roll-out could be completed by 2018 (CER, 2011f; CER 2011g; CER 2011h).

Ireland is planning the deployment of electric vehicles (EVs) to decarbonise its passenger car sector, and grid integration is a key enabler for EVs. Ireland is putting in place a charging infrastructure and has invited partners within the research community to prepare a successful integration. By the end of 2011, ESB Networks targets to install across Ireland 2 000 home charge units, 1 500 public charge points and 30 fast charge points (ESB, 2012).

Ireland is collaborating with Northern Ireland and Scotland in the Irish-Scottish Links on Energy Study (ISLES) project in order to enable the implementation of significant levels of offshore marine renewable energy. This project, supported by the INTERREG IVA Programme of the European Commission and co-funded by the three governments, is assessing the technical, regulatory legal, economic and environmental requirements for interconnecting by sub-sea cables the grids of the three jurisdictions.

Ocean

Ocean energy is recognised as a large untapped source for renewable electricity generation from tidal or wave energy. Preliminary studies reveal that Ireland has

competitive advantages in ocean energy resources, and ocean energy has therefore been recognised as a research priority. Ireland may have an early-mover advantage as different research projects are developing in this field.

The Irish Ocean Energy Strategy was articulated in 2006 and described in full in the IEA *Energy Policies of IEA Countries: Ireland 2007 Review*. The Ocean Energy Development Unit of SEAI has developed a tailored R&D programme for prototype and test facilities, and research facilities at University College Cork have been significantly enhanced with the establishment of a fully instrumented large wave tank. Based in the University of Cork, the Hydraulics and Maritime Research Centre (HMRC) is a centre of excellence for ocean renewable energy and has expertise in a wide range of engineering backgrounds, notably civil, environmental, electrical and electronic, mechanical, aeronautical, naval and oceanographic engineering. The HMRC offers independent advice and support to developers through model testing, concept design, computer modelling, design performance validation, resource assessments and offshore data recording.

Irish universities and ocean device developers have had significant success in the EU Seventh Framework Research Programme, with projects such as STANDPOINT, CORES, EQUIMAR, ORECCA, MARINA-PLATFORM, and SOWFIA (EU Sixth Framework Programme) attracting some EUR 4.5 million in EU funds since 2007.

Because of the early stage of development and demonstration, Irish and international efforts are likely to be concentrated in a few excellent research facilities, and Ireland has the capacity to lead the international development on ocean energy. Strong potential for joint international work exists in this area.

Bioenergy[54]

Biofuels, along with increased electrification of vehicles and rail travel, are currently deployed as one of the few measures to decarbonise the transport sector. An obligation to use biofuels in transport is in place, although no biofuels are produced in Ireland currently and are thus not contributing to enhance energy security. National efforts to produce locally are investigated, especially because Ireland can draw on its expansive agricultural capacity and favourable climate.

Bord na Móna indicates that biomass accounts for 15% of annual inputs in its generating stations. Furthermore, feed-in tariffs to increase the use of biomass-fired power generation have been introduced, which should further encourage the co-firing of power plants with biomass. Yet detailed research on the environmental implications and an assessment of the national potential, are missing.

Ireland, along with Northern Ireland and Scotland, also participates in the Sustainable Fuels for Marine Biomass (Biomara) INTERREG project. Biomara is researching the potential for energy from marine algae and has become INTERREG's largest-ever energy research project.

The Biorefining and Bioenergy Technology Centre, funded by Enterprise Ireland and the Industrial Development Authority, is an organisation of industry members, academic experts, institutions and government agencies working together to expedite the commercial development of the vast potential of the Irish biomass resource.

54. The term designates sustainable bioenergy and takes into account food production, food chains and food security.

Development of Integrated Biomass Approaches NETwork – "DIBANET" is a project under the EU Seventh Framework Research Programme (EU FP7) co-ordinated by the University of Limerick with an Irish small enterprise and eleven other international partners. The project brings EUR 1.3 million of European Union funding to Ireland. The objective of the project is "The Production of Sustainable Diesel Miscible Biofuels from the Residues & Wastes of Europe & Latin America".

Another EU FP7 project is EBB – "Algae and aquatic biomass for a sustainable production of second generation biofuels". It attracted EUR 60 000 for the Irish Seaweed Centre, at the National University of Ireland in Galway (NUIG) in 2009.

EVALUATION AND FUNDING

Strategy and programme evaluation

Each agency with an energy research programme operates its own evaluation process that follows common guidelines, and progress is measured against key performance indicators by using quantitative and qualitative measures. The new energy research programme of the Science Foundation Ireland incorporates monitoring and evaluation comparable to those of established programmes of other agencies.

The Energy Research Strategy provides the following general recommendations as yardsticks for evaluation during the selection process and later to ensure excellence (Irish Energy Research Council, 2008):

- Funding proposals should be internationally peer-reviewed to the highest practicable standards, while acknowledging the often unique Irish aspect of demonstration and policy projects.
- Specific milestones need to be set for every research project, with a view to assessing whether or not to continue funding a project.
- A strong emphasis, with dedicated funding, should be placed on the ex ante and ex post evaluations of projects. The research dimension of demonstration projects, which can be costly and highly visible, should be clearly spelt out at the proposal stage, and outcomes should be stated explicitly and published.
- The public funding body needs to develop and monitor evaluation indicators, which can include such indicators as the level of peer-reviewed publications, the level of participation at major events, and the number of intellectual property-right applications.
- International collaboration contributes to the pursuit of excellence on the condition that the co-operating international bodies are themselves working to the highest standards in RD&D and have a strong track record.
- Selection priority or public funding should be given to projects if strong European Union or other international linkages and networks exist.

Irish funding agencies' monitoring and evaluation methodology was benchmarked against the National Science Foundation (United States), and found to compare very favourably in terms of good practice.[55]

55. Study visit to Boston College, April 2011.

SEAI is working with the Science Foundation Ireland (SFI), Invest in Ireland, Enterprise Ireland and key institutes to ensure that all state-funded energy R&D is focused on Irish needs. Budgetary constraints, in the context of public expenditure reviews, are an ongoing point of consideration.

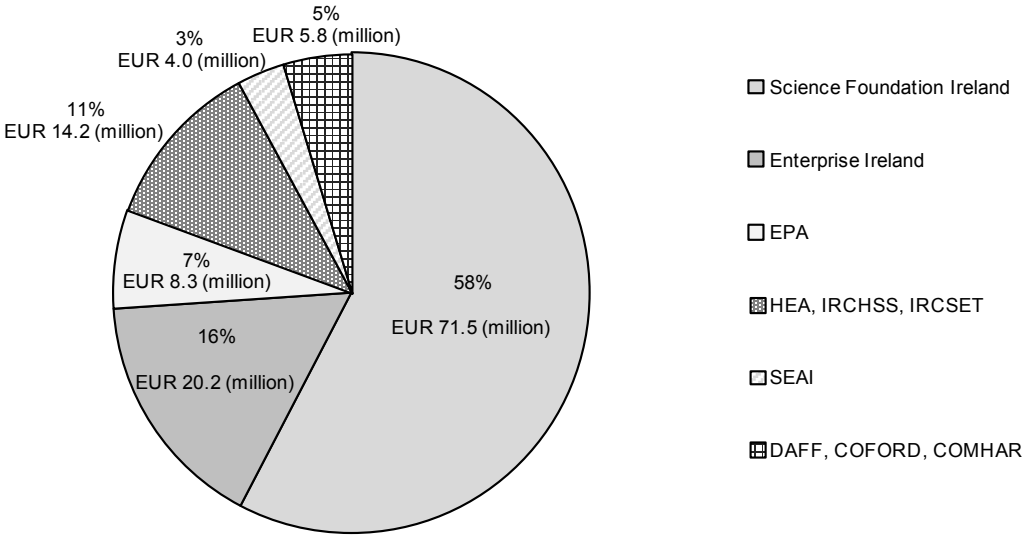
Funding mechanisms and levels

National efforts are co-ordinated by an inter-agency liaison group which is chaired by DCENR. This ensures compliance with high-level multi-annual government plans such as the National Development Plan and the Strategy for Science and Technological Innovation.

The Sustainable Energy Authority of Ireland (SEAI) produces a regular statistical inventory and commentary on RD&D projects and spending. The majority of RD&D funding is accounted for in the budget of the Department of Enterprise, Trade and Innovation, and disbursed through the specific programmes of SFI and Enterprise Ireland (EI). Funding for applied energy research, such as the Ocean Energy Programme, originates within the budget of the DCENR and is disbursed by defined programmes of the SEAI. Environment- and climate change-related energy research funding originates with the Department of the Environment, Community and Local Government and is disbursed through specific programmes of the Environmental Protection Agency. Universities are also supported through the Programme for Research in Third-Level Institutions, a programme of the Higher Education Authority, under the responsibility of the Department of Education and Science. The Science Foundation is by far the largest funding source, with 58% of all public funding between 2004 and 2010 (Figure 43).

The Charles Parsons Energy Research Awards (established in 2006) provide public funding to research groups through the Science Foundation and are aimed to attract more research capacity into energy. These awards enable several smaller research centres to become more viable and develop stronger focus on energy-related research.

Figure 43. **Public energy RD&D funding by source, 2004 to 2010**



Note: Higher Education Authoriy (HEA), Irish Research Council for the Humanities and Social Sciences (IRCHSS), Irish Research Council for Science, Engineering & Technology (IRCSET), Department of Agriculture, Fisheries and Food (DAFF), Council for Forest Research and Development (COFORD).

Sources: SEAI; data submitted by the government of Ireland to the IEA.

Approximately 500 energy research projects were identified in the university sector in Ireland over the 2004-10 period, accounting for EUR 156 million research funding. The sources of this funding came primarily from the Irish government (EUR 128 million), but also the European Union (EUR 18 million), industry (EUR 4 million), other international donors (EUR 2 million) and other non-specified sources (EUR 4 million).

INTERNATIONAL COLLABORATION

Ireland is a research leader in certain key sustainable energy technologies. This development has benefited from international collaboration in areas that are coherent with national energy strategy and targets. Continuous international leadership will help Ireland solidify its role.

Ireland is participating in eight IEA Implementing Agreements:

- Renewable Energy Technology Deployment;
- Wind Energy Systems;
- Ocean Energy Systems;
- Bioenergy;
- Energy Technology System Analysis;
- International Smart Grid Action Network;
- Hybrid and Electric Vehicles; and
- Energy conservation in buildings and community systems.

Ireland is participating in research projects within the framework of the British-Irish Council (BIC). On a European level, Ireland also participates in the steering committee of the European Strategic Energy Technology Plan (SET-Plan) and competitive research programmes of the European Union, including the Seventh Framework Programme and Intelligent Energy for Europe Programme. The Horizon 2020 programme, to be launched in 2014, will be the successor to encompass these programmes. It envisages EUR 6.2 billion for energy RD&D programmes over seven years to 2020 (compared with EUR 2.3 billion in EU-FP7).

PUBLIC-PRIVATE PARTNERSHIPS

Ireland is prioritising energy research by increasing public RD&D funding, but the country needs to continue to develop a strong and collaborative public-private partnership in order to achieve common goals and emerge as a clean technology leader, and consequently benefit the Irish economy and society. Recent efforts to spur private-sector participation in RD&D have focused on the research clusters, operating with a broad cross-section of industry involvement (Sustainable Energy Authority of Ireland, 2011).

The Electricity Research Centre (ERC), founded in 1991, is an industry-university research collaboration, with research driven by the energy industry worldwide, including institutions like University College Dublin (UCD) and Trinity College Dublin (TCD), and companies like Bord Gáis, ESB, Bord na Móna, Eirgrid, Viridian, EPRI, Gaelectric, Cylon, SSE Renewables, and Siemens. The ERC is based in the Electrical Engineering department

of UCD, with an Energy Economics branch housed at TCD. The main areas of research of the ERC are grid integration of renewables, particularly wind power, microgeneration and demand-side management.

The ERC is governed by a board chaired by the Commission for Energy Regulation (CER), and made up of the industry members and representatives from the DCENR, the Economic and Social Research Institute (ESRI) and SEAI. The Electricity Research Centre is funded by industry members, a Science Foundation's Charles Parsons Energy Research Award and other sources, including SFI Principal Investigator, Stokes, TIDA and Research Frontiers Programmes, EU Sixth Framework <Programme, IRCSET, IRCHSS and Teagasc. ERC is the first centre to be nominated as an Energy Strategic Research Cluster, and as such it has received designated funding from the Science Foundation (SFI).

The Advanced Biomimetic Materials for Solar Energy Conversion is funded through the SFI Strategic Research Programme and industry partners SSE Renewables (formerly Airtricity Holdings Ltd), Celtic Catalysts Ltd, and SolarPrint Ltd. Its research analyses materials and synthesis devices that mimic natural photosynthesis in order to produce from sunlight.

I2E2 (Innovation for Ireland's Energy Efficiency) assists manufacturing companies operating in Ireland to reduce, both the cost and the associated environmental impact of their energy usage. I2E2 is an initiative of Enterprise Ireland and of the Industrial Development Authority (IDA), with industry partners Pfizer, Intel, HP, DePuy, Crowley Carbon, Ceramicx, Bombardier, Boston Scientific, Aughinish Alumina, Analog Devices, Xerox and Vistakon.

The International Energy Research Centre (IERC), hosted by the Tyndall Institute at University College Cork (UCC) was recently set up and will focus on the application of ICT to the integration of energy systems. The Department of Enterprise, Jobs and Innovation and DCENR are overseeing, and committing funding to, the establishment of the Centre as part of a commitment of United Technologies to Ireland. The research priorities of the IERC are *i)* Commercial Building Integration of Energy Systems, *ii)* Home Area Networks to drive energy reductions, and *iii)* Smart Energy Networks in Factories.

In 2008, Bord Gáis Éireann (BGÉ) established a EUR 10 million Alternative Energy Research and Development Fund to support emerging energy-related technologies and programmes, including programmes such as the development of fuel cell-based micro combined heat and power (CHP) units by CERES Power; the development of wave energy conversion systems by Wavebob Limited and Pandion Ocean Power Limited; and the design, manufacturing, installation and maintenance of marine turbines by Open Hydro Group Tidal Energy (OHG).

There are currently no reliable estimates on aggregate levels of private energy RD&D funding, which would allow for a comprehensive analysis of private funding over the last years.

CRITIQUE

Ireland is emerging today as a leader in several important clean energy RD&D fields. Energy is viewed as a national priority, and the decarbonisation of the energy system is a point of emphasis. Public funding has roughly quintupled between 2005 and 2008, and pre-crisis 2008 levels of spending have since been maintained throughout the financial crisis. Irish per-capita investment has consequently moved into the higher tier of IEA countries.

The Energy Research Strategy for 2008 to 2013 has led the push for RD&D investments, and clearly identifies priorities for Ireland that draw upon its national resources and

capacities while also expanding Ireland's leading role internationally. On the whole, the national energy RD&D policies are well aligned with the country's energy policy priorities, and good co-ordination among the RD&D community, including within research departments and funding agencies, prevents the duplication of research activities and ensures cost-effectiveness. Ireland should continue to push for closer co-ordination and policy coherence between all implicated departments and agencies, as the consolidated policy co-ordination and alignment of Ireland's energy, environmental and climate change policies would allow for further synergies and provide stronger impetus for successful projects.

Promising results in smart grid RD&D projects, for example, must now be supported by the necessary policies. Although these research projects successfully combine the interests of the grid operator, the regulator and the government, participation of the retailers is missing, despite their essential role in creating a business model for smart grids.

Ireland has successfully developed local research capacity by attracting international companies and pooling national and international researchers. It must continue to leverage this advantage and push for a shift from support for basic research infrastructure to industry-driven research targeting commercialisation.

At present, project RD&D evaluation tools remain very diverse and specific to the funding body. The development of clear RD&D project evaluation metrics would enhance funding efficiency and would be a useful tool to assessing project quality. The use of homogeneous metrics across departments and agencies would facilitate comparability. This approach is recognised by the National Research Prioritisation Steering Group.

Long-term technical and economical analysis is key to supporting an energy strategy. While remarkable progress has been made on medium- and long-term energy modelling capabilities, the focus should now be to ensure that this analysis efficiently supports the needs of policy makers and other stakeholders. The SEAI Technology Roadmaps are a useful tool for supporting policy developments.

Ocean energy research efforts are still at a pre-commercialisation stage, and national efforts need to be concentrated, and international collaboration continued, to accelerate the development of this nascent industry. In this regard, the Marine Energy Research Centre in Cork could be a leading cluster for ocean energy research.

Ireland is strongly supporting biofuel development in general, but specific research in biogas should be further encouraged. Given Ireland's strong level of dependence on natural gas imports, the development and deployment of biogas would be beneficial from both an energy security and an environmental point of view. All bioenergy fuels differ substantially and specific policies are needed. The successful adoption of bioenergy in Ireland will depend on a rigorous understanding of the supply chain limitations for the proposed resource. Engagement with the agricultural and land-planning sector early in the research phase could create synergies and allow for more effective policy developments.

Ireland is collaborating on RD&D projects at regional, European and global levels, and Ireland's participation in international collaborative efforts, including IEA Implementing Agreements, is well aligned with national priorities. Such efforts should be continued, as international platforms for collaboration and exchange are important for further developing and propagating the research results and know-how of RD&D in general, and allow for Ireland to maintain its leading role in certain key fields such as strategic clean energy technologies.

RECOMMENDATIONS

The government of Ireland should:

- *Continue to support RD&D funding in key energy research priority areas*
- *Ensure a fully collaborative approach by Sustainable Energy Authority of Ireland, the Science Foundation Ireland, and all other relevant agencies and institutions for programme development and capacity building.*
- *Develop and apply homogeneous metrics for RD&D project evaluation.*
- *Increasingly use long-term modelling and planning capabilities to develop energy policies.*
- *Pursue world-leading efforts in electricity and smart grids involving government, regulator and grid operator, and enhance participation of retailers to develop smart grid business case.*
- *Concentrate efforts in ocean energy to accelerate development.*
- *Explore potential and strategy for all forms of bioenergy and evaluate their impact on the agricultural sector.*
- *Continue active engagement in international collaboration in RD&D, in particular in IEA Implementing Agreements, aligned with national priorities/.*
- *Optimise future opportunities for Irish energy research under European Union programmes, including Horizon 2020.*

PART IV
ANNEXES

ANNEX A: ORGANISATION OF THE REVIEW

REVIEW CRITERIA

The Shared Goals, which were adopted by the IEA Ministers at their meeting on 4 June 1993 in Paris, provide the evaluation criteria for the in-depth reviews conducted by the IEA. The Shared Goals are presented in Annex C.

REVIEW TEAM

The in-depth review team visited Ireland from 26 to 30 September 2011. The team met with government officials, energy suppliers, interest groups and various other organisations. This report was drafted on the basis of these meetings, the government's initial response to the IEA energy policy questionnaire and several updates to it since the September 2011 review visit, and other information. The team is grateful for the cooperation and assistance of the many people it met during the visit, the kind hospitality and willingness to discuss the challenges and opportunities that Ireland is facing. The team wishes to express its sincere appreciation to the staff of the Department of Communications, Energy and Natural Resources (DCENR), notably Mr. Eamonn Confrey, Ms. Bernie Comey, Ms. Aoife Duggan, Ms. Una Dixon, Ms. Carmel Fields, Mr. Martin Finucane, Mr. Keith Flanagan, Mr. Bob Hanna, Ms. Aoife MacEvilly, Ms. Mairéad McCabe, Ms. Joanne McCormack, Mr. Brian McSharry, Ms. Rebecca Minch, Mr. Bill Morrissey, Mr. Paul Mulqueen, Ms. Aisling Ní Bhradaigh, Ms. Una Nic Giolla Choille, Mr. Kevin O'Brien, Mr. Stjohn O'Connor and Mr. John Rice, for their unfailing helpfulness and dedication throughout the review process. The team is particularly grateful to Ms. Sara White, Deputy Secretary General, for her hospitality and significant personal engagement in briefing the team on energy policy issues, and providing guidance and assistance.

The members of the team were:

IEA member countries

Ms. Toril Svann, Norway (team leader)

Ms. Kristina Heussner, Germany

Mr. Werner Leuthard, Switzerland

Ms. Maria Brooks, United Kingdom

Mr. Sverre Sand, Norway

European Commission

Mr. Tadhg O'Briain

International Energy Agency

Mr. Shinji Fujino

Mr. Georg Bussmann

Mr. Steve Heinen

Mr. Dennis Volk

Mr. James Simpson (desk officer)

James Simpson managed the review and drafted the report, with the exception of the chapter on coal and peat, which was drafted by Georg Bussmann, and the chapter on RD&D, which was drafted by Steve Heinen. Also, Dennis Volk and Tadhg O'Briain drafted important sections in the electricity chapter. Georg Bussmann drafted statistics related sections for most chapters. Kieran McNamara organised the visit, and provided significant expert advice throughout the review and during the drafting process. Many other IEA colleagues have provided helpful comments, including Ingrid Barnsley, Ulrich Benterbusch, Aad van Bohemen, Anne-Sophie Corbeau, Anselm Eisentraut, Jason Elliott, David Elzinga, Greg Frost, Shinji Fujino, David Fyfe, Rebecca Gaghen, Christina Hood, Lisa Ryan, Akihiro Tonai and Robert Tromop.

Georg Bussmann, Bertrand Sadin and Yuichiro Tanaka prepared the figures. Karen Treanton and Alex Blackburn provided support on statistics. Muriel Custodio and Astrid Dumond managed the production process. Angela Gosmann laid out the report. Viviane Consoli and Cheryl Haines provided editorial assistance, and Marilyn Ferris helped in the final stages of preparation.

ORGANISATIONS VISITED

Academy of Engineers

Aughinish

Bord Gáis Éireann (BGE)

Bord na Móna

Commission for Energy Regulation (CER)

Competition Authority

Consumer Association of Ireland

Department of Agriculture

Department of Environment, Community & Local Government

Department of Finance

Department of Public Expenditure & Reform

Department of Enterprise, Jobs and Innovation

Economic and Social Research Institute (ESRI)

Eirgrid

Electricity Supply Board (ESB)

Endesa

Energy Institute

Engineers Ireland

Enterprise Ireland

Environmental Protection Agency (EPA)

Environment Pillar of Social Partnership

ForFas

Gaslink

Industrial Development Authority (IDA)

Irish Business and Employers Confederation (IBEC)

Irish Offshore Operators Association (IOOA)

MERC (Marine Energy Research Centre)

National Competitiveness Council (NCC)

National Consumer Agency

National Electricity Association of Ireland (NEAI)

National Oil Reserves Agency (NORA)

Science Foundation Ireland (SFI)

Shannon LNG

Single Electricity Market (SEM) Committee

Sustainable Energy Authority of Ireland (SEAI)

Sustainable Energy Research Group, University College Cork

Synergen

University College Dublin (UCD)

Tynagh

Viridian

ANNEX B:
ENERGY BALANCES
AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY		1973	1990	2000	2008	2009	2010	2020
TOTAL PRODUCTION		**1.120**	**3.467**	**2.190**	**1.585**	**1.595**	**1.985**	**4.071**
Coal		0.045	0.016	0.031	0.040	0.048	0.044	-
Peat		1.020	1.411	0.965	0.645	0.584	0.995	0.474
Oil		-	-	-	-	-	-	-
Natural Gas		-	1.872	0.958	0.354	0.318	0.316	1.593
Biofuels & Waste[1]		-	0.108	0.141	0.253	0.309	0.330	1.039
Nuclear		-	-	-	-	-	-	-
Hydro		0.055	0.060	0.073	0.083	0.078	0.052	0.053
Wind		-	-	0.021	0.207	0.254	0.242	0.911
Geothermal		-	-	-	-	-	-	-
Solar		-	-	-	0.003	0.004	0.006	-
TOTAL NET IMPORTS[2]		**5.620**	**6.702**	**11.472**	**13.390**	**12.542**	**12.234**	**10.047**
Coal	Exports	0.073	0.024	0.014	0.014	0.010	0.017	-
	Imports	0.578	2.033	1.711	1.704	1.382	1.055	1.139
	Net Imports	0.505	2.009	1.697	1.690	1.372	1.038	1.139
Oil	Exports	0.469	0.675	1.317	1.209	0.935	1.449	-
	Imports	5.917	5.734	9.341	9.711	8.715	8.983	7.014
	Int'l Marine and Aviation Bunkers	-0.337	-0.366	-0.733	-0.994	-0.666	-0.805	-0.590
	Net Imports	5.111	4.693	7.291	7.508	7.114	6.729	6.424
Natural Gas	Exports	-	-	-	-	-	-	-
	Imports	-	-	2.477	4.126	3.963	4.385	2.959
	Net Imports	-	-	2.477	4.126	3.963	4.385	2.959
Electricity	Exports	0.002	-	0.006	0.026	0.015	0.025	0.476
	Imports	0.006	-	0.015	0.065	0.081	0.065	-
	Net Imports	0.004	-	0.009	0.039	0.066	0.040	-0.476
TOTAL STOCK CHANGES		**0.168**	**-0.182**	**0.069**	**-0.019**	**0.265**	**0.179**	**-**
TOTAL SUPPLY (TPES)[3]		**6.908**	**9.988**	**13.730**	**14.956**	**14.402**	**14.397**	**14.118**
Coal		0.565	2.105	1.872	1.584	1.305	1.293	1.139
Peat		1.020	1.368	0.787	0.864	0.900	0.793	0.474
Oil		5.263	4.474	7.394	7.414	7.176	6.910	6.424
Natural Gas		-	1.872	3.435	4.481	4.283	4.695	4.553
Biofuels & Waste[1]		-	0.108	0.141	0.281	0.336	0.367	1.039
Nuclear		-	-	-	-	-	-	-
Hydro		0.055	0.060	0.073	0.083	0.078	0.052	0.053
Wind		-	-	0.021	0.207	0.254	0.242	0.911
Geothermal		-	-	-	-	-	-	-
Solar		-	-	-	0.003	0.004	0.006	-
Electricity Trade[4]		0.004	-	0.008	0.039	0.066	0.040	-0.476
Shares (%)								
Coal		*8.2*	*21.1*	*13.6*	*10.6*	*9.1*	*9.0*	*8.1*
Peat		*14.8*	*13.7*	*5.7*	*5.8*	*6.2*	*5.5*	*3.4*
Oil		*76.2*	*44.8*	*53.9*	*49.6*	*49.8*	*48.0*	*45.5*
Natural Gas		*-*	*18.7*	*25.0*	*30.0*	*29.7*	*32.6*	*32.2*
Biofuels & Waste		*-*	*1.1*	*1.0*	*1.9*	*2.3*	*2.5*	*7.4*
Nuclear		*-*	*-*	*-*	*-*	*-*	*-*	*-*
Hydro		*0.8*	*0.6*	*0.5*	*0.6*	*0.5*	*0.4*	*0.4*
Wind		*-*	*-*	*0.2*	*1.4*	*1.8*	*1.7*	*6.5*
Geothermal		*-*	*-*	*-*	*-*	*-*	*-*	*-*
Solar		*-*	*-*	*-*	*-*	*-*	*-*	*-*
Electricity Trade		*0.1*	*-*	*0.1*	*0.3*	*0.5*	*0.3*	*-3.4*

0 is negligible, - is nil, .. is not available

Forecasts are based on the 2010/2011 submission and refer to baseline scenario forecasts.
Forecast data for solar are included with biofuels and waste.

Unit: Mtoe

DEMAND							
FINAL CONSUMPTION	**1973**	**1990**	**2000**	**2008**	**2009**	**2010**	**2020**
TFC	**5.113**	**7.393**	**10.584**	**12.481**	**11.258**	**11.241**	**11.361**
Coal	0.623	1.138	0.518	0.521	0.466	0.434	0.158
Peat	0.408	0.394	0.115	0.116	0.114	0.111	0.128
Oil	3.553	3.734	6.506	7.755	6.773	6.622	6.424
Natural Gas	-	0.998	1.583	1.563	1.480	1.614	1.455
Biofuels & Waste[1]	-	0.108	0.117	0.229	0.273	0.290	0.904
Geothermal	-	-	-	-	-	-	-
Solar	-	-	-	0.003	0.004	0.006	-
Electricity	0.529	1.021	1.745	2.294	2.147	2.163	2.292
Heat	-	-	-	-	-	-	-
Shares (%)							
Coal	*12.2*	*15.4*	*4.9*	*4.2*	*4.1*	*3.9*	*1.4*
Peat	*8.0*	*5.3*	*1.1*	*0.9*	*1.0*	*1.0*	*1.1*
Oil	*69.5*	*50.5*	*61.5*	*62.1*	*60.2*	*58.9*	*56.5*
Natural Gas	*-*	*13.5*	*15.0*	*12.5*	*13.1*	*14.4*	*12.8*
Biofuels & Waste	*-*	*1.5*	*1.1*	*1.8*	*2.4*	*2.6*	*8.0*
Geothermal	*-*	*-*	*-*	*-*	*-*	*-*	*-*
Solar	*-*	*-*	*-*	*-*	*-*	*0.1*	*-*
Electricity	*10.3*	*13.8*	*16.5*	*18.4*	*19.1*	*19.2*	*20.2*
Heat	*-*	*-*	*-*	*-*	*-*	*-*	*-*
TOTAL INDUSTRY[5]	**1.906**	**2.358**	**3.049**	**2.738**	**2.225**	**2.186**	**2.271**
Coal	0.069	0.248	0.112	0.165	0.112	0.103	0.093
Peat	-	-	-	-	-	-	-
Oil	1.648	0.873	1.320	1.235	0.815	0.876	0.637
Natural Gas	-	0.787	0.853	0.513	0.429	0.467	0.546
Biofuels & Waste[1]	-	0.063	0.100	0.139	0.153	0.150	0.305
Geothermal	-	-	-	-	-	-	-
Solar	-	-	-	-	-	-	-
Electricity	0.189	0.386	0.665	0.686	0.716	0.591	0.690
Heat	-	-	-	-	-	-	-
Shares (%)							
Coal	*3.6*	*10.5*	*3.7*	*6.0*	*5.0*	*4.7*	*4.1*
Peat	*-*	*-*	*-*	*-*	*-*	*-*	*-*
Oil	*86.5*	*37.0*	*43.3*	*45.1*	*36.6*	*40.1*	*28.0*
Natural Gas	*-*	*33.4*	*28.0*	*18.7*	*19.3*	*21.4*	*24.0*
Biofuels & Waste	*-*	*2.7*	*3.3*	*5.1*	*6.9*	*6.9*	*13.4*
Geothermal	*-*	*-*	*-*	*-*	*-*	*-*	*-*
Solar	*-*	*-*	*-*	*-*	*-*	*-*	*-*
Electricity	*9.9*	*16.4*	*21.8*	*25.1*	*32.2*	*27.0*	*30.4*
Heat	*-*	*-*	*-*	*-*	*-*	*-*	*-*
TRANSPORT[3]	**1.129**	**1.641**	**3.435**	**4.526**	**4.113**	**3.914**	**4.679**
OTHER[6]	**2.078**	**3.395**	**4.099**	**5.216**	**4.920**	**5.141**	**4.410**
Coal	0.554	0.890	0.406	0.356	0.355	0.331	0.065
Peat	0.408	0.394	0.115	0.116	0.114	0.111	0.128
Oil	0.776	1.221	1.753	2.052	1.924	1.928	1.529
Natural Gas	-	0.211	0.730	1.050	1.050	1.147	0.909
Biofuels & Waste[1]	-	0.045	0.017	0.037	0.046	0.049	0.218
Geothermal	-	-	-	-	-	-	-
Solar	-	-	-	0.003	0.004	0.006	-
Electricity	0.340	0.634	1.078	1.603	1.428	1.569	1.561
Heat	-	-	-	-	-	-	-
Shares (%)							
Coal	*26.7*	*26.2*	*9.9*	*6.8*	*7.2*	*6.4*	*1.5*
Peat	*19.6*	*11.6*	*2.8*	*2.2*	*2.3*	*2.2*	*2.9*
Oil	*37.3*	*36.0*	*42.8*	*39.3*	*39.1*	*37.5*	*34.7*
Natural Gas	*-*	*6.2*	*17.8*	*20.1*	*21.3*	*22.3*	*20.6*
Biofuels & Waste	*-*	*1.3*	*0.4*	*0.7*	*0.9*	*1.0*	*4.9*
Geothermal	*-*	*-*	*-*	*-*	*-*	*-*	*-*
Solar	*-*	*-*	*-*	*0.1*	*0.1*	*0.1*	*-*
Electricity	*16.4*	*18.7*	*26.3*	*30.7*	*29.0*	*30.5*	*35.4*
Heat	*-*	*-*	*-*	*-*	*-*	*-*	*-*

Unit: Mtoe

DEMAND							
ENERGY TRANSFORMATION AND LOSSES	**1973**	**1990**	**2000**	**2008**	**2009**	**2010**	**2020**
ELECTRICITY GENERATION[7]							
INPUT (Mtoe)	**1.761**	**3.086**	**4.873**	**5.070**	**4.705**	**4.888**	**5.524**
OUTPUT (Mtoe)	**0.632**	**1.224**	**2.036**	**2.572**	**2.404**	**2.445**	**3.090**
(TWh gross)	7.348	14.229	23.673	29.907	27.955	28.434	35.932
Output Shares (%)							
Coal	*1.0*	*41.6*	*28.8*	*17.2*	*14.3*	*14.5*	*10.8*
Peat	*23.9*	*15.8*	*7.5*	*9.2*	*9.4*	*7.9*	*4.1*
Oil	*66.3*	*10.0*	*19.6*	*5.7*	*3.3*	*2.1*	-
Natural Gas	-	*27.7*	*39.1*	*55.9*	*58.3*	*62.3*	*52.3*
Biofuels & Waste	-	-	*0.4*	*0.7*	*0.9*	*1.1*	*1.5*
Nuclear	-	-	-	-	-	-	-
Hydro	*8.8*	*4.9*	*3.6*	*3.2*	*3.2*	*2.1*	*1.7*
Wind	-	-	*1.0*	*8.1*	*10.6*	*9.9*	*29.5*
Geothermal	-	-	-	-	-	-	-
Solar	-	-	-	-	-	-	-
TOTAL LOSSES	**1.674**	**2.244**	**3.392**	**3.227**	**3.001**	**3.068**	**2.734**
of which:							
Electricity and Heat Generation[8]	1.129	1.863	2.837	2.498	2.300	2.441	2.414
Other Transformation	0.357	0.072	0.112	0.177	0.183	0.120	..
Own Use and Losses[9]	0.188	0.309	0.443	0.552	0.518	0.507	0.320
Statistical Differences	**0.121**	**0.350**	**-0.245**	**-0.752**	**0.144**	**0.089**	**0.022**
INDICATORS	**1973**	**1990**	**2000**	**2008**	**2009**	**2010**	**2020**
GDP (billion 2005 USD)	41.96	82.43	159.79	218.48	203.20	202.33	264.09
Population (millions)	3.07	3.51	3.80	4.44	4.47	4.48	5.38
TPES/GDP[10]	0.17	0.12	0.09	0.07	0.07	0.07	0.05
Energy Production/TPES	0.16	0.35	0.16	0.11	0.11	0.14	0.29
Per Capita TPES[11]	2.25	2.85	3.61	3.37	3.22	3.22	2.62
Oil Supply/GDP[10]	0.13	0.05	0.05	0.03	0.04	0.03	0.02
TFC/GDP[10]	0.12	0.09	0.07	0.06	0.06	0.06	0.04
Per Capita TFC[11]	1.66	2.11	2.78	2.81	2.52	2.51	2.11
Energy-related CO_2 Emissions (Mt CO_2)[12]	20.9	29.8	40.9	43.5	39.0	38.7	35.8
CO_2 Emissions from Bunkers (Mt CO_2)	1.0	1.1	2.2	3.0	2.0	2.4	1.8
GROWTH RATES (% per year)	**73-79**	**79-90**	**90-00**	**00-08**	**08-09**	**09-10**	**10-20**
TPES	3.6	1.4	3.2	1.1	-3.7	-0.0	-0.2
Coal	6.9	8.7	-1.2	-2.1	-17.6	-0.9	-1.3
Peat	2.1	1.5	-5.4	1.2	4.2	-11.9	-5.0
Oil	2.3	-2.7	5.2	0.0	-3.2	-3.7	-0.7
Natural Gas	-	13.6	6.3	3.4	-4.4	9.6	-0.3
Biofuels & Waste	-	-	2.7	9.0	19.6	9.2	11.0
Nuclear	-	-	-	-	-	-	-
Hydro	4.3	-1.5	2.0	1.6	-6.0	-33.3	0.2
Wind	-	-	-	33.1	22.7	-4.7	14.2
Geothermal	-	-	-	-	-	-	-
Solar	-	-	-	-	33.3	50.0	-100.0
TFC	4.4	1.0	3.7	2.1	-9.8	-0.2	0.1
Electricity Consumption	5.8	2.9	5.5	3.5	-6.4	0.7	0.6
Energy Production	4.6	8.1	-4.5	-4.0	0.6	24.5	7.4
Net Oil Imports	2.9	-2.3	4.5	0.4	-5.2	-5.4	-0.5
GDP	4.9	3.6	6.8	4.0	-7.0	-0.4	2.7
Growth in the TPES/GDP Ratio	-1.3	-2.1	-3.4	-2.9	4.4	-	-2.9
Growth in the TFC/GDP Ratio	-0.6	-2.4	-3.1	-1.8	-3.5	1.8	-2.6

Please note: Rounding may cause totals to differ from the sum of the elements.

Footnotes to Energy Balances and Key Statistical Data

1. Biofuels and waste comprises solid biofuels, liquid biofuels, biogases and municipal waste. Data are often based on partial surveys and may not be comparable between countries.
2. In addition to coal, oil, natural gas and electricity, total net imports also include peat and biofuels.
3. Excludes international marine bunkers and international aviation bunkers.
4. Total supply of electricity represents net trade. A negative number in the share of TPES indicates that exports are greater than imports.
5. Industry includes non-energy use.
6. Other includes residential, commercial, public services, agriculture, forestry, fishing and other non-specified.
7. Inputs to electricity generation include inputs to electricity and CHP plants. Output refers only to electricity generation.
8. Losses arising in the production of electricity and heat at main activity producer utilities and autoproducers. For non-fossil-fuel electricity generation, theoretical losses are shown based on plant efficiencies of approximately 100% for hydro and wind.
9. Data on "losses" for forecast years often include large statistical differences covering differences between expected supply and demand and mostly do not reflect real expectations on transformation gains and losses.
10. Toe per thousand US dollars at 2005 prices and exchange rates.
11. Toe per person.
12. "Energy-related CO_2 emissions" have been estimated using the IPCC Tier I Sectoral Approach from the *Revised 1996 IPCC Guidelines*. In accordance with the IPCC methodology, emissions from international marine and aviation bunkers are not included in national totals. Projected emissions for oil and gas are derived by calculating the ratio of emissions to energy use for 2010 and applying this factor to forecast energy supply. Future coal emissions are based on product-specific supply projections and are calculated using the IPCC/OECD emission factors and methodology.

ANNEX C: INTERNATIONAL ENERGY AGENCY "SHARED GOALS"

The member countries* of the International Energy Agency (IEA) seek to create conditions in which the energy sectors of their economies can make the fullest possible contribution to sustainable economic development and to the well-being of their people and of the environment. In formulating energy policies, the establishment of free and open markets is a fundamental point of departure, though energy security and environmental protection need to be given particular emphasis by governments. IEA countries recognise the significance of increasing global interdependence in energy. They therefore seek to promote the effective operation of international energy markets and encourage dialogue with all participants. In order to secure their objectives, member countries therefore aim to create a policy framework consistent with the following goals:

1. Diversity, efficiency and flexibility within the energy sector are basic conditions for longer-term energy security: the fuels used within and across sectors and the sources of those fuels should be as diverse as practicable. Non-fossil fuels, particularly nuclear and hydro power, make a substantial contribution to the energy supply diversity of IEA countries as a group.

2. Energy systems should have **the ability to respond promptly and flexibly to energy emergencies.** In some cases this requires collective mechanisms and action: IEA countries co-operate through the Agency in responding jointly to oil supply emergencies.

3. The environmentally sustainable provision and use of energy are central to the achievement of these shared goals. Decision-makers should seek to minimise the adverse environmental impacts of energy activities, just as environmental decisions should take account of the energy consequences. Government interventions should respect the Polluter Pays Principle where practicable.

4. More environmentally acceptable energy sources need to be encouraged and developed. Clean and efficient use of fossil fuels is essential. The development of economic non-fossil sources is also a priority. A number of IEA member countries wish to retain and improve the nuclear option for the future, at the highest available safety standards, because nuclear energy does not emit carbon dioxide. Renewable sources will also have an increasingly important contribution to make.

5. Improved energy efficiency can promote both environmental protection and energy security in a cost-effective manner. There are significant opportunities for greater energy efficiency at all stages of the energy cycle from production to consumption. Strong efforts by governments and all energy users are needed to realise these opportunities.

6. Continued **research, development and market deployment of new and improved energy technologies** make a critical contribution to achieving the objectives outlined above. Energy technology policies should complement broader energy policies. International co-operation in the development and dissemination of energy technologies, including industry participation and co-operation with non-member countries, should be encouraged.

7. Undistorted energy prices enable markets to work efficiently. Energy prices should not be held artificially below the costs of supply to promote social or industrial goals. To the extent necessary and practicable, the environmental costs of energy production and use should be reflected in prices.

8. Free and open trade and a secure framework for investment contribute to efficient energy markets and energy security. Distortions to energy trade and investment should be avoided.

9. Co-operation among all energy market participants helps to improve information and understanding, and encourages the development of efficient, environmentally acceptable and flexible energy systems and markets worldwide. These are needed to help promote the investment, trade and confidence necessary to achieve global energy security and environmental objectives.

(The Shared Goals were adopted by IEA Ministers at the meeting of 4 June 1993 Paris, France.)

*Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Luxembourg, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States.

ANNEX D: GLOSSARY AND LIST OF ABBREVIATIONS

In this report, abbreviations and acronyms are substituted for a number of terms used within the International Energy Agency. While these terms generally have been written out on first mention, this glossary provides a quick and central reference for many of the abbreviations used.

bcm	billion cubic metres
BGÉ	Bord Gáis Éireann, the natural gas incumbent
CCS	carbon capture and storage
CHP	combined heat and power production
DCENR	Department of Communications, Energy and Natural Resources
DSO	distribution system operator
EI	Enterprise Ireland
EPA	Environmental Protection Agency
ERC	Electricity Research Centre at University College Dublin
ESB	Electricity Supply Board, the state-owned electricity incumbent
ETS	Emissions Trading Scheme
FP7	Seventh European Union Framework Research Programme
GHG	greenhouse gas
GW	gigawatt, or 1 watt x 10^9
GWh	gigawatt-hour
HMRC	Hydraulics and Maritime Research Centre at University College Cork
IDA	Industrial Development Authority
kb	thousand barrels
kt	thousand tonnes
kV	kilovolt, or 1 volt x 10^3
kW	kilowatt, or 1 watt x 10^3

LNG	liquefied natural gas
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
mcm	million cubic metres
Mtoe	million tonnes of oil equivalent
MW	Megawatt
MWh	Megawatt-hour
NEEAP	National Energy Efficiency Action Plan
NORA	National Oil Reserves Agency, the stockholding agency
NREAP	National Renewable Energy Action Plan
PPP	purchasing power parity; the rate of currency conversion that equalises the purchasing power of different currencies, *i.e.* estimates the differences in price levels between different countries
PSO	public service obligation
RD&D	research, development and demonstration
SEAI	Sustainable Energy Authority of Ireland
SEM	single electricity market
SFI	Science Foundation Ireland
SMEs	small and medium-sized enterprises
SONI	system operator Northern Ireland
TAO	transmission asset owner
TFC	total final consumption of energy
TPES	total primary energy supply
TSO	transmission system operator
TWh	terawatt-hour, (TW = terawatt, or 1 watt x 10^{12})

ANNEX E: REFERENCES

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PRINTED IN FRANCE BY SOREGRAPH, JULY 2012
(61 2012 03 1P1) ISBN: 9789264171466