



EUSUSTEL
European Sustainable Electricity; Comprehensive Analysis of
Future European Demand and Generation of European
Electricity and its Security of Supply

WP1: Country-wise analysis for EU-25

The case of
IRELAND

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DRAFT REPORT

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Geographical description

Ireland is the most northwesterly member state of the European Union and covers an area of 70 273 km². It shares a northern border with Northern Ireland (UK), but is otherwise surrounded by the Atlantic Ocean and the Sea of Ireland. Its temperate maritime climate is influenced by the North Atlantic Current. The terrain mainly consists of plains surrounded by hills and low mountains (Department of Public Enterprise 1999;IEA 2003;Wikipedia 2005).

Demographics

Ireland's population was approximately 3.9 million people in 2003, with a population density of around 56 people per square kilometre. The population is heavily concentrated around Dublin with slightly more than one million residents in this area. The rest of the country is sparsely populated (IEA 2003). In 2002 there were 1,287,958 households, and the average number of persons per household was approximately 2.9 (CSO Ireland;European Commission 2003;Wikipedia 2005).

Economy status

During the decade 1990-2000 Ireland experienced an impressive average annual GDP growth rate of 7.2%. From 2000 to 2003 the average GDP growth rate slowed to 5.3%. Ireland's GDP was 24,500 € per capita in 2004 (estimated, purchasing power parity) (Sustainable Energy Ireland 2005). The Irish unemployment rate for year 2004 was 4.6%. The reported labour force for the year 2004 is 1 920 300 people which is approximately 48% of the total population.

Table 1. Percentage of Labour force and GDP by sector for year 2002

	Labour force by occupation (%)	GDP by sector (%)
Services	64	49
Industry	29	46
Agriculture	8	5

The GDP of the country counts for slightly more than 1% of the total of the EU countries (Wikipedia 2005).

Energy

Domestic Production and Reserves

Ireland does not have any domestic oil production. In 2000 oil and oil products accounted for 56.5% of the Total Primary Energy Supply (TPES), while in 1996 this percentage was 50.4%. The annual growth rate of oil supply between this period was 5.4% (IEA 2003).

On the contrary, gas exploration and production has been underway in the Irish territories since 1979 from the Kinsale Head field. As the Kinsale Head field is depleting, a smaller field, the Seven Heads is being exploited and could supply 10% of the country's gas demand. Additionally, the Corrib field, with reserves between 22.6 Mtoe ($949.2 \cdot 10^3$ TJ) to 28.3 Mtoe ($1188.6 \cdot 10^3$ TJ), is planned to provide quantities beginning from 2005 such that 70% of the country's needs can be met by domestic production during 2005 and 2008.

Peat is an indigenous source of energy that is produced and consumed domestically. Its production is strongly dependent on weather conditions and varies from year to year (IEA 2003).

Imports/exports

The vast majority of oil imports until 2000 were from Norway. This changed the following year and the UK became the main oil provider of Ireland.

The decreased gas production from the Kinsale Head field has led to gas imports from the UK using two undersea gas pipelines connecting the two countries. The first interconnector has been in commercial use since 1993 and in 2001 it supplied 82% of the country's needs. The second interconnector, built to satisfy the rapid Irish economic growth needs, was expected to come on line from late 2002. However, domestic demand was lower than projected, and operation commencement is not due until at least 2005 (IEA 2003).

Final energy use by sector and fuel

Government sources (Sustainable Energy Ireland 2004c) indicate that between the years 1980 and 1998 the Total Primary Energy Requirements (TPER) grew by 58%. The overall energy consumption between 2002 and 2003 remained at the levels of 2001 despite economic growth of 10% during that period. The estimates for 2010

show a *further* 37% TPER increase over 1980 levels (Department of Public Enterprise 1999; Sustainable Energy Ireland 2005).

The dominant energy source is **oil** which in 1990 accounted for 46% of the TPER and increased to a peak of 59% of TPER in 1999. In 2003 the oil consumption decreased by 3.2% accounting for almost 54% of the TPER (Sustainable Energy Ireland 2004a). The main use of oil is in the transport sector which accounted for 56% Total Final Consumption (TFC) in 2000. Projections for future growth of the transport sector are 45% by 2010 over 1998 levels (Department of Public Enterprise 1999). The residential sector, as well as the industrial one, consumed 13% of oil TFC in 2000. During the decade 1990-2000 the annual growth of oil consumption in the residential sector was 9.3%, while for the same period the industrial growth rate for oil consumption was 3.5% (IEA 2003). The estimated increase in final energy use in the residential and industrial sectors is significant, at almost 32% (combined with the agriculture sector) and 45% respectively compared to 1998 levels (Department of Public Enterprise 1999).

The contribution of **natural gas** to the TPER since the beginning of the eighties has been consistently and significantly increasing. Gas consumption growth has reached 25% of the TPES in 2003 from 15% in 1990 and is expected to rise to 30% in 2010 (Department of Public Enterprise 1999; Sustainable Energy Ireland 2004a). This rapid growth is mainly due to its use in the electricity sector – 13.9% increase in 2003 alone and 150% increase by 2010 over the 1998 levels expected. This increase appears to be driven by the relative price of the fuel and its lower carbon emissions compared to the other fossil fuels. The residential sector also presented an important increase in gas consumption in 2003 (13.3% of total gas consumption increase) (Department of Public Enterprise 1999; Sustainable Energy Ireland 2005).

Coal use increased during the period 1985-1987 from 1% to 39% caused primarily by its contribution in the electricity sector. Its overall contribution to TPER from 23% in 1990 reduced to 16% in 1998 and 13% in 2000, expected to keep falling by 2010 to the level of 11%. The future of coal is mainly dependent on the Moneypoint 915 MW power plant. (Department of Public Enterprise 1999; Sustainable Energy Ireland 2005).

Peat, in 1980, contributed 15% to the TPER and since then this percentage is constantly falling. For 2003 it was almost at 5.7% and the projection for 2010 is 4%. The combustible renewables, mostly wood, hold a constant 2% of TPER which is expected to reach 3% by 2010 (Department of Public Enterprise 1999; Sustainable Energy Ireland 2005).

Renewable sources saw a significant increase by 9% in 2003 due to a 35% increase in hydro power output over the 2002 levels. From 1990 to 2003 the overall growth reached 54% (3.4% annually), so that their share in the TPES is around 1.8% (Sustainable Energy Ireland 2005).

Electricity

General

At approximately 5GW, Ireland has the second smallest installed electricity generation capacity of any EU country (after Luxembourg). The Electricity Supply Board's (ESB) installed capacity consists of 295 MW peat, 512 MW of pumped and regular hydro, 915 MW coal, 860 MW oil, 640 MW gas, and 1286 MW of oil and gas fired generation. The *Electricity Regulation Act 1999* stipulates that nuclear power cannot be used for electricity generation in Ireland (IEA 2003). From 1990-2000 the annual increase of the peak demand was 4% (from 2.6 GW in 1990 to 3.84 GW in 2000). The ESB, which in 2000 possessed more than 85% of the country's generation capacity, has a total of 4.5 GW of installed capacity, which is slightly more than the 4.4 GW peak demand record in January 2003 (IEA 2003). The Department of Public Enterprise estimates that the electricity demand by 2010 will be 65% greater than that of 1998 (Department of Public Enterprise 1999).

Irish consumption of electrical energy is constantly rising. During the decade 1990-2000 the annual growth in electricity consumption was 5.4%, almost double the average of the OECD countries. In 2000 electricity consumption was approximately 72 864 GJ (20.24 TWh) (IEA 2003). According to the IEA (IEA 2003) the primary components of electricity consumption are industry (38%), residential (34%), and commercial (27%).

The contribution of each primary energy source to the fuel mix for electricity generation from 1980 to 2010 is displayed in Figure 1. From 1990 onwards there has been continuous growth of natural gas use, an increase in renewable generation and a reasonably constant level of coal-fired generation. On the contrary, peat and oil are losing their shares after 2005 and 2000 respectively. According to the Green Paper on Sustainable Energy (Department of Public Enterprise 1999), estimated natural gas use for electricity generation will dominate the fuel mix by 2010, accounting for almost 56%.

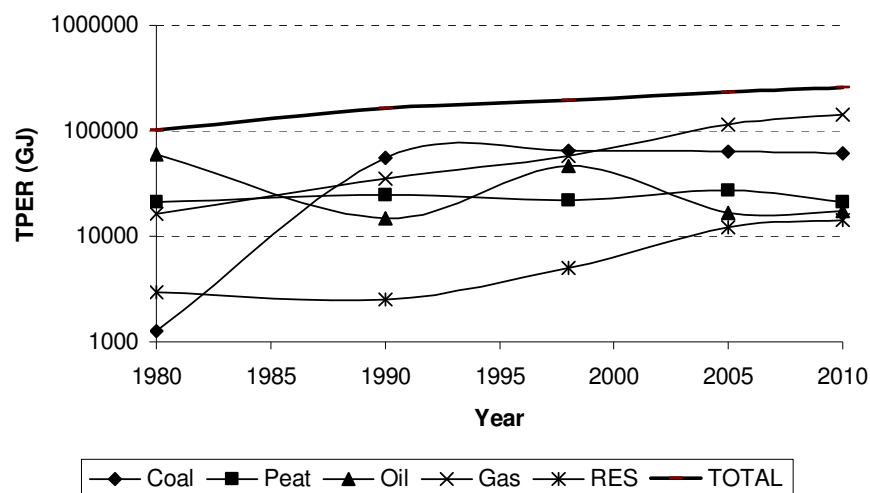


Figure 1. Fuel Mix 1980-2010

(Department of Public Enterprise 1999)

The transmission network is reinforced by an interconnection with the Northern Ireland's network which in 2001 was upgraded from 2x300 MW to 2x600 MW of nominal capacity. However, transmission constraints around the interconnectors severely limited the actual export/import possible in 2003 (IEA 2003). An interconnector with Wales (UK) of 500 MW capacity is under consideration, and if agreed could be complete between 2007 and 2009 (IEA 2003). Transmission and distribution losses in Ireland account for 1-2% in high voltage transmission and 6-8% in distribution network (Department of Public Enterprise 1999).

Renewables

The renewables installed capacity in Ireland in June 2005 was around 664.7 MWe (of which 223.6 MWe from large hydro and 378 MWe from on-shore wind). Biomass accounts for a small share of renewable capacity with only 4% (Department of Communications 2005). The contribution of renewables in TPER has slightly increased from 1.8% in 1990 to 1.9% in 2002. The actual absolute increase is well hidden behind the overall significant growth of the TPER especially during 1998 and 2001 (Sustainable Energy Ireland 2004c).

The Alternative Energy Requirement (AER) competition has set a target of installed capacity of 31 MW per annum between 2000 and 2010. This target has been updated such that by 2005 the renewable installed capacity should have reached 500 MWe over the 2000 levels, but the time limit has been moved to 2007 in the AER V and AER VI. The bulk of this capacity will come from wind turbines (Department of Public Enterprise 1999; Sustainable Energy Ireland 2004c).

Environmental issues

The energy efficiency level in power production in 2003 has been significantly increased to 40.4% from approximately 33% in 1990. This was due to a number of reasons, including the introduction of generation capacity using CCGT technology, the general increase of gas usage in fuel mix, and imports of electricity. This had direct effect in carbon intensity of generated electricity (kg of CO₂ emissions per kWh of generated electricity) which was reduced by almost 30% in 2003 compared to 1990 levels (Sustainable Energy Ireland 2005).

Due to the rapid economic growth described earlier, in 1997 the Kyoto targets (under the EU Burden Sharing Agreements) of an increase of 13% by 2008-2012 compared to 1990 levels for emissions abatement were overshoot, and by 2000 were 24% above 1990 levels (IEA 2003). In 2003 the CO₂ equivalent emissions had a slight reduction of 1.3% compared to the previous year. The share in Greenhouse Gas (GHG) emissions related to power generation in 2003 was 66% while in 1990 was 58%, but the tendency (as data for 2002 and 2003) show is for the reduction of these electricity related emissions (Sustainable Energy Ireland 2005).

An important factor is the relation between the carbon emissions related to the energy sector, the GDP and the TPER. Figure 2 indicates substantial decoupling of energy consumption from economic growth and a slight reduction in carbon intensity of energy supply.

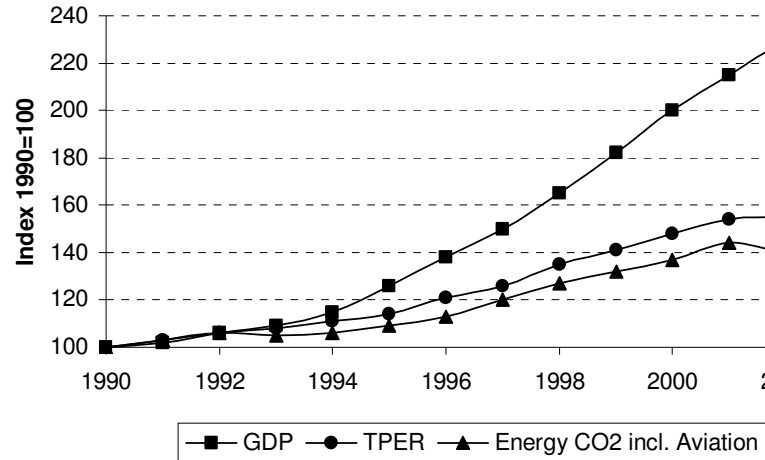


Figure 2. Index of Gross Domestic Product, TPER and Energy-related CO₂
(Energy in Ireland 1990-2003)

Policy issues

General

Policy concerning the energy sector and the environment are very closely related. Targets for Greenhouse Gas emissions reduction are focused primarily on the energy sector, which is responsible for the majority of the total emissions. Ireland has ratified the Kyoto Protocol agreement which has set the targets for GHG emissions control by 2008-2012. These targets require Ireland to reduce CO₂ equivalent emissions by 7 million tones of CO₂ per year by the commitment period (Department of Public Enterprise 1999). However, according to the 'Burden Sharing Agreement' among EU countries, Ireland's GHG emissions are permitted to be 13% over those in 1990, because it has been recognised that Ireland's economy is rapidly developing and it will have an associated increase in carbon emissions (Sustainable Energy Ireland 2004b).

Another relevant policy related issue is the Demand Side Management (DSM) program that the ESB implemented from 1976 to 1993. The shortage of capacity, the high generation costs and the difficulties in primary energy imports were the justification for this program. The three instruments of DSM were: (a) *changes in price structure*, (b) *incentives* and (c) *information programs*. At the end of the implementation period it became apparent that the impacts of the program were more long- than short-term, and that the energy consuming habits of the households became more eco-friendly. The program saved an estimated 7% of energy consumption. This fact shows that with the right incentives for the utilities, the customer information programs can have remarkable results (Dulleck & Kaufmann 2004).

Energy and electricity

Along with the environmental concerns and the emissions targets, the Irish Government has set three aims to achieve in its energy policy: **Energy Security**,

Environmental Protection and Economic Growth. The objectives to achieve these aims have to do with the *energy market reform*, the *improvement of energy infrastructure* and the *sustainability*. The responsible bodies for the formulation and implementation of the energy policy are (a) the *Department of Communications, Marine and Natural Resources* (DCMNR), (b) the *Commission for Energy Regulation* (CER) and (c) *Sustainable Energy Ireland* (SEI)

The main market reforms of the energy sector were the opening of the market for competition and the establishment of an independent regulatory body for electricity and gas (CER).

CER's responsibility is to provide authorisation for the building of new power plants and for the regulation of electricity suppliers. CER regulates the overall operation, maintenance and upgrade of the transmission and distribution network, and the arrangement of the tariffs for third-party access to the network. However the final decision for all these issues is taken from the minister of the DCMNR. From 2002 according to the *Gas Act 2002*, CER has also taken over the regulatory responsibilities for the gas market.

The SEI mainly deals with the promotion of energy efficiency and renewable energy policies.

The gas market reform has started in 1995 with the *Energy Act 1995*. Since then, with the *Gas Act 2000* and more recently the *Gas Act 2005*, the market is gradually opening. The percentage of market opening as at January 1st, 2003 was 85% and in 2005 the market is expected to be fully liberalised. The customers have the right to switch gas supplier (it is estimated that by the end of 2002 20-30% of the eligible customers for switching had used their right to do so) and furthermore private pipeline developers (other than the BGE – the state owned gas transmission and distribution company) are able to build and operate their own pipelines (CER 2005; IEA 2003).

The electricity sector has also been undergoing a process of reform. The *Electricity Regulation Act 1999* was the initial step for the sector's reform. First of all, the creation of CER as the independent regulator supported the market opening and supplier switching (which gradually gave the right to 'eligible' customers to change their electricity supplier). According to the CER every customer will have the right to switch supplier from 2005. 'Green' electricity from renewables and CHP plants enjoyed the free market even earlier, from February 2000. The 'green electricity customers' who wish to use green electricity had the right to choose their supplier according to the *Electricity Regulation Act 1999*. The Alternative Energy Requirement competitions (from I to VI) launched by the Government targeted the increase of renewables in the energy mix. Some instruments provided by the Alternative Energy Requirement competitions were tax incentives for investing in renewables and the obligatory purchase of the green electricity by the ESB at a fixed price (Sustainable Energy Ireland 2004c).

Furthermore, other very important changes for the reform were the establishment of an independent Transmission System Operator (TSO) and the simultaneous unbundling of the ESB (state owned electricity company). The TSO holds the responsibility to operate, develop and ensure the maintenance of the transmission

network, but the transmission owner (now the ESP but from very shortly the EirGrid) carries out the construction and maintenance works. (CER 2005;IEA 2003).

Environment

The environmental concerns in the global scene are strongly attached to the energy consuming rates of economies. Ireland is no exception, with economic growth over the last 15 years posing concerns regarding the way the country should meet the Kyoto Protocol targets. As previously stated, the Kyoto threshold for Greenhouse Gas emissions has been overshoot since 1997. The National Climate Change Strategy (NCCS) which sets a 10-year strategy for meeting the Kyoto targets was initiated by the Government in 2000. The NCCS includes cross-sectoral and sector-specific measures. The cross-sectoral measures are *taxation* and *international emissions trading*.

Carbon taxes are described by the NCCS as a way to identify the least expensive way to reduce the CO₂ emissions and in the same time as a fair way of introducing the different sectors of the economy to carbon abatement. However, the NCCS is concerned about the effects of any new taxation in the Irish economy.

These concerns, affected the postponement of the tax impose which finally resulted to abandonment of the carbon tax in mid-2004. The Department of Finance in September 2004 announced that a carbon tax will not help significantly to the carbon emissions abatement. On the contrary, it can easily be replaced by other more efficient ways of doing so, such as the energy efficiency measures (Department of Finance 2004).

International emissions trading (within the EU but also with other international players) is supported by the Department of Environment and the NCCS as a complementary means of reducing carbon emissions. In addition, the ESB and the industry also favour this strategy, as it is considered to be the less costly one (IEA 2003).

Future policy

Ireland has a small and relatively isolated energy market. Historical and future policy is dominated by energy security, competition concerns, and Kyoto burden sharing agreement targets.

A decision has recently been taken to extend the service life of the 915 MW Moneypoint coal-fired power station, thus improving Ireland's energy security, but seriously undermining the strength of the NCCS, which suggested Moneypoint's decommissioning in order to provide 22% of total GHG emissions reductions. Even with the extension of Moneypoint's life, Ireland faces energy security concerns due to a steadily increasing share of natural gas in the fuel mix. Therefore, diversification of energy sources, particularly towards renewables, and location of secure sources of natural gas are high policy priorities. In addition to these fuel mix concerns, Ireland's rapid economic development and coincident increase in energy demand have left the system strained and requiring capacity investment in the short term.

The possibility of Nuclear energy does not appear to be under consideration. The 1971 Carnsore reactor development never proceeded due to public opposition, and the site has now been used for wind energy development.

Barriers to competition are also perceived to be a continuing policy issue. The ESB owned around 85% of electricity generation capacity in 2003, giving it a high level of market power (IEA 2003). ESB also owns a supply business, and the transmission and distribution networks. It operates the distribution networks. Overall the electricity market in Ireland is dominated by the company, and it is anticipated that continuing international pressure to alleviate ESB's market power and encourage new market entrants will continue in the future.

Ireland's targets under the Kyoto agreement (and EU burden sharing agreement) were a 13% increase in GHG emissions by the commitment period over 1990 levels. In 2001 Ireland emitted 24% over 1990 levels, and business-as-usual scenarios projected approximately GHG emissions 37% above 1990 levels by the commitment period. Although it is unclear what impact the NCCS will have on the business-as-usual scenario, it is clear that Ireland faces a GHG-related challenge that will continue to be a policy driver.

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