Electricity Benchmarking Analysis and Policy Priorities

December 2007

Forfás

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Executive Summary

Promoting energy production and consumption patterns that are environmentally sustainable, economically competitive and secure is a challenge that has moved to the top of the political agenda across the globe and is central to any discussion of national competitiveness. Cost competitiveness remains critical to ensuring that Irish companies have the ability to compete in international markets. Energy is a key input to enterprise production activities. Ireland's ability to continue attracting high levels of foreign direct investment and to provide a supportive environment for Irish industry generally will depend on its capacity to deliver a secure and sustainable energy supply at a competitive cost.

This report assesses Ireland's comparative performance across key electricity indicators in terms of cost competitiveness, security of supply and environmental sustainability. It also focuses on the policy issues that need to be addressed to enable Ireland to deliver a competitively priced, secure and environmentally sustainable supply of energy. This work builds on the 2006 electricity benchmarking analysis.

Key Findings

- The increase in electricity demand in Ireland in recent years has been among the highest in the OECD due to strong economic and population growth. Electricity demand grew by 4.5 percent in 2006, which is the equivalent of a new 400 MW generation plant being absorbed every two years. It is notable however that the actual energy intensity of industry has decreased by 43 percent over the period 1990-2005. Changes in the structure of Irish industry and progress in improving energy efficiency are the main factors driving that decline.
- The rate of increase in industrial electricity prices (excluding VAT but including other taxes) in Ireland between January 2001 and January 2007 was almost twice that of EU-15. Industrial electricity prices in Ireland were the second highest of the EU-25 as of January 2007. Industrial electricity prices were 18.7 percent above the EU-15 average in January 2007 compared to 16.7 percent in 2006. Irish industrial prices were 15.5 percent more expensive than those in the UK in 2007, 59.3 percent more expensive than Denmark and almost double those in France. Only Italy had higher industrial electricity prices (18.9 percent above Ireland) in 2007.
- The Commission for Energy Regulation (CER) announced electricity price reductions of between 2.3 percent and 8.4 percent for SMEs, which came into effect on 1st November 2007.
- Maintaining security of supply in the short to medium term will be a significant challenge. In the short term, increased uncertainty around the availability of some older generating plants could lead to tight but manageable capacity margins during the winter 2007 peak period. For the period 2008-2010, significant improvements in the availability performance of generating plant from the current low level of 77 percent is critical to avoid generation capacity deficits.
- On a per capita basis, Ireland had the second highest CO_2 emissions of the EU-15 in 2005. Although there has been an improvement in the levels of CO_2 emissions per capita between 2000 and 2005, which declined by 2.3 percent, total carbon emissions in Ireland actually increased by 5.4 percent. Emissions increased by 3.8 percent across the EU-15 between 2000 and 2005.

- In 2005, the latest date for which comparable data is available, Ireland had the eighth highest renewables' share in electricity generation of the 13 benchmarked countries in this report. Renewables' contribution to electricity generation has continued to grow strongly, increasing to 8.6 percent in 2006 from 4.8 percent in 2005.

Conclusions and Recommendations

Addressing Ireland's energy issues, and in particular the comparatively higher prices of electricity, is critical for enterprise development. The Government's Energy White Paper sets out actions that will, if implemented in full and within the proposed timeframes, go a long way towards providing Irish businesses with a competitively priced, secure and environmentally sustainable supply of energy. The International Energy Agency (IEA), in its review of the Irish energy market in July 2007, broadly endorsed the direction of energy policy set out in the White Paper but stressed the importance of implementation of the proposed actions.

The main areas highlighted by the benchmarking analysis that need to be addressed to improve Ireland's performance across all three energy pillars and support the development of an electricity market that meets the needs of enterprise are discussed in detail in Section 4. They are:

- Restoring cost competitiveness;
- Improving generation adequacy;
- Ensuring diverse sources of electricity supply;
- Providing adequate regional capacity;
- Improving energy efficiency; and
- Energy policy planning for the longer term.

While a number of factors that affect Ireland's performance are outside its direct control, such as global fuel price volatility, there are a number of areas where Ireland can act to improve its performance and support the development of an electricity market that meets the needs of enterprise. The key milestones in the Energy White Paper of greatest importance for enterprise competitiveness are listed overleaf (Table I). It is essential that these initiatives are delivered on schedule.

Table I: Key Milestones in the Energy White Paper

Key Milestones	Expected Delivery Date
All-island strategy for grid development and Liquefied Natural Gas (LNG) storage	End 2007
Full ownership unbundling of the transmission network	End 2008
Development of a landbank of State owned sites	End 2008
Completion of new generation capacity[1] ▪ Aghada (430 MW) and Whitegate (400 MW)	 ▪ 2009 and 2010
Additional Interconnectors ▪ North-South (approx 350 MW) ▪ East-West (500MW) ▪ Cost benefit analysis and feasibility planning for further interconnection to Britain and mainland Europe	 ▪ 2011 ▪ 2012 ▪ By 2009
Network Infrastructure Investment ▪ Electricity transmission and distribution (€4.9 billion) ▪ Gas network (€1.7 billion)	2007-2013 (NDP)
Research investment (€150 million)	2007-2013 (NDP)
Divestment of 1,300 MW of capacity by ESB	2010
Implementation of smart metering for households	2012
Energy efficiency targets - national target for reduced energy use is 20% ▪ Industry target: 20% ▪ Public sector: 33%	By 2020
Renewables targets ▪ 15% of electricity generation ▪ 33% of electricity generation	 ▪ 2010 ▪ 2020

[1] A new 400 MW generation plant, Hunstown 2, came into operation in October 2007.

1. Introduction

Promoting energy production and consumption patterns that are environmentally sustainable, economically competitive and secure is a challenge that has moved to the top of the political agenda across the globe and is central to any discussion of competitiveness. Cost competitiveness remains critical to ensuring that Irish companies have the ability to compete in international markets. Energy is a key input to enterprise production activities. While Ireland is particularly exposed to today's energy challenges due to our geography, demography and a high dependence on imported sources of energy, the energy intensity of industry has decreased quite rapidly over the period 1990-2005 as actual energy intensity declined by 43 percent. Changes in the structure of Irish industry and progress in improving energy efficiency are the main factors driving that decline. Ireland's energy challenges present significant opportunities for the enterprise base. The environmental goods and services sector is hugely diverse, dynamic and growing rapidly year on year.

The Government's Energy White Paper, *Delivering a Sustainable Energy Future for Ireland*, which was published in March 2007, sets out actions to address Ireland's energy challenges in the short, medium and longer term. Among the main actions set out are the full ownership unbundling of the electricity transmission grid network, the development of a State-owned landbank to facilitate competition, a 33 percent target for renewable electricity generation by 2020 and further potential investment to interconnect the Irish market to Northern Ireland, Great Britain and potentially continental Europe. The timely implementation of the Energy White Paper is critical.

This report assesses Ireland's comparative performance across key electricity indicators in terms of cost competitiveness, security of supply and environmental sustainability. It also focuses on the policy issues that need to be addressed to enable Ireland to deliver a competitively priced, secure and environmentally sustainable supply of energy. This work builds on the 2006 electricity benchmarking analysis[2].

2. The Electricity Market in Ireland

The increase in electricity demand in Ireland in recent years has been among the highest in the OECD due to strong economic and population growth. Electricity demand grew by 4.5 percent in 2006, which is the equivalent of a new 400 MW generation plant being absorbed every two years. That said the Irish electricity market is relatively small in international terms, with a peak demand of approximately 5,000 MW in winter 2006, compared to a winter peak demand of 63,000 MW in the UK[3].

[2] The 2006 Electricity Benchmarking Analysis is available at: http://www.forfas.ie/publications/show/pub253.html.
[3] Electricity demand in Ireland hit a record high of 5,035 MW at 17:30 on 19th December 2006 and this is likely to be surpassed in winter 2007.

The most significant development in the Irish energy market in 2007 was the establishment of the all-island, Single Electricity Market (SEM), which went live on the 1st November 2007. The all-island market has 2.5 million electricity customers, 1.8 million in Ireland and 700,000 in Northern Ireland. Under the SEM, all electricity generated must be sold into a gross market pool and all wholesale electricity for consumption must be purchased from that pool[4]. The main change under the SEM is that the wholesale price of electricity will be market-driven and not administratively determined as was the case previously. This should over time lead to a more efficient and cost effective electricity market. The new market is designed to incentivise new generation investment which is critical for the security and reliability of electricity supply.

3. Ireland's Comparative Performance

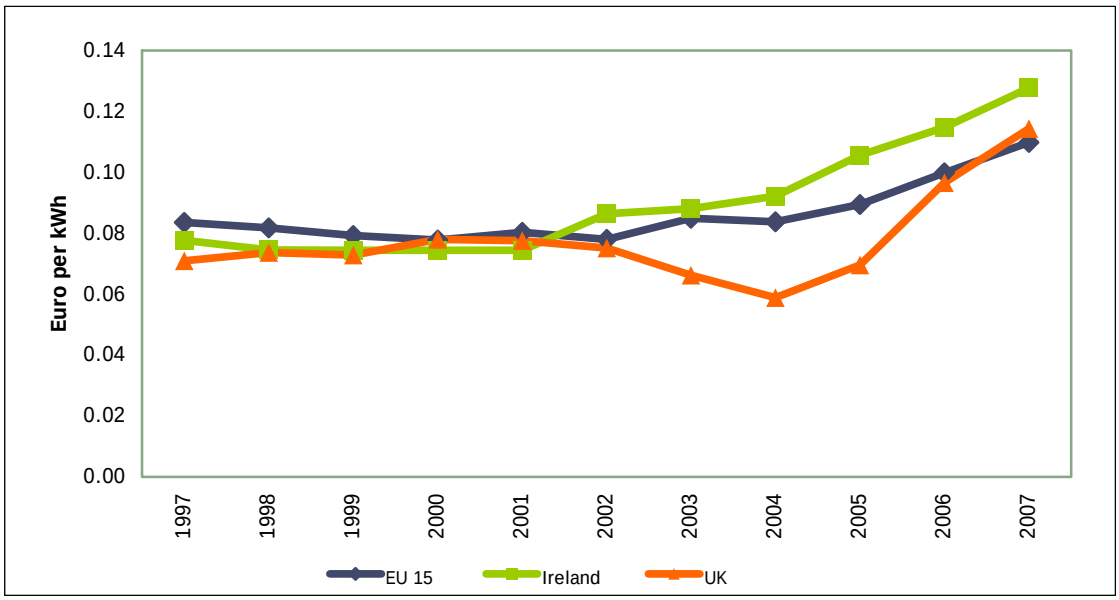
This section provides an update of Ireland's comparative performance across a range of indicators. Although there can be trade-offs between the three energy pillars: cost competitiveness; security of supply; and environmental sustainability, the analysis indicates that Ireland performs relatively poorly on all three.

3.1 Industrial Electricity Costs

This section looks at Ireland's performance with regard to the price of electricity.

[4] More details on how the SEM works are available in Appendix C.

Figure 1: Trends in Industrial Electricity Prices (Excl. VAT but incl. Other Taxes), 1997-2007[5]



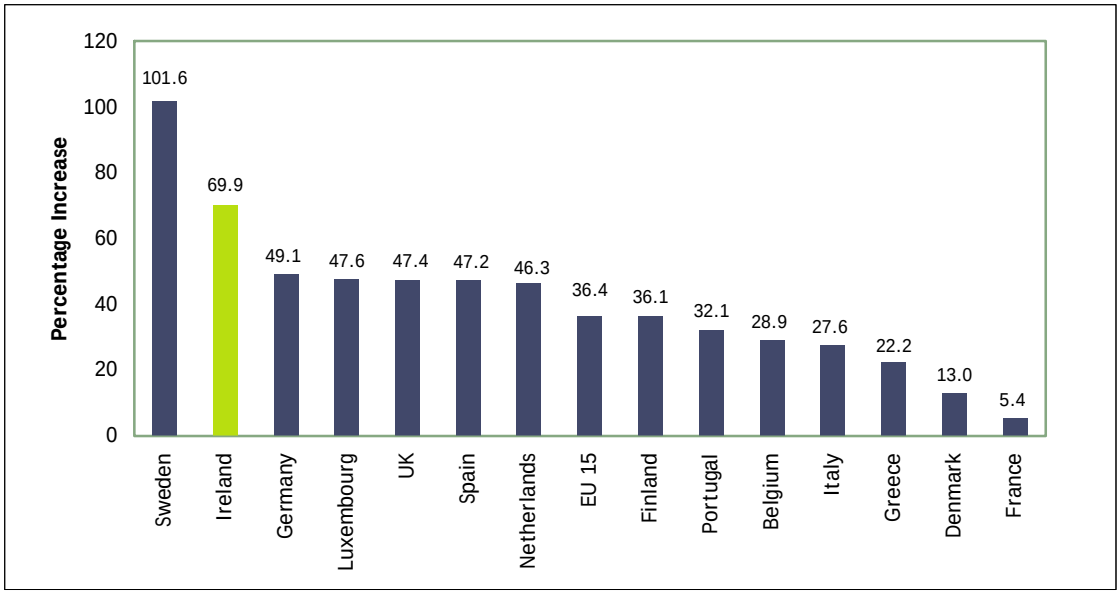
Source: Eurostat

The competitiveness gap between industrial electricity prices (excluding VAT but including other taxes) in Ireland and the EU-15 continues to increase (Figure 1). The gap with the UK has narrowed in the last couple of years as prices increased faster in the UK than in Ireland[6].

[5] Industrial electricity prices are based on annual consumption of 2,000 MWh; maximum demand of 500 kW and annual load of 4,000 hours.

[6] Excess generation capacity in the UK electricity market earlier this decade led to a sharp decrease in prices. However, as that excess capacity has been absorbed, prices have increased. The UK's dependence on gas for electricity generation also contributed to the increases in electricity prices seen in 2006 and 2007 as a result of higher global gas prices.

Figure 2: Increase in Industrial Electricity Prices in the EU-15 (Excl. VAT but incl. Other Taxes), Jan 2001 to Jan 2007

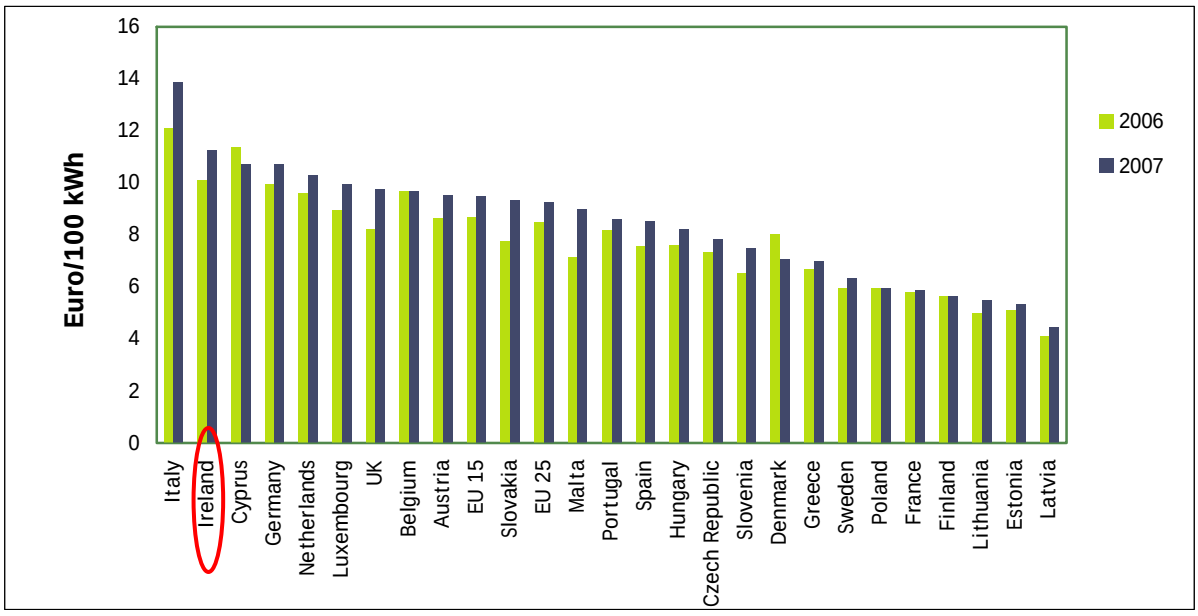


Source: Eurostat

Many countries experienced significant increases in energy prices between 2001 and 2007. However, Irish industrial electricity prices (excluding VAT but including other taxes) increased by almost 70 percent, which is almost twice the increase in the EU-15 average of 36.4 percent (Figure 2)[7].

[7] Sweden recorded the highest increase during the period 2001-2007, albeit from a low base. Industrial electricity prices in Sweden remain among the lowest in the EU-25.

Figure 3: Industrial Electricity Prices (excluding VAT but including all other taxes) Jan 2006 vs. Jan 2007

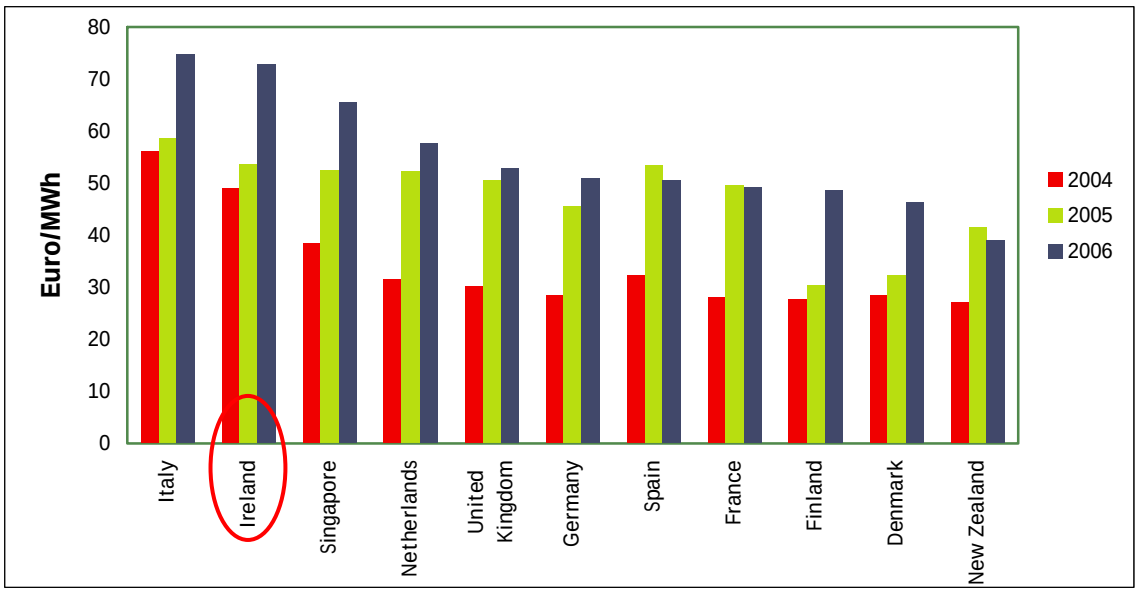


Source: Eurostat

Given price increases in recent years, industrial electricity prices (excluding VAT but including other taxes) in Ireland were the second highest in the EU-25 in January 2007 (Figure 3)[8]. In 2006, Ireland ranked third highest in the EU-25. Irish industrial prices were 18.7 percent above the EU-15 average in January 2007. They were 15.5 percent more expensive than those in the UK in 2007, 59.3 percent more expensive than Denmark and almost double those in France. Only Italy had higher industrial electricity prices (18.9 percent above Ireland) in 2007.

[8] The CER recently announced decreases of between 2.3 percent and 8.4 percent in electricity prices for SMEs. The reductions are effective from 1st November 2007.

Figure 4: Wholesale Electricity Prices, 2004-2006



Source: Pöyry Energy Consulting

Wholesale electricity prices in Ireland have increased significantly over the past three years (Figure 4)[9]. Much of this is due to the significant increases in the global price of oil and gas over the period in question. In 2006, the latest year for which comparable wholesale price data is available, Ireland ranked second most expensive of the eleven benchmarked countries[10].

Driving the higher prices in Ireland are a number of factors, including: the relatively high reliance on imported fossil fuels; the exposure to global fuel price changes; the poor availability performance of the generation plants; the low level of spare generation capacity; the relative scale of generation plants; and the limited competition in generation and supply. The poor availability performance of some generation plants and the low level of spare capacity over peak demand in Ireland are discussed in more detail in Section 3.2. Indicators of the relative level of competition in the electricity market in Ireland compared to the benchmarked countries are available in Appendix A (Figures A.4 and A.5).

[9] The wholesale electricity price is one of the key components of the final electricity price offered to customers.

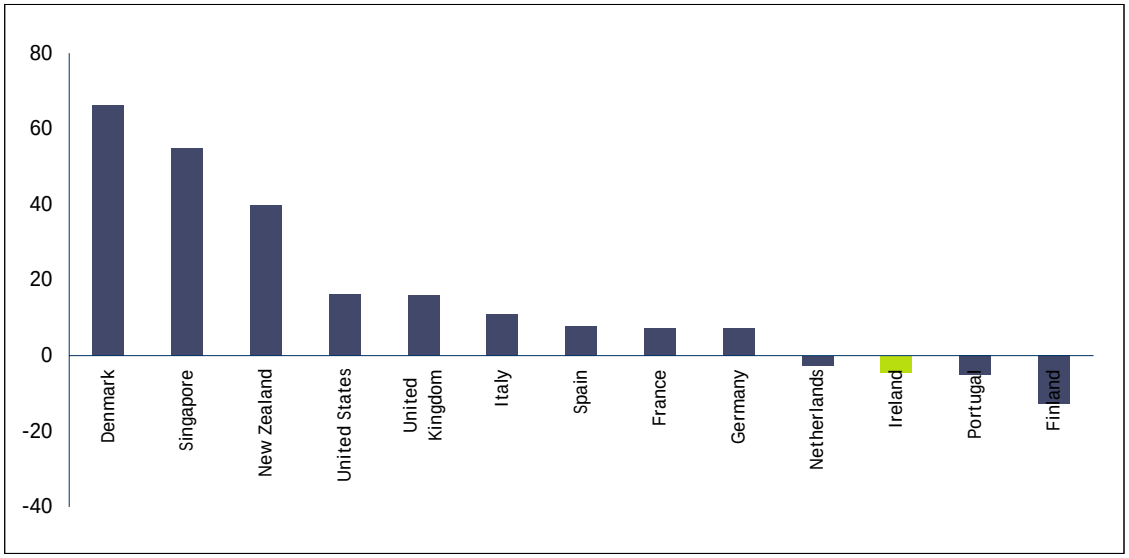
[10] Denmark and Finland experienced larger year-on-year increases in wholesale prices in 2006 than Ireland. The increase in Denmark can be attributed in part to its dependence on coal, the price of which has risen recently. The price of coal will be a factor in Finland too as its reliance on hydropower (a fifth of their total generation) forced them to rely on more expensive coal plant generation during the drought which hit in 2006.

3.2 Security of Supply

Security of supply is critical to supporting enterprise development. An unreliable electricity supply can result in additional costs for business, for instance as a result of reduced output or through investment in back-up sources. There are two key security of supply challenges:

- Ensuring adequate electricity generation capacity to meet demand; and
- reducing Ireland's reliance on imported fossil fuels.

Figure 5: Level of Spare Electricity Generation Capacity Over and Above Peak Demand, 2006



Source: Pöyry Energy Consulting

The level of spare capacity, known as the capacity margin, is the difference between average available capacity and peak demand[11]. For the purposes of this study, demand at peak times (i.e. when demand is highest and therefore the margin is lowest) is used to determine the level of spare capacity (Figure 5)[12]. It should be noted that the actual availability during peak time, which is usually December to February, is higher than the average available capacity[13]. Interconnection, which is not included in the calculation of spare capacity for any of the benchmarked countries, will also provide additional capacity to meet peak demand. Ireland is one of a number of countries that had a negative level of spare capacity at peak time in 2006. Small electricity markets, like Ireland, tend to have tighter levels of spare capacity than larger ones.

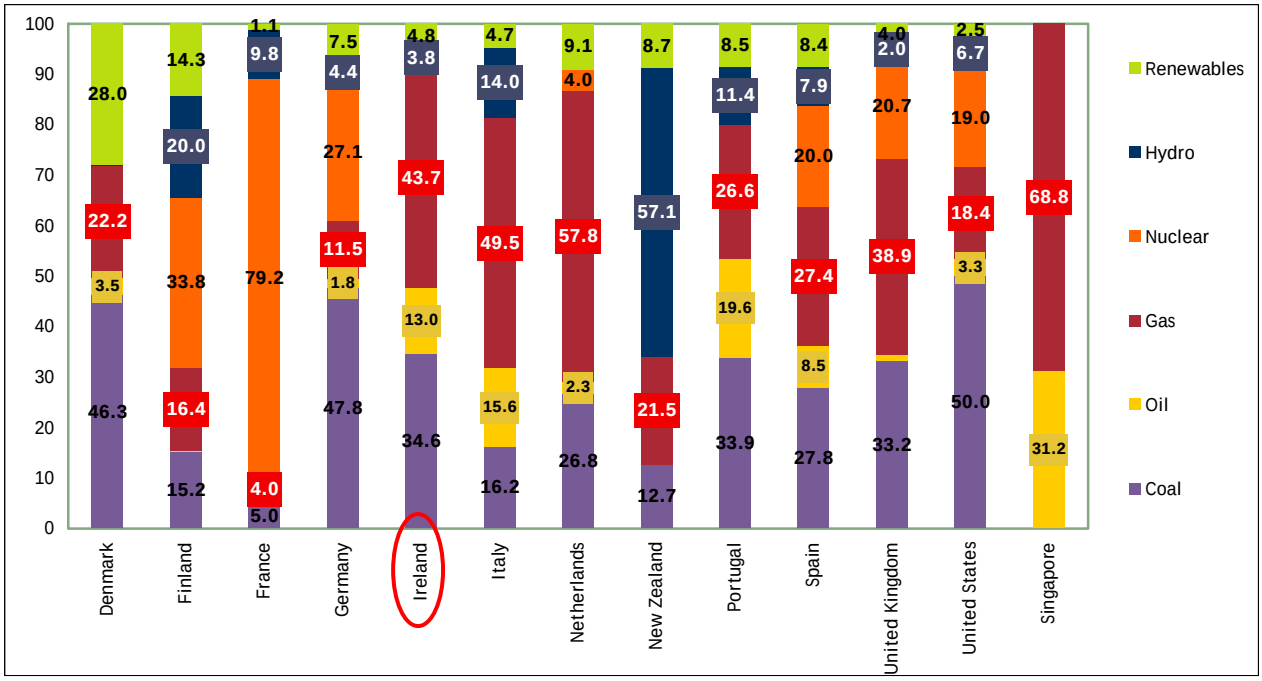
[11] Available capacity is less than installed capacity due to outages, temperature variations that can affect the ability of some stations to generate, and weather conditions. For example, the availability of hydro depends on the level of rainfall within that country over the course of the year.

[12] For many countries, including Ireland, peak demand occurs during the winter, but it is worth noting that for others it will be during the summer. For instance, in Spain and Italy, demand for electricity for air conditioning results in a level of demand in summer that is at least as high as that in the winter.

[13] See Figure A.6 in Appendix A.

Ireland's situation is compounded by the presence of a number of aging generation plants whose availability performance is poor. Plant availability performance in October 2007 remained low at 77 percent. Best practice availability performance internationally is above 85 percent. In the immediate term, increased uncertainty around the availability of some older units could lead to tight but manageable capacity margins during the winter 2007 peak period.

Figure 6: Fuel Mix Shares in Electricity Generation, 2005



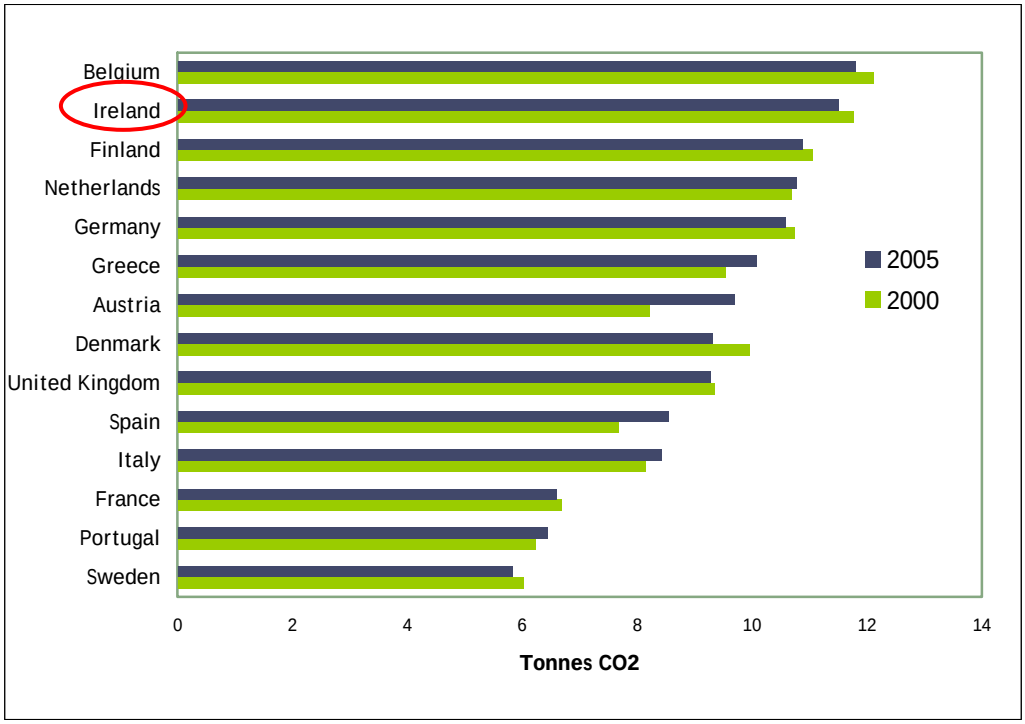
Source: Pöyry Energy Consulting

In addition to ensuring adequate electricity generation capacity to meet demand, Ireland also needs to address its high dependence on imported fossil fuels for electricity generation. Gas, oil and coal make up over 90 percent of electricity generation in Ireland (Figure 6). In 2005, renewables accounted for 4.8 percent of electricity generation. A significant increase in the amount of wind connected to the grid increased renewables' share of electricity generation to 8.6 percent in 2006.

3.3 Environmental Sustainability

Due to the economy's dependence on fossil fuels, Ireland had the second highest CO_2 emissions in the EU-15 in 2005, with transport in particular a source of continuing increasing emissions.

Figure 7: Per capita CO_2 Emissions in the EU-15, 2000 vs. 2005



Source: European Environment Agency

Although there has been a decline in the levels of CO_2 emissions per capita over the period, (by 2.3 percent), total carbon emissions in Ireland actually increased by 5.4 percent; from 44.9 million tonnes in 2000 to 47.3 million tonnes in 2005. Emissions increased by 3.8 percent across the EU-15 over the same period.

As addressed previously, Ireland has a relatively low share of renewables in its electricity generation mix. In 2005, the latest date for which comparable data is available, Ireland had the eighth highest renewables' share of the 13 benchmarked countries[14]. Leading the field was Denmark with 28 percent renewables followed by Finland, which had 14.3 percent.

Significant developments in Ireland in the last two years has seen renewables contribution to electricity generation increase significantly and with approximately 1,000 MW of wind due to be on the grid by the end of 2007, Ireland is on schedule to meet the 2010 target of 15 percent.

[14] See Figure A.7 in Appendix A.

4. Findings and Conclusions

Energy is a key input to enterprise production activities. Ireland's ability to continue attracting high levels of foreign direct investment and to provide a supportive environment for Irish industry generally will depend on its capacity to deliver a secure and sustainable energy supply at a competitive cost. Ireland's performance across the three pillars of energy policy, namely cost competitiveness, security of supply and environmental sustainability, remains poor relative to the benchmarked countries. A number of factors that affect Ireland's performance are outside our direct control, in particular, the exposure to global fuel price volatility. While gas prices have moderated in the last year, there have been significant increases in oil and coal prices.

There are, however, a number of areas where Ireland can act to improve its performance across all three energy pillars and support the development of an electricity market that meets the needs of enterprise. The actions required are set out below.

4.1 Implementing the Energy White Paper

The publication of the Government's Energy White Paper in March 2007 is a welcome development. The White Paper sets out actions that should, if implemented in full and within the proposed timeframes, go a long way towards providing Irish businesses with a competitively priced, secure and environmentally sustainable supply of energy.

The International Energy Agency (IEA), in its review of the Irish energy market in July 2007, broadly endorsed the direction of energy policy set out in the White Paper and stressed the importance of the implementation of the proposed actions.

The key milestones in the Energy White Paper that need to be achieved in order to provide a supportive energy environment for Irish enterprise development are outlined in Table 1. They include: the timely delivery of new generation plant and increased interconnection capacity; full ownership unbundling of the transmission network; divestment of 1,300 MW of ESB's price-setting plant by 2010; a 20 percent reduction in energy demand by 2020; and the 33 percent renewables target by 2020.

Table 1: Key Milestones in the Energy White Paper

Key Milestones	Expected Delivery Date
All-island strategy for grid development and Liquefied Natural Gas (LNG) storage	End 2007
Full ownership unbundling of the transmission network	End 2008
Development of a landbank of State owned sites	End 2008
Completion of new generation capacity[15] ▪ Aghada (430 MW) and Whitegate (400 MW)	 ▪ 2009 and 2010
Additional Interconnectors ▪ North-South (approx 350 MW) ▪ East-West (500MW) ▪ Cost benefit analysis and feasibility planning for further interconnection to Britain and mainland Europe	 ▪ 2011 ▪ 2012 ▪ By 2009
Network Infrastructure Investment ▪ Electricity transmission and distribution (€4.9 billion) ▪ Gas network (€1.7 billion)	2007-2013 (NDP)
Research investment (€150 million)	2007-2013 (NDP)
Divestment of 1,300 MW of capacity by ESB	2010
Implementation of smart metering for households	2012
Energy efficiency targets - national target for reduced energy use is 20% ▪ Industry target: 20% ▪ Public sector: 33%	By 2020
Renewables targets ▪ 15% of electricity generation ▪ 33% of electricity generation	 ▪ 2010 ▪ 2020

A welcome development are the investment plan announcements by new entrants in generation and supply in recent months, which would suggest that the White Paper may now be providing the degree of market certainty that new entrants require to invest. It is imperative that Government moves to action the White Paper commitments as a matter of urgency. It will be necessary to assess, in light of experience, whether these actions are fully sufficient to promote the development of the market.

[15] A new 400 MW generation plant, Hunstown 2, came into operation in October 2007.

4.2 Reforming the Electricity Market

A regulatory framework that supports competition is a critical factor in restoring Ireland's cost competitiveness. For competition to work effectively, the market needs to be transparent and predictable and barriers to entry need to be removed. Liberalised and competitive markets help security of supply through pro-competitive regulation that sends the right investment signals to industry participants. A stable framework for policies and regulation and confidence to leave the market to work are key for the efficient functioning of any energy market.

To date, the market in Ireland has not been sufficiently transparent, nor have the market mechanisms been sufficiently clear, to support a well-functioning electricity market. The implementation of the SEM is a positive and important development towards reforming the structure of the Irish electricity market. Once the SEM has had time to take effect, it will be important to monitor its progress and to make any modifications necessary to ensure a fully functioning all island market. The commitment in the White Paper to review the regulatory framework following the introduction of the SEM needs to be one of the top energy policy priorities in 2008.

4.3 Restoring Cost Competitiveness

The high price of electricity in Ireland has implications for all firms, particularly for energy sensitive ones in important sectors such as food, chemicals and engineering. Recently announced reductions in electricity prices are welcome. Price reductions of between 2.3 percent and 8.4 percent for SMEs came into effect on the 1st November 2007.

The CER no longer regulates large energy users' tariffs on the grounds that this sector is believed to be sufficiently competitive to warrant the removal of regulation[16]. There had been an expectation across large energy users that electricity prices would be significantly lower in 2008 due to the declines in the price of gas internationally[17]. Feedback from some of these large users suggests that the prices obtained from their electricity suppliers for 2007/08 are generally flat, which could indicate that competition is weak. It may also be due to the fact that, with the introduction of the new all island market, electricity suppliers have opted for hedge contracts with electricity generators to minimise any potential price uncertainty and this would have limited the electricity capacity they have available to offer to end users.

Another factor that is contributing to the higher electricity prices in Ireland is the limited choice of tariff options available to businesses. Seven and a half years after the electricity market was liberalised, only a small number of utility suppliers provide a limited choice of both gas and electricity tariffs. The implementation of the SEM provides an opportunity to empower enterprise to secure their energy supplies in new and innovative ways, such as a pool-price-pass-through tariff. This is here users are charged the price prevailing in the pool in each half hour, rather than a set

[16] Since 2006, there is a ban on all medium and high voltage customers supplied in the independent market from returning to ESB Customer Supply so as to foster competition in electricity supply.

[17] About three quarters of the retail price for large energy users is fuel-related. The share is lower the smaller the electricity consumption profile.

price. If there is a low level of volatility in pool price, such a tariff will be attractive to a number of large customers, particularly those with the capability to manage their loads.

Under the SEM, the full cost of carbon will be passed through to electricity customers from 2008. This will send an important signal to the market and encourage greater efficiencies by generators. However, the issue is complicated by the fact that electricity generators receive significant carbon credits under the Emissions Trading Scheme, thereby resulting in windfall gains for the generators. Forfás acknowledges the challenges involved in clawing back these windfall gains from generators given that we now have an all island market, which involves two jurisdictions with different legislative and regulatory systems. However, it is imperative that the authorities north and south deal with the issue promptly and provide the regulatory certainty that is required for the effective functioning of the SEM.

Under the EU Energy Tax Directive, all Member States are required to introduce an excise tax on electricity[18]. From the 1st October 2008, the minimum rate mandated by the directive of 50 cent per megawatt hour will apply for business use. Electricity use by households will be exempt. The Department of Finance estimates that this tax will raise about €1 million in a full year. While this is a relatively small sum, given Ireland's comparatively high electricity costs, it is important that the excise tax is kept at the minimum level in the future.

The increased price transparency provided under the SEM means that large energy users will be better informed with regard to the wholesale market price of electricity when negotiating their contracts next year. The SEM also introduces a new concept, demand side bidding, to the Irish electricity market[19]. Demand side bidding is a process that allows customers, by bidding into the pool, to commit to reducing their demand as pool prices rise[20]. While it is likely that only a small number of electricity users will be in a position to avail of this incentive, it does provide electricity consumers with the potential to exert downward pressure on the pool price. In order for this incentive to be effective, a process of awareness and education will be needed to highlight the benefits to potential users.

[18] The EU Directive can be accessed at: http://eur-lex.europa.eu/LexUriServ/site/en/oj/2003/l_283/l_28320031031en00510070.pdf.

[19] Demand side bidding operates in the opposite manner to that of generators bidding into the pool i.e. it means that large energy users bidding into the pool are prepared to reduce their electricity demand by the specified quantity for a price greater than or equal to the bid price they offer.

[20] Companies participating in the existing demand side management programme, the Winter Peak Demand Reduction Scheme, will not be eligible to avail of the demand side bidding initiative. The Winter Peak Demand Reduction Scheme was introduced by Eirgrid in 2003 as an incentive to business customers to reduce electricity consumption during the power system's peak hours (5pm-7pm) in winter months (November-February). Many industrial and commercial customers have taken advantage of the scheme, which is running again this winter.

4.4 Improving Generation Adequacy

A well functioning electricity market is critically important to ensure a secure and reliable supply of electricity. The capacity payments mechanism introduced as part of SEM is designed to provide appropriate signals to generators as to the timing and the type (baseload, mid-merit, peaking plant) of the generation capacity required[21].

According to the latest Generation Adequacy Report (2008-2014) from Eirgrid, published in December 2007, maintaining security of supply in the short to medium term will be a significant challenge[22]. For the period 2008-2010, significant improvements in the availability performance of generating plant from the current low level is critical to avoid generation capacity deficits. After 2011, even if generation availability performance is improved, significant capacity deficits are possible as a result of the planned closure of three aging ESB plants that generate 1,300 MW or approximately one fifth of Ireland's generation capacity. However, Eirgrid has indicated that there is significant investor interest in building new conventional generation capacity which would alleviate the medium term security of supply concerns. The completion of the second North-South interconnector will allow the generation adequacy benefits of the all island market to be captured. Currently, constraints on the amount of electricity that can be transferred between the north and the south means that the south is not able to take advantage of excess generation capacity in the north.

The Energy White Paper requires Eirgrid and the CER to plan for the progression of a fast build option to address immediate generation adequacy concerns[23]. A recent ESRI paper cautioned that additional mechanisms to incentivise new generation capacity, such as the fast build proposal, could undermine the effectiveness of the SEM based initiatives to deliver new capacity[24]. The potential adverse impact of the additional measures on the effective functioning of the SEM must be balanced against the need to ensure a secure and reliable supply of electricity. Given the poor availability performance of the older generation plants and the tight capacity margins, fallback measures may be necessary to deliver investment in new generation capacity in the short term. The potential of such fallback measures to distort the effective function of the SEM can be minimised if Government signals well in advance the conditions under which the fast build option will be activated and explain how its operation will affect investment in new generation capacity through the SEM.

The commercial incentives to ensure that a generation plant is actually available when required could be enhanced by some modifications to the basis upon which capacity payments are calculated. The allocation of the annual capacity payments pot into monthly sub-pots should ensure that the most money is available when generation availability is most required and valued i.e. at periods of peak demand[25]. The allocation between months is currently relatively flat. Revising the

[21] See Appendix C for an explanation of the capacity payment mechanism.
[22] http://www.eirgrid.com/EirgridPortal/uploads/Announcements/GAR%202008-2014.pdf.
[23] The proposed fast-build option relates to peaking plant of up to 200 MW. It further proposes that a regulated rate of return be paid to the provider of the fast-build plant. The provider of the fast-build plant would not be paid capacity, constraint or ancillary service payments.
[24] ESRI, Preserving Electricity Market Efficiency While Closing Ireland's Capacity Gap, Quarterly Economic Commentary, Autumn 2007.
[25] For 2008, the value of the total annual capacity payments pot is €575 million. For details, see http://www.allislandproject.org/en/capacity-payments-consultation.aspx?article=4c42e409-1082-4b9c-b9f3-b3e0ac03f564

profile to ensure that more money is available during the months of peak demand would provide stronger commercial incentives to be available at these times and, appropriately, a lower level of remuneration for periods of more modest demand when availability is less valuable.

The allocation of the monthly capacity payments pot should also be more heavily influenced by actual availability, rather than ex-ante (before the event) expectations of availability. At present, 70 percent of the monthly pot allocation is determined ex-ante, with only 30 percent determined ex-post (after the event). Increasing the proportion of capacity payments, which are determined ex-post based on actual availability, could enhance the commercial incentives being made available.

4.5 Ensuring Diverse Sources of Supply

Increased uncertainty around the availability of some older electricity generation plants has led Eirgrid to caution that this could lead to reduced but manageable capacity margins during the winter 2007 peak period[26]. The short to medium term outlook for generation capacity adequacy remains positive, with two new generation plants due to come on line by the end of 2009.

Delivering the East-West and the second North-South interconnectors in the timeframes set out in the White Paper is critical to ensuring generation adequacy in the medium term. Although the Government is positively disposed to the possibility of Exchequer funding for strategic energy investment projects, no allocation has been made in the budget estimates for capital expenditure in 2008. While mindful of the tighter fiscal environment that prevails, it is imperative that the funding of these strategic energy infrastructure projects is prioritised, given that sufficient interconnection is essential to supporting national security of supply, price competitiveness and the renewables' target of 33 percent by 2020.

The White Paper undertakes to complete a cost-benefit analysis and feasibility planning of further interconnection to Britain and potentially to mainland Europe within two years. It is crucial that the investigation of the feasibility of interconnection to mainland Europe is undertaken and includes locations such as Scandinavia and France which have very different fuel mix profiles to those of Ireland and Britain. This work needs to start as soon as possible.

Ireland imports over 90 percent of its energy and is expected to continue to do so, given the limited proven reserves of indigenous fuel sources. In addition, Ireland's reliance on gas as a fuel source is increasing which means a reduction in the diversity of the fuel mix and therefore greater exposure to the volatility in the global gas markets. The recent IEA review of Ireland pointed to the need for diversity of source in terms of gas supply. The UK has become a net importer of natural gas and an issue of concern is that Ireland will become increasingly dependent on natural gas sourced from more distant markets.

[26] Plant availability performance in September 2007 remained low at just below 75 percent compared to best practice internationally which is in the high 80s percent.

Access to liquefied natural gas (LNG) through the UK will also open different market sources and supply pathways for gas (i.e. ships rather than pipelines). An alternative to procuring LNG from the UK may be offered by the recently announced plan of Shannon LNG, an Irish subsidiary of Hess LNG Limited, to build a €400 million LNG receiving terminal on the Shannon estuary with a projected capability of serving up to 40 percent of the Irish gas market. The Government has commissioned a study to assess the medium to long-term security of supply on an all-island basis, including the scope for a common approach to gas storage and LNG.

Ireland is on schedule to meet its EU target of producing 15 percent of its electricity needs from renewable sources by 2010 which will improve the fuel mix in the future. In 2006, renewables contributed to 8.6 percent of electricity generation, with the biggest contribution coming from wind-powered generation. However, because of the variability of wind, it requires significant conventional generation back-up. At the time electricity demand peaked in 2006, the contribution of wind was zero. The development of other renewable resources (e.g. biomass and wave) will be important for Ireland to ensure that it meets its target of 33 percent of electricity generation from renewables by 2020 and to do so cost effectively.

4.6 Providing Adequate Regional Capacity

The recently published *Transmission Forecast Statement, 2007-2013* by Eirgrid looked at the capacity of the 110kV electricity stations to meet future demand requirements (see Table 2). It highlights limited capacity for additional electricity demand in a number of regions, particularly the East and South-East. This is a particular concern from a regional development perspective and may limit the ability of key NSS centres to support energy intensive investment projects. For example, a large energy user would need approximately 20 MW of electricity. All regions will not have the capability to accommodate such a user.

Forfás acknowledges the challenges a more disparate pattern of electricity generation brings for grid development. However, additional investment over and above that already planned is needed in the transmission network to increase the electricity capacity available for new demand in the affected regions.

Table 2: Capability (MW) for Additional Electricity Demand at 110 kV Stations, 2007

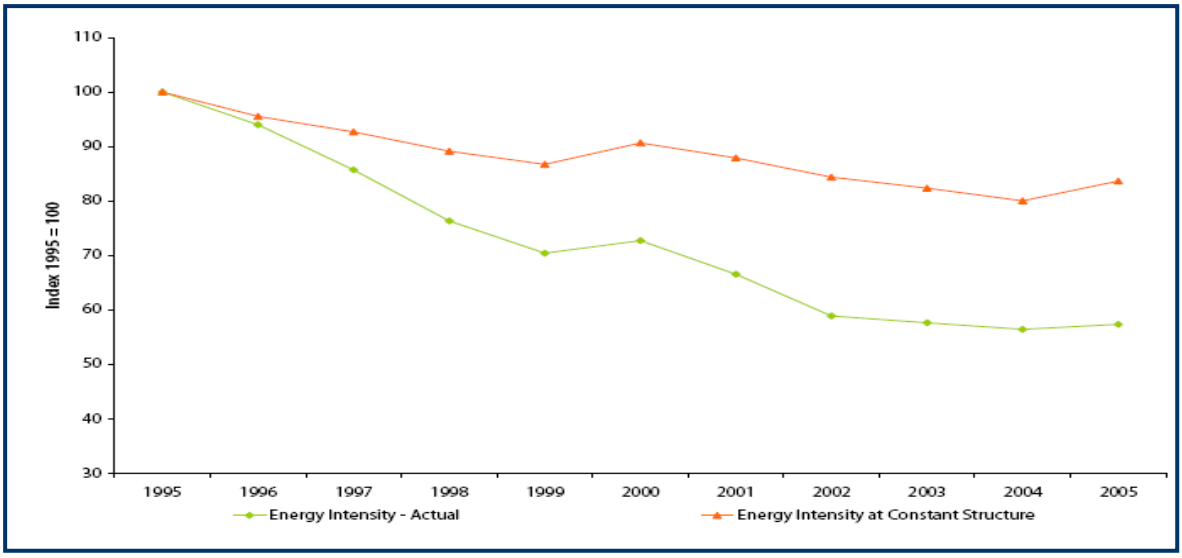
Region	110 kV Station	2008	2010	2013
North-East	Drybridge	100	110	100
	Mullagharlin	30	20	20
	Shankill	<10	90	80
North-West	Carrick-on-Shannon	90	70	90
	Castlebar	20	10	50
	Letterkenny	60	60	50
	Moy	20	20	40
	Sligo	80	40	30
East	Carrickmines	**<10**	**<10**	**<10**
	College Park	**<10**	**<10**	**<10**
	Mullingar	40	20	20
	Newbridge	50	30	**<10**
	Portlaoise	50	30	**10**
	Thornsberry	10	30	20
West	Athlone	30	<10	40
	Cashla	50	100	90
	Galway	<10	40	20
	Ennis	**10**	**<10**	**<10**
South-East	Arklow	**<10**	**<10**	**<10**
	Carlow	70	70	**<10**
	Kilkenny	**<10**	**<10**	**<10**
	Killoteran	60	60	**<10**
	Wexford	**<10**	20	**<10**
South-West	Barnahely	30	30	20
	Cahir	20	20	**<10**
	Cow Cross	70	70	70
	Kilbarry	130	110	60
	Limerick	10	70	20
	Tralee	**<10**	60	40

Source: Eirgrid

4.7 Improving Energy Efficiency

Energy efficiency is regarded as one of the most effective tools to address all three energy objectives (cost competitiveness, security of supply and environmental sustainability). Ireland has made good progress in creating a more energy-efficient economy. Between 1990 and 2005, the value added of industry grew by 224 percent, while industrial final energy consumption grew by only 45 percent. This resulted in the energy intensity of industry decreasing quite rapidly; over the period 1990-2005, actual energy intensity declined by 43 percent (Figure 8).

Figure 8: Index of Energy Intensity of Industry, 1995 to 2005[27]



Source: SEI

Changes in the structure of Irish industry between 1995 and 2000 accounted for 68 percent of the reduction in industrial energy intensity[28]. The remainder of the change in intensity is due to other effects such as changes in the fuel mix, economies of scale and behavioural changes.

The last decade has seen significant improvement in the aggregate energy efficiency of the Irish economy. Sustainable Energy Ireland (SEI) initiatives, such as the Large Industry Energy Users Network, have been particularly successful and have resulted in significant savings for business. The development agencies (Enterprise Ireland and IDA Ireland) are pursuing a number of initiatives aimed at facilitating client companies to reduce their energy costs by adopting economically sound energy efficiency systems. These include:

[27] Actual energy intensity is considered a crude indicator as it does not take other factors such as economic, structural, technical, and behavioural issues into account. To eliminate the effects of structural changes, an index of energy intensity at constant structure (1995) is also shown in Figure 8 (the orange line). Energy intensity is defined as the amount of energy required to produce some functional output and in the case of industry, it measures the amount of energy required to produce one euro of value added.

[28] Examples of the structural changes in industry which resulted in a reduction in energy intensity were the closures of steel production (Irish Ispat) and fertilizer manufacture (Irish Fertilizer Industries).

- Enterprise Ireland and IDA Ireland forming a close ongoing relationship with SEI with the objective of encouraging and facilitating companies to access the energy agreements, energy management and energy MAP programmes run by SEI; and
- IDA Ireland working with SEI on the most effective way to raise the future energy efficiency of the IDA's property offerings for overseas investors.

Continued and enhanced efforts are required to promote more efficient energy use by both business and residential users to achieve Ireland's target of a 20 percent reduction in energy demand by 2020.

Significant challenges remain for businesses, particularly among SMEs. As recommended by the International Energy Agency, it will be necessary to ensure that SEI is appropriately resourced and structured, and able to cope with the challenges it will face in implementing energy efficiency programmes in the coming years. Organisations such as IDA Ireland, Enterprise Ireland, IBEC, Chambers Ireland, ISME and other organisations who interface with SMEs also have a role in raising their awareness of the benefits of greater energy efficiency.

Many of these organisations are already working with SMEs on a range of waste/pollution prevention or resource conservation initiatives. This presents ready-made channels through which measures to improve energy efficiency can be communicated to SMEs. Limited resources, both in terms of time and people, is one of the biggest barriers to SMEs' capacity to engage with new initiatives. It is therefore imperative that this opportunity to develop a more integrated approach across a range of related issues is exploited to create greater awareness among SMEs of the benefits of more efficient energy use and facilitate SMEs' contribution to energy use reduction.

Promoting greater energy efficiency among domestic residential customers can have important benefits. The greatest variations in electricity demand are in the domestic sector. If domestic users reduce their demand at peak time, i.e. between 5.00pm and 7.00pm daily, this will reduce the generation capacity required, which will in turn reduce the price of electricity at peak times and deliver lower overall electricity prices for all users. The Power of One campaign is welcome in this regard. The recent announcement to introduce smart metering for domestic users within the next five years, which will incentivise householders to reduce their electricity use in the evening peak time, is an important development for enterprise competitiveness.

4.8 Energy Policy Planning for the Longer Term

Energy policy has entered a new era, as the long-term balance between energy demand and supply is becoming much more important and aligned with the actions necessary in combating climate change. Ireland faces similar energy challenges to those confronted worldwide but our situation is more acute by our small energy market, peripherality and limited indigenous fuel supplies. One of the biggest challenges facing us globally and nationally is the transition to a low carbon-based economy.

There are further specific constraints on policy-making, derived from policy decisions that have legal force at international level. They include the Kyoto protocol and also the specific commitments made by the Government at EU level. Inevitably when considering energy policy with potentially conflicting objectives, there will be short, medium and long-term trade-offs. Policy interventions need to take into account these trade-offs in order to arrive at a robust framework for ensuring Ireland has access to a secure, reliable and cost-effective source of energy with an ease of transition to a low carbon economy.

The interrelations between the issues are such that strong coordination is needed between all Government Departments and their agencies. The establishment of the Cabinet Sub-Committee on Energy Security and Climate Change and the new Oireachtas Committees is a positive step in providing the formal structures to achieve greater coordination.

Ensuring that the Government Departments with responsibility for energy policy, and their agencies, have the capacity in terms of skills and expertise to fully implement the White Paper within the required timescales must be a top priority for Government. For example, the decline in the number of electrical engineering students has implications for the energy sector's capacity to deliver in the future. It is also likely to be a barrier to exploiting the opportunities that exist for Ireland in the emerging environmental goods and services sector.

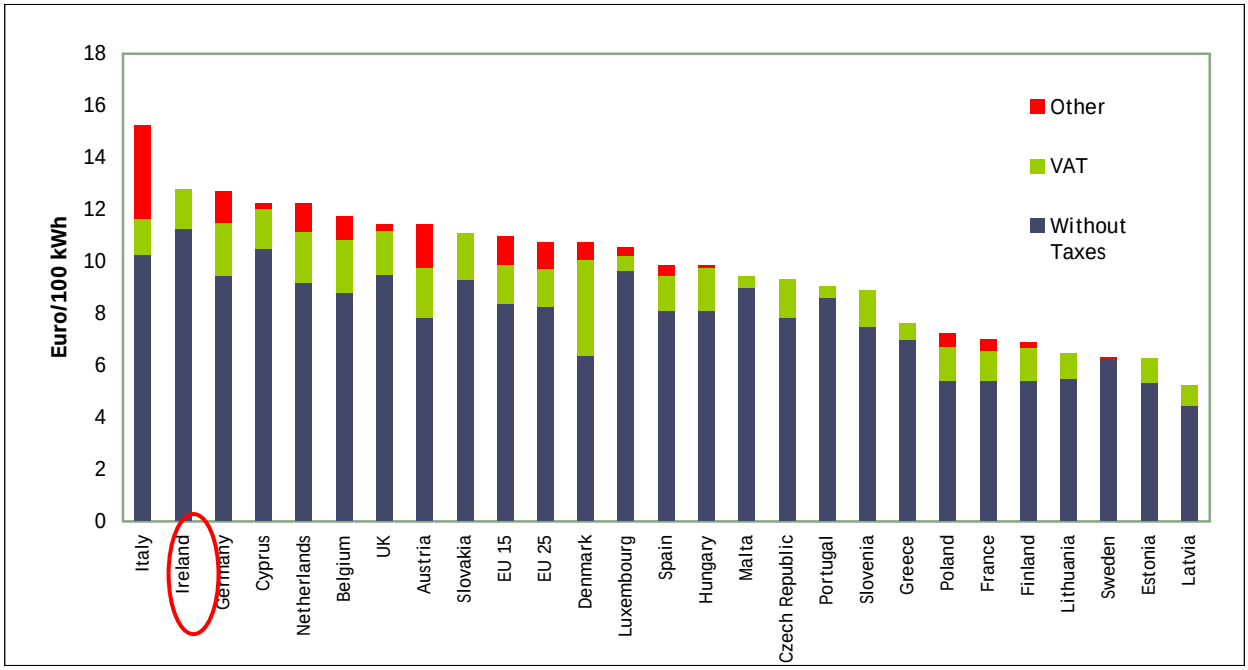
Appendix A: Additional Benchmarking Indicators

This section includes supplementary benchmarking indicators.

Industrial Electricity Prices

When all taxes are included, Ireland ranked second of the EU-25 countries in 2007 (Figure A.1).

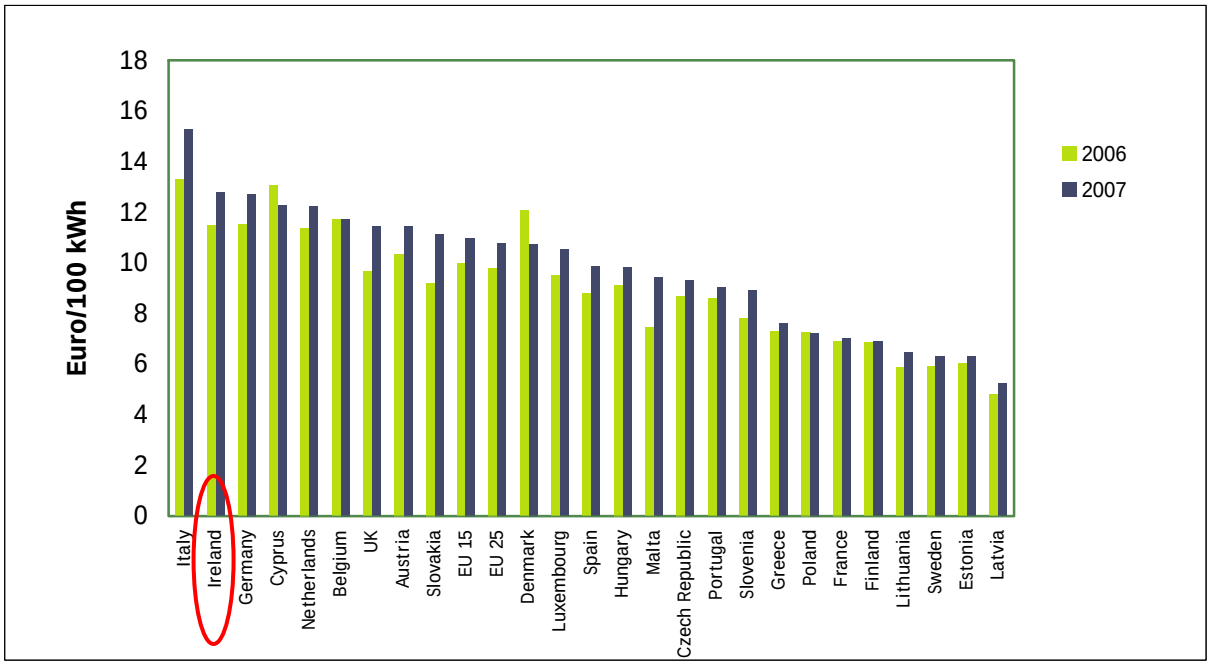
Figure A.1: Industrial Electricity Prices, January 2007



Source: Eurostat

Other taxes, which include energy taxes, green taxes, local taxes, vary considerably across the EU-25 (Figure A.1). Nevertheless, when all taxes are included, Ireland ranked second of the EU-25 countries in 2007, compared to sixth in 2006 (Figure A.2).

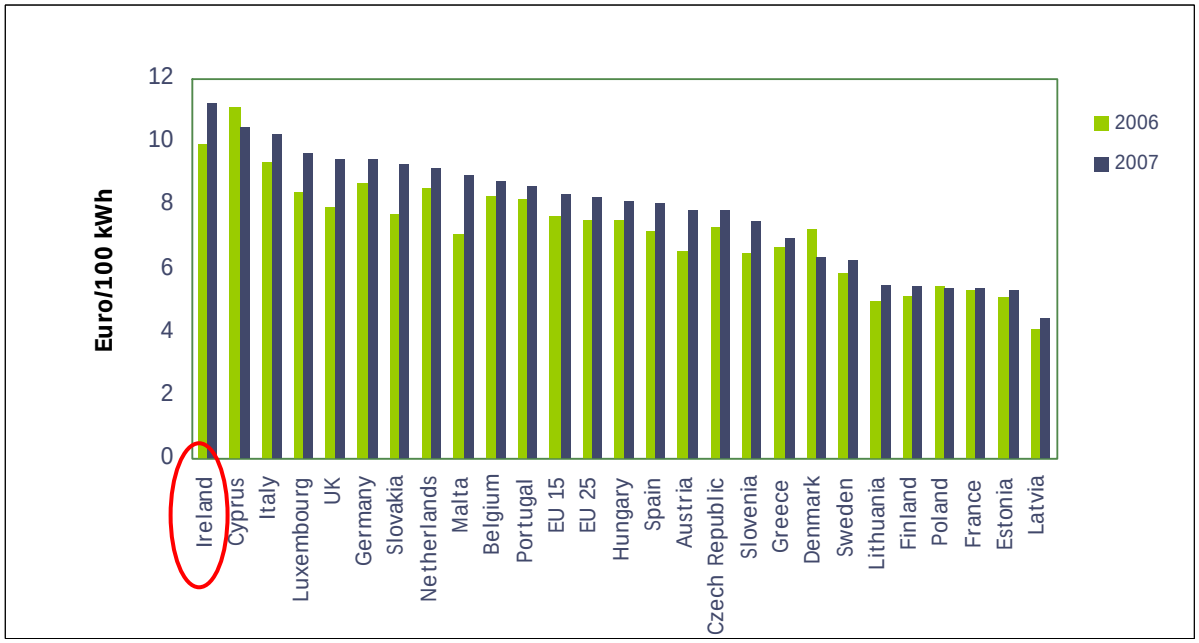
Figure A.2: Industrial Electricity Prices (including all taxes), Jan 2006 vs. Jan 2007



Source: Eurostat

When all taxes are excluded, Ireland has the most expensive industrial electricity prices of the EU-25 (Figure A.3).

Figure A.3: Industrial Electricity Prices (excluding all taxes), Jan 2006 vs. Jan 2007

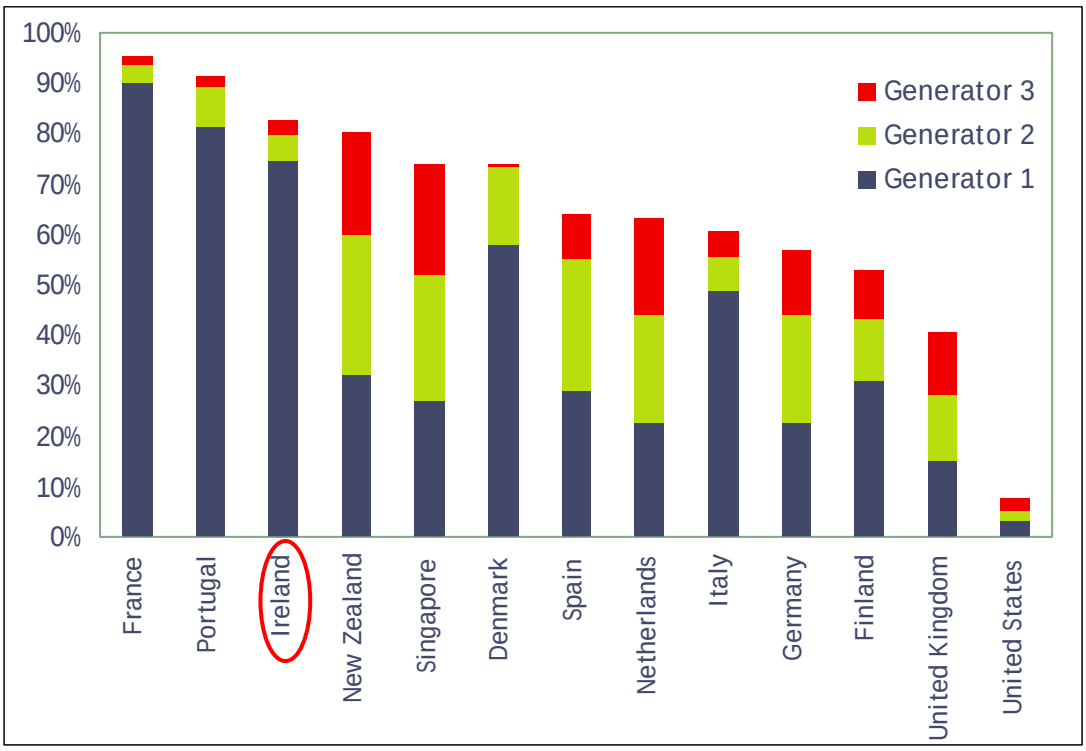


Source: Eurostat

Competitive Landscape

This section gives an indication of the level of competition in electricity generation and supply across the benchmarked countries.

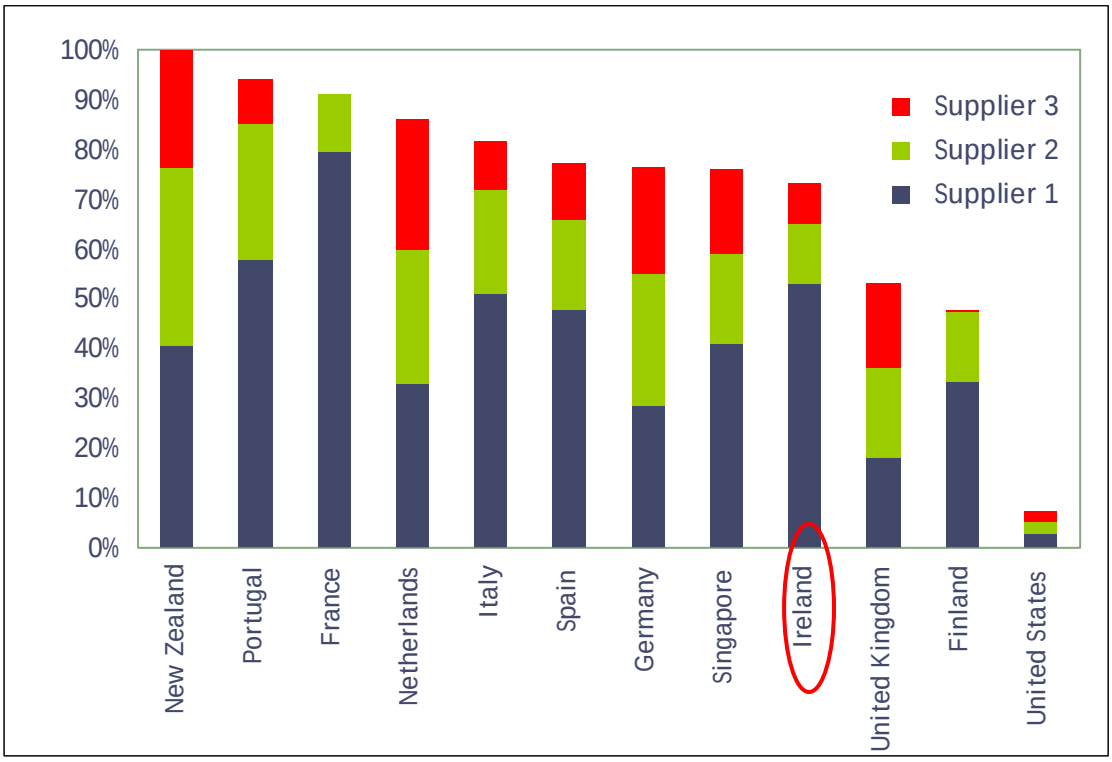
Figure A.4: Market Share of the Top Three Electricity Generators, 2006



Source: Pöyry Energy Consulting

Ireland's electricity generation market is relatively concentrated, with the largest generator accounting for over 75 percent of the market (Figure A.4). With respect to the electricity supply market, Ireland is more competitive, with the largest supplier accounting for just over 50 percent of the market (Figure A.5).

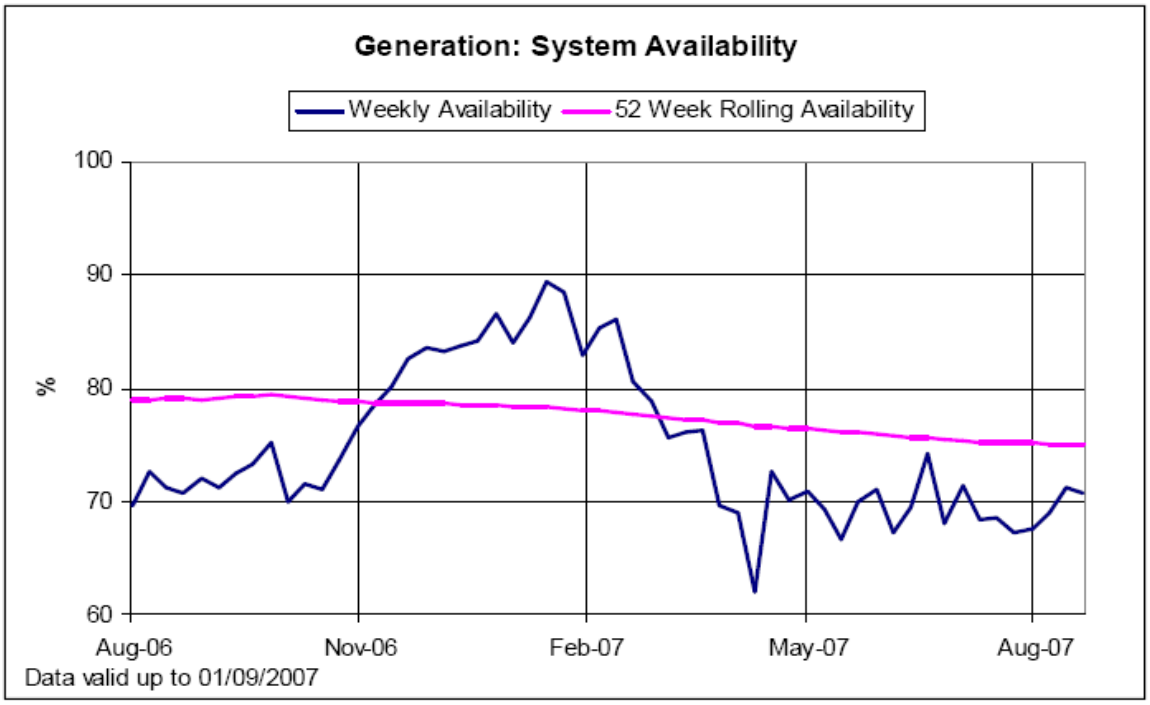
Figure A.5: Market Share of the Top Three Electricity Suppliers, 2006



Source: Pöyry Energy Consulting

Generation Capacity Availability

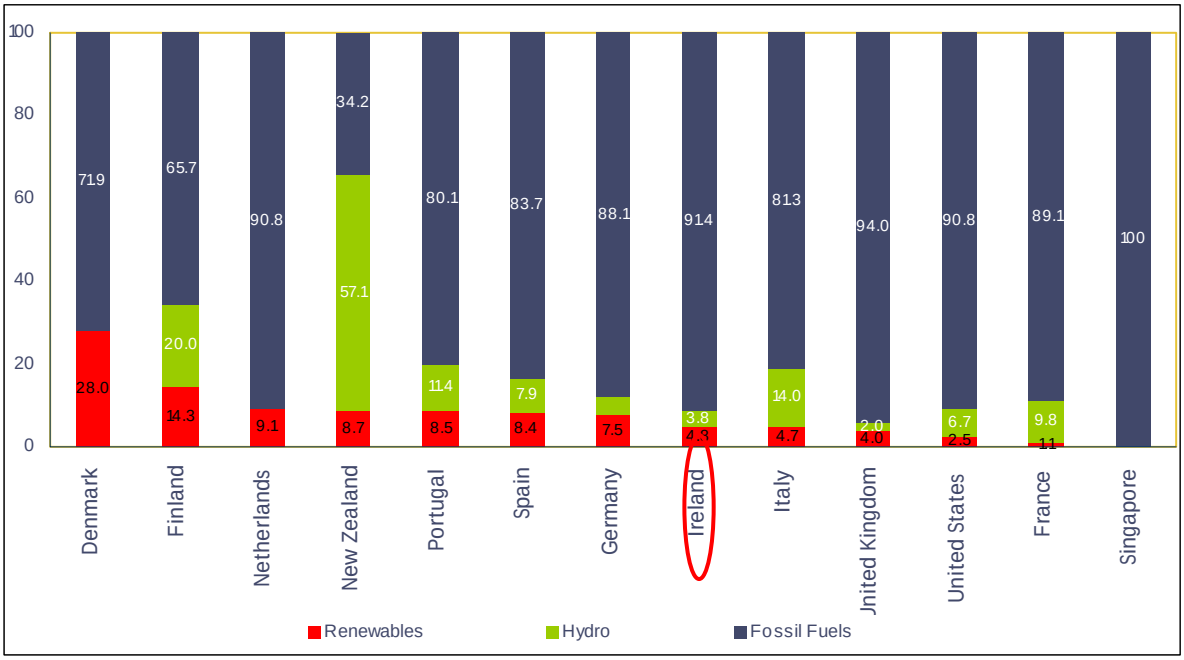
Figure A.6: Average vs. Actual Generation Capacity Availability in Ireland, 2006/07



Source: Eirgrid

Actual and average generation capacity availability between August 2006 and September 2007 are set out in Figure A.6. The deterioration in plant performance during 2007 is reflected in the average capacity availability. Critically, generation capacity availability during the winter peak was considerably above the average levels of availability.

Figure A.7: Share of Renewable Sources in the Fuel Mix, 2005



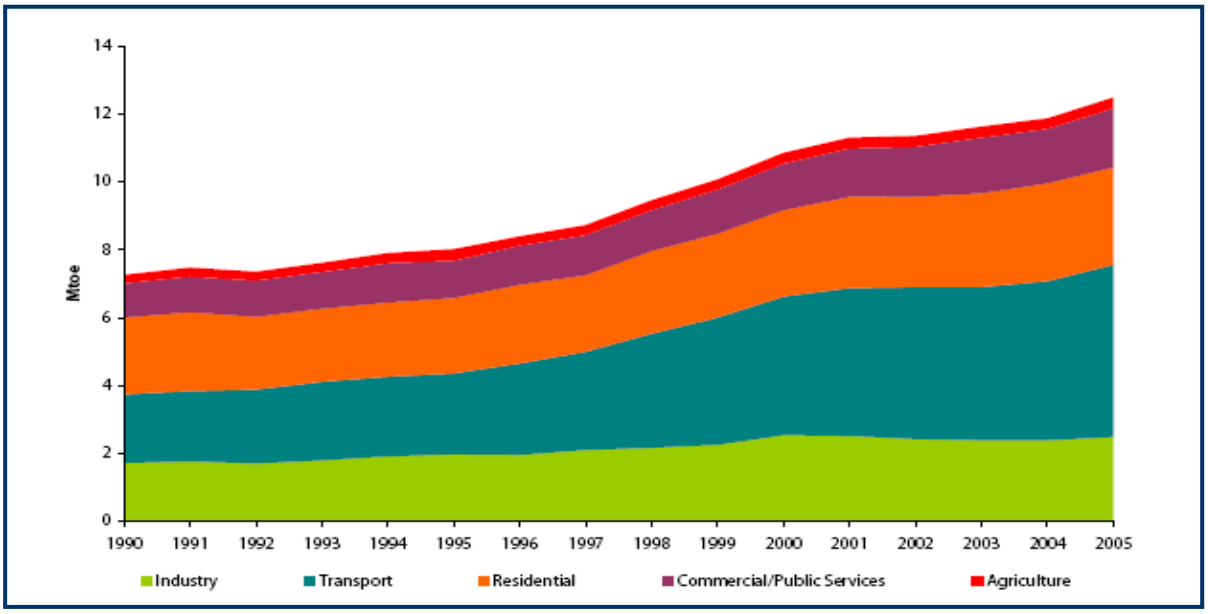
Source: Pöyry Energy Consulting

Ireland has a relatively low share of renewables in its electricity generation mix. In 2005, the latest date for which comparable data is available, Ireland had the eighth highest renewables' share of the 13 benchmarked countries. Leading the field was Denmark with 28 percent renewables followed by Finland which had 14.3 percent. Finland also has significant levels of hydro in its electricity fuel mix.

Appendix B: Energy Use by Enterprise

Transport, the largest energy consuming sector in Ireland, recorded the highest growth in energy demand in 2005, growing by 8.2 percent (Figure B.1). It was followed closely by the services sector, which increased its energy demand by 8.1 percent. There was a 4.1 percent increase in industry's energy demand.

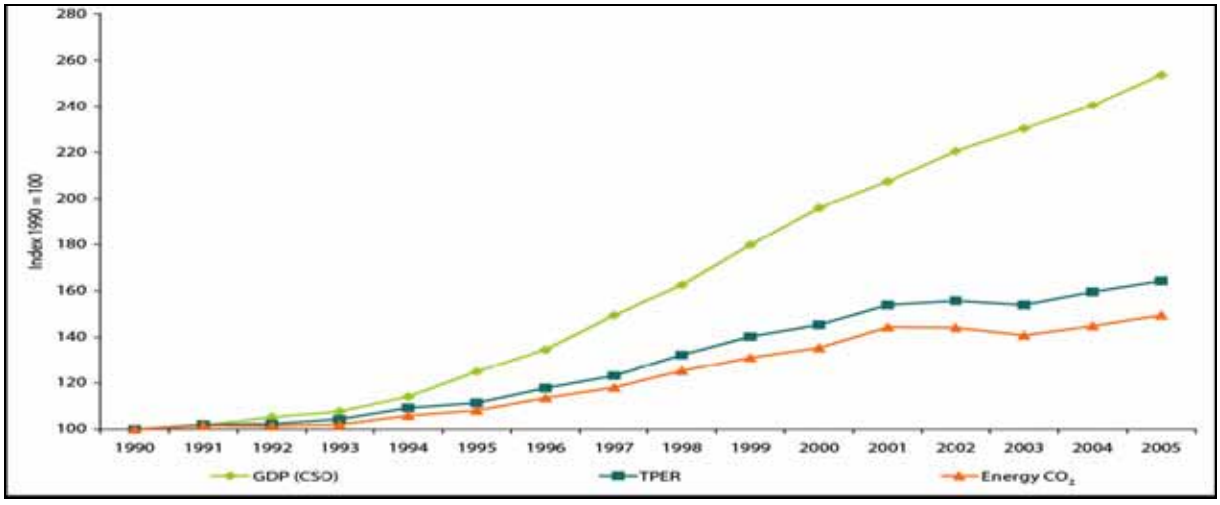
Figure B.1: Irish Energy Demand by Sector, 1990-2005 (Millions of Tonnes of Oil Equivalent)



Source: Sustainable Energy Ireland (SEI)

There was an increase of three percent in energy use, measured by the Total Primary Energy Requirement (TPER) and 3.2 percent in energy-related carbon dioxide (CO_2) emissions in Ireland in 2005, signalling a re-coupling of economic growth, energy and CO_2 emissions (Figure B.2).

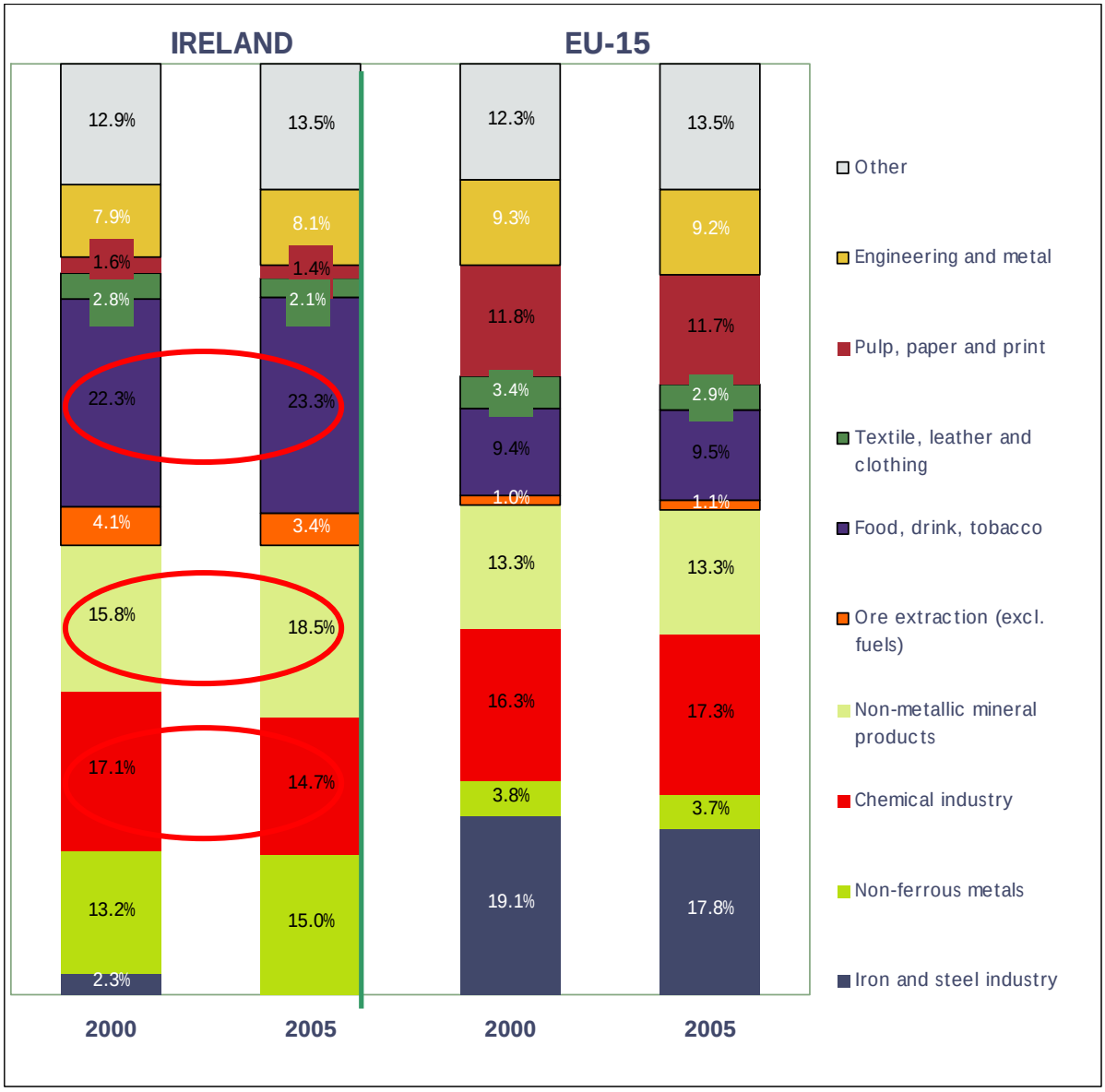
Figure B.2: Index of Irish GDP, Total Primary Energy Requirement and Energy CO_2, 1990-2005



Source: SEI

Industry's energy demand by sector in Ireland differs considerably from that of the EU-15 (Figure B.3). Historically, Ireland has not had a large presence of what are generally regarded as energy intensive industries (e.g. iron and steel). However, the largest energy consumers in Ireland are the Food, Drink & Tobacco sector, followed by the Engineering & Metals and Chemical sectors, which are strategically important sectors in the Irish economy.

Figure B.3: Industry Energy Demand by Sector in Ireland and EU-15: 2000 vs. 2005

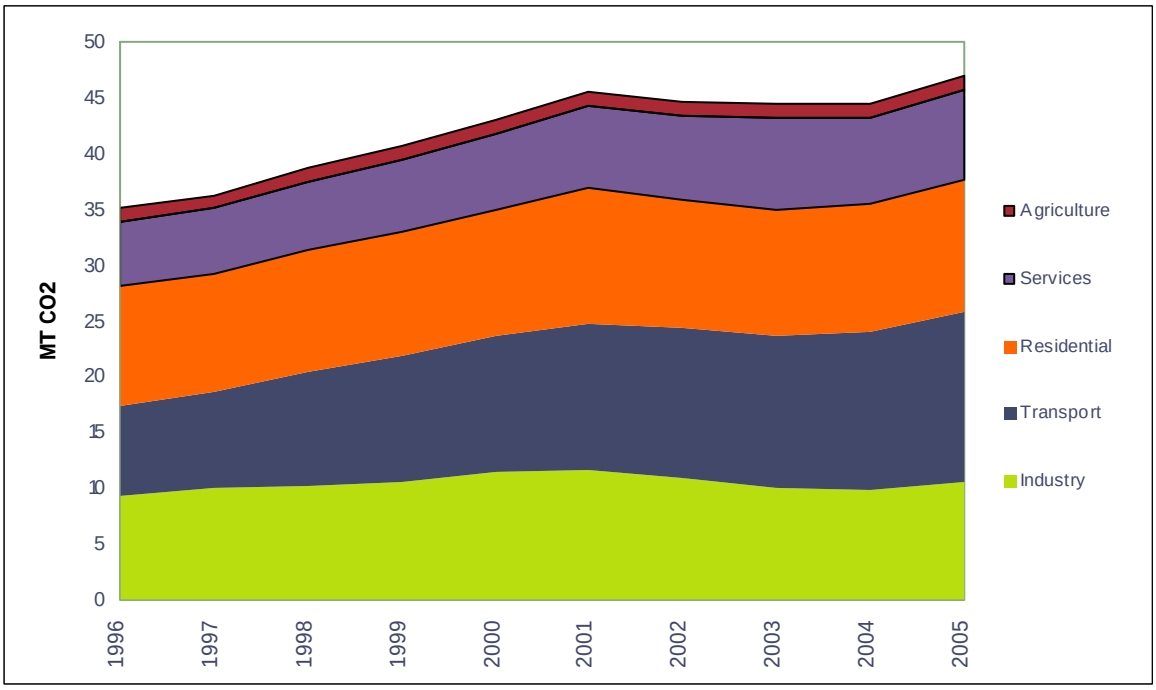


Source: Eurostat

Over the period 2000 to 2005, the Food, Drink & Tobacco sector's share of energy consumption increased, as did that of Engineering & Metals. The Chemicals sector's proportion actually declined from 17.1 percent in 2000 to 14.7 percent in 2005. This was mainly due to increased energy efficiency and structural change within the sector over the period.

The contribution of transport to energy-related CO_2 emissions has increased from 23 percent in 1996 to 32.5 percent in 2005, making it the largest sectoral contributor to CO_2 emissions. Total transport emissions grew by 88.7 percent between 1996 and 2005 compared to an increase of 33.9 percent in total CO_2 emissions (Figure B.4). Ireland's Kyoto target is to limit its average annual emissions to no more than 13 percent above 1990 levels over the five-year period to 2012. In 2005, CO_2emissions in Ireland were 25 percent above 1990 levels.

Figure B.4: Energy-related C02 Emissions in Ireland by Sector: 1996-2005



Source: SEI

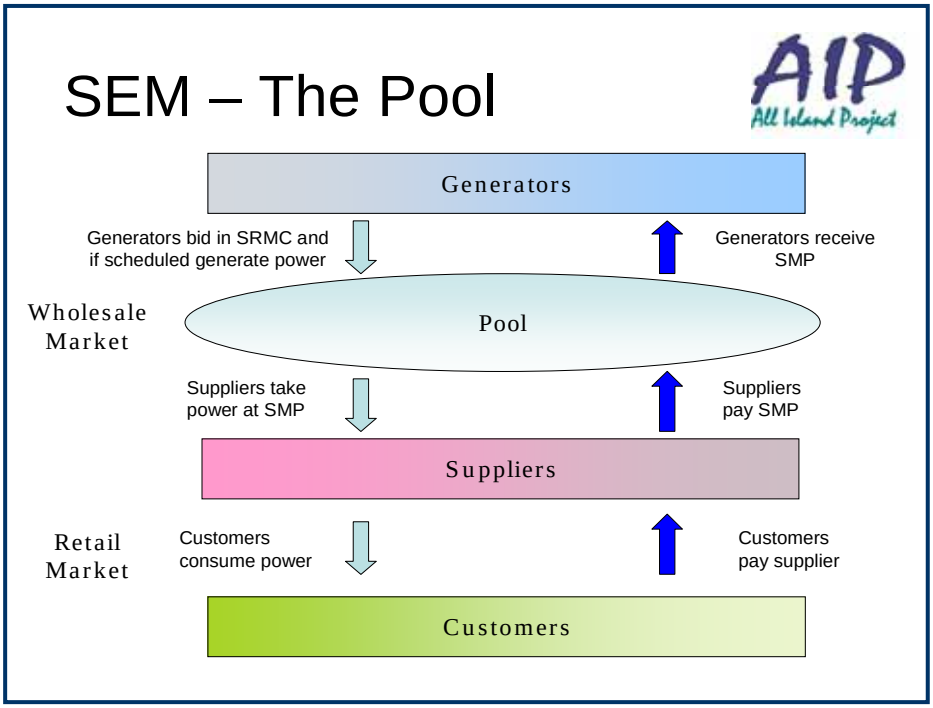
The services sector's share of CO_2 emissions has also increased; from 5.7 percent in 1996 to 8.1 percent in 2005. Services emissions grew by 42 percent over the period 1996 to 2005. Meanwhile, CO_2 emissions from the industry sector recorded a more modest increase of 12.7 percent between 1996 and 2005 and have actually declined by 7.8 percent since 2000. Industry's share of CO_2 emissions fell from 26.7 percent in 1996 to 22.4 percent in 2005.

Appendix C: Overview of the SEM

This section provides an overview of the Single Electricity market (SEM).

Under the SEM, all electricity generated on the island of Ireland must be sold into a gross market pool and all wholesale electricity for consumption on the island of Ireland must be purchased from that pool. The main change under the SEM is that the wholesale price of electricity will be market-driven and not administratively determined as was the case previously. This will over time lead to a more efficient and cost effective electricity market. The new market is designed to incentivise new generation investment which is critical for the security and reliability of electricity supply.

Figure C.1 Overview of the Single Electricity Market (SEM)



Source: All Island Project[29]

Notes: SRMC = Short Run Marginal Cost; SMP = System Marginal Price

Generators wishing to sell energy through the pool are required to submit bids to the market operator. Therefore the most cost efficient generators will be called upon to generate electricity first.

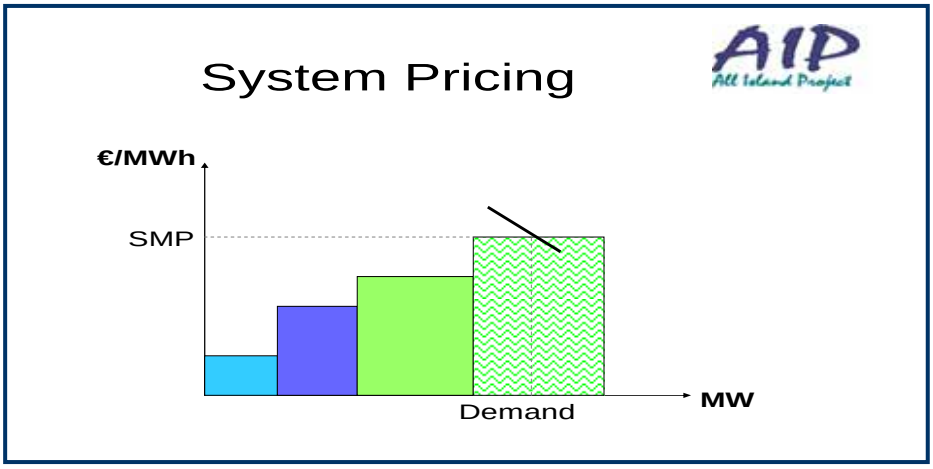
The SEM will have a single System Marginal Price (SMP) that is set for each half hour by the bid of the last generator that must be despatched to meet demand in that settlement period. Thus, under a pool based market the cost of generation varies over the day and season to reflect the short run

[29]The All Island Project is a CER and NIAUR (Northern Ireland Authority for Utility Regulation) joint initiative.

costs of the marginal generation at that time. Broadly speaking, this means that coal generation costs will dominate the load shape at off peak hours, and gas generation costs during daytime hours.

The SMP will be received by all participants in the pool regardless of their original bid (Figure C.2). The regulators have put in place mitigating measures to ensure that no market participant will have the potential to exert market power by manipulating the system price to their advantage. This will be achieved by imposition of strict bidding rules and monitoring of bidding behaviour.

Figure C.2: Determining the System Marginal Price (SMP)



Source: All Island Project

The SEM also incorporates a capacity payment mechanism; €575 million has been allocated for 2008. This means that generation plants will be encouraged to be available and rewarded when they are available to generate electricity, even if that plant is not called upon to generate. This decision is taken on the basis that an explicit capacity payment mechanism will offer greater security of supply to customers. The capacity payment is based on the costs of a conventional peaking plant, since this is the cost of providing generating capacity to meet demand at times of high system demand.

Reflecting the market concentration in both jurisdictions, the regulators have developed Market Power Mitigation arrangements. The principal components of these arrangements are:

Directed Contracts

Directed contracts enable the regulatory authorities to mandate that generators with market power contract forward with suppliers for a specified volume at a price based on a pre-determined pricing formula. The intention is that prescribed contracting in this manner will mitigate the incentives on incumbents to attempt to profit from the use of market power.

Bidding Principle

The regulatory authorities require all generators to bid at their Short Run Marginal Cost. This is intended to ensure that those generators with market power are unable to exert it to influence SMP determination or to game constraint payments in cases of localised market power.

Market Monitoring

The regulatory authorities have established a Market Monitoring Unit (MMU) as a separate unit of the regulatory authorities. The MMU will monitor the entire SEM and will report to the regulatory authorities. It will focus on the spot market only and not the contracts market. The MMU will also monitor compliance with bidding principles. The MMU will not undertake enforcement or adjudication, as these roles will continue to reside with the regulatory authorities.

NOTES

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