

Electricity Benchmarking Analysis

The Electricity Benchmarking analysis is published in easy-to-read slide format in order to communicate more effectively the main messages arising from the benchmarking exercise.

December 2006

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INTRODUCTION

Electricity & Enterprise Development

- ▶ A reliable, secure and competitively priced electricity supply is a vital ingredient in the competitiveness of Irish industry and Ireland's long term economic development.
- ▶ Ireland's ability to continue attracting high levels of foreign direct investment and to provide a supportive environment for enterprise generally will depend on its capacity to deliver a secure and uninterrupted energy supply at a competitive cost.

Indicators

In consultation with Forfás and the Electricity Benchmarking Steering* Group, Pöyry (formerly ILEX) developed a series of indicators to provide a backdrop against which to complete a more detailed analysis of Ireland's comparative electricity performance.

Price of electricity	Security of supply	Service access and quality	Competitive landscape
<ul style="list-style-type: none"> ■ Retail prices <ul style="list-style-type: none"> – to domestic and industrial customers – with and without taxes – snapshot and trend ■ Wholesale prices <ul style="list-style-type: none"> – price levels – presence or absence of wholesale price indicators 	<ul style="list-style-type: none"> ■ Primary fuel import % ■ Fuel mix of generation ■ Plant margin ■ Largest set size ■ Size of market ■ Barriers to entry in generation ■ Hours interruption 	<ul style="list-style-type: none"> ■ Degree of unbundling <ul style="list-style-type: none"> – transmission – distribution ■ Regulated third party access <ul style="list-style-type: none"> – transmission – distribution ■ Network density <ul style="list-style-type: none"> – transmission – distribution ■ Number of suppliers 	<ul style="list-style-type: none"> ■ Market concentration <ul style="list-style-type: none"> – retail – wholesale ■ Market opening ■ Switching rates ■ % foreign ownership

Note: *The Electricity Benchmarking Steering Group included representatives from industry as well as the Department of Communications, Marine and Natural Resources, the Department of Enterprise, Trade and Employment, the Commission for Energy Regulation (CER), Enterprise Ireland, IDA Ireland and the Western Development Commission.

KEY FINDINGS

Key Findings (1)

Increasing Demand

- Electricity demand in Ireland continues to grow. Annual growth in 2005 was 3.1% compared with an annual increase of 1.1% in the EU-25.
- Average annual growth of about 4% is forecast in the medium term in Ireland.

Higher Prices

- The price increases of recent years have put Ireland at a competitive disadvantage in relation to the EU-15 average. Up until 2001, industrial electricity prices in Ireland were below the EU-15 average but since then they have been significantly higher.
- Ireland recorded the second highest increase in industrial electricity prices of the EU-15 countries during the period 2000-2006.
- Industrial electricity prices (excl. VAT but incl. Other Taxes) rose by 52.7% in Ireland over the six-year period, compared to the more modest increase of 28.9% in the EU-15.

Key Findings (2)

Security of Supply

- Ireland has a low level of spare electricity capacity over and above peak demand compared to the other benchmark countries.
- It is expected that there will be sufficient generation capacity to meet demand until 2010 unless plant closure is advanced, or the availability performance of existing plant deteriorates, in which case supply shortages could arise in winter 2007 and winter 2008. To ensure generation adequacy in the short to medium term, it is critical that the performance of existing plant is improved and stabilised.
- Ireland is the second most reliant of the 13 benchmark countries on fossil fuels for electricity generation with 93% of its fuel mix made up of fossil fuels.

Limited Competition

- Both the generation and retail supply markets are relatively more concentrated in Ireland than in the other benchmark countries.
- France, followed by Ireland and Portugal have the least competition within their retail supply markets as a single large company with a very high market share dominates each and their generation market is dominated by a large generator.

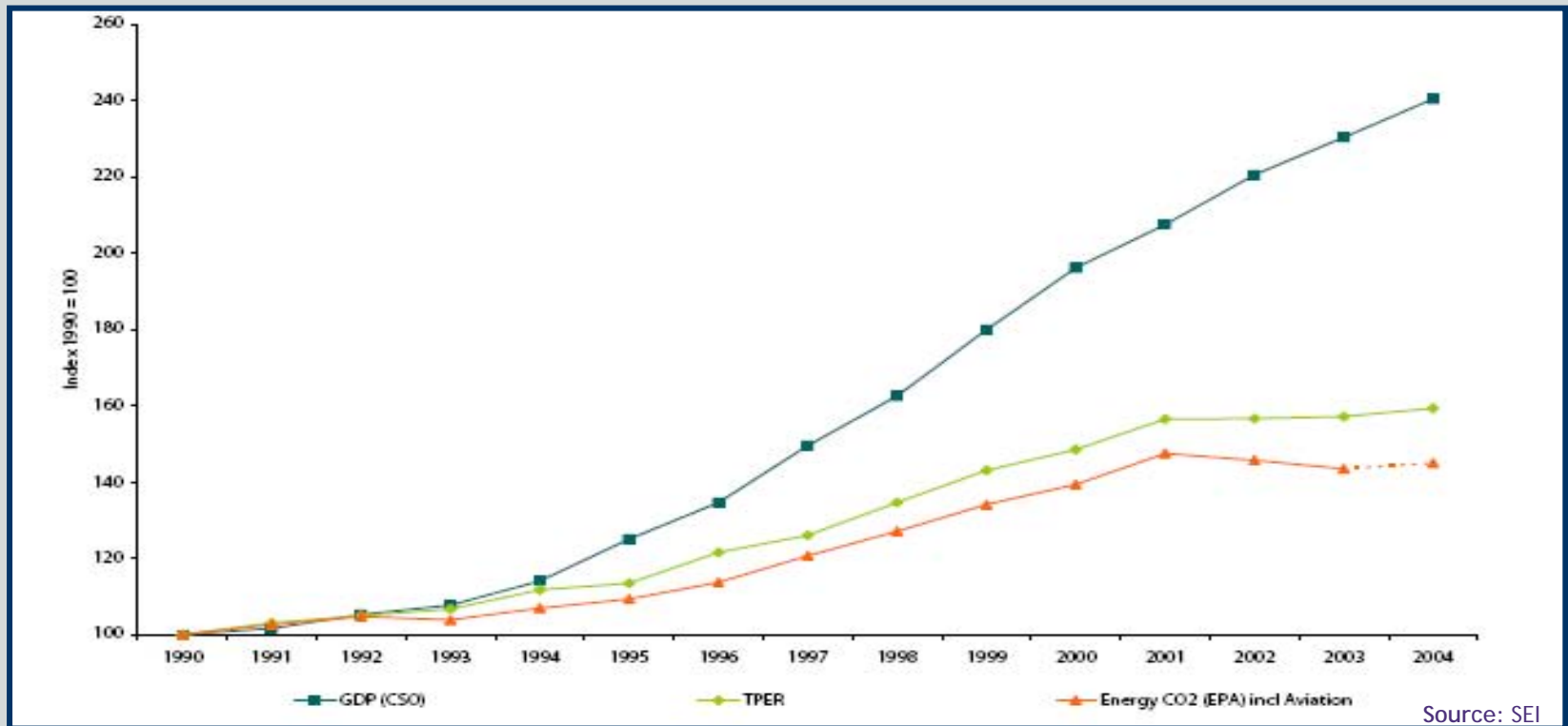
Key Findings (3)

Ireland's Overall Performance

- Ireland (along with Italy and Singapore) is joint bottom of the 13 benchmark countries on the composite indicator of meeting industry electricity needs. Ireland failed to secure a score higher than 5 on any of the four broad areas of focus, namely prices, security of supply, access/quality and competitive landscape.
- Ireland's lowest ranking was on price where it scored 2 and it also scored poorly (score of 4) on the important security of supply indicator.

ENERGY & INDUSTRY

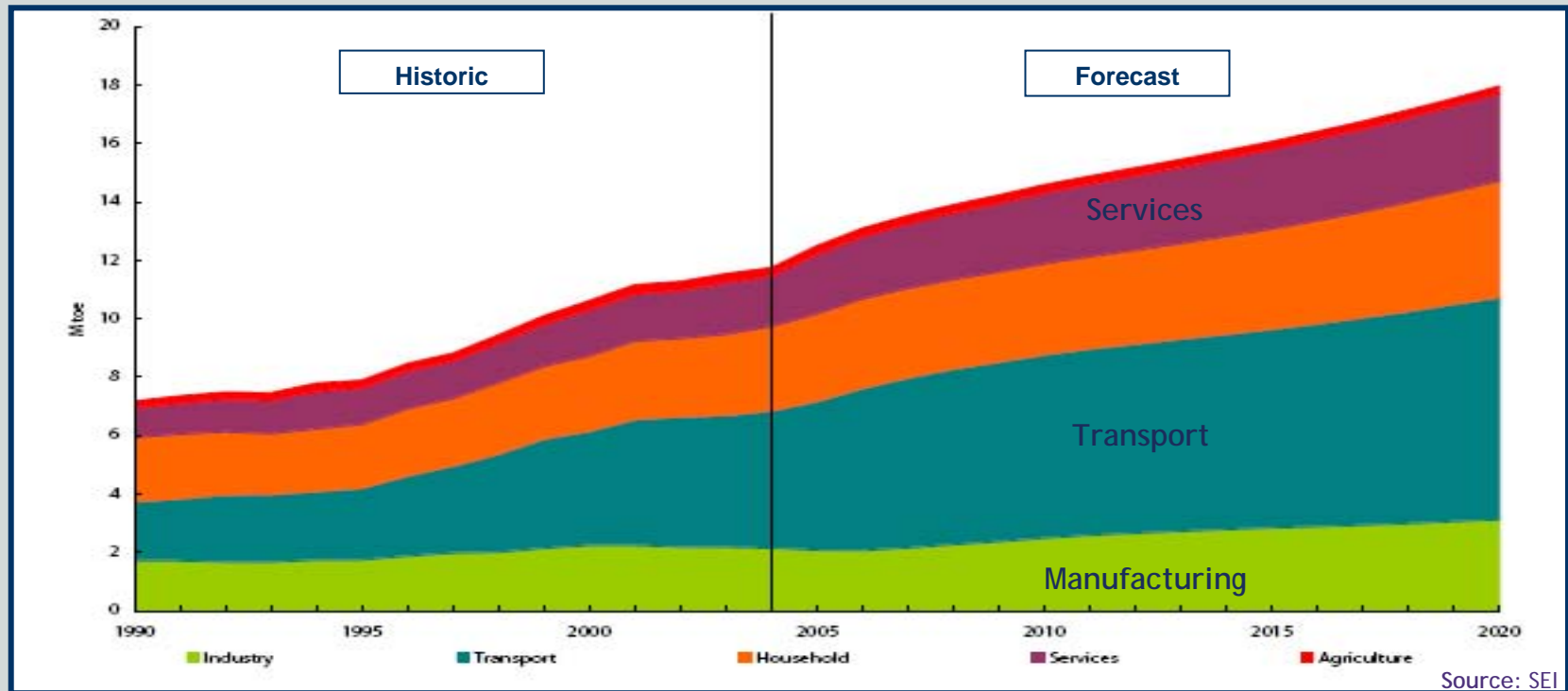
Index of GDP, Total Primary Energy Requirement and Energy CO₂, 1990-2004



- ▶ The Irish energy market is one of the fastest growing in the developed world with the Total Primary Energy Requirement (TPER) growing by 59.3% between 1990 and 2004.
- ▶ Changes in the structure of the economy and improvements in energy efficiency have resulted in the relative decoupling of TPER from economic growth.

Energy Demand by Sector

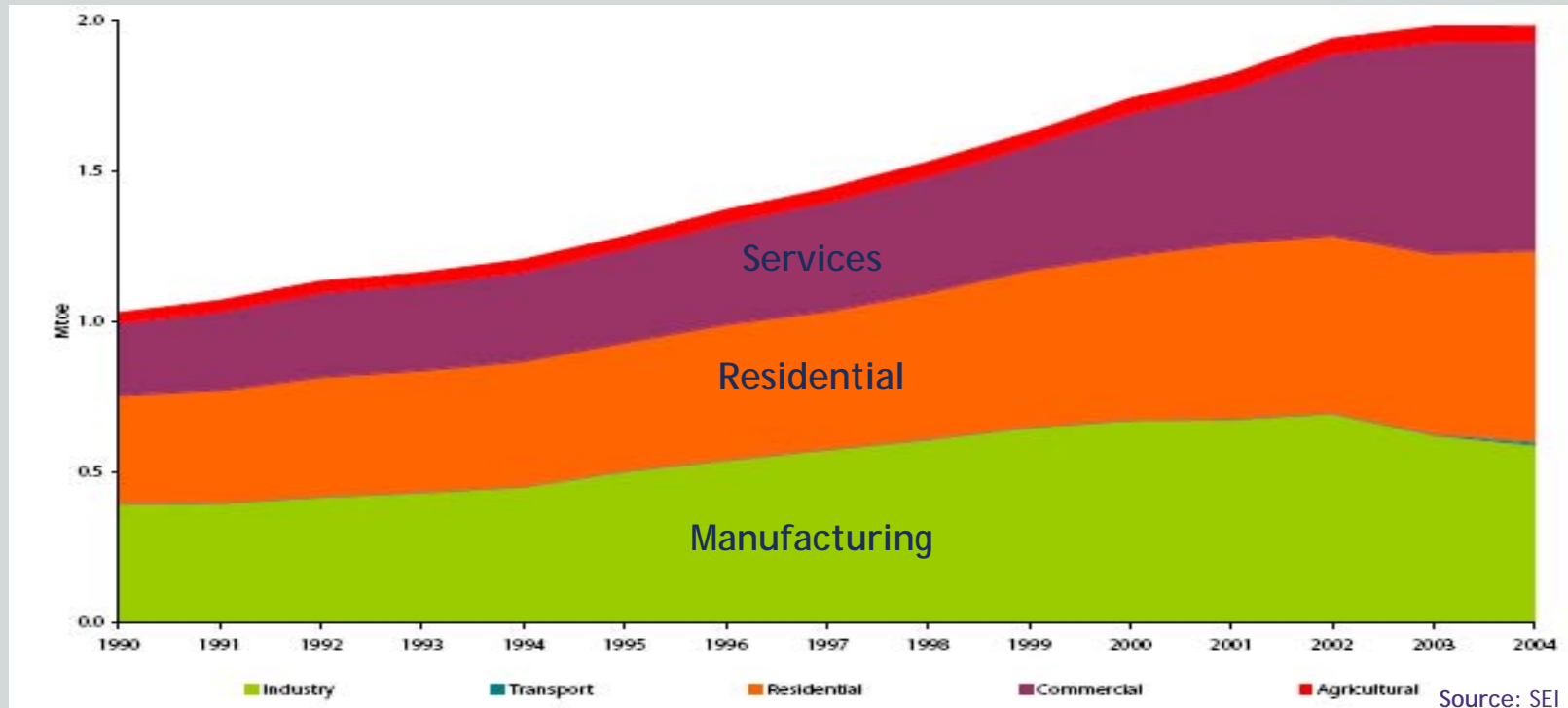
Historic vs. Future



Note: Mtoe = Millions of tonnes of oil equivalent (conventional standardised unit of energy) . Industry is defined as manufacturing industry.

- ▶ Sustainable Energy Ireland (SEI), using the macro-economic assumptions underpinning the high growth scenario of the ESRI's *Medium-Term Review: 2005-2012*, forecast energy demand growth of 43.6% percent in the period, 2005 to 2020 compared to the 64% increase in the previous 15 years.

Electricity Demand by Sector 1990-2004



Note: Mtoe = Millions of tonnes of oil equivalent (conventional standardised unit of energy) . Industry is defined as manufacturing industry.

- ▶ In terms of electricity demand, there has been strong growth in the services sector in the last decade.
- ▶ Manufacturing industry's electricity demand increased during the 1990s but has fallen back in recent years due to greater energy efficiencies and structural changes in the sector (e.g. closures of Irish Ispat (steel) and Irish Fertilizer Industries).

Electricity Demand - Growth and Shares

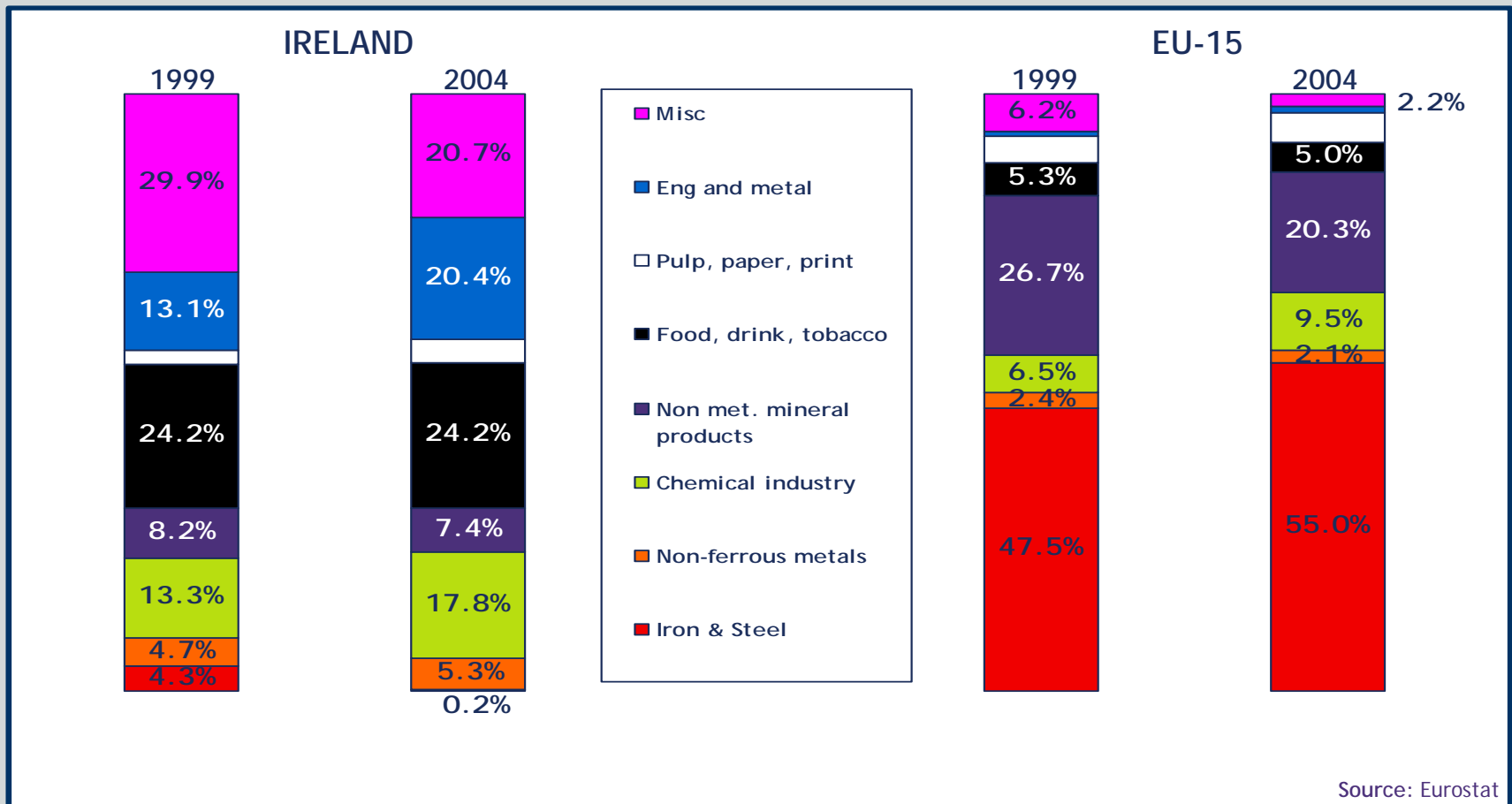
1990-2004

	Growth %	Average Annual Growth Rates %					Share %	
		1990-2004	1990-1995	1995-2000	2000-2004	2004	1990	2004
Industry	49.1	2.9	4.9	6.0	-3.2	-5.4	38.5	29.9
Transport	760.0	16.6	0.6	5.3	59.5	547.2	0.1	0.7
Residential	77.6	4.2	3.7	5.0	3.8	5.4	34.5	31.9
Services	188.6	7.9	5.2	8.9	10.1	-1.2	23.3	35.0
Agriculture	42.7	2.6	3.2	2.7	1.6	0.6	3.6	2.6
Total	96.1	4.9	4.5	6.3	3.8	2.1		

Source: SEI

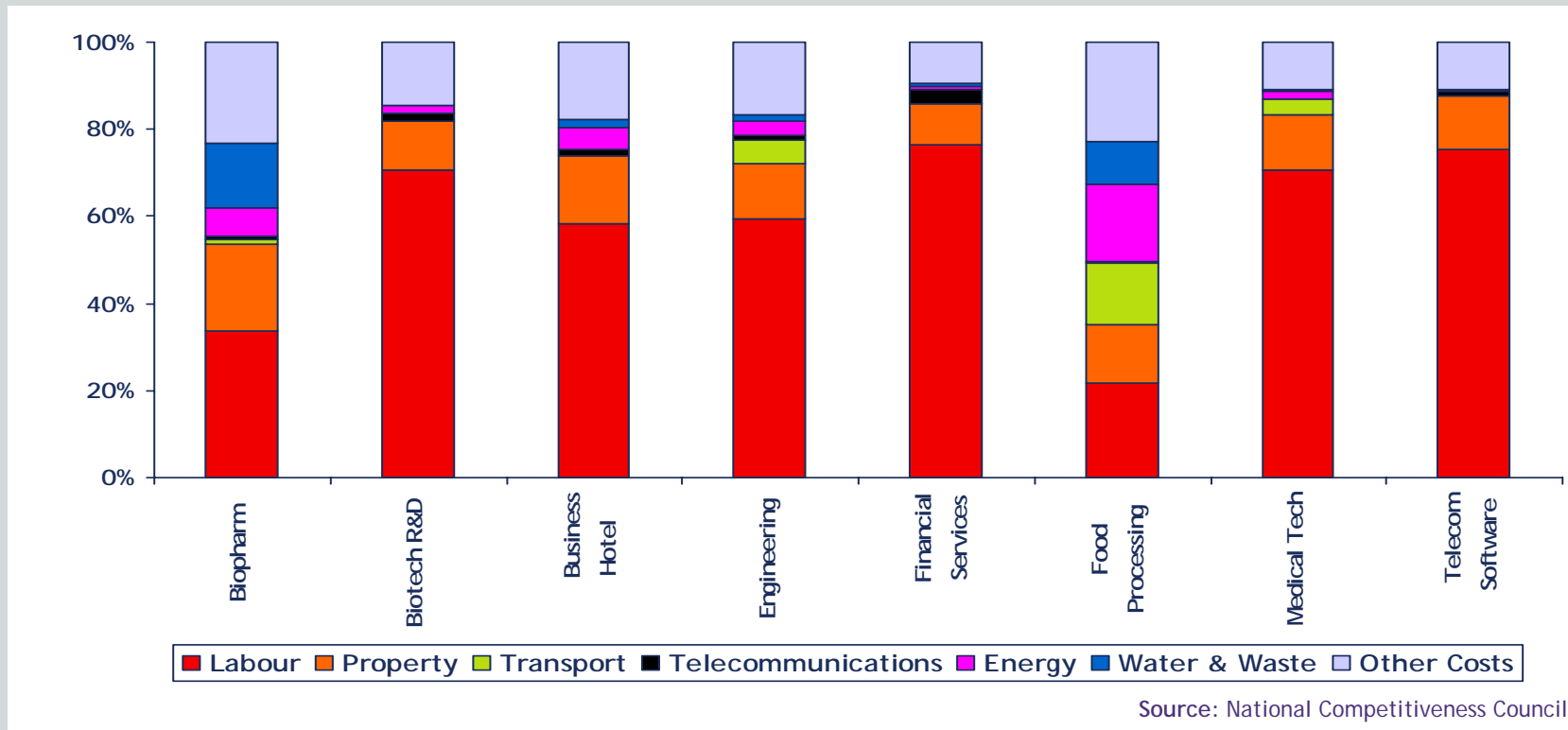
- ▶ Manufacturing industry's share of electricity demand declined from 38.5% in 1990 to 29.9% in 2004 while services saw its share increase from 23.3% to 35%, making it the largest sector in terms of electricity demand.

Industry's Energy Demand by Sector Ireland vs. EU-15



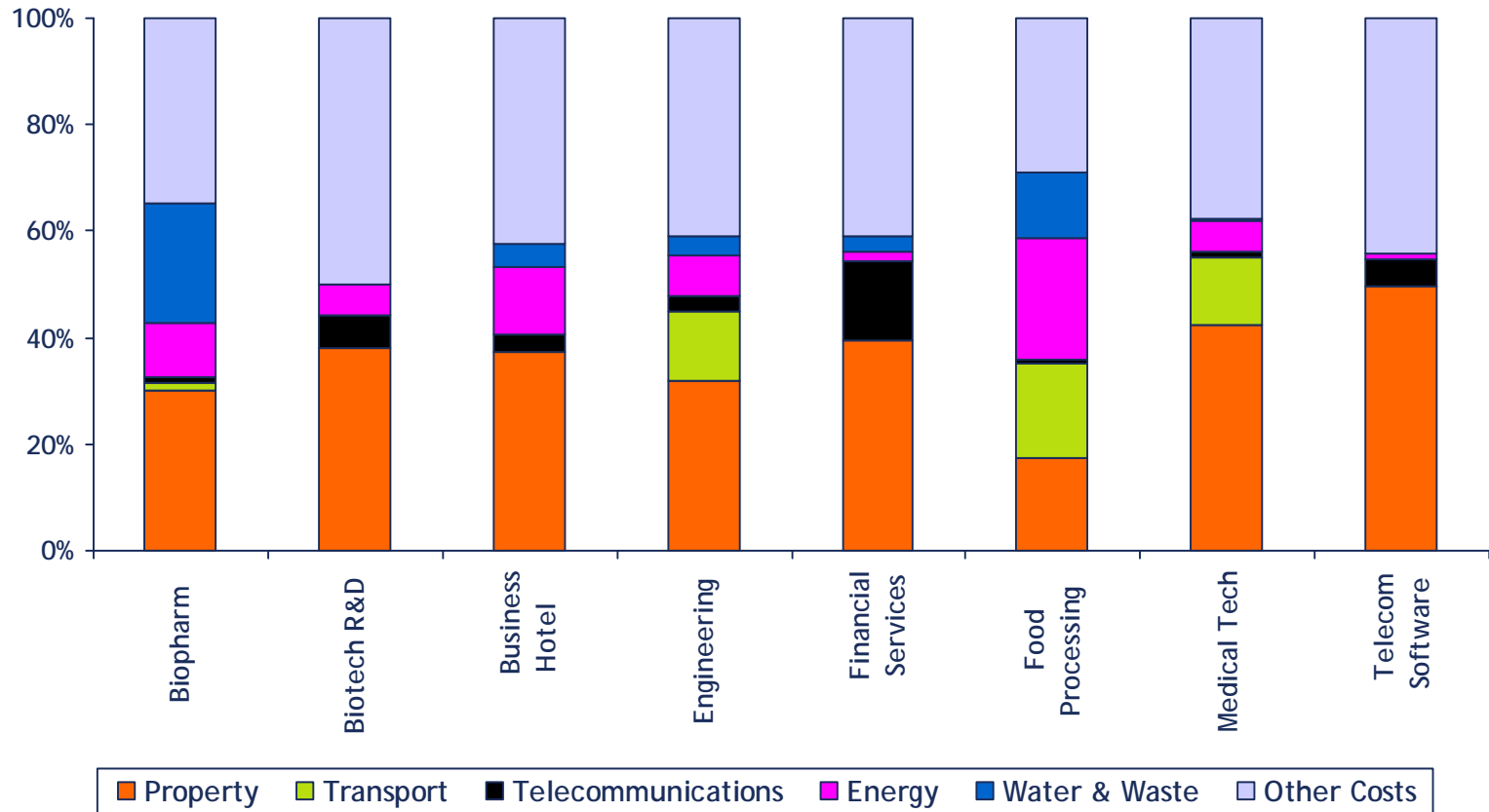
- ▶ Manufacturing industry's energy demand by sector in Ireland differs considerably from that of the EU-15. In 2004, the largest energy consumers in Ireland were the Food, Drink & Tobacco sector followed by the Engineering & Metals and Chemical sectors.

Cost Profile for a Typical Firm by Sector, 2006



- ▶ Recent research by the National Competitiveness Council (NCC) provides a breakdown of the costs profile for a selected firm across eight sectors. Caution should be exercised when drawing sectoral inferences as the profiles are based on a selected firm in each sector.
- ▶ Energy expenditure as a share of total costs is largest for the selected Food Processing firm.

Cost Profile (excl. Labour Costs) for a Typical Firm by Sector, 2006

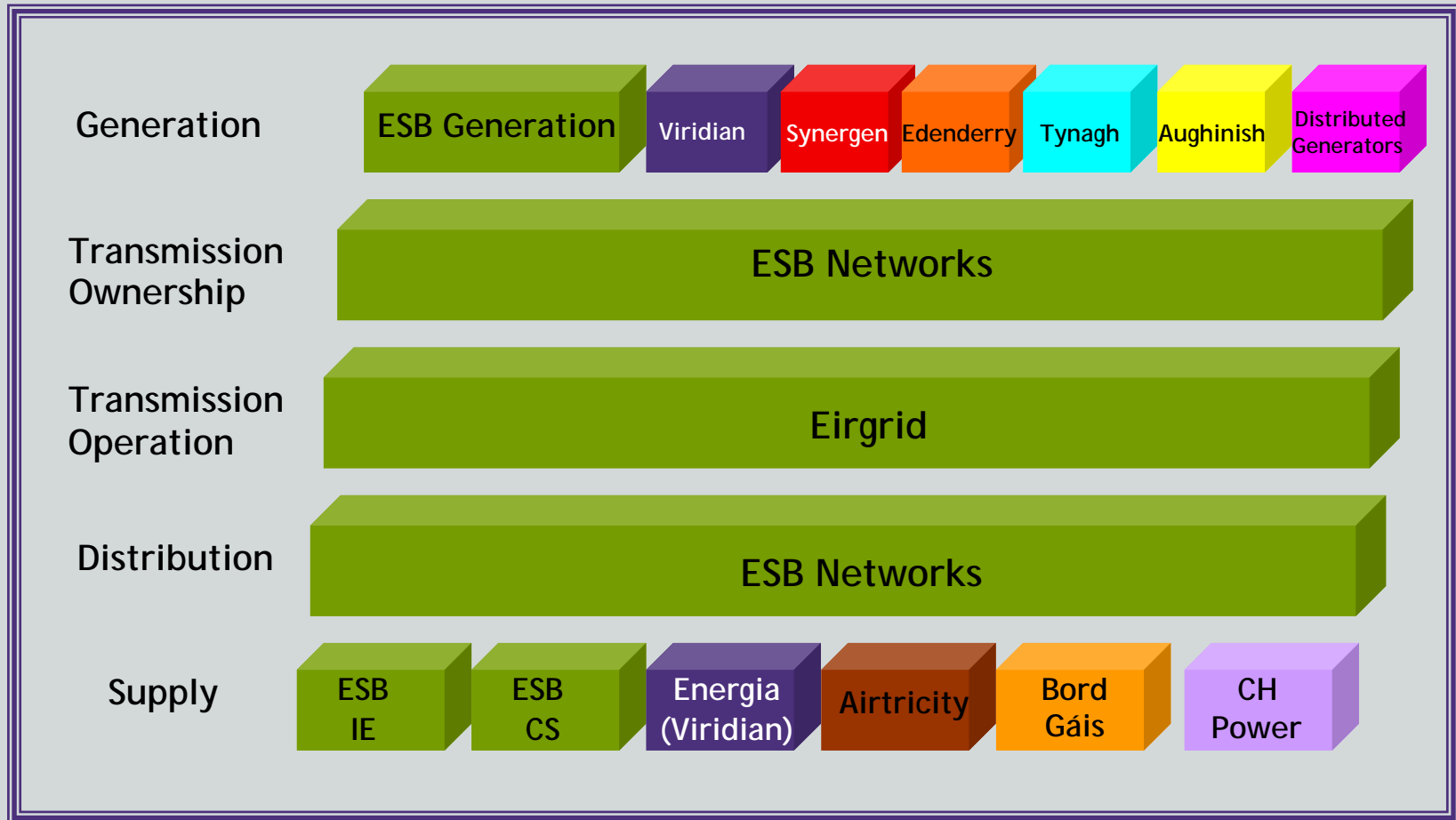


Source: National Competitiveness Council

- ▶ When labour costs are excluded, energy expenditure as a share of total costs is still largest for the Food firm. It is also a significant cost for the Biopharma, Business Hotels, Engineering and Medical Technology firms.

OVERVIEW OF IRISH ELECTRICITY MARKET

Electricity Market Structure



Note: Size of block is not intended to represent market share.

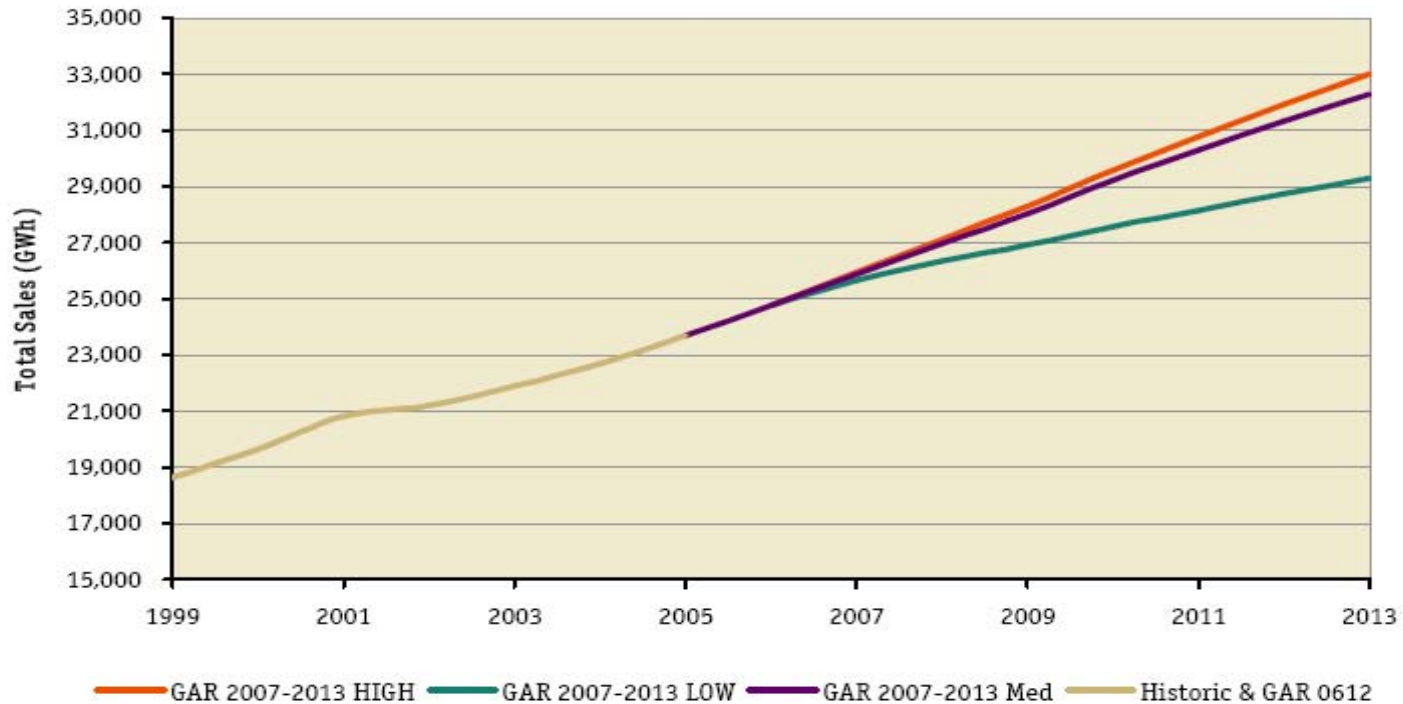
Electricity Demand Growth

Year	Total Electricity Requirement (GWh)	% Annual Growth
2001	23,511	-
2002	23,912	1.7%
2003	24,673	3.2%
2004	25,581	3.7%
2005	26,371	3.1%

Source: CER

- ▶ Total Electricity Requirement (TER) in Ireland recorded substantial growth in recent years, increasing by 12.2% during the period 2001-2005.
- ▶ The annual growth in 2005 was 3.1% compared with an annual increase of 1.1% in the EU-25 and 0.3% in the UK.

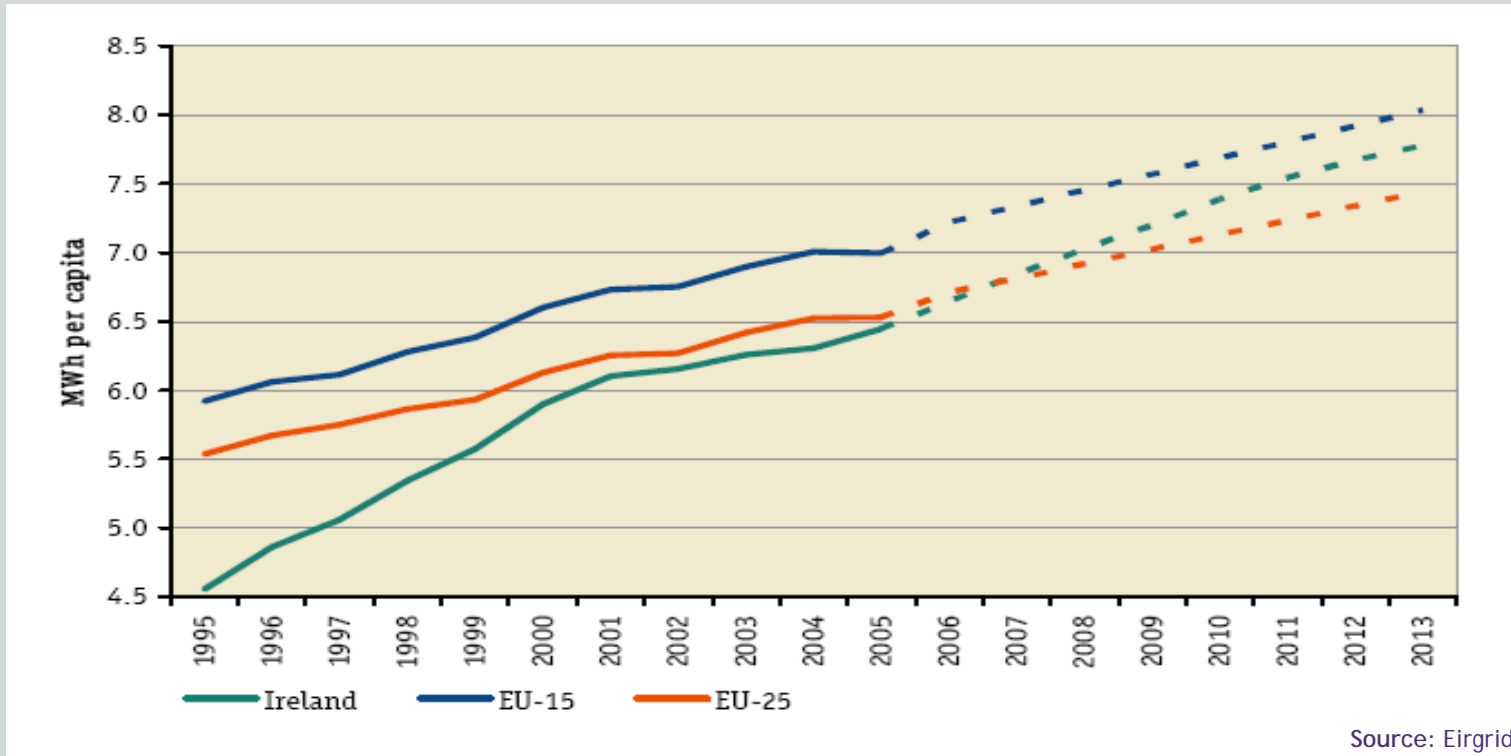
Electricity Demand Forecasts



Source: Eirgrid

- ▶ Eirgrid's *Generation Adequacy Report 2007-2013* looks at three possible demand scenarios - high (assumes increase of 4.2% p.a.), median (increase of 3.9% p.a.) and low (increase of 2.4% p.a).
- ▶ The forecast high and median demand growth scenarios are very much in line with historical trends while the low growth scenario represents a relative slow down.

Per Capita Demand



- ▶ Electricity demand per capita in Ireland has been increasing at a faster rate than in the rest of the EU in recent years, as evidenced by the narrowing gap between Ireland and the EU-15 and EU-25 above.
- ▶ Per capita demand in Ireland is forecast to surpass that of the EU-25 in the next couple of years.

Energy Policy Developments

▶ Energy Green Paper

In October, DCMNR published the Green Paper which puts forward energy policy options for the next decade and beyond to ensure safe and secure energy supplies, promote a sustainable energy future, and deliver competitive prices to Irish consumers. The Energy White Paper is due to be published in early 2007.

▶ Single Electricity Market (SEM)

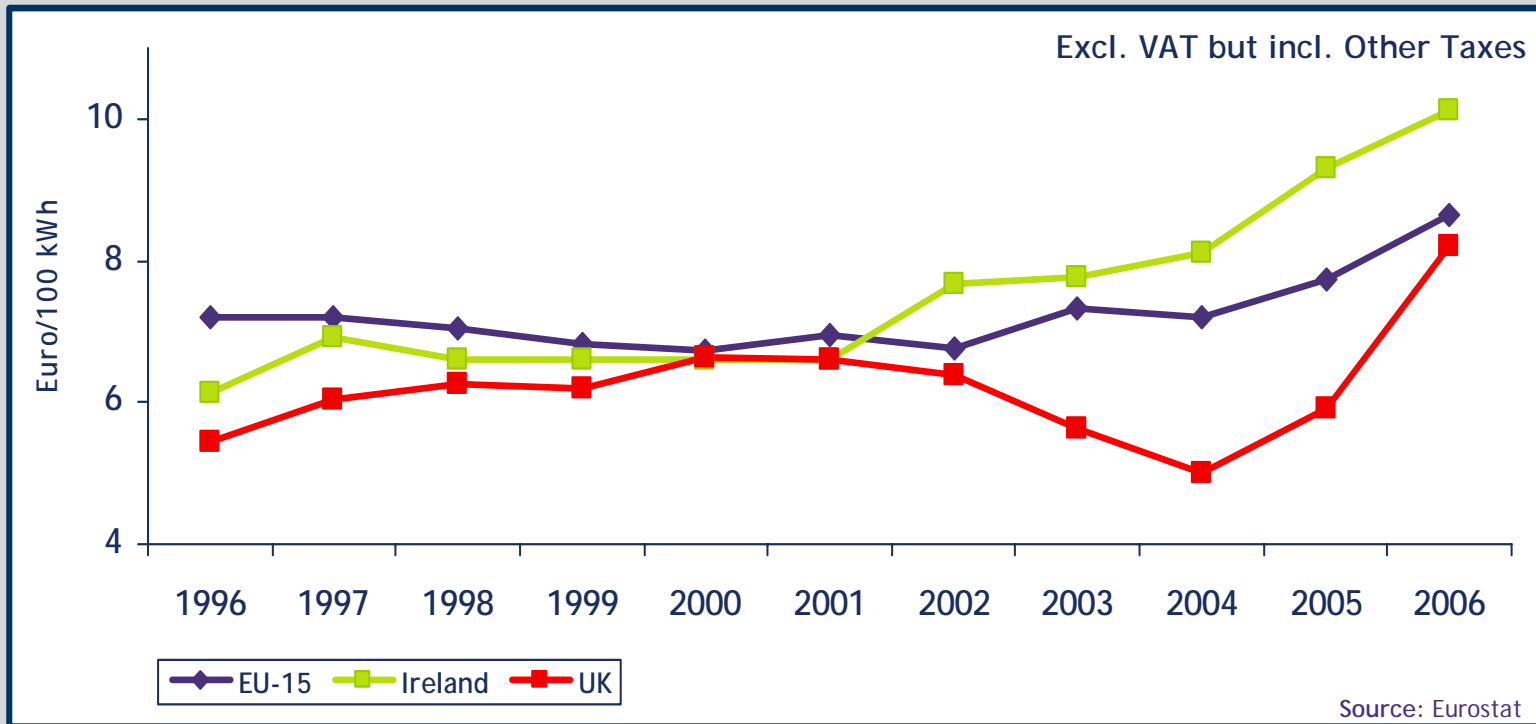
Since publication of the All-Island Energy Market Development Framework in 2004, significant progress has been made towards implementation of the SEM. The aim of SEM is to provide competitive, sustainable and reliable markets in electricity and natural gas on the island of Ireland at the minimum cost necessary. SEM is due to go live in November 2007.

▶ Market Structure

The CER recently announced that ESB will close or divest 1,300 MW of existing power plant by 2010. This represents almost 30% of ESB's present generation capacity. The CER will oversee the ensure that the appropriate mid-merit plants to reduce ESB's market power are closed by 2010.

KEY PERFORMANCE INDICATORS

Industrial Electricity Price Trends 1996-2006

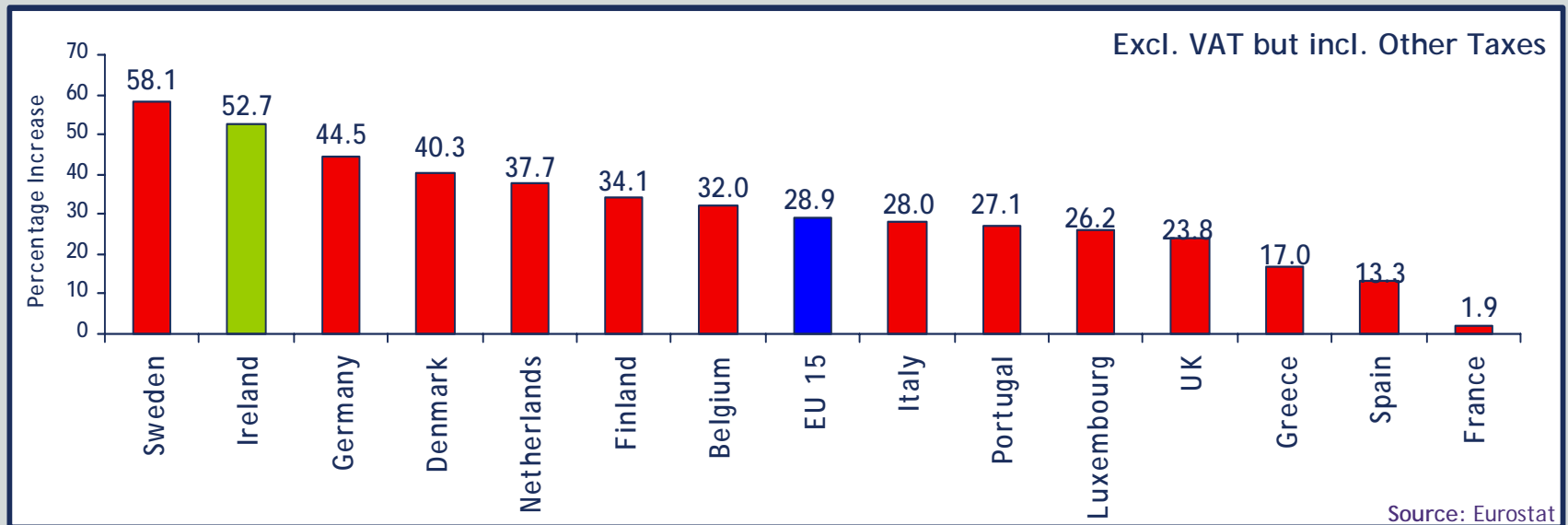


Note: Industrial electricity prices are based on annual consumption of 2,000 MWh; maximum demand of 500 kW and annual load of 4,000 hours.

- ▶ The price increases of recent years have put Ireland at a competitive disadvantage in relation to the EU-15 average. Up until 2001, industrial electricity prices in Ireland were below the EU-15 average but since then they have been significantly higher.
- ▶ While there had been a significant gap between industrial electricity prices in Ireland and the UK in recent years, increases in wholesale prices in the UK have seen that gap narrow in 2006.

Increase in Industrial Electricity Prices

1 Jan 2000 to 1 Jan 2006

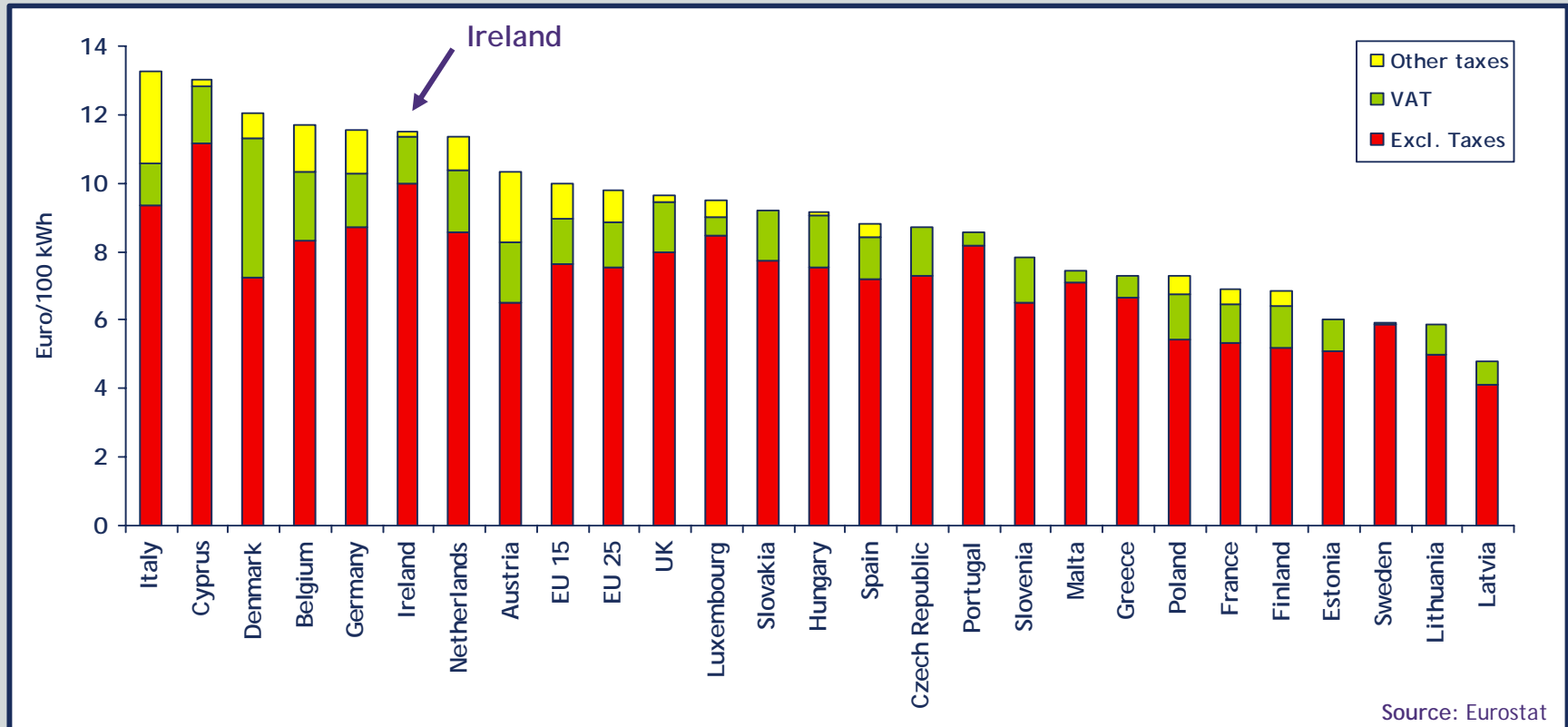


- Notes:
1. This price comparison relates to prices as of 1st January but price increases are applied at different times across the benchmark countries, therefore the data should be interpreted accordingly.
 2. Data for Austria was not available.

- ▶ Ireland recorded the second highest increase in industrial electricity prices of the EU-15 countries during the period 2000-2006.
- ▶ Industrial electricity prices (excl. VAT but incl. Other Taxes) rose by 52.7% in Ireland over the six-year period, compared to the more modest increase of 28.9% in the EU-15.

Industrial Electricity Prices

1 January 2006

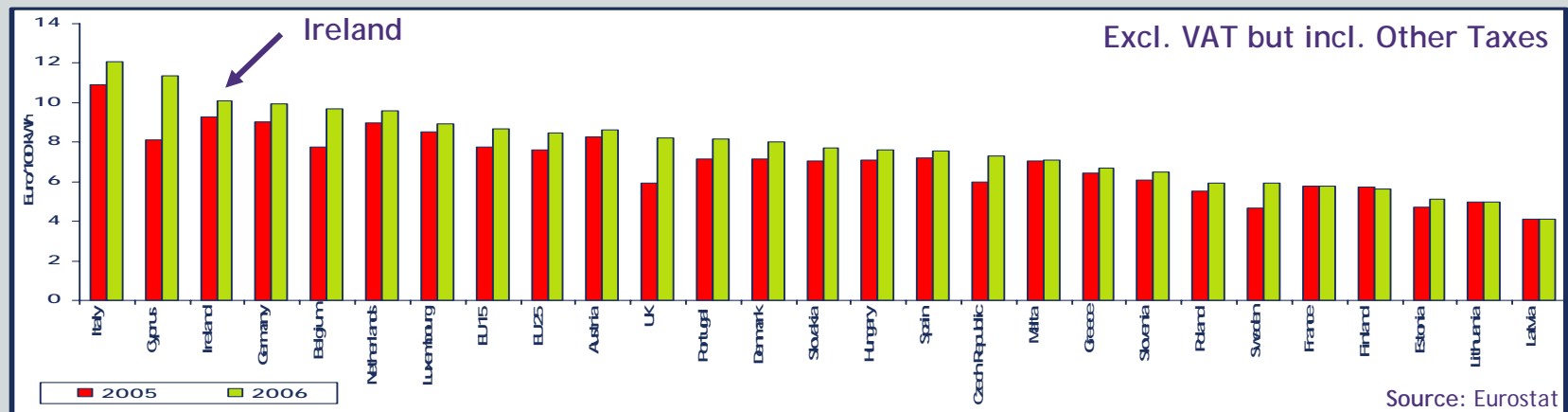
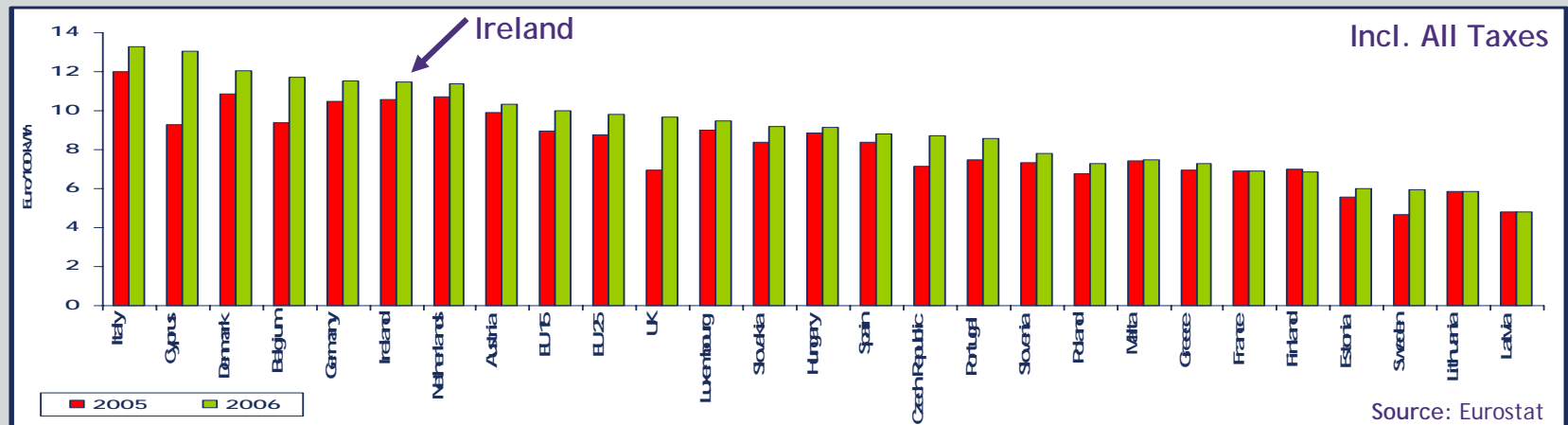


Note: This price comparison relates to prices as of 1st January but price increases are applied at different times across the benchmark countries, therefore the data should be interpreted accordingly.

- ▶ VAT and Other Taxes (energy taxes, green taxes, local taxes etc) vary considerably across the EU-25. Ireland ranked 6th of the EU-25 when all taxes are included.

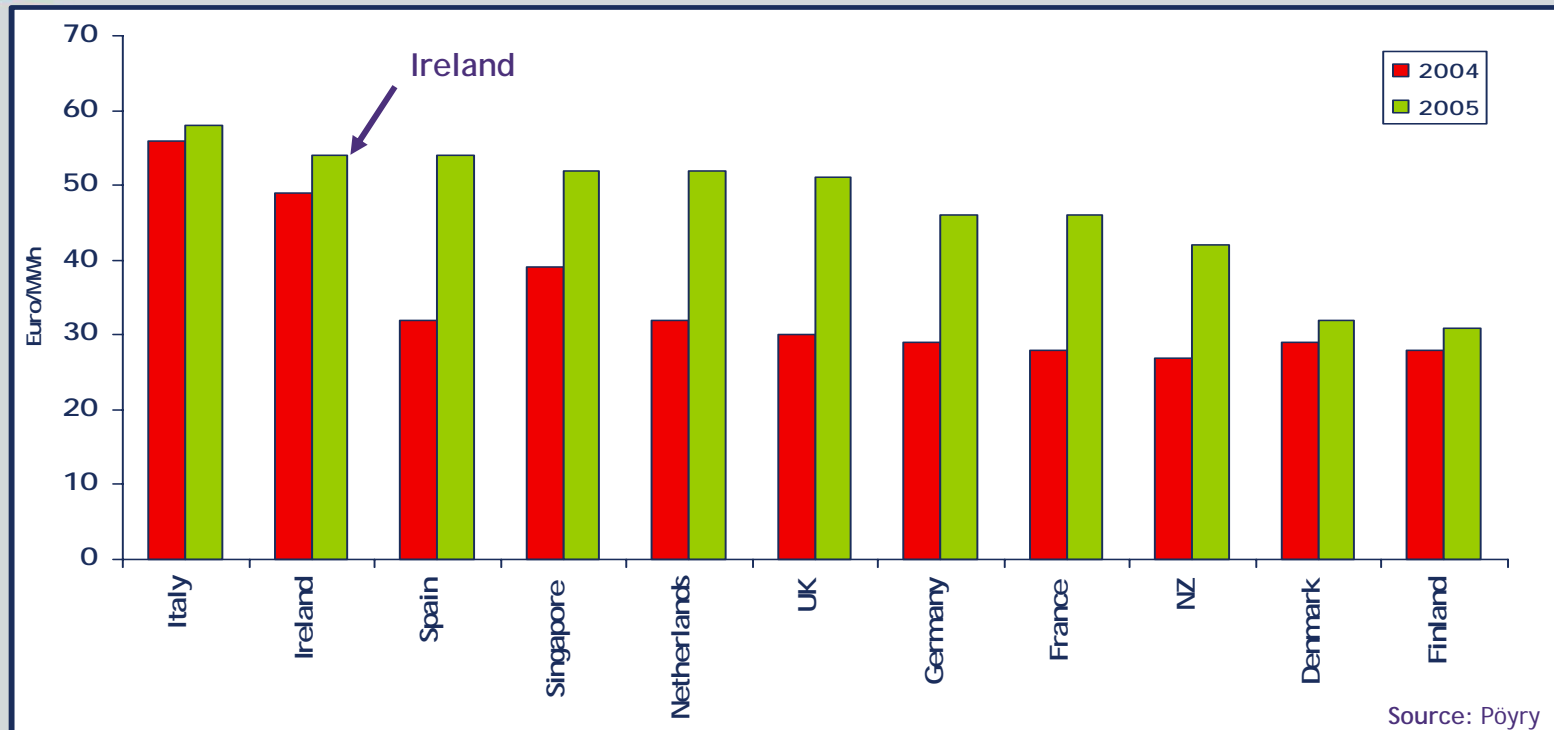
Industrial Electricity Prices

1 Jan 2005 vs. 1 Jan 2006



- ▶ There has been a slight improvement in Ireland's comparative performance in the year to 1 January 2006 as other countries experienced larger increases.
- ▶ In 2006, Ireland ranks 6th (4th highest in 2005) of the EU-25 when all taxes are included and 3rd (2nd highest in 2005) when VAT is excluded but Other Taxes are included.

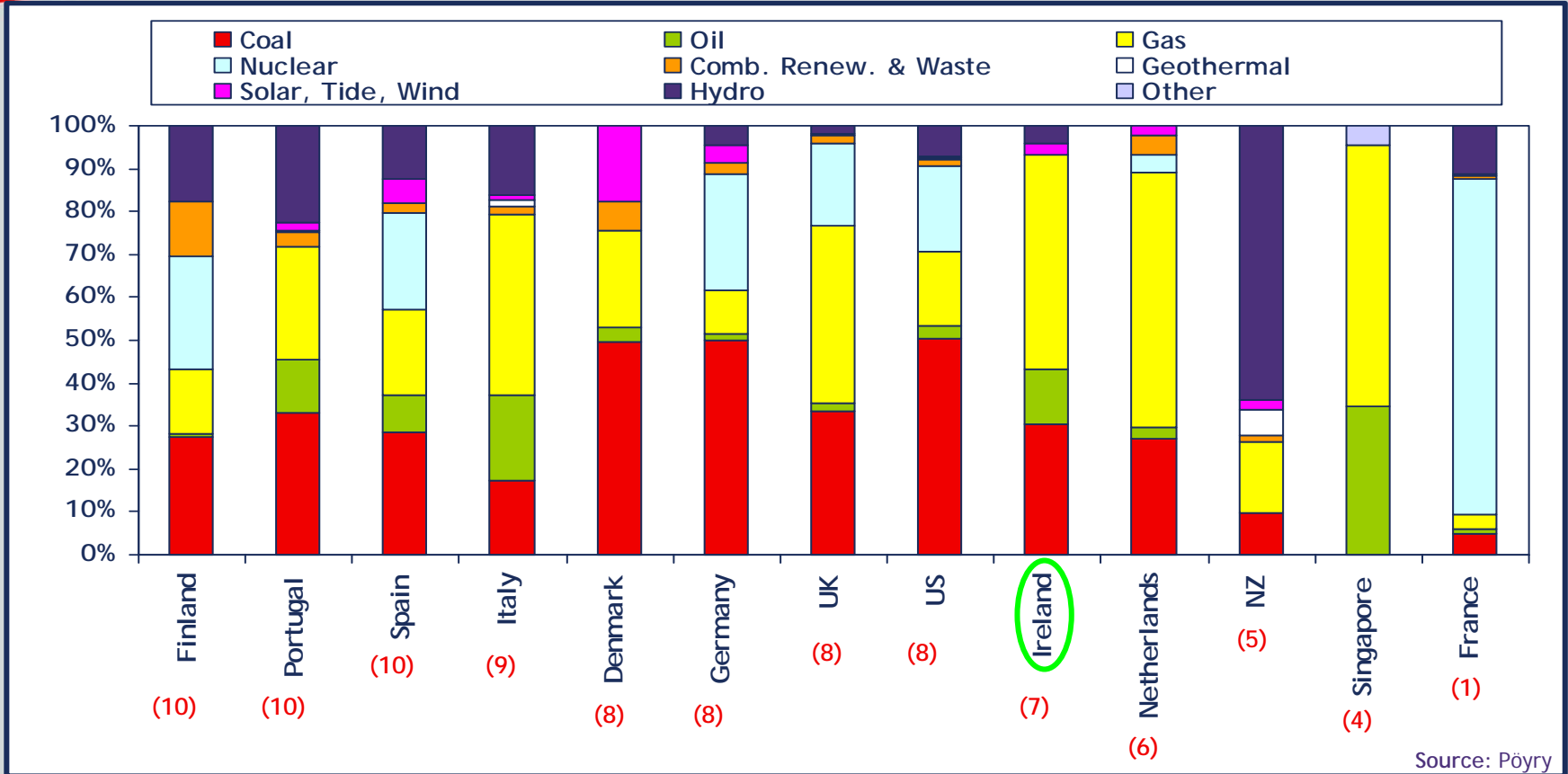
Wholesale Electricity Prices



- Notes: 1. The wholesale price for Ireland is based on the Best New Entrant Price (BNE) and for other countries on the average annual wholesale electricity price using published data.
 2. Data not available for Portugal and US.

- ▶ Many of the benchmark countries experienced large increases in wholesale prices year on year and as a result the gap between Ireland and the other countries has narrowed significantly. Ireland remains among the most expensive of the benchmark countries in terms of wholesale prices.
- ▶ The fact that other markets experienced increases in their wholesale prices later than Ireland could be caused by a range of factors from the fuel mix and associated costs to the local regulatory regime.

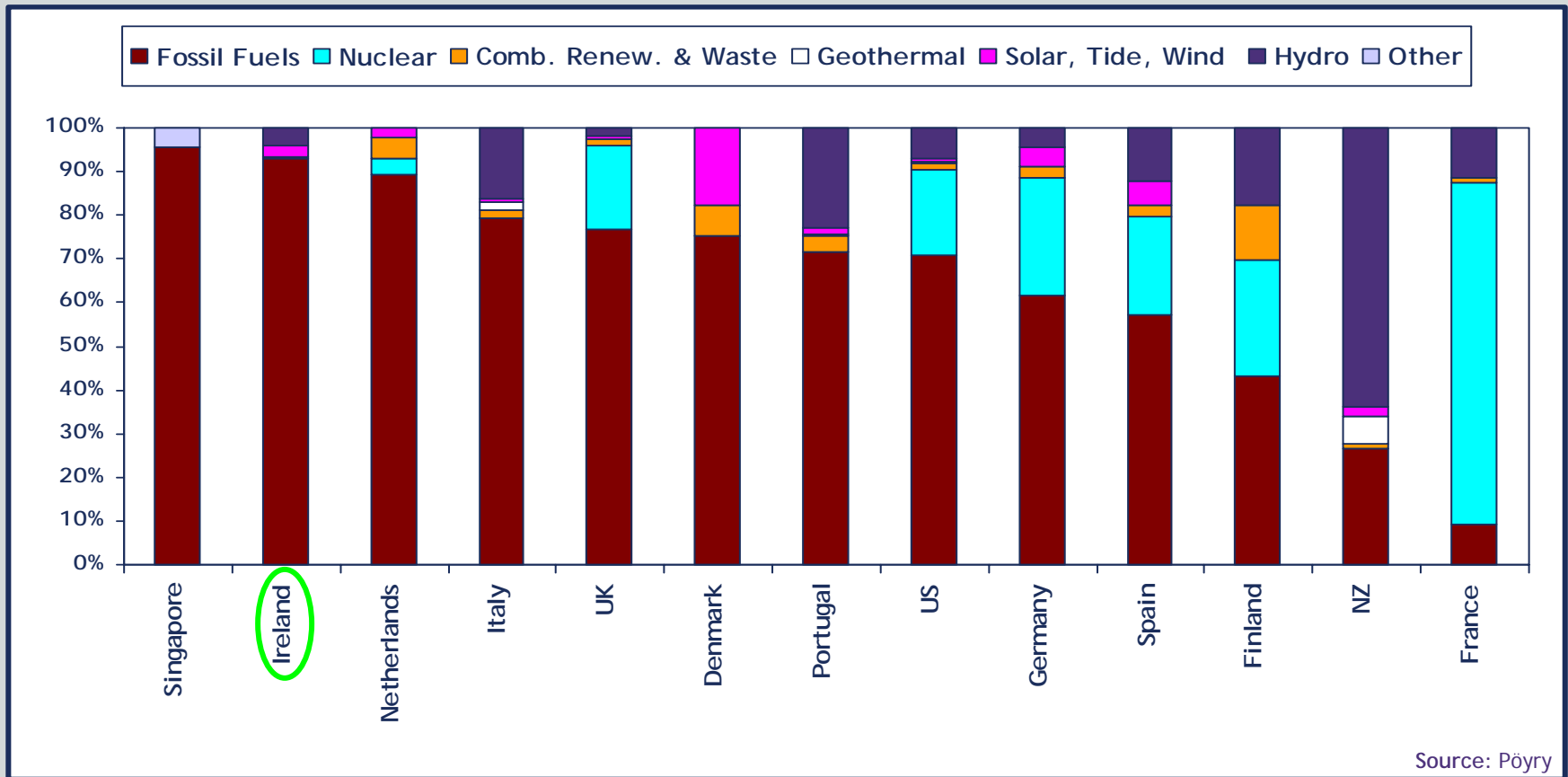
Fuel Mix, 2004



Notes: 1. Numbers in brackets represent each country's score (out of 10) for the diversity of the fuel mix used in generation.
 2. Data for Singapore is for 2003.

- ▶ While Ireland scored 7 out of 10 for the diversity of the fuel mix used in electricity generation, most of the benchmark countries scored 8 or above. This puts Ireland in the bottom five in terms of the diversity of its fuel mix.
- ▶ France has the least diverse portfolio as reflected in its low score (1).

Reliance on Fossil Fuels, 2004



Note: Data for Singapore is for 2003.

- ▶ When the fossil fuels (gas, oil and coal) are combined, Ireland is the second most reliant of the 13 benchmark countries on fossil fuels for electricity generation. 93% of Ireland's fuel for generation comes from fossil fuels.

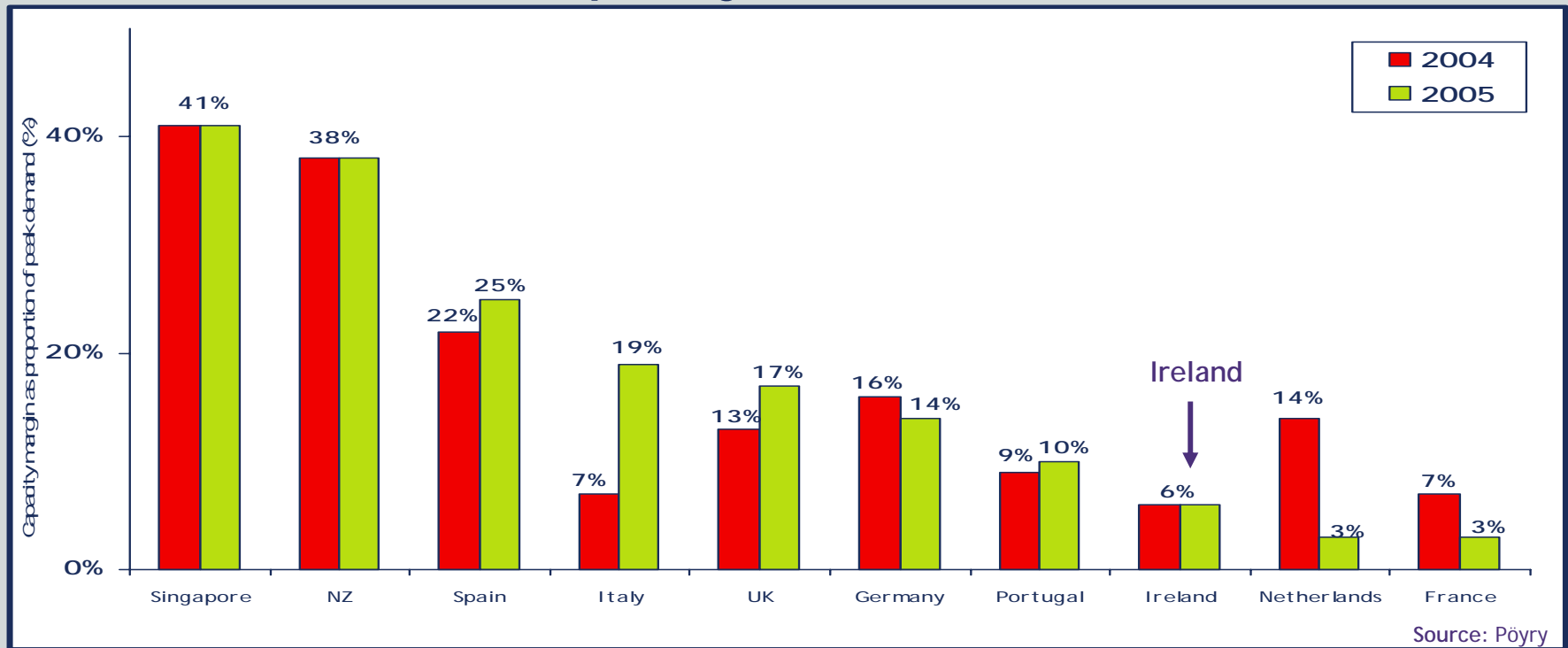
European Fuel Mix and Indicative Costs - An Explanation

- ▶ The next slide sets out a high level comparison of the impact of the fuel mix on generation costs. It suggests that the fuel mix plays a significant role in the relative level of final end-user prices across European countries.
- ▶ According to the Green Paper, the fuel mix used in generation in Ireland accounts for over 70% of the differential between Irish and European generation costs.

European Fuel Mix and Indicative Weighted Average Generation Costs

	Gas	Hydro	Nuclear	Coal	Oil	Weighted average generation cost	Country rankings
Marginal cost of generation	€27/MWh	€4/MWh	€7/MWh	€21/MWh	€38/MWh		
Generation fuel Mix (%)							
Austria	17%	68%	0%	11%	1%	€10/MWh	10
Belgium	35%	9%	37%	14%	3%	€16/MWh	8
Denmark	18%	0%	0%	50%	7%	€18/MWh	6
Finland	12%	18%	16%	48%	6%	€17/MWh	7
France	1%	22%	54%	13%	9%	€11/MWh	9
Germany	20%	8%	19%	44%	4%	€18/MWh	6
Greece	13%	26%	0%	40%	18%	€20/MWh	5
Ireland	49%	10%	0%	21%	17%	€25/MWh	1
Italy	37%	26%	0%	18%	15%	€21/MWh	3
Luxembourg	27%	70%	0%	0%	0%	€10/MWh	10
Netherlands	75%	0%	2%	20%	0%	€25/MWh	1
Portugal	21%	40%	0%	17%	20%	€18/MWh	6
Spain	15%	17%	24%	31%	8%	€16/MWh	8
Sweden	1%	48%	28%	3%	13%	€10/MWh	10
United Kingdom	33%	5%	15%	37%	7%	€21/MWh	3

Level of Spare Electricity Generation Capacity Over and Above Peak Demand



Notes: 1. The figure for NZ is unadjusted for availability.

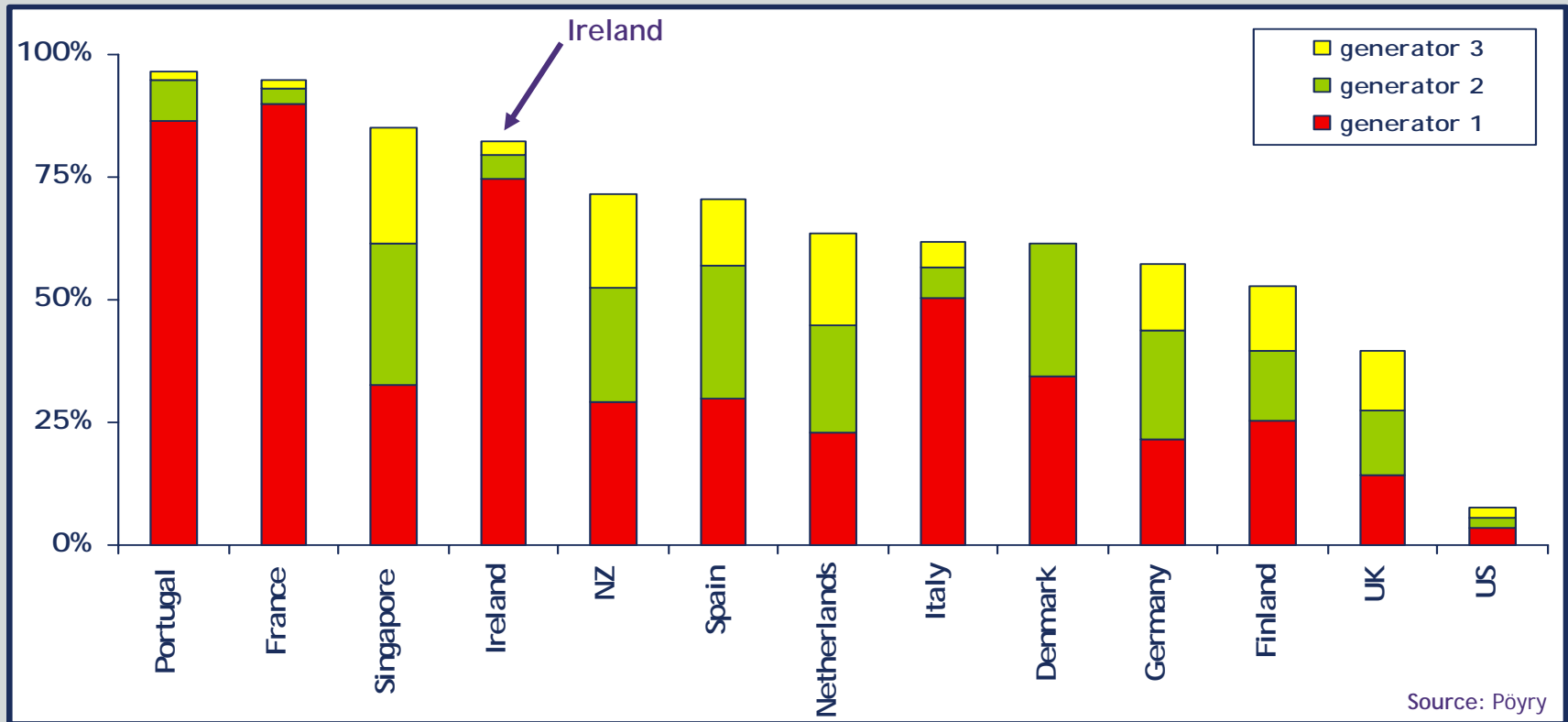
2. Denmark and Finland are excluded because availability information for these two countries is based on the entire Nordic region rather than country specific information. The US is also excluded.

- ▶ This indicator is based on the ratio of spare capacity (i.e. the difference between available capacity and peak demand) to peak demand. Peak demand is at its highest in Ireland in winter but for other countries it will be in summer due to demand for electricity for air conditioning. To calculate the available capacity, installed capacity data for each country is adjusted using the ratio of available to installed capacity from the European Transmission System Operator.
- ▶ Interconnection is not taken into account as peak demand often occurs at similar times in neighbouring countries. For generation adequacy assessments, the CER has agreed a reliance of 200MW on Northern Ireland can be assumed.

Generation Adequacy

- ▶ The previous slide shows that Ireland has a low level of spare electricity capacity over and above peak demand compared to the other benchmark countries. This is primarily due to the fact that installed capacity in Ireland is not greatly in excess of peak demand.
- ▶ The performance of generation plant in Ireland is also low compared to other countries. While plant availability had improved to the mid 80s during 2005, it has deteriorated during 2006 and in recent months has fallen below 80%. Plant availability in the UK averages 87%.
- ▶ According to the recently published *Generation Adequacy Report* by Eirgrid, under all demand growth scenarios (see Slide 21) and assuming median plant availability, there will be sufficient generation capacity to meet demand until 2010. However, if plant closure is advanced, or the availability performance of existing plant deteriorates, then supply shortages could arise in winter 2007 and winter 2008.
- ▶ To ensure generation adequacy in the short to medium term, it is critical that the performance of existing plant is improved and stabilised. Eirgrid also recommends that plant designated for closure is in an available state until replacement generation capacity has been commissioned.

Market Share of Top Three Generators, 2005

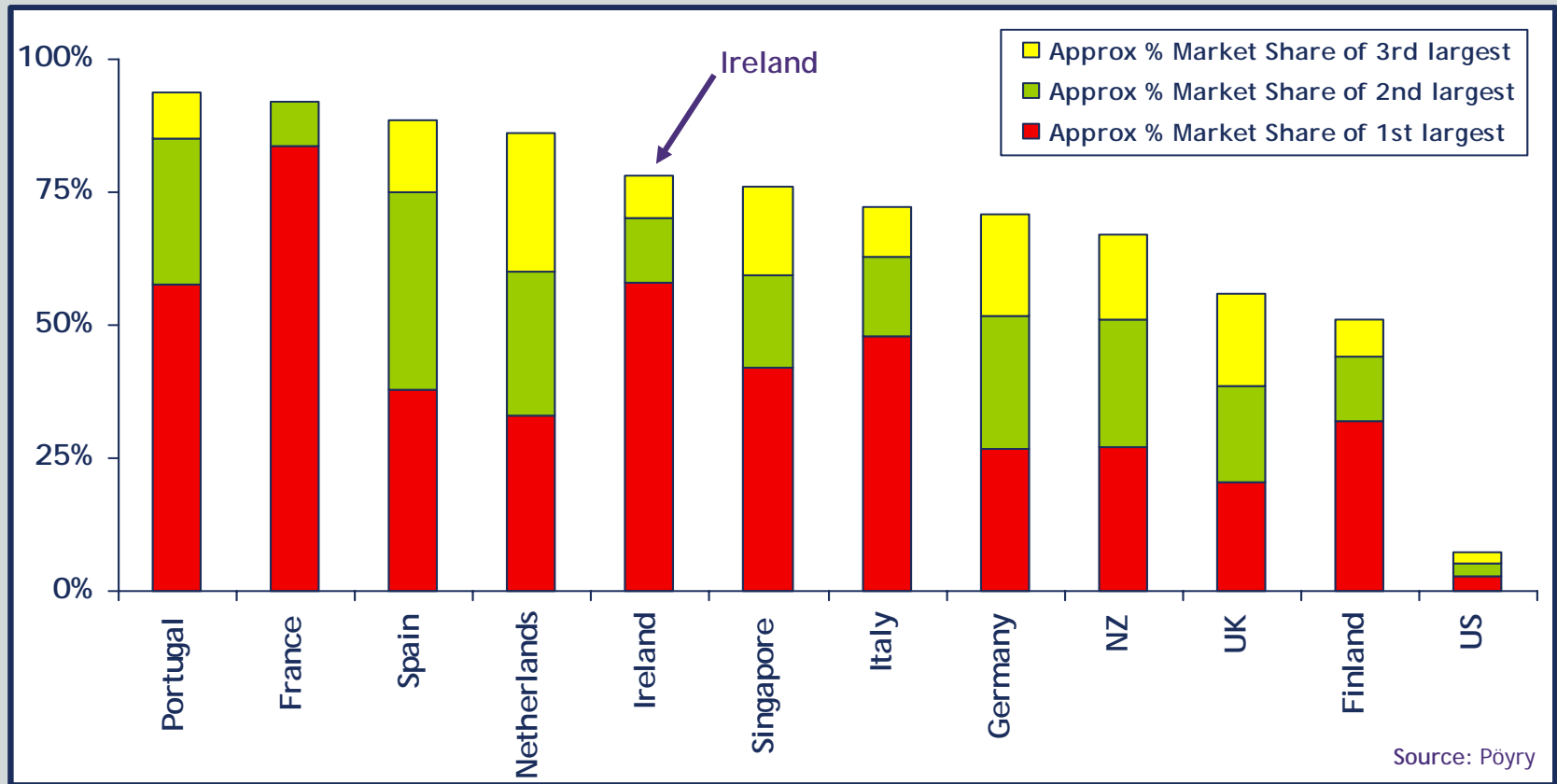


Notes: 1. Market share indicator is based on the installed capacity of each player.

2. Data not available for generator 3 in Denmark. Data for New Zealand and the US is for 2003.

- ▶ In Portugal, France and Ireland, the generation market is dominated by one large generator.

Market Share of Top Three Suppliers, 2005



- Notes: 1. Market share indicator is based on the volume of electricity supplied by each player.
 2. Data not available for Denmark. Data for Singapore is for 2004 and the US is for 2003.

- ▶ France, followed by Ireland and Portugal have the least competition within their retail supply markets as a single large company with a very high market share dominates each.

Composite Indicator

Composite indicator (Equal weighting)	Den	Fin	Fra	Ger	Ire	Ita	NL	NZ	Por	Spa	UK	US	Sin
Indicator I: price	6	9	7	3	2	2	5	7	4	5	6	5	3
Indicator II: security of supply	7	6	2	7	4	5	3	5	4	8	8	8	5
Indicator III: service access and quality	5	7	5	5	5	6	8	5	6	7	9	5	5
Composite indicator (equal weighting)	6	7	5	5	4	4	5	6	5	7	8	6	4
Indicator IV: competitive landscape	7	8	1	7	4	6	7	6	3	4	10	6	4

Source: Pöyry

Note: The scale used for each ranking runs from 0 to 10, where 0 refers the least attractive result from the perspective of a business customer and 10 refers to the most attractive within the group of benchmark countries.

- ▶ Pöyry developed a composite indicator to provide an indication of Ireland's comparative performance in meeting the electricity needs of industry.
- ▶ Ireland (along with Italy and Singapore) is joint bottom of the 13 benchmark countries on the composite indicator, having failed to secure a score higher than 5 on any of the four broad areas of focus.
- ▶ Ireland's lowest ranking was on price where it scored 2 and it also scored poorly (score of 4) on the important security of supply indicator.
- ▶ The UK tops the league table on overall performance (composite indicator) with a score of 8 - it also scores highest on the competitive landscape indicator (10).

Composite Indicator - Conclusions

- ▶ Comparing the ranking on the composite indicator (price + security of supply + access/quality) and the competitive landscape indicator, the benchmark countries fall in to two broad categories:
 1. In half of the benchmark countries there is no obvious correlation between performance on the composite indicator and the competitive landscape indicator; and
 2. For the other half, performance on the composite indicator and the competitive landscape indicator are closely aligned. Denmark, Finland, New Zealand, the UK and the US score well (6 or above) on both while Ireland and Singapore score poorly on both.

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<http://www.sei.ie/index.asp?locID=70&docID=-1>

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