Energy Policy and Economic Recovery 2010 - 2015

February 2011

The Irish Academy of Engineering

The Irish Academy of Engineering

The Irish Academy of Engineering is an all-Ireland body, concerned with long-term issues where the engineering profession can make a unique contribution to economic, social and technological development.

Its members are Irish engineers of distinction, drawn from a wide range of disciplines and membership currently stands at approximately 120.

Drawing on the experiences and knowledge of its distinguished members, The Academy works to facilitate communication and dialogue on engineering-related matters. It publishes reports and analyses, some jointly with other learned and professional bodies.

The Irish Academy of Engineering,
22 Clyde Road, Ballsbridge, Dublin 4
Tel: 00353 1 665 1337
academy@engineersireland.ie
www.iae.ie

Members of the Energy Standing Committee

Kieran O'Brien (Chairman)
Tony Barry
Prof Gerry Byrne
Michael Hayden
Patrick Lynch
Don Moore
Brian Sweeney
Frank Turvey
Prof Edward Walsh

The Irish Academy of Engineering would like to acknowledge the following who also contributed to the report:
Gerry Duggan
Gay Nolan
Tom Reeves

1. CONCLUSIONS AND KEY RECOMMENDATIONS

1.1 Policy

The unprecedented economic crisis in Ireland has created circumstances that require a rapid and fundamental change in energy policy in order to support economic recovery. A short term (five year) policy perspective is urgently required. For the next five years the overriding priority in the energy sector is to achieve significant cost reductions in order to facilitate competitiveness in the productive, particularly the export, sectors of the economy.

Given the constraints on the Irish economy, the priority for short term policy is the minimisation of energy costs and energy sector capital investment.

1.2 The Demand for Energy

Energy demand has dropped substantially since 2007 and demand growth is projected to remain low for the next decade mirroring the projected low growth in the Irish economy.

The Irish power industry is “over-invested” after more than a decade of extraordinarily high capital expenditure as planners appear to have assumed the indefinite continuation of the “bubble” economy. There is, for example, no requirement for additional generating capacity on the Irish power system for at least the next ten years.

Correspondingly there is little real need for substantial investment in gas and electricity networks.

A further large increase in generation capacity at a time of existing significant generation surpluses , particularly if, as is the case with wind power, it receives priority dispatch, is certain to dramatically reduce the load factors of existing generating plant thus partially “stranding” these assets. Such a policy will result in upward price pressures as investors seek compensation for their losses.

This is particularly serious in the case of state owned generation assets. In the event that investors (taxpayers) cannot recover these losses (from electricity consumers) then they must bear them directly. For taxpayers/electricity consumers this is a no win situation. In the further event that Government decides to sell such assets these losses will be immediately crystallised. This extremely important issue is discussed in more detail in **section 7.**

1.3 Energy Prices

Energy costs in Ireland rose significantly over the last decade for reasons outlined in this and previous Academy reports. Recent reductions, while welcome, are almost entirely a result of lower international natural gas prices.

In industry efficiency terms the Irish electricity sector does not match the performance of its EU peers when pre-tax price comparisons are used as an economic metric.

There is an opportunity to lower costs/prices further over the next five to ten years by:

- Minimising capital expenditure in the sector.
- Taking advantage of increased supplies of low priced internationally traded natural gas.

1.4 International Energy Supply Developments

Recent technical developments in the international gas industry have led to a major upward re-evaluation of global gas reserves and credible projections of cheap and reliable supplies for at least the next decade. Policy makers are increasingly of the view that natural gas now provides a reliable low cost bridge to a low carbon future.

Ireland, with its large fleet of efficient gas generating plant, is well positioned to benefit from this development and should not let the opportunity pass through stranding these assets by building thousands of MWs of unnecessary wind power over the next decade.

1.5 Energy Conservation

There is a compelling economic and environmental case for launching a significantly scaled-up conservation programme with a target of reducing national energy consumption by 20% by 2020.

This programme should embrace the transport, industry, commercial and domestic areas. Given the very high percentage of energy used in buildings, the insulation of buildings to best modern standards is a critical component.

There are two essential prerequisites for success of this programme:

- Funding mechanisms that minimise direct investment by the Government.
- Organisational structures that are appropriate for a programme of this scale (potentially reaching a gross annual investment of €1bn pa).

Such conservation programmes provide the ideal economic stimulus for the Irish economy, involving very little international leakage of resources and directing activity towards the badly damaged construction sector. This programme would also significantly reduce the requirement for investment in energy production facilities.

In the transport sector the Academy notes the positive results achieved in the recent past by well-targeted taxation initiatives which have encouraged a switch to efficient and low emission diesel engines, and recommends a continuation of this approach.

On the other hand the Academy is sceptical of the potential of electric vehicles to achieve significant reductions in emissions from the Irish transport fleet by 2020 and is doubtful of the wisdom of providing subsidies to encourage their early adoption in the absence of an Irish automobile industry.

1.6 Large Scale Wind Power

The aim of producing 40% of electricity in the Republic of Ireland from wind power by 2020 is not appropriate for a number of reasons:

- It would involve capital expenditure of the order of €10bn at a time when no new generating capacity is required.
- It would result in a high percentage of conventional plant being regularly forced off the system (not being used). In economic terms this is equivalent to partial stranding of these assets and is a very serious issue for the economics of the power industry generally.
- It is a relatively expensive form of electricity generation and an extremely expensive way of reducing greenhouse gas emissions when compared to other alternatives.
- The suggestion that large scale wind energy production could be exported in a commercially profitable way is without any sound economic basis. This type of risky investment should be left to the private sector and should not be subsidised by either the electricity consumer or tax payer.

The current Renewable Energy Feed-in Tariff (REFIT) terms should be reviewed. As constituted it is price inflating and lacks incentive to produce wind power more economically.

1.7 Environmental Targets

The Academy is fully supportive of EU targets in relation to energy efficiency and carbon abatement (the so called 20/20/20 target):

- A 20% reduction in greenhouse gas emissions by 2020
- A 20% reduction in energy consumption by 2020

However the target of producing 16% of Ireland's total energy requirements from renewable sources by 2020 is not currently feasible. As presently planned this would be achieved by producing 40% of Ireland's electricity from wind generation by 2020. This target is not economically sensible for Ireland at present.

This target should be deferred for at least five years until 2025.

1.8 Energy Security

Natural gas supply is the key issue when considering primary energy security. Such security can be best managed by completing the Corrib natural gas project and encouraging the construction, on a commercial basis, of an LNG regasification plant in Ireland.

Gas storage should also be encouraged for additional security.

1.9 Regulation

Because of the small size of the Irish economy and the many monopoly characteristics inherent in the energy industry it is not possible to rely solely on market forces to efficiently allocate industry resources in the overall national economic interest.

Professional regulation of the industry is essential. The current regulatory framework should be fully reviewed to ensure that it is properly structured to support national objectives, particularly industry competitiveness, and that it retains the confidence of the investment community in relation to its independence from Government.

1.10 Planning process

Ireland's planning and permitting processes are dysfunctional, unfit for purpose and lead to a higher cost infrastructure than is warranted. These processes need to be reviewed and streamlined in order to remove the high permitting risk currently perceived by investors

2 INTRODUCTION

The Irish Academy of Engineering (The Academy) published its first report on Irish energy[1] policy four years ago. Since then it has followed up with two other publications.

- Review of Ireland's Energy policy in the Context of a Changing Economy – June 2009[2]
- Irish Energy Policy – Update on Electricity Price Competitiveness - December 2009

The Academy has previously expressed reservations regarding Irish energy policy because of:

- A lack of competent techno-economic studies and, as a consequence, of evidence based policy making.
- A disconnect between the optimistic economic projections of the 2007 White Paper[3] and the subsequent collapse of the Irish economy.
- A lack of regard for the role energy prices play in contributing to the competitiveness of the economy.

The Academy is concerned at the delay in modifying Irish energy policy in the light of radically altered economic circumstances and holds that the application of evidence based energy policy will result in major reductions in capital expenditure and improved competitiveness.

This report focuses on the period to 2015 and proposes modifications to Ireland's energy policy in response to the unprecedented economic crisis.

Previous reports from the Academy have focussed on wide-ranging energy issues and have taken a long term perspective. This is as it should be given the high level of capital investment required in the industry, the long life of energy related assets and the slow rate of asset turnover. Changing the direction of energy investment normally requires decades rather than years.

Despite the requirement for a long term perspective there are times when the investment climate is so unpromising, the **financial problems** so overpowering and the social pressures so demanding that a short term "survival" focus is essential. This is such a time for Ireland.

Against this background the Academy has repeatedly questioned the wisdom of continuing to follow energy policies which were introduced at a time when no one envisaged either the type or scale of the economic emergency that now confronts the country.

The Academy has moved from concern to alarm over the past year as the Irish economy has contracted to an extent unmatched in any developed country in modern times, the Irish banking sector has moved from being illiquid to becoming insolvent and all the while energy policies based on massive capital investment in electricity production facilities remain effectively unaltered.

This report focuses on the next five years because it is the Academy's belief that economic growth provides the only exit from Ireland's current difficulties. This implies a major improvement in national competitiveness. An efficient energy industry will make a significant contribution to this objective.

In recommending short term actions the Academy is not unmindful of the need to ensure long term sustainability both environmental and financial and is satisfied that its short term recommendations do not in any way pre-empt appropriate long term investment decisions when the opportunity for such decision making arises.

In the longer term the Academy accepts that Ireland will have to play its part in meeting various international carbon abatement objectives and that investment in appropriate low carbon infrastructure will have to resume as growth in demand for energy in the Irish economy resumes.

In the short term however, particularly over the next five years,

---

1 *Future Energy Policy in Ireland*
2 *www.iae.ie/publications/*
3 *Delivering a Sustainable Energy Future, March 2007*

the Academy believes that the priority for the country must be improved competitiveness to stimulate economic growth. In the energy sector this implies minimum capital investment consistent with ensuring security of supply and low cost.

This report sets out an alternative strategy for the Irish energy sector for the next five years based on:

- **Reducing capital investment in the energy sector to necessary and sufficient levels.**
- **Switching investment to demand side measures, particularly to energy conservation measures.**
- **Taking advantage of the subdued level of natural gas prices predicted for the next five to ten years**

3 COMPETITIVENESS

The Academy believes that in the current uncertain circumstances a cautious approach based on flexible contingency planning principles offers a better approach to risk management over the short term than one which engages in large scale speculative hedging based on any particular technology.

In examining national competitiveness the two primary areas of interest are natural gas and electricity prices. While oil products make up a substantial proportion of Irish energy use, mainly in the transport sector, oil products by and large trade at world (or at least regional) prices and Ireland is a price taker as are most Western European countries.

3.1 Natural Gas

Ireland's gas transmission and distribution networks proved capable of meeting record daily demand levels in 2010. The record demand was due to two extraordinary cold spells, which gave rise to exceptional levels of gas demand for heating purposes.

These cold spells were also characterised by sustained periods of low wind speeds (a very common and entirely predictable occurrence), and, consequently, low levels of wind powered electricity generation. As a result electricity demand, the demand for gas for power generation and the demand for gas for heating peaked at the same time.

Despite this excellent performance however the security of Ireland's gas supplies still requires the urgent completion of the Corrib gas field onshore pipeline.

Ireland's gas prices are now highly competitive by European standards, though significantly higher than those in Great Britain (GB). Ireland is effectively part of the GB gas market, where prices have responded to falling international gas prices triggered to a significant degree by the development of unconventional[4] gas resources initially mainly in the US, but to be followed in other countries.

The development of the technology to tap unconventional gas resources has led to a fundamental reappraisal of the potential role that natural gas can play as a bridge to a low carbon future. Unconventional gas resources are now estimated to be over twice the size of conventional gas resources. Indeed total gas resources are now believed to equate to 250 years supply at current levels of production. Even more importantly these resources are much more evenly distributed across the globe, whereas much of the

Figure 3.1

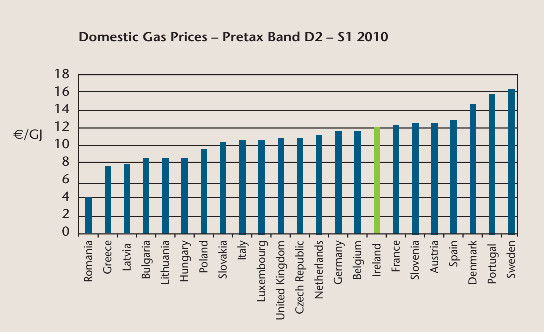
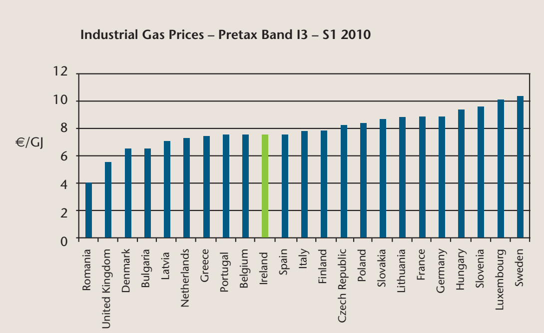


Figure 3.2



4 Referred to variously as "tight" gas or "shale" gas and also including coal-bed methane.

world's conventional[4] gas resources are concentrated in Russia, Iran and the Middle East

3.2 Electricity

Energy policy in the modern world of electricity seeks to meet three objectives:

- Supply security ("Keep the lights on")
- Sustainability ("Minimise environmental impact")
- Competitiveness / Affordability ("Minimise prices")

Clearly these objectives interact and conflict at many levels and one can at best seek to achieve a reasonable balance between them. It is the Academy's view that the competitiveness objective has, in recent years, received insufficient attention while the main focus has been on sustainability.

Irish electricity prices which were broadly comparable with EU averages a decade ago have moved steadily out of line over the past decade culminating in prices being 30% to 50% higher by 2008. Since then falling natural gas prices have led to significant improvements which have been welcomed by the Academy in previous reports.

Lower prices have coincided with increased renewables penetration in the power system and the view has been expressed that this correlation implies a causal relationship between increasing renewables penetration and low prices. The Academy rejects this contention and perceives such arguments to be based on an abuse of statistical methodology. Every electricity consumer in Ireland can clearly see on his or her electricity bill the amount of the Public Sector Obligation (PSO) associated with uneconomic power generation. As long as this figure is positive (as it currently is[5]) then power generation from peat and wind (the main contributors to the PSO) increase the cost of electricity production in Ireland from what it would otherwise have been.

In its decision for 2010/1011 the CER has calculated the total PSO (excluding administration and retrospective adjustment) as approximately €135m of which renewables subsidies constitute a little over 30%. Peat subsidies constitute over 50% of this total but are scheduled to largely disappear before the end of the decade. Increased wind production in a low gas price environment would however mean that the PSO for wind would rapidly increase in both absolute and relative terms.

It is also clear that the PSO as presently calculated does not capture all of the diseconomies associated with large renewables penetration, in particular the increased cost of transmission which is "socialised"[6] and not included in the PSO.

Eurostat figures for semester 1, 2010, which have recently been made available, show a continuing welcome improvement in the comparison between Irish and EU average electricity prices. These have been highlighted in a recent SEAI publication[7]. On average both industrial electricity prices and domestic electricity prices, after tax, are approximately 3% above the EU average.

All these comparisons however are based on post tax prices and are therefore heavily influenced by tax policies in the various EU jurisdictions. In assessing competitiveness the Academy's objective is to compare the Irish electricity industry with its European Union peers and, using price as a metric, reach appropriate conclusions on its relative economic[8] efficiency when compared to those EU peers.

It is the opinion of the Academy that such an analysis is best carried out using pre-tax prices thus excluding the effects of various arbitrary fiscal policies across the EU. On this basis a very different picture emerges. The following figures illustrate the large differences between the two approaches.

Industrial electricity prices weighted by consumption but "pre-tax" are 13% above the EU average while domestic prices are 26% higher.

Small and medium enterprises (SMEs) in Ireland, which are predominantly in bands IA to IC, collectively represent 50% of Irish industrial electricity consumption. It should be noted that the 'industrial' categories include a large number of commercial and service sector customers, including the hospitality and retail sectors, which are under

---

5 www.cer.ie/en/renewables-current-consultations.aspx?article=d7a3e817-e64d-47e4-8f50-e0b6b187ad69

6 Socialised costs are not attributed to any particular activity but averaged out over all consumers.

7 www.seai.ie/Publications/Statistics_Publications/EPSSU_Publications/Electricity_and_Gas_Prices/Electricity_and_Gas_Prices_in_Ireland_january_to_june.pdf

8 There are many technical definitions of economic efficiency. Without getting into detail, optimum efficiency as envisaged here occurs "when the cost of producing a given output is as low as possible". Allocative efficiency as defined by economists also remains an important issue in the electricity industry given the ease with which policy may create "winners" and "losers"

9 www.seai.ie/Publications/Statistics_Publications/EPSSU_Publications/Electricity_and_Gas_Prices/Electricity_and_Gas_Prices_in_Ireland_january_to_june.pdf

Figure 3.3

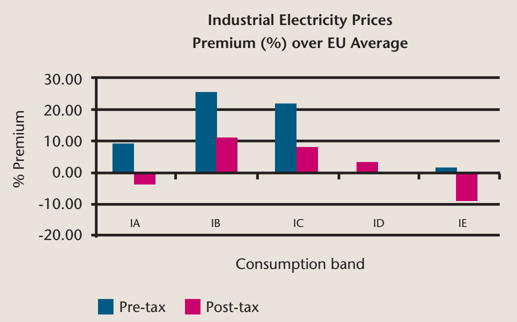


Figure 3.5

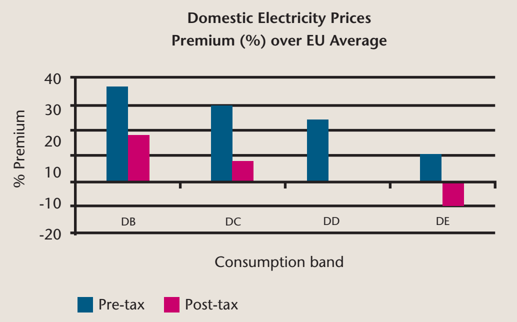


Figure 3.4

Band	Consumption	Typical consumption	Proportion of consumer total national consumption
IA	<20MWh	Small Industry	5.8%
IB	20MWhr – 500MWh	Small – Medium Industry	28.2%
IC	500MWhr – 2,000MWh	Medium Industry	15.9%
ID	2,000MWhr – 20,000MWh	Medium – Large Industry	30.4%
IE	20,000MWhr – 70,000MWh	Large Industry	12.6%

Figure 3.6

Band	Consumption	Typical consumer	Proportion of total national consumption[9]
DA	<1000kWh	Holiday home	0.9%
DB	1,000kWhr – 2,500kWh	Small house	6.8%
DC	2,500kWhr – 5,000kWh	Medium house	30.1%
DD	5000kWhr - 15,000kWh	Large Premises	53.6%
DE	>15,000kWh	Extra large Premises	8.7%

particular economic pressure at present. Pre tax prices for these industries are 23% above the EU average.

Detailed price comparisons are provided in the Technical Annex to this report.[10]

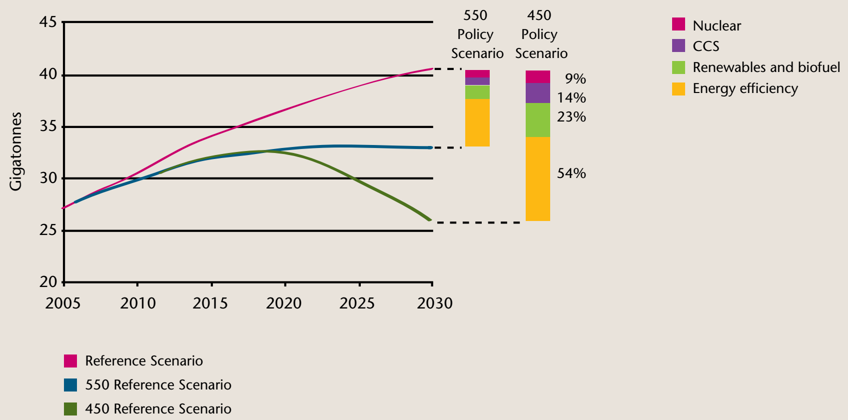
Since Ireland has already benefitted from a large reduction in gas prices there should be no sense of complacency about these figures. Ireland's electricity industry continues to produce prices well in excess of the EU average. Given the disproportionate benefit Ireland gets from its large usage of currently cheap natural gas there is no reason why the country should not have as an objective to return to its competitive position of a decade ago where Industrial prices were at or slightly below the EU average and domestic prices were among the lowest in Europe.

Given the current truly parlous state of the Irish economy it is essential that over the next five years energy policy is heavily biased towards minimising energy costs and further improving competitiveness.

10 www.iae.ie/publications/

4 ENERGY CONSERVATION

Figure 4.1 450 Policy scenario – CO_2 savings by policy measure (IEA)



The International Energy Agency (IEA) has long recognised that more than 50% of the CO_2 savings necessary to ameliorate climate change should come from conservation measures. **Figure 4.1** shows the "450 Policy Scenario" which illustrates the contribution that different energy technologies can make to stabilising the concentration of CO_2 in the atmosphere at 450 ppm which, it is estimated, would limit global temperature rise to 2°C.

Ireland has lagged its peers in this area, particularly in the implementation of conservation measures in its built environment. There are in addition major savings to be obtained in small industrial and commercial facilities and the Academy acknowledges the efforts being made by SEAI to promote energy saving in these areas.[11]

The SEAI programme for energy efficiency improvement has identified many successful commercial and industrial projects which have delivered 20% or more energy efficiency improvements with corresponding financial and emission savings. These investments typically provide a payback period of 2 to 3 years making them very attractive to facility owners. The Academy is of the view that many such opportunities exist for this range of energy saving in Ireland and strongly recommends that resources are allocated to this type of activity and that the relevant programme is scaled up and streamlined to the maximum extent possible.

The Academy also believes that a major energy saving opportunity exists in the retrofitting of insulation to domestic dwellings and again acknowledges the excellent work being done by SEAI in this area. However the Academy is of the view that a much larger scale effort is needed with considerably more resources and funding required. Details of the experience of other jurisdictions in successfully tackling the financing and execution of such large scale programmes are provided in the Technical Annex to this report[12] .

Such a programme would also provide an excellent economic stimulus with minimum international leakage and offer the potential to employ substantial numbers in the construction industry.

11 Corrib Oil case study in the Technical Annex

12 www.iae.ie/publications/

It is the Academy's view that available funding should be directed towards significantly enhancing and scaling up the current energy saving and retrofit programmes and that the experience of other countries should be built upon in rolling out such a comprehensive programme. In particular the Academy is mindful of the excellent report produced in 2009[13] by The Institute of International and European Affairs on this topic.

The Academy is strongly of the view that a switch from a policy focussed on increased electricity production to one focussed on reducing energy consumption would:

- Meet Ireland's carbon abatement obligations at a lower cost than current production focussed policy.
- Provide a significant and welcome stimulus to the Irish construction industry.

Excellent models are available internationally for successful programmes of this kind. In the particular circumstances which pertain in Ireland the Academy believes that an effective central delivery agency is required and that consideration of its further scale, expertise and location is warranted.

13 *Jobs, Growth and Reduced Energy Costs: Greenprint for a National Energy Efficiency Retrofit Programme*

5 DEMAND GROWTH AND INVESTMENT

As indicated earlier the completion of the Corrib field onshore gas pipeline is the key investment requirement in the gas system in the short term. Thereafter additional investment will be required in

- Gas storage facilities
- LNG regasification facilities

With respect to the delay in commissioning the Corrib field the Academy once again reiterates its dismay at the failure of the Irish physical planning system to deliver effective and timely decisions for large infrastructure projects. The current processes have been shown time and again to be dysfunctional. Legislators need to consider:

- A rebalancing of individual versus societal rights in relation to infrastructure required for the common good.
- Revised processes which deliver certainty to investors within a reasonable time frame.

The decline of the Irish economy over the past two years and the current very low economic growth prospects mean that electricity demand growth will be very subdued over the next decade.

EirGrid/SONI published its latest Generation Capacity Statement[14] in December 2010. Unfortunately the median scenario is based on ESRI's high economic growth forecast produced in July 2010. In the light of the EU/IMF rescue plan and the Government's four year recovery plan this forecast is now recognised as too optimistic and the ESRI low growth scenario is considered more compatible with the Government's formal four year recovery plan. The Academy is of the view that EirGrid's low demand growth scenario is by far the more realistic. Based on this, the likely plant surpluses arising over the next decade are shown in **Figure 5.1.**

From the point of view of generation adequacy no new generating plant of any kind is required on the Irish power system before 2020. This allows for the possible retirement of older plant. Indeed, based on currently realistic economic growth projections, the latest Generation Capacity Statement indicates a surplus of generation plant on the Republic of Ireland power system in 2020 of more than 1,000MW. For the Island as a whole the surplus in 2020 is projected to be almost 2,000MW.

Ireland has a relatively modern and efficient fleet of Combined Cycle Gas Turbine (CCGT) generating plant. Given the current low price of natural gas this investment is really "delivering" for the Irish consumer and is responsible for virtually all of the reduction in electricity prices evident over the past two years.

It is noteworthy that during the past decade more than 4,300MW of generation capacity (including 1,400MW of wind power) has been added in the Republic of Ireland to a power system with a peak demand of approximately 5,000MW. No other country in Europe installed anywhere near this level of relative capacity increase in a single decade.

It is no accident that changes in energy infrastructure take place slowly. The investments are so large, long term and risky that the industry can only change its infrastructure at a pace that normally ensures the continued utilisation of useful assets until the end of their economic lives.

This implies that change usually occurs at the margin involving new capital investment decisions and does not involve retiring large swathes of perfectly serviceable capacity, at huge cost, just to permit the addition of new technologies unless there is an overwhelming economic case for this. Yet this is precisely what will happen if Ireland proceeds to add several thousands of MWs of new generation capacity during a decade when large surpluses of existing plant are already emerging due to a decrease in demand.

14 www.eirgrid.com/media/GCS%202011-2020%20as%20published%2022%20Dec.pdf

Figure 5.1

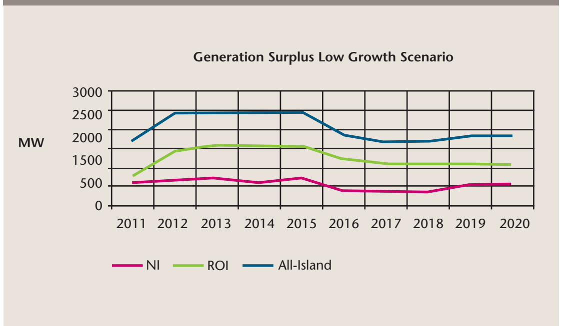


Figure 5.2

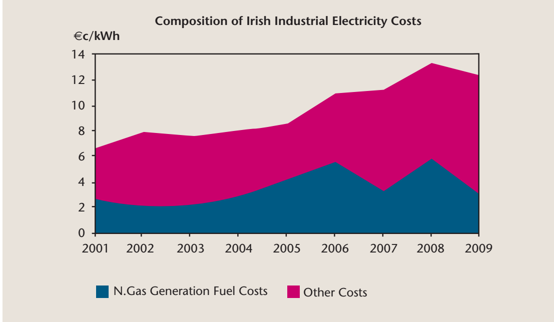


Figure 5.3

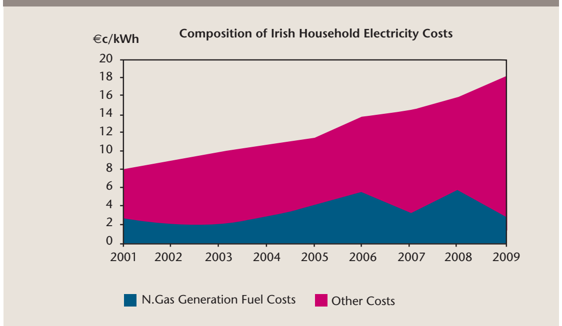
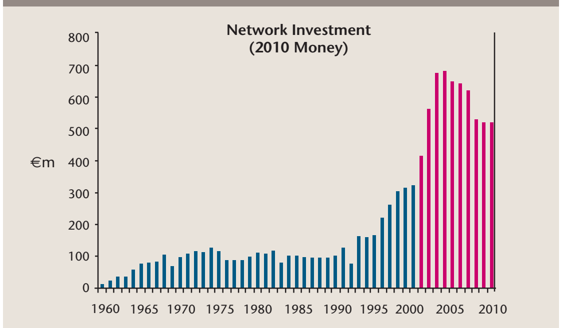


Figure 5.4



While gas price increases did contribute to the increased cost of Irish electricity in the past decade, most of this rapid increase has been driven by high levels of investment, see **Figure 5.2** and **Figure 5.3** above. While some of this (Gas fired Combined Cycle Gas Turbine (CCGT) plants for example) are providing good value for the customer, it is also evident that significant over investment has taken place. Such sunk capital must continue to be remunerated and when surplus to requirements becomes a cost burden on the consumer unless such losses are absorbed by private investors.

This in turn poses an interesting problem in the case of state owned generation assets. Who takes the losses, the consumer or the taxpayer? And does it really matter one way or another?

A similar situation pertains in relation to network investment. Undoubtedly network investment lagged behind demand in the 1990s but a considerable portion of network investment over the past decade (mainly in distribution) appears to have been based on the assumption of a continuation of unsustainable levels of growth in property markets and in the economy generally and of renewable electricity development. The scale of this investment, in relation to that in previous decades, is illustrated in **Figure 5.4**. While some investment "catch up" was required and networks undoubtedly perform better after this investment, it is quite clear that much of the investment over the past decade came about as a result of planning for a continuation of Ireland's "bubble" economy.

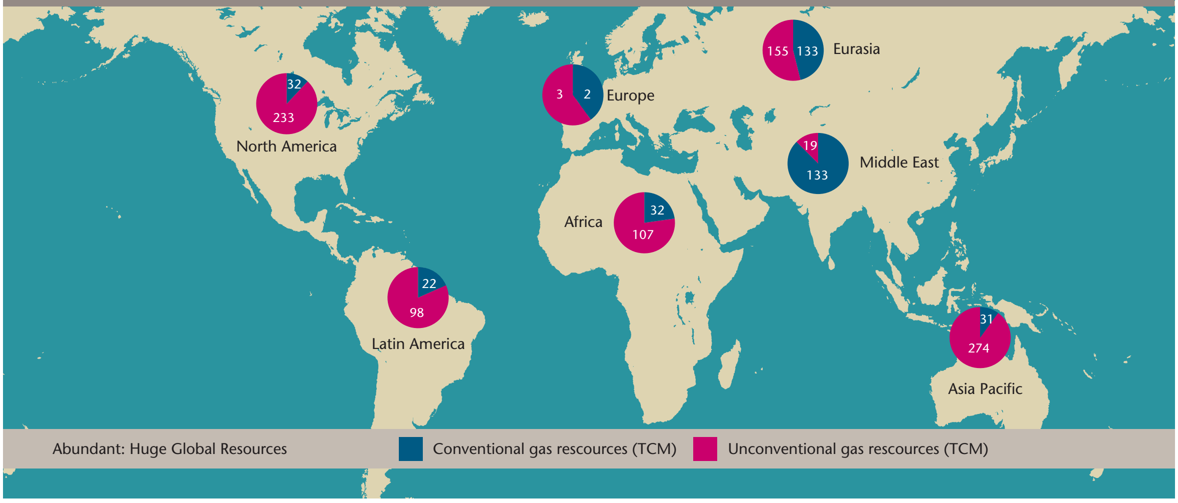
With the possible exception of China today with its sustained average GDP growth rate in excess of 10%, no other national power network has undertaken such a proportionately large level of investment during an equivalent period. Given the cost of such overinvestment in both generation and networks it is now essential to curtail capital investment to the minimum required and to "sweat" the existing investment for the next decade.

While fuel and capital costs have been the major influencing factors on Irish electricity prices other factors have been far from negligible:

- The cost of deregulation and market opening in a small and politically constrained economy.
- Ireland's generally high cost base in the past decade.
- The cost of subsidies to peat plants and (latterly) wind generation.
- Major delays in the planning process particularly for extensions to the National Grid.

6 NATURAL GAS – A GAME CHANGER?

Figure 6.1 IEA estimates 250 years global supply at current production level



In its recent reports the Academy has raised the issue of the "revolution" which the international natural gas industry is currently undergoing. New drilling technology and fracturing techniques ("fracking") have led to the potential economic recovery of vast new reserves of unconventional natural gas at reasonable prices. While this technology is currently being implemented principally in North America, already the effect on prices is being felt worldwide.

Recent estimates indicate that the world's unconventional natural gas resources are over twice as large as conventional gas resources and are far more uniformly distributed across the globe. Indeed total gas resources are now estimated[15] to equate to 250 years supply, at current consumption levels.

In recent publications the International Energy Agency (IEA) has referred to a "glut" of natural gas on international markets and predicted that prices of natural gas will remain subdued for most of the coming decade and will "decouple" from the price of oil which will continue to be a scarce commodity. Having reviewed the evidence the Academy concurs with the IEA view.

The world's media have picked up this major development:

- Economist lead article headline (11th March 2010)[16]
  "This changes everything…"
- Financial Times (May 24th 2010)[17]
  "Shale gas will change the world…"
- FT report (Feb 25th 2010)[18]
  "Gazprom has begun to change the basis of its contracts moving away from oil indexation and reducing prices."

The dramatic impact of unconventional gas on relative energy prices is clearly illustrated in the following figure

15 *Source IEA World Energy Outlook, Wood Mackenzie, Shell Interpretation*
16 *www.economist.com/node/15663500*
17 *www.ft.com/cms/s/0/d8c79266-6764-11df-a932-00144feab49a,s01=1.html*
18 *http://cachef.ft.com/cms/s/0/53068c2c-2254-11df-9a72-00144feab49a.html#axzz19cLqqWXO*

Figure 6.2

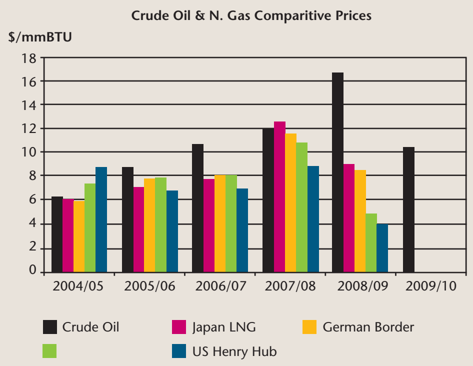
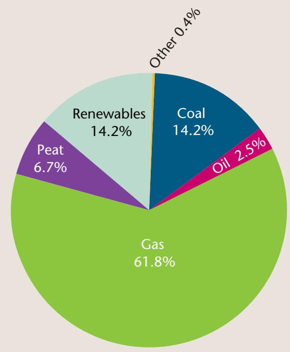


Figure 6.3 All Island Fuel Mix 2009 (CER)



Renewables - 11% wind, 2.6% hydro, 0.6% biomass and >0% photovoltaic

which compares the development of crude oil and natural gas prices in various markets in recent years. Because movements in gas prices have historically lagged those of oil prices by six months, due to contract arrangements, the oil price is compared with gas prices for the following year. Ireland, with its modern fleet of Natural Gas fired generating plant, is well positioned to benefit from this relatively cheap fuel source for at least the next five years and possibly for a decade. In particular little or no capital expenditure is required in order to take advantage of this.

An almost unique opportunity currently exists to defer investment in the electricity sector for at least five years and take advantage of a cheap internationally traded fuel to improve both energy and economic competitiveness.
Energy policy can be reviewed in 2015 in the light of:

- Ireland's economic prospects
- The probable continuing availability of cheap natural gas
- Ireland's then current international carbon abatement obligations
- The availability in 2015 of a range of cost effective technical options for new generation post 2020.

The Academy advises that the opportune coincidence of the unexpected availability of cheap natural gas and a large and efficient fleet of Irish **natural gas-fired plants** in which it can be burned must not be wasted and that Irish electricity policy for the next five years should rely on this fortunate combination of circumstances.
The situation should be reviewed in 2015 with a view to determining appropriate policy post 2020 when new generation may be required.

7 POSSIBLE SALE OF STATE ASSETS

The Academy is aware of many excellent energy utilities operating throughout the world, some are investor owned utilities and some are state owned. **In the matter of ownership whether private or public the Academy does not have any preference and does not presume to offer any policy input on the issue.**

It is true that many Governments in the developed world, for demographic and other reasons, encounter growing fiscal pressure as they attempt to finance long term pension, health care and social welfare obligations. Against this background the growth of Public Private Partnerships and the encouragement of private financing of public infrastructure have been steadily developing.

There have been two recent developments of significant importance for Ireland in this sphere:

- The EU/IMF financial package for the Irish Government specifically refers to the issue of state assets and the potential to dispose of some of these assets in order to ease the Government's financing burden. The agreement requires that the Government engage in a process to determine the feasibility of such disposals and lays down a timetable for decision making. Clearly such decisions can be taken only by the Irish Government.
- The Government itself has established a "Review Group on State Assets and Liabilities"[19]. The group[20] is expected to report in the near future. The following Terms of Reference have been set out for the Group:
  - To consider the potential for asset disposals in the public sector, including commercial state bodies, in view of the indebtedness of the State.
  - To draw up a list of possible asset disposals.
  - To assess how the use and disposition of such assets can best help restore growth and contribute to national investment priorities.
  - To review where appropriate, relevant investment and financing plans, commercial practices and regulatory requirements affecting the use of such assets in the national interest.

The most significant assets to be considered in the above assessment are likely to be in the energy sector and are most likely to include the large amount of power generating plant owned by semi-state companies.

In the event that a future Government might decide to dispose of such assets (and the Academy does not presume to provide any policy advice on this decision) there are extremely serious issues to be considered in relation to current energy policy.

Many Governments have disposed of state owned energy assets over the past two decades and the overall approach to implementing such "privatisation" decisions is well know at this stage. It is normal for Governments to:

1. Seek to structure the industry so that private investors deliver optimum consumer utility and are not in a position to exercise excessive market power.
2. Maximise the return to the exchequer from the sale subject to (1) above.

The latter objective is heavily influenced by perceived Government policy at the time of sale.

In time honoured fashion, valuation of the asset under consideration will commence by making an estimate of the Net Present Value (NPV) of future long term cash flows. This is often as much art as science but the estimation of

19 *www.finance.gov.ie/viewdoc.asp?DocID=6396*

20 *The members of the Review Group are University College Dublin economist Mr Colm McCarthy (Chairman), Department of Finance Second Secretary Mr Donal McNally and Trinity College Dublin economist Prof. Alan Matthews.*

future cash flows from the asset is absolutely critical to its ultimate valuation.

The current policy of adding large amounts of intermittent generation (with priority dispatch) to the power system will have a major impact on the operation of existing conventional plant, driving down its load factor, forcing sub optimum operation at part load and greatly increasing plant starts. Such an operating regime is far removed from the base load operation for which the plants were designed and often originally financed.

Such an operating regime will provide much reduced cash flows for plant owners and severely affect the valuation of the asset. The plant will, in effect, become partially stranded.[21] The cost of stranded assets can either be borne by investors or transferred to consumers. Imposing such costs on investors greatly increases perceived investment risk and negatively impacts the cost of new industry capital. For this reason Governments and regulators often impose at least some of the cost of stranded assets on consumers.

This gives rise to an interesting conundrum in the case of state owned assets. The choice would appear to boil down to imposing costs on consumers or on taxpayers, which is really no choice at all.

Under current policy then it would appear that the planned addition of large amounts of privately financed renewable generation with priority dispatch will severely depress the value of existing generating assets. In the case of state owned assets this will directly and negatively impact the consumer/taxpayer.

In the event of a sale of such assets the loss resulting from the partial stranding will be immediately crystallised.

In the event of a future Government deciding to dispose of state owned generating assets, the Academy is greatly concerned that current energy policy will significantly reduce the value of such assets as perceived by potential investors and correspondingly lead to a much lower sale value being realised on behalf of Irish taxpayers.

21 *Companies of all types have to make costly decisions about planning and construction that depend on a certain set of market conditions. When those conditions change, the viability of those plans can also change. And when a change as dramatic as deregulation of a marketplace occurs, those changes can be financially catastrophic. Companies can be stuck with massive investments that they would never have made in a competitive marketplace. When companies suffer expenses such as these as a result of legislated changes in market conditions, the associated costs are said to be stranded, or non-recoverable. Any assets that suddenly become worthless in such a situation are referred to as stranded assets.*

8 CONSTRAINTS ON MINIMISATION OF CAPITAL INVESTMENT

The only stated justification currently evident for continuing investment in generation capacity is the obligation Ireland has to supply 16% of its gross final energy requirements from renewables by 2020. The Government has chosen to meet this obligation by providing at least 40% of its electricity generation from renewables (mainly on-shore wind) by 2020. This latter decision is based on Irish policy development and is not an EU obligation.

Not only does this require a major capital investment in wind generation it also requires an almost equally large investment in network infrastructure because of Ireland's policy of permitting virtually random location of new generation with much of the network cost subsequently "socialised" and paid for by the consumer. The projected amount of wind generation needed to achieve this objective also requires further large capital investment in interconnection to other countries in order to ensure the stability of the Irish power system under conditions of high wind production.

Estimates of further capital investment during the next decade range from €8bn to €20bn. This capital investment is not necessary for either security of supply or competitiveness reasons. One of the significant concerns of the Academy has been the absence of rigorous evidence-based analysis associated with this projected capital investment. As a result there is much confusion and uncertainty over precisely what costs and benefits are likely to arise for Ireland.

The Academy is strongly of the view that the proposed capital investment in renewables for the period to 2015 should be greatly curtailed or totally suspended in view of Ireland's surplus installed generating capacity, and the emerging global gas glut. Failure to respond to the transformed global energy situation, cheap gas and the national economic circumstances will result in reduced rather than improved Irish competitiveness.

Policy options to support this change of focus might include:

- Using the sharp downturn in recent projections of Ireland's gross final energy demand to defer investment in further renewable energy generation for a period of at least five years.
- Back loading the investment towards the end of the decade.
- Implementation of an alternative strategy focussed on conservation as detailed in the Technical Annexe to this report which would considerably reduce investment in production facilities.
- Seeking a five year extension to 2025 of the 16% EU target based on the "material change of circumstances" arising from the collapse of the Irish economy and the real possibility of a default by Ireland in respect of its sovereign international debt.

Some combination of these options should underlie energy policy for the next five years.

It worth pausing to query the requirement for any mandatory level of renewable energy in Europe. Clearly this is not required to meet Europe's targets for CO_2 abatement as these targets can be adequately managed under the EU Emissions Trading Scheme (ETS). This scheme provides the economically most efficient route to reduce emissions and is operating reasonably successfully.

It is likely that fear of dependence on Russian gas supplies drove much of the policy formation underpinning this target. This was a particular concern since 2006 as disruptions to Russian supplies via the Ukraine caused considerable difficulties for some EU countries. However these concerns have been greatly eased over the past year or so as a result of:

- The development of vast new gas reserves in the US and the likelihood of similar reserves becoming available in many other politically stable countries.

Figure 8.1

Technology	REFIT Tariff	Estimated Additional Costs[23]	Marginal Cost of displaced CCGT[24]	CO_2 Reduction from Generation Displaced	Cost of Emission Saving
	€/MWh	€/MWh	€/MWh	t/MWh	€/tCO_2
Ocean Energy[25]	220	53	42	0.4	578
Offshore Wind	140	41	42	0.4	348
Biomass CHP	120	20	42	0.4	245
Onshore Wind	66.4	30	42	0.4	114
Biomass used in existing peat Stations	90		42	1.12	43

- The rapid expansion of Liquefied Natural Gas (LNG) supplies.
- Advancement of plans to bring Natural Gas from Central Asia to Europe.

It is perfectly possible that a reassessment of this target may be considered during the next decade in the light of the above developments and Ireland should raise this issue with its EU partners.

In considering future policy in relation to large scale renewables investment it is important to bring some clarity to the overall objective. Is it primarily aimed at?

1. Meeting Ireland's carbon abatement obligations?
2. Becoming a major exporter of renewable energy to Europe over a greatly enhanced (and very capital intensive) set of interconnections?
3. Encouraging new technologies such as tidal and ocean power production in order to capture some of the supply chain activities?

8.1 The Cost of Abating Carbon

The cost to the electricity customer of using renewable generation, to reduce emissions is summarised in **Figure 8.1** based on present Irish renewable energy feed in tariffs (REFIT). A more detailed analysis for the case of onshore wind is given in **section 9.3** and the methodology followed for other renewables is similar.

It should be noted that this is a simplified analysis and precise figures should be obtained from detailed system modelling. Nevertheless the orders of magnitude alone are very instructive.

Given that GHG emission permits can currently be purchased for €15/tonne and the price is not expected to exceed the €25 - €50/tonne range in the period to 2020, the use of biomass in the existing peat fired stations is obviously the only renewable technology that is potentially cost-effective in reducing CO_2 emissions, primarily because it displaces peat fired generation, with high emissions, rather than natural gas fired CCGT generation with relatively low emissions.

It is obvious that Ireland can make a much more cost effective contribution to the international carbon abatement effort by purchasing relatively cheap Greenhouse Gas (GHG) emission permits on the international market and, through the EU Emission Trading System (ETS), ensure that the country's emissions are effectively neutralised by GHG reductions elsewhere.

8.2 The Potential for Renewable Energy Exports

In respect of the foregoing there is little point in providing

23 Including 15% supplier margin where applicable in addition to transmission costs and backup costs.

*24 See **section 9.4***

25 See comments in Technical Annexe. Ocean Energy is currently in an R&D phase and is highly unlikely to become a commercial technology within a timescale relevant to this report. However the Academy is not opposed to supporting this technology as part of Ireland's industry policy as long as costs imposed on the electricity customer are reasonable and proportionate to the potential future benefit.

subsidies for renewable energy exports[26]. It is essential, therefore, that proper techno-economic studies are carried out on such proposals and, if they are found to be worthwhile, then the investment risk should be passed primarily to the private sector. The viability of such proposals should not depend on the socialisation of large network costs incurred primarily to facilitate the projects themselves.

The issue of wind power output being correlated across large areas of Western Europe poses a potential problem to a business model based on revenues from exports since high and low wind output tends to occur simultaneously in neighbouring countries. The UK's Renewable Energy Foundation[27] is not optimistic for this model. It has formally stated that "Wind in adjacent grid areas is significantly correlated[28], even over large distances".

It is a matter of considerable concern to the Academy that, in the absence of any proper studies, so many Irish policy makers take it upon themselves to publicly support such a capital intensive and risky endeavour, the cost of which, in the absence of any private sector support, is almost certain to fall on the backs of the much put upon Irish electricity consumer.

There is considerable activity ongoing at the international level examining large European grid expansion, including off-shore grids to facilitate renewables. The Academy fully supports such efforts and looks forward to the publication of well grounded, objective techno economic studies. It is evident however that most of these plans are aimed at developing grids in the post 2020 timescale and in reality possibly post 2030.

8.3 Research and Development

It is desirable that as part of a national **industrial development** strategy Ireland should support the development of currently uneconomic technologies such as wave and tidal energy which will not become commercial before the end of the decade but hold out the possibility of building new industries supported by Ireland's natural resources.

Such considerations also apply to technologies like micro generation and certain forms of solar energy.

As long as this support is confined to the R&D phase of development and does not impose disproportionate costs on the electricity consumer the Academy is supportive of such initiatives. They are not however likely to be material to the achievement of the current targets by 2020 or indeed to Irish energy policy generally in the next decade.

---

26 *Ireland undertook a similarly misguided policy when urea exports from the NET plant in Cork were subsidised, through the allocation of a significant part of the Kinsale Head gas field at below market price and should not repeat this economic folly.*

27 *http://www.ref.org.uk/*

28 *John Constable, Director of Policy and Research, REF, 20 January 2011*

9 LARGE SCALE WIND ENERGY

Ireland's policy makers have set a target of having 40% (recently increased to 42%) of electricity production from renewable generation (primarily wind) by 2020. This target has been set in the absence of credible techno-economic studies[29] to investigate the technical and economic barriers to be overcome.

9.1 The Danish Experience

Much has been made of the "Danish Experience" where a small country produces more than 25% of its generated power from wind. It is fairly evident however that approximately half of this power is exported over Denmark's interconnectors to Norway, Sweden and Germany as the Danish power system cannot absorb the large fluctuations in wind power. These interconnectors were mostly built many years ago for the purpose of optimising the Scandinavian power grid[30]. They were not by and large built to facilitate wind exports.

Surplus Danish wind power has on occasion driven the price of electricity on the Nord Pool exchange to zero providing substantial benefits to consumers in neighbouring countries but at the expense of considerable subsidies paid by Danish consumers. In addition the unforeseen surges of power have caused many problems on neighbouring transmission systems.

Danish technical authorities have shown remarkable ingenuity in managing their power system with a large wind generation input but they freely admit that this has only been possible because of the existence of very large scale interconnection which was by and large not constructed to export wind generation in the first place but was fully economic in its own right.

Figure 9.1 Denmark is interconnected with Norway, Sweden and Germany. An HVDC link between west and east is under construction.

In order to increase the percentage of wind generation on its system these authorities now agree that mechanisms must be found to absorb the increased wind output on the Danish system itself. Reliance on exports has reached its limit. Danish authorities, for example, are seeking to take advantage of the county's large installed base of Combined Heat and Power (CHP) plants, mainly serving the district heating market, in order to store excess wind generated electricity in the form of heat. This approach does however present formidable economic hurdles.

9.2 The Problem of Intermittency

The intermittency difficulties associated with large scale wind power have been well documented. It is true that many technical barriers have been overcome but always at considerable cost. Since wind generation is now a mature technology the issue of continuing large scale subsidies must be reviewed.

29 *In previous publications the Academy has commented on the obvious inadequacies of the so called "All Island Grid Study". These inadequacies were identified in the report by the report authors themselves and the Academy is strongly of the view that the shortcomings identified by the authors render it unsuitable for use as a basis for national policy.*

30 *These interconnectors were highly effective economic investments which balanced Norwegian hydro power with Swedish nuclear and Danish coal fired generation. The absence of a hydro option in Ireland's vicinity means that new interconnectors are far more difficult to justify economically. This may change as the EU moves towards a more integrated electricity market. Based on experience over the past decade and a half however one would have to be pessimistic about the likely pace of such change.*

Figure 9.2

Date	Total System Capacity MW	Wind Capacity MW	Wind Capacity as % of Total	Peak Demand MW	Wind Output MW	Wind Output as a % of Peak Demand	Wind Load Factor (%)
21/12/2010	8824	1479	16.1	5090	46	0.9	3.2

The current winter peak demand in the Republic of Ireland occurred on Tuesday 21st of December. Figure 9.2 indicates the contribution of wind power to the system.

The very low contribution of wind to the peak is not a statistical aberration; it occurs almost every year and is replicated across many countries in North West Europe. It is simply explained. Peak demand in NW Europe is heavily correlated with low temperatures which tend to occur when high pressure weather systems with very low wind activity "block" the normal Atlantic weather systems.

Wind generation therefore provides energy but very little if any firm capacity. This must be provided by other traditional generation at significant cost because of the "standby" arrangement of this service. The cost of "firming" wind power varies significantly but for high penetrations in a semi isolated system like that of Ireland is likely to be high. Again the Academy deplores the lack of proper techno economic studies in this area.

9.3 System Requirements to Accommodate 40% Wind Generation

The Academy is pleased to note that for the first time a serious technical study has been carried out by EirGrid/Soni[31] on this topic and published in June 2010. The Academy has long expressed the view that policy commitments should not be entered into in advance of the finalisation of such studies. The results of the technical modelling in the above study are disturbing.

The study concludes that, subject to certain provisos, the objective of 40% electricity generation from renewables can be met in the context of an All Island system. However, to meet the objective:

- It may be necessary to install up to 8400MW of wind capacity (on a system with a peak of 7550MW) and up to 23% of wind may have to be constrained off[32] (but would still have to be paid for under current regulations). This would mean that the effective cost of wind at the wind farm gate could approach €100/MWh.
- If it proves infeasible to deactivate protective rate-of-change-of frequency (ROCOF) relays on existing generators, even more wind would have to be constrained off. Indeed the study concludes that much further investigation is required in relation to this extremely important technical issue. In terms of operating a power system with a large amount of non-synchronous generation Ireland probably leads the world in its technical research and expertise. Whether this might ever constitute a sound policy remains an open question.
- The study was based on interconnector capacity of 1350MW (i.e. that a third interconnector would be built as well as Moyle and the East West Interconnector (EWIC)) and assumed that this capacity would be fully available for export. However, only 80MW out of 500MW of Moyle is available for export and increasing this limit is likely to cost significantly more. If the third interconnector is not built the constraints on wind generation would presumably increase.
- The study also found that for quite low penetrations of wind the import limitation on interconnectors could be as low as 500MW and would be somewhere between 500-1350MW. But there is already 500MW of import capacity. This implies that the East West Interconnector (EWIC) import capability may be limited, which would substantially reduce its benefits and its economic justification.
- A further finding of the Study is that 20-30MWs of kinetic energy would be required per MW of potential loss of wind output, which could result from system disturbances. With high wind penetration, this would require a large amount of conventional generation to be constrained on at low load and low efficiency, adding to electricity cost and carbon emissions.

31 *www.eirgrid.com/media/Renewable%20Studies%20V3.pdf*

32 *Not permitted to run by the System Operator for system stability reasons even though the plant is available and wind speeds such that it could generate.*

While the Academy unreservedly welcomes the publication of this detailed technical study it is mindful of the limitations which the authors specifically raise in their conclusions:

"The identified acceptable range for "operational metric 1" of 60% … 80% is only technically viable assuming major additional adaptations of the power system. The model provided by EirGrid and SONI was not optimised yet. Ongoing planning studies are currently investigating the optimum reinforcements required to accommodate the anticipated wind power up to 2025 [EirGrid (2008b)]. Examples of fundamental additional adaptations that were found necessary are:

- **Extended static and dynamic sources for reactive power;**
- **Uncompromised grid code compliance of the complete wind portfolio and all other generators throughout the whole lifetime;**
- **Replacement of ROCOF relays in distribution networks by alternative protection schemes or increased ROCOF relays threshold;**
- **Evolution of the power plant portfolio in line with the scenario, etc."**

The Academy's single significant criticism of this report however is that it confines itself to technical issues and does not fulfill a "techno-economic" role. Indeed the report concludes:

"Nevertheless, the identified limitations clearly imply challenges for power system economics and project viability as well as regulation; this was out of the scope of the studies and needs further analysis."

The Academy has repeatedly requested that "proper" techno-economic analyses be carried out on these complex issues prior to selecting specific policies and committing investment. In the Academy's view it is long past time for the CER to mandate EirGrid to carry out such studies.

9.4 Cost of the planned wind programme

The Renewable Energy Feed in Tariff (REFIT) for large wind plant is currently €66.35/MWh (2010 values). This is the amount paid to the generator. However the cost of wind power to the electricity customer is substantially higher as this cost includes:

- A sum of €9.95/MWh (2010 values) to reimburse the supplier who purchases and sells on the renewable energy
- The considerable network reinforcement costs associated with wind power development, based on present connection practice, including HVDC investment necessitated by higher levels of wind power penetration.
- The increased system operation costs associated with higher levels of wind power penetration, including the costs of having to operate thermal plant at part load and consequently reduced efficiency and cost of the increased number of starts required of thermal plant, which has an energy, availability and maintenance penalty.

Together these costs are estimated to add, on a very conservative basis, approximately €30/MWh to the wind power generation costs for the programme. Thus the cost of additional wind generation is estimated to be approximately €96/MWh (2010 values).

But additional wind generation in a system with large spare capacity must increasingly displace other forms of generation. Since the likelihood is that Moneypoint will continue to operate close to base load, the "marginal" generation[33] to be displaced is highly likely to be existing gas fired CCGT generation, which is over 50% efficient and emits less than 0.4 tonnes of CO_2 per MWh.

The marginal cost of this CCGT generation is close to the cost of gas/MWh electrical at UK NBP (National Balancing Point) prices (as the gas system fixed costs have to be paid in any event) plus the cost of associated CO_2 emissions. In average 2010 values, this marginal generation cost would be approximately €42/MWh. The cost of using wind to reduce emissions from CCGT plant in 2010 money values would thus be: € (96 – 42)/0.4 = € 135/tonne

This is almost ten times the cost of purchasing GHG emission permits on the market at late 2010 prices.

The REFIT is indexed to the CPI, but with no reduction if the CPI falls. This type of asymmetric price "ratchet" is of considerable benefit to investors in wind power but always at the expense of the consumer.

If inflation is assumed to average 2% p.a. in the period to 2025 and wind related system costs are assumed to increase

---

33 Highest cost generator on the system at a point in time. Marginal cost is defined as the change in total cost with respect to a small change in output.

Figure 9.5

Year	Minimum Marginal Cost of Gas Fired Generation to make wind competitive €/MWh	Corresponding minimum cost of Gas at UK NBP €/GJ, NCV
2020	100[36]	13.89[37]
2025	113	15.69

at the same rate, a conservative assumption is that these costs/MWh will tend to increase with increasing wind penetration. At that stage wind powered generation costs would be as follows.

Figure 9.3

Year	Wind powered generation cost
2020	€117/MWh[34]
2025	€130/MWh

EirGrid in its Interconnector Economic Feasibility Report[35] assumed that CO_2 prices would be as follows.

Figure 9.4

Year	Cost of CO_2
2020	€41.6/t
2025	€42.7/t

If increasing wind power generation is not to add to electricity costs this would require that the marginal cost of gas and gas fired generation would have to be at least the following values in **figure 9.5** (at top of page).

EirGrid in its Interconnector Report however assumed that gas costs would be as follows:

Figure 9.6

Year	Gas Cost €/GJ NCV	
	Base Case	Alternative Scenario
2020	7.025	7.32
2025	7.025	8.23

These are somewhat simplified calculations and in reality should be carried out as part of a proper system economic simulation.

Nevertheless it is clear, even using the EirGrid assumptions on projected carbon prices and gas prices, that incremental wind powered generation will add very substantially to generation costs at a time when there is no projected requirement for additional thermal generation capacity in the foreseeable future.

The Academy is of the view that in the context of the country's current economic difficulties such a policy is fundamentally misguided and will significantly damage Ireland's competitiveness in the short term.

9.5 REFIT Structure

In its particular application to large scale wind projects the structure of Ireland's REFIT is rather unusual. Essentially it is not a fixed feed-in tariff but rather a floor price.

- If the market price is less than the floor price then the generator is compensated for the difference by the customer through the PSO obligation.
- If the market price exceeds the floor price the difference is retained by the generator as profit.

This highly asymmetric risk profile tilts the pitch significantly against the customer and in favour of the generator. This arrangement should be reviewed with a view to "levelling the playing field" and presenting the customer with a fairer deal in the case of a technology that is now regarded as mature. This same asymmetric risk profile is evident in the inflation provision which permits only upward adjustment.

34 96 × (1 + 2/100)^{10}
35 http://www.eirgrid.com/media/47693_EG_Interconnect09.pdf
36 117 – (41.6 x 0.4)
37 100 x 0.5/3.6 (1MWh=3.6GJ)

10 TRANSPORT

EU regulations and changes to the Irish VRT and Motor Tax regimes have resulted in a rapid and sustained move towards the adoption of highly efficient diesel powered cars in Ireland. The Academy acknowledges the success of the measures introduced a few years ago by the Irish Minister for the Environment in this respect and is highly supportive of this policy. This policy, coupled with the economic downturn, has resulted in an 11% fall in petrol consumption between 2007 and 2009.

Road freight traffic accounts for approximately half of the transport fuel consumed in Ireland and within the road freight sector CSO data indicates that the construction sector accounted for 25% of the total tonne-kilometres. Clearly the latter has fallen off dramatically as the construction boom has ground to a halt; as a result auto diesel consumption fell by 10% between 2007 and 2009, despite the sharp increase in diesel powered cars.

The national motorway network will play a significant part in reducing road transport fuel usage further, in particular for the road freight sector. Implementation of existing speed limits will also assist in reducing fuel consumption.

All of the foregoing paints a positive picture of progress in increasing the efficiency of the transport sector which until recently had been the most significant factor in increasing Ireland's overall energy demand and emissions. In contrast the Academy believes that incentivising the early introduction of electric vehicles will have a negligible effect on reducing transport related emissions in 2020.

While the Academy is optimistic that electric vehicles will become part of the transport mix in due course, incentivising their early adoption in Ireland does little to meet Ireland's carbon abatement obligations and merely results in the transfer in the short term of extensive sums of money from Irish taxpayers to foreign automobile manufacturers.

As an alternative the development of biofuels is likely to have greater national economic benefit.

11 AN ALTERNATIVE SHORT TERM SCENARIO

In an effort to promote debate and more detailed analysis the Academy has proposed an alternative short term scenario aimed at minimising capital expenditure, keeping downward pressure on costs and aiming to meet Ireland's 16% final-energy-from-renewables target. The scenario, detailed in the technical annexe, is based on a few key principles:

- Future energy policy and demand projections should be based on conservative economic growth assumptions
- Maximum use should be made of existing assets
- Capital investment should be minimised
- Employment growth in Ireland should be fostered

Such a strategy could:

- Enable Ireland to comply with its obligations under the EU's 20/20/20 Strategy
- Reduce the electricity sector capital requirements by almost €4.4bn
- Reduce the cost of our energy imports in 2020 by €1350m p.a., at present day prices
- Avoid having to pay for GHG emission permits at an estimated cost of €300m p.a. in 2020
- Assist employment creation in Ireland as conservation investment has a much higher Irish labour content than electricity or automotive sector investment
- Significantly improve both GNP and the Balance of Trade

The Academy is putting forward this scenario (detailed in the Technical Annexe www.iae.ie/publications/) in the expectation of encouraging further analysis by specialised entities (such as EirGrid) with the necessary expertise and professionalism to carry out such work. The Academy will be pleased to engage in further debate around this proposal.

While alleviating the economic pressure on Ireland's energy industry to a significant degree this proposal of itself will probably not do enough to meet economic objectives if the fulfilment of the 16% renewables target by 2020 remains immutable.

LIST OF ACRONYMS

Acronym	Definition
CCGT	Combined cycle gas turbine
CHP	Combined heat and power
ESRI	Economic and Social Research Institute
EU ETS	European Union Emissions Trading System
GCS	Generation Capacity Statement
GCV	Gross Calorific Value (quantity of heat liberated by the complete combustion of a unit of fuel when the water produced is assumed to be condensed and the heat associated with the water is recovered)
GJ	Gigajoule (Unit of energy commonly used in thermal energy calculations)
GW	Gigawatt (1000 MW)
HVDC	High Voltage Direct Current
IAE	Irish Academy of Engineering
IEA	International Energy Agency
LNG	Liquefied natural gas
MW	Megawatt (Unit of electrical power or generation capacity)
MWh	Megawatt-hour (Unit of energy)
NCV	Net Calorific Value (quantity of heat liberated by the complete combustion of a unit of fuel when the water produced is assumed to remain as a vapour and the heat is not recovered)
NPV	Net Present Value (Present value of future cash flows less the purchase price)
PSO	Public service Obligation
REFIT	Renewable Energy Feed in Tariff
SONI	System Operator for Northern Ireland

Irish Academy of Engineering
22 Clyde Road
Ballsbridge
Dublin 4

T: +353 1 665 1337
E: academy@engineersireland.ie
www.iae.ie

ThinkMedia.ie