An Alternative Energy Policy for Ireland

THE PROFESSIONALS VIEW OF THE ENERGY DEBATE

By Engineers and Professionals in ESB

Foreword

Unite (Amicus Section) represents the 600 engineers and other professionals in the Electricity Supply Board (ESB). Since the foundation of the Electricity Supply Board engineers have played a key role in developing Ireland's natural resources for the safe, secure, reliable and efficient production of electricity. The ESB today has more than 1.8 million customers and a turnover of more than €2 billion. It is the largest engineering concern in the state and is a highly respected company globally. The ESB owns and operates more than 4000MW of power plant in Ireland and approximately the same abroad.

The ESB has a long history of improving individual's lifestyle and supporting industry. The Shannon Power Scheme and Rural Electrification are monuments to this. The ESB has a reputation for engineering integrity and delivery on results to the consumer, a reputation which dates back to the foundation of the company when the Ardnacrusha construction project in the 1920's was used as the blueprint for the Hoover Dam in the United States.

The engineers in the ESB are continuing to make a significant contribution for Ireland, at home and internationally. Engineers are involved in the design, construction, operation and maintenance of power plant, transmission and distribution infrastructure. They play a critical role in ensuring that technology is designed and deployed to meet Ireland's environmental obligations for the future. These activities are ranked amongst some of the most complex challenges facing modern Ireland in 2007.

ESB is a successful commercial semi-state company, 100 percent Irish owned and contributes in a significant way to the Irish economy both locally and nationally. ESB's profits from national and international activities are ultimately returned to the Irish people.

In, publishing this paper Unite (Amicus Section) Engineers and Professionals in ESB share their insights experience and analysis and in so doing are making their commitment to a prosperous economy in Ireland, geared and ready for the challenges ahead.

By Jerry Shanahan
National Officer of Unite (Amicus Section)
Chairman of the Energy Committee of the Irish Congress of Trade Unions

Table of Contents

1 Executive Summary 4

2 20 Actions towards an Energy Policy for 2020 6

3 The need for a National Energy Agency 7

4 A Balanced Approach 8

5 Minimising Emissions 9

5.1 Managing Transport 9
5.2 Modernising the Power Sector 10
5.3 Raising standards in Construction 10
5.4 Protecting our Environment 11
5.5 Energy Conservation 12
5.6 Forestation 12
5.7 The National Development Plan 13

6 Security of Supply 15

6.1 Choices for the Future 15
6.2 Ensuring a Secure Supply of Power 16
6.3 Fuel Diversity 17
6.4 Natural Gas 18
6.5 Coal 19
6.6 Nuclear 19
6.7 Renewable Energy 21
6.7.1 Wind 21
6.7.2 Biomass 25

7 Keeping Energy Costs Down 28

7.1 Competition 28
7.2 Market Pricing Mechanics. 29
7.3 Cost Transparency 30
7.4 Savings for Consumers 31
7.5 The role of ESB 31
7.5.1 Transfer of Transmission Assets. 32
7.5.2 Non-profit Mandate for ESB Networks 33

8 Conclusion 34

9 Glossary of Terms 36

10 References 36

1 Executive Summary

The management of energy is arguably the greatest single challenge facing Ireland and the world in 2007. The increased use and declining stocks of fossil fuels demand fresh thinking from governments, national bodies, energy producers and consumers.

Ireland needs a cohesive energy policy across all the energy sectors. As professionals in the Countries largest power industry, we are disappointed that the recent government white paper does not go nearly far enough in outlining such a policy.

The last Government's publication of "Delivering a Sustainable Energy Future for Ireland" substantially fails to deal with the critical balance between the key areas of energy, construction, transport (including airlines), and agriculture.

Energy policy needs a consistent approach across all these sectors and clearly requires significant input and execution across a number of government bodies. The best way this can be achieved is through the creation of a National Energy Agency.

In March, on the eve of a general election campaign, the issuing of a White Paper gave the impression of the government having a policy in place. That impression was wrong. The tough reality is that there remains an enormous amount of work to be done in settling on a coherent energy policy.

Reducing emissions to comply with our international obligations is important, but the cost of energy and the security of its supply are also key issues for Ireland. In order for us to remain competitive, energy costs, particularly in electricity, must be kept under control.

Energy policy needs three elements in order to meet Ireland's future requirements. The policy needs to be long term, it needs to embrace all energy sectors and it needs to be managed by individuals who fully understand all of the elements that go to make up a comprehensive and effective energy policy.

We have endured a recent history of Government Ministers not having the will to put in place long term policies that may be unpopular in the short term. It has also been clear that there is no coherent thinking by the multiple Government departments who are responsible for the various energy sectors. These issues must be addressed.

In order to sustain our recent economic success, we must develop a cohesive approach to our energy needs. We need a single body with responsibility across all energy sectors. It needs to place a balanced emphasis on industrial, commercial and personal life. It needs to be set up in a manner that is independent and has a long term perspective. It needs the correct mix of skills to cover the diverse elements in the energy sectors.

We need an independent National Energy Agency and we need it now.

In order to meet Kyoto targets we need to reduce our emissions by a significant amount. This can not be done by one measure alone; it needs a combination of measures spread over all energy sectors. This needs to be achieved in a manner which retains Ireland's competitiveness.

Clean coal with carbon capture and nuclear are low emissions fuel sources. Clean coal needs Government support to help offset development costs. Nuclear needs to be debated in an open and honest manner and prudent decisions need to be implemented from the debate. By including both in the fuel mix it ensures fuel diversity. This avoids the potential major pitfalls of over dependence on any single fuel.

Both of the above technologies would help the power industry significantly reduce its emissions levels. Old inefficient power plant needs to be replaced by modern efficient plant. Wind and biomass have roles to play and need support to achieve the appropriate penetration.

Energy conservation is also a direct method of reducing emissions. All sectors have a part to play. We all need to adopt our energy usage towards reduced consumption, this needs Government support. In the industrial sector saving energy can help to retain competitiveness in our industry. Increasing the awareness of waste and of better ways of doing things is a key step in achieving results. Energy conservation should be included in the education curriculum, this can only be done by Government support. Making energy advisors available to industry could also contribute to key savings.

The building industry can do much to make homes more energy efficient. Government enforcement of appropriate regulations is needed. Incentives need to be put in place to encourage existing householders to make their homes more energy efficient. The use of more energy efficient devices in our home needs to be supported. Building homes in locations which reduce commuting distances can contribute key savings. Measures to achieve this also improve the quality of life.

We need improved viable public transport so as to reduce the extent of car travel. Improved public transport should also enable a reduction in road freight. We need smarter methods of enforcing urban speed limits than ramps. We need to eliminate the need for vehicles to stop on motorways to collect tolls. We need better roads to reduce congestion, save time and fuel in the process. We need to encourage more efficient modes of transport. Bio diesel and ethanol needs Governmental support to encourage development. We need to set targets to reduce our dependence on imported oil. Air travel needs to be taxed in the same manner as other forms of transport.

Our policy of encouraging competition in the electricity sector in a manner that increases the cost needs to be reviewed. When ESB was the sole supplier of electricity in the state the price of electricity was amongst the lowest in Europe. After seven years of forced competition our prices are amongst the highest. The policies are currently not working. The Single Electricity Market is likely to make this much worse as it is aimed at increasing the profits of the base load generators. The concept of getting generators to bid into the market and then insisting on them being paid multiples of their bid price is ludicrous. There is no doubt that the electricity market needs to be open and competition encouraged but trying to force competition at the cost of increasing prices is neither welcome by industry or individuals.

Separating the electricity transmission network from ESB will add further costs. ESB workers have a reputation of restoring power very quickly after storms. We are likely to lose this in the separation process. The existing arrangement is working very well so why tamper with it and run the risk of increasing costs and reducing reliability of supply. The Government should concentrate on making changes in the areas where improvement is certain.

This contribution sets out to raise awareness, to openly debate many of the gaps in current thinking and to formulate a number of key affirmative actions to address or rebalance the arguments in favour of an energy policy that will work for Ireland into the Future.

2 20 Actions towards an Energy Policy for 2020

The 600 Amicus engineers and professionals working within the ESB propose that in order to develop a coherent energy policy for Ireland, that the incoming government should:

- Establish an National Energy Agency with the responsibility for defining and implementing Energy policy across all Government Departments and State Agencies
- Extend the National Development Plan to fund all energy infrastructure development
- Plan community based housing development in the right places to minimise commuting distances
- Develop and Improve the Public Transport infrastructure
- Develop fossil fuel alternatives for transport
- Implement energy friendly construction policies
- Educate the public and industry to use energy more efficiently
- Close our old inefficient power plants and replace them with modern efficient plants
- Fully Support the use of renewable sources for the generation of power
- Ensure all new buildings meet a minimum set of energy efficiency standards
- Ban the use of incandescent lighting
- Develop and support a hydrogen economy to assist renewable energy integration
- Ensure security of supply via a fuel diversity policy
- Put in place measures to support clean coal technology
- Open a debate on Nuclear Power as an option
- Provide NDP funding for research & development of energy efficiency and environmentally friendly technology
- Restructure indirect taxation of energy (Gas and Electricity) to ensure cost stabilisation
- Remove the standing charges on Energy bills for Gas and Electricity in favour of a pay as you use charge per unit of energy
- Increase the frequency of energy price reviews to quarterly from annually
- Put the emphasis on reducing electricity costs instead of promoting a market which is based on increasing profits of base load generators

3 The need for a National Energy Agency

The recent Government White Paper on Sustainable energy for Ireland falls well short of what is actually required. Instead it represents a collection of disjointed proposals driven mainly by political pandering. Are the policies pragmatic? No. Does the white paper comprehensively cover all aspects of energy policy? No it does not. It is a veiled attempt to appease ideologues and market sector lobbyists that have anything but the welfare of the country and consumers at heart.

> "It is critical that a single independent National Energy Agency is formed to define and implement an effective energy policy for Ireland"

Currently there are three government departments – (Communications Marine & Natural Resources, Transport and Environment) with a role to play in creating a comprehensive and meaningful energy policy. This policy should develop long term strategies in addition to delivering short term gains. We are making decisions now that will impact in 10 years time and on generations yet unborn. In doing so, we must preserve our national identity and pride. The real answer lies in effective joined up thinking to deliver an energy policy that encompasses all of its constituent parts, it is pragmatic therefore that a single agency is formed to develop, define and implement an effective energy policy for Ireland

In proposing such an independent "National Energy Agency" its objectives must be clear and achievable and it must cover all aspects of energy.

1. Developing standards for construction of energy efficient and environmentally friendly new buildings and managing compliance
2. Designing and managing our energy (power plant and infrastructure) and transport fleets (rail, road and air)
3. Efficient conversion of fuel to energy and due consideration for fuel diversity
4. Energy conservation
5. Coordinating required reductions in green house gas emissions.
6. Researching and developing new technologies to meet the challenges
7. Opening up the energy debate to cover all options including Nuclear

4 A Balanced Approach

There are three strands required to bind together a coherent energy policy. They are minimising emissions, security of supply and keeping energy costs down. Achieving the correct balance between them is vital to maintaining a prosperous economy.

In order to achieve the correct balance it is necessary to have a clear understanding of the issues and the interactions between them. This paper sets out to provide an understanding of the technical and economic issues and provides insight into what we as the engineers and professionals responsible for delivering the policies believe to be the correct way forward.

It is easy to see how our energy policy will influence energy cost but technical constraints must also be understood. For example Ireland is a country with little natural fuel resources but has an abundance of wind. It would be tempting to propose, as some have done, that all electricity be generated from wind. Unfortunately this is not technically possible with current technologies. This should not deter us from striving to achieve greater use of wind but policy needs to reflect the possible as much as the aspirational.

Almost all aspects of future energy policy changes impinge on all three strands of energy policy but to avoid repetition all fuels are discussed under security of supply, it must also be understood that each fuel will have a different impact on, emissions targets, energy cost, and fuel diversity. For example if we were to build a new conventional coal plant the main driving force to do so would be to improve our security of supply, however, if we were to build a new clean coal plant the main driving force would be to reduce emissions.

All three strands of energy policy are important and each need to be considered carefully to ensure the energy policy is balanced. Their timeframes are also different. For example, keeping costs down may require a different strategy as the costs of fuels change relative to each other but minimising emissions is going to be with us for the long term.

5 Minimising Emissions

We need to develop emissions reduction technologies in all the energy sectors to maximise our overall global reduction.

The need for joined up thinking is essential if we are to do so at a reasonable cost. Success in one area may well have a negative impact on another. Energy is so central to our economy and our personal life styles that we need to look at the various elements which make up the overall picture.

5.1 Managing Transport

Our policies in Ireland on public transport are too little, too late. Most of our freight is moved by road and people typically travel to work by car. We need to speed up our implementation of better public transport facilities.

Our policies on rezoning land and house prices in general are forcing individuals to buy houses in places which results in them driving 80 or more kilometres to work each day. This leads to a situation where people are producing more CO2 emissions travelling to work than when heating their home. An alternative range of policies to address this situation is urgently required.

> "The community as a whole pays a high price for our lack of a good roads infrastructure"

Our lack of a good road infrastructure leads to excessive journey time's thereby producing excessive emissions. This also has a knock on effect on industries which need mobility as it takes increased time and cost to carry out their functions. The community as a whole pay a high price both in financial terms and wasted time spent travelling. We need to promote efficient methods of travel in the non-public sector. We need to improve our road infrastructure to reduce journey times. We need to put incentives in place to support the use of ethanol and bio-diesel.

Enforcement of speed limits in urban areas should be a function of the Gardai but we use ramps to carry out this function. Drivers brake and accelerate in areas where ramps are fitted and in the process produce about three time the emissions that they would do in the absence of ramps. There must be a better way.

We erect toll barriers in the middle of motorways forcing traffic to brake to a halt and accelerate back to full speed again. Toll collection may facilitate private enterprise but is very wasteful on fuel and increases emissions. We understand that revenue must be raised to fund motorway construction but it could be done by raising the taxes on fuel without any environmental penalty. Motorway tolls are not necessary there are better ways of raising the necessary revenue.

Vehicles should be taxed on their fuel efficiency. In general if road tax revenue was collected as a fuel tax it would tend to promote fuel efficient vehicles and put a focus on what journeys are actually necessary.

Air transport is a significant producer of emissions, more intense than other forms of transport. It needs to be recognised as such and measures should be put in place to recoup fuel excise in the same manner as with other modes of transport. Airlines need to play their part in overall emissions reduction.

5.2 Modernising the Power Sector

More is expected of the power industry in reducing emissions than is sought of others in the energy sector. Forcing the power sector to do more than its fair share of emissions reduction will increase electricity prices further and limit Ireland's ability to remain competitive. This must be rebalanced in terms of national effort.

The White Paper on energy suggests that 33 per cent of our electrical energy requirements should come from renewable energy, mostly wind. This is a very laudable target which doubtless played well to a green electorate, but is it practical? Renewable energy such as wind, has a low load factor, the concept of load factor[2] deals with the day to day productivity of electricity generating plant. The variable nature of wind would make this target impossible to achieve without extensive energy storage facilities being commissioned as well.

> "Modern power production technologies can raise efficiency while reducing emissions"

Modern power production technologies are more efficient than older technologies. Consequently, modern technologies can satisfy demand while producing reduced emission levels. Replacing our aged power generation fleet on a new for old basis can significantly contribute to meeting our Kyoto targets. This can be done in parallel with developing an increased contribution from renewable energy sources.

We need to develop clean technology to reduce emissions. Government support is essential to offset huge development costs. We need to maximise renewables such as wind and biomass in so far as is possible to create a reduced emission environment.

Nuclear power also needs to be debated in an open and honest manner, taking into account all the positives and negatives associated with it.

5.3 Raising standards in Construction

Standards in the building regulations are simply not good enough to really make the required contribution to Ireland's energy and environmental position. Many new houses and buildings are sub optimal when it comes to energy efficiency and energy conservation.

> "All new construction projects must meet minimum agreed standards of energy efficiency"

Policy needs to be developed and radical and brave steps taken to ensure that all new homes and offices meet a minimum set of requirements in this area. In doing this we also need to tackle the existing buildings that fall far short of these minimum standards. Owners of premises with low ratings need to be incentivised to improve them. Sometimes simple to implement measures can have significant benefits. For example, the addition of thermostatic central heating radiator valves to an existing central heating system can reduce fuel consumption by 10 per cent, delivering a reduction in greenhouse gas emissions and an immediate benefit to the consumer in reduced energy costs.

Greener homes cost more to build or modify at present, this has to change and the new government need to be astute and deal with this anomaly sensibly.

[2] The load factor of an energy technology is the ratio (expressed as a percentage) of the net amount of electricity generated by a power plant to the net amount which it could have generated if it were operating at its net output capacity.

The construction industry itself needs to lead the way. There is vast money involved in construction and property investment. Those who benefit most must be held accountable for their behaviour in the future.

We need Government to be strong and to bring forward new building regulations which will make a difference even if unpalatable to certain interest groups.

5.4 Protecting our Environment

There is scientific consensus that greenhouse gas emissions need to be regulated to preserve our environment. It is the total global emissions which affect the environment rather than those of any single country. The per capita emissions from established Western economies are significantly higher than emerging economies such as India and China. These later developing nations will increase their per capita emissions over time as they develop. It would be unfair to limit their growth by restricting their emissions. Consequently it is necessary for the Western economies to lead the way in limiting their emissions.

> "Road Transport accounts for 93 per cent of Ireland's transport related Greenhouse Gas emissions"

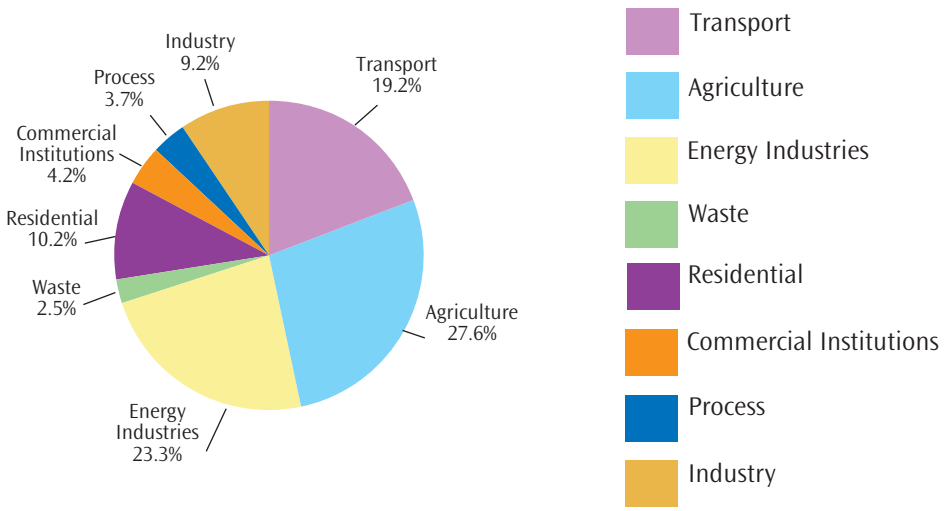
Emissions technologies developed in the West should be made available to developing countries to limit their emissions.

As discussed, Ireland's target under the Kyoto Protocol limits the growth of greenhouse gas emissions to a maximum of 13 per cent above 1990 levels for the 2008- 2012 period. In 2004, actual national emissions were 23.1 per cent above 1990 levels. The transport sector, the fastest growing contributor to national greenhouse gas emission levels, has shown a growth rate of 144 per cent in the period 1990- 2004. [1] This represents 18.4 per cent of total national greenhouse gas emissions, with road transport accounting for an estimated 93 per cent of the greenhouse gases emitted by the transport sector in Ireland in 2003.

Figure 1 below shows the contribution from each sector[3] [2].

Fig 1: Ireland's Greenhouse Gas Emissions per sector in 2005.

2005 National Climate Change Strategy Breakdown



[3] Data used is the category sectors as set out in the National Climate Change Strategy (NCCS).

It is also useful to note that in March 2007 the European member states pledged to further increase their efforts in this area. A new target to cut greenhouse gas emissions by 20 per cent below 1990 levels by 2020 has been agreed by EU Environment ministers. This will be increased to 30 per cent if that commitment can be matched by other countries not signed up to the Kyoto protocol such as the USA, India and China.

In conclusion, the current emissions reduction policy of this country is grossly inadequate if we are to come close to these commitments.

5.5 Energy Conservation

As a nation we are poor at energy conservation. This is largely because of a poor level of understanding of the role of energy conservation and the lack of motivation to learn more.

While much energy wastage takes place in the home it also takes place in our commercial, industrial and transportation sectors. Energy conservation starts with the design of heating, ventilation and lighting, and the use of natural sources to reduce wastage. It extends to the design of energy consuming devices in the premises, the whole transportation sector and other areas such as public lighting. Processes in factories can be designed to cut out waste. The manner in which energy consuming devices are used on a day to day basis also has a major bearing on our overall consumption of energy.

> "Banning of non energy efficient lighting"

For example the Australian Government have banned incandescent lighting products in favour of new technology CFLs. If we did this in Ireland it would equate to 100MW of power plant and a reduction of 350 Kt of CO_2 per annum, not to mention the savings to individual consumers on the electricity bills. There are many myths about energy conservation. Replacing a five year old car with one which is more efficient and environmentally friendly seems like the right thing to do. Unfortunately more energy is expended in producing a car than it will use in its entire lifetime. The overall cycle needs to be considered to reach an optimum energy saving solution.

The key to energy conservation is educating our population in the design and use of day to day items which influence energy wastage and the resultant additional pollution. Currently we have little or no awareness of how we can conserve energy. This awareness needs to start as part of the overall educational programme and continue throughout our lifetimes.

Government policy needs to be developed and implemented to educate the population at large and it needs to start now. It should be focused on the costs and the environmental impact associated with wastage.

5.6 Forestation

The growing process involves photosynthesis to convert carbon dioxide in the atmosphere to the wood in the tree. Hence forestation can be viewed as reversing the effect of emitting carbon dioxide from a combustion process. Ireland has a lot of relatively poor land which does not contribute to agricultural output but could be used for forestation. Forestation needs to be viewed as part of the total emissions equation for Ireland. It will not happen without active Government support. As a result of the long term nature of forestation, development action needs to take place now.

Forestation has the potential to expand our wood industry in Ireland while at the same time supporting rural life and reducing our overall generation of carbon dioxide.

5.7 The National Development Plan

The NDP proposes to invest some €184 billion over a period 2007 – 2013, yet only 0.3 per cent is earmarked for any direct energy related activities. This does not suggest good planning. The proposals are to spend €270 m for the purchase of carbon credits and €276 m for a sustainable energy programme such as wind, wave and other initiatives. In contrast €13 billion (7 per cent) is allocated to the transport sector over the next seven years to promote and facilitate a switch in transport mode from private cars to public transport, thereby reducing fossil fuel consumption and greenhouse gas emissions.

There seems to be a major imbalance here, considering that the transport sector only contributes 19 per cent of Irish greenhouse gas emissions. (See Figure 1)

> "What is needed here is investment in the region of €60 billion in the non Transport energy sector"

What is needed here is investment in the region of €60 billion on a pro-rata basis. If this government was seriously in tune with the requirement to minimise emissions the NDP would have properly reflected this amount to fund an action programme for Kyoto compliance and rebuilding our energy infrastructure.

6 Security of Supply

6.1 Choices for the Future

The government White Paper mentions that as a result of the statutory prohibition on nuclear generation "and in the absence of significant additional hydro resources, our dependence on natural gas for power generation will be 70 per cent by 2020, without policy intervention." The question here is whether there has been a real examination of the feasibility of new clean coal technology or, dare we say it, a reopening of the nuclear debate to redress the ongoing power generation bias towards gas. While the government should be supportive of effective competition and active participation in the electricity and gas market, is future government content to allow the security of supply - which is much more important to Ireland's economic wellbeing than market participation - rest on the harsh reality of weak gas interconnection and volatile prices?

The current markets system is designed to stimulate IPP (Independent Power Producers) entry into the base load (almost always run) sector and leave the balancing work to the oldest plant on the system; in this case ESB plant which is least capable of doing so, due to its age and inherent design.

Since the deregulation of the Irish electricity system the main players that have entered the market, taking a considerable market share and a vast percentage of system capacity have utilised CCGTs (Combined Cycle Gas Turbine) technology to do so. These new entrants operate in the base load sector and are all utilising gas as their primary fuel. While it is agreed that this is the most economic build, diversity of the Republic of Ireland system must be considered when we are advancing towards such a one-sided fuel dependency.

When this portfolio imbalance is further examined in light of current EU policy, it is clear that the portfolio must change.

The EU wants to significantly reduce its CO2 emissions, with EU environment ministers recently agreeing in principle to cut emissions by 20 percent from 1990 levels by 2020. It is also interesting to note that the flagship European emissions trading scheme (ETS) is struggling to establish a suitably strong carbon price to incentivise genuine emission abatement.

The Commission's proposal of having 20 percent of all energy produced from "green" sources by 2020 will mean that, in practice, half of all electricity must come from low-carbon emitting forms of power generation, this is mainly due to the negligible impact the initiatives are expected to have on car and air transport. As we already have a dangerously high dependency on gas, the future technologies that need to be considered for emissions abatement are limited to clean coal technology and nuclear.

Nuclear certainly ticks all the right boxes. It is already the largest EU low-carbon producing source of power today. It has relatively stable costs and uranium reserves are sufficient for many decades. They are also widely distributed around the globe in "friendly" nations. From an Irish economic perspective, while it is likely to be a significant struggle to gain acceptance for nuclear energy, we owe it to ourselves and our children to rationally discuss the matter.

In the meantime, therefore, Ireland must also look to clean coal. While clean coal is not at present a proven technology, it will be readily and easily accepted by industry and regulators and produce substantial public benefits.

The potential benefits are clear and clean coal technology may prove to be a viable option in achieving energy security and curtailing carbon emissions. This is a prospect Ireland must face up to now, not in 10 years time.

Each EU Member State must weigh up the pros and cons associated with meeting EU CO2 emission targets while maintaining security of supply. In simplistic terms the choice is between Nuclear with proven technology but which is politically challenging, or clean coal where the technology is not yet proven but which is easier to sell politically.

EirGrid, the Transmission System Operator, in its Generation Adequacy Report 2007-2013 (GAR) [2] outlines a deficit in generation plant in 2013 from

750MW to as much as 1100MW based on the relationship between projected demand and power plant availability. This capacity deficit is the ideal size for either new clean coal technology or a nuclear plant to be developed to address this capacity deficit and presents the ideal timeframe for delivery provided we take action now

We must develop and deliver a clear long term strategy, devised across all the sectors as outlined earlier in this document. Only then can we plan for the key areas of ensuring the supply of the power that runs our lives.

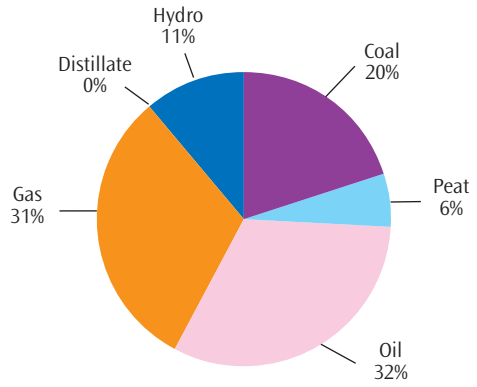
6.2 Ensuring a Secure Supply of Power

The EirGrid GAR report 2007-2013 [3] shows that should another IPP utilising gas as its fuel source enter the market between now and 2013 approximately 67 per cent of the fully dispatchable portfolio would then be dependent on gas while all other dispatchable sector would be relatively small. Coal would then only have a 15 per cent share in Ireland's generation portfolio. On actual seasonal generation dispatch gas power generation could rise to 80 per cent of dispatched power plant on a daily basis.

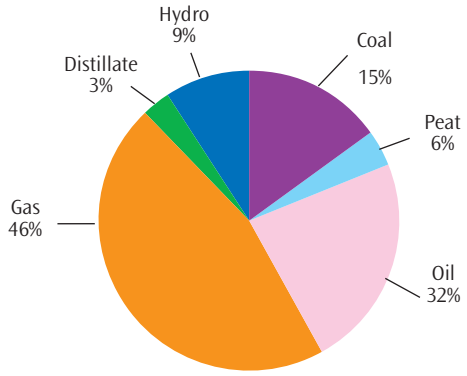
To ensure a secure supply of energy the system must rely on dispatchable generation. While it is acknowledged that wind energy and interconnection will play a role in meeting system demand neither technology can be fully relied upon to ensure adequate security of supply. When wind power generation and our limited interconnection is taken out of the portfolio the contribution of reliable plant is outlined as in Fig 2 below.

Fig 2: Ireland's actual and estimated dispatcahle plant portfolio 1997, 2007, 2017

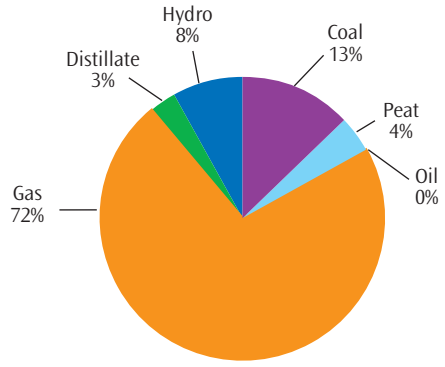
Dispatchable Plant Portfolio 1997



Dispatchable Plant Portfolio 2007



Predicted Dispatchable Plant Portfolio 2017



The 2017 estimated portfolio assumes a growth in electricity demand of 3.5 percent per annum and that after potential ESB plant closures all new plant will be CCGT gas fired plant. This would create a dependency of up to 72 percent of our dependable plant portfolio reliant on gas.

Any review of our energy strategy must address long term prudent planning. Undoubtedly one of the greatest threats to our economy is ensuring we deliver security of supply now and into the future. Key to facilitating this is rebalancing our generation portfolio with regard to fuel diversity. We must not ignore our current and emerging high dependence on gas. All new independent power producers use gas as the fuel of choice. At present there seems to be no co-ordination to ensure that there is a diverse portfolio fuel mix. Government policy needs to address the lack of any coherent optimal national power generation portfolio policy.

6.3 Fuel Diversity

Our modern economy and lifestyle are extremely dependent on electricity to keep them performing. In the 1970's we had two oil crises; people queued at the pumps in the hope of getting fuel. Various steps were taken on a global scale to ensure it would not happen again but yet again we are following the same treacherous path. This time it is over dependence on natural gas presently from a single source with little storage facilities for power generation.

Ireland is an island nation with very few indigenous fuel sources. As such we are very dependent on resources which are outside of our control.

Many of the recent power plants commissioned onto the Irish system claim their ability to dual fuel. This is indeed true however this dual fuel capability (usually with distillate,ie diesel) is designed to mitigate against plant local issue and most importantly is only designed presently to be carried out for very short periods of time. For example a 400MW CCGT plant would require 73 tonnes of distillate fuel every hour to sustain full operation. This would require two 40 tonne trucks an hour. In the event of gas shortages this measure is not sustainable; surely our roads are busy enough at present.

We need diverse fuel supplies with sufficient storage ability to weather temporary incidents. Currently our imported gas comes only from the UK.

Appropriate fuel diversity will allow us to purchase energy from cheaper sources and enable industry to remain competitive. This is a keystone to future economic success.

A gas shortage would cause a regime of severe power cuts and rationing of supply. Our economy is very dependent on foreign investment. Ireland has attracted many high profile multinational companies over the past 15 years, one of the main reasons we are selected over our global competitors is our record regarding our energy system security, stability, reliability and power quality. Sustained power cuts would drive these investors from our shores, to those nations which have had the foresight and long term planning to prudently diversify fuel. This would ruin our economy and have very severe long term effects on our people.

6.4 Natural Gas

Natural gas has a much higher proportion of hydrogen than any other commercial fuel. Consequently a much higher proportion of the energy from combustion comes from hydrogen rather than carbon in the fuel. Hydrogen combusts to form water while carbon combusts to form carbon dioxide. As a result of the low Carbon dioxide emissions from natural gas it is an environmentally friendly fuel.

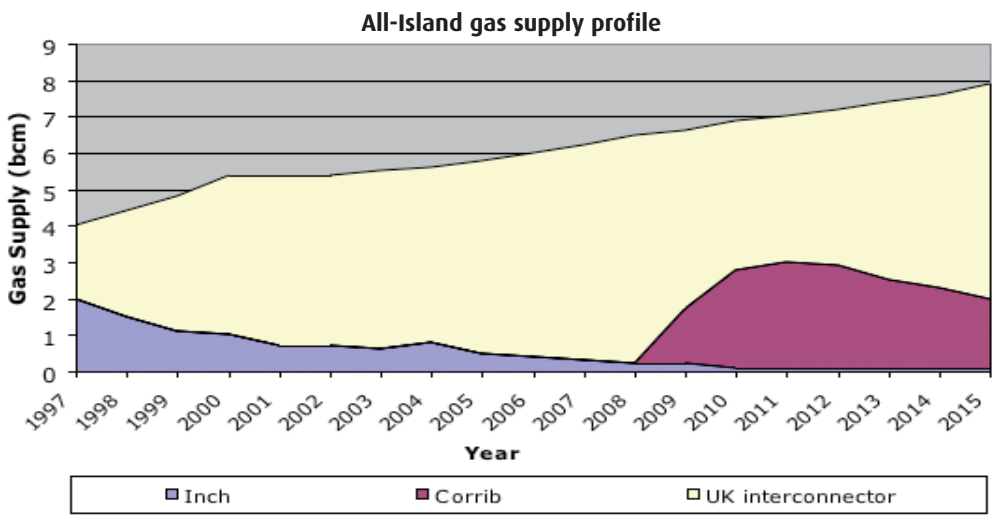
Natural gas is the ideal fuel for Combined Cycle Gas Turbines (CCGT). The "Gas" in the title refers to the fact that the turbine power comes from exhaust gas rather than the fact that gas is the most common fuel used to fire the turbines. The "Combined" in the title refers to the fact that waste heat is collected to generate steam in a steam turbine. Distillate can also be used to fire CCGTs but it is a refined fuel and is expensive. CCGTs have low capital investment per Megawatt produced and have relatively short lead times to build. CCGTs are fuel efficient and require very little investment to reduce pollution. In short they are an ideal investment for those who require a quick return on their capital. They are the choice of Independent Power Producers.

Much of the world's natural gas use is for industrial sector processes and power generation. This sector accounted for 44 percent of world natural gas consumption in 2004 and is projected to be at similar levels in 2030. With world oil prices expected to remain high relative to historical levels throughout the period 2007 - 2030, natural gas is projected to displace liquids in the industrial sector to some extent. Industrial use of natural gas is projected to increase at an average annual rate of 1.9 percent from 2004 to 2030, as compared with an average increase of 1.1 percent per year for liquids consumption in the industrial sector. Global supplies of natural gas are relatively small with an average reserve being about 65 years. [4]

> "Global supplies of Natural Gas are relatively small and likely to last less than 70 years"

So, Natural Gas is the ideal fuel, well not really, while it has many advantages it also has disadvantages. World supplies are relatively small. It is likely to become increasingly expensive and currently there can be massive swings in price from one hour to the next. Ireland presently has very small indigenous gas supplies, certainly until the relatively modest Corrib field is developed. All our supplies come through a twin pipeline from a single take-off point in the UK which makes it very vulnerable to supply failure. Figure 3 below shows Ireland predicted gas supply profile.

Fig 3: All-Island gas supply profile.



From an economic point of view you can become vulnerable to overpricing of a fuel if you are over dependent on it. For an island nation with little or no indigenous fuel supplies we need fuel diversity and we need to be able to store fuel in significant quantities to ensure that temporary events do not endanger our electricity supplies.

All our gas supplies come through a single pipeline at one point in the UK. The UK now is a net Gas importer getting the majority of its gas from Europe and Russia. The risk of severe gas shortages is relatively high as a single incident could cut off the entire supply. It could be an industrial incident, a terrorist attack or political fallout.

6.5 Coal

Coal, as currently burnt, is a high producer of carbon dioxide emissions. Much research and development in the area of "clean coal technology" [5] is currently underway. The ultimate prize is to perfect "carbon capture" technology. This is where the carbon dioxide is captured, compressed to a liquid and stored in long term storage. The amount of storage space is considerable because about 2.5 tonnes of carbon dioxide is generated from each tonne of coal burnt. The commercial operation of carbon capture is probably more than ten years away. As an island nation we need to have it high on our list of options.

Coal has in excess of two hundred years of known reserves and is likely globally to become the fuel of choice as gas supplies become exhausted or, more importantly, become too expensive.

As coal can be purchased from numerous locations, is easily stored and is relatively stable in price, it offers advantages over other fuels. It is an important fuel to include in Ireland's fuel mix. Burning it cleanly is the key to its future use. There are expensive development costs associated with clean coal technology and it needs Government support to ensure diversity of fuels and low emission levels.

> "Coal is about a third of the cost of natural gas and globally it is estimated that we have 200 years worth of reserves"

While the price of natural gas is three times that of coal, it is economically feasible to build coal-fired facilities. Such facilities require that expensive pollution controls be installed. This means they are more costly and more time consuming to build than gas-fired plants. The reality is that IPP's enter the market in the fast-build gas fired CCGT base load sector. As a result of this we have a heavily one-sided fuel dependency on gas. In the recent government White Paper, it outlines that Ireland's dependence on natural gas will be 70 per cent by 2020. In terms of the amount of electricity produced from gas fired plant, this will reach 70 per cent of our load much sooner.

The reality is that coal remains cheap and plentiful and it should form an integral part of Ireland's energy mix.

6.6 Nuclear

Nuclear energy has the problems of accident risk and long term storage of radioactive waste associated with it. However, it does not produce any carbon dioxide emissions. The Irish Government has always been totally set against it, a position which was probably induced by our opposition to Sellafield.

As an island nation we do need however, to consider Nuclear in the fuel mix. It is unreasonable to stifle debate on an energy source which produces no carbon emissions. Using nuclear generated energy from interconnection is avoiding the issue. It is an Irish Government solution to an Irish problem. It needs serious consideration now, as the lead time to build a nuclear plant in Ireland would be significant.

Under energy legislation currently in force, Nuclear Energy is specifically prohibited in Ireland, and this

prohibition is further underpinned as policy in the Energy White Paper. This position is predicated by emotive issues such as Chernobyl, Three Mile Island and the Sellafield debate. We need to remove the emotion and look at the facts.

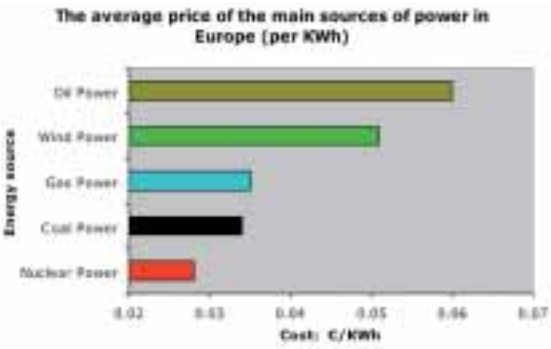
> "Let's fully debate the nuclear issue and implement consensus"

Nuclear Power contributes almost zero carbon dioxide and this is the most prominent greenhouse gas.

However, the capital cost of Nuclear is high. It has to be looked at on a national basis and compared to the cost of other technologies to assist in the reduction of our greenhouse gas emissions. The right size nuclear plant for Ireland is in the region of 600 – 800 MW. The relative cost of construction on this size of plant is between 10 and 50 per cent higher than for conventional CCGT plant. Based on the optimum size of plant, the capital cost of a nuclear plant would be of the order of €0.7-1.2 Billion [6]; this type of investment needs to be managed at a national level. However, as nuclear plants have much lower running costs than coal or gas, nuclear ends up being a much cheaper method of generating electricity over its life-cycle than the other two.

Nuclear energy carries with it real economic benefits. It allows for the production of a large amount of power in a cheap way. In Europe, this price is currently set about €0.028 per KWh and its marginal cost of production is around €0.02. The price of the nuclear KWh is lower than the price of other sources of energy. Figure 4 presents the average price of the main sources of power in Europe:

Figure 4: The average price of the main sources of power in Europe (per KWh)



We need to develop new technologies which would facilitate using surplus power at night to produce hydrogen as an additional fuel.

The nuclear power process does present a risk of accident and raises important issues on the management and disposal of nuclear waste products. Nuclear waste processing plants handle nuclear waste from a number of countries and the addition of Ireland to the waste programme would be incrementally small. The Sellafield debate and legal challenges by Ireland in International courts have biased public opinion away from a rational debate on the subject. We need to be rational and debate the issue relative to all the other issues that present dangers to the public.

Leaving aside the poorly-designed and poorly-managed Chernobyl plant, there have been no fatalities at nuclear generating stations in over 50 years. The Three Mile Island accident did not result in a single injury or fatality. Compare this to the millions killed globally in road accidents. We need to consider the enormous ecological impact of greenhouse gas emissions, and the actual danger of nuclear power to put the issues into perspective.

> "Ensure the correct Policies are implemented. Can we afford the "Not in my backyard" attitude"

The current policy is hypocritical. Ireland imports a proportion of its electrical power over an inter-connector with the UK via the NI Grid system. There are advanced plans to build an East-West interconnector directly between the Republic of Ireland and Wales. When these investments are fully in service they will be importing energy from the UK and European grids. It must be noted that a significant proportion of the base load power on these grids is generated by nuclear plants, so we are in fact using nuclear energy at present and plan to increase this in the future as approximately 15 per cent of the power required will come via these interconnections.

The Nuclear question is not going to dissipate so long as it is not thoroughly debated and rational conclusions arrived at. It is our recommendation that this debate starts immediately, coordinated by the National Energy Agency, which will have appropriate terms of reference that include its place in an energy future for Ireland, that the myths are examined and proven or dispelled, that all views are heard and that all aspects including ownership, cost, impact and regulation are determined in making the correct policy decisions.

6.7 Renewable Energy

As outlined in the recent energy white paper, the target for our energy consumption from renewable sources is to achieve 15 per cent by 2010 and 33 per cent by 2020. While neither of these targets relates specifically to wind power, it is anticipated that, in each case, wind power will ultimately contribute in excess of 90 per cent towards achieving these targets. Indeed these are ambitious targets, but are they practical, achievable or even wise.

The engineers and professionals at the ESB fully support the structured implementation of renewable energy as part of a balanced portfolio but there are realistic limits and we believe it is wise to examine these issues in detail before we forge ahead. The limits of what can be achieved are linked to security of supply issues and a thorough review is needed of all the obvious and hidden costs associated with achieving these targets and the benefits that can be delivered.

6.7.1 Wind

Wind energy needs to be maximised in an effort to reducing carbon emissions and reduce fuel imports. Ireland is ideally situated to generate significant amount of electricity from wind as a result of the average high values of wind on our western sea front.

> "We must maximise renewables. We must also understand the costs and limitations of significant wind power integration onto our system"

We need to maximise the use of wind energy. We also need to understand the technical complexities of wind in the power system as a whole to optimise its use. As a result of the variable nature of wind you can generate full output some days and little or no output on other days. The average output of a wind turbine is of the order of 30 to 35 per cent of its full output. But more significantly, our coldest days tend to have clear skies with very calm conditions. On a recent peak in electricity demand less than 2 per cent of the output from wind turbines was available. In effect, wind turbines can reduce our fuel consumption but do not significantly reduce the amount of installed conventional electrical generating plant required to run the grid system. The provision of reserve plant to cover for calm days can be very expensive because of the low load factors of this plant and needs to be factored in to the overall economics of wind.

The 744 MW of wind energy currently operating in Ireland has a capacity credit of over 100 MW, replacing or avoiding the need to build an equivalent amount of capacity. Capacity credit falls as penetration of wind and other non-firm technologies into the system increases. This will become an issue when levels reach

approximately 20 per cent of installed system capacity. Spinning reserve (the ability to pick up load when an existing generator trips) from other "firm technologies" including inter - connection will always be needed to cater for unexpected unavailability or low levels of electricity generated from wind. Therefore, there is a price which ultimately all electricity customers will pay in so far as there has to be adequate capacity planning of these "firm technologies" to make the best effective use of wind.

In operating a grid system, spinning reserve capacity is required to kick into production in the event of sudden increases in demand or when running plants trip out of production. Wind energy has no ability to increase output for these events. Conventional units give up inertial energy to the grid system as they slow down which helps slow down frequency drops and enables the conventional units to increase output ensuring that the frequency dip is not severe. Wind turbines have no spinning reserve capacity and do not give up inertial energy on frequency dips. These factors limit the practical amount of wind energy which can be installed on a grid system. Increased use of wind energy increases the risk of cascade tripping of running plant resulting in potential widespread switching off of customers.

What is important to realise here is that in economics the law of diminishing returns state that if one factor of production is increased while the others remain constant, the overall returns will relatively decrease after a certain point. Thus, for example, if more and more wind turbines are added to a power system, at some point each additional wind turbine will add relatively less system capacity and fuel savings than his predecessor did, simply because there is a lesser amount of fixed capacity to influence. Thus the capacity credit is around the mean wind power output for small penetrations of wind power in a grid, and drops to a value near the minimum wind power generation for larger penetrations.

This provides an opportunity for additional non wind energy to make up the shortfall. If we are committed to meeting our renewable energy electricity consumption targets and we require a reliable safe, secure energy system then we need to look to new fast acting technologies that give Ireland a responsive generation portfolio along with interconnection.

As all Irish people know, winds often storm across this island and at other times, it can be totally calm. The obvious solution for matching supply and demand would be to store the temporary surplus wind energy, making it available as a resource for periods of insufficient supply. This would be a better way of conserving resources rather than just feeding raw wind energy into the system and thus avoiding the balancing problem and generation reserve required for wind energy generation. As a result of the arbitrary nature of wind, its output can often be low all day and high all night when the demand is not nearly as high, or it can be varied all day and night. This requires effective demand side management of wind and potential curtailment of wind and two shifting of thermal power stations to maintain a secure system. On the 19th of December 2006 at 17.30 the Transmission system reached a new peak demand of 5,106MW, however at that time there was only 11MW of an installed 744MW of wind contributing to the system demand.

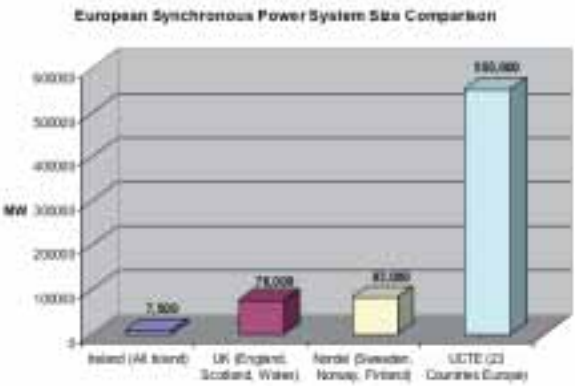
At present the grid network is essentially used as an easily accessibly and seemingly cost free energy dump for wind. **It follows that storage facilities are a precondition for greatly expanding the use of regenerative energy sources on the Irish system.**

There are limited resources available to offset the effects of a significant growth in intermittent generation penetration because the electricity system in Ireland is a small, isolated island system with only weak interconnection with the United Kingdom. The projected total in excess of 2584MW (made up of 744MW of installed capacity, 548MW of signed capacity and 1292MW of connection applications [4]) would bring wind penetration in the Irish electricity system to a level exceeding the highest penetration in any electrical system internationally. This can be seen when WPG

penetration level is compared across European (synchronous) systems. (See figure 5 and 6) The significance of this is also highlighted in terms of Ireland's lack of strong interconnection relative to other synchronous electrical system across Europe.

With all this in mind Ireland needs to develop a strategy to facilitate the increased penetration of wind power into the national electricity market, while ensuring that we continue to have a secure, reliable economic power supply. Is storage the answer?

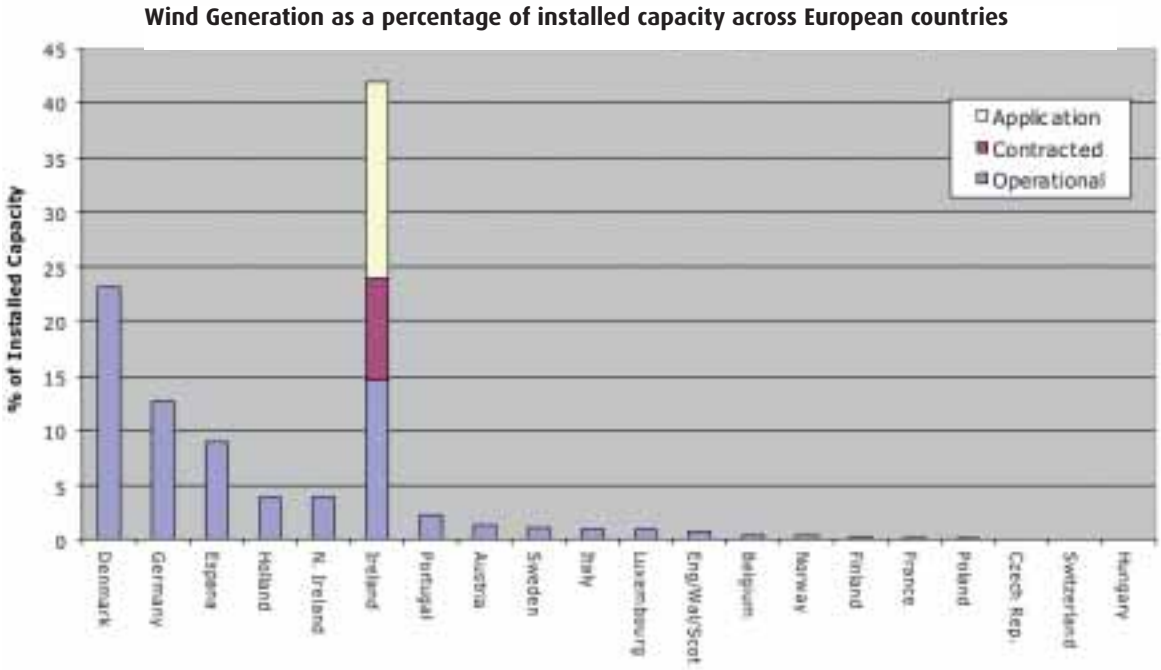
Fig 6: European Synchronous System Power Size Comparison



It is assumed that as wind penetration levels increase the amount of curtailment and the frequency of curtailment will increase. Revenue earned by wind energy generation is based on an energy payment. Constraining off will therefore reduce its potential revenue and in turn affect the economic viability of these investments. This will have the result of increasing the amount of financial support to wind power generation and as a consequence raise the general electricity tariff thus affecting the countries competitiveness in general. Alternatively if financial support is not available for wind energy generation under these new system conditions then curtailment may constitute a barrier to entry to wind power generation as it will be very difficult to finance.

Operational reserve is required for a power system to function in a safe and secure manner. The vast majority of the Irish system reserve is carried out by Turlough Hill pumped storage station, with the remainder of other available units on the system providing limited levels of reserve based on there running regime.

Fig 5: Wind power generation as a percentage of installed capacity across Europe



What is the cost of reserve to cover the target 33 per cent penetration of renewables? Most conventional power plant is considerably less efficient when running below its maximum exporting capacity. With a high level of wind on the system this plant will be required to adopt a cycling running regime which lowers efficiency and burns more fuel per MW produced, although perhaps even more importantly it will emit more CO2 into the atmosphere. A recent study undertaken by EirGrid, [7] shows that the capacity factor of mid merit order plant almost halved from 51 per cent to 29.5 per cent, as wind power generation increased to 1500MW on the Irish system. High merit (low cost high efficiency plant) also saw a reduction in output.

Wind resources by their very nature tend to be strongest and most viable in remote areas of the country usually far away from the cities and the traditional load centres that the national grid is built around. To cater for the wind resources to gain access to the national grid usually requires transmission or distribution lines to be built, having a local environmental impact. Further to this, in many cases the transmission or distribution network infrastructure often needs to be upgraded. These costs are socialised and all energy users pay.

The total of all these yet unknown cost represents the real picture in terms of moving towards these targets. The law of diminishing returns must be considered with regard to this target and the requirement for the system to hold reserve plus Wind Following Capability (WFC) reserve.

With increased levels of wind penetration there is an obvious affect on capacity requirements and utilisation. It can be shown that as Wind Power Generation (WPG) increases, additional or surplus generation capacity is required if security of supply is to be maintained. This is invariably due to the intermittent nature of wind and also to the potential for rapid reduction in wind output as a result of protective shutdowns of wind farms from huge wind surges caused by regional disturbances of the wind field.

The energy white paper looks for a 33 per cent penetration by 2020. It is clear that there are many technical and commercial issues that need to be addressed before these targets can be adopted. Potentially many of the technical considerations could be addressed by catering for additional fast acting plant utilising Open Cycle Gas Turbine (OCGT) technology or additional pumped storage hydro schemes. Reasonable levels of wind penetration are unachievable within the context of operating a secure reliable transmission and distribution system.

Traditionally, energy sources such as wind are viewed sceptically by the electricity industry on the grounds that they are weather dependent and therefore intermittent. So, it can be claimed that wind power does not reduce the requirement for traditional power stations, transmission or distribution network capacity. Undoubtedly the fickle nature of wind will be a barrier to large development as real problems of system management emerge. The impact of government policy to maximise WPG on system stability in terms of security and reliability leads inevitably to the control of the system becoming much more complex.

The use of thermal plant as reserve capacity, though technically feasible, has both cost and environmental penalties. Most thermal plant cannot run up quickly and needs to be run at either part load or on hot standby. Both cases result in the inefficient use of fuel and resulting increased emissions. This erodes the environmental benefit of wind generation. Moreover, the under-utilisation of very expensive thermal plant is, of course reflected in the price paid by all electricity consumers.

Using the power generated by wind when wind velocities are high to generate hydrogen would facilitate higher penetrations of wind energy. In such a scheme the excess wind energy could be used to produce hydrogen, which can be stored. Hydrogen gas could be produced by means of an electrolyser close to the wind farm facility. At times when the energy demand is high, the electricity produced by wind turbines would be supplied directly to the grid, but during off peak hours when demand is low or the price of electricity is cheap,

the power provided by the wind turbines may be used to create Hydrogen via an electrolyser. This hydrogen can be converted back to electrical power during peak hours.

If we are serious about effective wind power integration we should implement a R&D programme to examine wind/hydrogen storage schemes.

Hydrogen can be viewed as a clean, storable and transportable fuel that can stabilize wind energy generation. The justification for wind energy-hydrogen storage hybrid power generation is that it provides clean combustion, transportability and simple storage techniques. The system produces no harmful waste and depletes no natural resources. Governments who are serious about Kyoto CO2 emissions and meeting the agreed targets should produce a policy on energy storage from renewable energy as distinct from renewable energy strategies.

6.7.2 Biomass

Biomass is the growing of fuel crops to be used as a source of energy. Carbon dioxide is generated in the combustion process but overall it is carbon neutral because it absorbs carbon from the atmosphere during the growing process.

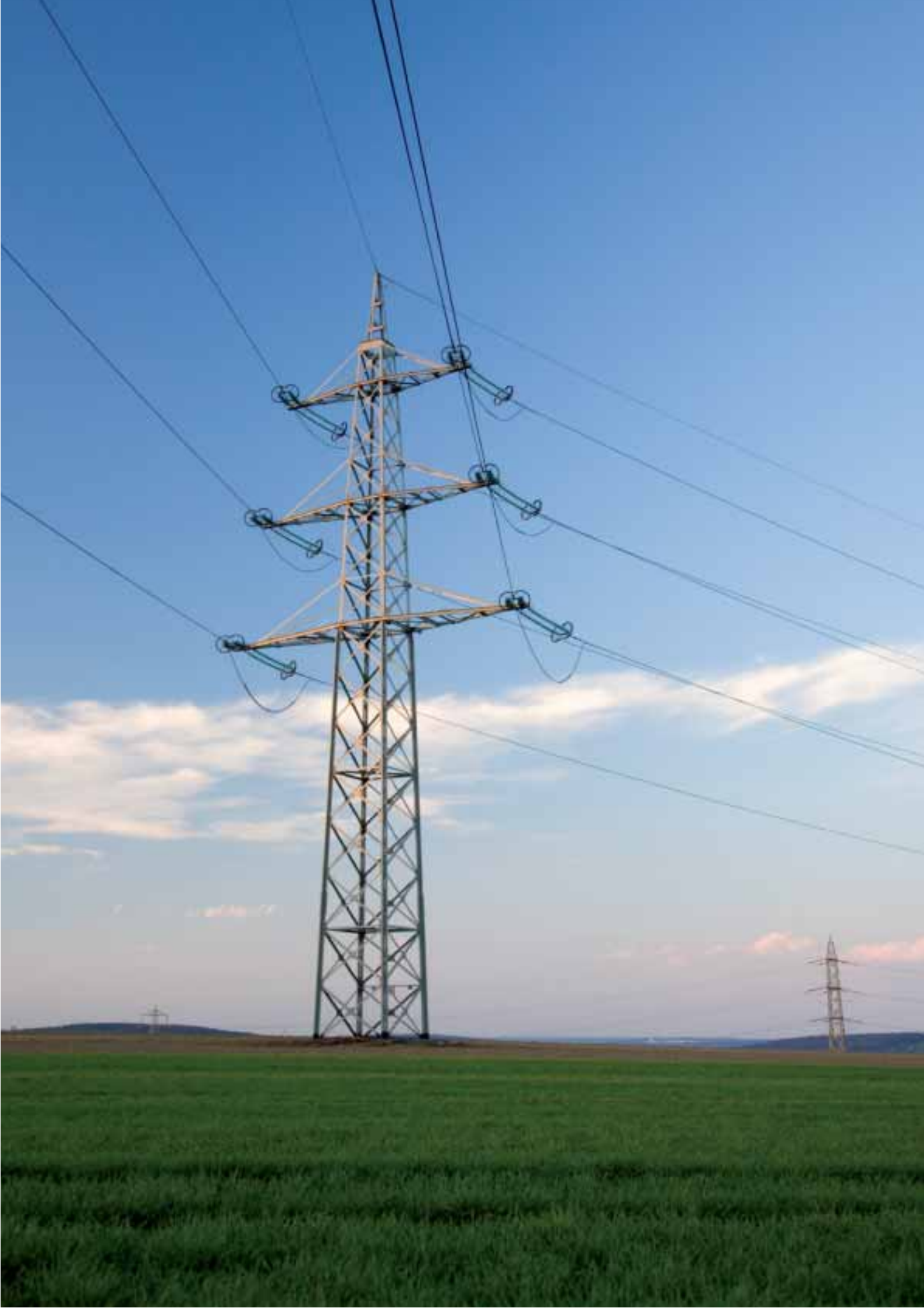
The disadvantages of biomass are that it requires a lot of land to grow significant quantities and it has a high moisture content which reduces its net calorific value. Biomass is bulky and heavy, has a low calorific value and it can not be economically transported over large distances. The fuel used by the trucks transporting it becomes significant in overall carbon emission reduction if it is transported over long distances. It needs to be burnt relatively close (about 50 km) to where it is produced. It is almost carbon neutral overall and must be considered as a fuel for Ireland. It could be used to displace coal or peat in the existing stations which burn these fuels. New small plants could also be developed to produce electricity. It can also be used in pellet form for heating.

> "Biomass needs active Government support now. This support should be directed towards the power generation business with a particular focus on supporting Irish farmers to produce biomass crops for energy utilisation"

Biomass needs active Government support now. This support should be directed towards the power generation business with a particular focus on supporting Irish farmers to produce biomass crops for energy utilisation. As many young farmers are now abandoning their farms in favour of more reliable jobs it is clear that such initiatives are not only good for the environment but essential for the future of the rural environment and community that is distinctly part of our Irish heritage.

The work of the Wexford Farmers Co-Op in developing a green biofuel facility in New Ross is to be applauded but more needs to be done.

For the transport sector, bio-diesel and ethanol need to be developed and the infrastructures need to be put in place to support them. This can reduce carbon dioxide emissions and reduce our dependence on imported fuels. Imported fuels are still relatively cheap and the development of replacement fuels will not take place without active Government support. Countries like Sweden have very ambitious targets in place to curb dependence on imported oil based fuels. Action needs to take place in Ireland now.



7 Keeping Energy Costs Down

7.1 Competition

One of the most frequently discussed features of electricity is the concept of "competition." Unfortunately, it also may be one of the most misused and least understood features.

On the surface, policies that encourage competition should promote desirable results such as increased investment, lower prices, innovative solutions to unmet market demands, and a reduced burden on government intervention.

The government has, over the last seven years, mandated the Commission for Energy Regulation to foster competition in the electricity and gas wholesale markets. The results have been entirely negative, and this begs the question as to whether such a policy can be sustained if it clearly cannot be delivered.

Given that the primary duty of a regulator is to protect the interests of the consumer, it is important to establish whether this duty has been, or is likely to be, fulfilled by the Commission for Energy Regulation.

In examining this issue, it is important to look at how the consumer has fared in five key areas of Access, Price, Quality, Choice and Fairness.

1 Access:

The regulator has been successful in ensuring that new entrants get effective and efficient access to the electricity and gas systems since deregulation. While in theory this is a good thing, it has to be noted that it has come at a significant cost to the customer as the millions of euro for system upgrades and reinforcements that has had to be spent to accommodate new entrants has been borne by the whole industry and added to consumer bills.

2 Price:

For the 9 years prior to the de-regulation of the electricity market electricity price was static or fixed, however since competition has entered the electricity market, the electricity price was static. Even allowing for fuel price, increases have gone from having the third cheapest electricity prices in the EU to being among the most expensive in the enlarged union.

3 Quality:

It is fair to say that deregulation has not given rise to any reduction in the quality of service or supply to date. Having said that, the desire to introduce greater reliance on Independent Power Producers does not bode well. Over the past number of years there have been numerous blackouts in countries predominantly or fully supplied by IPP's. Because they put profit above security of supply, they represent a potential risk to Ireland's economic future.

4 Choice:

Competition has not delivered any increased choice for domestic customers; the IPP's have cherry picked certain large industrial and commercial customers but since the ESB facilitated the opening of the domestic market in 2005 not a single IPP has expressed any interest in supplying the domestic customer.

5 Fairness:

Many of ESB's older power generation plants are commercially unviable at present. These plants called "mid merit" plant are not always running and the correct business decision would be to close them down. This cannot happen at present however, as the grid system depends on the output from these plants for system security as the supplier of last resort. No new entrants have expressed any interest in operating in this sector, though the ESB is forced to. This is discriminating unfairly against ESB. In other markets all players are treated equally and are compensated fully for providing this essential though mostly unprofitable service.

> "Ireland enjoyed the third lowest electricity price in the EU for many years. Now, almost ten years after deregulation, it suffers one of the highest"

The blame for spiralling electricity prices has been laid at the door of the ESB.

In fact, the ESB has been acting to limit the increase in prices. This is clearly demonstrated by the fact that the ESB has been the sole market player which has bid regulated cost reflective prices to the market over the last decade.

In contrast, Independent Power Producers have been making very high profits relative to their equivalent sector abroad.

While criticism of the ESB comes easily to many, it is rarely recognised that where the ESB does influence the market, it is almost exclusively to depress the price, leading to savings for the consumer.

In fact, there is a concern that the CER must increase market price in order to incentivise new entrants into the market.

The strategy is that prices should be increased, in order to make the Irish market attractive to new entrants. **The hope then is that resulting competition will ultimately lead to a fall in prices. Consumers are being used as pawns in this strategy, forced to bear the pain of higher prices in the short term in order to benefit in the longer run from cheaper prices. We are seven years in and prices are still rising.**

Unfortunately, there are no concrete examples of where this strategy has succeeded in its ultimate aim to lower prices.

7.2 Market Pricing Mechanics

The greatest danger presented by the current stampede to restructure national electricity and gas markets is the temptation to adopt and incorporate features of other markets without fully understanding them.

Global deregulation policy or aspects of one country's market structure or policy framework may often seem attractive or logical and plans to transplant them from one country to another might seem reasonable at first. However, policy or market features taken out of context can produce disastrous results. Where mistakes are made all costs are socialised and the result is another increase in electricity prices.

The EU Directive of *'One Size Fits All'* is not appropriate for a small market such as the electricity market in Ireland.

Many countries or states have adopted variants of the deregulated wholesale electricity model. Almost all have conceded defeat on making it work.

The most common reason for failure is the size of the market not being viable for genuine competition in the normal sense.

The 'poster boy' for proponents of deregulation and competitive wholesale electricity models is the PJM (ISO/RTO). This (ISO/RTO) manages the markets and transmission system across 13 states in the USA. The difference between it and Ireland is that it has 700 large generation plants in the market, owned between 50 companies, and serving a population of some 50 million.

There is little doubt that competition is a highly desirable feature in most markets, but electricity is different. Electricity is physically different from all other commodities. It can't be stored, there will always be imbalances and there are unique problems associated with its delivery and transportation.

Fundamentally, with any other commodity, the purchase decision is based on the price. This price sensitivity does not exist in the case of electricity as it is a vital resource. There is not an option to use electricity or not to, based on price, as is the case with many other commodities.

Ireland's GDP is approximately €0.5 billion per day, and almost every element of this is based on a supply of electricity to drive it.

While competitive markets can serve as an excellent model to deliver certain products in as efficient and optimally priced manner as possible, electricity is a more sensitive product which presents complex issues that need to be handled carefully.

For competition to be effective there needs to be a competitive environment in all three sectors of the electricity market, base load, mid merit and peaking. This is currently not the case, and as a result we have a very disjointed market.

The ESB has a significant role to play in the future, being an efficient low cost producer of electricity giving the customers best value for money.

7.3 Cost Transparency

The ESB has acted in a cost transparent manner in the national interest for decades. Unfortunately, new market entrants are not expected to be transparent in their dealings with the Irish customer.

The new SEM (Single Energy Market), covering the whole island of Ireland, acknowledges the need for a market monitor to assess if IPP's are at any point "gaming" the market by not bidding cost reflective prices. In practice this should work but in reality it has always been unclear how powerful that market monitor would be. On past experience, it would not exercise much power. The ESB has a track record of bidding cost reflective prices at all times, leading to savings for the customer.

7.4 Savings for Consumers

There has been much commentary in the press about the cost of Electricity and Gas. Competition was supposed to deliver lower prices, yet today there is no competition in the domestic supply market and prices to consumers are the third highest in Europe. At the same time there is a direct correlation between the increase in the price of energy to the consumer and the increase in profits to the Power Generators both independent and ESB. What has the Commission for Energy Regulation done to avoid this, the answer being nothing. In fact they have created the situation and have no policy to reduce prices in real terms for the consumer.

Looking at that price in a little more detail it is made up of four components;

- Standing Charge (the charge for the supply infrastructure and meter)
- The cost per unit of energy (varies with cost of production and most dependent on fuel cost)
- Public Service Obligation (a charge for covering the cost of indigenous power production Electricity only)
- Government Tax (VAT at the rate of 13.5 per cent)

If one considers that the government also charges a duty on the fuel that the Power producers require to create electricity and that the government takes a dividend from ESB, and changes a corporation tax on producer profits, then it is clear that policy is key to how much we ask consumers pay.

What is required are a small number of strategic but important actions. These will immediately reduce the cost of energy between 10 per cent and 20 per cent for the more vulnerable consumers, and they are as follows:

- Remove the standing charge for domestic customers in favour of a usage based charge, this will immediately reduce the cost for users that use very little electricity or gas, it is unreasonable for such low volume users to pay the same standing charges as large volume consumers.
- Introduce quarterly price reviews for the wholesale price of energy, to take advantage of global fuel market price fluctuation, prices come down as well as go up.
- Remove the public service obligation and fund this imbalance through the NDP and other measures.
- Restructure the indirect tax take or replace it with a fixed duty per unit on a pay as you use basis.

These measures are simple and have immediate returns without fundamentally changing the overall economics for the economy as a whole. In so doing, the measures fundamentally change the structure and cost of energy to the consumer, and for the better.

7.5 The role of ESB

One of the major advantages of the VIU model is its ability to access capital at a significantly lower cost to Generation or Distribution/Supply companies to deliver new generation and transmission projects. While each individual generation or transmission project will have its own risk profile and cost of capital, the financial health of the entity that is making the investment is the pre-eminent investor criteria.

The primary risk driver will be based on the ability to repay the debt for these very capital intensive projects. The electricity sector is one of the most capitally intensive industries in the world, a lower cost of capital for one model over the other will, in theory, produce lower retail prices, and in many circumstances substantially lower ones.

There have been very few efforts by government to improve the efficiency of the VIU model, rather they take the "one size fits all approach" and in many cases blindly follow utility unbundling models that have delivered high prices, fractured working utilities and support markets that are designed to allow IPP to garner excessive profits.

There are many different areas of efficiency for VIUs. The ones that are most relevant are the optimization of the VIU's transmission, distribution and generation resources. It is clear that to improve efficiencies and productivity requires eliminating institutional barriers that isolate and misalign different departments' goals and objectives and forestall efforts to optimize the entity's enterprise performance. This continuous improvement process is often referred to as "removing the silos." This is now the preferred model in many countries that are now trying to bring the VIU model back to life. Irish consumers should not be forced to go through this exercise, when it is clear that there are no gains to be achieved.

7.5.1 Transfer of Transmission Assets

The incoming government will need to quickly address the uncertainty arising out of the energy white paper proposal to transfer ownership of the transmission assets from the current owners, ESB, to EirGrid. While the proposal was mooted to reduce costs for consumers this has not been substantiated in any form in the proposal. It does not make any sense for EirGrid to duplicate what ESB already has in place for its own electricity network asset for distribution and end user supply. The ESB is correctly resourced to own, manage and maintain all network assets. EirGrid similarly is well equipped to manage the operation and capacity planning of the national grid.

It makes no sense to duplicate activities under two agencies, and would undoubtedly result in increased costs for customers.

The current proposal is being justified by the claim that independent generators will enter the market because they will now have less fear that the ESB can obstruct them via control of the transmission assets. This argument is flawed on a number of fronts.

No evidence has been produced to show that the ESB has used its ownership to obstruct new entrants. In fact the opposite is the case. The ESB through ESB National Grid and now EirGrid, has overseen access to the transmission and distribution system of over 6 large IPP's and numerous wind farm IPP's at the same time as reducing its own market share from 52 per cent in the Republic of Ireland and 40 per cent on an all-island market basis.

Viridian, competitors to the ESB in the Republic of Ireland market, currently, own, manage and maintain the transmission assets in Northern Ireland. They are on record as confirming that they have no issue with ESB owning such assets in the Republic.

Access to the transmission grid is controlled by EirGrid, a separate independent company. If there was any evidence of obstruction then EirGrid would be the logical target for such criticism.

Should this proposal go ahead EirGrid would need to staff up and develop expertise to take on the Transmission Asset Owner responsibilities from ESB Networks. ESB Networks will not be able to simply transfer staff because of their own ongoing responsibilities. Any final reductions in cost to ESB would be significantly less than the increases in the costs of Eirgrid.

ESB Networks staff are responsible for both distribution and transmission activities. Because of this dual role ESB Networks can achieve greater efficiencies than would be possible with separation of responsibilities for distribution and transmission activities. The same

supervisors and electricians work on all voltages. One simple example of this is that during storms and power outages affecting transmission and distribution ESB Networks can get power back to the customers much quicker than would be the case where two separate companies had to manage this process.

The devil is very much in the detail regarding this proposal. The inefficiencies associated with separation of responsibilities would be most marked in substation activities. The majority of transmission stations contain both transmission and distribution assets. Accordingly, separation of responsibilities would lead to inefficiencies and potential conflicts in design, material procurement and work management. Of particular concern would be safety management during station work.

The transmission system is wrongly viewed as an instrument for state transport of bulk power rather than as an instrument for improving vertical integration. There is a strong logic for combining the responsibilities for all Distribution and Transmission activities in one company given the size of the respective networks in Ireland both North and South. However, the separation of this combined entity from the ESB would be detrimental to the company's future again for reasons of size in this case in terms of asset backing required for a viable independent utility.

7.5.2 Non-profit Mandate for ESB Networks

In the outgoing governments white paper on energy there is a proposal that ESB Networks would operate on a risk related rate of return. This proposal is based on the premise that any profits made by ESB Networks will all be at a cost to the customer. Yet again, this proposal is fundamentally flawed.

The incentive for companies to become more efficient and generate higher profits is to make profits for investment in expanding their business. Take away this incentive and you are left with a recipe for stagnation, inefficiency and decline in services to customers.

The acknowledged best practice model for regulation of natural network monopolies is that practised in the USA and elsewhere which ensures that utilities are motivated to become more efficient and pass on benefits to customers by allowing them to retain a proportion of any profits made for investments which can be used to grow the company.

Until the government recognises that it is impossible to achieve real competition in an electricity market as small as Ireland's and adopts the type of regulated model previously used in the USA to achieve efficiencies which Europe was originally trying to match, Irish electricity customers will be paying higher electricity prices than necessary for a service that will become less efficient and effective over time and accordingly more difficult and expensive to rectify in the longer term.

8 Conclusion

Our modern lifestyle is based on massive increases in the consumption of energy. At the same time we demand 'big picture' action to reduce emissions. This conflict is not easily resolved. Government attempts to reduce energy consumption are resented by the individual and can prove unpopular in the short term. As a result, Government may know what the correct thing is to do in the long term but may hesitate to do it because of retaliation of the electorate. In the immediate aftermath of an election, and hopefully five years out from the next, is the optimum time to consider long term options.

Our whole lifestyle impacts on the amount of energy we consume. From where we live, the type of housing we live in, how we heat and light our homes, to how we travel away from them to work, school, shops or entertainment facilities. In order to have a cohesive policy governing the diverse aspects of our lives, all matters relating to energy usage need to be governed by a single agency which puts the appropriate policies in place. Spreading it across multiple Government Ministries without assigning overall control or responsibility will never produce a cohesive energy policy.

The extent of the pollution resulting from energy consumption is dependent on the source of the energy and the technology in use. Reducing pollution means developing new technology and in most cases new infrastructures to make use of ways of doing things cleaner. It also means changing the mindset of the population on a global scale.

Major change on a global scale takes a long time to accomplish. Developing new technology and building new infrastructures needs major investment. Investors will not invest unless they are sure of a return on investment. Hence there needs to be certainty that the policies in place are clearly thought out and will remain in place in the long term. When energy policies are in the hands of Government Ministers there can be no certainty of a consistent long term policy. This frightens investors away from long term investment strategies needed to develop new technologies and new infrastructures. It is imperative that we create a National Energy Agency who take a long term view to guarantee consistent long term policies. We must create a legacy in energy production and consumption which lasts beyond the five year horizon on which governments gazes are fixed.

Ireland is extremely dependent on foreign Natural Gas, in particular for electricity production. At one point it comes through a single pipeline. Bearing in mind that economic and social life ceases to function when the electricity system collapses, it is unacceptable to be over dependent on a single fuel with no storage facilities and which could be shut off easily by terrorist attack or natural disaster. As an island nation with little natural resource fuel we need a fuel policy in which fuel diversity is a key element.

Ireland needs a National Energy Agency to cover all aspects of policy which determine energy usage. It needs to take a long term view and be free from short term political interference. It needs professionals who are qualified in the energy and pollution disciplines. All options including Nuclear need to be considered in our fuel mix to ensure diversity. We need to take politics out of energy, it is too important in the long term to be used for political advantage in the short term.

9 Glossary of Terms

CO2	Carbon Dioxide
EPA	Environmental Protection Agency
IPP	Independent Power Producer
GHG	Greenhouse Gas
SEM	Single Electricity Market
OCGT	Open cycle gas turbine
CCGT	Combined cycle gas turbine
NDP	National Development Plan
TSO	Transmission System Operator
ISO	Independent System Operator
RTO	Regional Transmission Operator
GAR	Generation Adequacy Report
WFC	Wind Following Capability
WPG	Wind Power Generation
VIU	Vertically Integrated Utility
CER	Commission Energy Regulation
TAO	Transmission Asset Owner
KWHr	Kilowatt-Hour

10 References

[1] Dept of Transport Statement of Strategy (2005 2007)

[2] Government National Climate Change Strategy

[3] 2007-2013 GAR Generation Adequacy Report, EirGrid

[4] International Energy Outlook 2007 Energy Information Administration Office of Integrated Analysis and Forecasting U.S. Department of Energy

[5] International energy Agency Clean Coal Centre http://www.iea-coal.org.uk/site/ieaccc/home

[6] http://www.world-nuclear.org/info/inf63.html

[7] "Impact of wind power generation in Ireland on the operation of conventional plant and the economic implications" ESB National Grid (now EirGrid) www.eirgrid.com

RYANAIR