EIRGRID GROUP

ANNUAL RENEWABLE REPORT 2012

Towards a Smart, Sustainable Energy Future

EIRGRID semo SONI



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Towards a Smart, Sustainable Energy Future

Foreword

Last year almost 18% of the electricity we consumed was from renewable energy sources, mainly wind; and through this action, we were able to reduce our dependency on imported gas by over 20%. Increasing our consumption of renewable energy increases our security of supply, provides a hedge against high fossil fuel prices and contributes to our climate change strategy. These are the principles that underpin our 2020 targets.

Our National Renewable Energy Action Plan and our Strategy for Renewable Energy 2012-2020 illustrate our approach to achieving our goals in renewable energy, across the transport, electricity and heating sectors. This report from EirGrid focuses particularly on renewable electricity. The bulk of our target will be met in the electricity sector and moving from around 18% of consumption in the electricity sector from renewable resources today, to around 40% by 2020, represents a challenging transformation, and I welcome the on-going work by EirGrid to help realise this goal.

EirGrid is at the forefront of renewable integration and is working with all industry stakeholders to ensure the delivery of an electricity network that has the infrastructural capacity and operational capability to exploit the country's renewable energy potential.

The Government is fully supportive of this work and in this regard, the Department of Communications, Energy & Natural Resources recently published a Government Policy Statement on the Strategic Importance of Transmission and Other Energy Infrastructure that should assist in the delivery of Grid25.

Through its DS3 programme, EirGrid is working on the necessary operational changes required to ensure that system security and stability are maintained, while catering for increasing amounts of intermittent renewable generation onto the electricity system by 2020. This work is a vital part of meeting our renewable obligations.

I welcome the publication of EirGrid's Annual Renewable Report 2012. This is the third such report that provides a detailed overview of key developments in the renewable electricity sector in Ireland over the past twelve months, and offers a timely assessment of continued progress towards meeting our 2020 renewable energy target.

Pat Rabbitte T.D.
Minister for Communications,
Energy and Natural Resources



Contents

Introduction

The transition towards a low-carbon electricity system in Ireland and Northern Ireland is well underway.

This trend has continued over the last year despite the lingering shadow of the international economic crisis. While a degree of financial and regulatory uncertainty remains in the sector, the Irish government has incorporated an expansion of renewable energy sources (RES) into its broader Programme for Government (2011-2016). In 2010 Northern Ireland established a robust policy framework to exploit the opportunities arising from RES development and have continued the implementation of this process over the last twelve months. It is now clear that both jurisdictions view renewable energy development as an important catalyst for economic renewal, job creation and sustainable development.

The drive to ensure a sustainable approach to economic, environmental and social change is a welcome undertaking. While energy efficiency offers one of the most cost-effective means of reducing CO_2 emissions, and significantly increases the value derived from the energy services used on a daily basis, the deployment of renewable generation has immediate benefits too. The renewable electricity sector has the potential to foster technological innovation, market creation and employment, which will help both economies on the island grow in a more sustainable manner. Given the current economic climate, this is a particularly salient point.

Increasing our levels of renewable energy can also enhance energy supply security through diversification, and improve public health through reduced local air pollution. The work of EirGrid and SONI is fundamental to this development.

In 2011 renewable generation supplied 17% of electricity demand on an all-island basis – 18% in Ireland and 12% in Northern Ireland – up from 12% in 2010. In the year to September 2012, renewable integration has continued progressively, and today installed renewable capacity on the island has reached a combined total of 2,484 MW – 2,000 MW in the South and 484 MW in the North.

The emerging policy consensus in Europe is now pointing towards a situation where it is not simply about meeting a small percentage of our energy from renewable sources, but moving to a situation where renewables rather than fossil fuels will be a significant part of our electricity generation portfolio.

Enabling this low-carbon transition while maintaining a secure electricity supply is essential for economic development and society, and is at the heart of EirGrid and SONI's role as Transmission System Operators (TSOs). This work involves: building new and upgrading existing grid infrastructure; the completion of the East-West Interconnector (EWIC); developing the operational capabilities of the power system (DS3) in order to operate the power system securely with increasing amounts of variable renewable generation; and integrating Smart Grid technologies into the power system.

There has been significant progress on each of these areas during the last year.

In order to meet the renewable electricity targets it is projected that the amount of wind generation across the island of Ireland will reach an installed capacity of between 4,800 MW and 5,300 MW by 2020.[1] At this level, Ireland and Northern Ireland will have one of the highest penetrations of renewable generation, as a percentage of system size, in the world. Even today, we are managing instantaneous penetration levels of variable wind generation above 40% more often than ever before, putting us in a world-leading position for managing high levels of wind generation on a synchronous power system.

Of course, our work does not stop with wind. In the last year, we have continued our efforts to identify and solve the operational challenges associated with integrating other renewable sources and technologies, such as ocean energy, biomass and waste-to-energy plants. We also note the recent statements by the governments of Ireland and the United Kingdom outlining the potential for exporting renewable energy from Ireland to the U.K., and we stand ready to support the delivery of the necessary actions arising from the anticipated Memorandum of Understanding with the U.K.

In the last few months we also issued a call for advanced demonstration technologies to apply to work with us in order to stimulate the emergence of innovative Smart Grid technological developments and established a Smart Grid Innovation Hub that is a collaborative initiative between EirGrid, SONI and the National Digital Research Centre (NDRC) to promote the development of innovative Smart Grid ideas on the island of Ireland. At the same time, we continued our work at the European Union level through ENTSO-E and maintained our regular engagement with the Regulatory Authorities and relevant government departments across the island. In recognition of the broad nature and strategic importance of our work, we have maintained a considerable level of stakeholder engagement over the last twelve months and we are committed to continuing open communication and stakeholder coordination in the years ahead.

For further information on EirGrid and SONI's role and the various initiatives underway, I would encourage you to visit our website at www.eirgrid.com.

Fintan Slye
Chief Executive
EirGrid

[1]See the All- Island Generation Capacity Statement 2012-2021.

Executive Summary

The renewable electricity sector will play a key role in shaping a sustainable energy future for Ireland and Northern Ireland.

In helping to decarbonise the electricity power system, the benefits of renewable energy integration can have a positive impact on the environment, economy and society more generally.

As an all-island group, EirGrid plc is helping develop many of the necessary solutions to facilitate a paradigm shift towards greater energy sustainability across the island. Over the past year, considerable progress has been made in all aspects of our work.

As the Transmission System Operators (TSOs), EirGrid and SONI are responsible for managing electricity supply and demand in real-time and controlling flows of power on the island's transmission systems. The integration of more variable renewable forms of generation on the power system means TSOs must consider an increasingly complex range of demand and supply issues such as the operational challenges of switching to sustainable but more variable non-synchronous power sources, security of supply in terms of managing an increasing variety of generation technology types and protection from cyber-attack, and 'smart meters' which can regulate electricity usage at the point of consumption.

The 2012 Annual Renewable Report details progress in the renewable electricity sector over the last twelve months and, for perspective, it sets these developments in a broader regional and international context. The report also includes a chapter on the history of the electricity power system in Ireland and Northern Ireland, which is designed to place contemporary developments in historical context.

The structure of this report is as follows:

Chapter 1 - Policy Landscape:

This chapter provides a review of renewable policy developments in the European Union (E.U.), Ireland, and Northern Ireland and details progress in the deployment of renewable energy. This is of particular interest in the context of a sustainable energy future.

Chapter 2 - EirGrid and SONI in the Renewable Electricity Sector:

This chapter presents an overview of EirGrid and SONI's work in meeting the renewable electricity targets.[2] It covers recent developments, current status and forthcoming milestones across the full range of our work in the renewable sector. The chapter also provides an overview of our engagement with key stakeholders throughout the last year and highlights our regional and international involvement over the same period.

Chapter 3 - A History of the Power System:

This chapter provides a short historical overview of the development of the electricity power system on the island of Ireland. This year marks the 85th anniversary of the Ardnacrusha hydroelectric power station and is thus a timely opportunity to review the development of the power system in Ireland and Northern Ireland over the last 85 years. This overview also helps place the extent of the transition underway today in context.

Chapter 4 - A Smart, Sustainable Energy System:

This chapter offers a highlight of some of the main international developments in the renewable energy space in the last year, focusing particularly on the E.U., the U.S. and China. This chapter also presents an update on developments underway in the marine energy sector.

Chapter 5 – Conclusion:

The concluding chapter provides some brief closing remarks.

Please note that the renewable energy figures throughout this report are not normalised as per the methodology in the 2009 E.U. Renewable Energy Directive.

[2] The EirGrid Group comprises EirGrid TSO, SONI TSO, the Single Electricity Market Operator (SEMO), EirGrid Interconnector Ltd (EIL), EirGrid Telecoms Ltd (ETL) and EirGrid U.K. Holdings Ltd. Hereafter, EirGrid will be used to refer to all businesses of the Group.

1. Policy Landscape

The integration of increasing levels of renewable generation continues to revolutionise the electricity landscape across the globe.

Targets for renewable energy are now in place in 118 countries worldwide and renewable generation accounted for almost half of the 208 GW of new electricity generation capacity installed globally in 2011.[3] The introduction of policy measures designed to ensure a stable framework for financial investment in the renewable sector continued to pay dividends in 2011, with global investment increasing by 17% to $257 billion.[4] This increase is 94% more than the total invested in 2007, and represents a continuing upward trend in the sector despite the strain of the financial crisis. It is important to note that the recent increase in investment and deployment of renewables has been fuelled in some countries by the Fukushima nuclear crisis in Japan and by the call to double the share of renewable in the energy mix by 2030 by the United Nations (U.N.).[5]

In the European Union (E.U.), renewable energy has now become a fundamental part of the generation portfolio mix and last year renewable energy accounted for almost 18% of the E.U.'s electricity consumption.[6] The E.U.'s commitment to renewable energy has found legal expression in a range of energy and climate change "packages," broader communications and energy roadmaps. Indeed, there is now broad political agreement that the use of renewable energy sources can contribute to combating climate change, to increasing security of supply and help drive down costs for consumers. The introduction of the climate change and third internal energy market package has laid out the framework conditions for ensuring greater levels of energy efficiency, renewable energy, and the completion of the internal energy market.

According to the National Renewable Energy Action Plans (NREAPs), almost 35% of the E.U.'s electricity consumption will be derived from renewable energy in 2020. From a TSO perspective, this represents a paradigm shift and poses considerable challenges for electricity system operators to overcome. On top of the core changes already underway, it is expected

that the electricity system can be utilised to deliver a low carbon transport and heating sector too – a change that will pose additional operational challenges out to 2030 and 2050.

The publication of a number of E.U. policy documents in the past year has provided a level of systematic convergence linking efforts to decarbonise the electricity power sector with the need for grid infrastructure, renewable energy integration, energy efficiency measures, and the need to focus on long-term policies to drive significant investments. In October 2011, the European Commission (E.C.) adopted the proposal for a Regulation on "Guidelines for trans-European energy infrastructure". It aims at ensuring that strategic energy networks and storage facilities are completed by 2020. To this end, the E.C. has identified 12 priority energy corridors and proposed a regime of "common interest" for projects contributing to implementing these priorities.

The publication of the E.U. Commission's Energy Roadmap 2050 in December 2011 set out a number of different scenarios for developing a decarbonised energy sector over the coming decades. In each scenario, renewable energy is predicted to form a central part of the E.U.'s future generation portfolio, possibly reaching 97% of electricity consumption in a high renewable scenario by 2050.

[3]Renewables 2012: Global Status Report: REN 21. Available at www.ren21.net
[4]Global Trends in Renewable Energy Investment 2012 UNEP Collaborating Centre: Bloomberg New Energy Finance.
[5]The United Nations: The Sustainable Energy for All Initiative. Available at http://www.sustainableenergyforall.org/
[6]Eurostat: Electricity Statistics – Provisional Data for 2011 (June 2012). Available at: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php?title=File:Electricity_Statistics,_2011_(in_GWh).png&filetimestamp=20120507123319

The strategy to decarbonise the energy sector is set in the context of the European Council's target of an 80-95% reduction in E.U. greenhouse gas emissions below 1990 levels by 2050.[7]

An important Communication on E.U. renewable energy policy was issued by the European Commission in June 2012. This Communication outlined options for the growth in renewables in the period beyond 2020 and called for a more coordinated E.U. approach in the establishment and reform of support schemes and an increased use of renewable energy trading within the E.U.

1.1 RENEWABLES IN THE SINGLE ELECTRICITY MARKET (SEM)

The power system of Ireland and Northern Ireland is changing. While the continuing economic recession is fostering a level of investment uncertainty in the renewable energy sector, the E.U. has continued its push for structural changes in the functioning of the energy market. These market developments have direct implications for renewable energy integration and the design of the Single Electricity Market in Ireland and Northern Ireland.

The most important development in the SEM over the past year was the introduction of Intra-Day Trading (IDT). The new system promotes more competition in the market by allowing electricity trading closer to real time and enabling the use of increasing amounts of variable renewable generation. The project was launched by SEMO in July 2012 on time and within budget.

One of the most important policy decisions in the last year was the E.U. Commission decision on state-aid clearance for the Renewable Energy Feed-in Tariffs, REFIT 2 and REFIT 3 in Ireland. The Irish government received E.U. approval for both in March 2012. In order to qualify for this REFIT support scheme a wind farm must be operational by 2015. This decision is likely to provide some additional financial certainty to wind farm investors over the medium term.

There was also a consultation in Northern Ireland in 2011 on the introduction of proposed changes to the Northern Ireland Renewable Obligation (NIRO) in 2013. The publication of a Northern Ireland government response to this consultation in August 2012 outlining the amended levels of incentivisation for various technologies has provided certainty to potential renewable developers in Northern Ireland.[8]

1.2 RENEWABLE POLICY & TARGETS: IRELAND

The principal aim of energy policy in Ireland is "to ensure competitive, secure and sustainable energy for the economy and for society."[9] The development of indigenous renewable energy in the electricity sector is crucial to fulfilling this goal, and for improving Ireland's balance of payments position through an overall reduction in energy imports. In 2011 displacement of fossil fuel for electricity generation by renewable energy is estimated by SEAI to have resulted in an avoidance of almost €300 million in natural gas imports – equivalent to the annual energy needs of almost 350,000 homes.[10]

[7] See the E.U. Energy Road Map 2050. Available at http://ec.europa.eu/energy/energy2020/roadmap/index_en.htm
[8] The Northern Ireland Department of Energy, Trade and Investment (DETI) response published in August 2012 can be found at: http://www.detini.gov.uk/niro_2012_consultation_-_government_response.pdf.
[9] See the Strategy for Renewable Energy 2012-2020. Available at http://www.dcenr.gov.ie/NR/rdonlyres/9472D68A-40F4-41B8-B8FD-F5F788D4207A/0/RenewableEnergyStrategy2012_2020.pdf
[10] Information provided by the Sustainable Energy Authority of Ireland (SEAI) to EirGrid, October 2012.

The electricity sector accounted for 19% of final energy demand in Ireland in 2011. Thus, using indigenous renewable energy has the potential to contribute more broadly to energy security, environmental sustainability and by extension economic growth and job creation. Indeed, according the Executive Director of the International Energy Agency (IEA), Ms Maria van der Hoeven, "investing in low-carbon technologies makes economic sense and is essential for Ireland, given its comparative advantage in renewable sources of energy."[11]

The deployment of renewable energy in the Irish electricity sector has increased considerably over the last number of years. In 2005 renewable energy met 5% of electricity demand; at the end of 2011 this had increased to 18%. At the end of September 2012, there was 1,695 MW of wind capacity, 237 MW of hydro power and 68 MW of smaller renewable sources installed in Ireland. Moreover, at particular time intervals, wind has produced enough power to meet 50% of electricity demand, and has reached a high of 38% of total daily electricity demand.[12] The recent IEA energy policy review of Ireland recognises this progress and notes that "Ireland has made big strides in recent years in accelerating renewable generation."[13]

The growth in renewable energy in Ireland is underpinned by a favourable policy and financial support framework, and capital investment in the necessary grid infrastructure. The government recognises that achieving the 40% renewable electricity target will require continued social acceptance, best practice in planning and permitting procedures and a level of policy coherence across the environmental and renewable sectors. The introduction of REFIT 2 and REFIT 3 earlier this year and the publication of a strategy on renewable energy and a policy statement on energy infrastructure are welcome developments that will provide a level of additional certainty in the industry.

In early 2012, the government declared its intention to pursue the potential and opportunities for renewable electricity export within the framework of the co-operation mechanism in the Renewable Energy Directive, provided the costs and benefits make sense. As the Minister for Communications, Energy and Natural Resources, Pat Rabbitte T.D., noted in July 2012:"we now have a real opportunity to go beyond providing for our own needs and to develop our abundant natural resources to become a renewable electricity exporter of scale."[14] Through the British-Irish Council, the government is working towards the conclusion of a mutually beneficial agreement on renewable electricity trading between Great Britain and Ireland. A Memorandum of Understanding is expected to be signed by the end of 2012.

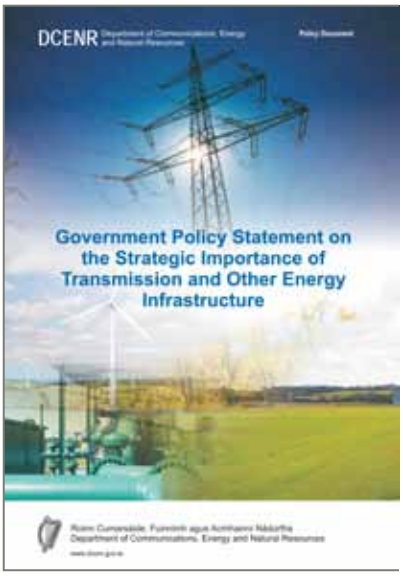
In the meantime, the Irish government is fully committed to achieving the 2020 renewable energy target and recently published three important policy statements that directly relate to developments in this sector.

[11]The Sustainable Energy of Authority Ireland press release on the launch of the International Energy Agency (IEA) Energy Policy Review: Ireland 2012.http://www.seai.ie/News_Events/Press_Releases/2012/Head_of_IEA_states_investing_in_low_carbon_technologies_is_essential_for_Ireland.html

[12]Wind generation is split between the Transmission System Operator and Distribution System Operator (DSO). Wind figures on the Distribution System are provided to EirGrid from the DSO. Small renewable include: renewable CHP, land fill gas, and biomass

[13]See the IEA Energy Policy Review: Ireland 2012 p.92.

[14]Irish and UK Governments Working to Build Europe's First Cross-Jurisdictional Renewable Electricity Trade: Speech by Minister Pat Rabbitte at the Sustainability Summit Global Village Volvo Ocean Race, Galway, July 4th 2012.



First, in May 2012, the government issued a Strategy for Renewable Energy 2012-2020. This document reinforced a commitment to deliver the renewable electricity targets and supported the requirement to build the necessary grid infrastructure and develop the operational solutions to manage increasing levels of variable renewable generation.

This Strategy document was followed in July by a separate policy statement on the Strategic Importance of Transmission and Other Energy Infrastructure. This policy statement underlined "the need and urgency for new energy infrastructure in the national interest."[15]

Finally, in July 2012, the government released a document entitled, Harnessing Our Ocean Wealth – An Integrated Marine Plan for Ireland, which aims to generate momentum in the emerging market opportunities in the marine energy sector. The combination of these policy documents provides additional clarity over the government's planned response to the twin challenges of energy security and climate change.

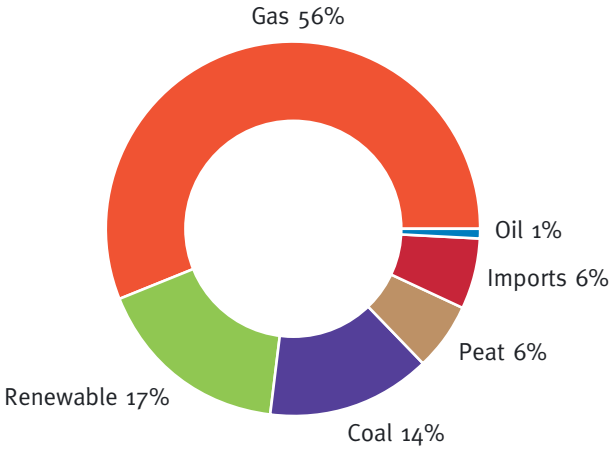
In the next twelve months, it is expected that the Irish government will publish a new energy policy framework for Ireland. This energy framework will succeed the 2007 Energy White Paper and will set the policy agenda in the energy sector over the short to medium term. In addition to this new energy framework document, it is expected that the E.U. Infrastructure Package will be finalised during the Irish E.U. Presidency, which will take place during the first six months of 2013.

In 2010, ESB Networks launched the pilot National Smart Metering Programme. The customer trial involved 6,300 users and the deployment of a range of time-of-use tariffs in conjunction with demand-side management incentives. The analysis estimates that the roll-out of smart meter technology could potentially provide a net benefit to customers of up to €220 million over the next 15 to 20 years. Following the successful completion of the exploratory trials and cost-benefit analysis, a decision to proceed to the second phase of the national programme to rollout smart meters to all homes was taken in July 2012.

[15]Government Statement of the Strategic Importance of Transmission and Other Energy Infrastructure, July 2012.
Available at: http://www.dcenr.gov.ie/NR/rdonlyres/1CA793D6-2853-4DF9-A5F7-41A5ED36D20B/0/TransmissionandOtherEnergyInfrastructure.pdf

All-Island Fuel Mix

2011



Source: Based on the Fuel Mix Disclosure Methodology as set out in the SEM Committee Decision Paper SEM-11-095.

1.3 RENEWABLE POLICY & TARGETS: NORTHERN IRELAND

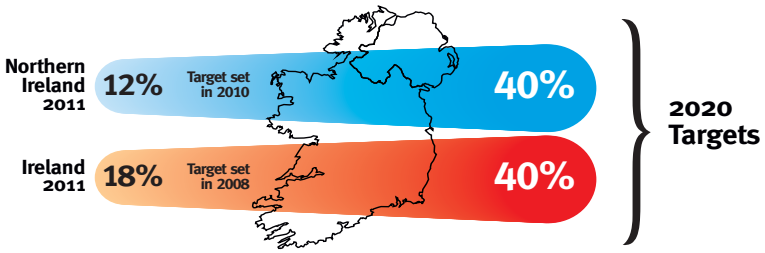
A similar governmental commitment to integrating renewable energy in the electricity sector has emerged in Northern Ireland over the past few years. The Northern Ireland Assembly voted in 2010 to increase the amount of electricity provided by renewable sources to 40% by 2020 and published a road map for an overhaul of Northern Ireland's electricity infrastructure, including proposals to introduce smart grid technologies and enhance sustainability levels throughout the energy sector.

This commitment was outlined in the 2010 Strategic Energy Framework (SEF).[16] More recently, the Department of Enterprise, Trade and Investment (DETI) has completed a consultation on the introduction of the primary legislation required to give effect to the SEF.

In Northern Ireland there are currently 484 MW of renewable generation connected to the power system. In July 2012 the Minister for Enterprise, Trade and Investment, Arlene Foster, MLA, announced that Northern Ireland had achieved its renewable target of 12% of electricity demand being sourced from renewable generation by 2012.

This progress places Northern Ireland on a clear path towards meeting its 20% interim renewable electricity target by 2015.

The Development of Renewable Electricity across the island 2011 to 2020



[16] See the Strategic Energy Framework for Northern Ireland at http://www.detini.gov.uk/strategic_energy_framework__sef_2010_-3.pdf

In addition to the introduction and implementation of the SEF, the integration of renewable generation was further enhanced by the recent announcement that the Crown Estate has offered development rights for offshore wind (600 MW) and tidal energy (100 MW) projects around the Northern Ireland coastline.

To meet the new 2020 renewable electricity target, EirGrid and SONI estimate that Northern Ireland will need to increase the installed level of wind generation on the power system to near 1,300 MW. This development will pose significant infrastructural and operational challenges that SONI, EirGrid and Northern Ireland Electricity (NIE) are working to overcome. It is estimated that to facilitate this renewable target approximately £1 billion will need to be invested in the electricity network across Northern Ireland.

1.4 DEVELOPMENTS IN THE UNITED KINGDOM

Electricity Market Reform (EMR) in the United Kingdom (U.K.) progressed further in 2012 with the publication of a draft Energy Bill[17] in May. Measures were included in the draft Bill to reform the electricity market and ensure the delivery of secure, clean and affordable electricity. At the heart of the EMR[18] proposals are:

- Feed-in Tariffs (FiT) with Contracts for Difference (CfDs) to provide investment signals and long term incentives for renewable generation implemented by 2014 for Great Britain (G.B.) and 2016 for Northern Ireland (NI).
- A Capacity Mechanism which complements the FiT CfD scheme ensuring reliable capacity is available avoiding potential security of supply issues.
- Carbon Price Floor (CPF) is a HM Treasury led mechanism that is designed to rebalance the electricity market towards low carbon generation by taxing generators based on the carbon content of the fuel.
- Emissions Performance Standard (EPS) to curb emissions of the most polluting power stations.

The published Energy Bill puts in place the institutional framework required to attract over £100 billion in investment to replace ageing capacity, upgrade the grid and to meet rising demand to 2020 and beyond.

The range of proposals under consideration in the EMR raises some interesting issues; not least in Northern Ireland where the implementation of EMR would impact on generators who participate in the Single Electricity Market (SEM).

[17] See the Department of Energy and Climate Change, Energy Bill 2012. Available at http://www.decc.gov.uk/en/content/cms/legislation/energybill2012/energybill2012.aspx
[18] See the Department of Energy and Climate Change, Electricity Market Reform. Available at: http://www.decc.gov.uk/en/content/cms/meeting_energy/markets/electricity/electricity.aspx

The CPF will mean that generators in Northern Ireland will pay an additional level of tax on their primary fuel source if the price of carbon under the E.U. Emissions Trading Scheme (E.U.-ETS) is below the floor price of £16/tonne in 2013 rising to £30/tonne in 2020.

In addition, the FiT CfD implementation in Northern Ireland, which will replace the existing Northern Ireland Renewables Obligation (NIRO), will be implemented later than in G.B. which could create a level of uncertainty for Northern Ireland strike and reference prices applicable to the scheme.

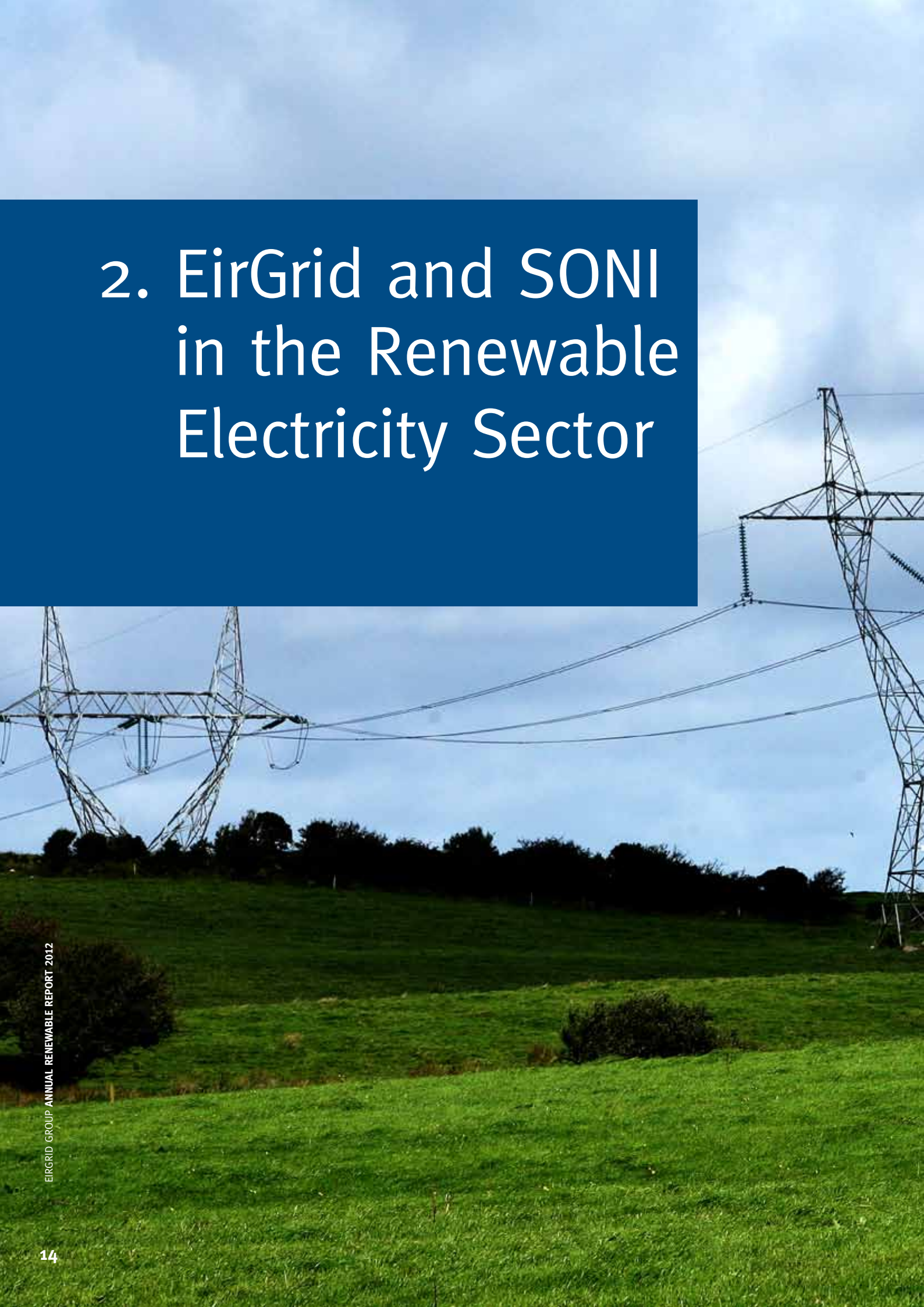
However, as set out in the policy overview that was published alongside the draft Energy Bill on 22 May, the U.K. government recognises that industry has concerns about the proposed legal framework and payment model for CfDs, the design of which is currently being addressed.

The driver for EMR is to reach targets of 100g CO_2/kWh by 2030 following recognition of the need for a more sustainable and low carbon future. The Stern report[19] laid down the groundwork of EMR by stating the "greatest market failure of all time" was that the price of carbon is not reflected in the market price.

In light of these concerns, the U.K. government is committed to working closely with devolved administrations to monitor the interactions of EMR with the SEM and to mitigate any possible impacts the implementation of the measures in Northern Ireland may have.

[19]See the Stern Report 2006: http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/stern_review_report.htm

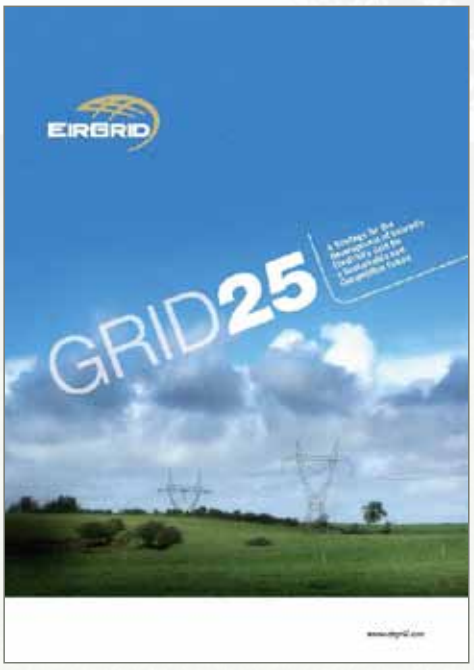
2. EirGrid and SONI in the Renewable Electricity Sector



A sustainable energy supply, both in the short and the long-term, is fundamental to economic development, people's quality of life, and environmental protection.

This is the focal point of energy policy in Ireland and Northern Ireland and is the rationale that underpins the motivation to increase the level of renewable energy in the electricity sector to 40% by 2020.

Indeed, meeting these renewable energy obligations and increasing energy security are the primary catalysts for change in the electricity sector today - change that is not only creating the need for new and upgraded electricity grid infrastructure, but also a need to better understand the impact of renewable energy on the operational aspects of the power system. EirGrid and SONI have estimated that to meet this target the amount of installed wind generation across the island of Ireland will need to reach between 4,800 MW and 5,300 MW by the end of 2020. To ensure the continued secure operation of the power system in this new context, EirGrid and SONI are engaged in several interrelated activities that contribute in different ways to the integration of increasing amounts of variable renewable generation technology sources. This section outlines our work in this regard.



2.1 ELECTRICITY INFRASTRUCTURE DEVELOPMENT

It is widely recognised that to meet the renewable electricity targets, a major expansion and upgrade of the all-island transmission network is needed. Investment in the all-island transmission network is also required to manage new conventional generators and future increases in electricity demand.

In 2008 EirGrid published the transmission network capital investment plan out to 2025 entitled Grid25. The Grid25 Strategy will provide a platform to harness Ireland's renewable energy potential and, in conjunction with EWIC, will enable Ireland to link with Great Britain with the potential to both export and import electricity. While EirGrid is making progress on the roll-out of Grid25, the IEA has noted that to meet all "Grid25's ambitious goals regarding the construction of new transmission lines, a speedy, streamlined and consenting process – including community acceptance – is required."[20] This is an accurate reflection of the various interrelated elements that are needed in order to implement Grid25 on time.

The physical location of renewable plant is often at different locations to existing conventional generation and to load centres. As a consequence, additional and upgraded grid infrastructure is required to provide access for distributed forms of renewable generation and to reinforce the system. In addition, developing system infrastructure will provide the means to integrate a greater quantity of renewable plant.

[20]International Energy Agency (IEA) Energy Policies of IEA Countries – Ireland Review, May 2012, p.71.

Since the Grid25 strategy was developed, significant progress has been made in optimising our investment plans, in identifying new technical solutions, in building new transmission circuits and in uprating existing circuits. In 2011 the total estimated cost of Grid25 was revised down from €4 billion to €3.2 billion. There has been continued significant development of the transmission system in the past year with the completion of 125 km of new transmission lines, along with upgrades to 300 km of existing lines. Planning applications have been submitted to the Strategic Infrastructure Division of An Bord Pleanála for a number of new substations in the South West during the past year and public consultation on study area constraints has started on the Grid Link and Grid West 400 kV Projects. The development of these projects is consistent with the Grid25 strategy which is designed to ensure that all regions in Ireland will have access to reliable, high-quality power supplies, facilitating access to renewable energy resources.

Following the publication in 2010 of Northern Ireland's Strategic Energy Framework, DETI completed Strategic Environmental Assessments for both off-shore and on-shore renewable generation. DETI has also published Strategic Action Plans (SAPs). Northern Ireland Electricity (NIE) is the party in Northern Ireland with responsibility for planning and developing the transmission network and in fulfilling this role they interact with SONI and exchange information. Taking all this information into account, NIE is currently in the early stages of preparing a strategy document, Network 25, for publication.

According to the on-shore SAP the "Network 25 plan will explore the need for future grid strengthening and will address grid requirements for all forms of generation."[21]

EirGrid and SONI are also working with NIE on the Renewables Integration Development Project (RIDP). RIDP will focus on potential transmission reinforcement options for the North West region, including a large portion of the North and West of Northern Ireland and County Donegal. The current stage of the project will compare a number of candidate schemes using a wide range of technical, economic and environmental performance indicators, with the aim of selecting a preferred reinforcement scheme for the study area.

This work is scheduled to be completed in the coming months, with final reports presently being reviewed. EirGrid and NIE will each review the outcome of this current study phase, namely the preferred scheme for the study area and will seek the necessary approvals in order to move forward with the first stages of transmission development. In order to align with forthcoming E.U. funding changes, a key element of the preferred scheme design has also been submitted to the E.U. with the aim of receiving the designation of a Project of Common Interest (PCI).

[21]See the Draft Onshore Renewable Electricity Action Plan 2011-2020 recently released by DETI. Available at http://www.onshorerenewablesni.co.uk/

Transmission System January 2012

In Northern Ireland, there has been significant renewable generation related development and the first transmission connected wind farm, Slieve Kirk, was completed in August 2011. More recently, a new wind generation cluster has been constructed at Magherakeel, while four dedicated wind-cluster substations are currently in the pre-construction stage. To accommodate the increasing levels of renewable generation, particularly in the northern and western areas of Northern Ireland, NIE has developed a Medium Term Plan (MTP) to reinforce the 110 kV network in those areas ahead of any RIDP development.

A number of MTP projects have already been completed; the most recent project to upgrade some 80km of transmission circuits between Omagh and Dungannon with High Temperature Low Sag conductor was carried out over winter 2011/12.

2.2 EAST-WEST INTERCONNECTOR (EWIC)

On the 20th of September 2012, An Taoiseach Enda Kenny T.D. officially opened the East-West Interconnector linking Ireland to Great Britain following the completion of the construction of the project. The 500 MW interconnector project, represents a significant investment that will have considerable benefits for Ireland. The Interconnector will help Ireland reach its renewable electricity targets, improve security of supply, and increase competition in the market. As the Taoiseach noted in his opening address, "Ireland being a peripheral energy market makes this project a hugely significant one for us, for these islands and for Europe as a whole."

The East-West Interconnector connects Ireland to the island of Great Britain and by extension the broader European energy market. Indeed, in many ways, the Interconnector is symbolic of Ireland's commitment to European energy-market integration.

The 500 MW capacity equates to enough electricity to power 300,000 homes. In order to prepare for trading on the Interconnector, a number of trade workshops took place over the past 18 months to present the auction management platform, provide information on access rules, and to consult on products that would be available on the East-West Interconnector.

2.3 CONNECTION PROCESS

Ireland: The Gate 3 Connection Process

The government target in the electricity sector is for 40% of electricity to be consumed from renewable sources by 2020. The Gate process is a fundamental part of reaching this target. The Gate 3 Connection Process was put in place by the Commission for Energy Regulation in 2008 following a public consultation. Under the Gate 3 process, over 4,000 MW of connection offers were issued to renewable generators, a process that was completed in 2011. Based on electricity demand forecast levels in 2020, this amount of renewable generation is sufficient for the achievement of Ireland's renewable electricity target. To date there have been over 730 MW of accepted offers for over 30 projects.

Northern Ireland

In Northern Ireland, any generator wishing to connect to the electricity transmission system must submit an application to SONI. Similarly a generator wishing to connect to the distribution system must submit an application to NIE, the Distribution System Operator (DSO). Any generator applying to either SONI or NIE for a connection must already have received full Planning Permission for their installation.

With 450 MW of wind generation connected in Northern Ireland, and in excess of a further 530 MW of wind generation with planning permission anticipating to connect in the medium term, the delivery of the Medium Term Plan will be vital in enabling this generation to connect.

It is estimated that approximately 1,300 MW of renewable generation will be required to be connected to meet DETI targets.

While the level of renewable generation involved in these connection processes represents a significant milestone on the road to reaching Ireland and Northern Ireland's renewable electricity targets, it is important to note that the actual rate and level of these connections is contingent on a number of variables – many of which are outside the control of the system operators. These include difficulties with securing financing for proposed wind farm projects, obtaining the necessary planning permission (in Ireland), commercial decisions and the construction of the wind farm itself.

2.4 DELIVERING A SECURE, SUSTAINABLE ELECTRICITY SYSTEM (DS3)

The amount of wind generation installed on the island has been increasing steadily, and has now surpassed 2,000 MW. The record for instantaneous wind generation is 1,474 MW in Ireland (November 2011) and 394 MW in Northern Ireland (September 2012). The management of large amounts of non-synchronous variable generation (essentially wind and High Voltage DC interconnection) on a relatively small island is a complex task.

The DS3 programme is the long term programme of work that has been put in place by EirGrid and SONI to ensure the secure, safe operation of the power system in Ireland and Northern Ireland for the future.

This programme will assist in achieving the challenging 2020 target of having 40% of our electricity generated from renewable sources while minimising levels of renewable curtailment.

The objectives of the DS3 programme are to consider the operational implications for the power system of managing high renewable generation levels. The challenge is: how much of the generation on a single system can come from wind generation (non-synchronous generation) while still operating the system in a secure and safe manner?

The maximum allowable system non-synchronous penetration (SNSP) level has implications for the load factor on both wind and conventional power plants and ultimately the design of appropriate market mechanisms in a deregulated industry. At present an SNSP level of 50% applies to the all-island power system. This means that non-synchronous generation (wind generation and HVDC imports) relative to system demand cannot exceed 50%. EirGrid and SONI are working as part of the DS3 programme to increase this level and will continue to work towards this over the coming year through delivery of the DS3 programme.

What is SNSP?

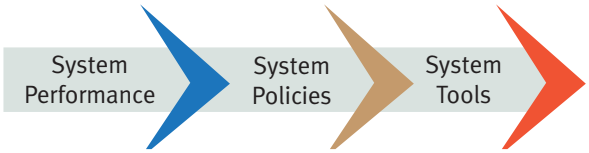
System Non-Synchronous Penetration (SNSP) is a real-time measure of the percentage of generation that comes from non-synchronous sources, such as wind and HDVC interconnector imports relative to the system demand.

Since the establishment of the DS3 programme, there have been some key achievements which include:

- A significant review of the System Services requirements, capability and remuneration levels on the island of Ireland. This included the publication of two consultation papers, an international review of system services arrangements and analysis of the value of System Services to the all-island power system. This work is still underway with further consultations planned and a final decision expected in Q1 2013.

- A review of technical standards and requirements has been carried out which has fed into the Grid Code workstream. This has resulted in proposed modifications to wind farm standards in Ireland and Northern Ireland which were developed in conjunction with a Joint Grid Code working group comprising of representatives from across the electricity industry.
- One of the key limiting factors in increasing the SNSP level is the risk of a high Rate of Change of Frequency (RoCoF) on the power system. In that context, EirGrid and SONI have worked with industry to develop a proposal for an all-island RoCoF standard in the Grid Codes. A decision on this RoCoF standard is expected by the regulators in Q1 2013.
- In line with developing and improving power system performance capability, over the past 12 months we have worked to enhance the existing performance monitoring processes and harmonise our systems on an all island basis.

The focus over the past year has been on creating the right technical and commercial mechanisms to incentivise and improve system performance and capability. In that context, there has been much development and work on technical standards and commercial incentives as outlined above. This will continue over the coming months but the focus will start to move towards implementation of increased performance capability.



Over the next 12 months, the DS3 programme will investigate and deliver on the following:

- New tools required in the Control Centres.
- Implementation of operational policies e.g. ramping policy following a decision on System Services.
- Implementation phase for System Services e.g. developing contracts, IT systems, enhanced monitoring equipment.
- Further studies are now required to review the results of the Facilitation of Renewables studies and to update in the context of the outputs from the Grid Code, System Services and RoCoF workstreams.

EirGrid and SONI will continue to work closely with industry to ensure delivery of the DS3 programme. The Advisory Council comprising of electricity industry representatives was established in October 2011. This Council will continue to ensure that the focus of the TSOs is on those most pertinent issues with regard to renewable integration. The TSOs are of course mindful of the work of other system operators in Europe and will endeavour to ensure this is captured in the context of the DS3 programme and its focus.

The focus of DS3 is on delivery of a power system that can be operated securely at high levels of renewable generation, thereby creating a centre of excellence in renewable integration on the island of Ireland.

In that sense, the TSOs are pioneering new ways of operating the power system and pushing the boundaries and traditional theories of system operation.

2.5 SMART GRIDS

Electricity power systems across the world are undergoing a paradigm shift as the imperative to improve the sustainability of the power sector, while maintaining a secure energy supply at competitive prices, is tackled. While the utilisation of increasing levels of renewable energy sources, some of which are less controllable and predictable, is at the heart of this shift, the introduction of energy efficiency measures, demand-side participation and electric vehicles are also expected to be widely deployed in the coming years. This will lead to dramatic changes in how power systems are operated and managed.

In Ireland and Northern Ireland, due to the relatively small size of our power system coupled with our ambitious targets for incorporating renewable generation, we are at the forefront of identifying, and solving, many of these challenges. No other synchronous system manages the same levels of instantaneous wind penetration levels (50%) seen today, and no other synchronous power system is aiming to safely and securely manage real-time penetration levels of 75% by 2020.

While the term Smart Grid has been used for a variety of concepts, solutions and products for several years, there is no doubt that the power system needs "smart" solutions in order to manage the new system complexity that increased levels of variable renewables and customer participation will educe.

Many elements of the Smart Grid are already in place on the transmission system; the operational and infrastructural elements of our work are at the heart of what is commonly referred to as the Smart Grid. Nonetheless, it is widely accepted that the difference between today's grid and a Smart Grid of the future is mainly the grid's capability to handle more complexity than today in an efficient and effective way.

EirGrid's Smart Grid programme is designed to achieve this goal. At its core, it is a collection of technologies, services, and series of projects to upgrade our current electricity system; to drive innovation and to deliver a low carbon energy future; while continuing to operate and maintain a safe, secure and reliable system. The programme focuses on four key areas:

Technology & Infrastructure

Grid25 is EirGrid's strategy for the development of Ireland's transmission grid for a sustainable and competitive future and will deliver vital network infrastructure. Furthermore the new East-West Interconnector will bring significant benefits to consumers by increasing energy security, competition, and encouraging the growth of renewable energy. These projects are key enablers for the development of the Smart Grid.

It is the application of digital technology on the grid infrastructure that allows us to optimise our power system to ensure that it is used as efficiently as possible and which really makes our Grid "Smart". This technology or intelligence layer allows communication across the network and EirGrid are in the process of both trialling and deploying a number of innovative Smart technologies onto the system.

The advanced technologies at the heart of the Smart Grid will bring about a number of benefits for electricity consumers, suppliers and network operators and will form a vital element in any future strategy designed to increase flexibility on the demand-side and increase control over new forms of renewable generation.

Our Smart Grid Programme
Shaping our Smart Grid Future

DS3

EirGrid's DS3 programme is developing innovative solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. Please refer to the "DS3" section of this report for further information.

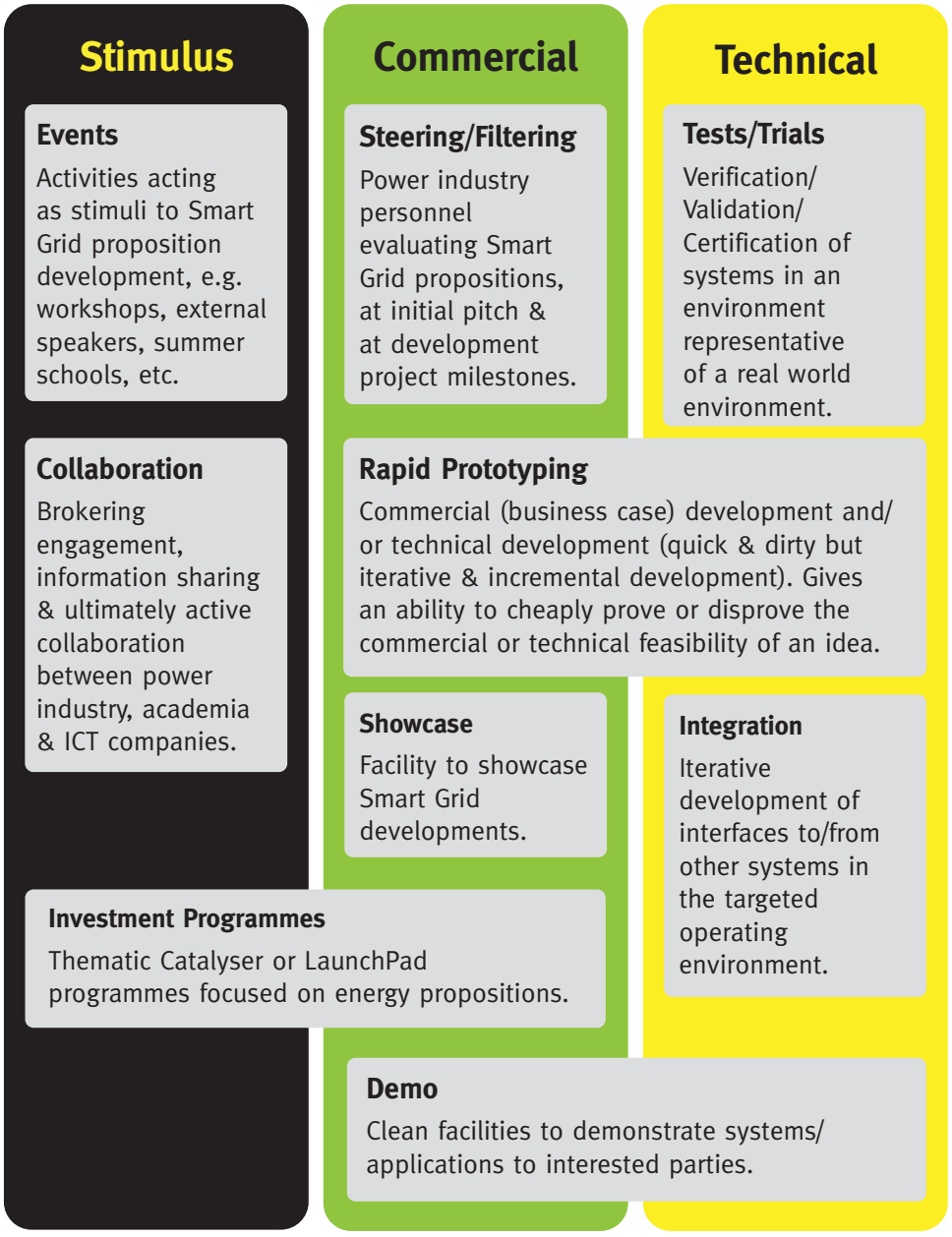
Smart Grid Innovation Hub

Ireland and Northern Ireland have a unique opportunity in Smart Grids. The governments of Ireland and Northern Ireland have set ambitious renewable targets of achieving 40% Renewable energy by 2020. Coupled with this, the Information and Communication Technology (ICT) sector in Ireland has developed significantly over several decades. On the industrial front, 9 of the top 10 global ICT companies have a presence here and on the academic front Ireland and Northern Ireland have excellent, long established ICT research programmes in all Third Level Institutions. A Smart Grid is one in which ICT is incorporated into every aspect of electricity generation, delivery and consumption, so a critical competence in developing the Smart Grid.

The Smart Grid Innovation Hub combines the Energy and ICT industries and is a collaborative initiative between EirGrid, SONI and the National Digital Research Centre (NDRC) to promote the development of innovative Smart Grid ideas on the island of Ireland. It has been established to create a facility to enable innovation in the Smart Grid arena in Ireland or Northern Ireland, with access to the people, systems and data necessary to test ideas and concepts and enable them to develop from ideas to reality.

> *"NDRC builds high-impact new ventures. By providing the people, the time, the space and the investment needed at the earliest stages of dedicated commercialisation work, NDRC can help to realise the Smart Grid in Ireland and beyond. Our work with EirGrid and the Smart Grid Innovation Hub will see us bringing together the players who have a role to play in Smart Grid development: the role of the power industry who conceive and specify Smart Grid systems and applications; the role of academia who offer advanced technologies based on research; and the role of the ICT industry who will build the systems and applications. Through this Innovation Hub, we will work side-by-side with these players to enable convergence and to turn great ideas into new ventures that will lead the Smart Grid evolution."*
>
> Ben Hurley, CEO, NDRC (National Digital Research Centre)

Smart Grid Innovation Hub



What it is

- A facility - 'the Sandbox' to enable prototyping, test, integration and demonstration of Smart Grid systems and applications built on digital technologies.
- Commercialisation support structures – people, funding, customers, know-how.
- Access to data and systems with ability to test/trial products and applications.
- Project spaces: temporary/short term office facilities (desks) at the sponsor companies.
- Access to a network of experts across the sponsor companies encompassing technical and engineering domain expertise in electrical engineering, system operation and ICT.
- Access to a wider network within the Smart Grid community, energy industry and supporting industries.
- The hub will operate on 3 levels: Stimulus, Commercial, and Technical

Demonstration Projects

In the development, trialling and proving of new concepts/solutions and technologies EirGrid and SONI recognise that demonstration projects can play an important role. In that context, a transparent process has been developed for progressing demonstration projects to trial advanced technologies on the system and EirGrid and SONI have recently commenced a number of demonstration projects with various industry parties. EirGrid and SONI view this engagement as an important mechanism to promote and support innovation in new grid applications across the Smart Grid domain. All these projects ensure our electricity network works smarter to deliver for the future in a cost effective, efficient and sustainable way.

For more information on our call for demonstration projects please visit our website at: http://www.eirgrid.com/operations/demonstrationprojects/

2.6 CUSTOMER AND STAKEHOLDER ENGAGEMENT

EirGrid is committed to engaging with all our customers and stakeholders through regular and open communications. In the last year, we hosted and sponsored a range of workshops, seminars, and conferences designed to fulfil this commitment.

EirGrid Customer Conference

The EirGrid Customer Conference, entitled 'Delivering the Power System for Tomorrow' was held in the Ballymascanlon House Hotel in Dundalk on the 25th of October 2012. The conference was attended by approximately 200 delegates from the electricity sector including renewable generators and suppliers, large electricity customers, personnel for state bodies and representative groups, expert consultants, academics and researchers. It offered a useful and open forum to discuss a range of issues in the energy space. Topics of particular interest to the renewables industry included an update on power system operation (DS3) and grid development. There were also sessions on the evolution of the Single Electricity Market and the launch of the Smart Grid Innovation Hub. A link to the presentations from the conference can be found on the EirGrid website.

Delivering a Secure Sustainable Power System (DS3) – Forums and Advisory Council

Following the launch of the DS3 Programme in August 2011, EirGrid and SONI hosted two forums on DS3 in March and July 2012, and another is scheduled for November 2012. Both forums were attended by approximately 90 delegates from across the energy industry and were very well received. These forums will be continuing as part of the on-going DS3 Programme. In addition, the DS3 Advisory Council meetings are continuing as part of the DS3 programme. The Advisory Council was established to provide a forum to discuss views and concerns on those issues which impact on the successful implementation of the programme. The Council is comprised of experts from academia, industry and research centres across the island and internationally.


EirGrid Customer Conference 2012.


From Left to Right: EirGrid Chief Executive, Fin
Minister Pat Rabbitte T.D. and EirGrid Chairpe

Customer Connections Forums and Updates

As part of EirGrid's Customer Communications plan, we host a number of Customer Connections Forums each year which are primarily aimed at Gate 3 customers and those who are contracted to connect to the grid or who have a live connection offer. Forums were held in November 2011 and May 2012, and another is scheduled for later in the year. The forums provide EirGrid with an opportunity to update customers on EirGrid developments that may affect their projects and provides an open platform for customers to raise industry issues and concerns and to engage with EirGrid staff. EirGrid also hosts dedicated workshops on current topics when necessary, for example, the Wind Availability Signal Workshop which took place in August 2012. In addition, EirGrid publish a regular email bulletin to all customers highlighting current news and developments relevant to existing and future generator connected customers.

In January 2012 EirGrid sponsored a seminar on the Internal Energy Market (IEM) in association with the Institute for International and European Affairs (IIEA). The seminar explored what needs to be done to establish the IEM by 2014, the target set by the European Commission and Council. The focus of the seminar was Ireland's Single Electricity Market (SEM) – a wholesale market operating in Ireland and Northern Ireland. As the SEM operates with dual currencies and in multiple jurisdictions, it is a useful case study when considering the challenges of creating an E.U.-wide market.

The speakers included, Jean Arnaud Vinois, Acting Director of the Internal Energy Market Directorate at the European Commission, Daniel Dobbeni, President of the European Network of Transmission System Operators for Electricity, Garrett Blaney, Commissioner at the Commission for Energy Regulation and former EirGrid Chief Executive, Dermot Byrne.

U.S. Congressional Visit to EirGrid

EirGrid was delighted to welcome a bi-partisan Congressional delegation led by Minority Leader of the United States House of Representatives, Congresswoman Nancy Pelosi on the 14th of March 2012 for a meeting at the EirGrid offices. Minister for Communications, Energy and Natural Resources, Pat Rabbitte T.D. hosted the visit. Congresswoman Pelosi and her colleagues have a strong interest in renewable energy and this was an opportunity for EirGrid to describe the world-leading progress being made in facilitating high levels of wind energy on the Irish power system.

> *"It is remarkable that EirGrid is on track to achieve 40% integration of renewable sources into its power grid which is so critical to helping Ireland do its part to ensure that the E.U. reaches its goal of 20% renewable sources by 2020."*
>
> U.S. Congresswoman Nancy Pelosi

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EirGrid Chief Executive, Fintan Slye
and U.S. Congresswoman Nancy Pelosi.

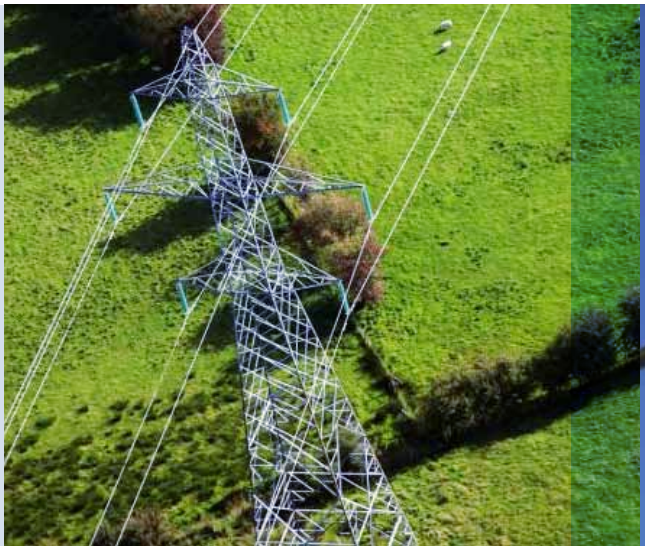
2.7 REGIONAL AND INTERNATIONAL INVOLVEMENT

Over the past twelve months, EirGrid has continued its involvement in a range of international research projects and organisations. The main research projects EirGrid is or has been involved with include Anemos Plus, SafeWind, the International Energy Agency Task 25 on wind energy, the European Wind Integration Studies (EWIS), SafeWind and CIGRE (the International Council on Large Electric Systems).

These projects offer a platform to engage with international stakeholders and share international best practice in the renewable energy space.

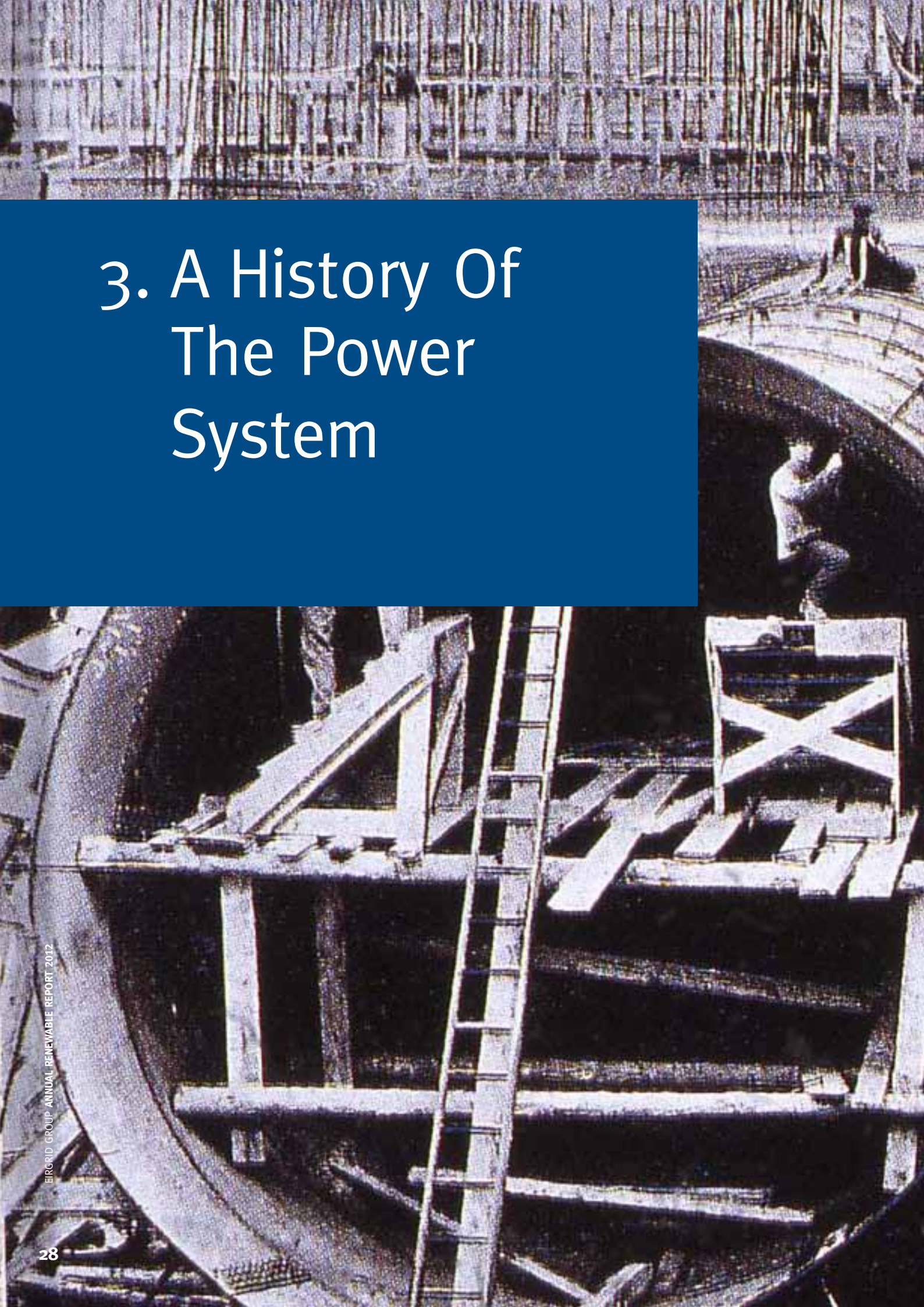
As active members of ENTSO-E, EirGrid and SONI are involved in a number of important European Working Groups (WG) and Committees that cover areas of strategic importance to the power system's in Ireland, Northern Ireland and Europe. For example, the North-West Europe (NWE) regional group in ENTSO-E is acting as a pilot project to develop a single solution for day-ahead and intraday markets across the NWE region based on the European Target Model. Two NWE Monitoring Groups for day-ahead and intraday have been established to ensure the solution for harmonising cross-border trading arrangements in NWE can be applied to other regions once they are ready. EirGrid is active in both of these groups providing a unique insight into the proposed developments on day-ahead and intraday trading in the European Target Model that will ultimately have a direct impact on the integration of renewable generation and the shape of the future internal electricity market in Europe.

In addition, EirGrid is convening two of the drafting teams for nine network codes currently being prepared by ENTSO-E, and is a full member on the other seven network code panels. The overriding objective of the network codes is to create the conditions for a properly functioning, efficient and secure internal energy market.



EirGrid is also a central participant in the North Seas Countries Offshore Grid Initiative and is working with other European countries to examine ways to develop a North Seas infrastructure that can deliver greater interconnection between the markets and facilitate the development of offshore wind in the region.[22]

[22]The North Seas Offshore Grid Initiative is a political agreement between ten European countries - Ireland, Germany, United Kingdom, France, Denmark, Sweden, the Netherlands, Belgium, Luxembourg and Norway.



3. A History Of The Power System

The year 2012 marked an important anniversary in the history of the Irish power system.

It was eighty-five years ago this year that Ardnacrusha power station was constructed and work began on the roll-out of the electricity network across the length and breadth of Ireland. The decision to build a renewable hydroelectric power station on the river Shannon and proceed with the electrification of Ireland set the country on a path of economic and social development that has had a profound impact on the lives of generations of Irish citizens, and represented the "foresight, imagination and enterprise" of the government at the time.[23]

The current push to develop a low carbon electricity power system through the deployment of renewable energy signifies a return to an earlier renewable heritage when the Ardnacrusha hydroelectric power station provided the lion's share of electricity for the country. While it is hard to overstate the importance of the Shannon Scheme to the economic and social development of the country, the scale of the transition underway in the electricity sector today is unprecedented. Nonetheless, there are some similarities between this early period and developments today, including the importance of maintaining a focus on strategic planning into the future. To ensure the successful electrification of the country, the idea of strategic planning underpinned developments in the electricity sector from its inception. As the Minister for Energy, Communication and Natural Resources Pat Rabbitte, T.D. recently noted: "The fact that Ireland has now one of the leading electricity systems worldwide in terms of safety and reliability is no accident – it is part of careful and strategic planning."

> *"foresight, imagination and enterprise."*

While the majority of electricity generation today is still sourced from imported fossil fuels, indigenous wind generation now accounts for around 16% and this is set to rise to 37% by 2020. This means that by 2020 Ireland will have installed around 4,000 MW of wind generation capacity. With a similar 40% renewable electricity target in Northern Ireland, installed wind generation is expected to reach approximately 5,300 MW across the island in the same time frame. In the context of this fast-paced transition, the anniversary of the Ardnacrusha hydroelectric power station is a timely opportunity to review the development of the power system in Ireland and Northern Ireland over the last 85 years.

> *"The fact that Ireland has now one of the leading electricity systems worldwide in terms of safety and reliability is no accident – it is part of careful and strategic planning."*

3.1 THE EARLY YEARS

The electricity systems in Ireland and Northern Ireland had their foundations in small private enterprises built to supply local lighting and industrial capability in the late 1890's. These grew and formed the basis of industrial expansion in the early part of the twentieth century. However, as the importance of electricity networks and the utility of large interconnected synchronous power systems dawned, many states enacted legislation to nationalise the industry and put it under central control. In 1919, the Electricity Act of Great Britain was introduced and led the way for similar legislation in Ireland and Northern Ireland, both governed directly from Westminster at the time.

[23]Former Taoiseach Liam Cosgrave address at the 85th anniversary of the Ardnacrusha power station July 2012.

3.2 IRELAND

By 1925 the Free State government in Ireland enacted similar electricity legislation founding the vertically integrated Electricity Supply Board (ESB) as well as commissioning the first hydro electricity scheme in Ardnacrusha. The ESB was Ireland's first state enterprise.

During the 1930's a number of additional hydroelectric schemes were constructed throughout the country. The development of peat electricity generating stations also took place during this early stage allowing Ireland to manage limited resources during the war time period. During the 1950's the focus was on the further development of peat stations and the roll out of a national electricity infrastructure – "rural electrification". In the late 1950's and 60's there was a move to oil generated power stations along with an ingenious pumped storage station in Turlough Hill. However, following the oil crisis of 1973 and 1979, there was a clear strategic imperative to lessen the country's dependence on imported oil. This led to the development of over 900 MW of coal powered generation in Moneypoint in 1985 along with a move to combined cycle natural gas generation.

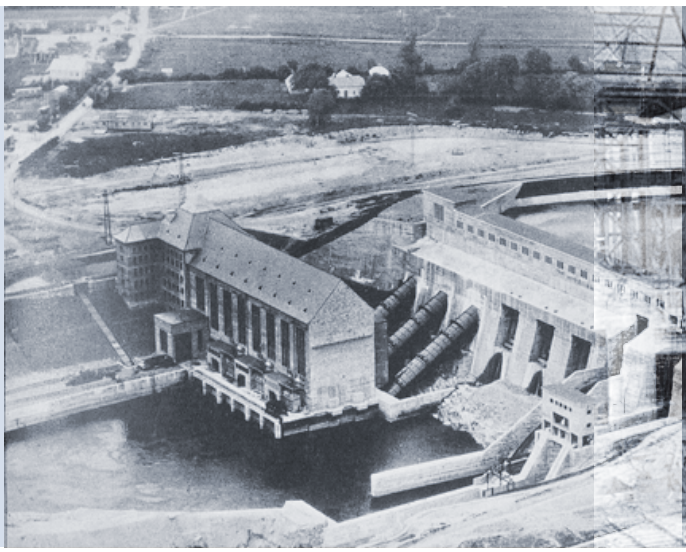
By the year 2000, the electricity system in Ireland had grown to over 3,300 km of 220 kV transmission lines with 10,000 km of 110 kV lines. The peak demand had risen to just over 3,700 MW with an energy requirement of just over 20 Terawatt hours (TWh). Over 96% of the energy was generated from fossil fuel powered units. During this time the wind industry began to develop with the construction of a 6.5 MW windfarm in Bellacorrick, Co. Mayo on the West coast of Ireland in 1992. By 2000, the installed windfarm capacity had risen to 21 MW in total within an overall installed generation capacity of 4,300 MW.

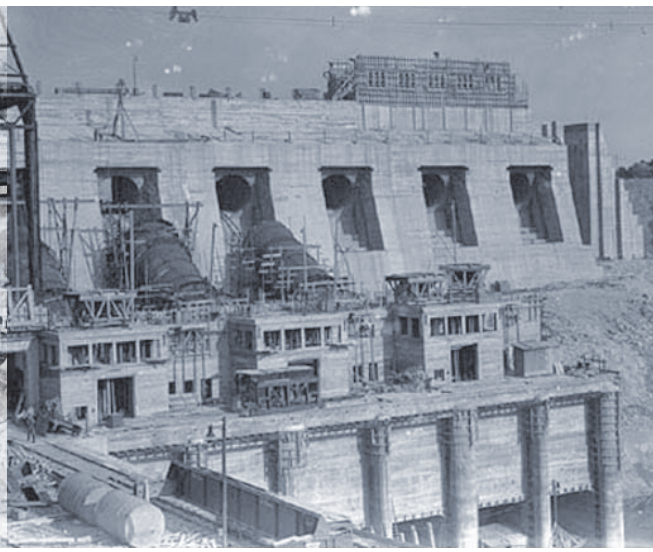
3.3 NORTHERN IRELAND

Electricity developments in Northern Ireland were similar to those in Ireland, though on a lesser scale. In the late 1890's and in the early 1900's commercial supply of electricity for public use came from private initiatives and the power system was predominantly powered by small imported coal fired generation sets. However, consistent with broader developments in the U.K., the Electricity (Supply) Act (Northern Ireland) 1931 established the Electricity Board for Northern Ireland (E.B.N.I), which along with the Corporation Electricity Departments and the Joint Electricity Authority, retained responsibility for Northern Ireland's electricity until 1973.

In 1973, these three bodies were amalgamated to form the Northern Ireland Electricity Service (NIES) and there were four power stations based in Coolkeeragh, Ballylumford, Kilroot and Belfast. This new entity, like the ESB in Ireland, was responsible for the entire generation, transmission, distribution and supply of electricity throughout Northern Ireland.

During the period 1992-1993, the electricity industry in Northern Ireland was deregulated and restructured through privatisation.





The power stations were separated into independent companies, and were sold in a tendering process to private investors. In June 1993, Northern Ireland Electricity plc (NIE) was formed under this restructuring process and granted licences to be the power procurer of the output from these stations; own and operate the transmission and distribution networks; and be the sole supplier of electricity to final customers. In addition the Northern Ireland Authority for Utility Regulation (NIAUR) was established to oversee this newly privatised industry and the single buyer model it had adopted. In 1998, the regulated and non-regulated parts of the NIE business were de-coupled and a number of subsidiary companies set up under a new holding company, Viridian Group PLC. This was a precursor to the implementation of the outcomes of the 2nd European energy directive. By 1998, Northern Ireland had a peak of just over 1,400 MW an energy requirement of 6 TWh, a transmission infrastructure of 275 kV and 110 kV network with over 700,000 customers.

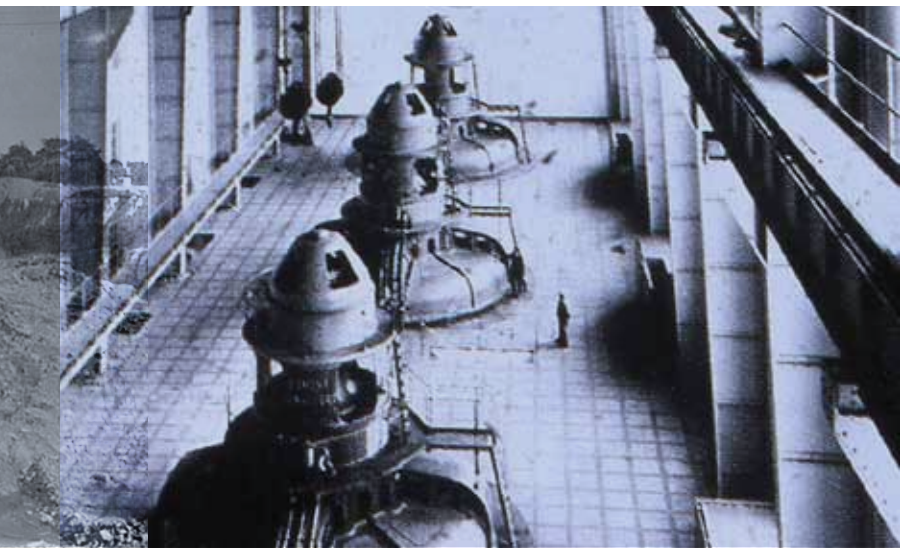
3.4 THE MODERN ERA

With the introduction of the first European energy package in 1996 member states were obliged to introduce legislation in their jurisdictions to provide for an electricity regulator, an independent system operator of the transmission system and a fully functioning wholesale electricity market with 100% retail opening to follow by 2005. This legislation was to be implemented by all member states by February 1999, although Ireland did successfully lobby to have a one year extension.

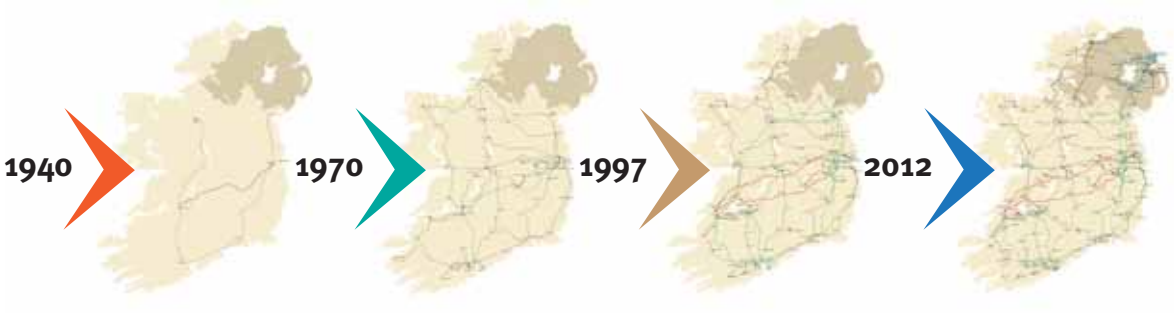
The power system of Ireland and Northern Ireland had developed by 2000 as two independent power systems with an agreed operational protocol across the double circuit 275 kV tie-line between the two systems along with the 110 kV stand-by interconnectors in Letterkenny-Starbane and Enniskillen-Corclassy.

The introduction of a broad range of European legislation in the energy space has had a transformational impact on the electricity industries in Ireland and Northern Ireland. In Northern Ireland the regulator created the necessary licences for ring-fencing parts of NIE to perform the role of system operator (SONI) as well as the power procurer. In addition, an Interim Market was designed to overlay onto the single buyer model implemented in 1993. This market was a Bilateral Market with administered top-up and spill prices. It allowed for independent power producers to enter the market and for third parties to trade energy and to sell onto final customers. In addition, it allowed for the Moyle group as interconnector owner to allow third party trade across a new 500 MW HVDC line commutated link between Northern Ireland and Scotland.

In Ireland the impact was more dramatic. First, the Commission for Electricity Regulation (CER) was established to oversee the industry. Then a new independent Transmission System Operator was established in February 2000 with responsibility for the planning, operation and development of the transmission network.



Transmission System Development (1940 - 2012)



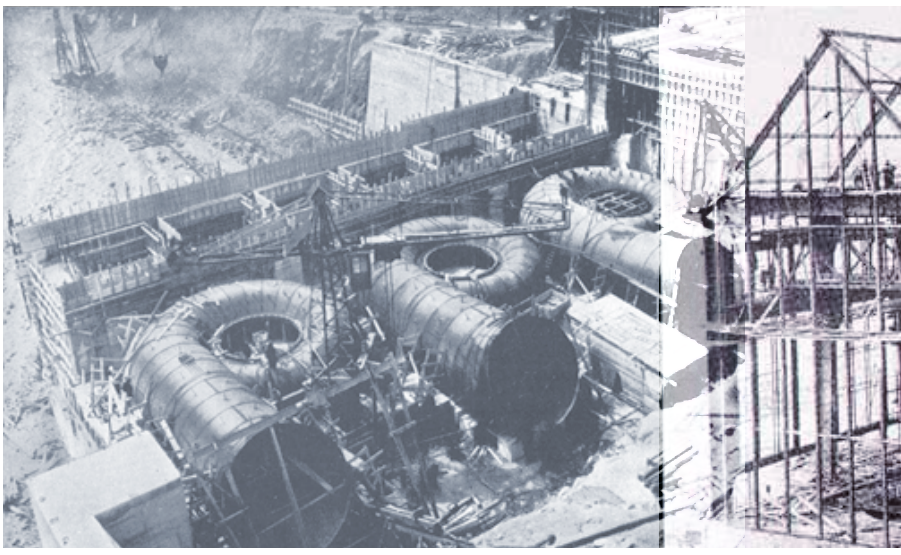
This company, EirGrid, was initially staffed from the expertise within ESB National Grid, the then system control department of the ESB, and was not fully operational and separated until July 2006. EirGrid was entrusted at the time with the development and operation of the nascent wholesale electricity market, which, as in Northern Ireland, was a Bilateral Market with an administered top-up price but a market derived spill price. In addition, ESB was directed to organise into regulated and unregulated business units. The regulated business units included ESB Networks, ESB Power Generation and ESB Customer Supply.

Given the relatively small size of the power system of Ireland and Northern Ireland the policy makers in both jurisdictions considered it appropriate to develop a wholesale Single Electricity Market (SEM). The SEM is a joint venture between EirGrid and SONI run on an all-island basis. The genesis for SEM was outlined in November 2004, when the government departments published a Development Framework for an All Island Energy Market. On 1st November 2007 the Single Electricity Market (SEM) went live, commencing the trading of wholesale electricity in Ireland and Northern Ireland.

SEM consists of a gross mandatory pool market, into which all electricity generated on or imported onto the island of Ireland must be sold, and from which all wholesale electricity for consumption or export must be purchased. The new governance scheme involved a SEM Committee to be established comprising members of the CER, NIAUR each with a single vote and an independent member and deputy independent member with a deciding vote in the event CER and NIAUR were unable to reach agreement.

3.5 RENEWABLE DEVELOPMENT

Ireland and Northern Ireland have limited fossil fuels to meet their current and future energy requirements. In 2010 over 90% of primary energy requirements came from imported fossil fuels. This poses significant strategic issues to their economies which have resulted in both jurisdictions having high energy costs in general and electricity prices in particular.



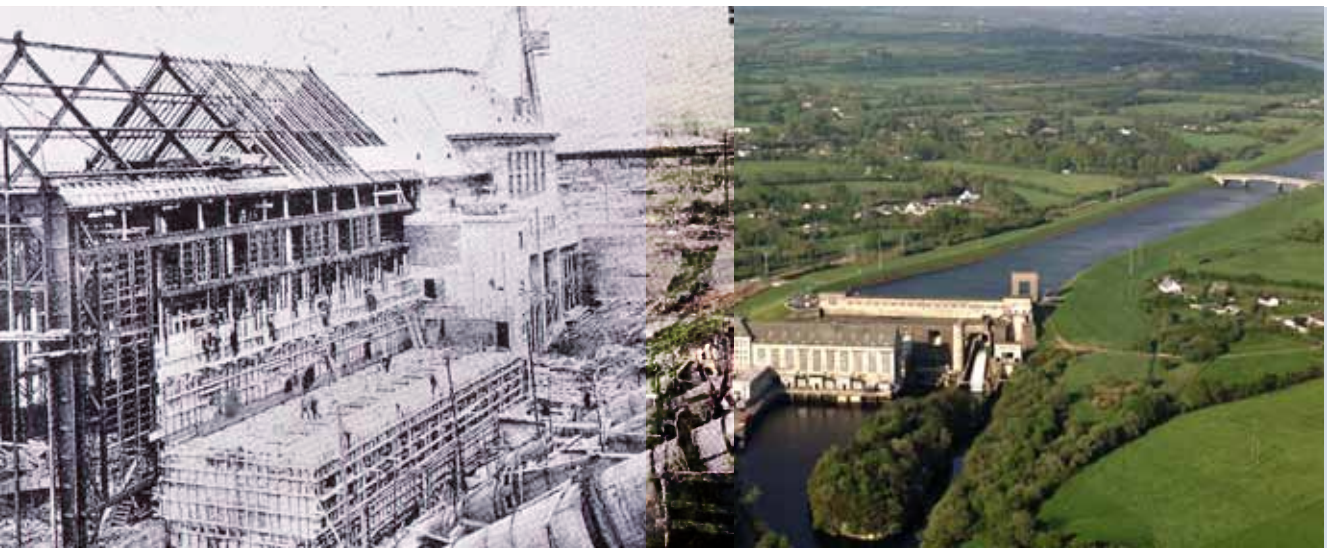
This also exposes both economies to significant fallout from remote geopolitical conflicts as witnessed by the oil crises in the 1970's and the recent Ukrainian gas pipeline controversy.

The governments of Ireland and Northern Ireland have recognised this weakness and have set policies, consistent with European directives on renewable energies, to address these shortcomings over the coming years. The cornerstone of these policies will result in the power system of Ireland and Northern Ireland having almost 40% of the electricity consumption from wind by 2020.

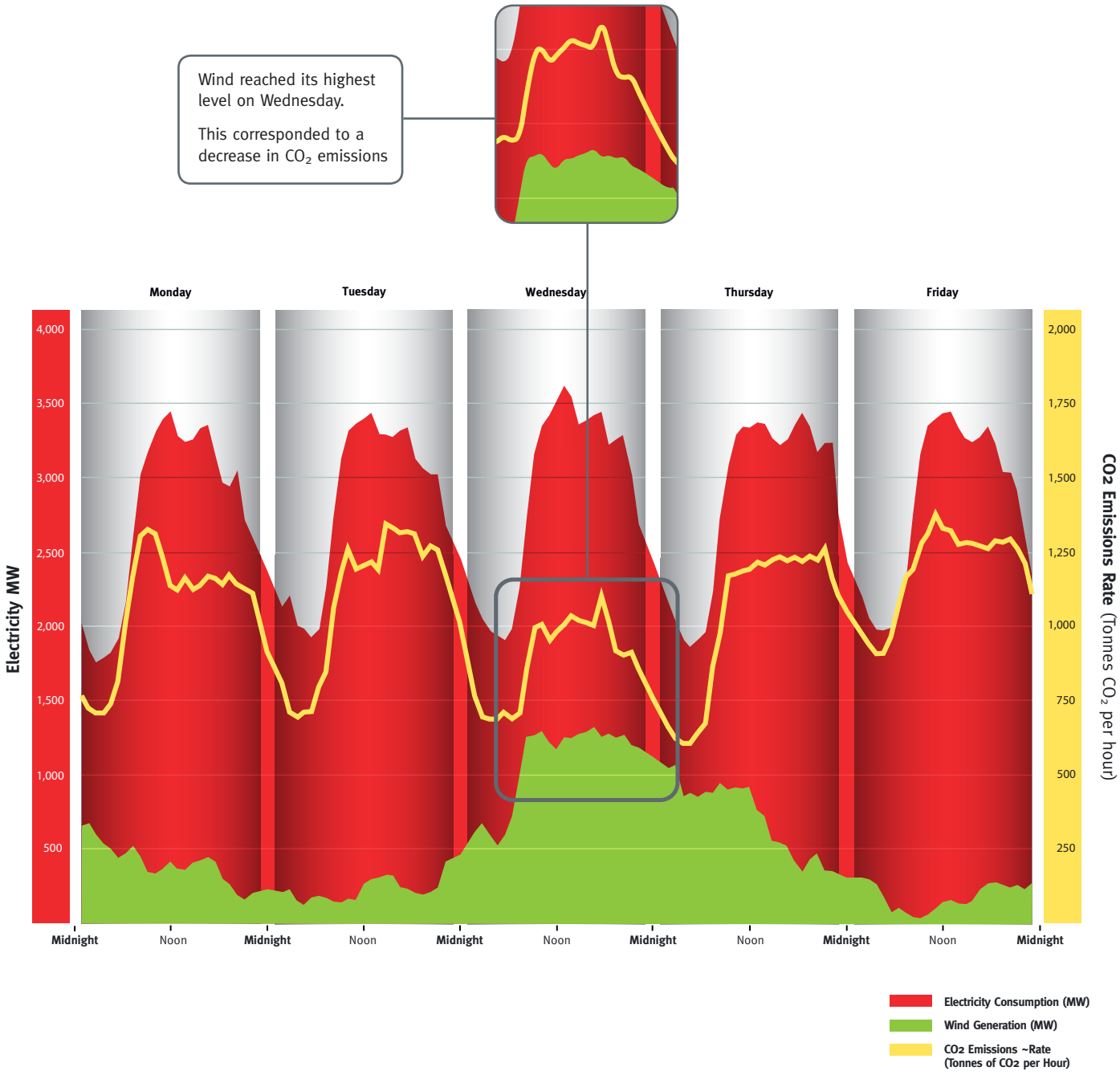
In order to encourage the development and deployment of renewable energy, European energy legislation also allowed for governmental supports, with appropriate European approval, to be granted to support renewable energy. The initial scheme adopted in Ireland was to run competitions for an amount of energy to be given a 15 year contract from ESB at a fixed price for the energy generated at the site of the renewable generation. This scheme, known as Alternative Energy Requirement (AER), was run six times and over 530 MW of generation, predominately windfarms, were granted support between 1995 and 2003. However, it had two drawbacks from the windfarms' perspective. First, while the AER competition ensured an efficient price for the final consumer (who would ultimately bear it) it was seen as a barrier to the significant deployment of these renewable technologies as there was uncertainty in the final price to allow investors to predict future revenues. Secondly, with the nascent electricity market there was no legal basis in only allowing ESB to purchase this energy and not other third party suppliers. To address this, the Renewable Energy Feed-in Tariff (REFIT) replaced the AER scheme in 2006. This scheme provided a transparent fixed floor price for 15 years for certain technologies with a formula to allow for different technologies and consumer price increases. To date over 1,300 MW of renewable generation has been awarded REFIT support.

In Northern Ireland the support mechanism was derived from that employed in Great Britain. This scheme, known as a Renewables Obligation Certificate (ROC), imposed an obligation on all suppliers of electricity to ensure their customers received an ever increasing proportion their energy from renewable electricity. Failure to achieve this would result in the supplier having to buy the relevant obligations at a set price from a centrally administered fund.

Between 2000 and September 2012 there has been over 1,695 MW of wind installed in Ireland and 484 MW in Northern Ireland. This is in a system with a peak load of 6,500 MW. These windfarms are located all throughout the system but there are significant clusters in the South West, West and North West of the island where the greatest wind resource off the Atlantic coast is located.



CO_2 Emissions from Power Generation (during a typical working week)



For more information on CO_2 emissions and wind generation charts and to download our award winning Smart Grid app see: www.eirgrid.com

3.6 DECARBONISING THE ELECTRICITY SECTOR

Electricity generated from wind has grown quickly across the island over the last decade, growing from an installed capacity of 55 MW in 2002 to 2,179 MW at the end of September 2012. The electricity generation sector accounts for approximately 22% of Ireland's overall carbon emissions and around 27% of carbon emissions in Northern Ireland.[24]

According to the Environmental Protection Agency (EPA) in Ireland, the deployment of increasing amounts of renewable energy has already had an impact on emissions. The data for 2011 shows overall emissions have dropped sharply to 15.77 Mtonnes from 17.36 Mtonnes in 2010, including an 11% decrease in emissions in the power generation sector in Ireland. While the extent of "the emission reduction reflects both the impact of the current recession in terms of reduced energy and cement demand....the increased availability of wind generation on the grid" is also having an impact.[25] In fact, according to the Sustainable Energy Authority of Ireland (SEAI), "the emissions avoided from wind were most significant in 2011 at 2,146 kt CO_2, followed by solid biomass 629 kt CO_2 and hydro 346 kt CO_2."[26]

The decarbonisation of the electricity power system is firmly underway in Ireland and Northern Ireland. Driven and shaped by ambitious renewable electricity targets, legislation promoting the operational integration of renewable generation and a range of financial support measures, the renewable technological research sector has expanded in recent years. This reduction in emissions calls for a fundamental shift in energy production and consumption habits, and the vectors for this shift have been a strong emphasis on the development of renewable energy and the promotion of energy efficiency and smart grid technologies. Continued development of both the renewable energy sector and energy efficiency policies is crucial to further reducing power generation emissions and meeting future overall carbon emissions obligations.

3.7 THE FUTURE OF THE ELECTRICITY POWER SYSTEM

The electricity sector is undergoing a transformation as a result of a number of mutually reinforcing policy objectives centred on the issues of energy security, climate change and economic competitiveness. The deployment of increasing amounts of wind generation, energy efficiency, and the integration of smart grid technologies including smart metering are central to achieving these energy policy aims and are driving and shaping the evolution of the electricity power system on the island.

In order to improve energy efficiency, reduce energy use, and increase the deployment of renewables, the future of the power system on the island must develop in a manner that manages an array of new additional complexities while maintaining system security and continuing to provide a high quality level of electricity supply. This can be achieved in the coming decades by creating a more controllable and intelligent overall energy system. All relevant energy industry stakeholders have a role in making this happen.

In order to fulfil our role in this development, EirGrid and SONI have developed long-term infrastructural and operational strategies, which we are currently working hard to implement. Indeed, EirGrid's Grid25 programme is the largest investment in Ireland's transmission system for several generations.

With the shift away from an electricity sector dominated by fossil fuel generation towards a reliance on increasing amounts of variable renewable generation, Ireland and Northern Ireland have entered a new phase in the history of electrification.

In addition to the delivery of critical energy infrastructure, innovative new twenty-first century smart operating tools need to be developed and deployed in order to manage and operate the power system safely. EirGrid and SONI are achieving this through the rollout of the DS3 programme of work and through collaboration with the Distribution System Operator (DSO), the Sustainable Energy Authority of Ireland (SEAI), government and the wider business community in the development of the all-island "Smart Grid".

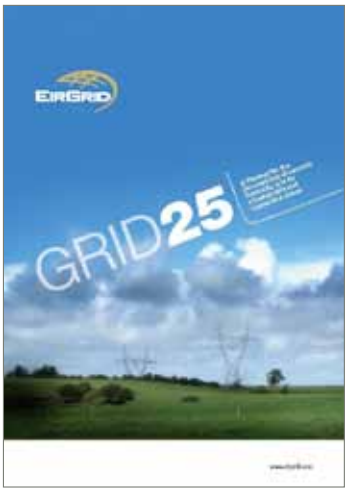
System users will play an important role in the Smart Grid, providing distributed system services that improve the resilience of the system as a whole. A system-wide understanding of the effects of these distributed smart services is essential to ensure that their full benefit can be realised. There is little doubt that the extent of this change is similar to that brought about by the decision to construct Ardnacrusha and begin the electrification of Ireland in the 1920's, and the benefits for the island as a whole will be as transformative.

[24]Figures for Ireland taken from the EPA Climate Change figures http://www.epa.ie/irelandsenvironment/climatechange/ and for Northern Ireland 2009 Northern Ireland Environmental Statistics Report, January 2012 http://www.doeni.gov.uk/northern_ireland_environmental_statistics_report_2012r.pdf
[25]Environmental Protection Agency press release 2012: http://www.epa.ie/news/pr/2012/april/name,32707,en.html
[26]Quote provided to EirGrid from the Sustainable Energy Authority of Ireland October 2012.

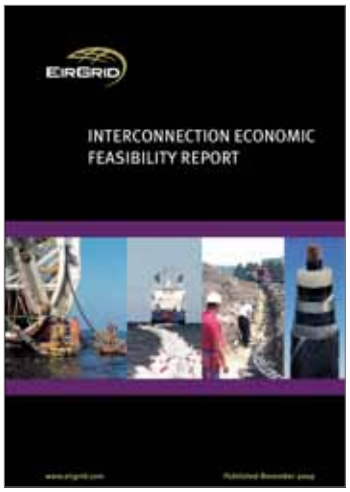
Our Smart Grid Programme

Delivering a Secure, Sustainable Electricity System

Our Grid Development Strategy

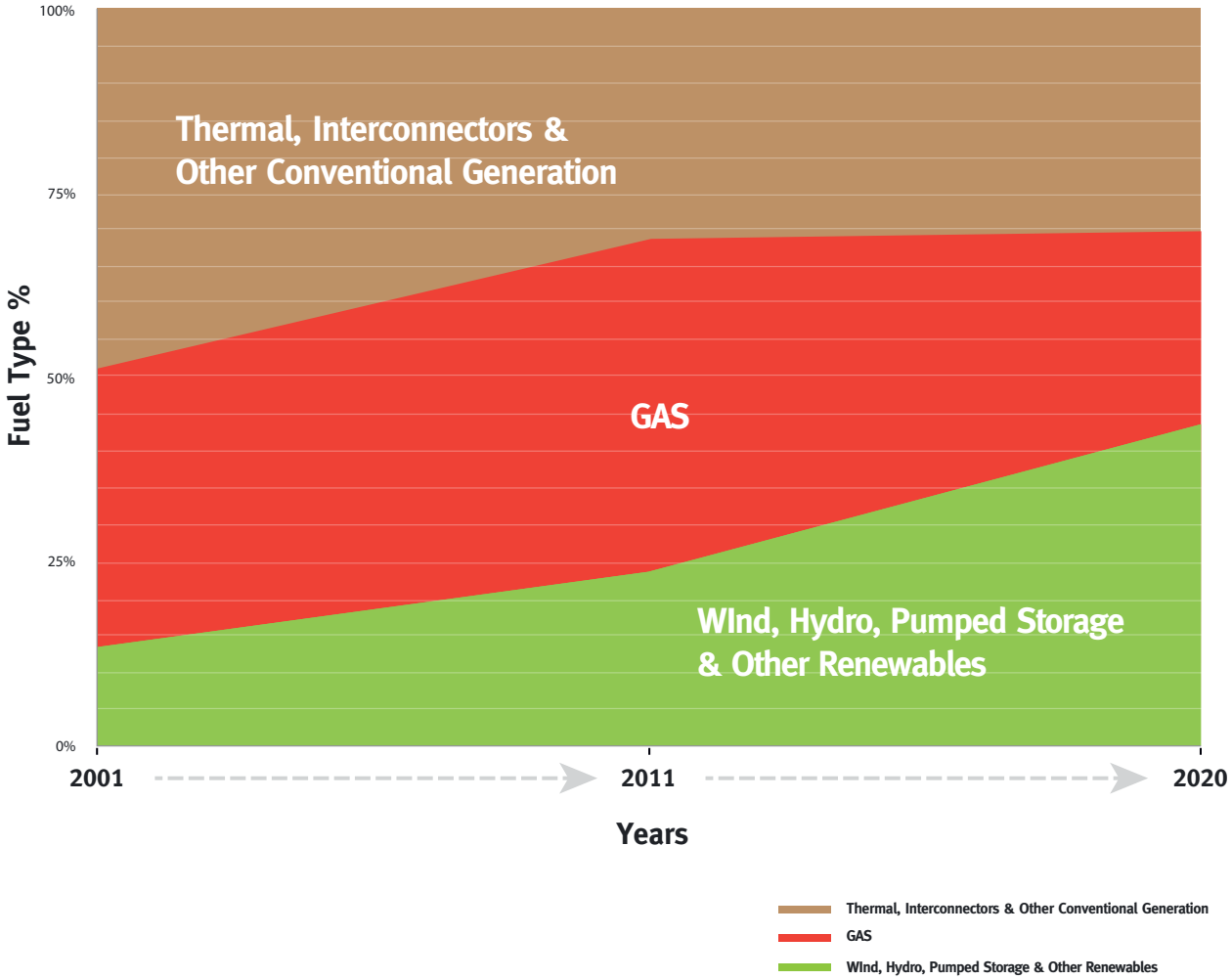


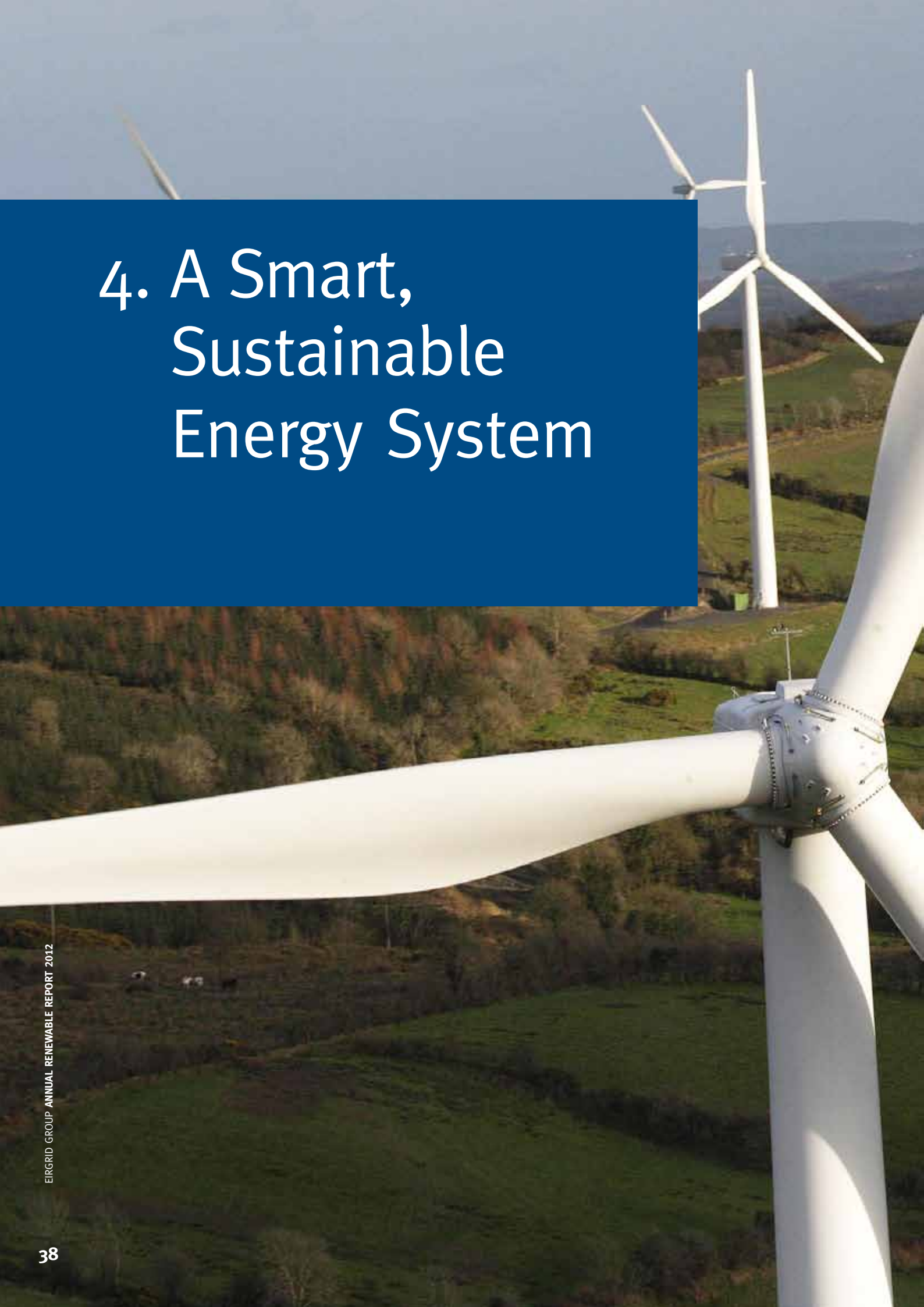
Future Interconnection Report



All-Island Generation Portfolio

Installed & Projected Capacity 2001, 2011 & 2020





4. A Smart, Sustainable Energy System

The United Nations General Assembly has declared 2012 as the International Year of Sustainable Energy for All.

The global initiative aims to mobilise action in support of three interlinked objectives to be achieved by 2030: providing universal access to modern energy services; doubling the global rate of improvement in energy efficiency; and doubling the share of renewable energy in the global energy mix.[27] In the electricity sector, the deployment of renewable energy, energy efficiency and Smart Grid development are regarded as the core components of a sustainable energy system, and for many governments these developments are viewed as a means to reduce their energy dependence on fossil fuel imports, fulfil climate change obligations, generate jobs and reduce the price of energy for all end-users.

This report is published at a time of continuing uncertainties in the global economy; nonetheless, renewable energy has continued to grow strongly in the electricity sector. Buoyed by a supportive policy and market framework, global installed renewable generating capacity[28] had reached 1,454 GW at the end of 2011 or 25% of total global installed generating capacity. On top of efforts in the renewable energy sector, the introduction of energy efficiency measures and the early stage roll-out of Smart Grids are beginning to crystallise in many countries. Indeed, as in Ireland, extensive investment in transmission and distribution systems is taking place in countries around the world with a view to providing a solid backbone for an intelligent and sustainable energy system to emerge.

4.1 EUROPEAN UNION

The European Union is a world leader in the deployment of renewable energy. In 2011 renewables accounted for more than 71% of newly installed electricity capacity and renewables have now reached 31% of total generating capacity. The renewable share of total electricity consumption was 18% in 2011.

At the heart of E.U. energy policy is an array of mechanisms and measures that aim to address the issues of energy security, climate change and economic competitiveness. The deployment of large-scale renewable generation is considered central to limiting E.U. energy imports in the future, which today stands at 50% of total energy. Without these concrete efforts it is predicted that this import dependency could increase to 70% in the coming decades.[29]

A sustainable energy system is a smarter, more unified and integrated energy system

Source: International Energy Agency (IEA)

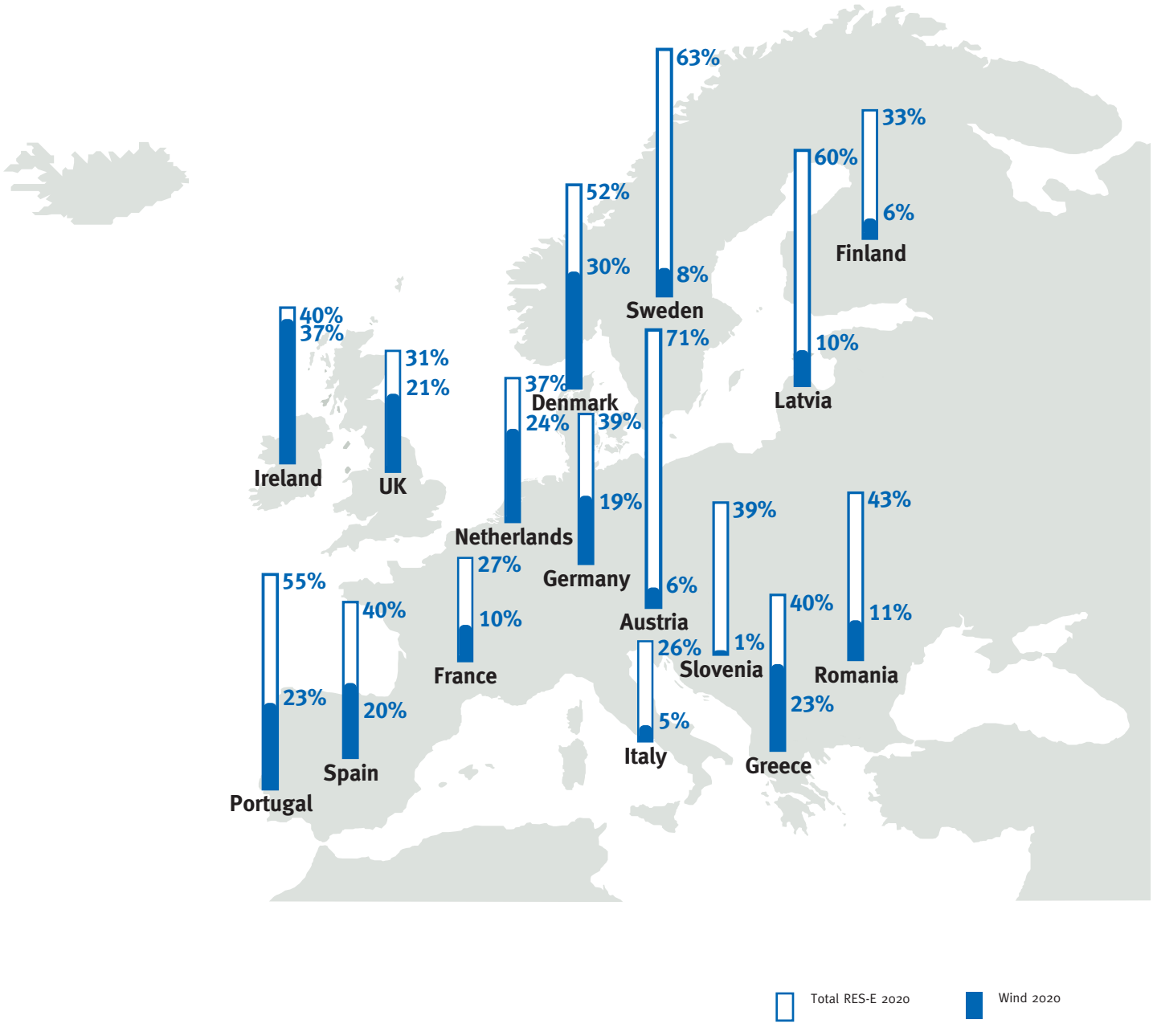
Last year was a good year for the deployment of renewable generation in the E.U.; indeed, 32 GW of new renewable generation (Wind, Concentrated Solar Power, Solar Photovoltaics, Biomass, Hydro and Geothermal) was installed throughout 2011- more than ever before. The deployment of wind generation in the E.U. in 2011 reached 9.6 GW of additional capacity, of which, 8.7 GW was onshore and 866 MW was offshore. Total installed wind generation in the E.U. has now reached over 100 GW.[30]

The E.U. Energy Roadmap 2050, published in December 2011, investigates possible pathways for a transition towards a low-carbon energy system in Europe. It identifies a higher penetration of renewable energy beyond 2020 as a major pre-requisite for a more sustainable and secure energy system. More specifically, it shows that renewables will supply the biggest share of E.U. final energy consumption in 2050.

[27]The United Nations: The Sustainable Energy for All Initiative. Available at http://www.sustainableenergyforall.org/
[28]Renewable Energy Medium-Term Market Report - IEA Market Trends and Projections to 2017, p. 166.
[29]Umbach F. Global energy security and the implications for the E.U. Energy Policy. 2010; 38:1229-1240.
[30]The European Wind Energy Association (EWEA) press release 27th of September, 2012. Available at: http://www.ewea.org/index.php?id=60&no_cache=1&tx_ttnews%5Btt_news%5D=1959&tx_ttnews%5BbackPid%5D=259&cHash=3259e84369df598531fb6d7d69ef7ea5

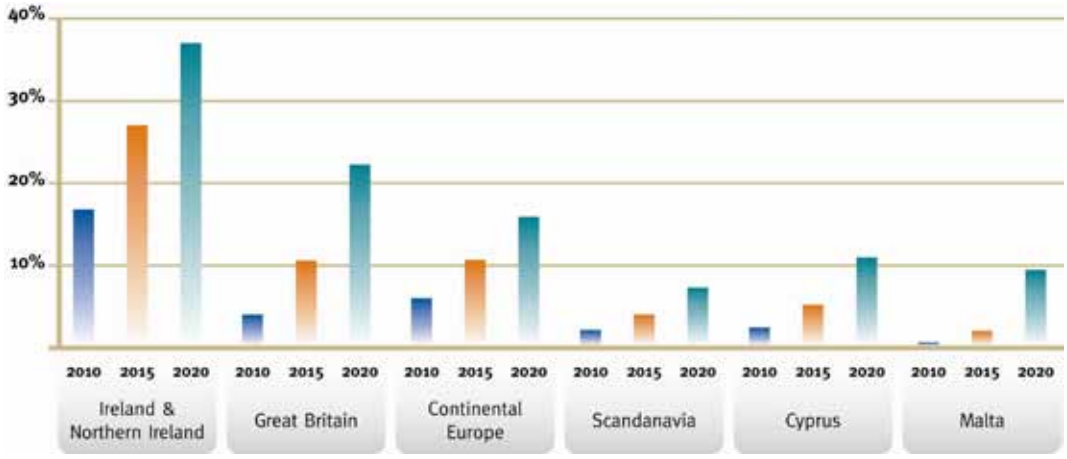
The European Union is a world leader in the deployment of renewable energy.

2020 Renewable Electricity Targets Across the EU



Source: The National Renewable Energy Action Plans (NREAP)

Penetration of Non-Synchronous Renewables in each European Synchronous System 2010 - 2020



Source: The National Renewable Energy Action Plans (NREAP)

What is a Synchronous System?

A Synchronous System is a power grid where electricity is generated at a single synchronised AC frequency. Ireland and Northern Ireland form such a system – all of the conventional generators on the island run in synchronism, producing electricity at 50 Hz. Synchronous systems can be relatively small, such as Ireland and Northern Ireland, or span vast areas, such as Continental Europe.

The direction of energy policy the E.U. indicates that, at the very least, renewable generation will be a significant percentage on the electricity system out to 2050, possibly reaching a high level of 97%.[31] This development will transform the behaviour of power systems across Europe, and the change must therefore be a core part of the design and operation of every facet of power systems, including operations, grid development and markets.

As well as working to integrate increasing amounts of renewable energy in the electricity power sector, Smart Grids are a key component of the European Strategy to a low carbon energy future. The Directive on Internal Markets (2009/72/EC) encourages member states to deploy Smart Grids and smart metering systems (Article 3). To help support this initiative, the European Electricity Grid Initiative (EEGI) laid down the Smart Grids Research, Development & Demonstration needs to achieve the European objectives by 2020 in a report published in 2010. This was followed in March 2012 by a Smart Grids Strategic Research Agenda 2035 that focused on the technology related research that will be necessary for the further development of the electricity system from 2020 to 2035 and beyond. Determining research and innovation activities, necessary for electricity networks and intelligent electric systems by 2035 and contributing to the E.U.'s envisioned CO_2 reduction of at least 80% by 2050 are at the heart of research work in this area. It is widely recognised that Smart Grid research must consider the increasing future complexities of maintaining a high quality level of the electricity supply and the security of the electric system by creating a more controllable and intelligent overall system.

4.2 UNITED STATES OF AMERICA

The renewable energy sector in the U.S. has proven to be dynamic and rapidly evolving over the last few years. In 2011 installed renewable electricity capacity had reached 167 GW, representing 13% of total generation. According to OECD projections, this capacity is expected grow by 4.9% a year up to 2017.

Although there is no federal target for renewable energy in the U.S., 29 states (and the District of Columbia) have a Renewable Portfolio Standard (RPS) already in place. The electricity sector is responsible for about one third of all U.S. greenhouse gas emissions and 40% of total carbon dioxide emissions, thus these renewable targets will help reduce America's total emissions. In March 2011 President Obama set an ambitious goal that 80% of America's electricity will come from clean technologies such as "renewable...along with natural gas, clean coal and nuclear power."

[31]See the E.U. Energy Road Map 2050. Available at http://ec.europa.eu/energy/energy2020/roadmap/index_en.htm

Although the American President provided no specific percentage for renewable generation, it is likely to make up a significant proportion of this.

The IEA has predicted that renewable generation will expand by 56% from 2011-2017 to reach an installed capacity of 223 GW.

In 2011, 6,816 MW of wind generation was installed in the U.S. Through the first six months of 2012 an additional 2,896 MW was installed, bringing the total installed wind to 49, 802 MW. For the 12 months from July 2011 to June 2012, the electricity produced from wind power in the United States amounted to 3.2% of all electricity generation. According to a 2008 study by U.S. Department of Energy, wind generation is capable of contributing up to 20% of America's electricity demand by 2030.[32]

The U.S. Department of Energy funds research, development, and deployment projects to advance the use and adoption of clean, renewable energy technologies and continued this funding last year for nascent generation technologies such as ocean energy. This research funding has produced a number of useful technical studies on integrating renewable generation such as the 2009 North American Electric Reliability Corporation (NERC) report on Integrating Variable Generation. This NERC study provides the U.S. with a robust roadmap for grid planning and operational changes needed to manage the future electricity generation portfolio.[33]

As in the E.U., in working to implement a smart, sustainable energy system for the future, the U.S. government has focused on the role out of the Smart Grids. Indeed, according to the U.S. Department of Energy, the development and deployment of Smart Grid technologies in the United States "represents an unprecedented opportunity to move the energy industry into a new era of reliability, availability, and efficiency that will contribute to our economic and environmental health."[34] To help fulfil this potential, the American Recovery and Reinvestment Act of 2009 allocated almost $4.5 billion funding for a range of Smart Grid projects. The two largest initiatives in the U.S. are the Smart Grid Investment Grant (SGIG) program and the Smart Grid Demonstration Program (SGDP). The SGIG aims to deploy existing smart grid technologies, tools, and techniques to improve grid performance today, while the SGDP explores advanced smart grid and energy storage systems and evaluates performance for future applications.

Both five year initiatives fall under the auspices of the Department of Energy's Office of Electricity Delivery and Energy Reliability.

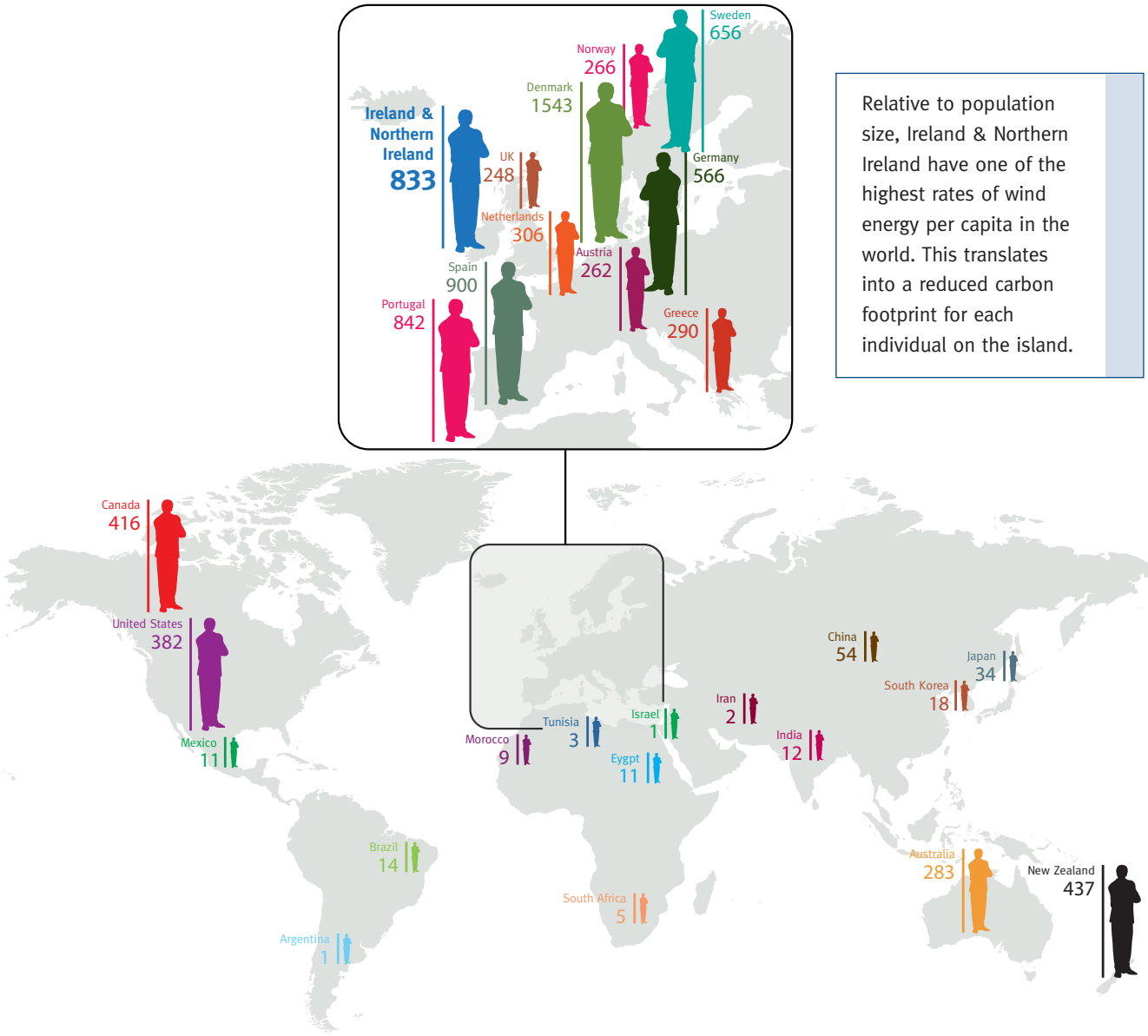
4.3 CHINA

China's robust economic growth and thirst for energy resources in the past decade has driven it to become one of the top global energy consumers. China has the largest oil and gas production in the Asia-Pacific region and the largest coal production in the world, but the country continued to experience strong renewable energy deployment across most generation technologies in 2011. Having installed 17.6 GW of wind generation last year, China continued to make strong progress towards its 100 GW target for wind by 2015. At the end of 2011, China had 62.3 GW of wind capacity installed. While coal still dominates China's generation portfolio mix, hydropower had reached 14% in 2011, making it the second largest generation source for the country. Wind, solar and biomass receive a financial support mechanism that is benchmarked against the price of coal and, to date, this has proven successful at stimulating rapid grow in the renewable sector.

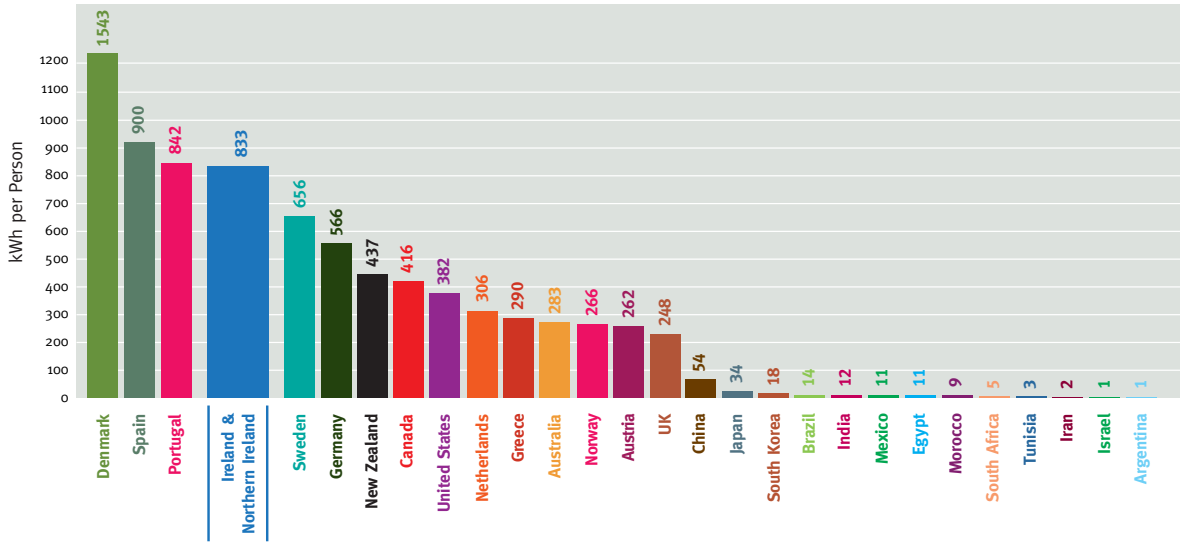
The 12th Five-Year Plan (2011-2015) published last year has set a number of targets for renewable energy in China. The plan seeks to create more sustainable growth across China and proposes to substantially increase the amount of renewable energy generated in the country by 2015. There are several aspects to the plan that cut across the Chinese economy as a whole. In the energy sector, there are several notable highlights: The State Grid Transmission Company is to be charged with the development of the Smart Grid and the growth of a massive market for smart grid equipment.
The proportion of non-fossil fuel in primary energy consumption should reach 11.4 % over the five years to 2015. Installed wind generation capacity is scheduled to reach 100 GW by 2015. Offshore wind generation is expected to expand to 5 GW in 2015 and 30 GW by 2020. The National Energy Administration has estimated that installed solar power capacity will reach 15 GW in 2015. Biomass, nuclear energy and electric vehicle are also expected to develop quickly over the next five years. Overall, China aims to derive 15% of its power generation from clean energy by 2020.

[32]See US Department of Energy Study: 20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply. http://www.nrel.gov/docs/fy08osti/41869.pdf
[33]The NERC study is available on the Internet at http://archive.awea.org/newsroom/releases/releases/NERC_study_16Apr09.html
[34]See Smart Grid.gov http://www.smartgrid.gov/the_smart_grid

Wind Energy Production in 2011 Relative to Population Size
(Kilowatt-hours per Person)



Relative to population size, Ireland & Northern Ireland have one of the highest rates of wind energy per capita in the world. This translates into a reduced carbon footprint for each individual on the island.



4.4 GLOBAL DEVELOPMENTS

The upward trend in the deployment of renewable energy in Europe, the U.S. and China was typical in many other parts of the world in 2011, too. India experienced strong growth in wind, solar and hydropower last year.

After installing 2.8 GW of wind in 2011, India now has an installed wind generation capacity of 15.9 GW. However, grid constraints remain a significant issue to further development on a countrywide basis.

The nuclear accident in Fukushima in 2011 will have a major impact on energy policy in Japan for many years to come. Many of the nuclear power facilities, which account for almost 30% of its electricity generation, have been shutdown since March 2011. And with the announcement of a new feed-in tariff for renewables in 2012, this has opened up the potential for renewables to grow rapidly in Japan over the next decade. At the end of 2011, wind, solar, biomass and geothermal power capacity totalled 11.3 GW.

In Australia, total installed wind capacity reached 2,005 MW in 2011, with the addition of 234 MW during the year. Total installed wind generation in Latin America reached 3.2 GW in 2011, adding more than 1 GW throughout the year for the first time. This represented a year-on-year growth rate of 56%, a remarkable achievement against the backdrop of the global economic recession.

4.5 RENEWABLE ENERGY TECHNOLOGY DEVELOPMENT

The 2012 government Strategy for Renewable Energy: 2012-2020 states that "Ireland can also become a global leader in research and development on renewable energy and related technologies." This commitment is being promoted through the introduction of a robust policy framework and financial support for research and innovation in the renewable sector. The work of the Marine Renewable Industry Association (MRIA) in the development of Ocean Energy technology is a good example of an emerging renewable technology which is being encouraged by the Irish government.

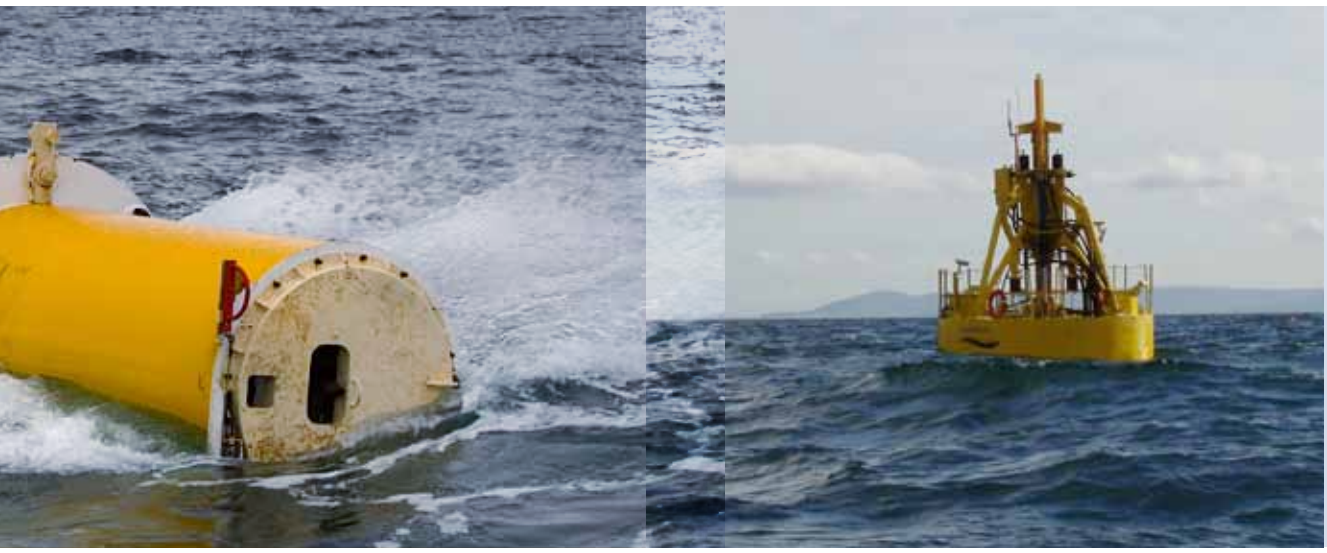
There is significant potential in utilising the country's ocean energy to generate carbon-free renewable electricity. As chairman of the MRIA, Peter Coyle, notes: "The fundamentals of ocean energy (wave and tidal) in Ireland do not change. We are blessed by nature with the world's most energy-intensive waves off the west coast, we have outstanding Research and Development facilities in place or under development, some of the most advanced device developers globally are Irish companies and, it has to be said, EirGrid has built an already impressive skill base (and reputation internationally) in offshore grid planning."

Ocean Energy – Marine Renewable Industry Association

The past year has been marked by significant change in ocean energy. In many ways, there has been a steady drumbeat of progress. The Irish government has underlined its commitment to the sector in various recent policy documents such as the integrated national marine plan 'Our Ocean Wealth', the recent national research prioritisation exercise undertaken by Forfás which identified ocean energy as one of fourteen national research priorities for the future and the recent Department of Communications, Energy and Natural Resources statement on energy priorities to 2020.

In addition, it is anticipated that later this year an Ocean Renewable Energy Development Plan and a legislative Bill designed to modernise the system for foreshore consenting – i.e. licensing developers to explore possible offshore sites and leasing sites – will be published. While these are all positive developments for the marine energy sector in Ireland, the current constraints on government expenditure means that funding to support Research and Development in the sector is limited. This is a particular problem in a sector where the technology is by no means finalised or mature.

Perhaps most important of all, progress continues to be made in building the intellectual foundations for this nascent industry. A recent Marine Renewables Industry Association MRIA study shows that 170 people now work full time in Ireland on ocean energy research and development and this is forecast to rise, largely through sponsored research, to over 400 within three years. Support has been finalised for the new Beaufort Laboratory at IMERC (Irish Maritime and Energy Resource Cluster – a joint enterprise by UCC, Cork Institute of Technology and the Naval Service at Ringaskiddy, Co Cork). Beaufort will be located next door to the 'state of the art' National Maritime College and will house all of UCC's renewables activities as well as a new complex of wave tanks and other facilities: UCC is now the single most important location for ocean energy research in the world. MRIA leads a cross-border exercise involving six universities and colleges of technology to develop a Masters degree in ocean energy for engineers. This is likely to be launched in 2013 and will feature a core course (probably provided by just one college) with specialist modules being provided 'virtually' by all of the participants. The new Masters is likely to attract world-wide interest. A further encouraging development is the first renewable energy leasing round off the Northern Ireland coast which was announced recently.



5. Conclusion

The aim of this report is to provide an overview of the wide array of renewable activity in the electricity sector across the island of Ireland and place these developments in a broader regional and international context.

As the report shows, renewable energy represents a significant and growing percentage of the overall generation portfolio mix on the island. At the end of September 2012, there is 2,000 MW of renewable generation connected to the electricity network in Ireland and 484 MW connected in Northern Ireland.

Developing a robust electrical power system across the island with the infrastructural capacity, technological capability and operational tools to facilitate the development of the island's renewable energy potential is fundamental to reaching the 40% renewable electricity targets – North and South. EirGrid and SONI are fully focused on ensuring that all aspects of delivering the 40% target – Grid25, the Gate 3 process, Smart Grid development, and DS3 – are in place to secure the island's future energy and sustainability needs.

While EirGrid and SONI will continue to work towards increasing the amount of renewable energy on the system, a wide array of renewable research and development activity is also taking place across the island. This report reviewed a selection of this activity taking place in the ocean energy sector in Ireland.

EirGrid and SONI are fully cognisant that fulfilling the ambitious renewable electricity targets across the island will only be met with the full engagement and support of all stakeholders in the electricity industry and the wider public and we look forward to enhancing our cooperative work with all stakeholders in the energy sector in the coming years.

EirGrid and SONI would like to thank the Sustainable Energy Authority of Ireland, the Marine Renewable Industry Association, the National Digital Research Council (NDRC) and the Environmental Protection Agency for contributions throughout this report.

EirGrid would also like to thank the Department of Communications, Energy and Natural Resources for their involvement.

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