



Rialtas na hÉireann  
Government of Ireland

# Focus on Energy, Cleantech & the Bioeconomy

December 2018

# Energy, Cleantech & the Bioeconomy

A sector in transition toward sustainability, focused on increasing renewables and driving the bioeconomy



## GLOBAL MARKET SIZE

**\$699bn**

Renewable Energy in 2017



**\$1,135bn**

Growth Forecast by 2021



Source: Global Renewable Energy, Marketline, January 2018

## IRISH MARKET

Energy Consumption in 2016

**11,680**

thousand tonnes of oil equivalent

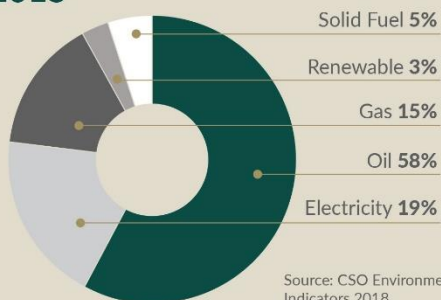
**24%** of primary energy production from renewable sources in 2016



Ireland is subject to the binding EU target of reducing greenhouse gas emissions by 30% compared to 2005 levels by 2030

Source: Environmental Protection Agency, 2018 GHG Emissions Projections Report

## ENERGY CONSUMPTION BY FUEL TYPE IN IRELAND IN 2015



Source: CSO Environment Indicators 2018

## RENEWABLE ENERGY PRODUCTION IN 2016



**28%**  
From biomass

**51%**  
From wind

Source: CSO Environment Indicators 2018



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Prepared by the Department of Business, Enterprise and Innovation

## The sector in numbers

Global <sup>i</sup>	Market Size		Growth Forecast	
		Renewable Energy \$669bn (2016)		Renewable Energy \$1,135bn by 2021 5-year CAGR, 11.2% (2016-2021)
Ireland <sup>ii</sup>	Consumption		Production	
	Energy Consumption (2016)	% of energy consumption from renewable energy sources (2015)	Renewable energy production (2016)	% of wind and biomass in total renewable energy production (2016)
	11,680 ('000 tonnes of oil equivalent)	3%	1,028 (kilotonne of oil equivalent) 24% of primary production	Wind 51% Biomass 28%
	<b>Fuel Exports (€ '000) 2017<sup>iii</sup></b>			
€1,984,500				

i) Global Renewable Energy, Marketline, January 2018

ii) Environmental Indicators Ireland, CSO, 2018

iii) CSO External Trade, 2017 figure includes exports of: Mineral fuels, lubricants and related materials; Coal, coke and briquettes; Petroleum, petroleum products and related materials; Gas, natural and manufactured; Electric current

## Description of the sector globally

*Note: This brief refers to the broad area relating to Energy, Cleantech and the Bioeconomy. In the strictest sense, it is not a discrete sector but refers to a range of activities, identifiable across many sectors, which have the common characteristic of being aimed at reducing negative impacts on the environment. The Brief includes reference to the Agri-food & Beverages, Marine & Maritime and Biopharmachem sectors for which separate briefs have been completed.*

*Note: the ongoing work of DCCAE to stimulate investments in renewables through the renewable electricity support scheme and work of Eirgrid on scenarios, future capacity requirements and investments are key to ensuring an efficient, effective energy supply. This Brief has focused primarily on the enterprise perspective in terms of opportunities and efficiencies.*

- Energy, Cleantech and Bioeconomy encompass a range of goods and services that fall within the scope of environmental and natural-resource use, management and protection. For the purposes of this brief, the 'sector' is categorised in terms of:

### **Energy renewables and efficiency:**

- The pursuit of lower emissions nationally from a combination of renewable energy creation in the context of climate change and the achievement of greater efficiencies in the use of fossil fuels (coal, oil, peat and gas).
- Enterprises have emerged that exclusively focus on renewable energy and includes builders/operators of energy utilities, technology developers and companies who export energy.

### **Green and Cleantech**

- Green and cleantech is pervasive across various sectors, e.g. manufacturing, construction, agri-food, smart cities, transport etc. It has a cross cutting impact within the economy driven by the international agenda to reduce climate change and by customer preference for more eco-friendly choices.
- Enterprises have emerged or transformed to exclusively focus on the growing demand for more environmentally-friendly products and services. These include eco-building and construction materials; water/wastewater treatment; waste management; environmental consultancy, green ICT applications and software; and smart grid development.
- Due to the breadth and nature of activity, it is difficult to measure the scale of impact of its collective influence. For example, companies that offer ‘green’ products/materials/services may be categorised as ‘green technology’ companies but may also be categorised within their ‘core’ sector (e.g. construction and eco-building).

### **Bioeconomy**

- parts of the economy that use renewable biological resources from land and sea – such as crops, forests, fish, animals and micro-organisms – to produce food, materials and energy i.e. the conversion of renewable resources and their associated waste streams into value-added products.

## **Global developments and implications**

- Global key drivers of growth include emissions reduction targets, fluctuating fossil fuel prices, diminishing natural resources, the impact of climate change, environmental legislation and consumer preferences.
- EU countries have agreed on a framework for climate and energy, including EU wide targets to reduce greenhouse gas emissions by 40% by 2030 compared to 1990 levels. 2030 targets have also been set for member states to achieve at least a 27% share of renewable energy consumption and at least 27% increase in energy efficiency.<sup>1</sup>
- As of 2015, renewable energy provided an estimated 19.3% of global final energy consumption. The power sector experienced the greatest increases in renewable energy capacity in 2016, whereas the growth of renewables in the heating and cooling and transport sectors was comparatively slow.<sup>2</sup>

<sup>1</sup> European Commission, 2030 Energy Strategy, (2016) available from: <https://ec.europa.eu/energy/en/topics/energy-strategy/2030-energy-strategy>

<sup>2</sup> Ren21, Renewable Energy Policy Network for the 21st Century, Renewables 2017 – Global Status Report (2017)

- In 2016, new or revised targets were adopted in all regions of the globe. At COP22 leaders of 48 developing nations committed to work towards achieving 100% renewable energy. Throughout 2016, 117 countries submitted their first Nationally Determined Contributions (NDCs) under the Paris Agreement, and 55 of these countries featured renewable energy targets.
- The market for renewable energy is forecast to grow with demand being driven by a combination of “push-and-pull” factors. Technological developments and efficiencies and financial incentives encourage the use of natural resources which drives growth, as does the imposition of targets through government regulation.
- Many energy providers traditionally focussed on fossil fuels are now expanding their portfolios to include renewable energy in response to greenhouse gases emission targets, climate change and consumer demand.
- New technologies are constantly entering the market, offering alternatives to the current pattern of energy usage. However, they often require long testing periods and substantial amounts of capital investment to compete with existing sources while the barriers to new entrants to the production market can also be high.

### The sector in Ireland

- The energy market in Ireland consists of fossil fuels and renewable energies (hydroelectricity; wind energy; solar, tide and wave energy; energy generated through biomass and waste; and geothermal energy).
- Energy consumption in Ireland in 2015 was dominated by oil which accounted for 58% of final energy consumption, electricity accounted for 19%, gas 15%, solid fuel 5% and renewable energy accounted for 3%.<sup>3</sup>
- The use of renewable energy sources in the generation of electricity in Ireland has increased from an annual average of 5% in 1990-1994 to 27.2% in 2016. Wind is the main source of renewables used in electricity generation, with its share growing from 0% in 1990-1994 to 22.3% in 2016.<sup>4</sup>
- A new Effort Sharing Regulation setting out 2030 greenhouse gas emissions targets for EU Member States has recently been adopted by the European Council. Irelands 2030 target is a 30% reduction of emissions compared to 2005 levels by 2030 with binding annual limits over the 2021-2030 period to meet that target.<sup>5</sup> In 2015 Ireland ranked 19th out of 28 EU Member States and in terms of total greenhouse gas emissions relative to the base year of 2005.<sup>6</sup>

<sup>3</sup> CSO Environmental Indicators, 2018

<sup>4</sup> ibid

<sup>5</sup> EPA 2018 GHG Emissions Projections Report

<sup>6</sup> CSO Environmental Indicators 2018

- The European Commission included a 'land use' clause which allows countries to offset environmentally-friendly use of land and afforestation against their emissions target. Ireland has been granted more flexibility than any other member state to reflect its high dependency on agriculture (5.6% - the maximum available).<sup>7</sup>
- The state aims to gradually reduce dependence on the fossil fuels (as listed above) that currently dominate our energy mix. But it is acknowledged that there will continue to be a need for oil and gas to meet our energy needs well into this century.<sup>8</sup>
- In 2016, the CO<sub>2</sub> emissions intensity of Ireland's energy supply was 32% higher than the OECD European average due to greater use of high-carbon fuels including oil, coal and peat.<sup>9</sup>
- In 2014, total renewable energy increased by 13.3%. All forms of renewable energy experienced a growth with hydro, wind and biomass growing by 18.2%, 13.2% and 13.9% respectively.<sup>10</sup> The activities of those energy sources can be broken down as follows:
  - Hydro (Ocean): Ireland has unrivalled wave energy in Europe and has potential to grow the industry. There are test and demonstration facilities covering all Technology Readiness Levels (TRLs) in Cork, Mayo and Galway.
  - Wind: The sector in Ireland is well-developed. Numerous renewable electricity generation companies (initially focussed on the Irish market) now have international operations in developing, financing, constructing and operating large scale renewable energy plants for utilities, investment in companies and global consumer brands (e.g. IKEA).
  - Biomass: Ireland has one of the best climates for growing biomass and supports the forest sector in developing this market. Companies are investing in biomass plants fuelled by local sustainable forestry and waste wood. Our agriculture industry provides opportunities for anaerobic digestion projects. Anaerobic digestion and biogas provide dual benefits for energy generation and a possible transport fuel.
- Ireland is a preferred location for green data centre hosting thanks to its temperate maritime climate, secure power supply and high levels of renewable energy generation. Many large MNCs (e.g. Apple, Facebook, Amazon) have chosen Ireland as a location for their data centres. Data centres have established a clear preference and priority that utilisation of energy should come from renewable energy sources. This commitment makes a significant contribution to policy formation and supports the renewable energy industry.<sup>11</sup>

<sup>7</sup> Irish Times, Government wins concessions in new EU emissions targets, July 2016. Available from: <http://www.irishtimes.com/news/environment/government-wins-concessions-in-new-eu-emissions-targets-1.2728492>

<sup>8</sup> Department of Communication, Energy and Natural Resources, Ireland's Transition to a Low Carbon Energy Future 2015-2030, (2015)

<sup>9</sup> SEAI

<sup>10</sup>SEAI, Energy in Ireland, Key Statistics 2015 (2015)

<sup>11</sup> <https://www.idaireland.com/newsroom/publications/ida-ireland-economic-benefits-of-data-centre-inves>

- Green and cleantech activity in Ireland is characterised by a small number of large operations including: NTR (Greenstar); Mainstream Renewable Power; Celtic Anglian Water; DCC, Glen Dimplex and Kingspan) and a large number of SMEs (most of which have been established over the last decade).
- In terms of Bioeconomy:
  - Ireland has about 2/3 of its land devoted to agricultural use and Agri-food is the largest indigenous sector and accounts for 5.7% of GDP. Approximately 10.7% of Ireland is under forests which produce 3.2 million m<sup>3</sup> of material each year and this is forecast to increase to 8 million by 2035.
  - Ireland has one of the largest seabed territories in Europe which is about 10 times its landmass and is an enormous reservoir of genetic material with natural product potential. In 2016, Ireland's ocean economy had a turnover of €5.7 billion. The direct economic value was worth €1.8 billion or approximately 0.9% of GDP.

## Ecosystem

- Project Ireland 2040, the National Planning Framework and National Development Plan places a key focus on sustainability as an outcome to be delivered through investment, compact growth, and technology deployment.
- A number of research and technology centres make up the ecosystem e.g. the International Energy Research Centre (IERC) at the Tyndall National Institute; Marine Renewable Energy Ireland (MaREI); Sustainable Electrical Energy Systems Ireland (SEES) in the Electricity Research Centre in UCD; the Irish Centre for Research in Applied Geosciences (ICRAG); the Irish Centre for High-End Computing (ICHEC); the I2E2 Energy Research Centre; the Technology Centre for Biorefining and Bioenergy (TCBB); AMBER Advanced Materials and Bio-engineering Research; and BEACON, a Bioeconomy Research Centre focused on sustainable novel processes and products using bio based resources.
- The Energy Systems Integration Partnership Programme (ESIPP) (Science Foundation Ireland and UCD Energy Institute) aims to build Energy Systems Integration research capacity within Ireland.
- Irish Government funding in green RD&I is derived from a multitude of sources (e.g., EPA, SFI, Teagasc, Marine Institute, county councils, local energy agencies) which results in fragmentation in the research base and a consequential lack of scale.
- The Sustainable Energy Authority of Ireland (SEAI) aids the government in transforming Ireland into a society based on sustainable energy structures, technologies and practice. It delivers a range of programmes and implements energy efficiency actions that reduce intensity and usage.
- A number of tax incentives and grants are available to aid the transition to a low carbon economy, these include; the Better Energy Homes Scheme (SEAI), the Accelerated Capital Allowance tax incentive (SEAI), Electric Vehicle grants (SEAI), the Cleaner Greener Production Programme (EPA), Intelligent Energy Europe (EU) and the Ocean Energy Prototype Development Fund (SEAI). Enterprise Ireland also offers

incentives to firms including, the Carbon Management/Reduction Initiative, the Eco-Label Initiative and the Environmentally Superior Products Initiative.

- Enterprise Ireland leads a small 'Smart Energy cluster' of companies engaged in Energy management and Smart Grid.
- The new Renewable Electricity Support Scheme (RESS), proposed by the Department of Communications, Climate Action and Environment, will provide support to renewable electricity projects in Ireland and aims for a renewable electricity (RES-E) ambition of up to a maximum of 55% by 2030, subject to determining the cost-effective level, which will be set out in the draft National Energy and Climate Plan (NECP). Through multiple competitive capacity auctions, the RESS will provide ongoing demand, and transparent future market demand, for many types of renewable energy generation projects and which should stimulate investment in the sector.

## Relevant Reports

*Click on hyperlinks below*

- [National Policy Statement on the Bioeconomy, Government of Ireland, February 2018](#)
- [Renewables 2017 Global Status Report, Renewable Energy Policy Network for the 21st Century, 2017](#)
- [Project Ireland 2040](#)
- [National Mitigation Plan](#)

## Key actors

**Government Departments:** Department of Business Enterprise and Innovation (DBEI), Department of Finance (DoF), Department of Communications Climate Action and Environment (DCCAE)

**Agencies:** Enterprise Ireland, IDA Ireland, Sustainable Energy Authority of Ireland

**Industry Associations:** IBEC, National Standards Authority of Ireland,

## Recent Developments

### Company Developments

- Two of the recipients of SFI's Career Development Award Programme (co-funded with Sustainable Energy Authority Ireland) will contribute to the advancing research in areas such as energy, materials, environment, technology, and health (April 2018)
- Irish owned wave energy technology company, Ocean Energy, announced that its pioneering wave energy convertor, the 'OE Buoy', will be built in the United States by Oregon-based marine-fabrication company Vigor, and deployed at the US Navy's Wave Energy Test Site on the Hawaiian Island of O'ahu in autumn



2018. The contract value is €5.25 million out of a total project value of almost €10 million for this first of a kind grid-scale project at the Hawaiian test site (January 2018)

- Dublin and Clonmel based, ENBIO received €1.52 million from the European Commission to develop a green alternative to the toxic chemicals necessary to coat metals. Their work will be focussed initially on the space sector but has wide-ranging applications in aerospace, automotive and general industry, as well as public infrastructure and civilian applications. The funding is provided under the EU's Horizon 2020 SME Instrument (September 2017)
- Rinocloud, provides online solutions for the management of raw data generated by researchers in academic and corporate research in the greentech, automotive, medical and artificial intelligence sectors. Rinocloud will be hiring for 10 new positions in Cork and recruitment will begin immediately. The new positions are for scientists and software professionals (April 2017)
- BorgWarner, a leading supplier of advanced hybrid and electric vehicle (EV) technologies, extends its production capabilities in Tralee, Ireland, with a €11.5mn investment. Up to 50 new jobs could be created (April 2017)
- The renewable energies joint venture, BRNG Neon Holdings, Limited will create 60 new jobs in the South and East in operations and maintenance at 23 new solar projects by 2020 (January 2017)
- The waste management company, Eras Eco, plans a new green energy plant in Cork, providing 15 full time roles and 20 jobs during construction (October 2016)
- Wood Group, who service the oil and gas industry, is to create 10 new jobs at its new data analytics centre of excellence In Galway (September 2016)
- 17 new jobs have been created at the opening of a new Top Oil filling station in Cobh Cross. This marks the first in a series of investments by the company in the coming year (January 2017)

#### Sector Developments

- Gas Networks Ireland are working with Green Generation, as part of an Innovation Fund supported project, to complete the first Renewable Gas grid injection project for Ireland in Cush, Co. Kildare. The project is expected to commission in late 2018 and will deliver the first injection of Biomethane into the Natural Gas Grid in Ireland. The project will act as a quarter scale demonstrator for the industry, and to assist in finalising and proving the technical requirements and designs for subsequent projects.