Roinn Cumarsáide, Gníomhaithe
ar son na hAeráide & Comhshaoil
Department of Communications,
Climate Action & Environment

National Energy & Climate Plan

2021-2030

Preface

This 2019 National Energy and Climate Plan (NECP) was prepared in accordance with Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action to incorporate all planned policies and measures that were identified up to the end of 2019 and which collectively deliver a 30% reduction by 2030 in non-ETS greenhouse gas emissions (from 2005 levels).

A new European Commission introduced the European Green Deal at the end of 2019, clearly setting out increased levels of ambition for the EU as a whole and aims to deliver net-zero greenhouse gas emissions at EU level by 2050 and to increase the EU-wide greenhouse gas emissions reduction target from 40% to up to 55% by 2030. Delivering the Green Deal will require a transformation of the EU and national economies with sectors such as transport, the built environment, agriculture, industry, and energy all having to become more environmentally sustainable if the goal of decoupling economic growth from resource use is to be achieved.

Following an election in early February, a new Government was formed in Ireland at the end of June. This new Government agreed an ambitious Programme for Government, Our Shared Future. Ireland is committed to achieving a 7% annual average reduction in greenhouse gas emissions between 2021 and 2030. This NECP was drafted in line with the current EU effort-sharing approach, before the Government committed to this higher level of ambition, and therefore does not reflect this higher commitment.

Accordingly, Ireland is submitting this NECP in order to facilitate the ongoing analysis at EU level. It will be revised to bring it in line with the 7% trajectory and to include policies and measures currently being developed to achieve the 7% trajectory. Ireland is currently developing those policies and measures and intends to integrate the revision of the NECP into the process which will be required for increasing the overall EU contribution under the Paris Agreement.

Table of Contents

Table of Tables

Glossary

AA	Appropriate Assessment
ACA	Accelerated Capital Allowance
ACER	Agency for the Cooperation of Energy Regulators
AD	Anaerobic Digestion
AER	Alternative Energy Requirement
AFLOWT	Accelerating market uptake of Floating Wind Technology
AMETS	Atlantic Marine Test Site
BEC	Better Energy Communities
BEIS	Department of Business, Energy and Industrial Strategy (UK)
BER	Building Energy Rating
BIC	British-Irish Council
bn	Billion
c/kWh	cents per kWh
CAP	Common Agricultural Policy
Capex	Capital expenditure
CARO	Climate Action Regional Office
CCAC	Climate Change Advisory Council
CCGT	Combined Cycle Gas Turbine
CCS	Carbon Capture and Storage
CCU	Carbon Capture and Utilization
CEER	Council of European Energy Regulators
CEF	Connecting Europe Facility
CEP	Clean Energy Package
CH_4	Methane
CHP	Combined Heat & Power
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CO_{2e}eq	Carbon Dioxide Equivalent

COREPER	Committee of Permanent Representatives in the European Union
CORSIA	Carbon Offsetting and Reduction Schemes for International Aviation
CRM	Capacity Remuneration Mechanism
CRU	Commission for Regulation of Utilities
CSO	Central Statistics Office
CCT	Customer Care Team
DART	Dublin Area Rapid Transit
DBEI	Department of Business, Enterprise and Innovation
DCCAE	Department of Communications, Climate Action and Environment
DS3	Delivering a Secure Sustainable Electricity System
DSU	Demand-Side unit
DTTAS	Department of Transport, Tourism & Sport
EE	Energy Efficiency
EEA	European Economic Area
EED	Energy Efficiency Directive
EEOS	Energy Efficiency Obligations Scheme
EIB	European Investment Bank
ENTSO-E	European Network of Transmission System Operators for Electricity
ENTSO-G	European Network of Transmission System Operators for Gas
EPA	Environmental Protection Agency
ERA-Net	European Research Area Networks
ESB	Electricity Supply Board
ESR	Effort Sharing Regulation
ETS	Emissions Trading System
EU	European Union
EU ETS	EU Emissions Trading System
EV	Electric Vehicle
EWIC	East West Interconnector
EXEED	Excellence in Energy Efficient Design
F-Gases	Fluorinated GHG

GB	Great Britain
GDA	Greater Dublin Area
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GJ	Gigajoule
GNI	Gas Networks Ireland
GNI	Gross National Income
GNP	Gross National Product
GVA	Gross Value Added
GW	Gigawatt
GWh	Gigawatt hours
H2020	Horizon 2020
ha	hectare
HDD	Heating Degree Days
HSE	Health Service Executive
HVDC	High Voltage Direct Current
I3E	Economy, Energy and Environment
ICAO	International Civil Aviation Organisation
ICAP	International Carbon Action Partnership
IDA Ireland	Industrial Development Authority of Ireland
IEA	International Energy Agency
IEM	Internal energy market
IFS	International Financial Services
InnovFin	EIB innovation financing programme
INTERREG	EU territorial cooperation initiative
IPCC	Intergovernmental Panel on Climate Change
I-SEM	Integrated Single Electricity Market
ISIF	Ireland Strategic Investment Fund
ISLES	Irish-Scottish Links on Energy Study
IWEA	Irish Wind Energy Association

Km	kilometer
Ktoe	Kilotonne of oil equivalent
kV	kilovolt
kWh	Kilo Watt hour
kWp	kilowatt peak
LEV	Low Emission Vehicle
LIEN	Large Industry Energy Network
LNG	Liquid Natural Gas
LPT	Local Property Tax
LTRS	Long Term Renovation Strategy
LUAS	Dublin tram / light rail system
LULUCF	Land Use, Land-Use Change and Forestry
M	Million
MAC	Maritime Area Consent
MPDM	Marine Planning and Development Management
MSP	Maritime Spatial Planning
Mt	Million tonnes
$MtCO_2eq$	Metric tons of carbon dioxide equivalent
Mtoe	Millions of tonnes of oil equivalent
MW	Megawatt
MWh	Megawatt hour
N	Nitrogen
NAF	National Adaptation Framework
NAPCP	National Air Pollution Control Programme
NCC	National Competitiveness Council
NCSC	National Cyber Security Centre
NDP	National Development Plan
NEC	National Emissions Ceilings
NECP	National Energy and Climate Plan
NESC	National Economic and Social Council

NewERA	New Economy and Recovery Authority
NGO	Non-governmental organization
NH3	Ammonia
NMP	National Mitigation Plan
NMPF	National Marine Planning Framework
NORA	National Oil Reserves Agency
NO_x	Nitrogen oxide
NSEC	North Seas Energy Cooperation
NTA	National Transport Authority
NZEB	Nearly Zero Energy Buildings
OECD	Organisation for Economic Co-operation and Development
Opex	Operating expenditure
OPW	Office of Public Works
OREDP	Offshore Renewable Energy Development Plan
PCI	Project of Common Interest
PEE	Primary Energy Equivalent
PLACARD	Platform for Climate Adaptation and Risk Reduction
PLEXOS	Simulation software for energy market analysis
PPA	Power Purchase Agreement
PSO	Public Service Obligation
PV	Photovoltaic
RE	Renewable Energy
REFIT	Renewable Energy Feed in Tariff
REPDF	Renewable Electricity Policy and Development Framework
RES	Renewable energy share
RES-E	Renewable energy - electricity
RES-H	Renewable energy - heat
RESS	Renewable Electricity Support Scheme
RES-T	Renewable energy - transport
RIDP	Renewable Integration Development Project

S.I.	Statutory Instrument
SDGs	Sustainable Development Goals
SDZs	Strategic Development Zones
SEA	Strategic Environmental Assessment
SEAI	Sustainable Energy Authority of Ireland
SEM	Single Electricity Market
SEMC	Single Electricity Market Committee
SET Plan	Strategic Energy Technology Plan
SME	Small and medium enterprises
SNSP	System Non-Synchronous Penetration
SO2	Sulphur dioxide
SONI	Transmission System Operator (NI)
SRSS	Structural Reform Support Service
SSRH	Support Scheme for Renewable Heat
TAMS II	Targeted Agricultural Modernisation Schemes
TCP	Technology Collaboration Programme
TPER	Total primary energy requirement
TSO	Transmission System Operator
TWh	Terawatt hour
TYNDP	Ten Year Network Development Plan
UK	United Kingdom
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
UR	Utility Regulator (NI)
VAT	Value Added Tax
VRT	Vehicle Registration Tax
WAM	With Additional Measures
WEDG	Wind Energy Development Guidelines
WEM	With Existing Measures

Section A: National Plan

1. Overview and Process For Establishing the Plan

1.1. Executive Summary

i. Political, economic, environmental, and social context of the plan

Climate change is one of the most profound challenges we face globally. Tackling this challenge will require substantial reductions in carbon emissions across all sectors of the economy, alongside a rapid transition to a net zero-carbon energy system. Ireland is committed to becoming one of the leaders in responding to climate disruption. In terms of energy policy our goal is to facilitate an energy transition to a low carbon energy system, which provides secure supplies of competitive energy to citizens. Neither energy nor climate policy can operate in a vacuum. Ireland has recognised the close interactions between the development and implementation of climate and energy policy, both in a European and International context. Energy and climate policy have operated under a single Department, the Department of Communications, Climate Action and Environment (DCCAE), since 2016.

The Irish economy has recovered well from the economic crisis in 2008. However, the improved economic outlook in recent years has seen emissions grow once more, highlighting that Ireland has failed to completely break the link between emissions and growing prosperity. Ensuring the complete decoupling of energy consumption from economic and population growth will be vital in successfully decarbonising our economy.

The island of Ireland is shared between Ireland and Northern Ireland. The total land area of Ireland is 70,273 square kilometres. It is bounded in the west and north-west by the Atlantic Ocean, in the south by the Celtic Sea and in the east by the Irish Sea. Our climate consists of mild winters and cool summers, with a high degree of humidity throughout the year.

Ireland is a parliamentary democracy; there are 26 county councils, three city councils, and two city and county councils. Local authorities play a key role in meeting Ireland's energy targets, particularly for climate change and energy efficiency.

Ireland had a population of 4.75 million in 2016, of which slightly more than 1.3 million resided in Dublin city and county. This was an increase of 3.8% for the total population and 5.7% for Dublin city and county above the 2011 level. Other large urban centres include Cork on the southern coast, and Limerick and Galway on the western coast. Ireland is a sparsely populated country, and has the highest percentage of population living in rural areas in the European Union.

ii. Strategy relating to the five dimensions of the Energy Union

Ireland is committed to achieving an energy resilient union with a forward looking climate policy. This Plan builds on previous national strategies and sets out in detail our objectives regarding the five energy dimensions together with our planned policies and measures to ensure that we achieve those objectives. In June 2019, the government agreed to support the adoption of a net zero target by 2050 at EU level, and to pursue a trajectory of emissions reduction nationally which is in line with reaching net zero in Ireland by 2050.

Decarbonisation – GHG Emissions and Removals

Building on the policy framework of the National Mitigation Plan (NMP) and Project Ireland 2040, the Government published its Climate Action Plan in June 2019. The Climate Action Plan identifies how Ireland will achieve its 2030 targets for greenhouse gas emissions in a manner consistent with a trajectory to achieve net zero emissions by 2050. The Non-ETS (Emissions Trading System) sector accounts for 74% of total EU emissions in Ireland. The ESR enshrines a greenhouse gas emissions reduction target for Ireland of 30% by 2030 relative to 2005 levels. The Climate Action Plan sets out over 180 actions, together with hundreds of sub-actions, that need to be taken and embraces every relevant sector: electricity, industry, enterprise, housing, heating, transport, agriculture, waste, and the public sector.

Reflecting the central priority of climate change in our political and administrative systems into the future, Ireland is establishing new governance arrangements including carbon-proofing our policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council (CCAC) and greater accountability to the Parliament. We have introduced measures to ensure that citizens become engaged and mobilised to take climate action, while ensuring that the necessary societal and economic transition that we have to make is fair, both in Ireland and globally.

Decarbonisation – Renewable Energy

Ireland has excellent renewable energy (RE) resources, which will be a critical and growing component of Irish energy supply to 2020 and beyond. Indigenous renewable energy already plays a vital role in our domestic fuel mix. It also increases sustainability through the use of clean power sources and enhances energy security by reducing Ireland's dependence on imported fuels. Ireland has established an ambitious and challenging target of increasing reliance on renewables from 30% to 70% by 2030. As regards flexibility, the Delivering a Secure Sustainable Electricity System (DS3) Programme will remain key to achieving a more flexible Irish energy system with the objective of raising the already recording breaking levels of intermittent generation penetration in the Single Electricity

Market (SEM) from the current 65% to 75% by 2020, one of the world's highest levels of renewable penetration. Ireland is committed to delivering an early and complete phase-out of coal and peat fired electricity generation.

Energy Efficiency

The Climate Action Plan defines a roadmap to a net zero carbon energy systems objective by 2050. In terms of energy efficiency a number of actions across various sectors will contribute to achievement of Ireland's national energy efficiency contribution. Ireland has made significant progress towards our energy efficiency targets. Further improving energy efficiency is central to our transition to a low carbon economy. Using less energy in a more flexible way is the most cost effective and accessible way we can tackle climate disruption. Ireland is committed to applying the energy efficiency first principle to all proposals, decisions and investments flowing from this Plan. This Plan commits to a wide range of ambitious and far-reaching policies and measures aimed at improving our energy efficiency.

Energy Security

Ireland's objectives are to maintain and, where necessary, facilitate the enhancement of resilience of the gas and electricity networks. Ireland is committed to maintaining the security of our energy system in the most cost-effective manner. Ireland is cognisant of the risks posed by the impacts of climate change to our energy security. The policies and measures set out under this plan, both in terms of mitigation and adaptation, serve to offset those risks. The impact of the wide range of policies and measures aimed at increasing energy efficiency will contribute considerably to ensuring security of our energy system. A review of the security of energy supply of Ireland's natural gas and electricity systems is being carried out. The focus of the review is the period to 2030 in the context of ensuring a sustainable pathway to 2050. Given the increasing dependence of electricity production on natural gas and the increasing dependence on imports from the UK, it is important that close co-operation on security of supply continues with EU Member States and the UK.

A policy statement on Petroleum Exploration and Production Activities as part of Ireland's Transition to a Low Carbon Economy was published on 17th December 2019. This sets out the government's vision for natural gas in the Irish offshore as a key component of our energy mix, as we transition to a low carbon economy. The Policy confirms that existing applications and authorisations at 23 September 2019 can progress through the standard lifecycle stages for exploration, extraction and production of natural gas and/or oil but that future licensing will be for natural gas exploration only.

Internal Energy Market

Ireland's recent wholesale electricity market redesign, together with other related initiatives, form an interlinked policy-aligned system of measures which underpin and facilitate greater renewable electricity penetration in Ireland and progressive decarbonisation of its wholesale electricity sector, and also ensure efficiency and security of electricity supply. Ireland's national objective relating to the EU internal energy market is, and has been over the long term, to continue to deepen the integration of Ireland's wholesale electricity market, and its regulation, with the EU internal energy market (IEM), building on well-known ongoing plans, programmes and actions in this regard. Ireland is committed to supporting customers' participation in the energy system and enabling them to sell excess electricity they have produced back to the grid. Ireland's peripheral location at the north-western edge of mainland Europe presents obvious challenges to interconnection, not least in the area of costs, yet may also highlight the desirability of interconnection, particularly in the context of security and diversification of electricity supply. The national and regulatory policy combined have now created a model environment for the proposal of additional interconnection as appropriate to assist in meeting our national targets.

Research, Innovation and Competitiveness

Given the level of Ireland's ambition regarding reduction of greenhouse gas emissions new technologies must be developed and deployed in the coming years. There is a need to ensure that the best scientific evidence and advice is available to underpin policy and support the policies and measures set out under this Plan. The update to national research priorities for 2018 to 2023 reflects the increased urgency of the need to address climate change, with a new research priority theme focusing on Energy, Climate Action and Sustainability, and two priority areas concentrating on decarbonising and sustainable living and also smart and sustainable food production and processing. To enhance the resilience of Ireland's economy, the Government will continue its efforts to reduce the debt and deficit levels and avoid any narrowing of the tax base.

iii. Overview table with key objectives, policies and measures of the plan

Dimension	Key Objectives	Key Policies and Measures *
Decarbonisation - GHG emissions and removals	Reduce emissions from sectors outside the EU's Emissions Trading System by 30% (relative to 2005 levels) by 2030.	• A range of policies and measures promoting RE and EE (set out further below). • Launch targeted calls under Climate Action Fund • Trajectory of carbon pricing to create behavioural change and avoid locking in carbon intensive technologies. • Establish a system of 5-year carbon budgets and sectoral targets. • Carbon proofing all government decisions and major investments. • Establish a Just Transition Review Group • A new Climate Action Act which will include a 2050 target. • Eliminate non-recyclable plastic and impose higher fees on the production of materials which are difficult to recycle. • Implement measures to ban single-use plastic plates, cutlery, straws, balloon sticks and cotton buds. • Expanding the network of cycling paths and "Park and Ride" facilities. • Making growth less transport intensive through better planning, remote working and modal shift • Specified range of improvements in farming practice in line with recommendations from Teagasc. • Promoting the increased use of domestic harvested wood in longer lived products, which will enhance the storage of carbon in these products and act as a substitute for materials with a higher carbon intensity. • Deliver expansion of forestry planting and soil management to ensure that carbon abatement from land-use is delivered in 2021-30 and in the years beyond. • Support diversification within Agriculture and land use to develop sustainable and circular value chains and business models for lower carbon intensity farming. • Reduce the vulnerability of the State to the negative effects of climate change and to avail of any positive impacts that may occur • Mainstream biodiversity across the decision making process in the State.
Decarbonisation - Renewable energy	Ireland has established an objective of achieving a 34% share of renewable energy in energy consumption by 2030. Increase electricity generated from renewable sources to 70%. At least 3.5 GW of offshore renewable energy. Up to 1.5 GW of grid scale solar energy. Onshore wind capacity of up to 8.2 GW.	• Increase electricity generated from renewable sources to 70%, underpinned by the Renewable Electricity Support Scheme (RESS). • At least 3.5 GW of offshore renewable energy of mainly offshore wind, the development of up to 1.5 GW of grid scale solar energy, an increase in onshore wind capacity of up to 8.2 GW. • Streamline consenting and connection arrangements. • Phase-out of coal and peat-fired electricity generation. • Introduce a support scheme for micro-generation. • Facilitate community participation in renewable generation under the Renewable Electricity Support Scheme.

		• Provide funding supports for new technologies onshore and offshore. • Ensure that 15% of electricity demand is met by renewable sources contracted under Corporate Purchase Power Agreements (PPAs). • electricity meters will be replaced in every house by 2024 under the Smart Metering Programme. • Support the ocean energy research, development and demonstration pathway for emerging marine technologies and associated test infrastructure. • Accelerate the penetration of electric vehicles (EVs) so that 936,000 will be on the road by 2030, underpinned by policy tools such as vehicle and fuel taxation measures, and a strong carbon tax trajectory. • Increase the renewable biofuel content of motor fuels underpinned by the biofuels obligation scheme. • Introduce legislation to ban the sale of new fossil fuel cars from 2030. • No diesel-only purchases for urban public buses from July 2019 onwards. • Develop the CNG fuelling network to support the uptake of CNG vehicles.
Energy efficiency	Contribute towards the EU wide target of achieving at least 32.5% improvement in energy efficiency by 2030. Saving obligations in accordance with Article 7 of the Energy Efficiency Directive (EED). Saving obligations in accordance with the requirements of Article 5 of the EED.	• A range of policies and measures listed under the other dimensions will go towards achievement of our energy efficiency objective. • All new dwellings will be built to NZEB standard from 1 November 2019. • Setting stricter requirements for new buildings and substantial refurbishments. • Building a supply chain and a model for aggregation where home retrofits are grouped together. • 500,000 homes retrofitted to a B2 Building Energy Rating or cost optimal equivalent by 2030. • Public sector buildings to have a B Building Energy Rating (BER) by 2030. • One third of commercial (including mixed use) buildings to have a B BER (or carbon equivalent gains) by 2030. • 600,000 heat pumps installed over the period 2021-2030. • Effectively ban the installation of oil boilers from 2022 and the installation of gas boilers from 2025 in all new dwellings through the introduction of new regulatory standards for home heating systems. Progressively phase out oil and gas boilers in existing dwellings through a combination of incentives, information and regulatory measures. • Ensure a suitable policy framework is in place to support district heating. • A 50% energy efficiency target for the Public Sector by 2030. • The Targeted Agricultural Modernisation Scheme (TAMS) II Scheme provides grant aid for a number of investments specifically aimed at improving energy efficiency in the farming sector. • Scale-up and improve the Sustainable Energy Communities and Better Energy Communities (BEC) programme and enlist a wider range of organisations to anchor its collective approach. • Develop the necessary supply chain, including working with Regional Skills Fora to train skilled

		workers.
Energy security	Ireland is committed to maintaining the security of our energy system in the most cost effective manner.	• A review of the security of energy supply of Ireland's natural gas and electricity systems is being carried out. The focus of the review is the period to 2030 in the context of ensuring a sustainable pathway to 2050. • Support efforts to increase indigenous renewable sources in the energy mix, including wind, solar and bioenergy. • Facilitate infrastructure projects, including private sector commercial projects, which enhance Ireland's security of supply and are in keeping with Ireland's overall climate and energy objectives. • In light of uncertainties related to the withdrawal of the United Kingdom, work closely with our EU partners to maintain existing good regional co-operation between Ireland and the United Kingdom in relation to Emergency Preparedness and Response. • The National Cyber Security Council (NCSC) having due regard to the Commission recommendation is working with providers of critical national infrastructure to improve the overall level of cybersecurity in the energy sector.
Internal energy market	Continue to deepen the integration of IRL's wholesale electricity market, and its regulation, with the EU internal energy market (IEM), building on well-known ongoing plans, programmes and actions in this regard. Develop further interconnection to facilitate Ireland's 2030 target of 70% renewable electricity. Continue to align further IRL's retail electricity market, with the EU internal energy market. Continue to develop Ireland's natural gas market in line with European energy policy.	• Maintain and develop the successful all island wholesale Single Electricity Market, or SEM, to include ensuring that all aspects of the new I-SEM market, the capacity mechanism and other planned/signalled reforms are fully implemented, over the next few years. • Implement the requirements of the Third Energy package Network Codes and Guidelines and the Electricity Regulation and Electricity Directive of the Clean Energy Package in the Irish electricity market. • Ensure continued compliance of Ireland's SEM capacity mechanism with the obligations in the CEP and in the European Commission's November 2017 State Aid approval. • Design and implement the next phase of the DS3 System Services programme to provide enhanced system flexibility to accommodate increased renewables on the electricity system. • Ireland is committed to supporting customers' participation in the energy system and enabling them to sell excess electricity they have produced back to the grid. • Ireland is developing the regulatory and market regime necessary to allow renewable gas be injected into the natural gas grid and used in the heat and transport sectors. • Ireland's independent energy regulator is charged with closely monitoring electricity and gas retail markets to ensure that competition continues to

		develop and that the interests of electricity and gas customers are protected. • Alleviate the burden of energy poverty on the most vulnerable in society through actions focused on improving the efficiency of homes.
Research, innovation and competitiveness	Ensure that the best scientific evidence and advice is available to underpin Government policy and support the objectives, policies and measures in Ireland's NECP. Given the level of Ireland's ambition regarding reduction of greenhouse gas emissions new technologies must be developed and deployed in the coming years.	• Broaden the enterprise and export base by strengthening support for indigenous business to scale and to internationalise. • Increase investment in knowledge-based capital (e.g. intellectual property, software, organisational changes, training and design) is also vital. • The update to national research priorities for 2018 to 2023 reflects the increased urgency of the need to address climate change, with a new research priority theme focusing on Energy, Climate Action and Sustainability, and two priority areas concentrating on decarbonising and sustainable living and also smart and sustainable food production and processing. • Strengthen delivery of public funding for basic and applied research to meet Ireland's decarbonisation objectives and open up new economic opportunities • Increase in a stepwise fashion public funding for the SEAI National Energy Research Development & Demonstration Funding Programme • Consideration of the role of hydrogen in the decarbonisation of Ireland's energy system including the potential production of renewable hydrogen from excess renewable electricity. • examine the feasibility of the utilisation of CCS in Ireland and to develop policy in the area.
*** This list is not exhaustive – see Chapter 3 and voluntary templates for further detail**		

Table 1: Key objectives, policies and measures of the plan

1.2. Overview of Current Policy Situation

i. National and Union energy system and policy context of the national plan

Ireland is firmly committed to the concept of the Energy Union and its ultimate goal of achieving an energy-resilient union with a forward-looking climate policy. As a peripheral, less-well-connected country, the Energy Union has the potential to greatly enable Ireland's transition to a low carbon future, just as the Single Market led to an economic transition for many Member States.

Ireland's Climate Action Plan 2019, National Mitigation Plan 2017, and Energy White Paper 2015, align fully with the principles set out in the Energy Union strategy, and provide the national framework to transform Ireland into a low carbon society and economy.

The EU agreed a comprehensive update of its energy policy framework to facilitate the transition away from fossil fuels towards cleaner energy and to deliver on the EU's Paris Agreement commitments for reducing greenhouse gas emissions. The Clean energy for all

Europeans package marks a significant step towards the implementation of the energy union strategy.

The changes will bring considerable benefits from a consumer perspective, from an environmental perspective, and from an economic perspective. It also underlines EU leadership in tackling global warming and provides an important contribution to the EU's long-term strategy of achieving carbon neutrality by 2050. Ireland is committed to the Energy Union and to achieving a net zero carbon energy system objective for Irish society.

Ireland published its All of Government Climate Action Plan in June 2019. The Plan clearly identifies the nature and scale of the challenge facing Ireland. It outlines the current state of play across key sectors including Energy, Transport, Built Environment, Industry and Agriculture and charts a course towards ambitious decarbonisation targets for each of the sectors. Reflecting the central priority climate change will have in our political and administrative systems into the future, the Plan also sets out governance arrangements including carbon-proofing our policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The Plan recognises that Ireland must fundamentally step up its commitments to tackle climate disruption and puts in place a decarbonisation pathway to 2030 consistent with the adoption of a net zero target in Ireland by 2050.

The Climate Action Plan builds on the policy framework, measures and actions set out in the National Mitigation Plan and Project Ireland 2040. Together with the Irish Government's Energy White Paper (2015) these policy documents present a long-term strategic vision intended to guide the direction of Irish climate and energy policy from now until 2030 and beyond.

The Climate Action Plan sets out a wide range of actions and measures which Ireland needs to implement to meet our EU 2030 targets and to achieve net zero emissions by 2050. The climate actions identified will be implemented by 13 Government Departments and 40 agencies under the remit of those Departments. Delivering with such an integrated set of actions and policies will require a deep level of collaboration across Government.

Some key governance actions outlined in the Plan include the establishment of a Climate Action Delivery Board within the Department of An Taoiseach to hold designated bodies to account. In support of the Delivery Board, a new Climate Action Unit has also been established to monitor and drive implementation and assist with the preparation of a progress report each quarter.

The 2030 Agenda for Sustainable Development encourages countries to develop national responses to the Sustainable Development Goals (SDGs) and incorporate them into

planning and policy. The Minister for Communications, Climate Action and Environment has lead responsibility for promoting and overseeing national implementation of the 2030 Agenda for Sustainable Development and its 17 SDGs. This is a whole-of-government initiative where all Ministers retain responsibility for implementing the individual SDGs relating to their functions. The Climate Action Plan 2019 has been incorporated into this Plan and reflects Ireland's commitment to achieving the 2030 SDGs. The first National Implementation Plan was published in early 2018 and sets out arrangements for interdepartmental coordination, stakeholder engagement and periodic progress reporting at national and global levels.

ii. Current energy and climate policies and measures relating to the five dimensions of the Energy Union

See section 1.1 for a summary of the key policies and measures relating to the five dimensions of the Energy Union. A more detailed description can be found at section 3. A voluntary spreadsheet setting out a detailed list of policies and measures under the five dimensions will also be submitted to the European Commission.

iii. Key issues of cross-border relevance

The UK's decision to leave the European Union has important implications, some of which will not be clear until such time as the final exit agreement emerges. In the meantime, the Irish authorities have been clear on energy issues

The impact of the UK's withdrawal on the all island Single Electricity Market and further market development and integration is not yet known. Existing energy and trading arrangements between Ireland and the UK, ensuring the continuity of mutually dependent energy arrangements and maintaining the long-standing history of beneficial co-operation in this sphere are very important to both jurisdictions on an enduring basis. During negotiations on the Withdrawal Agreement, the Irish and UK governments and the European Commission consistently outlined their commitment to maintaining the existence of the all-island Single Electricity Market when the UK leaves the EU.

Since October 2018, the Irish wholesale electricity market has been directly linked with other EU markets and the IEM through EU Single Day-ahead coupling. This coupling has resulted in a marked increase in the efficiency of the allocation of capacity and trade across the two interconnectors between the SEM with Great Britain (GB). Ireland's objective in the context of the UK exit is to maintain security of supply.

In the event of a no deal UK exit from the EU, uncertainty will remain as to the consequences of Brexit for electricity trade across interconnectors between the all-island

SEM and Great Britain. This uncertainty primarily relates to the removal of the GB market from pan-EU Single Day-ahead Coupling in a no deal exit from the EU. This development would result in less efficient electricity trade across interconnectors between the SEM and Great Britain, which would subsequently take place through the intra-day timeframe in which these two markets will remain coupled following Brexit. With the risk to interconnector trade posed by the UK decision to leave the EU, an important objective of Ireland will be to retain the benefits of market coupling in so far as possible, cognisant of Ireland's continued EU membership, and the UK's future Third Country status. In this regard, the Irish energy regulator and Transmission System Operator (TSO) have committed to work to mitigate any possible future loss of efficiency in interconnector flows between the SEM and GB in so far as possible.

Given the increasing dependence of electricity production on natural gas and the increasing dependence on imports from the UK, it is important that close co-operation on security of supply continues with EU Member States and the UK. This includes continued regional co-operation with the UK on emergency preparedness and response for electricity and gas security of supply. Additionally, it will be important that Ireland retains access to EU funding for energy infrastructure projects to improve Ireland's energy security of supply. Once the UK leaves the EU, Ireland will have no electricity interconnection with any Member State. By providing a direct electricity link with mainland Europe, the Celtic Interconnector with France, once operational, will directly connect Ireland to the EU's Internal Energy Market post-Brexit.

Ireland is currently reliant on the UK for approximately 60% of its petroleum product imports and for about 25% of its crude oil imports. Ireland's policy statement on Petroleum Exploration and Production Activities as part of Ireland's Transition to a Low Carbon Economy sets out the government's vision for natural gas in the Irish offshore as a key component of our energy mix, as we transition to a low carbon economy. The UK's continuing adherence to the established European standards mechanisms and the close proximity of UK refineries to Ireland should mean a continuation of this trade, post the UK withdrawal from the EU. 21% of Ireland's emergency oil stockholding is currently physically stored in the UK. Whether this may continue to be counted towards our EU stockholding obligation may ultimately depend on the final trade agreement between the EU and the UK.

Ireland is committed to regional energy co-operation and is a member of the North Seas Energy Co-operation (NSEC), the British-Irish Council (BIC) and is a signatory to the EU Islands forum. These fora are discussed in more detail at section 1.4. Ireland's policy position on interconnection is outlined in the 2018 National Policy Statement on Electricity Interconnection. It emphasises the important role of interconnection in the transition to a low

carbon energy future. It reflects the increasing importance of interconnection to national and EU policy. Further detail is set out under section 3.

The UK exit from the EU currently represents the foremost downside economic risk for Ireland. As set out in Ireland's National Competitiveness Council's 'Benchmarking Competitiveness Ireland & the UK 2017" report, the potential imminent structural shift in the UK's trading relations with the EU has far reaching implications for Irish competitiveness across a range of policy areas – including trade, investment, skills, and sector specific competitiveness impacts.

Ireland retains strong linkages to key international fora in the energy and climate research sectors (e.g. Horizon 2020, SET Plan, UNFCCC, IEA etc.). It is expected that these key strategic engagements will assist Ireland in effectively responding to the uncertainties associated with the UK's withdrawal from the EU and to consider any opportunities which may eventuate. The terms of the UK's withdrawal from the EU will determine the range and scale of opportunity and challenge for the Irish research, innovation and competitiveness sectors.

iv. Administrative structure of implementing national energy and climate policies

The Department of Communications, Climate Action and Environment (DCCAE) is the lead government department (ministry) with responsibility for setting Ireland's overall energy, climate, and environment policy. Delivering and implementing the wide range of policies and measures necessary to achieve our energy and climate goals will require a deep level of collaboration across Government, local authorities and agencies.

The Climate Action Plan provides for a detailed governance structure to ensure full and proper implementation of the plan and achievement of our climate goals. Included under the governance structures set out in the Climate Action Plan are the establishment of a Climate Action Delivery Board, the carbon proofing of Government policies, the establishment of a Climate Action Council, the adoption of a new carbon budget system with clear sectoral targets to be formally set out under new legislation. These governance structures are expanded on further below and will be employed to ensure implementation of the policies set out under this plan.

1.3. Consultations and Involvement of National and Union Entities and Their Outcome

i. Involvement of the national parliament

Ireland's Programme for a Partnership Government, published in May 2016, committed the Government to the establishment of a Citizens' Assembly to consider some of the most important issues facing Ireland's future. In late 2017 the Citizen's Assembly considered the topic of "How the State can make Ireland a Leader in tackling Climate Change" and their Report and Recommendations on the issue of climate change was published on 18 April 2018. On 11 July 2018 a new parliamentary Committee, the Joint Committee on Climate Action, met for the first time with a mandate to consider the Assembly's Report and Recommendations. The terms of reference establishing this Joint Committee instructed the Committee to consider how the Assembly recommendations might inform the development of Ireland's NECP. The Committee launched its final, cross-party report entitled, 'Climate Change: A Cross- Party Consensus for Action' in mid-April this year. The report makes over 40 recommendations on steering Ireland's approach towards climate action.

The committee's proposals heavily fed into the Government's Climate Action Plan published in June 2019 which in turn significantly informed the final NECP. Ireland became the second country in the world to declare a climate and biodiversity emergency in May 2019.

The NECP will be subject to final approval by Government prior to formal submission to the European Commission.

ii. Involvement of local and regional authorities

Ireland's Local Authorities play a pivotal role in their local communities and can act to demonstrate public sector leadership on climate action in their areas as well as key mobilisers of change. In 2018 four Climate Action Regional Offices (CAROs) were established to assist the Local Authority sector in building capacity to engage effectively on climate change. These groups and structures were consulted in the development of the Climate Action Plan and NECP.

A Climate Action Charter for Local Authorities will be developed and support offered in developing their activities under the Charter. Under the National Adaptation Framework (NAF) the 31 local authorities in Ireland are required to develop their own adaptation strategies in line with guidelines to be developed for the sector. Work on the development of strategies is undertaken by individual local authorities with support from the CARO in that region.

iii. Consultations of stakeholders, including the social partners, and engagement of civil society and the general public

The ministry met with NGOs and the environmental pillar of social partnership in relation to the development and finalisation of the NECP. The ministry also presented to the Climate Change Advisory Council on the draft NECP. The Climate Change Advisory Council was established under the Climate Action and Low Carbon Development Act 2015 and was signed into law on the 18th January 2016. It is an independent advisory body tasked with assessing and advising on how Ireland can achieve the transition to a low carbon, climate resilient and environmentally sustainable economy. The Council, with the support of its Secretariat, conducts evidence-based analysis on how best to respond to the impact of climate change and provides timely advice on the most effective policies to assist with Ireland's transition to a low carbon and climate resilient economy.

The Government has established a National Dialogue on Climate Action. The National Dialogue on Climate Action is a Government initiative led by the Department of Communications, Climate Action and Environment with the support of the Environmental Protection Agency (EPA). It involves structures, information flows and events to facilitate discussion and deliberation on responses to climate change challenges, as well as enabling and empowering action at local, regional and national levels. The National Dialogue provides an opportunity to create awareness, engagement and motivation to act (locally, regionally and nationally) in relation to the challenges presented by climate change.

An initial public consultation on the NECP was held in late 2018. This consultation explained the NECP template and process and asked a series of open questions. These were considered as the draft NECP was being compiled. A further public consultation was held in January and February 2019 on the detail of the draft NECP. Those public consultation responses together with the measures set out in the Oireachtas Committee Report, the All of Government Climate Action Plan, further analytical work by Departments and Agencies and the iterative process with the Commission all inform this final version of the NECP. The responses to the third, final consultation will inform the final Plan. A summary report of the public consultations held during 2018 and 2019 will be submitted to the European Commission together with the final plan.

The draft NECP was not subject to a Strategic Environmental Assessment (SEA) pursuant to the SEA Directive. The draft NECP set out the key objectives, policies and measures which Ireland intends to implement in order to contribute to the achievement of Irish and European goals related to climate change. The draft NECP consolidated all of the various measures which had been proposed across government. One of the main national documents included

in the NECP is the National Mitigation Plan (NMP). The NMP was prepared within the framework of the Climate Action and Low Carbon Development Act 2015 and was the subject of a statutory consultation, a Strategic Environmental Assessment (SEA), and Appropriate Assessment (AA). The National Mitigation Plan remains in place as the statutory plan under the 2015 Act.

The Climate Action Plan gives further effect to, rather than replaces, the National Mitigation Plan. The Climate Action Plan outlines a coherent set of abatement measures across the five sectors that contribute most to Ireland's greenhouse gas emissions: Agriculture, Transport, Electricity, Built Environment, and Industry. These measures are incorporated into the final NECP. The Climate Action Plan, published in June 2019, was not subject to SEA. In those circumstances, the ministry commenced a screening process on the NECP to assess whether an SEA or AA is required, taking into account the updates required to the NECP to incorporate the Climate Action Plan commitments. It has been assessed that an SEA and AA should be carried out. That work will commence as soon as the plan has received Government approval.

iv. Consultations of other Member States

Ireland consulted on its National Energy and Climate Plan in the area of planned offshore wind deployment until 2030 and related grid planning aspects with the other North Seas countries within the framework of the North Seas Energy Co-operation.

Officials from DCCAE met with counterparts from Northern Ireland's energy ministry to discuss their formulation of a new energy strategy to 2030, their input to the UK NECP and the preparation and development of Ireland's NECP. Officials also travelled to Paris and Berlin to discuss the formulation of France and Germanys' NECPs.

v. Iterative process with the Commission

Pursuant to the requirements of the Governance Regulation, Ireland submitted its draft NECP in December 2018. The submission of the draft plan represented the first step of the iterative process between the Commission and Ireland for the purpose of the finalisation of the plan and its subsequent implementation. Ireland actively engaged in the iterative process in a variety of ways with the Commission throughout 2019. Ireland attended and participated at expert working groups on the NECP and presented to the Commission and other Member States a number of times in respect of the draft plan and the process of putting it together. Ireland also engaged in bilateral discussions with the Commission to ensure robustness and completeness in the final plan. The Commission issued its Recommendations to Ireland on

the draft NECP in June 2018 and Ireland has worked closely with the Commission to ensure that due account is taken of the Recommendations in this final plan.

1.4. Regional Co-operation in Preparing the Plan

i. Elements subject to joint or coordinated planning with other Member States

Ireland is part of the wider North Seas region, which has a large offshore renewable energy potential. The European Commission has estimated that offshore wind from the North Seas can cover up to 12 per cent of the electric power consumption in the EU by 2030.

Offshore wind generation and grid infrastructure projects may have cross-border effects on energy prices, security of supply and the environment, including availability of marine space as well as the pace of innovation. The North Seas countries therefore have great benefits to gain from co-operation with each other.

The North Seas Energy Co-operation (NSEC) is a voluntary market-oriented, regional co-operation initiative established in 2016, which seeks to create synergies, to reduce incompatibilities between national policies and to share knowledge on international best practices and foster joint strategies where possible and mutually beneficial. The aim is to coordinate and facilitate further cost-effective deployment of offshore renewable energy, in particular wind, ensuring a sustainable, secure and affordable energy supply in the North Seas countries through increased and better coordinated offshore wind deployment as well as potential joint projects or cluster projects. The NSEC focuses on working together with the perspective of developing further integration and increased efficiency of wholesale electricity markets in the longer term, while contributing to a reduction of greenhouse gas emissions, in average wholesale electricity price spreads and enhancing overall security of supply in the region.

The NESC consists of 10 countries with participation from the European Commission: Belgium, the Netherlands, Luxembourg, France, Germany, UK, Ireland, Norway, Sweden and Denmark.

ii. Explanation of how regional co-operation is considered in the plan

North Seas

As regards to preparing this plan, Ireland made use of the NSEC, in which experts in the support groups shared information and experiences on specific aspects, for example on barriers and best practices of national offshore wind development and in particular on aggregation of national renewable energy trajectories for offshore wind until 2030 and market integration.

Ireland furthermore consulted on its National Energy and Climate Plan in the area of planned offshore wind deployment until 2030 and related grid planning aspects with the other North Seas countries.

The support groups under the co-operation focus on the following subjects:

- **Support group 1:** Maritime Spatial Planning and environmental assessment
- **Support group 2:** Development and regulation of offshore grids and other offshore infrastructure
- **Support group 3:** Support framework and finance for offshore wind projects
- **Support group 4:** Standards, technical rules and regulations in the offshore wind sector

Within the NESC Ireland contributes to the work on establishing common environmental impact assessment methodology. In order to reach our energy and climate targets within the EU, there is a need to better understand the possible ecological limits of large scale wind development in the North Seas. Further work is needed on maritime spatial planning and environmental assessment to be able to utilise the potential of the North Seas. To increase knowledge and support the deployment of offshore wind in the North Seas, the North Seas countries will continue to cooperate closely on maritime spatial planning, environmental research, cumulative impact assessment of wind farms between responsible authorities for energy, maritime spatial planning and environment.

Offshore Grids and Other Offshore Infrastructure

The NSEC serves as a platform to jointly work on concepts for potential joint wind offshore projects and for coordinated electricity infrastructure including transmission infrastructure.

Ireland works together with the other North Seas Energy Co-operation countries on the possibilities for concrete co-operation projects. Besides joint offshore wind projects that would be connected to and supported by several Member States, this includes the work on possible 'hybrid' solutions that would use cross-border solutions for connecting offshore wind farms to the grid and seek synergies with interconnection capacity between countries, and on the corresponding market arrangements.

Ireland is therefore contributing to the development of policies for co-operation on hybrid projects and identifying and addressing possible legal, regulatory and commercial barriers. By coordinating on increased interconnection among the countries in the NSEC, an increasing amount of excess production of energy could flow across borders to meet demand in a well-functioning internal energy market.

The NSEC has identified a list of potential areas and projects in the region, where joint projects could be particularly beneficial. These include: (1) IJmuiden Ver offshore wind farm to UK, (2) CGS IJmuiden Ver – Norfolk, (3) COBRA Cable, (4) DE offshore wind farm connected to NL and (5) North Seas Wind Power Hub.

The NSEC is working on developing concrete concepts for the implementation of selected projects from the above list.

The NSEC will continue to work on the actions plans for the specific hybrid projects which can also be taken further at a national and regional level. Furthermore, the co-operation will continue to work as a forum to reflect on how to deal with the uncertainties about the regulatory treatment of hybrid projects at EU and national level and as a forum to discuss options for addressing these issues.

Support Framework and Finance of Offshore Wind Projects

As regards to measures, Ireland benefits from the NSEC in several ways. The work in the NSEC provides a platform for exchange of best practice regarding the design of support schemes and to develop and work on new concepts tackling new challenges concerning support for offshore wind as well as to develop possible options for future joint offshore wind projects.

Ireland works in the NSEC to coordinate the timing of tenders, to exchange best practices on the design for offshore wind support schemes and to identify, where possible, common principles as well as possible options for alignment of support.

As regards to coordination of tenders, Ireland regularly shares information regarding its national tender schedule with the other NSEC countries with the aim of identifying possible overlaps in time and enabling the most continuous tender pipeline across the North Seas region to ensure that tender processes maximize competition and deliver most value for money to consumers. Ireland is ready to take into account, amongst other criteria and where possible, this overview of tender schedules in its future tender planning to avoid unnecessary bottlenecks and to provide a steady capacity pipeline to involved stakeholders without stop and go cycles.

Ireland shares and discusses in the NSEC the estimated national offshore renewable trajectory, information on its national offshore deployment plans and best practices in the design of offshore wind tenders.

At the Ministerial meeting in Esbjerg on the 20th of June 2019, North Seas countries agreed to work together to achieve an indicative aggregated installed offshore wind capacity of Member States of the NSEC of at least 70 GW by 2030 based on national planning. The

indicative contribution of Ireland to this aggregate capacity in 2030 is at least 3.5 GW (see also section 2.1.2).

In order to reflect the dynamics of offshore wind deployment in the region, this aggregate planned capacity of at least 70 GW for 2030 can be translated into an overall trajectory with indicative milestones for the region of approximately 25 GW in 2020 and 54 GW in 2025.

In the NSEC, Ireland also contributes to the work of analysing and developing options for further mobilisation of investment capital for joint projects, for instance through EU funds such as European Fund for Strategic Investments (EFSI) and Connecting Europe Facility (CEF) as well as institutional investors. Such future joint projects could be cross-border projects for renewable energy in accordance with the CEF proposal.

Harmonisation of Rules, Regulation and Technical Standards

The North Seas Energy Co-operation is working on aligning standards and technical requirements that could contribute to further reducing costs of offshore wind deployment. The focus is on aligning rules, regulation and technical standards within five identified areas. These include: (1) Aviation, marking and lights, (2) Health and safety, (3) Certification of regulatory requirements, (4) Park layout and site investigation and (5) Approaches to research. The NSEC works to develop proposals and recommendations for implementation in close co-operation with industry. The aim of those recommendations is to achieve cost reductions whilst at the same time be achievable. The co-operation will continue to work on aligning standards and technical requirements as well as exchange of best practices to reduce unnecessary regulation and costs for the industry.

Clean Energy for EU Islands

The Clean Energy for EU islands initiative provides a long-term framework to help islands generate their own sustainable, low-cost energy. This will result in:

- Reduced energy costs and greatly increased production of renewable energy and the construction of energy storage facilities and demand response systems, using the latest technologies
- better energy security for islands, which will be less reliant on imports
- improved air quality, lower greenhouse gas emissions, and less impact on islands' natural environments
- the creation of new jobs and business opportunities, boosting islands' economic self-sufficiency.

The initiative was launched in May 2017 in Malta, when the European Commission and 14 EU countries (Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Malta, Portugal, Spain, and Sweden) signed a Political Declaration.

In 2018, the Commission launched the 'Clean energy for EU islands secretariat', which offers support and assistance on project preparation to Europe's islands communities. The objective of the Clean Energy for EU Islands Secretariat is to help as many European islands as possible embark on and advance their clean energy transition in a way that includes the whole island and its stakeholders. The initiative provides a forum for exchange of best practice which has assisted Ireland in developing this plan and enhancing co-operation with other Member States.

Further elements of regional co-operation under the five energy dimensions, including detail on the British-Irish Council and interconnection co-operation, together with how regional co-operation is considered in the plan is set out under Chapter 3.

2. National Objectives and Targets

2.1. Dimension Decarbonisation

2.1.1. GHG Emissions and Removals

i. The elements set out in point (a)(1) of Article 4

Effort Sharing Regulation

The "Effort Sharing Regulation" (ESR), sets out binding annual greenhouse gas emission targets for Member States for each year for the period 2021–2030. These targets cover sectors of the economy that fall outside the scope of the EU Emissions Trading System (EU ETS). These sectors, including transport, buildings, agriculture and waste management, account for almost 60% of total EU emissions and 74% for Ireland. The Regulation is the follow-up to the Effort Sharing Decision (ESD), which established national emissions targets for Member States in the non-ETS sectors between 2013 and 2020.

For the ESR, targets have been assigned to Member States based on GDP per capita and the cost-effectiveness of domestic emissions reductions within individual Member States. The ESR enshrines a greenhouse gas emissions reduction target for Ireland of 30% by 2030 relative to 2005 levels.

There are no individual targets for each sector in the ESR. The 30% reduction target that has been set for Ireland covers all non-ETS sectors, including transport, buildings, agriculture and waste management.

Use of ESR Flexibilities

Flexibility options built into the ESR agreement allow Ireland to transfer 4% of credits from the EU Emissions Trading System (ETS) and to account for Land Use, Land-Use Change and Forestry (LULUCF) credits equivalent to a maximum of 26.8 Mt CO_2 equivalent over the period 2021-2030.

ETS flexibility: Eligible Member States have to notify the Commission by the end of 2019 of the amount of this flexibility they will use over the period. Since the transfer is strictly limited in volume, and decided beforehand, predictability and environmental integrity are maintained. Ireland will be able to avail of a transfer of 4% of its 2005 emissions to be used for compliance under the ESR, for every year in the 2021-2030 period. The modelling and trajectories set out under this plan do not assume use of the ETS flexibility.

LULUCF (Land Use, Land Use Change and Forestry) flexibility: All Member States are eligible to make use of this flexibility, while access is higher for Member States with a larger share of emissions from agriculture (Ireland received highest %- 5.6% - this equates to a maximum amount of 26.8 Mt to be taken from the LULUCF sector). In line with EU guidance, this recognises that there is a lower mitigation potential for emissions from the agriculture sector. Ireland will use this flexibility.

Ireland's agriculture accounts for 34% of national emissions whereas agriculture in the EU 28 represents only 10% of EU-28 emissions. As a portion of the non-ETS sector (for which the State is responsible under EU law), agriculture represents over 45% of non-ETS emissions in Ireland, but only 18% of EU-28 non-ETS emissions. This high proportion of agriculture emissions reflects the importance of the agriculture sector to the Irish economy, the biological nature of agricultural emissions and the lack of heavy industry in the Irish economic make-up. Therefore, recognition of the unusually large contribution of agriculture to our national emissions is vitally important to Ireland. The EU has already recognised (including in European Council conclusions) the multiple objectives of the agriculture and land use sector with their lower mitigation potential.

Land Use, Land Use Change and Forestry (LULUCF)

The LULUCF Regulation sets out the accounting rules for emissions and removals from the categories of afforested land, deforested land, managed cropland, managed grassland, managed forest land and managed wetland.

The inclusion of LULUCF is seen as reflective of the recognition in the Paris Agreement of the role of balancing sources and sinks in climate action and the lower mitigation potential of

agriculture. Final agreement of the LULUCF Regulation was reached at COREPER (Committee of Permanent Representatives in the European Union) in December 2017.

Key targets and commitments for Ireland to achieve the 26.8 $MtCO_2eq.$ abatement through LULUCF actions over the period 2021 to 2030 include:

- an average of 8,000 ha per annum of newly planted forest, and sustainable forest management of existing forests (up to 21 $MtCO_2eq.$ cumulative abatement)
- at least 40,000 ha per annum of reduced management intensity of grasslands on drained organic soils (4.4 $MtCO_2eq.$ cumulative abatement)
- better management of grasslands, tillage land and non-agricultural wetlands (1.4 $MtCO_2eq.$ cumulative abatement)

National Policy Position

In June 2019, the Irish government agreed to support the adoption of a net zero greenhouse gas emissions target by 2050 at EU level, and to pursue a trajectory of emissions reduction nationally which is in line with reaching net zero in Ireland by 2050, and to evaluate in detail the changes which would be necessary in Ireland to achieve this target at national level. The Climate Action Plan 2019 puts in place a decarbonisation pathway to 2030 which would be consistent with the adoption of a net zero target in Ireland by 2050. Action 1 under the Plan has also committed to evaluating in detail the changes required to adopt a more ambitious commitment of net-zero greenhouse gas emissions by 2050, as part of finalising Ireland's long-term climate strategy as per the advice of the Intergovernmental Panel on Climate Change and the recommendation of the Joint Oireachtas Committee on Climate Action.

Ireland's Long-term Strategy identifies additional measures and pathways beyond 2030, towards decarbonisation to 2050 underpinned by analysis of transition options across all key sectors of the economy, including energy, buildings, transport, enterprise, waste, agriculture and land-use. The Long-Term Strategy will inform future policy making, business investment decisions and household, community and citizen action. It builds on the decarbonisation pathway to 2030 detailed in the Climate Action Plan 2019 and reflected in this National Energy and Climate Plan. Ireland's preparation of the Long-term Strategy is in fulfilment of our EU obligation to prepare and submit to the European Commission a long-term low greenhouse gas emission development strategy with a perspective of at least 30 years.

Furthermore, Ireland's Long-term Strategy reflects the government's commitment under Action 1 of the Climate Action Plan 2019 to evaluate in detail the changes required to adopt a more ambitious commitment of net-zero greenhouse gas emissions by 2050, as part of finalising Ireland's Long-term Climate Strategy. This is in line with the advice of the

Intergovernmental Panel on Climate Change (IPCC), the recommendation of the Joint Oireachtas Committee on Climate Action, and the advice of the Climate Change Advisory Council of 5 December 2019.

To inform the development of Ireland's Long-term Strategy, there has been extensive consultation and engagement with Departments, Agencies, Commercial Semi-States and the public. This includes a public consultation held at the end of 2019 whereby 404 submissions were received in response to specific questions on key issues to be addressed in Ireland's Long-term Strategy.

Table 2: Projected trends in GHG emissions (WAM)

tCO_2eq	2015	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
ETS sector emissions	16835810	17233860	16120067	15228762	15093652	14828786	13788683	12686909	12900451	12963343	13166563	13008449	16082747	18457684
Effort Sharing sector GHG emissions	43037173	45383370	44507151	43661185	42701921	41635081	40732039	39365369	38129760	36655754	35177870	33647875	32022170	31313519
LULUCF	4519528	3483568	3770419	3962518	5808292	5003527	5376567	4645674	5187693	5354044	5747414	6649220	7867571	7577932

Table 3: Projections of sectoral developments (WAM)

$ktCO_2eq$	2015	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Industry	4469.57	5481.89	5454.90	5382.31	5284.40	5214.56	5148.23	5121.77	5099.51	5079.66	5065.86	5050.41	5596.68	6367.68
Residential	6041.31	6169.41	6037.19	5831.12	5446.03	5080.85	4709.34	4343.07	3981.75	3624.34	3280.68	2933.15	2726.04	2744.98
Tertiary	1799.55	2124.07	2066.83	1997.77	1904.63	1836.07	1764.80	1675.54	1588.62	1503.17	1423.03	1344.00	1373.88	1478.37
Transport	11827.32	12383.34	12127.85	11797.35	11565.66	11164.23	10935.35	10299.67	9770.59	9069.35	8355.93	7600.41	5812.06	4407.39

ii. Where applicable, other national objectives and targets consistent with the Paris Agreement and the existing long-term strategies. Where applicable for the contribution to the overall Union commitment of reducing the GHG emissions, other objectives and targets, including sector targets and adaptation goals, if available

Climate Adaptation

Ireland is committed to reducing the vulnerability of the State to the negative effects of climate change and to avail of any positive impacts that may occur. Ireland's first statutory National Adaptation Framework (NAF) was published in January 2018. The NAF identifies 12 key national sectors under the remit of 7 Government Ministers where sectoral adaptation plans were required to be submitted to Government for approval by 30 September 2019. The NAF will be reviewed in line with statutory requirements at least once before January 2023.

The sectoral plans were approved by Government in October 2019. Plans were developed in line with the national guidelines "Sectoral Planning Guidelines for Climate Change Adaptation" which were published in May 2018 to ensure that a coherent and consistent approach to the development of plans was taken across Government.

Under NAF Ireland's 31 local authorities also prepared local adaptation strategies in line with "Local Authority Adaptation Strategy Development Guidelines" published by the Department of Communications, Climate Action and Environment.

Circular Economy

Ireland's national waste policy is based on the waste hierarchy: waste prevention; preparing for reuse; recycling; and energy recovery; with disposal, namely landfill, being the least desirable option. The current strategic national waste prevention plan (2014 -2020) is called Towards a Resource Efficient Ireland and is backed by three Regional Waste Management Plans (2015-2021).

As part of a series of measures included in the Climate Action Plan 2019, the Department of Communications, Climate Action and Environment plans to transform the national approach to waste in line with modern, circular economy principles. This will involve a mind-set change from accepting waste as a fact of life, to demanding the highest level of protection for our natural and man-made resources and the environment. A revised national policy will be delivered in 2020 to lead the necessary transformation from waste management to circular economy practices. Ireland's key objective in this regard is to lead the transformation from waste management to circular economy practice through delivery of our new national policy.

A public consultation was launched at the end of 2019 focussing on a number of key areas including:

- Measures to tackle fast fashion
- Better labelling for recyclable goods
- Targets to ensure correct bins are used, providing clearer information on what goes into each bin
- Measures to halve food waste
- Ending the use of non-recyclable plastic
- How to further crack down on illegal dumping
- Incentivising the use of recycled materials in the construction industry
- Working with other EU Member States to design the structure of an EU wide plastic packaging tax to encourage the further prevention of plastic packaging.
- How we can raise awareness among individuals and businesses on how best to manage their waste. This will include consideration of making waste prevention/recycling part of the school curriculum.

Biodiversity

Biodiversity provides us with clean air, water, food, materials, medicines and health benefits. It supports pollination and soil fertility, regulates climate and protects us from extreme weather and other impacts arising from climate change. Biodiversity contributes to health, wellbeing and sustainable development as set out in the United Nations Sustainable Development Goals. Despite the important role that biodiversity plays in underpinning our economy, health and resilience to climate change, we are losing biodiversity at a rate seen only during previous mass extinctions. By the end of the century, climate change is likely to become the most significant driver of biodiversity loss. Increases in temperature will change the timing of life cycle events and the distribution of species. The physical impact of more intense storms and increased winter/spring rainfall will accelerate the degradation of habitats that are already compromised by unsustainable practices. The conservation and sustainable use of biodiversity needs to be escalated. Actions within this Biodiversity Sectoral Climate Change Adaptation Plan build on the foundations of the National Biodiversity Action Plan (2017- 2021) and are aimed at improving sustainable agriculture and fisheries, better soil and land management and, most urgently, the restoration of natural systems. The Biodiversity Adaptation Plan also emphasises the need to consider biodiversity as an adaptation tool for other sectors.

The primary objective of the Biodiversity Adaptation Plan is to protect biodiversity from the impacts of climate change and to conserve and manage ecosystems so that they deliver services that increase the adaptive capacity of people and biodiversity while also contributing to climate change mitigation.

Bioeconomy

The EU's 2050 long-term strategy outlines the bioeconomy as one of the strategic priorities in the road to a climate neutral economy. The Department of Agriculture, Food and the Marine and the Department of Communications, Climate Action and Environment co-chair the national Bioeconomy Implementation Group through which Ireland's bio economy is promoted and action scaled up. A National policy statement on the bioeconomy was published in 2018, and the First Progress Report of the Group was published in September 2019. The importance of the bioeconomy is also recognised in the Government's Climate Action Plan and other cross-sectoral policies including Future Jobs Ireland. The Government recognises that the bioeconomy is crucial for sustainability while also providing an impetus to rural development and employment. The Action Plan for Rural Development (2017) underlines how the bioeconomy can contribute to decarbonisation, sustainable growth and job creation in the agricultural, industrial and technological sectors in rural areas. With 80% of the agri-food sector based in rural Ireland, the potential for the bioeconomy to boost employment in regions is clear.

Ireland's key objective is to grow Ireland's ambition to be a global leader for the bioeconomy through a co-ordinated approach that harnesses Ireland's natural resources and competitive advantage and that fully exploits the opportunities available while monitoring and avoiding unintended consequences. Our goal is to move Ireland beyond simply a target compliance and carbon mitigation focus to integrating sustainable economic development into our economic model as we transition to a low carbon and circular economy.

Peatlands Strategy

In recent years, along with increased understanding and concern over climate change, scientific research has established the importance of peatlands as carbon stores and potential buttresses against some of the projected effects of climate change. As they develop, peatlands slowly remove carbon from the atmosphere and store it in the form of peat. By taking the carbon dioxide from the atmosphere over long periods and by emitting other greenhouse gases such as methane (CH4), natural bogs affect and regulate the global climate. Ireland's National Peatland Strategy was published in 2015 and will be revised in 2020 in light of the priority being given to climate crisis adaptation and the importance of peatlands in this regard.

Air Quality

Ireland's key objective in this area is to reduce harmful emissions and improve air quality and public health in a manner which meets current and future EU and international obligations. We are currently developing Ireland's first National Clean Air Strategy with the aim of promoting clean air policies to enhance and protect the quality of the air we breathe. The Clean Air Strategy will provide the strategic policy framework necessary to identify and promote the integrated measures across government policy that are required to reduce air pollution and promote cleaner air.

Our emissions are measured on an annual basis and Ireland has specific responsibilities and targets under a number of international and European agreements. The most notable of these being the international Convention on Long Range Transboundary Air Pollution (CLRTAP) and the EU National Emission Ceilings (NEC) Directive (EU) 2016/2284). The Clean Air for Europe (CAFE) Directive underpins our responsibilities for our ambient air quality and this sets maximum concentration levels for a range of priority pollutants that impact on human health. There are a number of air pollutants that Ireland has been monitoring and reducing over the last few decades, and details of all these can be found in the EPA inventory report. However the priority air pollutants are as follows:

- Nitrogen oxide (NOx)
- Ammonia (NH3)
- Fine particulate matter (PM2.5 and PM10)
- Non-methane volatile organic compounds (NMVOCs)
- Sulphur dioxide (SO_2)

The latest emissions data shows that we are in compliance with our 2010 emissions targets for all pollutants except ammonia. Ireland's National Air Pollution Control Programme (NAPCP), was completed in July 2019 as required under NEC Directive (transposed by the European Union (National Emission Ceilings) Regulations 2018 (Statutory Instrument (S.I) No. 232/2018)). An updated version of the NAPCP is currently being prepared for submission in September 2020 to reflect the policies and measures set out under the Climate Action Plan and this Plan. It will also include a number of additional programmes and measures in relation to agriculture which are expected to bring our emissions levels into compliance.

Ireland recognises the significance of clean air to the health and well-being of its citizens and its environment and is aware of its international obligations in this area. As the population and economy grow, and as sectors develop, there are both challenges and opportunities to

be recognised in regard to managing future air quality. In this regard Ireland is fully committed to developing and deploying further measures and initiatives to enhance and protect air quality in parallel with broader national policy priorities of relevance.

2.1.2. Renewable Energy

i. The elements set out in point (a)(2) of Article 4

Tables 4 and 5 set out the estimated trajectory for the overall share of renewable energy for two scenarios:

- With Existing Measures (WEM), low oil price with fixed carbon tax
- With Additional Measures (WAM), low oil price with variable carbon tax

The tables also provide a comparison between the estimated trajectory and that set out in the Governance Regulation and set out the evolution of RES-E, RES-H and RES-T over the two scenarios. The modelling indicates Ireland's overall renewable energy share (RES) of gross final energy consumption across the three energy sectors, for 2018, for a projection over the decade between, 2020 and 2030 and also a snapshot look for 2040). The impact of planned policies and measures can be observed by comparing the WEM with the WAM scenario. The impact of planned policies on Ireland's overall renewable energy share is described in further detail section 5.

Table 4: Trajectories for renewable heating and cooling, electricity and transport (WEM)

Renewable Trajectories	2018	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
RES-H&C (%)	6.5%	7.6%	8.2%	8.9%	9.9%	10.9%	11.8%	12.2%	12.7%	13.1%	13.6%	14.0%	15.6%
RES-E (%)	33.2%	37.6%	39.5%	40.2%	42.2%	44.8%	46.8%	49.0%	50.9%	52.3%	53.5%	54.9%	54.4%
RES-T (%)	3.8%	5.7%	5.8%	5.8%	5.8%	5.9%	5.9%	6.0%	6.2%	6.4%	6.7%	7.2%	11.0%
Overall RES Share (%)	11.0%	12.9%	13.6%	14.2%	15.1%	16.2%	17.1%	17.9%	18.8%	19.6%	20.4%	21.5%	25.5%
Article 4(a)(2) Target for RES Increase	-	-	-	18.0%	-	-	43.0%	-	65.0%	-	-	100%	-
RES Min Trajectory (%)	-	16.0%	-	17.0%	-	-	18.4%	-	19.6%	-	-	21.5%	-
RES Projected Trajectory (%)	-	12.9%	-	14.2%	-	-	17.1%	-	18.8%	-	-	21.5%	-
Shortfall (%)	-	3.1%	-	2.8%	-	-	1.2%	-	0.8%	-	-	0.0%	-

Table 5: Trajectories for renewable heating and cooling, electricity and transport (WAM)

Renewable Trajectories	2018	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
RES-H&C (%)	6.5%	7.8%	8.4%	9.7%	11.4%	13.2%	15.1%	16.8%	18.6%	20.3%	22.1%	24.0%	26.7%
RES-E (%)	33.2%	36.5%	39.5%	42.3%	44.8%	45.5%	46.8%	60.2%	65.5%	68.8%	69.3%	70.0%	69.1%
RES-T (%)	3.8%	5.8%	5.9%	6.7%	6.7%	8.3%	5.9%	9.3%	9.7%	11.0%	11.8%	13.4%	17.8%
Overall RES Share (%)	11.0%	12.8%	13.9%	15.5%	17.0%	16.2%	18.6%	24.6%	27.4%	30.0%	31.8%	34.1%	40.2%
Article 4(a)(2) Target for RES Increase	-	-	-	18.0%	-	-	43.0%	-	65.0%	-	-	100%	-
RES Min Trajectory (%)	-	16.0%	-	19.3%	-	-	23.8%	-	27.8%	-	-	34.1%	-
RES Projected Trajectory (%)	-	12.8%	-	15.5%	-	-	21.3%	-	27.4%	-	-	34.1%	-
Shortfall (%)	-	3.2%	-	3.7%	-	-	2.5%	-	0.4%	-	-	0.0%	-

It can be noted from the above table that Ireland's proposed trajectory will not be in line with the trajectory waypoints pursuant to the Governance Regulation. This is primarily due to the fact that large projects, particularly offshore wind projects, cannot be constructed in shorter timeframes and will not become operational in Irish waters until mid-decade.

ii. Estimated trajectories for the sectoral share of renewable energy in final energy consumption from 2021 to 2030 in the electricity, heating and cooling, and transport sector

The tables at section 2.1.2(i) set out the estimated trajectories for the share of renewable energy by sector for each of the two scenarios. The figures provided for RES-T are based on actual energy share and do not include the use of multipliers as set out in the Renewable Energy Directive.

In order to promote the use of renewable energy in the heating and cooling sector, in line with Article 23.1 of the 2018 Directive on the promotion of the use of energy from renewable sources (recast), Ireland intends to adhere to the indicative 1.1 percentage point increase (i.e. without the inclusion of waste heat and cold).

District heating and cooling in Ireland is at a very low level and is estimated at most at about 0.8% of heat consumption. In addition, structural barriers arise from the nature of Ireland's dispersed settlement structure with low population density.

Table 5 illustrating the annual trajectories for the WAM scenario assumptions for renewable energy, 2018-2040, shows an increase in the percentage of renewables in heating and cooling (not including waste heat and cooling) rising from a figure of 7.8% in 2020 to 9.7% in 2022, 15.1% in 2025, 18.6% in 2027, and to 24.0% in 2030.

These trajectories would indicate that the requirements to endeavour to increase the share of renewable energy in heating and cooling by an indicative 1.1% as an annual average for the period 2021 to 2025 and 2026 to 2030, will be fulfilled. The increase in the first period is forecast to be 7.3% and the increase in the second period is forecast to be 8.9%.

Measures to deploy energy from renewable sources in the heating and cooling sector include Ireland's Support Scheme for Renewable Heat which has the primary objective of increasing the level of renewable energy in the heat sector. Heat pump uptake through building regulations and support schemes will also drive the growth of renewables.

Use of the structures established under the national energy savings obligation set out in Article 7 of Directive 2012/27/EU will be considered when deciding on the further implementation and monitoring of the measures referred to in Article 23.3 of the Renewables Directive.

iii. Estimated trajectories by renewable energy technology that the Member State projects to use to achieve the overall and sectoral trajectories for renewable energy from 2021 to 2030, including expected total gross final energy consumption per technology and sector in Mtoe and total planned installed capacity (divided by new capacity and repowering) per technology and sector in MW

Table 6: Trajectories by renewable energy technology (WEM)

Renewable Electricity-Installed Capacities (MW)												
	2018	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
Hydro	234	234	234	234	234	234	234	234	234	234	234	234
Biodegradable Municipal Solid Waste	39	39	39	39	39	39	39	39	39	39	39	39
Biogas	24	24	24	24	24	24	24	24	24	24	24	24
Biomass CHP	10	60	60	60	60	60	60	60	60	60	60	60
Biomass Co-Firing	51	153	153	153	153	213	213	213	355	355	355	0
Onshore Wind	3572	4359	4544	4728	4912	5097	5281	5465	5650	5834	6018	8465
Offshore Wind	25	25	25	247	469	691	913	1134	1356	1578	1800	3300
Solar PV	10	124	197	271	286	300	490	680	870	1060	1250	1750
Ocean	0	0	0	0	0	0	0	0	0	0	0	0
Renewable Electricity-Generation by Source (ktoe)												
	2018	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
Hydro	60	63	62	62	62	62	61	61	61	60	60	61
Biodegradable Municipal Solid Waste	28	23	23	23	23	23	23	23	23	23	23	23
Biogas	16	5	5	5	5	4	4	4	4	4	4	4
Biomass (CHP and Co-Firing)	29	113	113	113	113	113	113	113	115	113	113	33

Onshore Wind	740	911	950	984	1019	1048	1081	1112	1142	1173	1231	1725
Offshore Wind	6	6	6	48	120	181	238	294	342	392	443	797
Solar PV	1	10	16	22	24	25	39	54	69	83	98	141
Ocean	0	0	0	0	0	0	0	0	0	0	0	0
Renewable Transport Consumption by Source (ktoe)												
	2018	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2040**
Ethanol - Total	27.3	34.2	34.4	34.6	34.7	34.7	34.6	33.8	32.5	31.0	29.0	15.3
Part A, Annex IX Ethanol	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2
Part B, Annex IX Ethanol	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food or Feed Ethanol	27.3	33.9	34.1	34.2	34.3	34.3	34.2	33.4	32.2	30.7	28.7	15.2
Biodiesel - Total	127.0	213.7	213.9	213.9	213.6	213.0	211.5	207.9	202.2	195.8	187.5	140.1
Part A, Annex IX Biodiesel	0.0	9.6	19.2	28.9	38.5	47.9	72.3	95.4	116.5	135.7	151.9	113.5
Part B, Annex IX Biodiesel	127.0	204.1	194.6	185.0	175.2	165.1	139.2	112.5	85.7	60.1	35.6	26.6
Food or Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biofuels - Total	**154.2**	**247.9**	**248.3**	**248.5**	**248.3**	**247.7**	**246.1**	**241.7**	**234.8**	**226.9**	**216.5**	**155.4**
Renewable Heat-Generation by Source and Sector (ktoe)												
	2018	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2040**
Industry												
Biogas	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	7.0
Biomass	196.1	248.4	258.7	279.9	301.0	319.4	319.4	319.4	319.4	319.4	319.4	319.4
Renewable Portion of Heat Pumps	0.0	9.2	10.5	11.8	13.3	14.8	16.3	17.9	19.3	20.7	22.3	36.5
Solar Thermal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Industry	198.4	259.6	271.2	293.7	316.4	336.2	337.7	339.3	340.7	342.1	343.7	362.9
Residential												
Biogas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biomass	27.9	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0
Renewable Portion of Heat Pumps	27.1	54.5	74.5	94.5	114.5	134.5	154.5	174.5	194.5	214.5	234.6	434.6
Solar Thermal	13.4	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1
Total Residential	68.4	95.6	115.6	135.6	155.6	175.7	195.7	215.7	235.7	255.7	275.7	475.8
Tertiary												
Biogas	7.5	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
Biomass	18.1	26.9	30.9	37.6	44.6	51.6	51.6	51.6	51.6	51.6	51.6	51.6
Renewable Portion of Heat Pumps	17.1	48.0	53.5	59.2	65.5	72.1	79.3	87.5	95.9	105.1	115.4	209.3
Solar Thermal	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Residential	42.9	82.7	92.2	104.6	117.9	131.4	138.7	146.8	155.3	164.5	174.7	268.7

Table 7: Trajectories by renewable energy technology (WAM)

Renewable Electricity-Installed Capacities (MW)												
	2018	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
Hydro	234	234	234	234	234	234	234	234	234	234	234	234
Biodegradable Municipal Solid Waste	39	39	39	39	39	39	39	39	39	39	39	39
Biogas	24	24	24	24	24	24	24	24	24	24	24	24
Biomass CHP	10	60	60	60	60	60	60	60	60	60	60	60
Biomass Co-Firing	35	51	51	51	0	0	0	0	0	0	0	0
Onshore Wind	3572	4655	5207	5565	5900	5900	5900	5900	6401	6955	7512	8012
Offshore Wind	25	25	25	25	25	1025	1943	2870	3232	3232	3525	7025
Solar PV	10	79	100	121	144	173	208	249	299	359	431	656
Ocean	0	0	0	5	9	12	16	19	23	26	30	110
Renewable Electricity-Generation by Source (ktoe)												
	2018	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
Hydro	60	63	61	61	61	61	62	60	59	57	56	57
Biodegradable Municipal Solid Waste	28	23	23	23	23	23	23	23	23	23	23	23
Biogas	16	5	5	5	5	4	12	19	26	34	41	51
Biomass (CHP and Co-Firing)	29	60	60	60	33	33	33	33	33	33	33	33
Onshore Wind	740	959	1060	1149	1217	1231	1218	1200	1241	1334	1462	1542
Offshore Wind	6	6	6	6	6	228	522	765	893	896	889	1698
Solar PV	1	6	8	10	12	14	17	19	22	27	31	49
Ocean	0	0	0	1	2	2	3	4	4	5	6	21
Renewable Transport Consumption by Source (ktoe)												
	2018	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
Ethanol - Total	27.3	32.7	32.4	32.1	64.8	64.1	60.6	57.1	52.4	47.2	41.1	11.8
Part A, Annex IX Ethanol	0.0	0.3	0.3	0.3	0.6	0.6	0.6	0.6	0.5	0.5	0.4	0.1
Part B, Annex IX Ethanol	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food or Feed Ethanol	27.3	32.4	32.1	31.8	64.2	63.5	60.0	56.6	51.9	46.7	40.7	11.7
Biodiesel - Total	127.0	201.9	229.0	223.8	246.3	240.5	254.0	241.1	249.5	231.0	234.2	151.1
Part A, Annex IX Biodiesel	0.0	7.3	16.5	24.2	35.5	43.3	64.0	78.1	98.8	108.1	126.5	81.6
Part B, Annex IX Biodiesel	127.0	192.6	208.0	192.9	201.0	185.2	173.5	143.7	127.0	97.5	78.5	50.6
Food or Feed	0.0	2.0	4.6	6.7	9.9	12.0	16.5	19.3	23.7	25.4	29.3	18.9
Biofuels - Total	**154.2**	**234.7**	**261.5**	**256.0**	**311.2**	**304.7**	**314.6**	**298.3**	**301.9**	**278.2**	**275.3**	**163.0**

Renewable Heat-Generation by Source and Sector (ktoe)												
	2018	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
Industry												
Biogas	2.2	2.0	2.0	2.0	2.0	6.0	10.9	15.3	20.0	24.3	29.2	26.6
Biomass	196.1	245.1	267.8	290.5	314.4	334.7	334.7	334.7	334.7	334.7	334.7	334.7
Renewable Portion of Heat Pumps	0.0	9.2	10.5	11.8	13.3	14.7	16.1	17.7	19.1	20.7	22.7	37.6
Solar Thermal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Industry	198.4	256.3	280.3	304.3	329.7	355.4	361.8	367.7	373.8	379.8	386.7	398.9
Residential												
Biogas	0.0	0.0	0.0	0.0	0.0	2.7	5.9	8.7	11.6	14.2	17.2	15.5
Biomass	27.9	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0
Renewable Portion of Heat Pumps	27.1	52.5	75.3	114.3	153.5	192.9	232.4	271.9	311.3	350.8	390.3	613.7
Solar Thermal	13.4	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1
Total Residential	68.4	93.7	116.4	155.4	194.6	236.8	279.5	321.7	364.1	406.2	448.6	670.3
Tertiary												
Biogas	7.5	7.8	7.8	7.8	7.8	9.9	12.4	14.6	16.8	18.9	21.1	20.2
Biomass	18.1	27.6	34.6	41.7	49.1	56.2	56.2	56.2	56.2	56.2	56.2	56.2
Renewable Portion of Heat Pumps	17.1	46.8	51.7	56.6	61.7	66.8	82.0	97.6	113.0	128.6	145.0	294.2
Solar Thermal	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Residential	42.9	82.1	94.1	106.1	118.5	133.0	150.7	168.4	186.0	203.7	222.3	370.6

iv. Estimated trajectories on bioenergy demand, disaggregated between heat, electricity and transport, and on biomass supply by feedstocks and origin (distinguishing between domestic production and imports). For forest biomass, an assessment of its source and impact on the LULUCF sink

The following tables set out estimated trajectories on bioenergy demand sector and biomass supply.

Table 8: Bioenergy demand, biomass supply by feedstock (WEM)

Bioenergy Demand, Total Final Consumption (ktoe)	2018	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity											
Solid Biomass	28.7	113.4	113.2	113.3	113.2	113.2	113.3	113.4	114.5	113.3	113.3
Biogas	1.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Landfill Gas	12.0	2.0	2.0	1.9	1.9	1.4	1.4	1.3	1.3	1.3	0.9
Biodegradable Municipal Solid Waste	28.4	23.0	23.1	23.0	23.1	23.1	23.0	23.0	23.1	23.0	23.1
Sewage Sludge Gas	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7

Heat											
Solid Biomass	242.1	302.3	316.6	344.5	372.7	398.0	398.0	398.0	398.0	398.0	398.0
Biogas	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
Transport											
Ethanol	27.3	34.2	34.4	34.6	34.7	34.7	34.6	33.8	32.5	31.0	29.0
Biodiesel	127.0	213.7	213.9	213.9	213.6	213.0	211.5	207.9	202.2	195.8	187.5

Biomass Supply by Feedstock (ktoe)	2018	2020	2030
Biomass from Forestry	232	246	448
Domestic	167	181	375
Imported	65	65	73
Biomass from Agricultural Crops	31	40	43
Domestic	4	7	14
Imported	27	34	29
Biomass from Agricultural Residues	0.0	0.3	152
Domestic	0.0	0.0	152
Imported	0.0	0.3	0.3
Biomass from Waste	271	172	195
Domestic	169	172	195
Imported	102	0	0

Table 9: Bioenergy demand, biomass supply by feedstock (WAM)

Bioenergy Demand, Total Final Consumption (ktoe)	2018	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity											
Solid Biomass	28.7	60.0	59.8	59.9	33.1	33.1	33.2	33.2	33.5	33.1	33.1
Biogas	1.2	0.4	0.4	0.4	0.4	0.4	8.2	15.0	22.6	29.9	37.6
Landfill Gas	12.0	2.0	1.9	1.8	1.8	1.4	1.5	1.3	1.2	1.2	0.8
Biodegradable Municipal Solid Waste	28.4	23.0	23.1	23.0	23.1	23.1	23.0	23.0	23.1	23.0	23.1
Sewage Sludge Gas	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Heat											
Solid Biomass	242.1	299.6	329.5	359.2	390.5	417.9	417.9	417.9	417.9	417.9	417.9
Biogas	9.8	9.8	9.8	9.8	9.8	18.6	29.3	38.6	48.4	57.5	67.5
Transport											
Ethanol	27.3	32.7	32.4	32.1	64.8	64.1	60.6	57.1	52.4	47.2	41.1
Biodiesel	127.0	201.9	229.0	223.8	246.3	240.5	240.0	241.1	249.5	231.0	234.2

Biomass Supply by Feedstock (ktoe)	2018	2020	2030
Biomass from Forestry	232	246	304
Domestic	167	181	277
Imported	65	65	26
Biomass from Agricultural Crops	31	40	94
Domestic	4	7	24
Imported	27	33	70
Biomass from Agricultural Residues	0.0	0.3	184
Domestic	0.0	0.0	183
Imported	0.0	0.3	0.4
Biomass from Waste	271	357	286
Domestic	169	175	232
Imported	102	182	53

v. Where applicable, other national trajectories and objectives, including those that are long term or sectoral (e.g. share of renewable energy in district heating, renewable energy use in buildings, renewable energy produced by cities, renewable energy communities and renewables self-consumers, energy recovered from the sludge acquired through the treatment of wastewater)

All relevant national trajectories and targets are set out in the above sections.

2.2. Dimension Energy Efficiency

i. The elements set out in point (b) of Article 4.

Table 10: Energy efficiency trajectories (WEM)

Energy Efficiency Policies (GWh)	2018	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Primary Energy Savings	19,420	23,458	25,805	28,138	30,218	32,438	34,829	37,307	40,061	41,979	44,052	46,362
Final Energy Savings	17,016	20,274	22,258	24,220	25,987	27,902	30,059	32,353	34,788	36,625	38,562	40,731
Supply-Side Energy Savings	6,983	6,298	8,103	8,972	9,503	10,056	11,718	14,247	14,825	15,930	16,342	17,304
Total Primary Energy Consumption	170,922	186,100	185,639	188,084	188,654	190,923	192,708	191,469	192,012	191,981	193,342	192,905
Total Final Energy Consumption	143,061	154,259	155,438	156,689	157,435	158,627	159,852	160,821	161,296	161,460	161,632	161,510

Table 11: Energy efficiency trajectories (WAM)

Energy Efficiency Policies (GWh)	2018	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Primary Energy Savings	19,326	25,103	28,142	31,277	34,834	38,347	41,877	45,859	49,692	53,650	57,758	62,171
Final Energy Savings	17,266	21,780	24,408	27,212	30,314	33,479	36,940	40,830	44,394	48,141	51,952	56,159
Supply-Side Energy Savings	6,983	6,747	8,665	11,114	11,533	12,850	16,342	18,747	19,490	20,167	20,456	21,626
Total Primary Energy Consumption	170,922	181,716	179,266	177,385	174,817	173,225	171,582	165,273	165,125	163,388	161,571	159,146
Total Final Energy Consumption	143,061	150,446	149,231	148,035	146,073	144,611	143,197	140,563	138,114	135,475	132,708	130,493

ii. The indicative milestones for 2030, 2040 and 2050, the domestically established measurable progress indicators, an evidence-based estimate of expected energy savings and wider benefits, and their contributions to the Union's energy efficiency targets as included in the roadmaps set out in the long-term renovation strategies for the national stock of residential and non-residential buildings, both public and private, in accordance with **Article 2a of Directive 2010/31/EU**

In accordance with Directive 2018/844, Ireland's next Long Term Renovation Strategy (LTRS) will outline these milestones and indicators. The current LTRS is available on the Department's website. The next LTRS will further reflect the commitments in the National Development Plan (NDP) and the actions set out in the Irish Government's Climate Action Plan.

For 2030 these include:

- 500,000 homes retrofitted to a B2 Building Energy Rating or cost optimal by 2030
- Public sector buildings to have a B Building Energy Rating (or carbon equivalent) by 2030
- One third of all commercial buildings to have a B Building Energy Rating (or carbon equivalent gains) by 2030

For 2050 these include:

- In 2014 Ireland adopted a National Policy Position for an 80% reduction in CO_2eq emissions by 2050 compared to 1990 levels for the electricity generation, built environment, and transport sectors
- The Climate Action plan states the Government's ambition to support the adoption of a net zero target by 2050 at EU level

iii. Where applicable, other national objectives, including long-term targets or strategies and sectoral targets, and national objectives in areas such as energy efficiency in the transport sector and with regard to heating and cooling

The Climate Action Plan defines a roadmap to a net zero carbon energy systems objective by 2050 for Ireland and sets out a coherent set of policy actions and targets to 2030 that will set us on track to achieve that goal. In terms of energy efficiency, a number of actions across various sectors will contribute to achievement of Ireland's national energy efficiency contribution.

Buildings

- The Plan sets out targets for the significant improvement of the energy efficiency of our building stock with a target of 500,000 existing buildings to be retrofitted to a B2 Building Energy Rating or cost optimal by 2030
- All new dwellings will be built to NZEB standard from 1 November 2019. All new "Buildings other than dwellings" are built to NZEB from 1st Jan 2019.
- One third of all commercial (including mixed use) buildings to have a B Building Energy Rating (or carbon equivalent gains) by 2030

Heating

- A shift to alternative heating sources is also set out in the Plan, with targets of 600,000 heat pumps installed over the period 2021-2030
- Effectively ban the installation of oil boilers from 2022 and the installation of gas boilers from 2025 in all new dwellings through the introduction of new regulatory standards for home heating systems. Progressively phase out oil and gas boilers in existing dwellings through a combination of incentives, information and regulatory measures
- Phase 2 of the social housing retrofit programme to bring dwellings more than 40 years old (30% of the social housing stock) to a B2 equivalent BER

Transport

- In the transport sector the Plan sets out actions to accelerate the penetration of electric vehicles into sales of cars and vans on the route to reach 100% of new vehicle sales by 2030, so that 936,000 electric vehicles will be on the road by 2030;
- The Plan also commits to make growth less transport intensive through better planning, remote and home-working and modal shift to public transport
- Increase the renewable biofuel content of motor fuels

- Set targets for the conversion of public transport fleets to zero carbon alternatives

Agriculture

- The plan also aims to deliver substantial verifiable greenhouse gas abatement through the adoption of a specified range of improvements in farming practice

Electricity Generation

- The Plan aims to increase reliance on renewables from 30% to 70% adding 12GW of renewable energy capacity (with peat and coal plants closing)

Public Sector

- A 50% energy efficiency target for the Public Sector by 2030
- Public sector buildings to have a B Building Energy Rating by 2030

2.3. Dimension Energy Security

i. The elements set out in point (c) of Article 4

Gas & Electricity

Ireland has a small population base and consequently a high cost per capita to fund infrastructure. Its peripheral location at the end of the European electricity and gas grids, with relatively high dependence on imported gas from the UK, low import route diversity for gas, potential increasing role of gas in the energy mix for heat, transport and power generation, including as a back-up for intermittent power generation, means that our energy security profile is different to most other Member States. Following the exit of the UK from the EU, we will no longer be physically connected to the EU Internal Energy Market (IEM).

It is expected that peat and coal will no longer be part of Ireland's electricity generation mix by 2025. While this will have a positive impact on greenhouse gas and other harmful emissions, it will lead to an increased reliance on natural gas thus reducing the diversification of our fuel mix and impacting on security of supply.

Given this profile a review of the security of energy supply of Ireland's natural gas and electricity systems is being carried out. The focus of the review is the period to 2030 in the context of ensuring a sustainable pathway to 2050. The outcome of this review will inform the relevant polices and measures.

Ireland's objectives are, in the most cost effective way, to:

- Maintain and, where necessary, facilitate the enhancement of resilience of the gas and electricity networks provided such enhancements are in keeping with Ireland's overall climate and energy objectives

- Based on the outcome of the review, put in place policies and measures to address potential constraints or supply interruptions
- Increase and diversify the indigenous production of clean energy sources, in particular the development of large offshore wind projects
- Facilitate, as a preference, commercial investment through policy and regulatory certainty
- Maintain close co-operation on security of supply at EU and regional level, in particular continued co-operation with the UK
- Ensure that measures are aligned with national and EU climate policy objectives;
- Actively participate in EU Project of Common Interest (PCI) process including supporting projects which enhance energy security and are in keeping with Ireland's overall climate and energy objectives

Oil

Given that the Irish oil market is characterised by a lack of indigenous oil production, with no commercially viable finds having been discovered there is limited scope for reducing petroleum import dependency in the short to medium term. Ireland's domestic downstream oil industry is fully privatised and largely de-regulated with the origin of imports being determined by cost and logistical factors. Ireland's policy statement on Petroleum Exploration and Production Activities as part of Ireland's Transition to a Low Carbon Economy states that existing licences are not affected by the decision to cease exploration for oil and they can continue towards exploration and production for both oil and/or gas as per their existing terms.

Our objectives regarding oil are to:

- Provide a policy and regulatory framework to facilitate the commercial oil companies in their supplying of product to the domestic market
- Facilitate the continued operation of sufficient infrastructure to import and supply oil to the market place
- Support renewable and sustainable alternatives to petroleum products, including electric vehicles, biofuels and CNG in transports
- Continue to engage in oil emergency planning, including the measures specified below

Cybersecurity

The Commission Recommendation (EU) 2019/553 provides non exhaustive guidance to Member States and relevant stakeholders, in particular network operators and technology suppliers, for achieving a higher level of cybersecurity in view of the specific real time requirements identified for the energy sector, cascading effects and the combination of legacy and state of the art technologies. The guidance aims at helping stakeholders keep in mind the specific requirements of the energy sector when implementing internationally recognised cybersecurity standards.

The recommendation calls on Member States to ensure the relevant stakeholders take the necessary measures and encourage them to build up knowledge and skills related to cyber security in energy. While dialogue on cyber security in the energy sector is mainly through the NIS Co-operation Group (Network and Information Systems Directive) the Commission provides regular updates to DCCAE and the Regulator through meetings of the Gas Coordination Group and Electricity Coordination Group. Co-operation on crisis management is fundamental to cyber security. Operators of Essential Services in the energy sector are advised to follow the recommendation and consider cybersecurity in regional/national risk assessments under EU Regulation 2017/1938 for security of gas supply and under EU Regulation 2019/942 for security of electricity supply.

The National Cyber Security Centre (NCSC) having due regard to the recommendation is working with providers of critical national infrastructure to improve the overall level of cybersecurity in the energy sector. The NCSC have developed cyber security guidance which provides a framework in alignment with international standards for cybersecurity, from which critical infrastructure providers can adopt a risk management culture to safeguard the protection and resilience of critical services.

The NCSC is actively engaging with providers to develop communication channels within the energy sector to facilitate collaboration between key stakeholders. Incident guidance levels have been published to assist providers in the reporting of incidents, which can aid the sector in the prevention, detection and management of incidents. In its ongoing engagement with stakeholders, the NCSC will proactively seek to continually improve the cyber security maturity level within the sector.

The current National Cyber Security Strategy was published in December 2019, and follows on from the country's first Strategy which was published in 2015. It is a broader and more comprehensive document than the last one, and takes advantage of the operational experience gained by the National Cyber Security Centre from 2015 to 2019, and from ongoing national and international engagements in the area.

The vision behind the 2019 Strategy is to allow Ireland to continue to safely enjoy the benefits of the digital revolution and to play a full part in shaping the future of the Internet. Some of the key objectives of the strategy are to continue to improve the ability of the State and to identify and protect critical national infrastructure by increasing its resilience to cyber-attack and by ensuring that operators of essential services have appropriate incident response plans in place to reduce and manage any disruption to services.

ii. National objectives with regard to increasing: the diversification of energy sources and supply from third countries for the purpose of increasing the resilience of regional and national energy systems

In relation to natural gas, Ireland has a number of challenges including a high import dependency, a lack of import route diversity, and a declining indigenous gas supply. In addition, Ireland has a small synchronous island electricity system and envisaged increasing integration of renewable energy sources for heat, transport and power generation, including intermittent renewable sources. Given the above, our objectives are to:

- Ensure that there is sufficient flexibility in the energy system to maintain energy security of supply and facilitate the integration and transition to clean energy sources in the most cost effective way
- Support further electricity interconnection to improve the functioning and flexibility of the national energy system
- Support projects which are needed for energy security and consistent with national and EU climate policy objectives, through the EU Projects of Common Interest process and EU funding mechanisms

In relation to oil, there is no substantial domestic production of biofuels or other alternative fuels, and therefore as things stand, little alternative to the continued import of petroleum products. The sourcing of oil products is largely determined by pricing and logistics considerations. Crude oil is sourced mainly from Norwegian North Sea production and product is currently imported primarily from UK refineries, in particular from Valero's refinery at Pembroke.

The UK's withdrawal from the EU is not expected to impact significantly on the volume of product imported from UK refineries. However, given that gasoline and kerosene imported from UK refineries may be liable for tariffs, it is possible that the importing oil companies may seek more competitively priced product from EU refineries. As things stand, some diesel is imported from elsewhere, including the Russian Federation and the Gulf Coast of the United

States. Ireland will continue to ensure the oil industry has the flexibility to obtain sufficient oil supplies of the necessary quality and will:

- Continue to utilise European and international standards for petroleum products, through its membership of by the European Committee for Standardisation (CEN)
- Continue to enforce fuel quality standards by confirming quality compliance and specifying instances of non-compliance periodically to the Commission under Article 8 of the Fuel Quality Directive

iii. Where applicable, national objectives with regard to reducing energy import dependency from third countries, for the purpose of increasing the resilience of regional and national energy systems

Given Ireland's high and increasing reliance on gas for electricity, our low import route diversity, Ireland's relatively high dependence on imported gas, which is likely to increase as the Corrib gas field progressively depletes, and the potential increasing role of gas in the energy mix for heat, transport and power generation including as a back-up for intermittent power generation, our objectives are to:

- Ensure the resilience of the gas network to a long-duration supply disruption, in the context of EU and national climate objectives;
- Actively participate in EU and regional initiatives to maintain and enhance security of supply including national, regional and EU co-operation on emergency planning and response for gas and electricity networks, including risk assessments, preventative plans and emergency plans;
- Following the withdrawal of the United Kingdom from the EU, engage with our EU partners to put in place an EU/UK framework for continued necessary regional co-operation between Ireland and the UK on matters related to gas and electricity security of supply, including emergency preparedness and response and solidarity in an emergency situation.

iv. National objectives with regard to increasing the flexibility of the national energy system, in particular by means of deploying domestic energy sources, demand response and energy storage

Given that Ireland has a small synchronous Island electricity system, and the envisaged increasing integration of renewable energy sources for heat, transport and power generation, including intermittent renewable sources, our objectives are to:

- Ensure, in the most cost effective way, that there is sufficient flexibility in the energy system to maintain energy security of supply and facilitate the integration and transition to clean energy sources
- Support further electricity interconnection to improve the functioning and flexibility of the national energy system

Ireland currently has no indigenous oil supplies and as things stand limited domestic production of sustainable fuels. All oil imports are transported by sea and placed on the market through an oil terminal. Taking this vulnerability into account, Ireland will continue to maintain existing policy measures and develop additional capacity to deal with an oil supply emergency, including:

- The ongoing maintenance of Ireland's strategic oil reserve of 90 days of net imports, stored in Ireland or within the EU, as required by EU legislation and IEA rules;
- Continued regional co-operation with Northern Ireland to ensure sufficient import capacity in the event of prolonged infrastructure disruption
- Continued development of demand restraint measures aimed at reducing oil usage during a prolonged emergency, in particular in the transport sector
- Further development of policy around Government intervention to ensure the supply of oil to critical infrastructure and for societal need, if required

2.4. Dimension Internal Energy Market

2.4.1. Electricity Interconnectivity

i. The level of electricity interconnectivity that the Member State aims for in 2030 in consideration of the electricity interconnection target for 2030 of at least 15%, with a strategy with the level from 2021 onwards defined in close co-operation with affected Member States, taking into account the 2020 interconnection target of 10% and the following indicators of the urgency of action:

1) **Price differential in the wholesale market exceeding an indicative threshold of EUR 2/MWh between Member States, regions or bidding zones;**
2) **Nominal transmission capacity of interconnectors below 30 % of peak load;**
3) **Nominal transmission capacity of interconnectors below 30 % of installed renewable generation.**

Each new interconnector shall be subject to a socioeconomic and environmental cost-benefit analysis and implemented only if the potential benefits outweigh the costs

Ireland's 2018 National Policy Statement on Electricity Interconnection emphasises the important role of interconnection in the transition to a low carbon energy future. Ireland's level of interconnection is currently reported by the European Commission as 7.4%. When the UK leaves the EU, Ireland will have no direct electrical interconnection with the rest of the EU. However, there are three interconnectors, all on the 4th PCI list, that are steadily maturing towards construction. Two will connect with the UK and the third with France. Their combined capacity will be 2,700MW and the last of the three is scheduled for energisation in 2026. The latest EirGrid Tomorrow's Energy Scenarios report also includes up to two additional interconnectors across three of its scenarios mapping out Ireland's non-generation flexibility mix need by 2040.

The Climate Action Plan 2019 states the importance of developing further interconnection to facilitate Ireland's 2030 target of 70% renewable electricity. However, due to the continuing uncertainty and challenging circumstances for Ireland around the UK's withdrawal from the EU, a national interconnection target has not yet been established.

2.4.2. Energy Transmission Infrastructure

i. Key electricity and gas transmission infrastructure projects, and, where relevant, modernisation projects, that are necessary for the achievement of objectives and targets under the five dimensions of the Energy Union Strategy

On 31 October 2019 the European Commission published the updated list of Projects of Common Interest (PCIs), the fourth such list, which is published on the EC website. PCIs are intended to help the EU achieve its energy policy and climate objectives: affordable, secure and sustainable energy for all citizens. There are five Irish electricity PCIs included in this fourth list, four interconnection PCIs and one new storage PCI together with one gas project and one Carbon Capture and Storage (CCS) project.

Table 12: Irish projects included on the fourth PCI list

PCI Number	Project Promoter	Project Title
1.6	EirGrid & Réseau de Transport d'Electricité (RTE)	France - Ireland interconnection (known as Celtic Interconnector)
1.9.1	Third party	Ireland – United Kingdom interconnection (known as Greenlink)
2.13.1	EirGrid & SONI	Ireland – United Kingdom interconnection (known as North-South Interconnector)
2.13.2	EirGrid & SONI	Ireland – United Kingdom interconnection (known as Renewable Integration Development Project, RIDP)
5.3	Shannon LNG	Shannon LNG Terminal and connecting pipeline
12.6	Ervia	Ervia Cork CCS Project
2.29	Third party	Hydroelectric Power Station Silvermines

The European Network of Transmission System Operators for Electricity (ENTSO-E) publishes a Ten Year Network Development Plan (TYNDP) every two years. The most recent TYNDP is TYNDP 2018. The TYNDP includes projects of pan-European significance. The Irish projects include the five electricity PCIs listed above and the following two projects:

Table 13: Irish projects included in TYNDP 2018

TYNDP Number	Project Promoter	Project Title
349	Third party	Marex Organic Power Interconnector
1030	Third party	Marex Organic Power Energy Storage

ii. Where applicable, main infrastructure projects envisaged other than Projects of Common Interest (PCIs)

To help plan and the develop energy networks for the future, both EirGrid and Gas Networks Ireland produce ten year network development plans. EirGrid also produces a ten year Generation Capacity Statement and a ten year All-Island Transmission Forecast Statement. These network development plans and statements are future looking documents that allow both EirGrid and Gas Networks Ireland (GNI) to assess the demand for and development of energy networks and related infrastructure in Ireland.

In addition to the PCI projects set out above and the projects developed by EirGrid and Gas Networks Ireland there are a number of private sector infrastructure projects which could enhance Ireland's energy security by increasing our import route diversity and also contribute to Ireland being able to meet the EU's gas "N-1" infrastructure standard on a national level.

In addition, as Ireland transitions itself to a low carbon economy, the gas and electricity networks must be planned and developed to make the transition as smooth as possible. As we make the transition the energy networks in Ireland will face many challenges. For example, as the penetration of electricity generated from wind increases the electricity network must be flexible to handle the unpredictability of wind while still operating in a secure manner. The increased penetration of wind energy also places an increased reliance on Ireland's gas network.

Following on from EU support to twin the final 50 km of the gas interconnector system from Scotland to Ireland, further work has commenced by Gas Networks Ireland to fully separate the two gas interconnectors which will further increase the resilience, flexibility and capacity of the gas system.

Every year the Commission for the Regulation of Utilities (CRU) holds a public consultation on Gas Networks Ireland's Network Development Plan and on EirGrid's Transmission Development Plan. The CRU's public consultation gives stakeholders the opportunity to express their views on the plans.

The Development Plans presents Gas Networks Ireland and EirGrid's views of the future needs of the gas and electricity networks in Ireland. It also presents plans to meet the needs of the network over a ten-year period. The Development Plans include, among other things, investment needs, planned network investment, supply and demand forecasts.

2.4.3. Market Integration

Reform of the Wholesale Electricity Market and Decarbonising the Electricity System

Ireland's recent wholesale electricity market redesign, together with other related initiatives, form an interlinked policy-aligned system of measures which underpin and facilitate greater renewable electricity penetration in Ireland and progressive decarbonisation of its wholesale electricity sector, and also ensure efficiency and security of electricity supply. Ireland's recent wholesale electricity market redesign, together with other related initiatives, form an interlinked policy-aligned system of measures which underpin and facilitate greater renewable electricity penetration in Ireland and progressive decarbonisation of its wholesale electricity sector, and also ensure efficiency and security of electricity supply. The new system comprises both policy and regulatory measures which can be grouped under three headings as follows:

- New wholesale electricity market rules ("I-SEM" project), recently launched and fully compliant with EU Third and Clean Energy packages
- A new competitive auction-based capacity mechanism in the wholesale market (fully compliant with state aid measures and Clean Energy package)
- Regulated TSO payments for system services known as DS3

These elements correspond to payment categories, or revenue streams, that the electricity industry can expect from the market, for energy, capacity and system services respectively. The implementation of reforms in these revenue streams provides industry with the certainty needed for them to invest and encourages this to happen in ways that also contribute to the goal of secure and efficient decarbonisation. These interlocking measures are designed to work together and reinforce each other and thereby facilitate delivery of energy policy goals over a sustained period, in line with typical electricity market investment time frames over decades, as opposed to a couple of years. It is important when considering Ireland's approach to decarbonising its electricity market to take these elements together as a coherent whole, rather than evaluate any one of market, capacity or system services measures separately.

Ireland's Wholesale Electricity Market – SEM and I-SEM

The Single Electricity Market (SEM) is the wholesale electricity market for the island of Ireland, regulated jointly by the national regulatory authority in Ireland, CRU, and its counterpart in Northern Ireland, the Utility Regulator (UR). By combining what were two separate jurisdictional electricity markets (for Ireland and Northern Ireland), the SEM became one of the first of its kind in Europe when it went live on 1 November 2007.

A new market design for the SEM, substantially different to the original 2007 design took place under the Integrated Single Electricity Market (I-SEM) Project which took over six years and went live on 1st October 2018 . This included the establishment of new Day-Ahead, Intra-Day and Balancing Markets, with an ex ante clearing price compared to the previous ex-post gross mandatory pool system, and a new obligation on participants to take responsibility for imbalances. This market redesign had the objectives of facilitating greater market integration through the application of internal energy market rules and enhancing competitive outcomes to benefit consumers. Finally it also had the objective of ensuring compliance with the network codes and guidelines developed under Regulation (EC) 714/2009 within the EU's Third Energy Package and with the principles of wholesale market design laid out in the Clean Energy Package, and in particular the recast electricity market regulation.

The new SEM market arrangements are delivering a range of benefits to Irish consumers and the energy system as a whole. For instance, more competitive trading arrangements facilitate better use of existing infrastructure assets in the electricity system, as highlighted by the significant increase in the efficiency of interconnector flows between the SEM and Great Britain (GB) since October 2018. Through the ability to trade closer to real time, the new market design is promoting the continued growth of renewable generation and decarbonisation of Irish power generation. This will facilitate swifter decarbonisation of power generation, thereby helping Ireland to meet its ambitious 70% renewables target contained in the Climate Action Plan published in June 2019, at lowest cost to consumers.

The New SEM Capacity Mechanism

In parallel with the I-SEM market design project, a new competitive capacity remuneration mechanism (CRM) was introduced, having been approved for State Aid by the European Commission in November 2017. As noted above, the CRM is an integral component, rather than an annex, of the new SEM design and facilitates continued decarbonisation of power generation on the island of Ireland, while maintaining system and resource adequacy. Concern over system security and the level of future long-term investment is particularly prevalent in the SEM due to the small size of the market, the large and rising volume of

intermittant renewable energy on the island of Ireland, and the proportionally large generation sets in the SEM, with its limited high voltage direct current (HVDC) interconnection.

The value of capacity in the market under the new CRM is now determined through competitive auction, with penalties for generators in receipt of reliability option payments that are unavailable to produce when required by the TSO. A number of successful auctions have already taken place under the new CRM, which in addition to securing necessary future capacity have facilitated future investment in the flexible generation, demand side participation and battery storage required to complement Ireland's high and rising volume of renewables generation.

The recast Electricity Market Regulation requires Member States with capacity mechanisms to carry out certain tasks, depending inter alia on whether the Member State intends to have, or already has, in place a capacity mechanism and, if the latter, on the timing of its capacity auctions. This includes the submission of an Implementation Plan containing timelines for adopting measures to eliminate any identified regulatory distortions or market failures causing resource adequacy concerns. In December 2019 Ireland submitted its draft Implementation Plan for Commission opinion. The Commission will issue its opinion on this plan in the coming months and may invite Ireland to amend the implementation plan. Ireland will produce and publish an annual report monitoring the application of the implementation plan, and submit this to the Commission, in accordance with the requirements of the Regulation.

DS3 System Services

Due to Ireland's isolated island status and the dramatic increase in wind penetration levels in recent years, the level of non-synchronous power on the SEM system has risen at a faster rate than in any other region in Europe over this timeframe. In order to address some of the potential problems resulting from these unprecedented levels of intermittent renewables, the DS3 Programme was established by the Single Electricity Market Committee (SEMC) to provide for the introduction of a number of new system services by the TSOs, EirGrid and SONI, to ensure a safe and secure energy system, while also facilitating increased levels of non-synchronous generation (primarily renewables). To date, the DS3 Programme has enabled EirGrid and SONI to increase levels of instantaneous system non-synchronous penetration (SNSP) from 50% to 65%, with the aim of increasing this incrementally to 75% in 2020. The DS3 programme has therefore been overwhelmingly successful in facilitating the integration of renewables on the SEM system, which in terms of SNSP is unprecedented.

Given the relatively recent launch of both the wholesale market rules and the associated capacity mechanism as well as the ongoing development of the system services programme, the priority for the next number of years is to “bed down” these recent new market arrangements and allow a sufficient period for them to be applied and deliver results and benefits, rather than countenance any second such fundamental market reform programme. Specifically, the tasks to be addressed in this process of “bedding down” fall into the following areas:

- new market rules (I-SEM) implementation issues
- adjustments to the capacity mechanism, specifically to meet requirements of the State aid approval
- Changes in the wholesale electricity market from Implementation of the Electricity Regulation

i. National objectives related to other aspects of the internal energy market such as increasing system flexibility, in particular related to the promotion of competitively determined electricity prices in line with relevant sectoral law, market integration and coupling, aimed at increasing the tradeable capacity of existing interconnectors, smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, re-dispatching and curtailment, and real-time price signals, including a timeframe for when the objectives shall be met

Ireland’s national objective relating to the EU internal energy market is, and has been over the long term, to continue to deepen the integration of Ireland’s wholesale electricity market, and its regulation, with the EU internal energy market (IEM), building on well-known ongoing plans, programmes and actions in this regard. As has been the position for many years, it is the objective of Ireland to participate and contribute in the continued development of the EU IEM, and remain coupled with other EU electricity markets to as great an extent as possible.

From the market regulation perspective, the main elements of the objective consist of:

- Maintaining and developing the successful all island wholesale Single Electricity Market, or SEM, to include ensuring that all aspects of the new I-SEM market, the capacity mechanism and other planned/signalled reforms are fully implemented, over the next few years
- Implementing the requirements of the Third Energy package Network Codes and Guidelines and the Electricity Regulation and Directive of the Clean Energy Package (CEP) in the Irish electricity and gas markets

- Ensuring continued compliance of Ireland's SEM capacity mechanism with the obligations in the CEP and in the European Commission's November 2017 State Aid approval
- Designing and implementing the next phase of the DS3 System Services programme to provide enhanced system flexibility to accommodate increased renewables on the electricity system

The new market and its associated capacity mechanism were launched in October 2018. Developing and implementing the new market design was a huge project, entitled the I-SEM project, taking over six years, involving considerable input from the Department; Regulators; the TSOs and industry. Many of the objectives listed above in relation to the internal energy market, such as market integration and coupling, aimed at increasing the tradable capacity of existing interconnectors, smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, re-dispatching and curtailment, and real-time price signals were addressed in the new I-SEM market design and are either already implemented, or being implemented, by the regulators and TSOs as part of that process or are being addressed as part of the implementation of the Electricity Regulation in the SEM, again by the regulators and the TSOs.

As regards a national objective for "the promotion of competitively determined electricity prices" it should be noted that retail price regulation by the regulator, the CRU, ceased in the electricity market in 2011 and in the gas market in 2014. The development of competition for the benefit of final consumers is a regulatory function, formally expressed in legislation since 2011, with various regulatory actions and initiatives, including analysis and publications, having been progressed over recent years. These are further detailed in section 2.4.3(v) below and in the associated policies and measures section.

Ireland welcomes the completion of the CEP and is fully committed to implementation of these ambitious and far reaching legislative files over the coming years, with a view to increasing power generation decarbonisation. It is important to note the scale and depth of reforms to the SEM already implemented or in the process of being implemented under the I-SEM project and its associated capacity mechanism, required a significant effort from the regulators, TSOs and industry. As a result of the design and implementation of the I-SEM arrangements, the SEM's new market design is compliant in many aspects with the principles for the design and operation of electricity markets outlined in the CEP's recast electricity market regulation. Meeting the remaining associated additional requirements is now the objective for the SEM and doing so will assist in meeting the ambitious 70% renewables target set out in the Climate Action Plan.

The Climate Action Plan 2019 contains measures requiring EirGrid to continue the roll out of its multi-year DS3 programme. This work programme includes enhancing generation portfolio performance, developing new operational policies and system tools to efficiently use the generation portfolio to the best of its capabilities and regularly reviewing the needs of the system as the portfolio capability evolves. As these challenges are being encountered on the island of Ireland before they become critical for larger electricity systems elsewhere, Ireland and Northern Ireland have the opportunity to lead the way in the integration of renewable generation.

ii. Where applicable, national objectives related to the non-discriminatory participation of renewable energy, demand response and storage, including via aggregation, in all energy markets, including a timeframe for when the objectives are to be met

Participation in the day-ahead, intra-day and balancing markets introduced under the I-SEM project is already non-discriminatory for all market participants, including renewables, Demand Side Units (DSU) and battery storage. In addition, it should be noted that all technologies are permitted to participate in the new SEM capacity mechanism which received State Aid approval from the European Commission in November 2017. Therefore, no national objective as regards participation in the various timeframes would appear to be relevant.

As part of the overall process of implementing the CEP, new rules regarding dispatch and priority dispatch contained in the recast electricity market regulation will be implemented.

As regards demand response, Ireland has historically witnessed a relatively inflexible electricity demand profile, largely part due to the small proportion of heavy industry in the domestic economy compared to other European economies. There has been a sharp rise in demand-side participation in the capacity auctions in the new SEM market, which evidence suggests is attributable to greater investment certainty provided by the all-island market's new CRM, according to the Irish TSO. Noting the important role that can be played by active demand towards meeting future decarbonisation goals, this is a welcome development. It should be noted that time bound commitments with regard to DSU participation entered into under the terms of the EU Commission's State Aid ruling are scheduled to be rolled out by the CRU over the coming years.

iii. Where applicable, national objectives with regard to ensuring that consumers participate in the energy system and benefit from self-generation and new technologies, including smart meters

Ireland is committed to supporting customers' participation in the energy system and enabling them to sell excess electricity they have produced back to the grid. In this regard, we have established the following key objectives:

Smart Meters

- As set out in the Climate Action Plan 2019, smart-ready electricity meters will be installed in every house by 2024
- The rollout will occur in a structured and phased basis, commencing with an initial delivery of 250,000 meters between September 2019 and the end of 2020 and a further 500,000 meters every year from 2021 to 2024
- The delivery plan will phase in smart services from 2021 giving consumers more choice and information, enabling them to be more proactive in their use of electricity and save money

Micro-Generation

- Deliver pilot solar photovoltaic (PV) micro-generation scheme with a view to commencement of an enduring support scheme by 2021 to ensure that people can sell excess electricity they produce back to the grid
- Develop an enabling framework for micro- generation which tackles existing barriers and establishes suitable supports within relevant market segments
- Deliver the Smart Metering Programme in line with current planned timelines that will support the market for micro-generation

Route to Market for Renewable Energy Generation

- Design and implement the RESS. Increase the volumes and frequencies of RESS auctions to deliver on the 70% renewable electricity target by 2030 ensuring an appropriate enterprise/community mix to achieve an efficient delivery of renewables
- Ensure that 15% of electricity demand is met by renewable sources contracted under Corporate Power Purchase Agreements (CPPAs)

Regulatory Streamlining of Renewables and Grid Development

- Ensure that the network operators (Electricity Supply Board (ESB) Networks and EirGrid) plan network and deliver on connecting renewable energy sources to meet the 2030 70% RES-E target
- Ensure that renewable electricity grid connection policy is fit for purpose to deliver on renewable energy targets and community projects, and report annually on the timeliness of grid connection
- Facilitate additional hybrid connections (e.g. solar/wind/batteries) operating in the electricity market to increase RES-E penetration
- Implement energy actions under the Government Statement on the Role of Data Centres in Ireland's Enterprise Strategy to ensure that large demand connections are regionally balanced to minimise grid reinforcements
- The revised updated planning guidelines for onshore wind energy development were issued for public consultation in December 2019
- Further consider facilitation of private networks/direct lines
- Assess the network development required to integrate higher levels of RES-E and develop a high-level network development plan to (and beyond) 2030
- Facilitate very high penetration of variable renewable electricity by 2030 (both SNSP and average) through system services and market arrangements

iv. National objectives with regard to ensuring electricity system adequacy, as well as for the flexibility of the energy system with regard to renewable energy production, including a timeframe for when the objectives are to be met

A core objective of changes to market trading rules introduced in recent years has been to facilitate a more flexible energy system, with increased efficiency of cross border trade across interconnectors and the additional volumes of renewables, DSU and storage required to facilitate power generation decarbonisation. In addition, a more flexible energy system, which can integrate higher volumes of renewables onto the grid, is paramount to meeting the ambitious goals outlined in the Climate Action Plan.

The new SEM's State Aid approved CRM is considered crucial for system adequacy on the island of Ireland. It is important to note that in addition to procuring necessary capacity, the auctions that have so far taken place under the SEM CRM since November 2017 have delivered investment in the future flexible generation, demand-side response, and battery storage. Apart from maintaining the mechanism in line with market lifecycles and needs assessment, the objective in respect of the capacity mechanism is to ensure continued

compliance with the obligations in the European Commission's State Aid approval ruling of November 2017, as well as compliance with Chapter IV of the Clean Energy Package recast Electricity Market Regulation.

As regards flexibility, the DS3 Programme will remain key to achieving a more flexible Irish energy system with the objective of raising the already record breaking levels of intermittent generation penetration in the SEM from the current 65% to 75% by 2020. The Climate Action Plan contains a number of actions and timelines for the Irish TSO and NRA, as well as the Department of Communications, Climate Action and Environment (DCCAE), to ensure enhancement of Ireland's highly successful DS3 programme. One of these actions includes technical analysis by EirGrid to identify impediments to managing a real time operational limit of over 90% SNSP by 2030.

v. Where applicable, national objectives to protect energy consumers and improve the competitiveness of the retail energy sector

Consistent with European energy regulation policy, the electricity and gas markets in Ireland are commercial, liberalised, and competitive. The CRU ended its regulation of retail market prices for electricity in 2011 and for gas in 2014. The position of successive Governments is that competitive energy markets result in greater choice for consumers and businesses, in terms of suppliers, products and prices. Government policy on energy costs is focused on supporting the competitive market to drive down prices.

While electricity and gas retail market prices are no longer regulated, the CRU has a statutory obligation to closely monitor electricity and gas retail markets to ensure that competition continues to develop.

Regarding future national objectives, the CRU will continue to monitor the retail market to ensure that final customers are benefiting from competition in the supply of electricity and gas, as per its statutory functions set out in SI 630/2011. This S.I. sets out CRU's oversight of the development of competition, wider market monitoring, dispute resolution and enforcement functions. The CRU also has a statutory responsibility for customer protection under S.I. 463 2011. This S.I. sets out national consumer protection objectives to protect energy customers specifically addressing matters relating to vulnerable customers, customer charters, codes of practice for consumer protection, dispute resolution, single points of contact for information, and enforcement powers for CRU.

In addition, it is a priority objective to transpose and implement the CEP Directive on the common rules for the internal market in electricity noting in particular the provisions in Chapter 3 relating to consumer empowerment and protection. This includes providing more information to the consumer to enable informed decisions about their market participation.

This is to be done by requiring further information to be available on consumer contracts and energy bills, and also by providing consumers with accurate price comparison tools which will enable informed switching decisions. Additionally, the Directive provides that consumers should have access to smart meters which will provide up-to-date and accurate data, but which will not jeopardise their privacy with regards to personal information. These smart meters should also not be a barrier to supplier switching, and all consumers should be able to freely switch suppliers without incurring switching related fees.

The Directive also calls for regulatory frameworks to be developed for independent aggregators and for demand response along principles that enable their full participation in the market.

2.4.4. Energy Poverty

Where applicable, national objectives with regard to energy poverty, including a timeframe for when the objectives are to be met

Ireland's Strategy to combat energy poverty is the current policy on alleviating energy poverty which sets out current objectives in relation to energy poverty. The strategy aims to alleviate the burden of energy poverty on the most vulnerable in society through actions focused on improving the efficiency of homes, supporting lower income households with their energy costs and minimising the costs to consumers associated with action on climate change and with ensuring security of supply. The strategy is due to be reviewed in 2020 and new objectives will be set then, where appropriate.

Analysis conducted in 2016 indicated that 28% of Irish households were at risk of energy poverty. In 2019 this had reduced to 17.4%. Research carried out by the Economic and Social Research Institute in Ireland has found that, in Ireland, energy poverty is not a distinct type of deprivation. In other words, households that experience basic deprivation and households that experience fuel poverty are one and the same. In order to target households in fuel poverty, it is appropriate to target households in poverty.

Ireland has an overall target to reduce consistent poverty to 2 per cent or less by 2020. We also have a target contribution to the EU 2020 Poverty target to lift at least 200,000 people out of 'combined poverty' (i.e. the combination of consistent poverty, at-risk-of-poverty and basic deprivation) between 2010 and 2020.

2.5. Dimension Research, Innovation and Competitiveness

i. National objectives and funding targets for public and, where available, private research and innovation relating to the Energy Union, including, where appropriate, a timeframe for when the objectives are to be met

Given the level of Ireland's ambition regarding reduction of greenhouse gas emissions new technologies must be developed and deployed in the coming years.

A key metric for the assessment of innovation activity is Research & Development (R&D) intensity (R&D expenditure as a percentage of Gross National Product (GNP)) which reflects the extent of research and innovation activities undertaken in a country in terms of resources input. Ireland's Research, Development and Innovation (RDI) intensity rate is estimated at 1.46% (€3,396bn) of GNP for 2017, unchanged from the rate of 1.46% (€3,243bn) of GNP in 2016 and reduced from 1.56% (€3,131bn) in 2015. Since the publication of Innovation 2020 in 2015, direct Exchequer funding of RDI (GBARD) has increased from €736m in 2015 to an estimated €751.7m in 2018. This is the highest level of public expenditure on RDI since 2012. Despite the gradual reduction in the RDI intensity rate, GBARD has managed to prevail consistently at around 1% of total Government expenditure since 2011.

Overall expenditure on RDI (GERD) has increased from €3.13bn in 2015 to an estimated €3.4bn in 2017, an increase of €270m. GERD has increased year on year since committing to the Europe 2020 target, with an overall increase of €700m since 2011.

However, reaching the 2.5% of GNP intensity rate target presents a very significant challenge. In 2017 our GNP intensity level stood at an estimated 1.46% of GNP, down from 1.99% in 2012. Even when using GNI* as a complementary indicator (GNI* removes globalisation impacts on the Irish economy), the RDI intensity rate is estimated at 1.87% for 2017. This is in part due to the strength of our economic performance and subsequent increases in GNP growth rates year on year over the last number of years. Our challenge is to increase the level of investment in RDI to keep pace with GNP growth rates.

Innovation 2020 is Ireland's five-year strategy on research and development of science and technology. Innovation 2020 sets out the roadmap for continuing progress towards the goal of making Ireland a Global Innovation Leader, driving a strong sustainable economy and a better society. Innovation 2020 recognises energy as one of six enterprise themes which are of particular importance to Ireland, and calls for greater use of RDI funding to find solutions to pressing societal challenges in areas such as energy.

Ireland's overall level of public investment in R&D as measured by R&D intensity is low relative to the target set by the European Commission. In addition, analysis by the

International Energy Agency indicates that Ireland's public investment in energy R&D is one of the lowest in the OECD. In order to address this, DCCAE intends to increase in a stepwise fashion public funding for the SEAI National Energy Research Development & Demonstration (RD&D) Funding Programme. This funding will supplement the funding provided to the Prototype Development Fund, and other national initiatives funded by other Government Departments. This funding will allow DCCAE's national energy authority (SEAI) to instigate new initiatives, expand current activities, develop strategic collaborative partnerships with national & international organisations and further strengthen the capacity of the energy RD&D system in Ireland. This increased investment in energy RD&D will also assist Ireland in meeting its medium and long term low-carbon transition targets & obligations and will unlock enterprise opportunities for Irish businesses.

ii. Where available, national 2050 objectives related to the promotion of clean energy technologies and, where appropriate, national objectives, including long-term targets (2050) for deployment of low-carbon technologies, including for decarbonising energy and carbon-intensive industrial sectors and, where applicable, for related carbon transport and storage infrastructure

Ireland supports the emerging ambition to achieve a net zero target across the EU by 2050. This plan commits to evaluate in detail the changes required to adopt such a goal in Ireland. Ireland has sought a pathway to 2030 which would be consistent with a net zero target by 2050. In order to meet these targets, it is possible that residual emissions in some sectors may need to be balanced by negative emissions technologies in energy systems and increased levels of afforestation.

Ireland's 2019 Climate Action Plan puts in place a decarbonisation pathway to 2030 that is consistent with the adoption of a net zero target in Ireland by 2050. The Plan also commits to evaluating in detail the changes which would be necessary in Ireland to achieve this target. It also outlines an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise on national capacity for sustainable food production. The first action in this Climate Action Plan is to evaluate in detail the changes required to adopt a more ambitious commitment of net zero greenhouse gas emissions by 2050. This aims to finalise Ireland's long-term climate strategy by the end of 2019, as per the advice of the Intergovernmental Panel on Climate Change and the recommendation of the Joint Oireachtas Committee on Climate Action, which will help formulate the objectives for the 2050 plan.

The societal benefits of research and innovation are both significant in scale and wide-ranging. Research & innovation play a key role in addressing global and national challenges,

and improving quality of life in all sectors and segments of Ireland's economy and society. Ireland's National Development Plan launched four new 'Project Ireland 2040' funds, comprising the Climate Action Fund, Disruptive Technologies Innovation Fund, the Urban Regeneration and Development Fund, and the Rural Regeneration and Development Fund. These funds will have a collective budget amounting to an estimated €4bn over the ten-year period of Project Ireland 2040. Each of the four funds has been established to pursue distinct objectives, which must also be aligned with the strategic investment priorities and the National Strategic Outcomes of Project Ireland 2040. Whilst three of the funds are not specifically aligned with climate action, the Climate Action Fund is fully dedicated to activities of relevance to Ireland's NECP. The Climate Action Fund will fund initiatives that contribute to the achievement of Ireland's climate and energy targets in a cost-effective manner. It offers the potential for innovative interventions which in the absence of support from the fund, would not otherwise be developed.

There is a need to ensure that the best scientific evidence and advice is available to underpin Government policy and support the actions in Ireland's NECP. Ireland has strategically programmed and built a strong energy and climate science research and innovation infrastructure in recent years, with funding provided to Ireland's research performing organisations to carry out science and policy-relevant research. The update to national research priorities for 2018 to 2023 reflects the increased urgency of the need to address climate change, with a new research priority theme focusing on Energy, Climate Action and Sustainability, and two priority areas concentrating on decarbonising and sustainable living and also smart and sustainable food production and processing.

The National Energy RD&D and Ocean Energy Prototype Development Funding Programmes fund the deployment of research, development & demonstration stage energy/low-carbon technology pilot facilities. This funding aims to stimulate and accelerate the development & deployment of energy/low-carbon technology related products, processes and systems in the Irish marketplace, to grow Ireland's national capacity to carry out internationally leading RD&D activities; and to support solutions that enable technical & other barriers to market uptake of energy/low-carbon technology related products, processes & systems to be overcome. Through Ireland's active participation in Europe's SET-Plan Steering Group and within individual SET-Plan Implementation Groups, research calls are aligned with SET-Plan priorities. This enables better alignment of Irish research priorities with research and innovation programmes both at EU level and across other member states. This also increases co-operation between national programmes to avoid duplication of research.

The EPA's Research Strategy 2014-2020 is framed by the need for Ireland to transition to a carbon neutral, low-emission and climate-resilient economy and society by 2050, and will become a source of climate change information and solutions. An interim review of this programme is underway and will inform the remainder of the current programme, as well as the development of a new programme for post-2020.

Electricity Infrastructure: Ireland's Climate Action Plan commits to achieving the following goals by 2030:

- Reduce CO_2 eq. emissions from the sector by 50–55% relative to 2030 Pre-NDP projections
- Deliver an early and complete phase-out of coal- and peat-fired electricity generation
- Increase electricity generated from renewable sources to 70%, indicatively comprised of :
    - at least 3.5 GW of offshore renewable energy
    - up to 1.5 GW of grid-scale solar energy
    - up to 8.2 GW total of increased onshore wind capacity
- Meet 15% of electricity demand by renewable sources contracted under Corporate PPAs

A number of major electricity infrastructure upgrades/extensions are planned or are in progress, including the North-South Interconnector Project (new 400kV line connecting Ireland and Northern Ireland); the West Dublin Project (220/110kV substation installation connecting to an existing 220kV double circuit line) to meet local demand for electricity; the Laois/Kilkenny Project (new 400/110kV substation near Portlaoise looped into an existing 400kV and 110kV line, connected to a new 110/38kV substation in Kilkenny by new 110kV lines); and the Celtic Interconnector. EirGrid estimates that implementation of the Climate Action Plan targets will require a €2bn investment in the electricity network.

Transport Infrastructure: Ireland's Climate Action Plan commits to achieving the following goals by 2030:

- Reduce CO_2 eq. emissions from the sector by 45–50% relative to 2030 pre-NDP projections
- Increase the number of EVs to 936,000, comprised of:
    - 840,000 passenger EVs
    - 95,000 electric vans and trucks

    - 1,200 electric buses
- Build the EV charging network to support the growth of EVs at the rate required, and develop our fast-charging infrastructure to stay ahead of demand
- Require at least one recharging point in new non-residential buildings with more than 10 parking spaces
- Raise the blend proportion of biofuels in road transport to 10% in petrol and 12% in diesel

Storage infrastructure: The only large scale energy storage device in Ireland is a pumped hydro station at Turlough Hill, consisting of 4 x 73MW generators, and with a storage capacity of 1750MWhrs. The Government's Energy Policy (White) Paper, Ireland's Transition to a Low Carbon Energy Future 2015-2030, states that Carbon Capture and Storage (CCS) is recognised as a potential bridging technology that could support the transition to a low carbon economy. Ireland adopted a 5-year CCS review process, which will inform any decision to commit resources to put regulatory and permitting systems in place. Ireland's National Mitigation Plan 2017 includes a specific action for DCCAE to carry out an exploration of the feasibility of utilising suitable reservoirs for CO_2 storage.

Support for Deployment of Low-Carbon Technologies in Ireland: The SEAI technology team provides energy/low carbon technology sector market support and technology-related policy support to DCCAE. It covers areas such as wind & electricity, heat & bioenergy, solar, ocean and smart grids. The group develops technology roadmaps (informed by SEAI modelling), promotes the growth of relevant supply chains, represents Ireland in technology fora, develops guidance relevant to technology sub-sectors for suppliers, installers, manufacturers and consumers, and supports critical supply chain development, often in collaboration with partner state agencies such as the Industrial Development Authority of Ireland (IDA Ireland) and Enterprise Ireland.

In 2020 SEAI plans to carry out a detailed technology analysis of each energy/low carbon technology which will be required to meet Ireland's long-term targets. This modelling will assist with the targeting of energy research & innovation investment prioritisation with a view of achieving targets in 2030 and 2050, with a view of building capacity in the energy research & innovation system in Ireland, and developing enterprise opportunities. It will then analyse the RD&D readiness of technologies against what research resources are available and identify any gaps for these technologies and how targeted mission-oriented RD&D can fill those gaps. Technologies identified as ready for market deployment will be analysed to identify their respective resources and any gaps that may need to be addressed to support

mass deployment of that technology to help Ireland achieve it 2030 and 2050 target and objectives. Finally, for mature technologies SEAI will continue to examine how it can maximise supply chain opportunities.

iii. Where applicable, national objectives with regard to competitiveness

Ireland's National Competitiveness Council (NCC) reports to the Irish Government on key competitiveness issues facing the Irish economy and provides recommendations on policy actions required to enhance Ireland's competitiveness position. Details in this section are drawn from Ireland's Competitiveness Challenge 2019 report, published in December 2019. The report identifies a range of recommendations that address both immediate competitiveness issues, and more medium-term challenges aimed at enhancing Ireland's competitiveness and productivity performance. The report notes that climate change presents a deeper, more existential, threat to Ireland that goes beyond Ireland's economy and competitive position. Climate disruption is already having diverse and wide-ranging impacts on Ireland's environment, society, and economy. Looking to the future, the NCC intends to move the publication of the Competitiveness Challenge to an earlier point in the calendar year so that the recommendations can be better integrated into the European Semester process. Structural reforms that focus on promoting growth and employment in line with the Europe 2020 strategy, and that increase productivity and growth potential in the member states are an integral part of addressing the economic challenges facing Ireland and the EU.

Competitiveness is a multidimensional concept incorporating many interlinked and interdependent factors. Reflecting this complexity, Ireland's Competitiveness Scorecard analyses over 170 measures, each of which articulates an aspect of Ireland's competitiveness performance. Competitiveness performance reflects the interaction of a wide range of factors that, combined, determine the ability of firms to compete successfully in international markets. Ireland's performance across several international competitiveness indices has improved in recent years.

The 2019 World Economic Forum Global Competitiveness Report showed Ireland ranked 24th most competitive economy out of 141 countries. The World Bank's 2017 Ease of Doing Business report placed Ireland 23rd out of 190 economies. The 2018 Globalisation Report ranks Ireland the most globalised economy in the EU. Exports and Imports as a percentage of GDP were 120 per cent and 88 per cent respectively in 2017. Trade as a proportion of GDP in Ireland is significantly above Euro area and OECD averages.

3. Policies and Measures

3.1. Dimension Decarbonisation

3.1.1. GHG Emissions and Removals

i. Policies and measures to achieve the target set under Regulation (EU) 2018/842 as referred in point 2.1.1 and policies and measures to comply with Regulation (EU) 2018/841, covering all key emitting sectors and sectors for the enhancement of removals, with an outlook to the long-term vision and goal to become a low emission economy and achieving a balance between emissions and removals in accordance with the Paris Agreement

Building on the policy framework of the National Mitigation Plan and Project Ireland 2040, the Government published its Climate Action Plan in June 2019. The Plan identifies how Ireland will achieve its 2030 targets for greenhouse gas emissions which is also consistent with a trajectory to achieve net zero emissions by 2050. The Plan sets out over 180 actions, together with hundreds of sub-actions that need to be taken and embraces every relevant sector: electricity, enterprise, housing, heating, transport, agriculture, waste, and the public sector.

The Plan, which is to be annually updated and reported on quarterly, also includes actions to ensure that citizens become engaged and mobilised to take climate action, while ensuring that the necessary societal and economic transition that we have to make is fair, both in Ireland and globally. A National Dialogue on Climate Action had already been established to provide an opportunity to create awareness, engagement and motivation to act (locally, regionally and nationally) in relation to the challenges presented by climate change, and create structures and information flows to facilitate people gathering to discuss, deliberate and achieve consensus on appropriate responses to these challenges as well as enable and empower appropriate action. The Plan takes into account the outcomes from the examination of the issue of climate action by the “Citizens' Assembly" as well as the work of the All-Party Committee on Climate Action. A Climate Action Delivery Board has been established to ensure coordination and accountability across Government on the various actions and to focus effectively on timely implementation.

Reflecting the central priority of climate change in our political and administrative systems into the future, the Plan sets out new governance arrangements including carbon-proofing our policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Parliament. A new legal framework will drive the

definition of targets and the governance process. In early 2020, the government published the general scheme of a new Climate Action Bill that will provide an unprecedented national legal basis for the setting of mitigation targets and the governance of climate policy. Under the proposed legislation, Ireland will adopt five-year carbon budgets at the national level following recommendations by a strengthened, statutorily independent Climate Action Council. Three five-year budgets (i.e. up to 2035 in the first instance) would be approved by the Government and by the Dáil. In addition, the Government is proposing to set target ranges and trajectories for each sector within the overall carbon budget. It is proposed that considerations, such as distributional effects and cost effectiveness, will be taken into account in the establishment of budgets and target ranges on the basis of criteria to be set out in the legislation. The governance of the plan will follow the approach successfully applied in the Action Plan for Jobs. A very detailed list of actions and measures are assigned at Department level and implementation will be monitored and reported on a quarterly basis under the supervision of the Department of the Taoiseach.

Some of the key measures set out in the Plan include:

- Trajectory of carbon pricing to create behavioural change and avoid locking in carbon intensive technologies
- Establish a system of 5-year carbon budgets and sectoral targets
- Carbon proofing all government decisions and major investments
- Establish a Just Transition Review Group
- Every public body to adopt a Climate Action Mandate
- A new Climate Action Act which will include a 2050 target
- Establish a parliamentary Standing Committee on climate action
- Eliminate non-recyclable plastic and impose higher fees on the production of materials which are difficult to recycle, implement measures to ban single-use plastic plates, cutlery, straws, balloon sticks and cotton buds
- Increasing the penetration of renewable electricity to 70%
- Phasing out coal and peat fired generation
- Putting in place a coherent support scheme for micro-generation with a price for selling power to the grid
- Setting stricter requirements for new buildings and substantial refurbishments
- Designing policy to upgrade 500,000 homes to BER B2

- Building a supply chain and a model for aggregation where home retrofits are grouped together
- Accelerating the penetration of electric vehicles into sales of cars and vans and deliver a nationwide charging network
- Expanding the network of cycling paths and "Park and Ride" facilities
- Making growth less transport intensive through better planning, remote working and modal shift
- Deliver substantial verifiable GHG abatement through adoption of a specified range of improvements in farming practice in line with recommendations from Teagasc
- Promoting the increased use of domestic harvested wood in longer lived products, which will enhance the storage of carbon in these products and act as a substitute for materials with a higher carbon intensity.
- Deliver expansion of forestry planting and soil management to ensure that carbon abatement from land-use is delivered in 2021-30 and in the years beyond; and
- Support diversification within Agriculture and land use to develop sustainable and circular value chains and business models for lower carbon intensity farming

The following sections provide an overview of the various actions covering all key emitting sectors.

Electricity Generation

Energy is indispensable to contemporary social and economic functioning, while energy policy seeks to balance the sometimes competing aspects of sustainability, competitiveness and security of supply. Given the scale, scope and extent of energy use, it inevitably has significant environmental aspects including greenhouse gas emissions arising from power generation, heating and transport. Harnessing Ireland's renewable energy resources will play a key role in the transition towards a sustainable, secure and competitive energy system. A key sector in this transition is electricity generation which since 2005, has been subject to the EU's ETS.

While representing just under a third of emissions from the energy sector, electricity has been an area of considerable decarbonising success and a target area for future progress. Under the Renewable Energy Directive 2009/28/EC, Ireland is legally bound to deliver 16% of its final energy requirements from renewable sources by 2020. Ireland has committed to meeting this overall renewable target by achieving 40% renewable electricity, 12%

renewable heat and 10% renewable transport by 2020. Some of the key actions for the Electricity Generation sector include:

- Increase electricity generated from renewable sources to 70%, underpinned by the Renewable Electricity Support Scheme (RESS)
- Streamline consenting and connection arrangements
- Phase-out of coal and peat-fired electricity generation
- Introduce a support scheme for micro-generation
- Facilitate community participation in renewable generation under the Renewable Electricity Support Scheme
- Provide funding supports for new technologies onshore and off-shore
- Ensure that 15% of electricity demand is met by renewable sources contracted under Corporate PPAs
- Deliver Smart Metering Programme in line with current timelines
- Support the ocean energy research, development and demonstration pathway for emerging marine technologies and associated test infrastructure

Built Environment

Improving energy efficiency is central to the transition to a low carbon economy. Using less energy, and using it in a more flexible way, is the most cost-effective and accessible way to tackle climate change. This is why conserving energy is the first step to take in the process of decarbonising the built environment. In addition, the more energy use is reduced through efficiency measures, the lower the effort required to achieve renewable energy targets.

The Energy White Paper recognises that in terms of energy efficiency, attaining the objective of a low carbon future will involve radically changing behaviour as citizens, industry and Government and becoming significantly more energy efficient. Energy efficiency upgrades to the fabric of buildings by for example, carrying out works such as insulation and airtightness reduces the amount of energy needed for heating and cooling and reduces the CO_2 emissions connected with our energy use in those homes and workplaces. However, this is just the first step. To actually decarbonise the built environment, the switch from using fossil fuel as the source for the energy used in buildings to alternative energy sources will be vital.

There are two main options for switching away from fossil fuels: renewable fuels such as biomass or electrification of heat using technologies such as heat pumps. However, it is critical that the fabric of a building is upgraded first so that the desired levels of comfort and

function are maintained in homes and workplaces when a less energy intensive renewable energy system is then used. The principle of 'fabric first' is now embedded in existing support for energy efficiency upgrades and will continue to define the ongoing development of measures to combine energy efficiency improvements with the fuel switching necessary to make real progress on decarbonising Ireland's built environment. Some of the key actions for the Built Environment sector include:

- Stricter requirements for new buildings and substantial refurbishments
- Design policy to upgrade 500,000 homes to B2 Building Energy Rating (BER)
- Install 600,000 renewable energy heating sources
- Build a supply chain and a model for aggregation where home retrofits are grouped together to allow this level of activity to be funded and delivered
- Develop a plan to ensure that the grant schemes, new finance models and the delivery system are effectively integrated
- Skill-up current contractors/other industry players in deep retrofit, NZEB and new technology installations
- Develop a policy framework for the development of district heating
- Increase the number of Sustainable Energy Communities to 1,500
- A target of 30% reduction in CO_2eq emissions by 2030 and a 50% improvement in public sector energy efficiency
- Increase attention to Energy and Carbon ratings in all aspects of managing property assets

Transport

Moving to a low carbon society represents a significant challenge for Ireland's expanding transport sector where the use of fossil fuels is firmly embedded in driving culture and travel demand is increasing in response to population and economic growth. To address the challenge of transitioning from conventionally fuelled vehicles to alternative fuels and technologies an ambitious national target was established whereby all new cars sold in Ireland will be zero carbon emission or zero emission-capable by 2030 as well as many of our public transport buses and rail lines. The ultimate aim is to decarbonise the national passenger car fleet by 2050 and increase the use of alternative fuels in the freight sector.

A mix of further measures, developments and initiatives will be needed to continue to respond to the climate challenge into the future. New technology deployment and

behavioural change initiatives need to be advanced across the transport sector, stimulating changes to the way people travel and the types and amounts of fuels that are used. Further measures being progressed are the implementation of the National Planning Framework, which aims to ensure better integration of land use and transport planning policy in order to reduce commuter travel demand and support more efficient patterns of development and travel; increasing public transport capacity and securing a shift, where feasible alternatives exist, away from private car use; encouraging the take-up of alternative fuels to petrol and diesel; and the increase of the obligation under the Biofuels Obligation Scheme to further reduce the concentration of high-emitting fuels. In addition, the potential role of taxation, the impact of eco-driving and driving behaviours are all also being examined and advanced.

Alongside national policy objectives, the transport sector is also bound by certain commitments at EU level. The Renewable Energy Directive specifies a legally binding 10% renewable energy in transport target to be achieved by all Member States by 2020. The Biofuels Obligation Scheme is the primary mechanism being deployed to achieve this target by 2020. Progress is being made in increasing the share of renewable energy in Ireland's transport energy. By end 2017 this share was 4.1% or 7.4% as applied in accordance with the Directive. Some of the key actions for the Transport sector include:

- Accelerate the penetration of electric vehicles so that 936,000 will be on the road by 2030, underpinned by policy tools such as vehicle and fuel taxation measures, and a strong carbon tax trajectory
- Make growth less transport intensive through better planning as set out in the National Planning Framework, remote working and greater modal shift through the delivery of major projects such as the BusConnects Programme
- Increase the renewable biofuel content of motor fuels underpinned by the biofuels obligation scheme
- Set targets for the conversion of public fleets underpinned by a Green Public Procurement Framework and a public sector mandate
- Build electric vehicle charging network to stay ahead of demand with support being provided under the Climate Action Fund and coupled with clear planning rules that facilitate installation
- Expand cycle path network and 'Park and Ride' facilities through the establishment of a Park-and-Ride development office and a cycling project office within the National Transport Authority (NTA)

Agriculture, Forestry and Land Use

The long term vision, as per our 2014 National Policy Position, for the agriculture, forest and land use sectors is based on an approach to carbon neutrality in these sectors, which does not compromise our capacity for sustainable food production. This effectively means that agricultural emissions are balanced by reducing emissions of methane, nitrous oxide and carbon dioxide in so far as the best available science allows, increasing carbon-sequestration through forests and land use and displacing fossil fuel and energy intensive materials with renewable sources. This vision aligns with the Paris Agreement, European Council Conclusions of October 2014 and also the Programme for a Partnership Government which sets out the objective to be achieved in this sector as to balance the control of agricultural emissions with the economic and social objective of promoting the sustainable development of a rural economy.

The Irish agriculture sector is committed to sustainability so that Ireland can play its part in meeting the increasing global food demand while having regard to Ireland's climate obligations. The sector is also committed, through proactive use of research, technology and institutional arrangements, to demonstrate how sustainable agricultural and land management and resource efficiency can reduce emissions while improving the resilience of food production systems and contributing to climate action. The sector must be in a position to anticipate and adapt to the negative impacts of climate change in order to build resilience and enable sustainable development.

The scale of the challenge facing the sector in this regard is recognised at national, EU and international levels, with increasing emphasis on linking additional demand for food, fuel and fibre production in the sector with improving environmental credentials. The multiple objectives of the agriculture and land use sector with their lower mitigation potential were clearly recognised in the October 2014 European Council Conclusions. In Ireland, the sector not only produces sustainable food products, displaces fossil fuels and energy intensive materials through supply of biomass and wood products; it also sequesters carbon while providing other essential eco system services including those related to water and biodiversity. The development of the Irish agriculture sector is supported by the European Union's Common Agriculture Policy (CAP) through a combination of direct payments to farmers, financial assistance towards investments in rural development and environmental protection and market support measures. Some of the key actions in the Agriculture, Forestry and Land Use sector include:

- Deliver substantial verifiable greenhouse gas abatement through adoption of a specified range of improvements in farming practice, including through implementing

the full suite of cost-effective, on-farm abatement measures identified by Teagasc in their 2018 report. Some of the key measures identified in the Teagasc report include:

  - accelerated gains in the genetic merit of dairy cows
  - improved beef genetics
  - extended grazing
  - improved nitrogen (N) use efficiency
  - inclusion of clover in pasture swards
  - altered fertilizer formulation
  - improved animal health

- Deliver expansion of forestry planting and soil management to ensure that carbon abatement from land-use is delivered in 2021-30 and in the years beyond. To include:
  - an average of 8,000 ha per annum of newly planted forest, and sustainable forest management of existing forests, including the increased use of harvested wood products
  - at least 40,000 ha per annum of reduced management intensity of grasslands on drained organic soils
  - better management of grasslands, tillage land and non-agricultural wetlands
- Develop exemplar networks with leaders in adopting best practice to improve soil fertility and optimise fertiliser use leading to reduced greenhouse gas emissions and enhanced carbon sequestration in soil/biomass
- Implement and review roadmap for achieving afforestation rates as outlined in the Programme for Government and Forestry Programme Mid-Term Review
- Support diversification within Agriculture and land use to develop sustainable and circular value chains and business models for lower carbon intensity farming including organic production and protection and enhancement of biodiversity and water quality; and the production of bio-based products and bioenergy through the Common Agricultural Policy and implementation of the National Policy Statement on the Bioeconomy
- National Bioeconomy Implementation Group to examine sectoral coherence, network and awareness raising, research and innovation and the circular bioeconomy potential of harnessing the value from side-streams from both agriculture and forestry

- Actively engage all stakeholders to develop a roadmap to ensure the future development of the agriculture and land-use (including forestry) sector will be built on environmental sustainability, and contribute fairly to Ireland's climate, air and energy targets
- Upskill farmers and foresters to ensure they have the knowledge and tools required to implement climate mitigation practices
- Set a target for the level of energy to be supplied by indigenous biomethane injection in 2030, taking account of the domestic supplies of feedstock that meet strict sustainability criteria and consider how the supports necessary to reach such a target would be funded

Other Sectors

The Plan also includes actions in relation to other sectors of the economy which have an important role to play such as enterprise and the waste sector. Key actions in these sectors include:

- Develop coherent Reduction Strategies for Plastics, Food Waste and Resource Use
- Increase the level and the quality of recycling with less contamination and greater replacement of virgin materials by recycling
- Reduce the reliance on landfill with sharp reductions in plastics and compatibles entering landfill
- Embed energy efficiency, replacement of fossil fuels, careful management of materials and waste and carbon abatement across all enterprises and public service bodies
- Mobilise clusters regionally and sectorally to become centres of excellence for the adoption of low carbon technologies
- Develop networks in key industry sectors and a roadmap of actions to support decarbonisation of large industry
- Expand the EXEED (Excellence in Energy Efficient Design) programme to influence and deliver new best practices in energy efficient design

ii. Where relevant, regional co-operation in the area

Details of regional co-operation under the five energy dimensions, including detail on the North Seas Energy Co-operation, the Clean Energy for EU Islands Initiative, the British-Irish Council and interconnection co-operation are set out under the relevant sections. Co-

operation in these forums contributes to our long-term vision and goal to become a low emission economy.

iii. Without prejudice to the applicability of State aid rules, financing measures, including Union support and the use of Union funds, in this area at national level, where applicable

The National Development Plan 2018-2027 provides an allocation of €300m to fund the Support Scheme for Renewable Heat and €200m to support the uptake of electric vehicles.

The Climate Action Fund was approved by Government in May 2018 and will, over the lifetime of the National Development Plan, invest a total of €500m. The objective of the Climate Action Fund is to support initiatives that contribute to the achievement of Ireland's climate and energy targets in a cost effective manner or offer the potential for innovative interventions in these sectors and which, in the absence of support from the Fund, would not otherwise be developed. The Government Decision also approved the repurposing of part of the existing petroleum products levy (also known at the National Oil Reserves Agency or NORA levy) to provide financing to the Climate Action Fund. In July 2018, the first Call for Applications under the Climate Action Fund was issued resulting in support of up to €77m being provided to seven successful projects. The Climate Action Plan sets out that the next call for applications will commence by the end of 2019 with further calls to take place in future years.

Financing the domestic transition envisaged under the Climate Action Plan as well as the agenda under Article 2 of the Paris Agreement on making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development is an important issue for Ireland. On the private sector side, green and sustainable finance is an emerging high-growth international financial services sub-sector. Importantly from a financial markets perspective the significant funding requirement to achieve this transition to sustainable climate resilient world is well recognised. Over the next 15 years, the G20 estimates that the world will need to invest around US$90 trillion in sustainable infrastructure assets.

Turning to state-funded green finance, Ireland has a strong record of supporting international climate action, making significant advances in the delivery of climate finance in recent years. A consistent approach to programming climate support, based on policy prioritisation on addressing climate finance, is improving the predictability of Irish climate finance. The majority of Ireland's financial support of €175m to be provided over the period 2016 to 2020 is provided through Irish Aid. The proposed contributions to be provided by the Irish

Government as contributions towards the $100bn goal entail an additional contribution by Ireland towards this goal.

Further financing measures relevant to this area are set out in the following sections.

3.1.2. Renewable Energy

i. Policies and measures to achieve the national contribution to the binding 2030 Union target for renewable energy and trajectories as referred to in point (a)(2) Article 4, and where applicable or available, the elements referred to in point 2.1.2 of this Annex, including sector-and technology-specific measures

Harnessing Renewable Energy Through Support Schemes

Ireland will continue to operate the existing support schemes for renewable electricity until the contracted support period ends, these schemes (which are now closed for new applicants) include:

- the Alternative Energy Requirement (AER) scheme - closed,
- three Renewable Electricity Support schemes (REFIT 1, 2 and 3)

The AER scheme was launched by the then Department of Transport, Energy and Communications in 1996 and was the first step towards a market support for wind energy as part of the Department's programme to promote generation (When planning those measures, Member States shall take into account the end of life of existing installations and the potential for repowering) of electricity from renewable resources. The programme involved the tendering for contracts of certain fixed amounts of capacity, by potential renewable energy generators. The AER will remain in place until 2021.

REFIT 1, was open for applications until 31 December 2009. The technologies covered in REFIT 1 are small wind (< 5MW), large wind (>5MW), Hydroelectricity and Biomass/Landfill gas. The support is provided for a period of 15 years. Due to delays in grid rollout for REFIT 1 projects, and with State Aid approval in August 2013, the backstop date for REFIT 1 was extended by two years to 2027.

REFIT 2, which succeeded REFIT 1, came into operation in March 2012. It provides for up to 4,000MW of renewable generation. The technologies covered are small wind (< 5MW), large wind (>5MW), Hydroelectricity and Biomass/Landfill gas. The backstop date for REFIT 2 is 2032 and the scheme closed to new applications in 2015.

REFIT3 aims to support the addition of 310MW of biomass technologies including anaerobic digestion (AD) and Combined Heat and Power (CHP). CHP is the simultaneous generation of useable heat and electricity in a single process and is regarded as a highly efficient

energy production process. It makes use of the heat produced in electricity generation instead of releasing it into the atmosphere. The heat generated in a CHP plant can be used for many purposes including district heating and displacing industrial heat demand. The backstop date for REFIT 3 is 2030 and the scheme closed to new applications in 2015.

The new Renewable Electricity Support Scheme (RESS) is being developed under the aegis of the Climate Action Plan and commits to 70% of electricity from renewable sources by 2030. The RESS has been designed within a competitive auction-based, cost effective framework and the Scheme will provide for a renewable electricity (RES-E) ambition of 70% by 2030.

The new RESS is already expected to support up to an additional 4.5 GW of renewable electricity by 2030, while ensuring citizens and communities can fully participate in the future energy transition in Ireland.

The Scheme aims to deliver a broader range of objectives including:

- Providing pathways and supports for communities to participate in renewable energy projects
- Broadening the renewable technology mix (the diversity of technologies)
- Increasing energy security, energy sustainability and ensuring the cost effectiveness of energy policy.

We will increase the volumes and frequencies of the RESS auctions to deliver on the 70% renewable electricity target by 2030. Reaching 70% renewable electricity on the grid will be one of the world's highest levels of renewable penetration. Stakeholder briefings took place in September and November 2019 on the first RESS auction.

The terms and conditions of the first RESS auction were published in February 2020 with the qualification window to open in June 2020 subject to the state aid notification process with the EU Commission. The qualification process for RESS 1 began at the end of 2019 with participants being briefed on the auction and qualification procedures and the publication of the detailed timetable for the auction. The target date for the auction bidding process is June 2020.

This first auction under RESS is expected to procure between 1,000 and 3,000 GWh with the final auction quantity determined by competition analysis determined by the Commission for Regulation of Utilities (CRU). The RESS will include a range of measures to support community participation including a proposed category for community owned projects and a citizen investment scheme.

There will be approximately six RESS auctions up to 2030. These auctions are expected to connect circa 13,000 GWh of renewable electricity. Various technology specific levers will be applied in the individual auctions to facilitate diversity of renewable technologies and also increased community participation. These levers include a solar preference category and community projects preference category in the first RESS auction subject to State Aid approval. Future levers may include offshore wind preference categories. Further detail on the community aspects of the RESS are set out below.

Terms and conditions will be prepared for auctions to provide a route to market for offshore wind, see above textbox on RESS Auction. The second RESS auction is scheduled to commence qualification in 2021.

Alternative Routes to Market

In addition to the RESS, subsidy free renewable energy through corporate power purchase agreements provide a route to market for renewable project developers in the shorter term providing them with a real opportunity to boost Ireland's renewable energy capacity in advance of the commencement of RESS. The Climate Action Plan commits to a 15% target for the renewable industry to develop projects through subsidy free corporate power purchase agreements.

Ireland has established a cross Government Steering Group to develop, effective policy tools to harness the significant potential of Corporate PPAs to meet at least 15% of Ireland’s 2030 electricity demand from renewable sources. This will be based on input from the industry intensive stakeholder interactions with a report to be delivered by the SEAI in Q2 2020. This will be followed by the development of a Government Policy Paper based on consultancy study and Advisory Group Recommendations Paper in Q3 2020 and the implementation of relevant policy measures from Q4 2020.

Offshore Wind

Ireland is targeting at least 3.5 GW of offshore renewable energy of mainly offshore wind, the development of up to 1.5 GW of grid scale solar energy, and an increase in onshore wind capacity of up to 8.2 GW. This will be delivered in a competitive framework of auctions and corporate contracting with a renewed focus on community and citizen participation.

Ireland has one of the best offshore renewable energy resources in the world with a sea area of 900,000 square kilometres which is approximately 10 times the size of our landmass. Because of Ireland’s location at the Atlantic edge of the EU, we have more offshore energy potential than most other countries in Europe. Achieving 70% renewable electricity by 2030 will require us to build out significant infrastructures and the capacity to integrate new

technologies such as wave and tidal energy. Ireland's coast is one of the most energy productive in Europe, with a long-term potential of 70GW of ocean energy opportunity (wind, wave and tidal) within 100 km of the Irish coastline.

Ireland's ambitions for the offshore renewable energy sector are contingent on delivering a licensing and regulatory regime for offshore renewable energy. This will provide certainty to project promoters and provide a pathway to realising the necessary investment in offshore renewable energy. Work is underway to develop Ireland's first marine spatial plan. The plan, which will be known as the National Marine Planning Framework (NMPF), will set out the Irish Government's long-term planning objectives and priorities for the management of our seas over a 20-year time frame. The plan will set out specific objectives and marine planning policies for all of the activities taking place in Ireland's seas, from aquaculture through to waste water treatment. All of these activities will be contextualised within the pillars of their economic, environmental and social considerations. The NMPF will also set out the proposed future approach to the adoption of spatial designations for marine activities including offshore renewable energy development, or designated marine protected areas, and taking account of the existing network of designated European sites under the Birds and Habitat Directives by the Minister for Culture, Heritage and the Gaeltacht.

The Department of Housing, Planning & Local Government are currently preparing the Marine Planning and Development Management (MPDM) Bill. The MPDM Bill seeks to establish into law a new marine planning system, which is underpinned by a statutory Marine Planning Statement, and guided by the National Marine Planning Framework. It consists of a development management regime from the high water mark to the outer limit of the State's continental shelf administered by An Bord Pleanála and the coastal local authorities. It will provide a modern, up-to-date regulatory and marine planning framework for offshore renewable energy developments beyond the limits of the foreshore (12 nautical miles). This will be an important foundation for investment in the offshore renewable energy sector as well as providing a more transparent, participative system for all marine stakeholders. The MPDM will also streamline procedures using a single consent principle: one state consent (Maritime Area Consent: MAC) to enable occupation of the Maritime Area and one development consent (planning permission), with a single environmental assessment. The passage of the legislation has been prioritised to ensure that the new consenting model, as well as implementation of a new offshore grid connection policy that lines up with the RESS auction timeframes will ultimately deliver our 2030 targets.

Ireland's Offshore Renewable Energy Development Plan (OREDP) published in 2014 highlights Ireland's focus on stimulating industry-led projects for the development and deployment of ocean energy devices and systems. The OREDP identifies resources for

increasing indigenous production of renewable electricity, contributing to reductions in our greenhouse gas emissions, improving the security of our energy supply and creating jobs in the green economy. The OREDP sets out key principles, policy actions and enablers for delivery of Ireland's significant potential in this area. The development of a new Offshore Renewable Energy Development Plan is due to commence in 2020. The new OREDP will set out the Government's policy for the sustainable development of our abundant offshore renewable energy resources.

In line with our commitment in Future Jobs Ireland 2019, a Top Team has been established for offshore renewables to provide a multi-organisational response to leveraging the industrial/employment opportunities arising from the operationalisation of the offshore energy policy framework under the MPDM legislation. Ireland will examine the increased use of cross border joint co-operation mechanisms for funding renewables, particularly offshore wind, to reduce the cost impacts on Irish consumers and businesses, including for hybrid assets as part of the North Seas Energy Co-operation Initiative.

There will be three phases to developing offshore wind in Ireland.

Phase 1 represents the foundations and early projects for offshore wind and will take place in the first half of the decade. There will be several key actions and milestones required during this phase. We will need to ensure that MPDM has been enacted to allow for a consenting regime for offshore wind. We will require two offshore auctions to take place to provide a support mechanism for offshore wind projects using the RESS framework. The main focus area for fixed bottom offshore wind development in Ireland up to 2030 will be the Irish Sea East coast due to the relatively favourable sea depth and wave conditions, the more developed and robust onshore transmission system and the close location to big electricity demand growth centres.

A revision of the OREDP in conjunction with the Marine Spatial Plan will help identify suitable areas for future offshore wind projects. As we move to this plan-led approach, Ireland will designate an Offshore Renewable Energy Development Body. This Body will undertake grid development which may include site selection and securing necessary permissions in relation to the grid connection to facilitate further ORE development by third party developers.

Phase 2 focuses on achieving our 2030 target of at least 3.5GW of offshore wind to be operational and moving towards full decarbonisation. The Irish Government recognises that to realise the enormous potential of the offshore energy sector will require fully coordinated support across government, from research and development, through supply chain development, to commercial deployment. In the latter part of the decade, Ireland will focus

on plan-led offshore wind projects using sites previously identified for development, including on the South and West Coast. We will look to demonstrate floating wind in Irish waters building on the experience of the AFLOWT (Accelerating market uptake of Floating Wind Technology) project, which is a 5-year project with the objective of testing a full-scale floating turbine in the Atlantic Marine Test Site (AMETS) off the West Coast in 2022/23, subject to consent. A third auction will be held in the second half of the decade which between all three planned auctions will provide a total of between 3.5 and 5 GW of offshore wind operational in Irish waters by 2030. In the latter part of the decade we will examine new technologies and plan for how best to incorporate these new technologies including the future role of hydrogen.

Phase 3 looks beyond 2030 and our longer-term options. At this stage, Ireland will be in a position to deploy commercially operating floating windfarms. The South and West coast will, in time, be more suitable for floating offshore wind development which will favour our deeper and more exposed sea conditions. Ireland will scale offshore renewable energy to fully decarbonise electricity generation in Ireland. This will allow us to examine whether any surplus generated could be used for interconnection with another market or for export alone. We will demonstrate new green technologies such as the generation of green hydrogen as a by-product from offshore wind.

Wind Energy Development Guidelines (WEDG)

Updated Wind Energy Guidelines are expected to be published by the Department of Planning, Housing & Local Government in H1 2020 following the conclusion of a strategic environmental assessment process. A key aspect of the new Guidelines will be new noise regulations for wind turbines that are in line with World Health Organisation recommendations. The Guidelines will also set out clear rules for planning authorities to follow regarding early community engagement and community benefit measures for on shore wind farms.

In addition, the DCCAE is working collaboratively with Local Authorities and the EPA on the most suitable approach to noise monitoring and enforcement for wind energy with a focus on a flexible and enforceable approach. This may potentially include a regional structure that mirrors the Local Government ‘shared services’ approach adopted in other areas such as waste management and climate adaptation.

Renewable Electricity Policy and Development Framework (REPDF)

Ireland is developing a framework, known as the Renewable Electricity Policy and Development Framework (REPDF) that will guide the development of renewable electricity projects on land which are key objectives of Irish energy policy. The framework will identify

strategic areas on land for large-scale renewable generation (50MW+) with this analysis including a spatial component. In addition, the scope will include renewable electricity projects below this threshold (including Wind and Solar PV) at a national level. It is intended to go to public consultation in Q2 2020 with the framework being finalised in H2 2020.

Microgeneration Scheme

In July 2018 the Government announced a new pilot scheme to support microgeneration. This first phase of support for microgeneration is targeting solar PV installation and domestic customers for self-generation and consumption. A grant of up to a maximum €3,800 is now available (max 4kWp + battery) for homes built pre 2011. The new solar PV support scheme also aligns with the recast Renewable Energy Directive which brings the 'prosumer' to the heart of new energy policy across the EU. Demand for the scheme from residential consumers has been very high to date. A Microgeneration Working Group has been set up with key stakeholders under the Climate Action Plan to assess the most appropriate enabling framework for microgeneration within relevant market segments in order to deliver a support system by June 2021.

Increased Electricity Interconnection

Electricity interconnection is strategically important to Ireland, having a potentially substantial impact on each of the three pillars of Ireland's energy policy – sustainability, security of supply and competitiveness. Interconnection also supports the energy transition and may have a variety of wide-ranging benefits to the Irish consumer, including lower long term costs of electricity through connection to a larger market and diversity of electricity supply.

With a number of forthcoming interconnection proposals allied to strong national and EU policy backing, a new national policy statement on electricity interconnection in Ireland was published in July 2018. This policy statement lays out the official policy position on electricity interconnection. It outlines the many drivers and benefits of interconnection, as well as the potential impacts electricity interconnection may have on the wider energy market. It guides potential developers in better understanding the range of national policy drivers and the CRU (Ireland's energy regulator) in determining its regulatory approach to electricity interconnection, by drawing attention to key policy parameters for consideration in its evaluation of interconnection applications from project promoters.

The East West interconnector is a 500MW interconnector that has been in operation since 2012 and allows for the trading of electricity between the island of Ireland and British wholesale electricity markets. Within the Single Electricity Market there is an existing North South interconnector usually operating at 300MW capacity and a second 1500MW North South interconnector is planned and has PCI status. There are also two proposed

interconnector projects. The first is the 700MW Celtic interconnector that will run to the south-west coast of France and the second is the 500MW Greenlink interconnector that will run to Pembroke in Wales.

Phasing Out Fossil Fuels

Removing fossil fuels from the grid will be essential in the coming years. Ireland has committed to end the burning of coal in ESB's Moneypoint generation plant by 2025, and to replace coal-fired generation with low-carbon and renewable technologies. Facilitating this is the recent reform of the EU Emissions Trading System (ETS) and changes to the electricity market in Ireland, along with the resulting price signals. The ESB is engaging with the Department of Communications, Climate Action and Environment regarding the future of Moneypoint. The recent announcement by the ESB that it is to close two of the three remaining peat generation facilities in Ireland by the end of 2020 means that the transition away from peat will happen sooner than expected.

Mitigating measures to ensure that impacts on regional employment in the affected regions where peat and coal fired electricity generation is phased out will be critical to ensuring a just transition. Initiatives, such as including the Midlands Region in the EU Coal Regions in Transition Platform, and implementing a wider cross-Government policy framework supporting employment in the region, will ensure a just transition.

Biofuels

The Biofuels Obligation Scheme was introduced in 2010 and requires suppliers of road transport fuels to include a certain percentage of environmentally sustainable biofuels across their general fuel mix. It is administered by the National Oil Reserves Agency. The level of obligation has increased over time and, since January 2019, it has been set at 10% by volume. The obligation will increase to 11% by volume from January 2020. The obligation will increase to 11% by volume from January 2020. This is expected to lead to circa 5% biofuel in petrol and an average 6% biofuel blend in diesel by 2020. The Climate Action Plan sets out the Government's ambition to reach a level of 10% biofuel in petrol and 12% in diesel by 2030 – a doubling of the 2020 level. It is expected that the Biofuels Obligation Scheme will ensure an increase in the level of biofuel every two years (i.e. in 2022, 2024, 2026, 2028 and 2030) from 2020 to 2030 on a relatively linear basis. The Biofuels Obligation Scheme will also support the uptake of other low emission fuels in the transport sector including bio-CNG, bio-LNG and hydrogen produced from renewable sources. A public consultation which closed in November 2019 will help inform how this ambition will be delivered and elements of the recast Renewable Energy Directive that relate to the transport sector will be implemented.

District Heating

The Climate Action Plan sets out the need to ensure a suitable policy framework is in place to support district heating. A public consultation commenced at the end of 2019 with a policy framework to be in place by the end of 2020. The National Planning Framework also highlights the role of district heating in developing sustainable compact urban growth – in particular in relation to the cities of Dublin, Cork, Limerick, Galway and Waterford. An updated Comprehensive Assessment (set out under Article 14 of the Energy Efficiency Directive (EED) and required to be completed by the end of 2020) will help inform the potential locations for district heating in Ireland. The Climate Action Fund is providing support to two projects (the Dublin District Heating System in central Dublin and the Tallaght District Heating System in a suburb of Dublin).

ii. Where relevant, specific measures for regional co-operation, as well as, as an option, the estimated excess production of energy from renewable sources which could be transferred to other Member States in order to achieve the national contribution and trajectories referred to in point 2.1.2

North Seas Energy Co-operation (NSEC)

The North Seas Energy Co-operation works to increase electricity transmission capacity among the countries involved as well as to the rest of Europe. The NSEC aims to ensure a sustainable, secure and affordable energy supply in the North Seas region through further integration of wholesale electricity markets. A key element in this integration is to increase the interconnection between countries in the region that could be promoted through the NSEC. Furthermore, Ireland is committed to exploring further opportunities for hybrid interconnection/offshore assets as part of the NSEC and to implement regulatory arrangements to support new interconnection, including hybrid assets as set out in Action 23 of the Climate Action Plan.

Cross Border Participation in Support Schemes

As part of the design of the RESS, Ireland is committed to opening the scheme to participants from other European Member States with whom Ireland has a direct electricity connection, provided a co-operation agreement has been signed by both parties.

It is expected that Producers located in other European Member States (or in a neighbouring State with which a free trade agreement exists) will be allowed to bid for a certain percentage of the capacity allocated within the tenders. The support quota for each participating member state will be based on the volume of imported electricity, the RES-e

share in total final electricity consumption of that country and the total final electricity consumption in Ireland.

The participation of producers from other States in the RESS is subject to the following conditions:

- a co-operation agreement with the relevant State is in place; the co-operation agreement describes the rules to prove physical delivery of the green electricity; and
- the projects in the relevant State fulfil the same requirements as the projects located in Irish territory

iii. Specific measures on financial support, where applicable, including Union support and the use of Union funds, for the promotion of the production and use of energy from renewable sources in electricity, heating and cooling, and transport

Many of the measures and schemes set out in the preceding sections are considered financial supports including, the Climate Action Fund, the Support Scheme for Renewable Heat and the supports provide to incentivise the uptake of electric vehicles and other low emission vehicles (LEVs). There are no European funds involved in these measures to date.

The costs of the AER and REFIT schemes are recovered directly from electricity consumers through an annual public service obligation (PSO) levy, payable by all electricity consumers. While these schemes are all now closed to new applicants, support will be provided to projects under these various schemes –each of which have different end points (2021 to 2032). Regarding the schemes being developed, the RESS, which will be funded through the PSO levy, will commence in Q1 2020 with operational aid payable for up to 16.5 years.

As regards the support measures for electric vehicles, a number of measures are Exchequer-funded, while others are taxation and licensing measures.

iv. Where applicable, the assessment of the support for electricity from renewable sources that Member States are to carry out pursuant to Article 6(4) of Directive (EU) 2018/2001

This assessment on the effectiveness of the support scheme will be undertaken for the RESS within five years of the operation of the scheme.

v. Specific measures to introduce one or more contact points, streamline administrative procedures, provide information and training, and facilitate the uptake of power purchase agreements

These measures will be developed as part of the implementation of Articles 15 and 16 of the recast Renewable Energy Directive. As stated above, Ireland will develop effective policy tools to harness the significant potential of Corporate PPAs to meet at least 15% of Ireland's 2030 electricity demand from renewable sources. The MPDM Bill will significantly streamline ORE procedures by a single consent principle: one state consent (Maritime Area Consent: MAC) to enable occupation of the Maritime Area and one development consent (planning permission), with a single environmental assessment.

Summary of the policies and measures under the enabling framework Member States have to put in place pursuant to Article 21(6) and Article 22(5) of Directive (EU) 2018/2001 to promote and facilitate the development of self-consumption and renewable energy communities

Ireland's objective is to support up to 10% community renewable electricity projects by 2030. This policy objective is in line with the Clean Energy Package, in particular the recast Renewable Energy Directive (Article 22 Renewable Energy Communities).

The High-Level Design of the RESS was approved by Government in July 2018. The RESS is being designed to deliver a broad range of policy objectives including:

- Delivery of Ireland's 2030 climate and energy targets
- Broadening the renewable electricity technology mix, the diversity of technologies
- Increasing energy security, energy sustainability and ensuring the cost effectiveness of energy policy
- The provision of pathways and supports for communities to participate in renewable energy projects

There are four pillars to the community framework which is subject to EU state aid approval:

- Preference for Community Projects in RESS auctions - It is proposed that for all RESS auctions there will be a preference for community-led projects
- Community Benefit Fund (CBF) - A mandatory Community Benefit Fund must be provided by all projects successful in a RESS auction. The contribution is to be set at €2/MWh. The CBF will be aligned to incentivise investment in local renewable energy, energy efficiency measures and climate action initiatives

- Investment opportunities - The RESS will mandate that Irish citizens or communities will have access to investment opportunities in renewable energy projects, prioritising those citizens that live in closer proximity to the projects
- Community Supports - The Community Framework is in essence an enabling framework to encourage the development of a meaningful community electricity generation sector. Measures included within this framework will consist of:
    - Financial supports including grants and soft loans
    - A trusted intermediary network to/ work with communities through the various stages of projects
    - A trusted advisor network to be available to them to give them specialist advice such as legal and financial.
    - A trusted information source for a variety of “how-to” information guides.
    - A central point of contact organisation to co-ordinate all of these enabling services

vi. Assessment of the necessity to build new infrastructure for district heating and cooling produced from renewable sources

As set out above, a new policy framework is currently being developed to support the uptake of district heating in Ireland. District heating and cooling in Ireland is at a very low level and is estimated at most at about 0.8% of heat consumption. In addition, structural barriers arise from the nature of Ireland’s dispersed settlement structure with low population density.

vii. Where applicable, specific measures on the promotion of the use of energy from biomass, especially for new biomass mobilisation taking into account:

- **Biomass availability, including sustainable biomass: both domestic potential and imports from third countries**
- **Other biomass uses by other sectors (agriculture and forest-based sectors); as well as measures for the sustainability of biomass production and use**

The Support Scheme for Renewable Heat incentivises the installation and use of biomass and anaerobic digestion heating systems. The scheme includes detailed sustainability criteria in line with the recast Renewable Energy Directive.

Government will continue financial supports for the continued mobilisation of biomass from forests by providing assistance for measures such as forest road construction, knowledge transfer groups and decision support tools. Wood fibre used for energy generation will

continue to be used in the forest products sector to dry sawn timber reducing the dependency on fossil fuels. Use of biomass for heat and electricity generation will continue to use small diameter material which facilitates the sustainable management of forests where harvesting is regulated by the Forestry Act 2014. Forests felled are replanted ensuring that biomass is harvested from sustainable resources. The Irish Forest estate is forecasted to increase the supply of wood biomass for energy and wood-based panels from 1.8 million cubic metres currently, to over 4 million cubic metres by 2035. Significantly more volumes in excess of these figures will be used by the sawmilling sector. Where demand exceeds available domestic supply biomass and will be imported from third countries from sustainable sources which also must satisfy the requirements of the EU timber regulation.

Planned increases in afforestation as set out in Irelands Climate Action Plan will take place while protecting and increasing the levels of biodiversity. All land converted to forestry is regulated by the requirements of the Forestry Act 2014 and adherence to a suite of environmental requirements which aims *inter alia* to protect existing water courses, biodiversity and archaeology. All land use change to forestry requires a detailed assessment by the competent authority to ensure that there are no significant impacts on statutory designations as regulated by the Habitats Directive.

3.1.3. Other Elements of the Dimension

i. Where applicable, national policies and measures affecting the EU ETS sector and assessment of the complementarity and impacts on the EU ETS

The EU Emissions Trading System (ETS) includes some 11,000 stationary installations (over 100 currently in operation in Ireland of which approximately 70 are industrial installations) with an installed power-generation capacity of more than 20 megawatts; Irish-based ETS plants are mainly in power-generation and large-scale industrial production. The system covers emissions of carbon dioxide (CO_2) from power and heat generation and a wide range of energy-intensive industry sectors including oil refineries, steel works and production of iron, aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids and bulk organic chemicals. Nitrous oxide emissions from the production of certain acids and emissions of perfluoro-carbons from aluminium production are also included. Since the start of 2012, emissions from all flights from, to and within the European Economic Area (EEA) are included in the EU ETS. The legislation, adopted in 2008, applies to EU and non-EU airlines alike, and all Irish-based carriers above the ETS threshold must participate fully in the Scheme.

The EU ETS, now in its third phase, covers about 45% of total EU emissions, but just 26% of total emissions in Ireland, based on the latest (2018) inventories published by the Irish

Environmental Protection Agency in October 2019. The relatively small share of total greenhouse gas emissions which the ETS sector in Ireland accounts for is owing to the relatively light industrial base in Ireland and the disproportionately large agricultural sector for which emissions are captured in the non-ETS inventory. Emissions from the ETS sector have been rising in recent years in Ireland; this is most likely attributable to the recession and decreased output from industry during 2009-2013 and the subsequent pent-up demand that industry is now attempting to satisfy. As the carbon price in ETS rises, the decarbonisation signal for ETS participants will become stronger, incentivising additional efficiency improvements in capital stock.

Revenues obtained from EU ETS auctioning are used by the Irish Exchequer to support green and climate-related activities and overseas climate financing as well as administration of the system. As the carbon price increases, auction revenues will also increase, affording increased opportunities for climate-related investments by Government. Between 2013 and 2017, auction revenues in Ireland amounted to between €36m and €54m per annum. However, due to the large increase in the price of internationally traded carbon (i.e. emission unit allowances) seen over the past 18 months, auction revenues totalled over €142m in 2018. Of the approximately 100 installations currently participating in EU ETS in Ireland, approximately 60 receive some form of free allowance allocation through the carbon leakage mechanism.

In terms of national energy policies affecting the ETS sector, there are some measures aimed at power generation that are relevant. Ireland is currently developing a Renewable Electricity Support Scheme (RESS) to contribute to Ireland's 2020 renewable electricity targets and to deliver Ireland's renewable energy ambitions out to 2030. While RESS will incentivise the introduction of sufficient renewable generation to deliver national and EU-wide renewable energy and decarbonisation targets, there are other energy policy objectives such as broadening and diversifying the renewable technology mix, enhancing security of energy supply, promoting economic development, and supporting community and citizen participation in the transition to a low carbon economy, that must be met, while simultaneously delivering value for money for the consumer.

Ireland’s Support Scheme for Renewable Heat (SSRH) is a government funded initiative designed to increase the energy generated from renewable sources in the heat sector. The scheme is open to commercial, industrial, agricultural, district heating, public sector and other non-domestic heat users.

The primary objective of the support scheme for renewable heat is to increase the level of renewable energy in the heat sector. This will contribute to meeting Ireland’s 2020

renewable energy targets whilst also reducing greenhouse gas emissions. The government funded scheme will support the adoption of renewable heating systems by commercial, industrial, agricultural, district heating, public sector and other non-domestic heat users not covered by the emissions trading system. The scheme aims to bridge the gap between the installation and operating costs of renewable heating systems and the conventional fossil fuel alternatives; and incentivise the development and supply of renewable heat.

In addition, a Public Service Obligation (PSO) has operated in Ireland since 2001 to support certain conventional power-generation constructed for security of supply purposes, and for the development of renewable electricity. The levy compensates electricity suppliers for the additional costs they incur by purchasing electricity generated by these producers. This levy is vital to enable Ireland meet its target for electricity generated from renewable sources.

ii. Policies and measures to achieve other national targets, where applicable

Climate Adaptation

In outlining a whole of Government approach to climate adaptation, Ireland's National Adaptation Framework (NAF) sets out a wide range of policies and measures. The Plan identifies 12 key sectors under the remit of 7 Government Ministers where sectoral adaptation plans will be prepared. Key policies and measures provided for under the NAF include:

- Preparation of sectoral adaptation plans by 7 Government departments for 12 key sectors.
- Putting in place revised governance and reporting arrangements
- Formalising the status of existing adaptation guidelines and decision making supports - these include the online climate information platform Climate Ireland, adaptation planning guidelines for the 12 key sectors and local authority adaptation strategy development guidelines
- Increasing awareness around climate adaptation and resilience
- Integrating climate adaptation into key national plans and policies

Sectoral plans were approved by Government in 2019. Plans were developed in line with the national guidelines "Sectoral Planning Guidelines for Climate Change Adaptation" which were published in May 2018 to ensure that a coherent and consistent approach to the development of plans was taken across Government. Table 14 below sets out the sectors and lead Government departments that have prepared plans under the NAF. The NAF will be reviewed in line with current statutory requirements at least once before end 2023.

Table 14: Sectoral adaptation plans under the National Adaptation Framework

Theme	Sector Level	Lead Department for Sectoral Adaptation Plans
Natural & Cultural Capital	Seafood	Department of Agriculture, Food and the Marine
	Agriculture	
	Forestry	
	Biodiversity	Department of Culture, Heritage and the Gaeltacht
	Cultural, Built and Archaeological Heritage	
Critical Infrastructure	Transport infrastructure	Department of Transport, Tourism and Sport
	Electricity and Gas Networks	Department of Communications, Climate Action and Environment
	Communications Networks	
Water Resource & Flood Risk Management	Flood Risk Management	Office of Public Works
	Water Quality	Department of Housing, Planning and Local Government
	Water Services Infrastructure	
Public Health	Health	Department of Health

Chapter 16 of the Climate Action Plan 2019 covers climate adaptation, primarily in the context of the ongoing implementation of the NAF. For 2019, the actions in the Plan in relation to adaptation relate to the development of sectoral adaptation plans and local authority adaptation strategies and the climate information platform 'Climate Ireland'.

Some sectors (i.e. Agriculture and Forestry; Transport; Electricity and Gas Networks and Flood Risk Management) also developed non-statutory plans during 2017 and 2018 under the 2012 National Climate Change Adaptation Framework. These plans were revised and updated in line with the requirements of the NAF and the Climate Act.

Institutional governance and monitoring - Since 2015 sectoral coordination of national adaptation policy has taken place under the auspices of the National Adaptation Steering Committee which is chaired by the Department of Communications, Climate Action and Environment. As a key action under the NAF, the National Adaptation Steering Committee has been reviewed and restructured to ensure that a coordinated, comprehensive and

coherent approach continues to operate in implementing actions under the NAF. The need for appropriate cross sectoral coordination and consultation is identified as crucial in the NAF and the Climate Act and the Steering Committee will have a key role to play in promoting and encouraging work in this regard.

Members of the Steering Committee include: Departments preparing sectoral plans under the NAF; Department of Foreign Affairs and Trade; Irish Water; EPA; regional and local government; the National Standards Authority of Ireland; and Met Éireann.

The National Adaptation Steering Committee reports to the Climate Action High Level Steering Group, which was established under the National Mitigation Plan and is chaired by the Minister for Communications, Climate Action and Environment. Since summer 2018, this group now addresses both climate mitigation and adaptation. In terms of adaptation, the High Level Steering Group will:

- Monitor progress by sectors and agencies in delivering on climate change adaptation actions for which they are responsible; and
- Ensure that a coordinated and coherent approach is adopted and maintained towards achieving a climate resilient Ireland.

Regional and local level adaptation – National climate action policy in Ireland recognises the potential which exists within the local government sector to contribute to the transition to a low carbon and climate resilient future. The NAF identifies the critical role to be played by local authorities in addressing climate change adaptation. In January 2018 the Minister for Communications, Climate Action and Environment announced the provision of €10m in funding over 5 years to the local authority sector to establish 4 Climate Action Regional Offices (CAROs). This commitment recognises the significant obligation which has been placed on local government to develop and implement its own climate action measures, as well as the need to build capacity within the sector to engage effectively with climate change – both in terms of mitigation and adaptation.

The Climate Action Regional Offices (CARO's) are being operated by a lead local authority in 4 different regions grouped according to shared climate change risks. The establishment of these offices is enabling a more coordinated engagement across the whole of government and will help build on the experience and expertise which exists across the sector.

Under the NAF the 31 local authorities in Ireland have developed their own adaptation strategies in line with guidelines to be developed for the sector (these are currently being reviewed and updated with a view to publication in Q4 2018). Work on the development of strategies was undertaken by individual local authorities with support from the Climate Action

Regional Office in their region. Local authorities have adopted their local adaptation strategies in 2019.

Monitoring at local level – A National Local Authority Climate Change Steering Committee monitors the CAROs and implementation of their annual work programmes. The CAROs and the local authority sector are also integrated into national oversight bodies for climate action, with representatives on the National Adaptation Steering Committee, Climate Action High Level Steering Group and the Adaptation Committee of the Climate Change Advisory Council (CCAC).

Progress under EU Strategy on Adaptation to Climate Change - Ireland is committed to ensuring comprehensive and transparent reporting on adaptation in line with the requirements of the Governance of the Energy Union and Climate Action Regulation and facilitating the EU's commitments on adaptation under the UNFCCC and the Paris Agreement.

As part of the EU Strategy on Adaptation to Climate Change the Commission developed an adaptation preparedness scoreboard, which identifies key indicators for measuring Member States' level of progress in terms of adaptation policy. The assessment of Ireland's performance under the indicators in the scoreboard completed in 2018 shows that Ireland has made significant progress in meeting many of the indicators under the scoreboard particularly in terms of putting in place the coordinating structure required for adaptation at national level, putting in place climate observations systems, filling knowledge gaps and in terms of knowledge transfer. The assessment did however show a number of indicators where progress is needed including in terms of integrating climate change into national disaster risk management plans, mainstreaming adaptation into insurance or alternative policy instruments and monitoring of progress on adaptation at local and regional level. Monitoring of local and regional adaptation has been considered above and the following discusses the areas of insurance and risk prevention and disaster risk management.

Alignment of Climate Adaptation and Disaster Risk Reduction – Recent reports and policy briefs from the European Environment Agency and the PLACARD (Platform for Climate Adaptation and Risk Reduction) project have noted that efforts to reduce disaster risk and at the same time adapt to a changing climate presents challenges and opportunities in both Europe and globally.

The NAF acknowledges the requirement to enhance coherence and complementarity between the Paris Agreement, the Sendai Framework for Disaster Risk Reduction as well as the UN Sustainable Development Goals. Ways to enhance coherence between adaptation and disaster risk reduction policies and practices in Ireland have also been considered in

recent research reports published by the EPA in 2018. National and International research and best practice, such as the outcomes of PLACARD, will continue to inform Irish policy in this regard and work on policy integration and indicators are identified as future research priorities in the NAF.

The NAF recognises that effective climate adaptation can minimise risks and costs and also protect lives and property by building resilience into existing systems. This can ultimately help minimise the emergency response that is necessary in response to severe weather events.

In Ireland statutory responsibility for emergency planning lies across a number of Government departments. For example, the Department of Housing, Planning and Local Government is designated as the Lead Government Department for coordinating the response to severe weather emergencies. "Strategic Emergency Management National Structures and Framework" sets out the national arrangements for the delivery of effective emergency management. It outlines the structures for coordinating a "whole of Government" approach and the framework for achieving a systems approach to emergency management. This Framework will be complemented by a series of 'Strategic Emergency Management (SEM) Guidelines' dealing with specific aspects of strategic emergency management. This will include a Guideline on climate change.

The NAF contains a specific objective to "Ensure continued alignment with emergency planning for extreme weather events including where plans related to emergencies assigned to a sectoral department as Lead Government Department under the "Strategic Emergency Management National Structures and Framework". The NAF also specifically recommends that sectors developing sectoral plans ensuring that plans related to emergencies assigned to a sectoral department as Lead Government Department under the Strategic Emergency Management National Structures and Framework are climate proofed. The NAF also identifies the need for climate research and modelling programmes should support climate adaptation by delivering climate services at a local level across all sectors of the economy, including emergency management.

Local authorities are designated as the lead agency for coordinating and delivering the response on the ground to severe weather emergencies and lead the local response in collaboration with the other Principal Response Agencies – An Garda Síochána (Ireland's National Police Service) and the HSE (Health Services Executive). The Climate Action Regional Offices (CAROs) will further improve alignment between adaptation policy and emergency responses at local level.

The NAF identifies the importance of any developments in the area of emergency management undertaken in line with the NAF and recognises existing structures and the policies underpinning them at national level. The NAF therefore seeks to ensure coherence between how the impacts of climate change will influence responses to both adaptation planning and national emergency planning for extreme weather events. This approach will help to align with the key responsibilities outlined under the Strategic Emergency Management National Structures and Framework and the associated guidance documents.

Insurance – The NAF recognises that the private sector has significant experience in quantifying, pricing, reducing risk and managing weather-related risks across the relevant sectors. In partnership with Government, therefore, it can play an important role in collecting and disseminating data on weather and catastrophe risk, financing risk assessments, and supporting the design and provision of insurance schemes. One project that sought to examine climate impacts on the insurance industry was the Adaptive Responses to Climate impacts (ARC) project. The aim of the ARC project, funded by the EPA, was to develop a framework for costing the impacts of climate change on the Irish economy and assessing the options for adaptation, with a specific focus on the role of key stakeholders. The study applied a framework to the specific case of flood risk in Cork and the South West region of Ireland.

The ARC project included a stakeholder forum, comprised of policy makers, local authorities, business groups and the insurance industry, to assess information needs and concerns of those exposed to current and future climate risks. It proceeded to examine two parallel but interlinked strands of research:

- Empirical estimates of the costs of climate impacts without adaptation, particularly focused on flooding; and
- The range of adaptation options available, including the appropriate role for insurance

The outputs from this project included: costs of flooding; recommendations on the use of tools and methods for costing climate impacts; policy recommendations on the design of adaptation strategies; and implications for the private sector, including insurance.

The benefits of a proactive adaptive approach and the role of insurance in this is identified as a research priority under the NAF. Awareness raising is a key action under the NAF and part of this will help individuals and businesses to reduce their own risk profiles. Information platforms such as Climate Ireland can help address both of these issues by providing insures with more accurate information on households risk level e.g. through flood mapping while also supporting households in taking actions to lower their risk level.

The National Adaptation Framework outlines Ireland's reporting obligations at International, EU and National levels. Ireland will continue to meet its EU and International obligations on adaptation, including forthcoming requirements on adaptation under the EU Governance of the Energy Union and Climate Action Regulation.

Biodiversity

As set out under section 2.1.1(i), the conservation and sustainable use of biodiversity needs to be escalated. Actions within the Biodiversity Sectoral Climate Change Adaptation Plan build on the foundations of the National Biodiversity Action Plan (2017- 2021) and are aimed at improving sustainable agriculture and fisheries, better soil and land management and, most urgently, the restoration of natural systems.

Ireland's National Biodiversity Action Plan is underpinned by seven strategic objectives together with 119 targeted actions. The Plan lays out a clear framework for Ireland's national approach to biodiversity, ensuring that efforts and achievements of the past are built upon, while looking ahead to what can be achieved over the next five years and beyond. The key policies under that Plan include:

- Mainstreaming biodiversity across the decision-making process in the State
- Strengthening the knowledge base underpinning work on biodiversity issues
- Increasing public awareness and participation
- Ensuring conservation of biodiversity in the wider countryside
- Ensuring conservation of biodiversity in the marine environment
- Expanding and improving on the management of protected areas and protected species
- Enhancing the contribution to international biodiversity issues

The Biodiversity Sectoral Climate Change Adaptation Plan was published in September 2019 and sets out the key goal of protecting biodiversity from the impacts of climate change and to conserve and manage ecosystems so that they deliver services that increase the adaptive capacity of people and biodiversity, while also contributing to climate change mitigation. A wide range of policies and measures are set out under the Adaptation Plan including 6 strategic objectives linked with the objectives under the action Plan. Some of the key measures under the Adaptation Plan include:

- Restore and enhance natural systems through management to increase resilience
- Establish and implement an all-island invasive species programme

- Develop and implement a National Soil Strategy to increase the resilience of soils
- Develop an integrated coastal management strategy which includes ecosystem based adaptation actions
- Promote ecosystem restoration and conservation through Payment for Ecosystem Services and investment in actions that increase carbon sinks while promoting biodiversity
- Carry out a comprehensive vulnerability assessment of biodiversity in Ireland
- Develop an impact assessment tool to screen for potential maladaptation impacts
- Design corridors and buffer zones to enhance the resilience of protected areas and designated sites by increasing opportunities for dispersal across the landscape
- Implement measures to reduce the barrier effects of roads, railways and technical objects in rivers and streams to facilitate species spatial responses to climate change
- Undertake natural capital accounting in all sectors to ensure natural capital is being valued and Ecosystem Based Adaptation and green infrastructure options are being employed

Circular Economy

Ireland is committed to leading the transformation from waste management to circular economy practice through delivery of a new national policy. Ireland has scope for major progress in all of the key areas of the waste hierarchy. A number of commitments have been made under the recent Climate Action Plan and these will be elaborated on further under the revised national waste policy in 2020. Key objectives already committed to and underway are:

- Revise waste legislation to incorporate new circular economy requirements, including legally binding waste/recycling targets
- Develop a new National Waste Prevention Programme, and Regional Waste Management Plans that will guide our transition to a circular economy by EPA and Local Authorities
- Support the development of eco-design and circular economy opportunities for Irish enterprises to reduce waste over the full lifecycle of products
- Develop and implement a suite of measures to reduce the impact of single-use plastics

- Maintain Government leadership in taking responsibility for own resource consumption, particularly single use plastics, energy, waste and water
- Identify opportunities to strengthen the regulatory and enforcement frameworks and structures for the waste collection and management system, to maximise the collection of clean, segregated materials for reuse and/or recycling from all households and businesses,
- Incentivise consumers to reduce, reuse and recycle
- Regulate and incentivise producers of waste, particularly packaging, to ensure the prevention of waste and the use of recycled materials in packaging products
- Scope a number of possible environmental levies, including a possible levy on single use plastics, as part of the review of the Environment Fund. Further detailed research would be required prior to the introduction of any new levy
- Identify and commence delivery of measures to address the key regulatory barriers to the development of the bio economy, including exploring opportunities to establish "End of Waste" criteria for certain bio-wastes

Bioeconomy

In seeking to expand our bioeconomy, Ireland will undertake a number of policies and measures as set out under the national Plan including:

- Ensure that there is coherence between all sectoral strategies which impact on the bioeconomy in Ireland
- Establish a network comprised of representatives of commercial entities operating within the bioeconomy and relevant public bodies to inform the future development of the bioeconomy - this network may make additional recommendations to be followed up; (This could also include the sharing of best practice regarding applications for BBIJU, SC-2 and H2020 funding)
- Encourage the translation of research into real world applications through promoting collaboration between research institutions (academia) and industry - through the use of pilots/demonstrations at the model demonstrator facilities (Lisheen site, the Marine Research Cluster in Connemara)
- Assess the current legislative definition of waste and recommend whether a redesignation is necessary for residual waste flows to be successfully managed for use in the bioeconomy

- Ensure greater sectoral coherence within the bioeconomy through the development of risk assessment and management protocols regarding the use of by-products which encourages the piloting of opportunities
- Progress the leading value chain propositions identified in the Bio-Eire project by establishing the conditions required for their commercial viability and how these might be fulfilled
- Examine how greater primary producer, public and consumer awareness of the bioeconomy and its products could be built up - through knowledge transfer, advisory, sustainable business models, public procurement, consumer awareness campaigns and product labelling initiatives etc.

Air Quality

Ireland's projections show that some positive changes have been made since 1990, benefiting air quality and human health. The implementation of the policies and measures set out under this Plan and the Climate Action Plan will have significant benefits in relation to air quality. In particular, actions to reduce the use of fossil fuels, increase electrification of the national transportation fleet and further increase penetration of renewables in electricity generation will have knock on effects on the level of emissions of key pollutants across the state.

Biomethane

The Climate Action Plan outlines the need to set a 2030 target for the level of energy to be supplied by indigenous biomethane injected into the gas grid and consider how necessary supports would be funded. The Marginal Abatement Cost Curve developed for the Climate Action Plan estimated that circa 1.6 TWh was considered part of the most cost-effective pathway to reduce emissions in line with Ireland's decarbonisation targets.

There are a number of limiting factors that need to be considered when setting a biomethane target – in particular biomethane is significantly more expensive than natural gas, impacting commercial viability, and therefore financial supports will be required. There are a number of funding options for biomethane that are under consideration with the most viable being:

- An obligation in the transport sector through the Biofuels Obligation Scheme
- An obligation in the heat sector (as set out in Article 23 of the recast Renewable Energy Directive)
- An exchequer funded support

Public consultations commenced on the Biofuels Obligation Scheme (September 2019) and a potential heat sector obligation (October 2019). The potential for an Exchequer funded support would need to include consideration of the availability of funds, in particular the ability to fund within existing allocations provided under the National Development Plan.

In the absence of certainty in relation to the mechanism by which biomethane will be supported, it is proposed to set an indicative target which will be reviewed in 2023 as part of the review process for the National Energy and Climate Plan. This review will take into account the development of supports and market development for biomethane and progress towards the indicative target. The indicative target for indigenous biomethane is therefore set at 1.6 TWh and will be reviewed in 2023.

Hydrogen

While it is probably too early to know with certainty the part hydrogen will play in a decarbonised integrated energy system, the production and use of hydrogen is expected to have a key role to play in Ireland's transition to a low carbon economy and society.

As we move towards fully decarbonising our energy system, it is clear that there will be a move towards stronger sector coupling across the electricity, heating/cooling and transport sectors. With the development of large scale offshore renewable energy, the potential to generate renewable hydrogen at the scale required with an acceptable market price is becoming more realistic. Green hydrogen has the potential to play a key role in sectors which are difficult to decarbonise with existing technologies, such as heavy vehicles and maritime traffic. To decarbonise fully, it is vital to prioritise the development of green hydrogen. Blue hydrogen can only be acceptable where there is full capture and storage of the resulting carbon while grey hydrogen without carbon capture could not be considered to be acceptable in our transition to a fully decarbonised energy system.

Developing a hydrogen economy will pose many challenges to the traditional energy sectors both on the demand-side and on the supply side. It is only by cooperating on a European scale that we can develop the necessary market rules, safety standards and cross border infrastructure to underpin the development of a sustainable and economically viable hydrogen sector. This can only be achieved in an efficient manner through the co-operation of national Governments, regulatory bodies, system operators and industry research.

Ireland has significant potential for production of electricity from renewable sources (such as onshore wind, offshore wind and solar). However, there are challenges in accommodating high levels of variable generation on the electricity system. The production of hydrogen could provide a variable demand that utilises renewable electricity that can help to decarbonise the natural gas grid and provide a zero emission energy source for use in difficult to decarbonise

sectors such as transport and industry. Ireland supports further exploration of hydrogen to support the integration of variable renewable electricity generation in particular for electrically isolated regions and in order to mitigate curtailment of wind energy. There is also an opportunity to incorporate hydrogen production from waste to energy plants that may find their electricity output curtailed during periods of low demand or high renewable penetration.

Ireland has ambitious plans for renewable electricity with 70% of our electricity due to come from renewable sources by 2030. At times our electrical grid will not be able to use all this renewable generation so having the option to produce green hydrogen and having an integrated energy system will help enable Ireland fully utilise its renewable resources. This in turn will have the potential to reduce the overall cost of reaching decarbonisation targets. This hydrogen produced via underutilised renewable electricity could be stored in the local gas grid and used in the heating and transport sectors. This would provide benefits to all sectors and help the difficult to decarbonise areas of the economy such as industry and heavy goods vehicles. Blending with natural gas can create a demand for hydrogen and reduce emissions in grids across Europe. Current CCGTs (Combined Cycle Gas Turbines) could be reconfigured for H2 and potentially hydrogen turbines could be developed as backups for intermittent renewables.

Carbon Capture & Storage

While reducing greenhouse gas emissions is a priority for climate action, the potential for capturing anthropogenic carbon dioxide is also mooted globally to prevent further carbon dioxide from entering the atmosphere and contributing to climate change. Technology is rapidly developing in this area and it is essential that Ireland remains abreast of relevant developments. Further to the commitment under the Climate Action Plan, a Steering Group was established in 2019 to examine the feasibility of the utilisation of CCS in Ireland and to develop policy in the area. This group is currently assessing a projected at feasibility stage promoted by Ervia, with a remit to report to the Dáil Standing Committee on Climate Action as appropriate.

In terms of CCS and regional co-operation, Ervia has recently signed a Memorandum of Understanding with Equinor (Norway) and received letters of support for its successful PCI application from the Dutch Ministry and other CCS project developers; Athos (Netherlands), Gasunie(Netherlands), Sapling (Scotland), Northern Lights(Norway), UKCCS Research Group, Bellona (Norway) and Port Talbot(Wales).

Supported by the Irish Government, the project received PCI status in October 2019 and has applied for Connecting Europe Facility (CEF) funding in Q2 2020.

The project, alongside European partners, was successfully granted European Horizon 2020 funding to demonstrate a carbon capture plant on Ireland's only oil refinery and is expected, subject to the necessary approvals, to seek funding from the Horizon 2020 Geological Storage Pilot to progress studies into the potential for storing CO2 in the Kinsale Gas Field and another potential field in Europe.

Carbon Tax

The Irish Government's Finance Act, 2010 introduced a carbon tax which is applied to mineral oils, natural gas and solid fuels supplied for combustion in Ireland. Since 1st May 2012, the tax for natural gas has been increased from €15 to €20 per tonne of carbon dioxide (CO_2) emitted. The rate of tax on solid fuels from 1st May 2013 to 30th April 2014 was based on a rate of €10 per tonne of CO_2 emitted by the fuel. The rate increased to €20 per tonne with effect from 1st May 2014. Budget 2020 in October 2019 announced a further increase in the carbon tax to €26 per tonne which was to apply immediately to auto fuels and be applied to other fuels from May 2020. This will raise €90m in 2020 all of which is to be ring-fenced to fund new climate action measures. Carbon tax imposition has been part of an environmental tax reform agenda in line with the polluter-pays principle; carbon tax has collected over €2bn in revenue since it was introduced in 2010. Carbon tax is equivalent to 2.2 per cent of income tax receipts in 2015 (€18.4bn). There is scope to increase this and use the money to reduce other taxes. Increasing the price of carbon by €5 would yield over €100m per annum. This would add about one per cent to the price of diesel and petrol. Measures to increase carbon taxes will be part of an ongoing review into the medium-term.

Aviation

The International Civil Aviation Organisation (ICAO) has proposed a Carbon Offsetting Scheme for International Aviation (CORSIA), in which aircraft operators will be required to purchase offsets, or emission units, for the growth in CO_2 emissions covered by the scheme. CORSIA aims to address any annual increase in total CO_2 emissions from international civil aviation above 2020 levels. Ireland supports the International Carbon Action Partnership (ICAP) CORSIA proposals covering international aviation emissions and sees this policy as a natural successor for EU ETS Aviation which will ensure a more level playing field for EU carriers currently operating in ETS and subject to costs associated with ETS compliance.

National Digital Strategy

The development of a framework for a new National Digital Strategy is being led as a shared project by the Department of the Taoiseach, Department of Business, Enterprise and Innovation (DBEI), Department of Communications, Climate Action and Environment (DCCAE), and the Department of Public Expenditure and Reform. The innovations,

efficiencies, growth and well-being benefits and opportunities from digitalisation require supporting forward-looking agile policy structures and open and collaborative approaches. Digital by its very nature is cross cutting and the new Strategy provides an opportunity to draw out and build upon linkages.

Better connectivity and skills leads to greater usability and inclusivity for all. This will again lead to less need for travelling to offices and other cities, thus further reducing the individual's carbon footprint. Digitalisation affects all aspects of economic and social life. It can help address policy challenges in a wide range of areas, including health, agriculture, tourism, public governance, tax, transport, education, and the environment. It also has significant implications for areas such as for regulating the sharing economy, labour market and training requirements due to automation and new forms of work, viability of physical retail and public services and implications for sustaining towns, taxation of digital services, impact of "fake news", digital exclusion etc.

In deriving a framework, for the new National Digital Strategy, it will be cognisant of the interaction between policy, and supporting investments, and effective utilisation and related economic and societal impacts. The opportunities afforded by digital technologies will be harnessed, including our commitment to connect all homes in Ireland to high-speed broadband, as a powerful enabler of citizen and community engagement in the low-carbon transition. These technologies will also be a key driver of new economic and employment opportunities for all regions in Ireland, which will also have the potential to make a positive impact on our emissions by, for example, reduced commuting.

Smart meters are one of the most significant energy infrastructure projects in a generation. They are a cornerstone of our plans to future-proof our energy sector - and indeed wider economy - for the coming decades. Smart meters will assist us decarbonise our society as they facilitate reduced energy consumption and additional energy efficiency. They will empower consumers by giving them more information and more choice around their energy consumption, and will facilitate the introduction of new energy products and services by suppliers. Smart meters will be a key enabler and are a vital element of plans to facilitate micro-generation and to enable consumers become energy suppliers in their own homes.

Gender Equality

Ireland is committed to ensuring gender equality and has established a comprehensive framework of laws that provide for equal treatment of women and men. Our National Strategy for Women and Girls 2017-2020: Creating a Better Society for All commits to ensuring that a gender perspective is integrated into decision-making on a wide range of policies. The Strategy's key theme is to promote equality for women and girls across all

areas of life, in the workplace, in education, in the family, on public and corporate boards, in sport and the arts. The Strategy sets out 139 actions across six high level-objectives. Included under the actions is a commitment to take gender equality issues into account in the implementation of the National Strategy to Combat Energy Poverty, which commits to ensuring that new energy policy measures are evidence-based and consider the distributional impacts of these policies. A further commitment is to address gender equality across SEAI programmes, including its research programmes.

A pilot initiative for Equality Budgeting was announced as part of Budget 2018. The paper Equality Budgeting: Proposed Next Steps in Ireland was also published with the Budget to provide more information. Six equality objectives were identified in the pilot, and performance measurements for them were then included in the Revised Estimates 2018 (published at the end of that year). Five of the objectives related to gender equality, whilst the sixth related to socio-economic equality. 'Equality Budgeting' involves providing greater information on the likely impact of budgetary measures across a range of areas such as income, health and education, and how outcomes differ across gender, age, ethnicity etc. Equality Budgeting helps policy-makers to better anticipate potential impacts in the budgetary process, thereby enhancing the Government's decision-making framework.

iii. Policies and measures to achieve low emission mobility (including electrification of transport)

As regards the private vehicle fleet, in line with Ireland's Climate Action Plan, Ireland plans to progressively electrify our mobility systems, moving away from polluting and carbon-intensive propulsion systems to new technologies, such as electric vehicles and introduction of electric and hybrid traction systems for public transport fleets, such that by 2040 Ireland's cities and towns will enjoy a cleaner, quieter environment free of combustion engine-driven transport systems. Ireland's Climate Action Plan contains a commitment to maintain and build on existing tax and financial incentives for low emissions vehicles, as well as stating a further ambition that all new cars and vans sold in Ireland from 2030 will be zero emission (or zero emissions-capable), in line with the National Policy Framework: Alternative Fuels Infrastructure for Transport in Ireland: 2017-2030.

Low Emission Vehicles

There are a range of measures in place to support the uptake of low emission vehicles. The supports for electric vehicles include:

- Vehicle Registration Tax (VRT) relief on the purchase of newly registered electric vehicles

- A purchase grant for electric vehicles
- Accelerated Capital Allowances (ACAs) for electric vehicles and charging infrastructure.
- A grant to support the installation of a home charger for purchasers of new and second-hand electric vehicles
- A grant to support the use of electric vehicles in the taxi/hackney/limousine sector.
- Relief from Benefit-in-Kind taxation for battery electric vehicles.
- Low motor tax for battery electric vehicles
- A discount on road tolls for electric vehicles
- A public awareness campaign led by the SEAI

There are also a number of measures in place to support the uptake of other low emission vehicles including:

- VRT relief on the purchase of newly registered hybrid electric vehicles.
- As part of the Causeway Project, Gas Network Ireland are currently rolling out 14 publicly accessible compressed natural gas (CNG) fuelling stations on the core TEN-T road network
- Excise duty on compressed natural gas (CNG) is set at a significantly reduced level from the comparable levels that apply to petrol and diesel
- Accelerated capital allowances for gas-propelled vehicles and refuelling equipment

The Low Emission Vehicle Taskforce is also considering further potential polices and measures to support the uptake of low emission vehicles. As regards electrification of transport, Ireland's recently published set of strategic overarching policy documents encompassing the National Planning Framework and the National Development Plan, Project Ireland 2040, contains a series of relevant measures. These include delivering the key rail projects set out in the Transport Strategy for the Greater Dublin Area (GDA), including Metro Link, DART expansion and the Luas green line link to Metro Link.

The Climate Action Plan sets a target of 936,000 electric vehicles (including both battery electric vehicles and plug-in hybrid electric vehicles) to be on the road in Ireland by 2030. There are a range of supports in place to incentivise the uptake of electric vehicles including:

- Purchase grants of up to €5,000
- Vehicle registration tax relief of up to €5,000

- Benefit-in-kind tax relief for battery electric vehicles
- Grants of up to €7,000 for electric vehicles in the taxi/hackney/limousine sector (increasing to €10,000 from 2020)
- Accelerated Capital Allowances for businesses
- Low rate of annual motor tax
- A discount on tolls

In addition, to support the development of charging infrastructure, the following supports are in place:

- A grant of up to €600 towards the cost of the installation of a domestic charge point (which will be expanded in 2020 to include shared parking in apartment blocks)
- Accelerated Capital Allowances for businesses to support investment in charging infrastructure
- A grant of up to €5,000 per charge point to support Local Authorities installing on-street chargers
- Support of €10m from the Climate Action Fund to support ESB ecars in renewing the existing public charging network and rolling out 50 fast chargers (50kW) and 90 superfast chargers (150kw) across the country

The Climate Action Plan sets out a number of actions to further support the uptake of electric vehicles including to:

- Introduce legislation to ban the sale of new fossil fuel cars from 2030
- Develop a roadmap on the optimum mix of regulatory, taxation and subsidy policies to drive significant ramp-up in passenger EVs and electric van sales from very early in the next decade
- Develop the EV charging network necessary to support the growth of electric vehicles and set a target for the supply of infrastructure to stay sufficiently ahead of demand
- Develop and implement planning rules and guidelines across residential and non-residential parking locations for electric vehicle charging infrastructure
- Ensure our regulatory regime for buildings requires the installation of electric vehicle charging infrastructure

The Climate Action Plan and recommendations from the Low Emission Vehicle Taskforce also recognise the need to incentivise the growth of low emission vehicles in addition to electric vehicles. In particular supports for the growth of CNG, LNG and hydrogen vehicles – particularly as the heavy duty vehicles – are being considered.

The Biofuels Obligation Scheme as detailed above ensures the continued increase in use of sustainable biofuels in the transport sector.

Land Use Planning

Ireland has a relatively low population density with 70 persons per square kilometre compared to 117.7 for the EU-28. Such settlement patterns give rise to dispersed journeys for which public transport provision is not always feasible. The net result is a higher dependence on private car use and longer journeys compared with more densely populated urban settlements. In addition, Ireland is experiencing population growth with an increasing tendency towards dispersed, low-density developments. The largest increases in population over the past twenty years have been in Fingal, Cork (outside Cork City Council area), Kildare, Meath, Laois and Galway County (outside Galway City Council area) accounting for approximately 45% of the additional population growth since 1996. These extensive catchments and dispersed land-use development patterns have resulted in greater car dependency, longer commutes, a high demand for road infrastructure and difficulties in supplying adequate public transport provision.

Transport policies aimed at reducing travel demand and travel distances can only be delivered if there are effective spatial policies in place. The location of schools, jobs, shops, local services and other land uses relative to the location of residential developments are critical determinants of the need to travel, the distances to be travelled and the modes of transport chosen. Additionally, the provision of sustainable transport alternatives can only be effective if matched with complementary development patterns which support and facilitate their use.

Future investment in new public facilities must take account of the need for access without reliance on the car. In the Greater Dublin Area, the National Transport Authority (NTA) published the Transport Strategy for the Greater Dublin Area 2016-2035 to ensure that spatial planning and transport planning are appropriately aligned. While it is not currently a statutory requirement for other cities to develop a similar transport strategy the NTA has assisted several local authorities across Ireland in preparing plans to strengthen the levels of integration between spatial planning and transport planning across the country. The National Planning Framework: Ireland 2040 includes a commitment to extend the NTA's statutory remit for transport planning in the GDA to the other cities. Outside the GDA, the NTA has

assisted the local authorities in Cork and Galway to develop the Galway Transport Strategy and the draft Cork Metropolitan Area Transport Strategy. Work is underway on the Limerick Shannon Metropolitan Area Transport Strategy and will start soon on the Waterford Metropolitan Area Transport Strategy.

In line with the energy efficiency first principle, public transport use and modal shift should be encouraged through efficient planning. The implementation of the National Planning Framework will be central in setting the context for future national planning objectives and will ensure that all future land use and transport planning are fully aligned to successfully influence how people travel. Land use policy is a key determinant in transport investment decisions at both the strategic and local level. The Framework has set National Strategic Outcomes for Sustainable Mobility and the Transition to a Low Carbon Climate and Climate Resilient Society. The Government has identified the transition to electric vehicles (EVs) and other low emission vehicles (LEVs) as a critical factor in delivering these outcomes, through:

- The provision of adequate charging infrastructure: The Government's vision is that, where feasible, EVs are charged primarily where they are parked overnight and that supplementary charging opportunities are made available at suitable locations and destinations where vehicle parking is provided and along key travel routes
- Local Authority Development Plans: The cost of retrofitting charging infrastructure to existing homes, businesses, car parks and other locations can be a barrier to its installation and therefore to the transition to EVs. Consequently, it is vital that Local Authorities should ensure that provision is made for EV charging within their Development Plans, particularly at the point of development and construction; and
- The provision of adequate charging LEV infrastructure: The provision of adequate fuelling infrastructure nationally for other LEVs (such as compressed natural gas, liquefied natural gas and hydrogen) should be facilitated, where appropriate, to support the uptake of these vehicles and their rollout nationally

A Working Group set up under the LEV Taskforce considered the role that planning policy and legislation, building regulations and state leadership may play in facilitating charging and refuelling infrastructure deployment. Planning Authorities play an important role in future proofing the need for LEV recharging/refuelling infrastructure through the planning process. Currently, in Ireland all Planning Authorities are required to have a *Development Plan* for their functional area which must support the promotion of measures to reduce greenhouse gases and address necessity of climate change adaptation.

To integrate LEVs further into Development Plans the LEV Taskforce recommended that the Guidelines be updated to include:

References to evolving government LEV policies to support the roll out of LEV infrastructure through Planning Authority functional areas; make certain adequate numbers of EV charging points are installed and provision is made (e.g. through the installation of ducting) for future installation of EV charging points at all appropriate locations where parking is provided for passenger vehicles (including homes, businesses, on street and car parks); safeguard that adequate numbers of public EV charging points are 'accessible for all'; and ensure locations that cater for traditional fuelling of vehicles (i.e. filling stations) provide charging for EVs and, where applicable and in line with government policy, fuelling for other LEVs.

The Taskforce also recommended that guidance be issued to planning authorities to ensure a consistent and future proofed approach to the rollout of EV charging infrastructure through planning decisions.

Improving the Efficiency of Public Transport

The Public Sector Energy Efficiency Strategy highlights the role that the public sector fleet can play in piloting, facilitating and accelerating market uptake of new, energy efficient technologies and alternative fuels. The efficiency of the public transport fleet is incrementally being improved through the replacement of older vehicles with newer models and prioritising/accelerating the roll-out of more energy efficient vehicles.

A. Electrification of Commuter Urban Rails

The DART (Dublin Area Rapid Transit) system is an electrified commuter rail network serving the east coast of Dublin, including its city centre. The DART currently serves 31 stations and provided over 35 million passenger journeys in 2018.

The National Development Plan committed €8.6bn to upcoming public transport projects over the period to 2027. Of this, an estimated €2bn is earmarked for investment in the DART Expansion Programme which will create a full metropolitan area DART network for Dublin and will transition current diesel commuter lines to electricity from the city centre to Drogheda, Co. Louth, to Celbridge/Hazelhatch and Maynooth, Co. Kildare. This will also involve a new interchange station with bus, LUAS (light rail) and planned MetroLink networks. This is the part of the national rail network that carries over 75% of total rail passengers each year.

Delivery is also expected in 2022 of Ireland's first diesel-electric trains, which will enable the enlargement of the rail fleet by approximately some 300 new rail carriages. In addition, Iarnród Éireann has also secured up to €15m funding under the Climate Action Fund to design new hybrid power-packs for intercity railcars to reduce diesel use and greenhouse gas emissions. Following the proof of concept in one three car train, the hybrid power-packs

could potentially be implemented across the wider fleet. These major rail projects will help supplement the range of viable low carbon alternatives to private passenger car travel and positively impact on our sectoral emissions and energy profile.

B. Cessation of Diesel Urban Bus Purchasing

In the urban bus fleet, a clear trajectory towards low-emission has firmly been established. In the short term, the National Development Plan committed Ireland to no longer purchase diesel-only buses for the urban public bus fleet from July 2019. In the short-term, a decision was made by the National Transport Authority (NTA), which is responsible for procurement of vehicles in the public service obligation (PSO) fleets, to purchase hybrid-electric buses in the short term. The Climate Action Plan also contains actions to accelerate the decarbonisation of the public bus fleet with the objective to only have low-emitting buses in the urban PSO bus fleet by 2035.

In order to inform future purchasing decisions, the Department of Transport, Tourism and Sport launched a low emission bus trial in December 2018. The trial assessed full electric, diesel-electric hybrids and compressed natural gas buses and key findings from this trial have been published on the DTTAS website. The medium and longer term approach to the NTA's procurement of low-carbon buses will be informed by a range of matters, including the outcome of the low-emission bus trials, as well as the Sustainable Mobility Policy review and complementary information from trials and demonstrations of lower-emitting buses undertaken in other jurisdictions across Europe.

The recast Clean Vehicles Directive also contains new stringent sub-targets for zero-emissions buses to promote cleaner and energy-efficient public transport vehicles. It is expected that this Directive will result, in the longer term, in acceleration and wider deployment of clean and energy efficient buses.

C. Electrification of New Public Transport Projects

Further investment from the National Development Plan allocation of €8.6bn to public transport includes almost €460m to 2021 for light rail projects in Dublin, including the Green Line Capacity Enhancement Project which, in addition to the recently completed Luas Cross City project, will add capacity to the light rail network in Dublin through additional and longer trams.

In addition, funding is also being allocated to progress a new metro system, MetroLink, which will stretch from Swords, north Co. Dublin, to Dublin's south city centre. This system will provide Dublin with a high-capacity, high-frequency cross-city rail corridor, serving critical destinations including Dublin Airport and Dublin City University. MetroLink will provide faster

reliable journey times to and from these key destinations while offering interchange with other rail, DART Expansion, light rail and bus services.

D. Demand Management Study in Major Cities

The Climate Action Plan sets out a number of actions and targets including some which should encourage fewer diesel and petrol cars on Irish roads, particularly in cities. Fewer fossil fuelled cars would have a number of effects in Irish cities, including improved air quality, less congestion and lower levels of CO_2 emissions. In order to encourage the transition away from fossil fuels onto more sustainable forms of transport, Action 81 of the Plan calls for: [The development of] a regulatory framework on low emission zones and parking pricing policies, and provide local authorities with the power to restrict access to certain parts of a city or a town to zero-emission vehicles. Examine the role of demand management measures in Irish cities, including low emission zones and parking pricing policies.

Implementing this commitment, the Department of Transport, Tourism and Sport (DTTAS) published a request for tenders to carry out a Demand Management Study, the purpose of which is to understand what measures are available to help address the impacts of growing transport levels in our major cities (Dublin, Cork, Limerick, Galway and Waterford). The study will look at a range of factors and ultimately should recommend options on how we might better manage travel demand in urban areas. A number of cities and countries have introduced various suites of demand management measures to limit traffic and encourage alternative transport modes, especially in urban areas due primarily to congestion and air quality concerns. These measures include: parking policies; low emission zones; tolling; and teleworking practices.

Implementation of the required and most appropriate measures in each case will have regard to existing powers of local authorities, including those reserved to elected members. DTTAS will work closely with the Department of Housing, Planning and Local Government if additional legislation or local authority functions are identified as providing pathways for addressing these problems.

E. Electric Vehicle Deployment Roadmap

Passenger cars account for over half of all land transport emissions in Ireland; therefore a transition to low and zero emission cars is one of the necessary changes if Ireland is to substantially reduce its transport emissions and energy use. Accordingly, electric vehicles (EVs) are a prominent mitigation in the Climate Action Plan, which sets targets of 180,000 EVs on Irish roads by 2025, and 936,000 EVs by 2030. With over 14,600 EVs in Ireland at the end of October 2019, these targets are very challenging and they are indicative of the

scale of the transformation that is needed across all sectors if Ireland is to reduce national emissions and reach its legally binding emission ceiling in future years.

It is widely expected that, over the coming years, the combination of:

- Improvements in technology
- Reductions in vehicle purchase prices
- Increasing driving ranges and model availabilities; and
- Government incentives and new investment in the recharging network

will maintain the current positive policy environment under which we have seen EV sales rise steeply over the past year, albeit from a low base.

To date, the Irish Government, supported by the Low Emission Vehicle Taskforce, has worked to ensure that conditions and policies are in place to support citizens in making greener vehicle choices. Several Government Departments have responsibility for incentives to encourage a move towards EVs; this concerted work across several Departments will continue in order to accelerate the current trajectory of EV sales. Action 79 of the Climate Action Plan commits DTTAS to develop a *roadmap* on the optimum mix of regulatory, taxation and subsidy policies to drive significant ramp-up in passenger EVs and electric van sales from very early in the next decade. The relevant Departments will be convened by the end of February 2020 to pursue this aim.

Public Transport Investment

The National Development Plan (NDP) sets out the major investments planned over the next 10 years for Public Transport. It provides for full Exchequer funding of €91bn allocated for public capital investment over the period 2018 to 2027 of which €8.6bn has been set aside for investment in Sustainable Mobility. Over the period leading up to 2027, the NDP will deliver the new MetroLink, the DART Expansion Programme, and BusConnects in the Greater Dublin Area and Cork and Galway.

MetroLink will run between Swords and Charlemont, connecting key destinations including Dublin Airport and the City Centre along the 19km route. It will provide Dublin with a high capacity, high-frequency cross-city rail corridor and will have the capacity for 30 trains per hour in each direction. It will cater for up to 20,000 passengers per direction per hour and carry up to 50 million passengers per annum.

The DART Expansion programme is a series of projects that will create a full metropolitan area DART network for Dublin with electrification of the Northern, Kildare and Maynooth lines. It includes buying additional fleet for the DART network and measures such as re-

signalling, junction and station changes and new stations to provide interchange with bus, LUAS and Metro networks.

BusConnects Dublin involves a blend of infrastructure and system improvement measures alongside a reconfigured bus network. The initiative aims to transform the current bus system in the Dublin Region. This programme is part of a wider BusConnects programme for Ireland's cities, starting in Dublin and rolling out to Galway, Cork and Ireland's remaining cities. BusConnects will deliver a better and more efficient bus network; faster journeys for public transport users; improved passenger information and ticketing technology and transition to a lower emission bus fleet

The NDP also includes maintenance of the current Public Transport network, fleet renewal, maintaining and upgrading heavy rail infrastructure, the appraisal and design of extending the Luas network for when and where it is needed, investment in cycling and walking facilities, accessibility upgrades, and the roll out of next generation ticketing systems.

Modal Shift/Share

Alongside technological developments, behavioural change amongst motorists will be critical in reducing emissions in the transport sector. Many mitigation measures are dependent on modal shift or a change in the fuel and/or technology currently employed to meet travel demands. It is critical to develop a better understanding of the important role that behavioural economics and psychology play in decision making to facilitate a greater uptake of energy efficient or sustainable travel options. Normalising new technologies and addressing consumer concerns will be required to accelerate the mitigating impact that alternative fuels and technologies can potentially have.

"*A New Transport Policy for Ireland 2009-2020*" sets out key modal share targets for achievement by 2020. These targets are aimed at reducing work-related commuting by car as a modal share of 65% to 45% and accommodating car drivers on other modes of transport such as walking, cycling, public transport and car sharing to the extent that commuting by these modes would rise to 55% by 2020 (or through other measures such as e-working).

Figures released from the Central Statistics Office (CSO) in the CSO *National Travel Survey* of 2016 indicate that the use of private cars nationally for work commuting purposes has dropped from 67% in 2011 to 66% in 2016. This has occurred against a background in the last few years of strong economic recovery, growth in the numbers of people at work, and consequent increases in travel demand and numbers of people commuting.

In the Greater Dublin Area there has been a much greater and a more significant modal shift. The *Annual Canal Cordon Report* recently published by Dublin City Council and the National Transport Authority - which provides data on trends in mode share of vehicles and people crossing the Canal Cordon in Dublin between 7am and 10am - indicates that a strong modal shift has been occurring in the Dublin City Centre area. It shows that 70% of all inbound trips crossing the canal cordon were made by a sustainable mode which includes cycling, walking, taxi and other public transport. Over the last 12 years, the share for sustainable modes has grown by 9 percentage points, and since 2010 there has continually been year-on-year growth.

In order to continue to build on this momentum and to encourage further modal shift nationally, over €110m in capital funding is being directly allocated to develop cycling and walking infrastructure in the Greater Dublin Area, Galway, Limerick, Cork and Waterford over the period 2018-2021. A further €135m capital funding is allocated over this same period for investment in Sustainable Urban Transport projects, and these will include projects that will provide either direct or indirect improvements for urban cycling. Investment of more than €750m on the Bus Connects Programme in the same period, will deliver a transformative investment package that will finance new and expanded bus routes, greatly improve bus access, and also includes the commencement of construction of core bus routes that include segregated cycle lanes and pedestrian footpath all which will greatly assist in encouraging modal shift. €2.5m per annum is also spent on behavioural change programmes including Green Schools, Cycle Right and Smarter Travel Workplace and Campus programmes aimed at encouraging a modal shift.

DTTAS has commenced a review of public transport policy "*to ensure services are sustainable into the future and are meeting the needs of a modern economy*". Preparations are now at an advanced stage for launching very shortly. This policy review has been drawing together data and information from many sources, including monitoring trends in modal shift in order to inform future policies in the context of encouraging further modal shift from the private car to sustainable public transport modes.

iv. Where applicable, national policies, timelines and measures planned to phase out energy subsidies, in particular for fossil fuels

Fossil Fuel Subsidies

The Climate Action Plan commits to phasing out coal-fired electricity generation by 2025 and peat-fired electricity generation by 2028. There are three electricity generating plants in the Midlands that use peat as the primary fuel, totalling 350MW of electricity. Two of these plants will close by the end of 2020 when current planning permission expires. The Plan also

includes an action to model the impacts, both in terms of the economy and in terms of emissions, of removing fossil fuel subsidies.

The Public Service Obligation (PSO) levy has been in place since 2001. It is the overall support mechanism for peat generation, for certain conventional generation constructed for security of supply purposes, and for the development of renewable electricity. The levy compensates electricity suppliers for the additional costs they incur by purchasing electricity generated by these producers.

The Commission for Regulation of Utilities (CRU) determines the PSO levy which is a charge on all electricity customers without exception. Regulations made under the Electricity Regulation Act 1999, as amended, provide the legal basis for the levy. The levy applies to all electricity customers and is reviewed annually. The PSO levy supports for peat generation will cease at the end of 2019. One of the actions in the Climate Action Plan is that CRU is to carry out an assessment of the impact of the current structure of electricity bill charges, including PSO and standing charges on self consumers and other consumers, in 2020.

Indirect Carbon Costs

ETS installations in Ireland are currently not permitted to recoup indirect carbon costs associated with electricity and gas expenditures that already bear carbon tax incidence. This discretionary aspect of EU ETS is subject to review by the Department of Finance.

Just Transition

The Climate Action Plan recognises that the level of change envisaged to decarbonise Ireland's economy cannot be avoided. However, it is essential that the burdens borne are seen to be fair and that every group is seen to be making an appropriate level of effort. This will be essential to maintaining the high level of political and civic consensus which has been built through the work of the Citizens' Assembly and the All Party Committee on Climate Action.

A Just Transition Review Group will be established within the National Economic and Social Council (NESC) as part of its working group structures. Through this Group, NESC will review the ongoing transition and identify specific transition needs among cohorts of workers, enterprises, communities and specific groups of people.

The Just Transition Review Group will collaborate with a wide range of stakeholders and will interact closely with both the National Dialogue on Climate Action and the Sustainable Development Goals Stakeholder Forum which operate under the Department of Communications, Climate Action and Environment.

The NESC was also tasked with publishing a periodic review and strategic advice on the Just Transition. This will include an examination of the range of national and international funding opportunities, and how these could be used to underpin the work of this Group and the priorities identified. The first periodic review and strategic advice will be published by the end of 2020 and is intended to be a key input to the formulation and adoption by Government of a five year Just Transition Strategy.

The Government recognises that addressing just transition is also about empowering communities and households to prepare for and to realise the opportunities that will be afforded by a low carbon transition. The Government is committed to delivering a just transition to those who are negatively impacted by climate action. This includes those workers affected from the move away from fossil fuels. Ireland will:

- Improve the resilience of communities and households by providing information and building capacity, taking account of the distinctive needs of urban and rural communities
- Provide improved training and support initiatives for community and voluntary stakeholders to support community, local and national low carbon action;
- Work to refine how our energy schemes target those most in need, to make them as efficient as possible
- Address the impact of proposals for carbon pricing on low income groups and those facing greater challenges in reducing their emissions
- Enhancing the capacity of our education and training system to support a just transition, including more explicit focus on the skills needed in the low-carbon transition. This includes supports for workers in vulnerable sectors and returnees to the labour market through a focus on career advice, up-skilling and re-training, as well as the development of new skills and expertise in our education and training system

Bord na Móna has been harvesting peat for electricity generation in the Midlands of Ireland for over 70 years. There are three electricity generating plants in the Midlands that use peat as the primary fuel, totalling 350MW of electricity. One plant at Edenderry is currently co-firing with peat and biomass. While it was planned to co-fire with peat and biomass and eventually move to 100% biomass by 2027 in all three plants due to several issues, including planning approvals, supply of indigenous biomass, compliance with EU and national objectives, and economic viability (carbon price, fuel costs, sustainability, etc.), two of these plants will close by the end of 2020 when current planning permission expires. The third

plant is likely to seek planning to move to 100% biomass when its current planning approval expires in 2023, thus maintaining some fuel diversity and possibly an indigenous fuel source if sufficient biomass can be produced locally.

Bord na Móna has been an integral part of the commercial and social development of the Midlands since 1947, creating significant employment in the region. Several supports are being put in place in the context of the Government's response to the challenges facing the Midlands region in the transition away from peat harvesting.

Budget 2020 announced specific measures to respond to the fallout from the cessation of peat harvesting by Bord na Móna:

- the appointment of a Just Transition Commissioner
- the establishment of a €6m Just Transition Fund to support the retraining and reskilling workers and assist local communities and businesses in the Midlands to adjust to the low carbon transition
- the allocation of €5m for bog restoration and rehabilitation which will restore bogs to their natural habitat and become sinks that absorb carbon
- providing €20m to deliver a new model to group housing upgrades together and targeted at the Midlands

These measures will be targeted at the Midlands and will support, alternative employment, retraining and reskilling workers and assist local communities and businesses in the Midlands to adjust to the low carbon transition. There will be further consultation with the structures already in place in the Midlands, including the Midlands Transition Team, on the application of the funding.

The bog restoration and rehabilitation fund will support the National Parks and Wildlife Service to restore to their natural habitat 1,800 hectares of bog. This restoration will return these bogs to carbon sinks once more, which, over the next 5 years, will result in 28 million tonnes of carbon being stored. 70 jobs will be created in year one, rising to 100 as the programme develops.

The delivery of a new model to group housing upgrades together is set out in the Climate Action Plan. This will be targeted at the Midlands and will support an estimated 400 jobs directly and indirectly, as well as significantly upgrading the social stock in the region during 2020.

A Just Transition Commissioner is to be appointed to engage with all relevant stakeholders in the Midlands, including Bord na Móna, the Midland Regional Transition Team, as well as

the National Economic and Social Council. This appointment will be part of the Government's Just Transition Plan, which is currently being led by the Department of An Taoiseach.

Ireland has also been included as members of the Platform for Coal Regions in Transition. Membership of the Platform enables the Midlands region to avail of the support of a dedicated Country Team of experts to assist with the development of strategies and projects for the region, focusing in particular on the employment challenges faced by the workers affected by efforts to decarbonise our economy. The ending of peat harvesting in the midlands will have significant implications for employment in the region and the Government has been successful in having the midlands included in the Platform for Coal and Other Carbon-Intensive Regions in Transition, which supports regions affected by climate policy. Membership of the Platform enables the Midlands region to avail of the support of a dedicated Country Team of experts to assist with the development of strategies and projects for the region, focusing in particular on the employment challenges faced by the workers affected by efforts to decarbonise our economy.

3.2. Dimension Energy Efficiency

Ireland's 4th National Energy Efficiency Action Plan (2017), National Mitigation Plan (2017), Long Term Renovation Strategy (2017) and National Development Plan (2018) set out the policies, measures and programmes that Ireland is already undertaking, developing and considering to achieve energy efficiency and climate objectives.

Ireland's further commitment for 2030 is set out in the Climate Action Plan (2019) which will intensify effort and investment aiming for Ireland to deliver primary energy savings of 62,171GWh by 2030. This new indicative national energy efficiency contribution for 2030 represents a substantial intensification over and above the significant scale of effort already in place (with the scale previously in place projected to deliver 16% energy efficiency improvement by end 2020).

The target for energy efficiency savings to be pursued in Ireland is based on the continuation of measures already in place, upscaling and adding to those measures based on the approach and level of investment set out in the National Development Plan together with the actions and intensifications outlined in the Climate Action Plan.

This level of achievement will be a significant challenge for Ireland. The key measures in each sector are set out in the Climate Action Plan.

Planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 as well as other objectives referred to in point 2.2, including planned measures and instruments (also of a financial nature) to promote the energy performance of buildings, in particular with regard to the following:

i. Energy efficiency obligation schemes and alternative policy measures under Articles 7a and 7b and Article 20(6) of Directive 2012/27/EU and to be prepared in accordance with Annex III to this Regulation

Ireland currently intends to deliver the energy savings required by Article 7 of the Directive 2012/27/EU through a combination of an obligation scheme on energy suppliers and distributors and a range of alternative measures. This is subject to ongoing consultation. Applying the annual savings rate (0.8%) from Article 7(1)(b) Ireland's cumulative Article 7 target will be approximately 5,180ktoe over the period 2021-2030. The estimated level of savings and the planned approach for meeting the target are provided in the voluntary guiding template under Directive 2012/27/EU.

ii. Long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private, including policies, measures and actions to stimulate cost-effective deep renovation and policies and actions to target the worst performing segments of the national building stock, in accordance with Article 2a of Directive 2010/31/EU

Under the 2017 Long Term Renovation Strategy (LTRS) Ireland already has a number of supports in place to encourage retrofitting of homes, businesses and public sector buildings. These supports have resulted in 400,000 homes being upgraded as well as thousands of community and commercial buildings. The majority of these upgrades have been shallower measures. Pilot schemes investigating the challenges and opportunities of deeper retrofit have also been rolled out and the leanings from the schemes have informed the approach to fulfil the level of retrofitting set out in the Climate Action Plan and this Plan.

Existing Measures

Residential

- Better Energy Programme – a number of grants are available for energy efficiency upgrades and renewable energy systems. The amount of support available depends on the household's financial situation. The Programme also funds upgrades in community buildings

- Home Renovation Incentive – a tax relief on renovation measures in homes which was in place until end 2018. This could be claimed for a range of renovation measures including energy efficiency upgrades
- Social Housing Retrofit Programme – the social housing stock is undergoing a programme of energy efficiency renovation

Commercial

- LIEN (Large Industry Energy Network) – A network of larger energy users that enables them to share best practice, improve energy management and energy efficiency
- EXEED (Excellence in Energy Efficient Design) – support programme with certification option to help businesses, both public and private, improve energy efficiency, and to embed energy efficient design thinking that will continue to benefit the organisation. The process encourages businesses or organisations to look at projects from the design stage, and consider most efficient process when commissioning or designing a new project, process or asset, thereby helping businesses to become more efficient, competitive and resilient
- ACA - The Accelerated Capital Allowance (ACA) is tax incentive operated by Revenue which encourages businesses to upgrade to the most energy efficiency equipment

Public Sector

- Detailed in section (iii, and iv)

Cross Sectoral

- Energy Efficiency Obligation Scheme (2014-2020)– Ireland has established an obligation scheme under Article 7 of the Energy Efficiency Directive. The scheme obligates larger energy suppliers to achieve energy savings among end users

Planned Measures

The new (2020) LTRS will further reflect the commitments in the National Development Plan and the actions set out in the Irish Government's Climate Action Plan.

For 2030 these include:

- 500,000 homes retrofitted to a B2 Building Energy Rating or cost optimal or carbon equivalent by 2030
- Public sector buildings to have a B Building Energy Rating by 2030

- One third of all commercial buildings to have a B Building Energy Rating or achieve carbon equivalent gains by 2030

These targets will be met through building on the existing approach with a set of new actions that will drive achievement of the targets:

New Delivery Structure for Retrofitting:

- To achieve the levels of retrofit required to reduce emissions from the Built Environment a new retrofitting delivery model is being developed. The model will group retrofits together to achieve economies of scale, leverage private finance, and ensure easy pay-back methods for homeowners
- To begin with a defined area of social housing will be identified as the core of a pilot approach, and will seek to include private households to make greater use of non-Exchequer funds. This approach will be trialled in the Midlands in 2020
- Area based, scaled approaches can make it easier to inform and engage the homeowners being targeted by building on existing community structures and programmes. They can also build the confidence of supply chains, which will need to invest in both competency and capacity as we fulfil our national ambition on the decarbonisation of our built environment
- The Department of Communications, Climate Action and Environment and SEAI will identify a delivery structure and funding options for an area based residential retrofit programme in early 2020

Building Standards, Retrofitting and Energy Efficiency:

- 500,000 homes to be retrofitted to a B2 Building Energy Rating or cost optimal.
- Local Authorities will upgrade their housing stock under Phase 2 of the social housing retrofit programme to bring dwellings more than 40 years old (30% of the social housing stock) to a B2 equivalent BER
- The Public Sector Energy Efficiency Strategy and its associated support programme are designed to assist public bodies in achieving the national energy efficiency targets of 33% 2020, and 50% by 2030.
- The Excellence in Energy Efficient Design (EXEED) programme will help commercial buildings and businesses embed energy efficiency measures in the design of their projects, processes, and assets

- Scale-up and improve the Sustainable Energy Communities and Better Energy Communities programme and enlist a wider range of organisations to anchor its collective approach. This will be done through developing new partners, creating more visibility within communities, and attracting matching finance
- Develop the necessary supply chain, including working with Regional Skills Fora to train skilled workers

Smart Finance:

- Develop a smart finance initiative to provide a competitive funding offer with State support. A guarantee-based product will offer both a degree of risk-sharing to lenders, and an additional leverage effect, which means that the funding is used in a more efficient way
- Expand salary incentive schemes within existing SEAI programmes, including setting up public and private sector pioneer programmes for these models and consider other 'easy pay' methods.

iii. Description of policy and measures to promote energy services in the public sector and measures to remove regulatory and non-regulatory barriers that impede the uptake of energy performance contracting and other energy efficiency service models

In 2009, the Government set a national target to improve energy efficiency by 20% by 2020 and at that time set the public sector the more challenging target of improving its energy efficiency by 33%. Since 2009 the public sector has improved its energy efficiency by 27%. To ensure that the public sector fully realise its targets the Government introduced a new Public Sector Energy Efficiency Strategy in January 2017. The Strategy underlines the importance of:

- the public sector demonstrating strong leadership on energy efficiency and of
- all Government Departments and the bodies under their aegis embedding efficient energy management at all levels of their business operations

A crucial provision of the new Strategy was the putting in place of a new Governance structure which includes assigning the role of Energy Performance Officer (EPO) to a member of the senior management in each public sector body. The EPO is accountable for energy management and performance and should oversee and be responsible for achievement of the energy goals in that body. S/he is expected to assign clear implementation responsibility to ensure targets are met. Since the strategy was introduced in

2017 the levels of energy efficiency achieved by the sector as a whole has increased steadily in each of the 2 subsequent measured years. The efficiencies achieved and progress made by each public body are tracked annually through the SEAI's Monitoring and Reporting system. All Public sector bodies report their data into this system which provides a solid evidence base to measure and manage progress. The scale of progress is reported annually in the Annual Report on Public Sector Energy Efficiency performance.

The Climate Action Plan sets a renewed ambition for the public sector – with a new 50% efficiency target for 2030 and for the sector to lead on decarbonisation of Ireland's economy. The Plan sets out actions to enable public bodies to go beyond shaping the policy framework and act as exemplars of best practice in taking climate action across all sectors and use their capacities to lead a wider transition

iv. Other planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 as well as other objectives referred to in point 2.2 (for example measures to promote the exemplary role of public buildings and energy-efficient public procurement, measures to promote energy audits and energy management systems, consumer information and training measures, and other measures to promote energy efficiency

Existing Measures

- SEAI have established a Behavioural Economics Unit which is focused on encouraging measurable changes to homeowners' and businesses' energy behaviour, using the latest evidence from Behavioural Science and Economics; their work also helps inform policies through SEAI
- SEAI engages frequently with consumers and business and carries out regular surveys of attitudes towards and perspectives on energy efficiency
- SEAI's website also provides useful information on taking action on energy efficiency for consumers and businesses;
- For businesses, SEAI provide a range of guidance and supports. These include: -
    - Online guidance and information including guidance on energy audits for identifying energy efficiency opportunities
    - classroom based energy management training for companies
    - Audits – For larger enterprises SEAI operate an Energy Audit Scheme which helps larger enterprises comply with their obligations under Article 8 of the Energy Efficiency Directive

- Ireland's Building Energy Rating system provides homeowners with information on the efficiency of their home as well as guidance on the steps they can take to reduce their energy usage and their costs
- Government has also funded the rollout of Home Energy Savings Kits across libraries, where individuals can borrow a kit of practical tools that will help them to understand their energy usage and take steps to become more efficient
- Schools Education programme is a collaboration between the Department of Education & Skills (DES) and the Department of Communications Climate Action & Environment through the SEAI to improve buildings energy efficiency in schools including fabric retrofit. Operating since 2017 in support of the Public Sector Energy Efficiency Strategy, this pathfinder programme has developed and continues to refine a retrofit approach that can be scaled up and rolled out to schools across Ireland when resources allow
- The Central Government Retrofit Programme, introduced in 2017, is another partnership pathfinder retrofit programme between the Office of Public Works (OPW) and SEAI for Central Government, and other OPW estate, buildings within the OPW building portfolio. The Programme's aim is to develop, test and refine retrofit approaches and build capacity for a large-scale energy retrofit programme for the wider public sector
- The OPW run a state-wide staff energy conservation campaign, entitled Optimising Power @ Work which operates in Central Government buildings. The core principle of the campaign is to intensively work and engage with staff to encourage behavioural change on energy use and to identify and eliminate energy waste. Participating buildings can achieve average annual energy savings of 20%
- A carbon price of at least €80 per tonne by 2030 has been announced by Government, with an initial €6 increase in 2020. This will improve the payback period for investments and increase the up-take of energy efficiency measures by factoring the cost of carbon into decision-making
- More stringent building regulations are in force since November 2019, with all new buildings to be Nearly Zero Energy Building (NZEB) and existing dwellings undergoing major renovations (more than 25% of the building envelope) to meet cost optimal performance equivalent to a BER of B2

Planned Measures

Market Signals:

- Smart-ready electricity meters will be installed in every house by 2024 under the Smart Metering Programme. This will facilitate consumers in improving energy efficiency

Regulation of New Buildings and Renovations:

- These will be progressively extended to improve energy efficiency performance, including to phase out the installation of oil boilers
- Examine ways in which audits for commercial buildings can be further progressed through the use of existing policy levers
- At least 40% of all new homes nationally will be delivered within the built-up footprint of existing settlements under our commitment to promote compact and sustainable growth of our cities, towns, and villages. Better spatial planning will reduce the carbon emissions of new developments, and deliver a better quality of life, including shorter commute times, better connections between our places of work and homes, and more vibrant, people-focused environments. Concrete actions to make this a reality include the Land Development Agency aggregating sites, pre-planning of transport, and ensuring that our education and health needs are met

District Heating:

- Develop a national policy framework for district heating, which covers the key areas of regulation, planning, financing and research
- Use the two district heating pilot schemes to develop experience and knowledge that can promote and inform further schemes nationwide to facilitate greater uptake of district heating through self-financed heat networks

Commercial Sector:

- As part of a suite of supports for business, SEAI has developed an interactive Online Training Platform to facilitate all businesses to access free, high-quality energy related training. This will consist of short online modules, and includes sector specific courses allowing businesses to certify their staff as having completed energy related training

v. Where applicable, a description of policies and measures to promote the role of local renewable energy communities in contributing to the implementation of policies and measures in points i, ii, iii and iv

Measures in Place

The Government funds a Sustainable Energy Communities network which has been a significant success in encouraging local actors to work together. It is underpinned by SEAI mentors and grants to develop a Local Energy Master Plan. The process and mentoring supports available should enable the community group to apply for grant funding to carry out the projects identified in their Plan.

The Better Energy Communities (BEC) Scheme provides funding for community groups to improve the efficiency and the sustainability of energy use in their local areas. The aim of the scheme is to support projects at a community level, specifically seeking to test innovative and pioneering partnerships for delivery between the public and private sectors, residential and non-residential sectors, and commercial and not-for-profit organisations. The scheme is part of the national retrofit programme which provides funding to upgrade Ireland's building stock and facilities to high standards of energy efficiency, thereby reducing fossil fuel use, running costs and greenhouse gas emissions.

Since 2012, the BEC Scheme has supported delivery of over 400 community energy efficiency projects. As a result almost 18,000 homes, and over 2,500 community, public and private buildings have been upgraded to end 2019 – from community centres, to sports clubs, schools, retail, religious and cultural centres. Government, through SEAI has provided grants of over €145m which have resulted in €370m total investment in communities across the country, achieving energy savings of over 900GWh. This success has been achieved through SEAI engagement with Lead Applicants and Project Co-ordinators and the projects they delivered have increased each year in scale, complexity and ambition, with total investment in community energy upgrades increasing from €11m in 2012 to approximately €60m in 2019.

Planned Measures

The Climate Action Plan sets out a number of actions to support communities to take local action by linking to existing and new networks and clustering initiatives. The Climate Action Regional Offices will lead a step-up in climate action within Local Authorities. A number of measures in the Climate Action Plan focus on building awareness in local communities of their energy use and how to reduce it. The Climate Action Plan aims to expand the SEC Network to 1500 communities all over Ireland receiving support to plan for a sustainable energy future.

vi. Description of measures to develop measures to utilise energy efficiency potentials of gas and electricity infrastructure

The generation of electicity using peat and coal is being phased out. This generation will be replaced by a combination of renewable energy, interconnection imports and, in the short to medium term, by generation from natural gas. Electricity is produced from natural gas at an efficiency of circa 50% on average in Ireland compared to 30-35% for peat and coal. The move from high-carbon solid fossil fuels to natural gas utilising the available capacity in the gas network will lead to a significant increase in efficiency.

vii. Regional co-operation in this area, where applicable

The policies listed in this section and section 3.4.4 apply nationally. The mainstream grant schemes, programmes and other supports are administered centrally and are available nationwide.

viii. Financing measures, including Union support and the use of Union funds, in the area at national level

- The National Development Plan has indicated funding of €4.5bn to fund energy efficiency improvements across the residential and public sector
- The Irish Government has committed to increasing the price of carbon to €80 per tonne by 2030. The Government has also stated that all revenues raised by the increases in carbon tax will be ring-fenced to support climate action and protect those most vulnerable. Over the next decade this will raise more than €6bn to be used in this way
- Ireland is using European Regional Development funding to co-fund the energy efficiency retrofit programme for low income households under Ireland's Regional Operational Programme 2014-2020
- Ireland is exploring the use of EIB funding opportunities to support retrofitting projects under the Smart Finance for Smart Buildings Initiative
- The TAMS II Schemes provides grant aid for a number of investments specifically aimed at improving energy efficiency in the farming sector. These include Plate coolers, Heat Transfer Units and Internal Ice Builders for the Dairy Sector.
- The Pigs and Poultry Scheme and the Young Farmer Capital Investment Scheme provides grant aid for biomass boilers, electrical heat pads, energy efficient LED lighting, indirect heating systems, solar panels for water heating and electricity

production, ventilation fans and control systems, insulation for doors, roofs and walls, air source heat pumps and heat recovery units

- Solar PV Installation on farms were provided for, on a pilot basis, with effect from April 2019 under tranche 14. Grant aid in the pilot phase will be available for 40% or of up to 60% in the case of qualified young farmers to fund the cost of a solar system of 6kWp
- EU support under the Structural Reform Support Service (SRSS) is being availed of by Ireland to help develop a framework for implementing a comprehensive building upgrade programme for the public sector – in support of the public sector building retrofit and energy efficiency targets
- ELENA support is being availed of by Ireland's Local Authorities (through Donegal County Council as lead partner with the Road Management Office) in support of the national public lighting upgrade project

3.3. Dimension Energy Security

i. Policies and measures related to the elements set out in point 2.3

Ireland is committed to maintaining the security of our energy system in the most cost-effective manner. Ireland is cognisant of the risks posed by the impacts of climate change to our energy security. The policies and measures set out under this plan, both in terms of mitigation and adaptation, serve to offset those risks. In addition, the impact of the wide range of policies and measures aimed at increasing energy efficiency will contribute considerably to ensuring security of our energy system. Ireland has established quantifiable objectives regarding indigenous production of clean energy. These together with the measures detailed in this plan regarding improving the flexibility of our system will strengthen Ireland's capacity to deal with the consequences of the planned closure of the coal and peat plants. A review of the security of energy supply of Ireland's natural gas and electricity systems is being carried out. The focus of the review is the period to 2030 in the context of ensuring a sustainable pathway to 2050.

In terms of gas and electricity the key policies and measures, in line with national policy including Ireland's National Energy Policy Paper and Programme for Government, include:

- In the context of decarbonisation, put in place the appropriate measures to maintain the resilience of Ireland's gas and electricity systems in the period to 2030 in the context of ensuring a sustainable pathway to 2050

- Support efforts to increase indigenous renewable sources in the energy mix, including wind, solar and bioenergy
- Develop, maintain and upgrade the electricity and gas networks to ensure that our energy system remains safe, secure and ready to meet increased demand;
- Actively participate in EU Project of Common Interest (PCI) process including supporting projects which enhance energy security and are consistent with national and EU climate policy objectives;
- Following the United Kingdom leaving the EU, work closely with our EU partners and the United Kingdom to put in place a framework for regional co-operation between the EU and the United Kingdom in relation to Emergency Preparedness and Response

The need for adaptation to address the current and future risks posed by a changing climate is both urgent and essential to successfully transition to a climate resilient economy and society by 2050. As referred to under the section on adaptation, tackling climate change will take the effort of our entire society and the electricity and gas networks sector is no different. As these changes continue and if, as predicted, increase over the coming decades, the energy sector must prepare for, and adapt to, these new conditions. By identifying areas of vulnerability now, steps can be taken and measures put in place to avoid or minimise future adverse impacts within the sector and to exploit opportunities. The Electricity and Gas Networks Sectoral Climate Change Adaptation Plan was published in September 2019 and represents a first step towards reducing vulnerability and building resilience in the sector. The plan sets out a number of key objectives and actions for implementation

Ireland's oil emergency management takes place within the framework of Ireland's membership of the European Union (Directive 2009/119/EC) and the International Energy Agency (IEA). Ireland holds 90 days of a strategic oil reserve, to be used in the event of a supply disruption. The National Oil Reserves Agency (NORA) is Ireland's Central Stockholding Entity (CSE), responsible for acquiring and managing Ireland's strategic oil reserve. NORA is funded by a Government levy of 2 cents per litre on oil disposals. At the end of 2017, NORA held approximately 68% of its stocks on the island of Ireland, with the remaining 32% of stocks held abroad

In the event of an oil supply disruption, the Department will liaise with NORA and the oil industry on the evolving situation. Where a stock release is warranted, a recommendation is made to the Minister for Communications, Climate Action and Environment by Departmental officials. The Minister informs his cabinet colleagues of his decision and instructs NORA to release stocks, specifying the product categories, volumes and location from which the

stocks are to be released. NORA has a Stock Drawdown Plan in place to deal with such a situation. NORA has also Memoranda of Agreement with five shipping companies that considerably strengthen the Agency's ability to ship products from storage locations at home and abroad to where it is needed in the event of a shortage of supply.

In the case of a domestic issue requiring stock drawdown, the Department would inform the EU/IEA of its actions and make arrangements with NORA on the replenishment of stocks. In the case of collective EU or IEA action, stocks would be released in accordance with agreed procedures.

The Department is currently developing the Oil Emergency Allocation Plan (OEAP) to enable the allocation of oil to ensure the continuation of societal functioning in a scenario where oil availability is limited. The Plan provides for the allocation of petroleum fuels and in combination with Ireland's strategic oil reserve, forms the basis of the Government's response to a prolonged fuel supply disruption within the state. The Plan is modular in nature, consisting of a number of schemes, which, if required, may be enacted in their entirety, depending on the extent and duration of the emergency and the fuel type(s) in short supply. Quantities of fuel allocated to various fuel users may also be varied during the lifetime of the plan, based on the level of fuel stocks at the Minister's disposal.

The Department works closely with NORA and the Irish oil industry (through IPIA – the Irish Petroleum Industry Association) on the development of oil emergency management policies and procedures. NORA updates its stock drawdown procedure at least annually. A number of cross sectoral oil emergency exercises have been held, involving the other Government Departments, NORA, and the IPIA, with the most recent being in November 2018. These are scenario based and explore the impacts of an oil emergency across all sectors, with an emphasis on a whole of government level response, taking into account the extent of the supply deficit in the market.

Refined product is largely sourced from the UK, with crude being imported from Norway. The UK's withdrawal from the EU may introduce an increased measure of supply diversification; however the UK will most likely remain the predominant source for imported refined product. While the UK will no longer attend the EU's Oil Coordination Group, Ireland will continue to cooperate with the UK on matters of oil security through our joint membership of the International Energy Agency (IEA).

As Ireland has no commercial oil reserves, by necessity all oil is imported. The oil market is largely deregulated, with the oil companies sourcing product based on cost and logistical factors. While it is expected that the decarbonisation of transport and heating will decrease petroleum product usage over time, currently the demand for refined product within the Irish

market is increasing year on year, driven largely by demand from the aviation industry. Although the increased use of biofuels will displace a small volume of petroleum product, there is no expectation that Ireland will be able to decrease its reliance on imported oil product in the short to medium term.

ii. Regional co-operation in this area

In order to ensure continued and ongoing regional co-operation Ireland will:

- Continue to implement the requirements of EU regulation 2017/1938 (Measures to safeguard security of gas supply) including risk assessments, preventative action plans, emergency plans, and solidarity. The CRU (CRU) is the designated competent authority for this regulation
- Implement the requirements of EU regulation 2019/941, which came into force on 4 July 2019, on Risk Preparedness in the Electricity Sector. This Regulation provides for Member States co-operation on common methods for assessing risks and to establish a framework for a more systematic monitoring of security of supply issues;
- Seek to maintain strong regional co-operation with the UK on emergency preparedness and response for gas and electricity including solidarity in an emergency situation
- Following the United Kingdom leaving the EU, work with EU partners and the UK to identify and put in place any measures and arrangements necessary for continued regional co-operation on emergency preparedness and response, and security of supply for gas/electricity systems
- Participate in EU fora for gas, electricity and oil security of supply;
- Cooperate with the Department of the Economy in Northern Ireland on the all-island dimensions of oil security, in particular around the utilisation of import infrastructure on an island wide basis, in the event of a disruption to the capacity to move product through a major oil terminal

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

Maintaining the security of our energy system requires adequate infrastructure and diversity of supply. This must be achieved in the most cost-effective manner. Access to suitable financing measures is essential to realising this objective. This plan sets out a number of financing measures relevant and necessary to furthering our climate and energy goals

including the support schemes for electricity and heat. These will impact positively on security of supply.

One of the key financing measures regarding security of supply is the EU Connecting Europe Facility (CEF) funding. Ireland has benefitted significantly from access to CEF funding. Ireland will work closely with the EU to avail of CEF funding and other EU funding support, without which projects would not be completed. The CEF established under Regulation (EU) No. 1316/2013, is a key EU funding instrument for targeted infrastructure investment at European level. Its aim is to accelerate investment in the field of trans-European networks, supporting the development of high performing, sustainable and efficiently interconnected networks in the fields of transport, energy and digital services. EU energy Projects of Common Interest (PCIs) are eligible to apply for CEF funding for works or studies, providing they satisfy certain criteria set out in both the PCI and CEF Regulations. While a PCI is eligible to apply for funding under CEF, it is not guaranteed. In general, projects that are commercially viable would not receive funding under CEF. CEF funding is only allowable for a maximum of 50% of the project costs, if recommended.

It is vital that access to this funding would continue to be available to Irish projects when the UK becomes a third country. Applications by gas infrastructure projects for EU connecting Europe Facility (CEF) funding will be considered in the context of national and EU climate policy objectives.

Project promoters may also avail of European Investment Bank (EIB) funding opportunities to support projects. The EIB offers financial support to projects through innovative financial instruments such as guarantees and project bonds. These instruments create significant leverage in their use of EU budget and act as a catalyst to attract further funding from the private sector and other public sector actors.

Regulated assets can also be funded by tariff related expenditure, which is subject to the approval of the Commission for Regulation of Utilities, Ireland’s national energy regulator.

3.4. Dimension Internal Energy Market

3.4.1. Electricity Infrastructure

i. Policies and measures to achieve the targeted level of interconnectivity as set out in point (d) of Article 4

Ireland’s peripheral location at the north-western edge of mainland Europe presents obvious challenges to interconnection, not least in the area of costs, yet may also highlight the desirability of interconnection, particularly in the context of security and diversification of

electricity supply. Details on Ireland's national policy on Electricity Interconnection are set out in section 3.1.2(i). Ireland continues to support key interconnection project proposals through the EU PCI process, primarily North-South, Greenlink and Celtic.

In August 2016, the CRU commenced the process of devising a Regulatory Policy for Electricity Interconnectors with the publication of a paper "Policy for Electricity Interconnectors" (CER/16/239) requesting submissions detailing what matters should be considered in developing a regulatory policy for electricity interconnectors.

In October 2017 CRU wrote to EirGrid directing them to process grid connection applications from Electricity Interconnector promoters with PCI status. In that note CRU reaffirmed its commitment to progress Electricity Interconnector applications.

CRU published a consultation paper on the Greenlink application and its planned approach to evaluating the application in June 2018. CRU then published a consultation on the evidence base details (regulatory and specifics) in July 2018. The next stage of the regulatory policy framework was the publication by CRU in September 2018 of its decision paper on Assessment Criteria for Interconnector applications. Subsequently in October 2018 CRU published its initial decision on Greenlink application for Cap and Floor treatment. This stage was the public interest test and has been passed. Next it plans to consult on a proposed cap and floor regime and hopes to issue its final decision in 2020.

Both the National Policy Statement and the CRU's own regulatory process are facilitating the evaluation of the two interconnector applications – Greenlink and Celtic. Regarding the Celtic interconnector, the regulators in Ireland and France reached a joint decision in 2019 on the "Cross Border Cost Allocation" for the project. Based on the benefits the regulators have ultimately agreed that 65% of the project's estimated construction costs will be allocated to Ireland and 35% to France, subject to a substantial grant from CEF.

The national and regulatory policy combined have now created a model environment for the proposal of additional interconnection as appropriate to assist in meeting our national targets.

ii. Regional co-operation in this area

North Seas Energy Co-operation

As stated above The North Seas Energy Co-operation (NSEC) aims to facilitate the further cost-effective deployment of offshore renewable energy with the aim of ensuring a sustainable, secure and affordable energy supply in the North Seas countries, thereby also facilitating further interconnection, further integration and increased efficiency of wholesale electricity markets in the longer term.

Ireland works together with the other North Seas Energy Co-operation countries on the possibilities for concrete co-operation projects. Besides joint offshore wind projects that would be connected to and supported by several Member States, this includes the work on possible 'hybrid' solutions that would use a grid connection cable for evacuating offshore wind as well as interconnection capacity between countries, and on the corresponding market arrangements.

A regional study is being developed looking at the possibilities for co-operation on hybrid projects and identifying and addressing possible legal, regulatory and commercial barriers. Further work is planned on synergies between offshore wind and offshore oil and gas installations. By coordinating on increased interconnection among the countries in the North Seas Energy Co-operation, an increasing amount of excess production of energy could flow across borders in a well-functioning internal energy market. The NSEC aims to reduce the costs of renewable energy and grid development and remove barriers to investment, thereby contributing to achieving climate goals and the EU-wide renewable energy 2030 target. Moreover, it strengthens security of supply and supports the EU's long term competitiveness and energy market integration.

The Irish-Scottish Links on Energy Study

Ireland was a partner in the Irish-Scottish Links on Energy Study (ISLES), a major initiative designed to enable the development of interconnected grid networks to enhance the integration of marine renewable energy between Scotland, Northern Ireland and Ireland. DCCAE is the lead administrative partner for ISLES in collaboration with the Scottish Government and the Department of the Economy in Northern Ireland.

The objective of the study was to investigate the feasibility of an offshore interconnected grid, and identify steps to reducing barriers to delivering this grid. The first phase of this project - ISLES I - was completed between 2010 and 2012 and produced a feasibility study. The second phase - ISLES II - was completed in June 2015 and comprised three research streams:

- Spatial Plan and Sustainability Appraisal
- Network Regulation and Market Alignment Study, and
- Business Plan

The project was part financed under the European Union’s INTERREG IVA Programme for Northern Ireland, the Border Region of Ireland and Western Scotland with the partners providing the match-funding.

British Irish Council – Energy Work Sector

Ireland is a central contributor to the British-Irish Council (BIC) Energy Working Group. This Work Sector was established in 2009 and was previously divided into two sub-groups, considering Marine Energy resources and Electricity Grid issues. In 2016 these two sub-groups came together in one group with a joint focus on marine and grid issues. The role of the Energy Work Sector is to provide a forum for discussion and collaborative working on cross-border issues in relation to electricity infrastructure. The Work Sector has been an important contributor to the ISLES project and in 2017 Ireland led discussions of the Work Sector in the area of electricity interconnection. June 2018 saw Scotland host an energy Ministerial where Ministers signed off on an ambitious programme of work focused on the grid and marine areas but also extended to include some other topics for co-operation such as community energy. In June 2019 a further Ministerial took place in tandem with a Heads of Administration Summit in Manchester.

General Co-operation

In addition to the above fora, Ireland cooperates regionally with both the UK, including Northern Ireland, and France in respect of existing, planned and potential interconnection.

Ongoing efficient trade in electricity coupled with strong regional co-operation with the UK will continue to be important in terms of security, consumers and decarbonisation.

The €1bn Celtic Interconnector will connect Ireland's electricity network to France via an underwater connection. Once built, its 700 megawatts capacity will power 450,000 households, and help Ireland to switch to 70% renewable energy as set out in the Government's Climate Action Plan. Once Britain leaves the EU, Ireland will have no electricity interconnection with any Member State of the European Union. By providing a direct electricity link with mainland Europe, Ireland will be connected to the EU's Internal Energy Market post the UK's exit. Further developing and maintaining the strong co-operation between the two countries will be imperative over the coming decade.

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

The ISLES project was part financed under the European Union's INTERREG IVA Programme for Northern Ireland, the Border Region of Ireland and Western Scotland with the partners providing the match-funding.

Both the Celtic and Greenlink interconnector have received CEF funding for studies. Greenlink has received a grant of up to €809,000 and Celtic has received three grant awards including two for approx. €3.75m and €4m. On 2 October 2019, the European Commission

announced the allocation of a €530.7m grant from the CEF for the Celtic Interconnector between Ireland and France. This grant reflects the project's value in terms of solidarity and security of supply, as well as its contribution to achieving the EU's energy policy objectives.

The CRU assess electricity interconnection applications on the basis of a set of technical, economic and regulatory criteria. In particular, the impact of each project both in terms of its socio-economic benefits as well as in terms of costs under a range of different scenarios and sensitivities. In carrying out our evaluation, CRU has due regard for the long-term interest of final consumers, in particular in ensuring that the impact on national tariffs does not represent a disproportionate burden for the Irish consumer.

3.4.2. Energy Transmission Infrastructure

i. Policies and measures related to the elements set out in point 2.4.2, including, where applicable, specific measures to enable the delivery of Projects of Common Interest (PCIs) and other key infrastructure projects

Government Policy Statement on the Strategic Importance of Transmission and Other Energy Infrastructure

In July 2012, the government produced a policy statement on the Strategic Importance of Transmission and other Energy Infrastructure. This statement reaffirmed the need for the development and renewal of energy networks to meet economic and social goals.

It stated that the planning process provides the necessary framework for ensuring that all necessary standards are met and that comprehensive statutory and non-statutory consultation is built into the process. It confirmed that Government "endorses, supports and promotes the strategic programmes of the energy infrastructure providers."

Compliance with Trans-European Energy Infrastructure Regulation

Ireland is compliant with EU Regulation 347/2013 which promotes the development of trans-European energy infrastructure. Under Article 8 of the regulation, DCCAE has designated Ireland's planning authority, An Bord Pleanála, as the competent authority responsible for facilitating and coordinating the permit granting process for projects of common interest.

An Bord Pleanála was designated Competent Authority for the purposes of Article 8.3(c) of Regulation 347/2013. An Bord Pleanála is carrying out this role in accordance with the requirements of Regulation 347/2013 for a streamlined permit granting procedure. The competent authority, in consultation with other consenting authorities, sets the time limits in accordance with Article 10 of the Regulation on which individual decisions shall be issued for a project of common interest.

EU Regulation 347/2013 lays down rules for the timely development and trans-European energy projects in order to achieve the energy policy objectives of the EU. The Energy Infrastructure Regulation contains guidelines for the identification of projects known as Projects of Common Interest (PCI). The PCI designation carries certain conditions and entitlements, including more streamlined planning and regulatory processes at Member State level. The regulation facilitates the timely implementation of projects of common interest by streamlining, coordinating more closely and accelerating permit granting processes and by enhancing public participation.

TSO Public Engagement

In discharging its duties as operator and developer of the national transmission grid, EirGrid engages with communities and citizens on an ongoing basis.

In December 2014 it completed a comprehensive review of its existing consultation process and has been working since then to implement the commitments arising from the review. EirGrid subsequently produced a new project development and consultation roadmap. This is in the form of a six-step process with the public central to each step.

Following an extensive review of its public consultation process EirGrid updated its process for developing the grid. Since October 2017, all projects follow a six-step process. The six steps are illustrated in the figure below. The process is detailed in the publication Have Your Say.

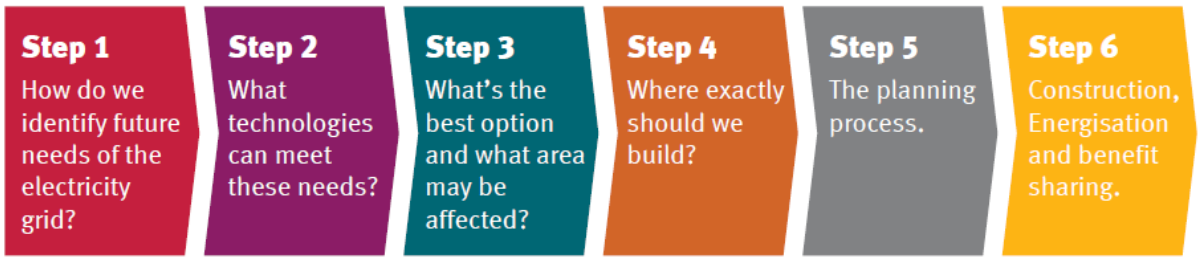


Figure 1: EirGrid's public consultation process

The six-step process seeks to ensure projects are developed in a consistent and transparent way with opportunities for stakeholder engagement and consultation throughout the process. As part of the process EirGrid use multi-criteria decision-making. This involves assessing the relative performance of options across agreed criteria. Decisions are then based on a detailed analysis of stakeholder feedback and on economic, technical, social, environmental and deliverability criteria.

ii. Regional co-operation in this area

EirGrid and Gas Networks Ireland work very closely with all European Transmission System Operators (TSOs) through ENTSO-E and ENTSO-G. Significant areas of work include the TYNDP and Network Codes. A joint TYNDP is produced by ENTSO-E and ENTSO-G. Network Codes are a common set of rules being adopted by the European Union which will enable electricity and gas network operators, generators, suppliers and consumers to operate more effectively in the pan-European electricity and gas market. The harmonisation of national rules will promote the efficient use of cross-border interconnection between countries and will provide a more secure and reliable systems with an increased level of renewable generation.

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

The majority of projects are financed through customers that use the transmission systems in Ireland.

Both the Celtic and Greenlink interconnector have received CEF funding for studies. Greenlink has received a grant of up to €809,000 and Celtic has received three grant awards including two for approx. €3.75m and €4m. On 2 October 2019, the European Commission announced the allocation of a €530.7m grant from the CEF for the Celtic Interconnector between Ireland and France. This grant reflects the project's value in terms of solidarity and security of supply, as well as its contribution to achieving the EU's energy policy objectives.

3.4.3. Market Integration

i. Policies and measures related to the elements set out in point 2.4.3

Some of the regulatory policies and measures related to the national objective for market integration in section 2.4 are already provided for in existing plans and programmes, comprising the new market design, the associated new capacity mechanism and the DS3 programme. Further regulatory measures in the SEM over the coming years are set to be implemented to ensure compliance with relevant EU energy acquis requirements, and in accordance with regulatory and system operator work programmes and timelines. The requirements flow from the EU relevant network codes and guidelines, the Electricity Market Regulation in the Clean Energy Package and the requirements of the SEM capacity mechanism State Aid approval. Further details on the main elements of these policies and measures are contained in this following section.

Given that the I-SEM project was being developed as the Clean Energy Package was being negotiated and the depth and broad scale of reforms implemented in the new market design,

in many respects the SEM is now already largely compliant with the principles for the design and operation of electricity markets outlined in the CEP recast electricity market regulation. This CRM introduced in 2017 is State Aid approved and is also similarly aligned in many respects with the regulation. It should also be noted that given the short time since the launch of both the new market and the associated capacity mechanism, a sufficiently long period after implementation in electricity market terms would be required to assess fully and properly the efficacy of the I-SEM reforms and new market design.

The new market launched on 1st October 2018 and included the establishment of new Day-Ahead, Intra-Day and Balancing Markets, with an ex ante clearing price compared to the previous ex-post gross mandatory pool system, and a new obligation on participants to take responsibility for imbalances. Under the I-SEM design new centralised Day-Ahead Market (DAM), Intra-Day Market (IDM) and Balancing Market (BM) are the exclusive routes for physical contract nomination and physical scheduling of generation in the SEM. Contracts struck in the forwards timeframe do not confer a right to physically schedule generation, demand or cross-zonal capacity in the all-island market. Forward contracts do not offset imbalance exposures caused by variations in metered volumes and traded positions from the DAM, IDM and BM.

In addition to the above, imbalances in the SEM are now traded out on public market places rather than vertically integrated participants being allowed to balance within their own portfolio outside of the market. The cost to the TSOs in relation to the procurement of energy needed to keep overall supply and demand in balance is reflected in the imbalance prices. Market participants are required to provide bids and offers to provide this energy to the TSOs in the Balancing Mechanism (BM), up to the technical capability of the market participant to respond to dispatch instructions.

The new market design is delivering a range of benefits to the Irish consumers and the energy system as a whole. For instance, more competitive trading arrangements is facilitating better use of existing infrastructure assets in the electricity system, as highlighted by the significant increase in the efficiency of interconnector flows between the SEM and Great Britain (GB) since October 2018.

Through the ability to trade closer to real time, the new market is also facilitating the continued growth of renewable generation and decarbonisation of Irish power generation. It is also important to note the non-discriminatory nature of participation in the new market and its capacity mechanism, which has led to a marked increase in demand side participation and battery storage in the SEM. This development will facilitate swifter decarbonisation of

power generation, thereby helping Ireland to meet its ambitious 70% renewables target contained in the Climate Action Plan published in June 2019.

A New Capacity Mechanism in the SEM

The new design for SEM included the introduction of a new competitive capacity remuneration mechanism (CRM) as an integral feature of the market, which was State Aid approved by the European Commission in November 2017.

Consistent with the thrust of EU acquis, including Article 22 of the CEP recast Electricity Market Regulation and the terms of the State Aid approval, the SEM's CRM is a measure (in energy sector terms) established to address existing resource adequacy issues. Considering the level of projected demand growth in Ireland, the transition to ever higher levels of variable renewables, and the need to manage the transition from an aging fleet of conventional fossil fuel units, the SEM capacity mechanism will continue to play a central role in securing the level of investment required in the coming years.

Given the importance of the CRM as a measure, the position of Ireland is that planned future amendments to the Environmental and Energy State Aid Guidelines, should not resort to a 'one size fits all' approach to Aid for Generation Adequacy such as capacity mechanisms, and the Guidelines must continue to account for the different structural circumstances across individual Member States of the EU. The Guidelines must remain sufficiently flexible both to ensure generation adequacy and security of supply and to facilitate the achievement of the ambitious decarbonisation objectives on the island of Ireland in a cost effective and efficient manner. Given the extent and ambitious nature of Ireland's 2030 70% target, the SEM's CRM, in conjunction with the energy and ancillary services markets, provides a necessary revenue stream to ensure adequate levels of future investment including in flexible generation, such as demand response and battery storage.

Unlike the pre-ISEM administratively determined capacity payment mechanism, the value of capacity in the market under the new CRM is now determined through competitive auction. The CRM includes penalties for generators that receive reliability option payments after a successful bid but are then not available to produce when required at times of system stress. A number of successful auctions have already taken place under the new CRM, which in addition to securing necessary future capacity have facilitated future investment in the flexible generation, demand side participation and battery storage required to complement Ireland's high and rising volume of renewables generation.

The recast Electricity Regulation requires Member States with capacity mechanisms to carry out certain tasks, depending inter alia on whether the Member State intends to have, or already has, in place a capacity mechanism and, if the latter, on the timing of its capacity

auctions. Such Member States are required to develop and publish an implementation plan with timelines for adopting measures to eliminate any identified regulatory distortions or market failures that cause or contribute to the emergence of identified resource adequacy concerns. When addressing these concerns the principles of wholesale market operation and design as set out in Article 3 of the Regulation must be taken into account. These principles relate to the operation of electricity markets and are quite wide ranging and high level, covering issues such as market rules, energy storage, cross border flows, regional co-operation, customer empowerment, free price formation and appropriate incentives for long term investment in generation.

Ireland's draft Implementation Plan was submitted to the Commission in December 2019 detailing the measures adopted, or being adopted, in the SEM, the measures listed under four headings: the I-SEM project; requirements in the EU's state aid approval for the SEM capacity mechanism; CEP implementation; and CAP implementation. Following receipt of the Commission's opinion on this plan, its application will be monitored and the results of this monitoring published in annual reports to be submitted to the Commission. It is important to note that redesign of the Irish wholesale market is far from complete. Further ambitious measures are envisaged, over the coming decade and beyond, alongside Ireland's more recent CEP obligations.

DS3 System Services

Due to Ireland's isolated island status and the dramatic increase in wind penetration levels in recent years, the level of non-synchronous power on the SEM system has risen at a faster rate than in any other region in Europe over this timeframe. It is important to highlight the overwhelming success of the DS3 programme in facilitating the integration of renewables on the SEM system, which in terms of SNSP is unprecedented.

Through the DS3 programme the TSOs on the island of Ireland have developed a unique range of System Services. These new System Services offer an enhanced portfolio of options available to the TSO, and encourage new entrants to the energy market. During a period of considerable upheaval, DS3 provides a reasonably predictable revenue stream, which in conjunction with energy market revenues in the new market and the new CRM, are considered vital to facilitating the necessary investment in flexible generation to meet Ireland's ambitious climate action goals.

In order to address some of the potential problems resulting from these unprecedented levels of intermittent renewables, the DS3 Programme was established by the SEMC to provide for the introduction of a number of new system services by the TSOs, EirGrid and SONI, to ensure a safe and secure energy system, while also facilitating increased levels of

non-synchronous generation (primarily renewables). To date, the DS3 Programme has enabled EirGrid and SONI to increase levels of instantaneous system non-synchronous penetration (SNSP) from 50% to 65%, with the aim of increasing this incrementally to 75%.

As highlighted in section 2.4.3, EirGrid's DS3 Programme has been and will remain a vital ingredient in power generation decarbonisation on the island of Ireland and the integration of record levels of intermittent RES, primarily wind, onto the SEM system. It is important to highlight that the nature of System Services on the Irish system is continuously evolving. The original aim of the DS3 programme was to ensure that the TSO can securely operate the power system with increasing amounts of variable non-synchronous renewable generation over the coming years, as Ireland progressed towards its 2020 renewable electricity target. The existing arrangements give service providers a good estimate of revenues out to 2023, with the possibility to extend to 2026.

Ireland's path to decarbonisation will not end at 2020, with Ireland's ambitious target of achieving 70% RES-E by 2030, as highlighted in the Climate Action Plan, providing a host of new challenges for our all-island electricity system. In this regard, the next phase of the TSO System Services programme will be critical in meeting these challenges. Further future development of ancillary services is highlighted as a key action point in the Plan published in June 2019 towards facilitating a very high penetration of variable renewable electricity by 2030 through system services and market arrangements. A set of time bound actions and measures, variously for the CRU and EirGrid up to 2023, are provided at Action 24.

The new market design chosen for the SEM also ensures that liquid and transparent trading arrangements are accessible by all heterogeneous market participants. Transparency of data facilitates competition and provides an effective market power mitigation measure, enabling participants and stakeholders to comprehend price formulation and market signals. Physical cross-zonal capacity is released for use only in centralised short-term markets, facilitating scheduled flows of power to and from the all-island market where it is efficient to do so, and increasing competition and efficiency.

The design provided for Inter-TSO collaboration to effect flows close to real-time and intra-day cross border trades occurring in the Intra-day market in order to facilitate the efficient use of the interconnector in real time.

ii. Measures to increase the flexibility of the energy system with regard to renewable energy production such as smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, re-dispatching and curtailment, real-time price signals, including the roll-out of intraday market coupling and cross-border balancing markets

Initial auctions that have taken place under the new CRM in the SEM have successfully procured future investment in flexible generation, including DSU and battery storage that will be required to complement Ireland's high and rising volume of intermittent renewables. In particular, the auction results suggest that the advent of the new CRM in the SEM has further spurred development of demand side response. The introduction of a firm Day Ahead Market schedule and price under I-SEM, resulting in more efficient short-term price signals, will also have played a role in stimulating more DSU investment. The roll-out of smart metering in Ireland from 2019 onwards is also anticipated to see a further increase in aggregated demand side response.

Looking ahead to future reforms related to demand side participation, in order to comply with the European Commission's State Aid ruling of November 2017, it is intended to modify the participation of DSU in the SEM CRM. When establishing the new CRM, the SEMC determined that DSUs, although able to participate in the CRM auctions, would be exempt from Reliability option (RO) payments where the contracted demand is delivered. RO difference payments would be applied to DSUs only when the demand reduction was not delivered and the Strike Price was exceeded by the Market Reference Price (MRP). This decision recognised the fact that DSUs do not have offsetting energy payments, unlike other auction participants.

The Commission's November 2017 State Aid approval facilitated this different treatment to apply to DSUs, but only as a temporary measure, with the Regulatory Authorities obliged to end the exemption from payback obligations for DSUs from the delivery period starting October 2020. To this end in March 2019 the SEMC published "DSU Compliance with State aid Consultation Paper" to provide stakeholders with an opportunity to comment on the proposals for achieving compliance with State aid, following which a formal decision paper was published in July 2019.

Due to the timescales involved in making system changes and developing the profiles and code changes required to determine the actual delivered quantity of an Individual Demand Site (IDS) and therefore a DSU and to avoid double-counting of energy, the SEM Committee have proposed an interim solution, with an enduring solution to follow. It includes the following key features:

- The assumption that dispatched quantity was a suitable proxy for metered quantity for DSUs
- Use of the Socialisation Fund to socialise the costs of DSU energy payments across Suppliers; and
- Option for DSUs energy payments to be made at all times or only at times of scarcity.

Regarding the enduring permanent solution, the SEMC determined that the choice of mechanism should be determined in line with the following principles:

- The socialisation mechanism must be robust to the lumpy nature of DSU energy payments and must ensure that all DSU energy payments are made
- The recovery mechanism should allocate the costs between Suppliers in a fair and reasonable way, in line with the Equity assessment criteria applied in the design of the I-SEM, i.e. "that the market design should allocate the costs and benefits associated with the production, transportation and consumption of electricity in a fair and reasonable manner"; and
- The mechanism must be capable of implementation for 1 October 2020

The DS3 Programme has been and will remain a vital ingredient in power generation decarbonisation and procurement of flexible generation on the island of Ireland and the integration of record levels of intermittent RES, primarily wind, onto the SEM system.

The Climate Action Plan commits to strengthening the policy framework to incentivise electricity storage and interconnection. Increased levels of storage and interconnection will be critical to absorbing high levels of renewable generation on to the system, as renewables require back-up which will have to be provided by quick response plant, storage or interconnection**.**

iii. Where applicable, measures to ensure the non-discriminatory participation of renewable energy, demand response and storage, including via aggregation, in all energy markets

Non-discriminatory participation of renewables, demand response and storage, national policy in Ireland will continue to be in accordance with and framed by adherence to EU legislation and future implementation of the Clean Energy Package.

Under national legislation, renewable generation currently receives priority dispatch in the Irish wholesale electricity market, notwithstanding that there are occasions when system security necessitates TSO curtailment of non-synchronous generation. Demand Side Units (DSUs) also have non-discriminatory access to wholesale electricity markets in Ireland.

iv. Policies and measures to protect customers, especially vulnerable and, where applicable, energy poor customers, and to improve the competitiveness and contestability of the retail energy market

Under national objectives to protect energy customers and improve the competitiveness of the retail energy sector the CRU has been assigned a range of statutory functions under the Electricity Regulation Act 1999 (as amended).

While electricity and gas retail market prices are no longer regulated, the CRU has a statutory obligation to closely monitor electricity and gas retail markets to ensure that competition continues to develop.

The CRU also oversees non-price aspects of competition, and has taken steps to facilitate market access for new supplier firm entrants, and increase transparency and consumer engagement in retail markets. In addition to its continued responsibility for ensuring retail market competition the CRU has an important statutory customer protection role.

The CRU conducts regular scrutiny of supply costs, and publishes a suite of reports including monthly switching reports, quarterly market monitoring reports, annual reports and emerging reports based on new market monitoring data and will continue to closely monitor future developments.

Under S.I 630/2011 the CRU has a statutory obligation to monitor retail markets to ensure that final customers are benefiting from competition in the supply of electricity and gas. This includes, but is not limited to:

- monitoring final tariffs charged to domestic customers including those on prepayment meters
- certification of price comparison websites,
- monitoring prices and the levels of discounts available
- monitoring the rates of customer switching between licenced electricity and gas suppliers, monitoring disconnection and de-energisation rates
- monitoring charges for and the execution of maintenance services, providing a complaints resolution service for domestic customers
- monitoring any distortion or restriction of competition in the supply of electricity and gas to final customers
- reporting on whether the development and operation of competition in the supply of electricity and gas is benefitting final customers, monitoring the level of market opening and monitoring competition on natural gas exchanges

Additionally, under S.I. 463 2011, the CRU has a statutory responsibility for customer protection. In delivering this requirement the CRU established a dedicated and independent Customer Care Team (CCT) who provide free and easy to access services providing information for customers about energy services, including information on consumer rights and obligations and a free dispute resolution service to customers with an unresolved complaint against an energy supplier or network operator. The CCT also operate a quarterly Consumer Stakeholder Group to facilitate consumer engagement. The CCT have powers to issue determinations and directions to suppliers and network operators which can include instructions to issue a refund or proportionate compensation. The CRU's Customer Care Team publishes an Annual Report on this service.

Retail market monitoring and reporting and CCT monitoring and reporting forms an important part of the CRU's activities, in terms of providing oversight of the market, protecting energy customers, improving competitiveness, highlighting specific issues, assessing existing measures and informing new policy. This results in, for example, periodic review of CRU's Electricity and Gas Supplier Handbook and Codes of Practice ensuring that suppliers adhere to best practices e.g. by updating the customers charter, the code of practice on marketing and advertising, the code of practice on customer sign up, the code of practice on billing, the code of practice on disconnection, the code of practice on complaint handling, the code of practice for vulnerable customers, the code of practice on PAYGM and budget controllers, and the terms and conditions for supply.

National policy in relation to vulnerable customers is specifically addressed under S.I. 463/2011. A vulnerable customer is defined as a household customer who is: "a. critically dependent on electrically powered equipment, which shall include but is not limited to life protecting devices, assistive technologies to support independent living and medical equipment, or b. particularly vulnerable to disconnection during winter months for reasons of advanced age or physical, sensory, intellectual or mental health". This S.I. also sets out the obligations placed on suppliers to establish a Priority Services Register of vulnerable customers, obligations in relation to disconnection and annual reporting to CRU. These obligations are further detailed and operationalised via the CRU Code of Practice for Vulnerable Customers and additional measures in the other Codes of Practice (noted above) under the Supplier Handbook.

Policies and measures to protect energy poor consumers are additionally provided for under the Strategy to Combat Energy Poverty. This strategy includes housing upgrade energy efficiency measures (e.g. the Better Energy Warmer Homes Scheme) and social protection measures (e.g. the Household Benefits Package and the National Fuel Scheme) that are set out in detail separately in this document.

v. Description of measures to enable and develop demand response, including those addressing tariffs to support dynamic pricing

Many of the objectives listed under section 2 in relation to the internal energy market, regarding demand response were addressed in the new I-SEM market design and are either already implemented, or being implemented, by the regulators and TSOs as part of that process or are being addressed as part of the implementation of the Electricity Market Regulation in the SEM, again by the Regulators and the TSOs.

As set out in the Climate Action Plan 2019, smart electricity meters will be installed in every house by 2024. The delivery plan will phase in smart services from 2021 giving consumers more choice and information, enabling them to be more proactive in their use of electricity and save money. The DS3 Programme will remain key to achieving a more flexible, dynamic Irish energy system with the objective of raising the already recording breaking levels of intermittent generation penetration in the SEM from the current 65% to 75% by 2020.

3.4.4. Energy Poverty

i. Where applicable, policies and measures to achieve the objectives set out in point 2.4.4

Ireland's Strategy to Combat Energy Poverty is due to be reviewed after 2019. A just transition and protecting the most vulnerable are at the heart of the Irish Government's Climate Action Plan. The government is committed to taking action to tackle energy poverty. Since the publication of the Government's Strategy to Combat Energy Poverty 2016 - 2019:

- the level of energy poverty has dropped from 28% to 17.4%. This is a significant improvement
- the proportion of people who report that they are unable to afford to keep the home adequately warm, a decrease on the 2015 figure of 9% to 4.4%

The government continues to prioritise measures to tackle energy poverty in Budget 2020, with a record level of funding allocated to retrofitting homes of people in energy poverty. These increases apply to both privately-owned and Local Authority homes.

Protecting the most vulnerable in our communities is a key part of the commitments set out in the Climate Action Plan. The Plan commits to developing a new delivery model for retrofitting. A key part of this will be to ensure that the new delivery model can continue to support those on low incomes who are at risk of energy poverty.

An advisory group was established to distinguish the best way to improve the efficiency of the rented sector. The objective is to identify the appropriate policy intervention aiming to

ensure that the approach taken minimises adverse impacts on the current accommodation shortage and on people living in energy poverty. An analysis of the responses to a public consultation on the options is currently underway. Following this, recommendations will be made to Government.

Energy Poverty is addressed under the following actions in the Climate Action Plan:

- Develop and optimise Government funding and grant schemes to drive demand for energy efficiency retrofits that deliver value for money
- enhance the delivery model and supports for households with lower incomes to improve the energy efficiency and comfort of their homes
- Review ways to improve how current energy poverty schemes target those most in need
- We will carefully examine the impacts (of carbon tax) on low-income and rural households and those experiencing fuel poverty, as well as broader distributional impacts.

We will also examine the interaction between carbon tax rates with other schemes such as the National Fuel Allowance Scheme, the Diesel Rebate Scheme, and SEAI's energy efficiency schemes. This will include further consideration of how we can balance the objective of upgrading heating systems with fuel subsidisation for low income households that are using high-carbon heating systems.

Existing Measures

Housing Upgrade Energy Efficiency Measures

- Better Energy Warmer Homes Scheme – free energy efficiency home upgrades for lower income households, including deeper measures and heating upgrades where appropriate
- Better Energy Communities Scheme – subsidised energy efficiency home upgrades for lower income households
- Energy Efficiency Obligation Scheme – target for energy suppliers to achieve a % of their target among households in energy poverty
- Warmth and Wellbeing pilot scheme – free energy efficiency home upgrade scheme for people with respiratory conditions who are lower income households
- Local Authority housing upgrade programme - programme to upgrade the social housing stock

- Housing Assistance for Older People - support for older people to upgrade their home, can include insulation and heating upgrades in some cases
- Housing Adaptation Grant – support for adaptations to the home which can include insulation and heating upgrades in some cases

Consumer Protection Measures

- Energy Engage Code – the energy industry has commited to never disconnect an engaging customer and to work with their customers on realistic and achievable payment plans for any arrears
- Energy Supplier Handbook - a customer charter or code of practice in place that sets out, in plain English, the services an energy supplier will provide and the quality levels offered, including in relation to vulnerable consumers
- CRU accredited price comparison websites - accredited comparison websites that can help consumers to find the best supplier and tariff for their needs

Social Protection Measures

- Household Benefits Package – income support to assist lower income households with their electricity and gas bills
- National Fuel Scheme – income support to assist lower income households with their energy costs

Planned Measures

- Review ways to improve how current energy poverty schemes target those most in need
- Develop indicators for energy poverty in Ireland
- Budget 2020 – announcement of ring-fenced revenue from increases in the carbon tax for climate action, including to fund energy efficiency in low income households and social housing

3.5. Dimension Research, Innovation and Competitiveness

i. Policies and measures related to the elements set out in point 2.5

Ireland's Climate Action Plan commits to the following policies and measures in respect of Research, Innovation and Competitiveness:

- Competitive funding rounds to promote research and innovation to meet the climate challenge

- Recognition of the need to ensure that the best scientific evidence and advice is available to underpin Government policy and support the actions in this plan
- Strengthen delivery of public funding for basic and applied research to meet Ireland's decarbonisation objectives and open up new economic opportunities
- Enhancement of SEAI's role as national coordinator of energy research, development and demonstration investments and activities in Ireland over the coming years
- Support the ocean energy research, development, and demonstration of floating wind, tidal, and wave technologies, including maximising supply chain and enterprise opportunities
- Develop a national policy framework for district heating, which covers the key areas of regulation, planning, financing and research
- Undertake further research to assess the potential to sequester, store and reduce emissions of carbon through the management, restoration and rehabilitation of peatlands
- Further development of research and innovation infrastructure relevant to the energy and climate action sectors
- Examine sectoral coherence, network and awareness raising, research and innovation and the circular bioeconomy potential of harnessing the value from side-streams from both agriculture and forestry
- A greater focus on research into land diversification in agricultural colleges, the EPA and Teagasc, to help educate farmers on the benefits of diversification
- Systematically develop economic opportunities associated with decarbonisation through research and innovation, enterprise hubs, and skill development at both national and regional level
- Commission research on the impact of the transition on specific sectors (jobs or roles), regions, communities and cohorts of citizens

The benefits to Ireland from joining the Mission Innovation Initiative are currently under consideration by DCCAE and a decision will be made in due course. Ireland has strong connections with our international energy research & innovation counterparts through participation in the European Commission's Strategic Energy Technology Plan (SETPlan), energy research & innovation programmes run by the European Commission (such as Horizon 2020/Horizon Europe, ERA-NET Partnerships etc.) and through several

International Energy Agency Committees in which DCCAE and SEAI participate or facilitate participation. Therefore, we are in the strong position to evaluate the benefits of Ireland joining Mission Innovation, in consultation with countries who have developed some experience of the initiative to-date.

Ireland takes a technology agnostic approach when funding energy RD&D. General prioritisation of areas to be funded is decided on the basis of an exercise run by the Department of Business, Enterprise & Innovation (which focuses on all sectors of the economy) and also an annual Cross-Government consultation which is run by the Sustainable Energy Authority of Ireland (SEAI) (which focuses specifically on the energy sector and its connections to other sectors). This coordinated approach ensures that energy research funding is highly targeted. Funding is available to all relevant areas, and recent research projects include those in areas such as: bioenergy, wind energy, ocean energy, carbon capture & storage (CCS), smart grids, hydrogen, solar energy, energy in transport, energy in agriculture, energy efficiency, renewable energy and ICT for energy.

The SEAI National Energy RD&D Funding Programme seeks to grow national capacity in energy research such that researchers in academia and industry are well placed to compete for national non-domain specific R&D funding and are in a position to be international thought leaders and actors (through, for example, thought leadership within relevant domains, playing leadership roles in International Energy Agency activities, and leading & participating in international collaborative initiatives such as Horizon 2020). Increased and sustained investment will help to ensure that companies and research performing organisations in Ireland are encouraged and enabled to invest time and resources in performance of energy RD&D, resulting in skilled and experienced researchers in the energy domain being developed and retained in Ireland.

SEAI's remit in respect of RD&D activities is to coordinate Irish energy research, lead and support excellent research, development, demonstration & innovation activities, to be at the forefront of knowledge generation relevant to the energy sector, and to promote its application in policy and practice. SEAI Research & Innovation funding is invested in projects at the following stages/for the following purposes: applied research, research for practice, research for policy, development, and demonstration projects in the energy domain. SEAI funding is primarily invested in companies, universities, institutes of technology, research institutions, semi state bodies and public bodies.

Climate science aspects of the Environmental Protection Agency Research Programme aim to provide:

- Advanced analysis of GHG emissions and removals, enabling improved policy development and decision making
- Research based information in support of risk and vulnerability analysis and adaptation actions in Ireland
- Solutions to achieve our 2020 targets and to identify and test solutions for achievement of societal and economic low carbon transformation to 2050.
- Information on pathways for achievement of highest air quality standards in Ireland and advance integrated assessment of air pollution, short life climate forcers, and other wider environmental issues

Domain agnostic funders of research in Ireland also have an important part of play in the energy & climate research ecosystem in Ireland. Enterprise Ireland, the Irish Research Council and Science Foundation Ireland are part of a broader network which supports energy & climate research in Ireland - the focus of the Irish Research Council and Science Foundation Ireland is primarily on early stage research, whilst the focus of Enterprise Ireland is primarily on supporting businesses in the manufacturing and internationally traded services sectors. DBEI provides funding for the Disruptive Technologies Innovation fund, which is a €500M fund targeted at a number of areas, including the area of energy, climate action and sustainability. The Future Jobs initiative is being developed jointly by the Department of Business, Enterprise and Innovation and the Department of the Taoiseach and was launched in 2019. This initiative will emphasise building resilience through improving productivity especially among Irish small and medium enterprises (SMEs); enhancing skills levels and increasing participation in the labour force; preparedness for, and exploitation of, anticipated transformational changes arising from technological developments and the transition to a low carbon and digital economy.

ii. Where applicable, co-operation with other Member States in this area, including, where appropriate, information on how the SET Plan objectives and policies are being translated to a national context

North Seas Energy Co-operation (NSEC)

- Ireland works in the NSEC on the prioritisation for the offshore research agenda and according SET plan funds

National Energy RD&D Funding Programme and SET Plan Objectives

- The National Energy RD&D and Ocean Energy Prototype Development Funding Programmes fund the deployment of research, development & demonstration stage energy/low-carbon technology pilot facilities. This funding aims to stimulate and accelerate the development & deployment of energy/low-carbon technology related products, processes & systems in the Irish marketplace, to grow Ireland's national capacity to carry out internationally leading RD&D activities; and to support solutions that enable technical & other barriers to market uptake of energy/low-carbon technology related products, processes & systems to be overcome. Through Ireland's active participation in Europe's SETPlan Steering Group and within individual SET-Plan Implementation Groups, research calls are aligned with SETPlan priorities. This enables alignment of national research priorities with research and innovation programmes both at EU level and across other member states. This also increases co-operation between national programmes to avoid duplication of research.

Ireland and the International Energy Agency (IEA)

- Ireland participates in extensive international collaboration on technology-related issues associated with the low-carbon transition via the IEA Technology Collaboration Programmes. Ireland is a signatory for eight IEA Technology Collaboration Programmes (TCPs). The scope and strategy of TCPs to which Ireland is a signatory align with national strategic objectives related to renewable energy, climate change and coordination of energy-related research
- Ireland is represented on IEA Standing Groups and Committees (e.g. the IEA Governing Board, IEA Committee on Energy Research & Technology; IEA Standing Group on Long-Term Co-operation; IEA Standing Group on Emergency Questions; IEA Standing Group on Global Energy Dialogue;) and Working Parties which, inter alia, oversee the IEA's strategy, work programme and priorities. Ireland is also represented on relevant IEA TCP Executive Committees
- Ireland is signatory to eight IEA Technology Collaboration Programmes. The scope and strategy of these TCPs aligns with our strategic objectives related to renewable energy, climate change and coordination of energy-related research. A national call for appointment of experts to TCP tasks in 2018 was undertaken, under a new structured approach for Irish engagement with IEA TCPs. Additional calls for experts, facilitated by this new structured selection process, are expected in subsequent years

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

The National Energy RD&D and Ocean Energy Prototype Development Funding Programmes aim to stimulate and accelerate the development and deployment of energy/low-carbon technology related products, processes and systems in the Irish marketplace, to grow Ireland's national capacity to carry out internationally leading RD&D activities; and to support solutions that enable technical and other barriers to market uptake of energy/low-carbon technology related products, processes and systems to be overcome. The programme underpins Ireland's efforts to transition to a low carbon economy, and to support the development of jobs and enterprise opportunities associated with the low carbon transition.

The EPA Research Programme includes a specific strand on climate science research in Ireland, recognising the need for research to inform a practical response to, and strategic engagement on, climate change. The EPA has a statutory role in coordinating environmental research in Ireland. EPA Research has a strong focus on policy and is driven by national regulations and European Directives. €10.2m available for new research projects to be awarded in 2019 and 2020.

Domain agnostic funders of research in Ireland also have an important part to play in the energy and climate research ecosystem in Ireland. Enterprise Ireland, the Irish Research Council and Science Foundation Ireland are part of a network which supports energy & climate research in Ireland - the focus of the Irish Research Council and Science Foundation Ireland is primarily on early stage research, whilst the focus of Enterprise Ireland is primarily on supporting businesses in the manufacturing and internationally traded services sectors.

Horizon 2020 is the EU's main instrument for funding research and development. It has a budget of nearly €80bn over 7 years. A budget of €5.9bn has been allocated to non-nuclear energy research for the period 2014-2020. Irish industry, academia and public sector bodies participate in Horizon 2020 with SEAI fulfilling the role of National Delegate for Societal Challenge 3 (Secure, Clean and Efficient Energy). The Report of the independent High Level Group on maximising the impact of EU Research & Innovation Programmes (European Commission, 2017) calls for a prioritisation of research and innovation in EU and national budgets and for a doubling of the EU research and innovation programme budget, from €80bn in Horizon 2020 (or FP8) to €160bn in FP9. Researchers based in Ireland won approximately €40M in energy-related RD&D funding from Horizon 2020 during the first half of the programme.

The EPA fulfils the role of National Delegate and National Contact Point for Societal Challenge 5 of the Horizon 2020 Work Programme. Researchers based in Ireland won approximately €1.2M in funding from Societal Challenge 5 of the Horizon 2020 Programme, with a further potential for €0.5M under consideration for 2019 - climate action, environment, resource efficiency and raw materials. These awards are across 9 research institutions.

Ireland also participates in several energy and climate related ERA-Nets and Joint Programme Initiatives (JPIs), including the Smart Energy Systems ERA-Net; Ocean ERA-Net; the Climate JPI and the LIFE Programme.

Section B: Analytical Basis

4. Current Situation and Projections with Existing Policies and Measures

4.1. Projected Evolution of Main Exogenous Factors Influencing Energy System and GHG Emission Developments

Ireland's draft NECP 2021-2030 is based on two scenarios – A baseline or With Existing Measures (WEM) scenario and an advance policy and measure or With Additional Measures (WAM) scenarios:

With Existing Measures (WEM) – a low oil price (constant 2016 prices) scenario based on the United Kingdom's Department of Business, Energy and Industrial Strategy (BEIS) price projections and fixed carbon tax of €20 per tonne. Policies and measures in place by the end of December 2018 are modelled in this scenario.

With Additional Measures (WAM) – a low oil price (constant 2016 prices) based on the same BEIS price projections as included in the WEM scenario with a varying carbon tax that increases to €80 per tonne by 2030 as announced in the 2020 Budget. The WAM includes the policies and measures announced in Ireland's 2019 Climate Action Plan.

i. Macroeconomic forecasts (GDP and population growth)

Projections for economic growth (GDP) and population growth are sourced from Ireland's Economic and Social Research Institute (ESRI) Core Structural macro-economic model (COSMO).

Table 15: Macroeconomic forecasts (WEM)

Macro-Economic forecasts	Unit	2018	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
GDP	EUR Million	222,044	237,014	244,889	253,020	261,410	270,080	279,033	288,277	297,824	307,685	317,870	328,388	444,945
Population	Million	4.75	4.82	4.86	4.90	4.94	4.98	5.02	5.06	5.10	5.14	5.18	5.22	5.65

ii. Sectoral changes expected to impact the energy system and GHG emissions

Projections for gross value added are also sourced from the ESRI, from the Environment, Energy and Economy (I3E) computable general equilibrium (CGE) model.

Table 16: Sectoral Gross Value Added (GVA)

Sectoral Gross Value Added	Unit	2018	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
Industry	EUR Million	53,369	57,165	59,037	60,972	60,962	65,026	67,157	69,355	71,625	73,970	76,392	78,887	106,765
Market Services	EUR Million	107,533	114,792	118,554	122,441	126,459	130,608	134,895	139,321	143,895	148,620	153,500	158,531	214,563
Non-Market Services, Health and Education	EUR Million	23,166	24,626	25,445	26,292	27,168	28,072	29,005	29,970	30,967	31,997	33,061	34,159	46,285
Public Admin and Defence	EUR Million	8,178	8,716	9,004	9,302	9,610	9,928	10,256	10,595	10,946	11,308	11,683	12,069	16,350

iii. Global energy trends, international fossil fuel prices, EU ETS carbon price

The low-price scenarios are based on the Department of Business, Energy and Industrial Strategy (UK) (BEIS) 2018 low fossil fuel prices (expressed in constant 2016 prices) for oil, gas and coal. The high oil price is from the 2019 EU Reference scenario (expressed in constant 2016 prices) recommended parameters. The recommended EU Reference scenario ETS price is used in all scenarios.

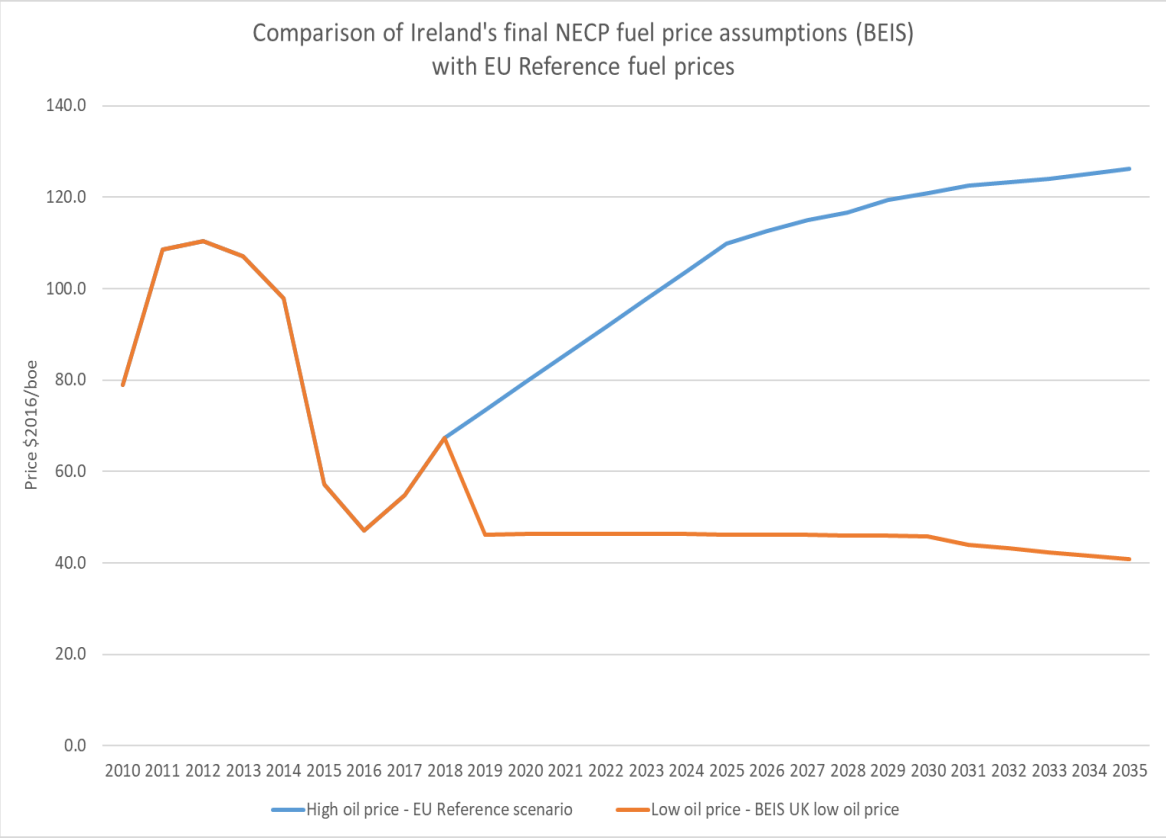


Figure 2: Comparison of BEIS oil price and EU Reference Scenario projections

Table 17: Projected global energy trends (WEM)

Sectoral Gross Value Added	Unit	2018	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
International Fuel Prices														
Oil	**EUR2016/GJ**	9.57	6.58	6.59	6.59	6.58	6.58	6.57	6.56	6.55	6.54	6.53	6.51	5.26
Gas	**EUR2016/GJ**	5.41	3.51	3.44	3.38	3.41	3.34	3.28	3.21	3.15	3.09	3.03	2.98	2.45
Coal	**EUR2016/GJ**	2.23	1.59	1.59	1.59	1.56	1.55	1.55	1.54	1.54	1.53	1.50	1.50	1.23
Carbon Price ETS Sector	**EUR2016/ton CO_2**	12.42	15.50	17.06	18.62	20.18	21.74	23.30	25.58	27.86	30.14	32.42	34.70	51.70

iv. Technology cost developments

The projected makeup of renewable electricity supply in each modelled scenario was informed in part by economic analysis conducted by Cambridge Economic Policy Associates on behalf of DCCAE for the design of Ireland's upcoming Renewable Electricity Support Scheme (RESS). This analysis modelled several scenarios with varying levels of RES-E achievement in 2030 factoring in the capital and operating costs of an array of renewable technologies. The modelling presented in this report draws on the findings of this piece of analysis in its assessment of possible RES-E mixes in 2030 and beyond. The technology cost assessment arising from the RESS economic analysis is summarised in the figure below which compares the levelised cost of electricity (LCOE) for each generation technology deployed in Ireland.

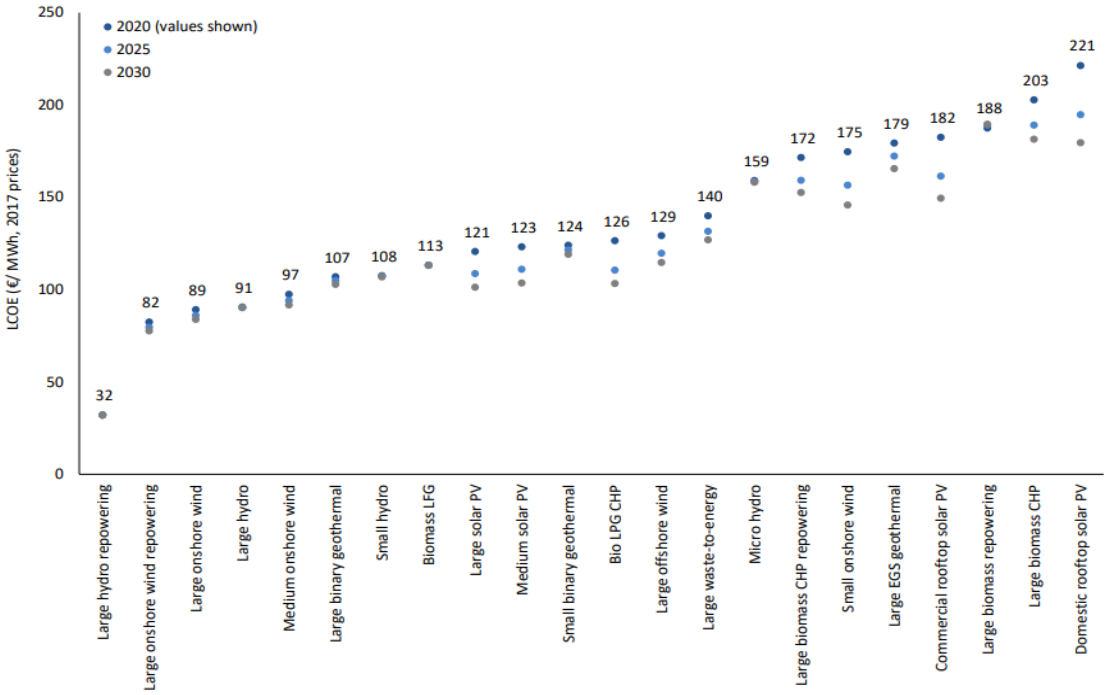


Figure 3: Central estimates for levelised cost of electricity, assuming 10% discount rate. **Source:** CEPA (2017)

The heating technology stock has been projected using an investment model which captures investors' willingness to pay for low carbon technologies given policy supports and changing fuel price dynamics. Capital and operating cost assumptions for low carbon and conventional heating technologies are presented in Table 18. The opex assumptions for each technology do not include fuel costs which vary by scenario and with time as prices change and biomass supply chains adjust to growing demands.

Table 18: Heating technology cost assumptions applied in modelling of heat sector

Technology	Size (kW)	Capex (€/kW)	Opex (€/kW)
Biomass Boiler	7	981	34
	30	787	28
	100	625	23
	300	478	18
	1,000	320	13
	3,000	320	13
Biomass CHP	100	3305	132
	300	3091	125
	1,000	2858	116
	3,000	2645	109
	10,000	2411	100
Ground Source Heat Pump	3	3466	11
	30	2042	9
	100	1297	8
	300	1297	8

	1,000	1297	8
Air Source Heat Pump	3	1408	32
	30	885	6
	100	612	3
	300	479	3
	1,000	479	3
Water Source Heat Pump	3	2777	56
	30	2426	56
	100	2242	56
	300	2075	56
	1,000	1891	56
	3,000	1786	56
	10,000	1786	56
Deep Geothermal	>200	2890	11
Solar Thermal	3	1464	8
	10	1464	8
	30	1464	8
	100	839	8
	300	839	8
	1,000	549	8
Gas Boiler	7	215	6.5
	30	182	5.5
	100	155	4.7
	300	130	3.9
	1,000	103	3.1
	3,000	78	2.3
Oil Boiler	7	128	3.8
	30	117	3.5
	100	107	3.2
	300	98	2.9
	1,000	89	2.7
	3,000	80	2.4
Electric Heating	7	374	1
	30	334	1
	100	301	1
	300	271	1
	1,000	238	1
	3,000	208	1

4.2. Dimension Decarbonisation

4.2.1. GHG Emissions and Removals

i. Trends in current GHG emissions and removals in the EU ETS, effort sharing and LULUCF sectors and different energy sectors

Table 19: Projected trends in GHG emissions (WEM)

tCO2eq	2015	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2025	2040
ETS sector emissions	16835810	17009933	16269069	16397888	16413768	16616544	16271854	15316115	15417641	15119419	15451984	15470240	19012971	21655782
Effort Sharing sector GHG emissions	43037173	46118604	46181381	46164131	46060792	46024465	45958708	45860966	45603625	45205319	44775457	44173964	43469915	43706418
LULUCF	4519528	3483568	3770419	3962518	5808292	5003527	5376567	4645674	5187693	5354044	5747414	6649220	7867571	7577932

The EPA has produced final estimates of greenhouse gas emissions for the period 1990 – 2018 that indicate that Ireland will exceed its 2018 annual limit set under the EU's Effort Sharing Decision (ESD), 406/2009/EC1 by 5.59 Mt CO2eq.

For 2018, total national greenhouse gas emissions are estimated to be 60.93 million tonnes carbon dioxide equivalent (Mt CO2eq). This is 0.1% lower (0.07 Mt CO2eq) than emissions in 2017 (60.65 Mt CO2 eq) and follows a 1.0% decrease in emissions reported for 2017. Emission reductions have been recorded in 7 of the last 10 years. In the last 2 years, national total emissions have only decreased by 1.2% or 0.74 Mt CO2eq, following very large increases of over 3.5% in both 2015 and 2016. In the same period, emissions in the stationary ETS sector have decreased by 12.5% or 2.22 Mt CO2eq whereas emissions under the ESD increased by 3.4% or 1.48 Mt CO2eq.

Whilst there was a reduction in emissions in 2018, due to a significant reduction in coal used for electricity generation, there were considerably large increases in residential, commercial and public services due to a cold winter, highlighting Ireland's poorly performing housing and building stock.

Table 20: Greenhouse gas emissions for 2017 and 2018 for Ireland Mt CO_2eq

Mt CO_2eq	2017	2018	% Change
Agriculture	20.253	20.633	1.9%
Transport	12.026	12.225	1.6%
Energy Industries	11.899	10.631	-10.7%
Residential	5.741	6.197	7.9%
Manufacturing Combustion	4.565	4.741	3.9%
Industrial Processes	2.270	2.316	2.0%
Commercial Services	1.072	1.129	5.3%
F-Gases	1.354	1.192	-11.9%
Public Services	0.906	0.980	8.2%
Waste	0.919	0.890	-3.2%
Total	**61.005**	**60.935**	**-0.1%**

Agriculture remains the single largest contributor to the overall emissions at 34.0% of the total. Transport and Energy Industries are the second and third largest contributors at 20.2% and 17.1% respectively. Residential and Manufacturing Combustion emissions account for 10.2% and 7.8 % respectively. These five sectors accounted for almost 90% of national total emissions in 2018. The remainder is made up by the Industrial Processes at 3.8%, Commercial Services at 1.9%, F-Gases at 1.8%, Public Services at 1.6% and Waste at 1.5%.

Agriculture emissions increased by 1.9% or 0.38 Mt CO2eq in 2018 following an increase in 2017 of 2.9%. The most significant drivers for the increased emissions in 2018 are higher dairy cow numbers (+2.7%) with an increase in milk production of 4.4%. In the last 5 years, dairy cow numbers have increased by 27% and corresponding milk production by 40%. This reflects national plans to expand milk production under Food Wise 2025 and the removal of the milk quota in 2015. In 2018, there were also increased CO2eq emissions from synthetic fertiliser application on agricultural soils (+10.6%). Other cattle and sheep numbers decreased by 1.2% and 1.7% respectively, whereas pig and poultry numbers increased by 0.7% and 0.5% respectively. Total fossil fuel consumption in agriculture, forestry and fishing activities increased by 7.8% in 2018.

For 2018, transport emissions increased by 1.6% in 2018 or 0.20 Mt CO2eq. This is the fifth year out of the last six with increased emissions in transport. Total energy consumption in road transport increased by 1.1% in 2018; petrol -9.2%, diesel +4.6% and biofuels -4.0%. Looking at the underlying drivers, the number of passenger diesel cars increased by 7.7% in 2018 while the number of passenger petrol cars decreased by 4.5%, commercial vehicle numbers increased by 1.7% and employment grew by 2.3% between Q4 2017 and Q4 2018.

Sectoral emissions in the Energy Industries sector show a decrease of 11.7% in 2018 which is attributable to decreases in consumption of coal and peat by 43.7% and 3.3 % respectively, whilst there were increases in natural gas, oil, biomass and non-renewable wastes of 1.5%, 2.3%, 24.8% and 60.9% respectively for electricity generated. The increases in biomass and non-renewable waste were due to the new waste to energy facility in Dublin operating at full capacity in 2018. In 2018, electricity generated from wind and hydro increased by 13.6% and 0.4% respectively, reflected in a 13.6% decrease in the emissions intensity of power generation in 2018 (377 g CO2/kWh) compared with 2017 (436 g CO2/kWh). Renewables now account for 32.6% of electricity generated in 2018 (up from 29.0% in 2017).

Emissions in the residential sector for 2018 increased by 7.9% or 0.46 Mt of CO2eq in 2018. Within the different fuels used in household space and water heating, all fuels showed increases; coal, peat, gasoil, kerosene, natural gas and biomass increased by 4.4%, 4.4%, 9.0%, 10.2%, 8.7% and 3.7% respectively in 2018. There were 7.6% more degree days in 2018, with all 25 weather stations showing more heating days especially during the months January to April 2018.

Emissions from the Manufacturing Combustion sector increased by 3.9% or 0.18 Mt CO2eq in 2018. There were increases in combustion emissions for all sub sectors including cement which increased by 5.8% in 2018. Increased emissions from companies within the ETS were

evident in the chemicals, food and drink and cement sectors, with emissions increasing by 1.0%, 0.9% and 5.8% respectively.

In 2018 emissions from the Industrial Processes sector continue to increase by 2.0% (0.05 Mt CO2eq) in 2018 following a 5.6% increase in 2017, mainly from increased cement production. Total process emissions from the mineral products subsector (including cement) increased by 2.7%.

In 2018, total emissions (combustion and process) from the cement sector increased by 4.7% and amount to 2.91 Mt CO2eq, or 4.8% of national total emissions. Cement sector emissions have now increased by 91.2% since 2011.

Emissions from Commercial Services and Public Services both increased by 5.3% and 8.2% respectively, with increases of 9.9% and 3.8% in natural gas and gasoil use in both sectors in 2018. There was a decrease in biomass/biogas use of 14.1% in commercial services and a decrease of 0.5% in public services.

Emissions from the Waste sector decreased by 2.8% in 2018, with a decrease in sub category; landfills of 3.5%. Overall emissions decreased by 0.03 Mt CO2eq.

Looking at longer term trends, the share of CO2 in total greenhouse gas emissions has increased to 63.5% of total greenhouse gas emissions in 2018 compared to 59.3% in 1990. In contrast, CH4 and N2O emissions, primarily from the agriculture sector, have fallen from 40.6% of total greenhouse gas emissions in 1990 to 34.7% in 2018. Emissions from F-gases account for 1.8% of the total in 2018.

Between 1990 and 2018, Transport shows the greatest overall increase at 137.1%, with road transport increasing by 143.4%. Emissions increased by 1.7% in 2018, the fifth year out of the last six with increased emissions in Transport emissions. Transport emissions have decreased by 15.3% below peak levels in 2007 primarily due to the economic downturn, improving vehicle fuel efficiency due to the changes in vehicle registration tax, the increased use in biofuels and significant decreases in fuel tourism in recent years. The increase up to 2007 can be attributed to general economic prosperity, increasing population with a high reliance on private car travel as well as rapidly increasing road freight transport.

Energy Industries show a decrease in emissions of 8.5% over the period 1990 – 2018. Over the time series, emissions from electricity generation have decreased by 10.3% whereas total electricity consumption has increased by 128.7%. Emissions from electricity generation increased from 1990 to 2001 by 54.2% and have decreased by 41.9% between 2001 and 2018. This decrease reflects the improvement in efficiency of modern gas fired power plants replacing older peat and oil-fired plants and the increased share of renewables, primarily,

wind power along with increased interconnectivity. This year was the lowest year in the 29-year time series for coal fired electricity generation, 44% less than in 2017, as Ireland's only coal fired plant was off line from August 2018 to the second half of 2019.

Emissions from Agriculture reached a peak in 1998 and have decreased to below their 1990 level since 2002, reflecting long-term decline in livestock populations and in fertiliser use due to the Common Agricultural Policy. Emissions from Agriculture in 2018 are now 1.1% above their 1990 levels and have increased for 6 out of the last 7 years.

The changes in Agriculture emissions are underpinned by higher animal numbers; in the 5-year period 2013-2018, dairy cow numbers have increased by 26.9% with a corresponding milk production by 39.8% and nitrogenous fertiliser use increased by 15.7%. This reflects national plans to expand milk production under Food Wise 2025 and the removal of the milk quota in 2015.

Increased housing stock drove the gradual upward trend in the emissions from the residential sector after 1998 following a sharp reduction in the early 1990s that resulted from fuel switching to reach a peak in 2010. The 2018 emissions in this sector are 7.9% higher than 2017 levels and are 17.6% lower than their 1990 level whereas the housing stock has increased by 77% in the same period. Winter heating demand is the most important variable determining emissions from this sector with 7.6% more degree days in 2018.

ii. Projections of sectoral developments with existing national and Union policies and measures at least until 2040 (including for the year 2030)

Table 21: Projections of sectoral developments (WEM)

$ktCO_2eq$	2015	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Industry	4469.57	5628.12	5674.25	5709.34	5694.88	5714.05	5743.31	5806.76	5872.31	5939.99	6013.19	6084.98	6770.93	7563.47
Residential	6041.31	6298.65	6232.23	6150.22	6025.88	5904.38	5787.01	5678.09	5575.85	5480.51	5401.85	5321.74	5509.68	5958.58
Tertiary	1799.55	2207.82	2200.28	2186.41	2150.36	2147.07	2145.56	2158.53	2171.99	2186.00	2200.72	2216.09	2468.86	2812.65
Transport	11827.32	12786.70	12814.15	12835.49	12841.03	12838.38	12813.04	12749.82	12528.54	12196.40	11806.90	11297.41	9576.93	8308.58

The greenhouse gas emissions projections prepared for the National Energy and Climate Plan take into account projected activity data provided by a number of key data providers including:

- Updated energy projections provided by the Sustainable Energy Authority of Ireland (SEAI) in January 2020.
- Agricultural projections provided by Teagasc in November 2019 which considers the impact of Food Wise 2025 for the agriculture sector.

The emissions projections that have been prepared for the National Energy and Climate Plan are projecting from the 2018 inventory baseline year (February 2020 version).

The *Projections with existing policies and measures* scenario assumes that no additional policies and measures, beyond those already in place by the end of 2018, are implemented.

In terms of sectors covered by the Effort Sharing Decision under this scenario Ireland is projected to cumulatively exceed its compliance obligations by approximately 13.4 Mt CO2 equivalent over the period 2013-2020.

In terms of the same sectors covered under the Effort Sharing Regulation the projections indicate that Ireland will exceed the carbon budget by approximately 32 Mt CO2 equivalent over the 2021-2030 period assuming both ETS and LULUCF flexibilities as set out in the Effort Sharing Regulation are fully utilised. If only the LULUCF flexibility were to be utilised that exceedance would increase to 50.8 Mt CO_2eq.

Under the *Projections with existing policies and measures* scenario total emissions (excluding LULULCF) are projected to decrease by 14.4% and 6.2% by 2030 and 2040 respectively compared to 2005 levels (from the 1990-2018 inventory).

ETS emissions are projected to decrease by 31% and 3.4% by 2030 and 2040 respectively compared to 2005 levels.

Total emissions from sectors under the Effort Sharing Regulation are projected to decrease by 6.3% and 7.3% by 2030 and 2040 respectively compared to 2005 levels.

- Emissions from Energy Industries (corresponding to IPCC Sector 1.A.1.) are projected to decrease by 45.4% and 20.1% by 2030 and 2040 respectively compared to 2005 levels.
- Emissions from Industry (corresponding to IPCC Sector 1.A.2.) are projected to increase by 3.6% and 28.8% by 2030 and 2040 respectively compared to 2005 levels.

- Emissions from Residential (corresponding to IPCC Sector 1.A.4.b.) are projected to decrease by 26.8% and 18% by 2030 and 2040 respectively compared to 2005 levels.
- Emissions from Tertiary (corresponding to IPCC Sector 1.A.4.a.) are projected to decrease by 8.7% by 2030 and increase by 15.8% by 2040 compared to 2005 levels.
- Emissions from Transport (corresponding to IPCC Sector 1.A.3.) are projected to decrease by 14% and 36.7% by 2030 and 2040 respectively compared to 2005 levels.
- Emissions from Agriculture (corresponding to IPCC Sector 3.) are projected to increase by 7.7% and 9.4% by 2030 and 2040 respectively compared to 2005 levels.
- Emissions from LULUCF are projected to increase by 4.2% and 18.8% by 2030 and 2040 respectively compared to 2005 levels.

4.2.2. Renewable Energy

i. Current share of renewable energy in gross final energy consumption and in different sectors (heating and cooling, electricity and transport) as well as per technology in each of these sectors

Table 22: Current share of renewable energy in gross final energy consumption

Renewable Energy Shares 2018	Renewables (Total)	Of Which						
		Hydro	Wind	Biomass	Biogases	Bioliquids	Solar	Heat Pumps/Geothermal
Primary Energy	10.0%	0.4%	5.1%	2.8%	0.4%	1.1%	0.1%	0.3%
Share of Gross Final Consumption - Renewable Directive (RES)	11.0%	0.5%	6.1%	2.4%	0.2%	1.3%	0.1%	0.4%
Share of Electricity Final Consumption - (RES-E)	33.2%	2.3%	28.1%	2.1%	0.6%	-	0.05%	-
Share of Heat Final Consumption - (RES-H)	6.5%	-	-	5.0%	0.2%	-	0.3%	0.9%
Share of Transport Final Consumption - (RES-T)	7.2%	-	-	-	-	7.1%	-	-

Overall and Modal Shares of Renewable Energy

The contribution from renewables in 2005 was 2.8%, rising to 11% of GFC in 2018. Figure 4 below illustrates where the various renewable targets fit within overall energy use in Ireland and the progress towards those targets in 2018. Towards the right of Figure 4 the 2018 percentages of renewables are shown relative to the amount of final energy that they refer to.

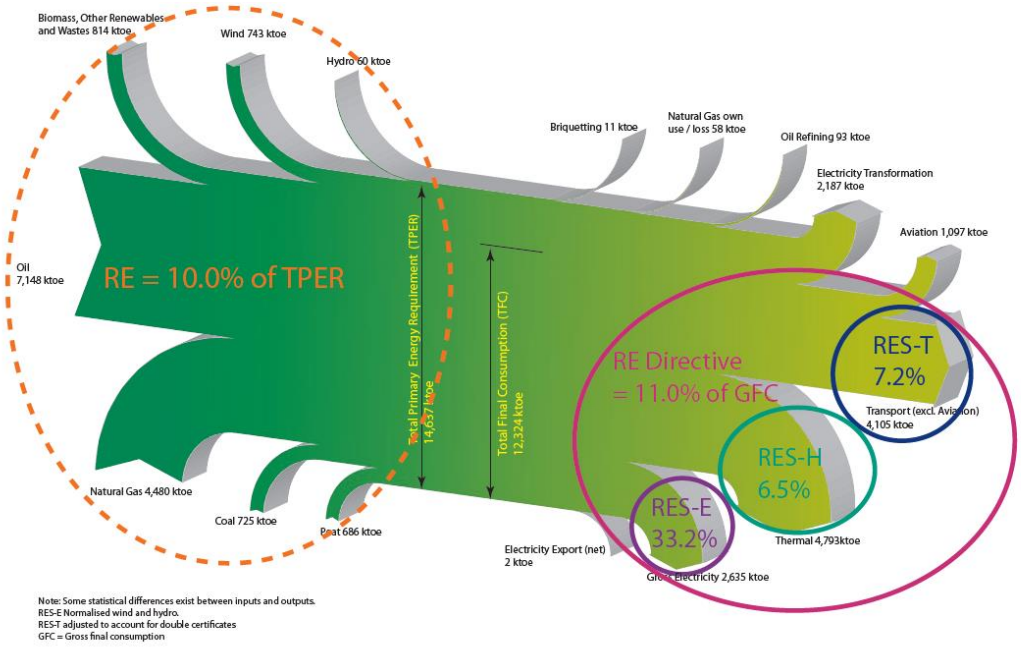
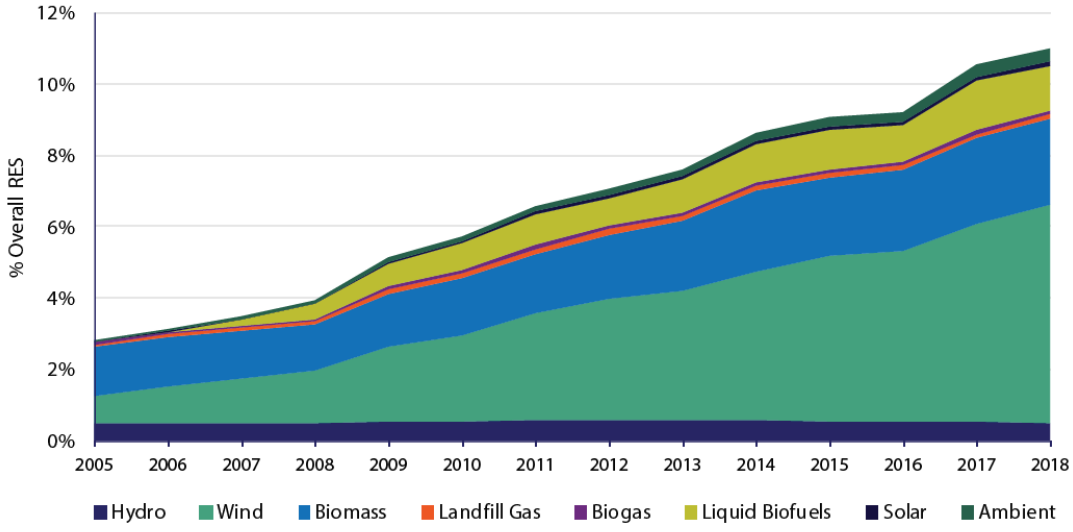


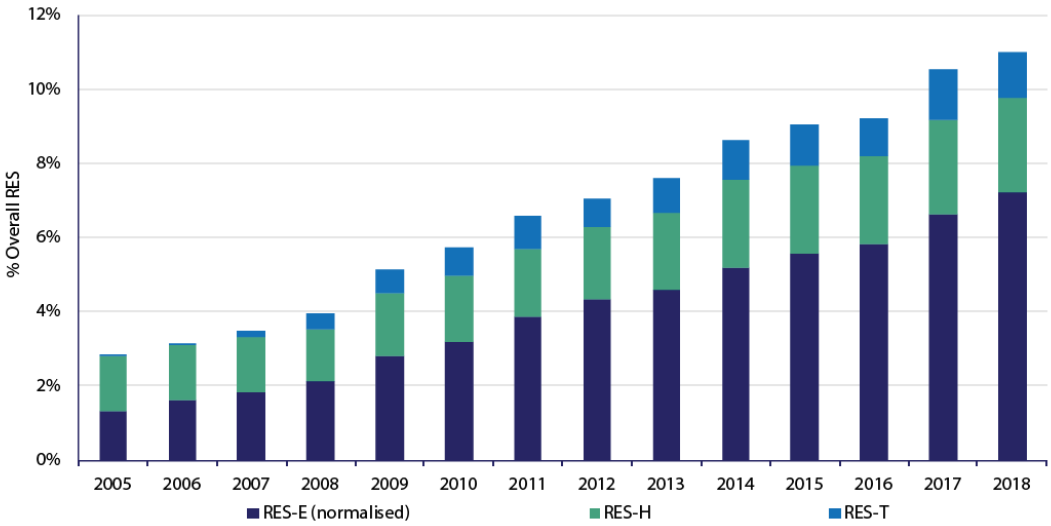
Figure 4: Progress to renewable energy targets 2018



Source: SEAI

Figure 5: Renewable energy contribution to gross final consumption

Figure 5 above shows the contribution as per the Directive methodology (2009/28/EC) from 2005 to 2018 while Figure 6 shows the renewable energy percentage contributions to gross final energy consumption by mode with RES-E normalised.



Source: SEAI

Figure 6: Renewable energy contribution to gross final energy consumption by mode

Renewable Electricity

The total contribution from renewable energy to gross electricity consumption in 2018 was 33.2% normalised (compared with 30.1% in 2017). The share of electricity from renewable energy has increased almost fivefold between 2005 and 2018 – from 7.2% to 33.2% – an increase of 23 percentage points over 13 years. In absolute terms there has been a fivefold increase in the volume of renewable electricity generated from 1,873 GWh in 2005 to 10,195 GWh in 2018.

Electricity production from wind energy has increased to the point that it accounted for 84% of the renewable electricity generated in 2018. Electricity generated from biomass accounted for 8.3% of renewable electricity in 2018. Biomass consists of contributions from solid biomass, landfill gas, the renewable portion of waste and other biogases.

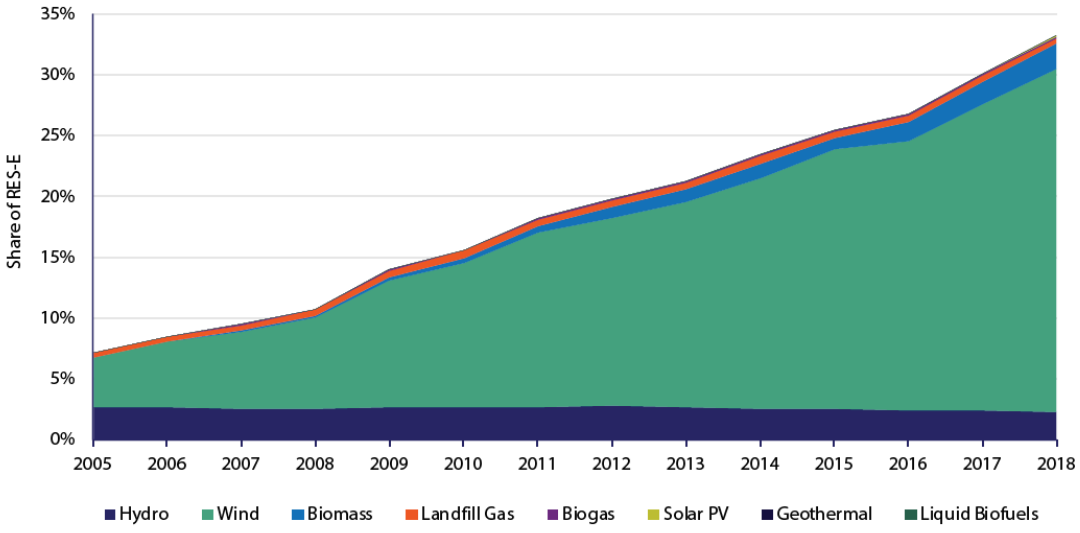


Figure 7: Renewable energy contribution to gross electricity consumption by technology (RES-E normalised)

Renewable Heat

Figure 8 below shows the contribution from renewable energy to heat or thermal energy uses. The increasing activity in specific sub-sectors of industry, as well as some incentives and regulations for renewable systems in residential dwellings, has led to renewable energy use rising from 187 ktoe in 2005 to 310 ktoe in 2018 (a growth of 65%). In 2018 absolute amount of renewable heat energy used increased in 2018, but the share of renewable heat reduced because the use of fossil fuels increased at a faster rate than renewables did in that year. Overall between 2005 and 2018, the amount of fossil fuels used for heat has reduced by 16%, which contributed positively towards the RES-H target, as the share of renewable heat is measured against a smaller total.

Following a decline in the contribution from renewables to thermal energy in the early 1990s (from 2.6% in 1990 to 2.1% in 1995), RES-H share grew between 2000 and 2014, from 2.4 % to 6.3%, and fell in 2015 to 6.2% and increasing again in 2016 and 2017 to 6.7% before small decline in 2018 to 6.5%. This overall trend in growth from 2000 has been dominated by solid biomass, mostly due to the increased use of wood waste as an energy source in the wood products and food sub-sectors of industry. In addition, recent growth in renewable energy use in the residential and services sectors can be attributed to the support of grant schemes and revisions to building regulations requiring a share of the energy demand in new dwellings to come from renewable sources.

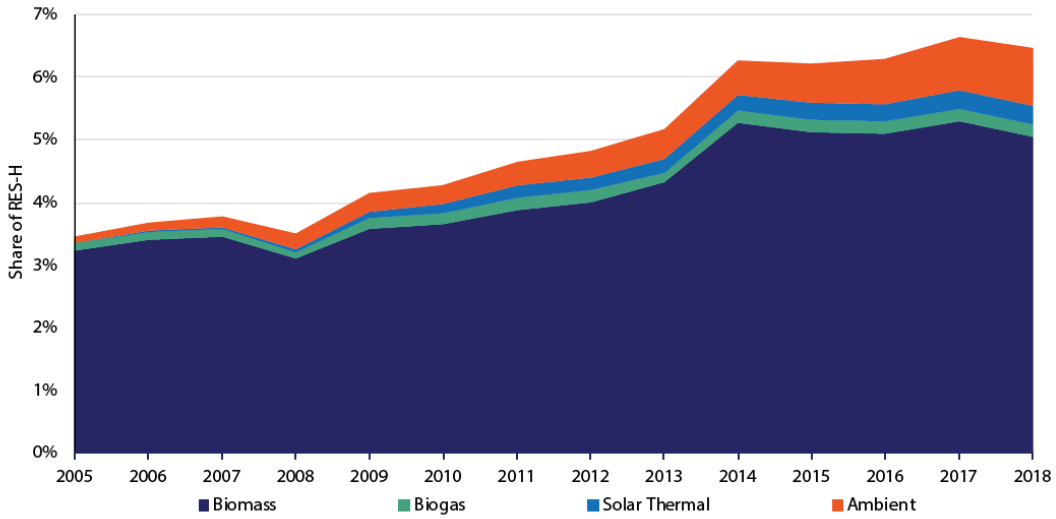


Figure 8: Renewable energy contribution to thermal energy (RES-H) by technology

Renewable Transport

The share of renewables in transport energy (RES-T) in 2018 was 3.9%, or 7.2% when the weightings for biofuels and renewable electricity are applied in accordance with the Directive. These are a reduction on the respective 2017 figures of 4.1% and 7.4%. 16% of the required certificates for 2018 were carried forward from 2016 and 2017 as allowed for under the Biofuel Obligation Scheme.

In absolute terms, biofuels in transport increased from 1 ktoe in 2005 (0.03%) to 98 ktoe in 2011 (2.6% of transport energy). The quantity fell in 2012 to 85 ktoe mainly as a result of the majority of biodiesel qualifying for double certificates, thereby allowing the obligation to be met with certificates but causing the actual volume of biofuel to fall. Actual volumes increased again after 2013 to reach 128 ktoe (3.3% of transport energy) in 2015 but fell to 119 ktoe in 2016 (3.0% of transport energy) before increasing again in 2017 by 36% to 161 ktoe. The volume fell again in 2018, to 156 ktoe. In 2018, all the biodiesel and approximately 10% of the bioethanol used for road transport were eligible for double certificates.

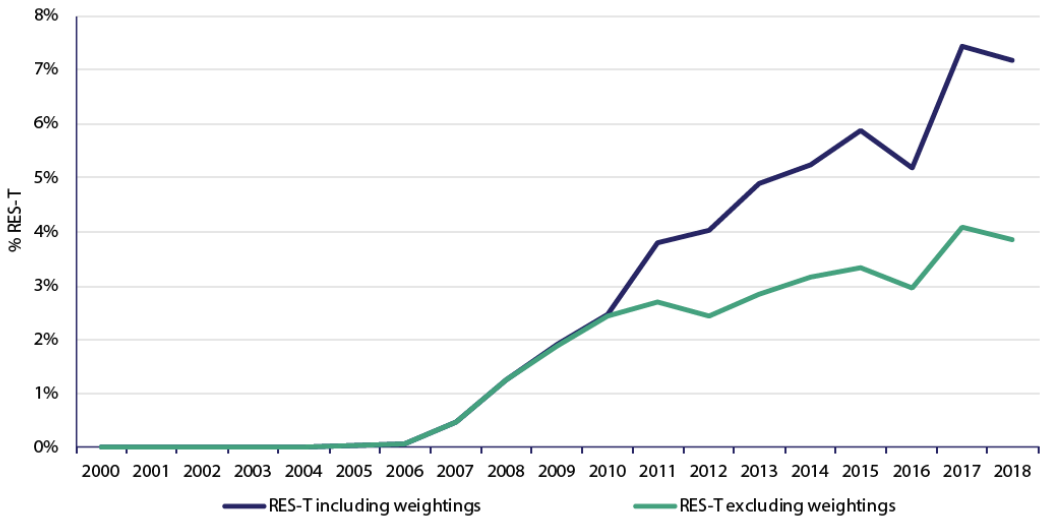


Figure 9: Renewable energy as a proportion of (petrol and diesel) transport (RES-T)

ii. Indicative projections of development with existing policies for the year 2030 (with an outlook to the year 2040)

Overall renewable energy share in gross final consumption With Existing Measures is anticipated to be in the order of 12.8% by 2020 in the WEM (low oil price) scenario. These projections do not include the anticipated impact of policies and measures announced after the end of 2018 (the end of the latest inventory year). Ireland is likely to achieve 80% of the required progress towards the 2020 target of 16% under the Renewable Energy Directive. Progress on renewable energy has been slower than anticipated in general across Europe and purchasing compliance will come at a higher cost to the Irish Exchequer particularly in a tight market supply.

In the context of 2030 renewable energy targets, the outcome is that Ireland will be starting from a point below its expected baseline of 16% from January 2021. While the commitments in the Climate Action Plan will assist in accelerating the deployment of renewable generation in the next decade, the renewable energy target is calculated as the proportion of energy consumed in the economy and electricity demand. Therefore the Irish authorities are considering the available options under the Governance Regulation and recast Renewable Energy Directive to set a cost effective pathway to meet the compliance milestones to 2030.

The outlook to 2030 for the WEM (baseline) scenario suggest an outturn of 21.5% overall RES, in a low oil price scenario. As for 2030, this is a baseline scenario only and does not include the impact of more recently announced policies and measures. Refer to Part 5 of this document for a comparison of the WEM scenario to the With Additional Measures (WAM) scenario.

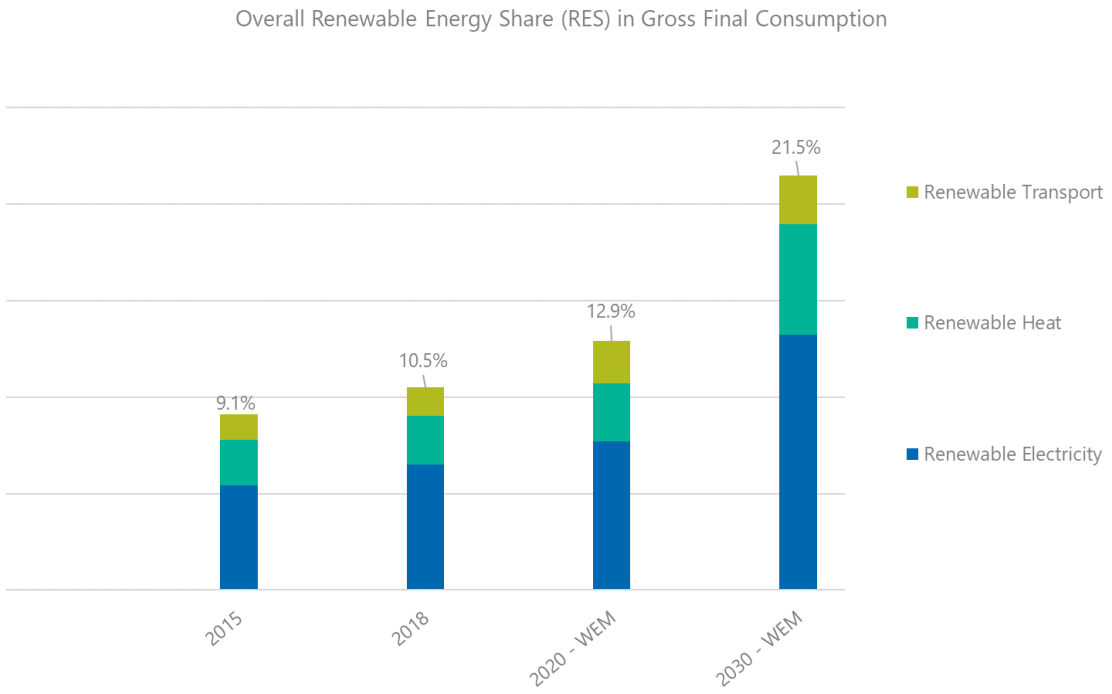


Figure 10: Overall renewable energy share in gross final consumption (WEM)

Table 23 illustrates the annual trajectories for the WEM scenario assumptions. It is evident that there is a shortfall on the deployment trajectory set out in Article 4(a)(2).

Table 23: Modelled trajectories for renewable energy by sector (WEM)

Renewable Trajectories	2018	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
RES-H&C (%)	6.5%	7.6%	8.2%	8.9%	9.9%	10.9%	11.8%	12.2%	12.7%	13.1%	13.6%	14.0%	15.6%
RES-E (%)	33.2%	37.6%	39.5%	40.2%	42.2%	44.8%	46.8%	49.0%	50.9%	52.3%	53.5%	54.9%	54.4%
RES-T (%)	3.8%	5.7%	5.8%	5.8%	5.8%	5.9%	5.9%	6.0%	6.2%	6.4%	6.7%	7.2%	11.0%
Overall RES Share (%)	11.0%	12.9%	13.6%	14.2%	15.1%	16.2%	17.1%	17.9%	18.8%	19.6%	20.4%	21.5%	25.5%
Article 4(a)(2) Target for RES Increase	-	-	-	18.0%	-	-	43.0%	-	65.0%	-	-	100%	-
RES Min Trajectory (%)	-	16.0%	-	17.0%	-	-	18.4%	-	19.6%	-	-	21.5%	-
RES Projected Trajectory (%)	-	12.9%	-	14.2%	-	-	17.1%	-	18.8%	-	-	21.5%	-
Shortfall (%)	-	3.1%	-	2.8%	-	-	1.2%	-	0.8%	-	-	0.0%	-

4.3. Dimension Energy Efficiency

i. Current primary and final energy consumption in the economy and per sector (including industry, residential, service and transport)

Primary Energy Requirement

Figure 11 shows the evolution of Ireland's primary energy requirement by sector from 2005 to 2018. The data presented in Table 24 shows that although there has been a decline in primary energy requirement since 2005, primary energy demand grew in 2018 in all sectors.

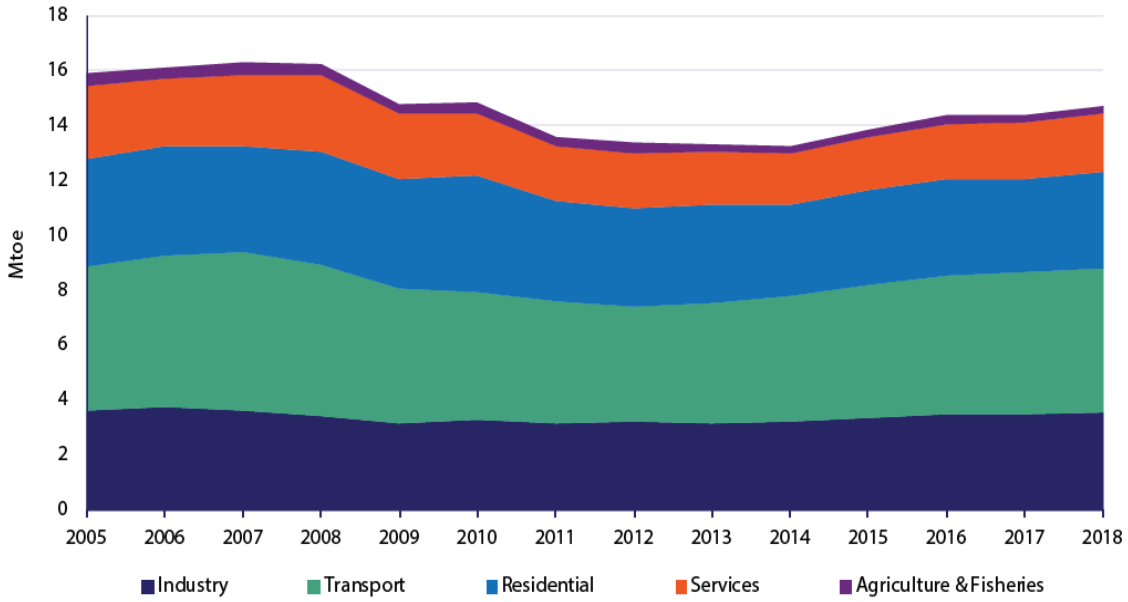


Figure 11: Total primary energy requirement by sector

Changes in sectoral primary energy consumption presented in the Table 24 below are as follows:

- In 2018, primary energy use in households grew by 2.9%, to 3,488 ktoe. The residential share of primary energy was 24% in 2018.
- Transport's primary energy use increased in 2018 by 2.6%, to 5,274 ktoe. Transport's primary energy use fell by 28% between 2007 and 2012 but has increased by 25% since then. Transport remains the largest energy-consuming sector, with a 36% share of primary energy in 2018.
- Use of primary energy in the commercial and public services sector increased by 1.6% in 2018, to 2,113 ktoe. Services' share of primary energy was 14% in 2018.
- Industry's primary energy use increased by 1.0% in 2018, to 3,523 ktoe. Industry's share of primary energy was 24% in 2018.

- Primary energy use in the residential sector and services sector can be considered collectively as energy in buildings as most of the energy use is associated with heating/cooling and lighting buildings. In 2018, primary energy in buildings accounted for 38% of primary energy supply. Overall, primary energy use in buildings has fallen by 15% since 2005 (1.2% per annum) and in 2018 it increased by 2.4%, to 5,601 ktoe.
- Agriculture and fisheries' primary energy use increased by 2.8%, in 2018 to 299 ktoe, and accounted for 2% of primary energy use.

Table 24: Growth Rates, Quantities and Shares of TPER by sector

	Overall Growth %	Average Annual Growth %					Quantity (ktoe)		Shares %	
	2005-2018	'05-'18	'05-'10	'10-'15	'15-'18	2018	2005	2018	2005	2018
Industry	-3.1	-0.2	-2.1	0.3	2.0	1.0	3,634	3,523	22.9	24.0
Transport	1.8	0.1	-2.1	0.8	2.7	2.6	5,181	5,274	32.7	35.9
Residential	-11.2	-0.9	1.5	-4.1	0.6	2.9	3,928	3,488	24.8	23.7
Services	-20.1	-1.7	-3.0	-3.2	3.0	1.6	2,646	2,113	16.7	14.4
Agriculture & Fisheries	-36.2	-3.4	-5.2	5.1	2.8	2.8	468	299	3.0	2.0

Energy use can be categorised by its mode of application: whether it is used for mobility (transport), power applications (electricity) or for thermal uses (space, water or process heating), as shown in the Figure 12 These modes also represent three distinct energy markets. Where thermal or transport energy is provided by electricity (e.g. electric heaters and electric vehicles) this energy is considered under electricity, and not under thermal or transport, so that double counting is avoided.

In primary energy terms, all three modes have a broadly similar share. In 2005, thermal uses for energy (5,683 ktoe) accounted for the highest share of primary energy at 36% while transport and electricity were equal at 32%. Since 2014, transport has had the largest share, accounting for 35.4% of primary energy in 2018 (5,197 ktoe), followed by heat at 33.5% (4,940 ktoe) and electricity at 31.2% (4,562 ktoe). The modal shares change when moving the discussion from primary energy to final energy. In particular, electricity makes up a far higher share of primary energy than it does of final energy. This is because primary energy includes the large amount of energy that is lost as waste heat in the electricity generation process.

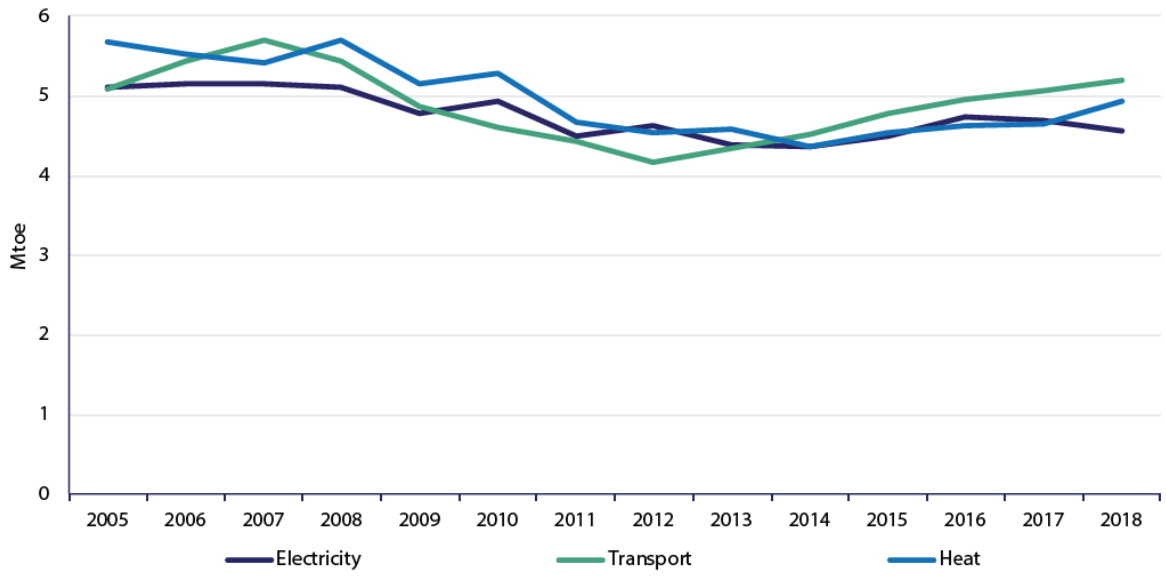


Figure 12: Gross final energy demand by mode

Final Energy Demand

The evolution of Ireland's final energy demand by sector is presented in the Figure 13. The effect of the economic downturn is evident from 2008 to 2012. It is also evident from this figure that transport continues to dominate as the largest energy consuming sector (on a final energy basis) with a share of 42% in 2018. The shares of the industry and residential sectors have decreased since 1990. In 2018 industry accounted for 21% of final energy use and the residential sector for 23%.

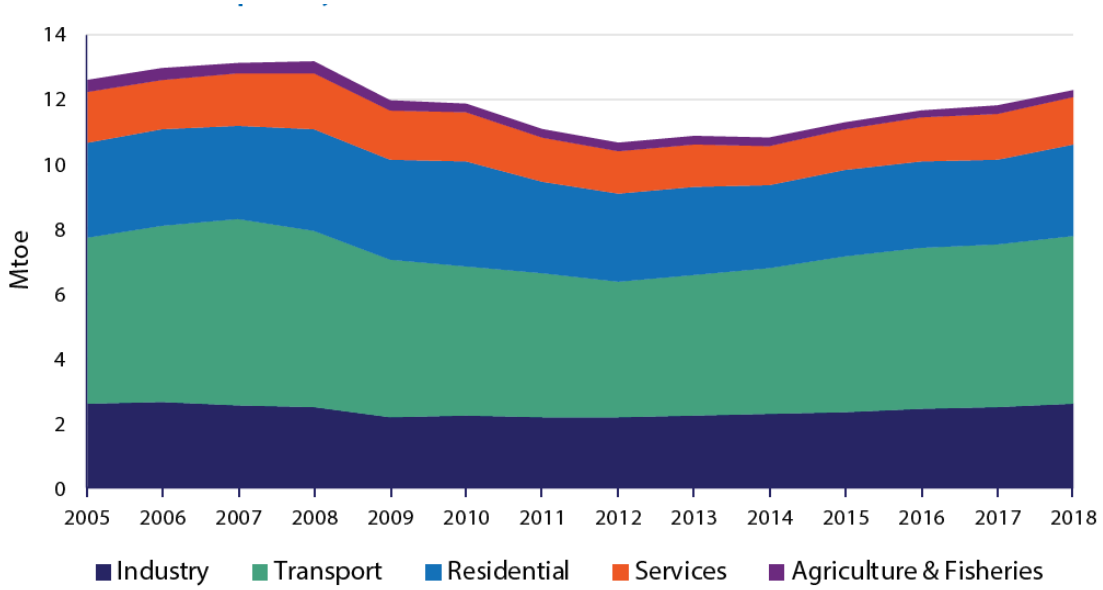


Figure 13: Total final energy demand by sector

The changes in growth rates, quantities and shares in final energy demand are shown in Table 25 and summarised as follows:

- Overall final energy consumption grew by 4.5% in 2018 – an increase of 533 ktoe to 12,324 ktoe – with all sectors showing growth
- Final energy use in the residential sector increased by 178 ktoe, or 6.8%, in 2018 to 2,786 ktoe. Correcting for weather, residential energy use increased by 5.5%.
- There was a 6.4% increase (90 ktoe) in final energy use in the services sector in 2018 to 1,484 ktoe. Correcting for weather, the increase was 5.2%
- In 2018, final energy use in industry grew by 4.7% – 117 ktoe in absolute terms – to 2,601 (or a 1.2% decrease in absolute terms) and its share of total final consumption remained steady at 21%
- Energy use in transport grew in 2018 by 2.6%, to 5,202 ktoe, and an increase in absolute terms of 134 ktoe.
- The agricultural and fisheries sector's relative share fell from 3.0% in 2005 to 2.0% in 2018. Agriculture's energy consumption increased in 2018 by 6.3% (15 ktoe) to 251 ktoe

Table 25: Growth in total final energy consumption by sector

	Overall Growth %	Average Annual Growth %					Quantity (ktoe)		Shares %	
	2005-2018	'05-'18	'05-'10	'10-'15	'15-'18	2018	2005	2018	2005	2018
Industry	-1.2	-0.1	-3.1	1.0	3.2	4.7	2,633	2,601	20.9	21.1
Transport	2.3	0.2	-2.0	0.8	2.8	2.6	5,084	5,202	40.3	42.2
Residential	-5.1	-0.4	2.1	-4.0	1.6	6.8	2,937	2,786	23.3	22.6
Services	-5.4	-0.4	-1.3	-2.7	5.0	6.4	1,569	1,484	12.4	12.0
Agriculture & Fisheries	-34.5	-3.2	-5.1	-5.6	4.4	6.3	383	251	3.0	2.0
Total	**-2.2**	**-0.2**	**-1.2**	**-1.0**	**2.9**	**4.5**	**12,606**	**12,324**	**-**	**-**

EirGrid's All Island Generation Capacity Statement 2018 – 2027 outlines that the demand forecast in Ireland is heavily influenced by the expected growth of large energy users, primarily Data Centres which can require the same amount of energy as a large town. EirGrid's analysis shows that demand from data centres could account for 31% of all demand by 2027 (in a median demand scenario).

In June 2018, the Department of Business, Enterprise and Innovation published a statement on The Role of Data Centres in Ireland's Enterprise Strategy. This statement acknowledges

that, as large consumers of electricity, data centres pose particular challenges to the future planning and operation of a sustainable power system.

The increased renewable electricity requirement linked to energy intensive investments will be mainly delivered by the development of the new Renewable Energy Support Scheme (RESS) which will also reflect falling costs across a range of renewable technologies and an ambition to increase community and citizen participation in renewable energy projects.

ii. Current potential for the application of high-efficiency cogeneration and efficient district heating and cooling

The heat demand in Ireland is generally low density in nature with around 90% of the heat demand at densities too low to make district heating a viable proposition largely around urban centres. The Climate Action Plan sets out the need to have a suitable policy framework in place to support district heating by the end of 2020.

iii. Projections considering existing energy efficiency policies, measures and programmes as described in point 1.2.(ii) for primary and final energy consumption for each sector at least until 2040 (including for the year 2030)

The results for energy savings from energy-efficiency policies and measures in the With Existing Measures (WEM) low oil price scenario are included in Table 26. Primary energy savings include the primary energy equivalent (PEE) of electricity savings in the end-use sectors. Autonomous savings are not accounted for in these tables.

In the WEM scenario, most national energy-efficiency programmes assumed to continue delivering their 2018 achieved level of savings until the end of 2022. No further activity under these schemes assumed from 2023 onwards. Achieved 2018 savings under the Energy Efficiency Obligations Scheme (EEOS) are assumed to be maintained until 2030. With the exception of the impact of the 2019 domestic building regulations and 2017 non-domestic building regulations, which included over entire forecast horizon, no further savings are included after 2030 in the WEM scenario.

The energy-efficiency savings by policy and measure are (currently) modelled based on government expenditure on energy-efficiency support programmes and the anticipated effect of regulations and tax incentives driving energy efficient investments. As energy demand is higher in a low oil price scenario, different scenario input assumptions would lead to different energy-efficiency savings estimates. For example, the energy price input assumption directly influences the savings quantified for the following policy measures:

- Carbon tax: in a low energy price scenario there are increased savings impact from carbon tax modelled, as there is higher energy demand starting point relative to a high oil price scenario
- Smart meters: lower energy prices lead to higher electricity demand and thus higher savings are achieved because the savings are based on a percentage reduction of demand instigated by smart meter plus in-home display
- Heat pumps: The SEAI's BioHeat model includes technology uptake simulations based on price signals and other barriers to uptake. Hence, savings from heat pump uptake are lower in low price scenarios given the reduced impact of fossil fuel price signals on (particularly business) consumers

Table 26: Energy efficiency savings in primary energy equivalent and demand (WEM)

Primary Energy Savings (GWhJ)	**2018**	**2020**	**2030**	**2040**
Household	6,981	8,437	19,218	25,124
Services	6,259	8,224	17,461	20,523
Industry	3,083	3,551	4,020	4,020
Transport	1,596	1,621	4,597	18,108
Cross-Sectoral	1,501	1,630	1,512	1,597
Total	**19,420**	**23,463**	**46,809**	**69,372**
Total Primary Energy Consumption (GWhJ)	**2018**	**2020**	**2030**	**2040**
Household	40,799	42,584	43,039	54,550
Services	22,772	26,157	27,292	34,974
Industry	40,216	47,586	53,738	68,557
Transport	62,882	65,698	63,955	62,714
Other	4,253	4,075	4,881	6,641
Total	**170,922**	**186,100**	**192,905**	**227,436**
Final Energy Savings (GWh)	**2018**	**2020**	**2030**	**2040**
Household	6,386	7,604	17,221	22,305
Services	4,970	6,476	14,398	16,943
Industry	2,563	2,948	3,450	3,450
Transport	1,596	1,621	4,597	18,108
Cross-Sectoral	1,501	1,630	1,512	1,597
Total	**17,016**	**20,279**	**41,178**	**62,402**
Total Final Energy Demand (GWh)	**2018**	**2020**	**2030**	**2040**
Household	33,394	33,720	34,770	43,646
Services	16,250	18,439	20,605	26,736
Industry	29,446	35,709	42,074	53,474
Transport	60,223	62,962	59,826	54,968

Other	3,748	3,430	4,235	5,798
Total	**143,061**	**154,259**	**161,510**	**184,623**

iv. Cost-optimal levels of minimum energy performance requirements resulting from national calculations, in accordance with Article 5 of Directive 2010/31/EU

A 2019 report has been completed by the Department of Housing, Planning and Local Government on the Development of Cost Optimal Calculations and Gap Analysis for Non-residential Buildings in Ireland under Directive 2010/31/EU on the Energy Performance of Buildings (recast).

4.4. Dimension Energy Security

i. Current energy mix, domestic energy resources, import dependency, including relevant risks

Current Energy Mix

Ireland's current energy mix is illustrated below in terms of primary energy requirement by fuel. Primary energy consumption in Ireland in 2018 was 14,653 ktoe, a 1.6% increase on the previous year. Over the period 2005 – 2018 Ireland's annual TPER fell in absolute terms by 7.6% (0.6% per annum on average).

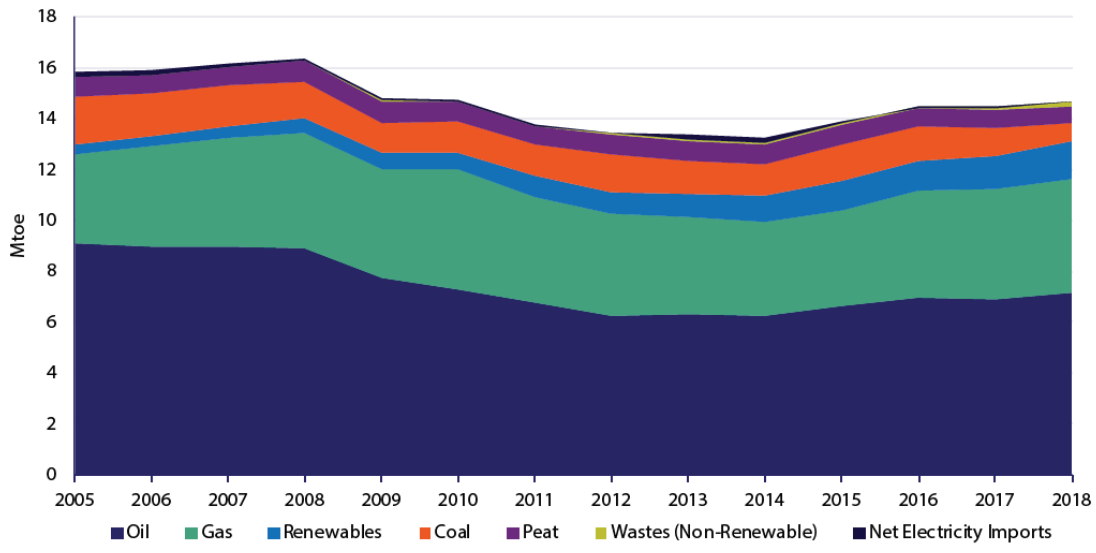


Figure 14: Total primary energy requirement by fuel

The individual fuel growth rates, quantities and shares are shown in Table 27. Primary energy requirement peaked in 2008 and has fallen by 10.3% since then. The following are the main trends in the national fuel share:

- Overall primary energy use grew by 1.6% in 2018
- Fossil fuels accounted for 89% of all the energy used in Ireland in 2018. Demand for fossil fuels increased by 0.1% in 2018, to 13,039 ktoe, but was 15% lower than in 2005
- Coal use decreased by 34% in 2018 and its share of total primary energy requirement fell to 4.9%, down from 10.3% in 2015. Since 2005, coal demand has fallen by 61% (7.1% per annum)
- Peat use fell by 1.3% in 2018 and its share of overall energy use was 4.7%
- Oil continues to be the dominant energy source and maintained a 49% share of total primary energy requirement in 2018. The share of oil in overall energy use peaked in 1999 at 60%. Consumption of oil, in absolute terms, increased by 3.3% in 2018, to 7,148 ktoe, but compared with 2005, oil demand in 2018 was 22% lower
- Natural gas use increased in 2018 by 3.8%, to 4,480 ktoe, and its share of total primary energy requirement increased to 31%. Natural gas use was 28% higher than in 2005
- Total renewable energy increased by 10.2% during 2018, to 1,471 ktoe. Hydro and wind increased by 0.4% and 16% respectively. Biomass use increased by 11% in 2018, to 410 ktoe, and other renewables fell by 2.8%, to 259 ktoe. The overall share of renewables in primary energy stood at 10.0% in 2018, up from 9.3% in 2017.
- Energy from non-renewable wastes increased by 28% in 2018, to 145 ktoe, and accounted for 1% of primary energy
- Ireland continued to be a net exporter of electricity in 2018, exporting just 2 ktoe, 96% less than in 2017

Table 27: Growth rates, Quantities and Shares of TPER fuels

	Overall Growth %	Average Annual Growth %					Quantity (ktoe)		Shares %	
	2005-2018	'05-'18	'05-'10	'10-'15	'15-'18	2018	2005	2018	2005	2018
Fossil Fuels (Total)	-14.8	-1.2	-1.8	-2.1	1.1	0.1	15,306	13,039	96.6	89.0
Coal	-61.5	-7.1	-8.1	3.0	-20.2	-34.1	1,882	725	11.9	4.9
Peat	-13.3	-1.1	-0.7	0.0	-3.6	-1.3	791	686	5.0	4.7
Oil	-21.7	-1.9	-4.4	-1.8	2.4	3.3	9,130	7,148	57.6	48.8
Natural Gas	27.9	1.9	6.1	-4.4	5.9	3.8	3,503	4,480	22.1	30.6
Renewables (Total)	297.2	11.2	12.9	10.9	9.0	10.2	370	1,471	2.3	10.0
Hydro	10.0	0.7	-1.0	6.1	-4.9	0.4	54	60	0.3	0.4
Wind	677.0	17.1	20.4	18.5	9.5	16.1	96	743	0.6	5.1

Biomass	127.1	6.5	3.1	6.2	12.9	11.0	180	410	1 .1	2.8
Other Renewables	546.1	15.4	34.2	4.5	6.1	-2.8	40	259	0.3	1.8
Wastes (Non-Renewable)	-	-	-	51.7	28.3	28.4	-	145	-	1.0
Electricity Imports (Net)	-101.4	-171.8	-25.5	7.4	-134.5	-95.9	176	-2	1.1	0.0
Total	**-7.6**	**-0.6**	**-1.5**	**-1.2**	**1.8**	**1.6**	**15,852**	**14,653**	**-**	**-**

Domestic Energy Resources

Figure 15 shows the indigenous energy fuel mix for Ireland over the period. The reduction in indigenous supply of natural gas (until 2016) is evident from Figure 15 as is the switch away from peat. Production of indigenous gas decreased by 94% over the period between 1990 and 2015 to 106 ktoe but then increased dramatically in 2016 to 2,493 ktoe. It increased again in 2017 to 2,854 ktoe. This is the highest natural gas production level ever recorded in Ireland. Production from the Corrib field is expected to cease by 2030 with the high level of production expected to taper off significantly in the next couple of years. This appears to have started in 2018, with a small reduction in production (to 2,752 ktoe).

Indigenous renewable energy production increased by 258% between 2005 and 2018 to 1,326 ktoe. Indigenous production of all energy in Ireland reached the highest level ever with a new peak in 2018 of 5,040 ktoe, up from the previous peak in 2017 at 4,884 ktoe.

Peat production was down since 2013 following significant production during that summer which provided favourable harvesting conditions for peat. In 2018 peat production was up 3.4% to 816 ktoe compared with the previous year.

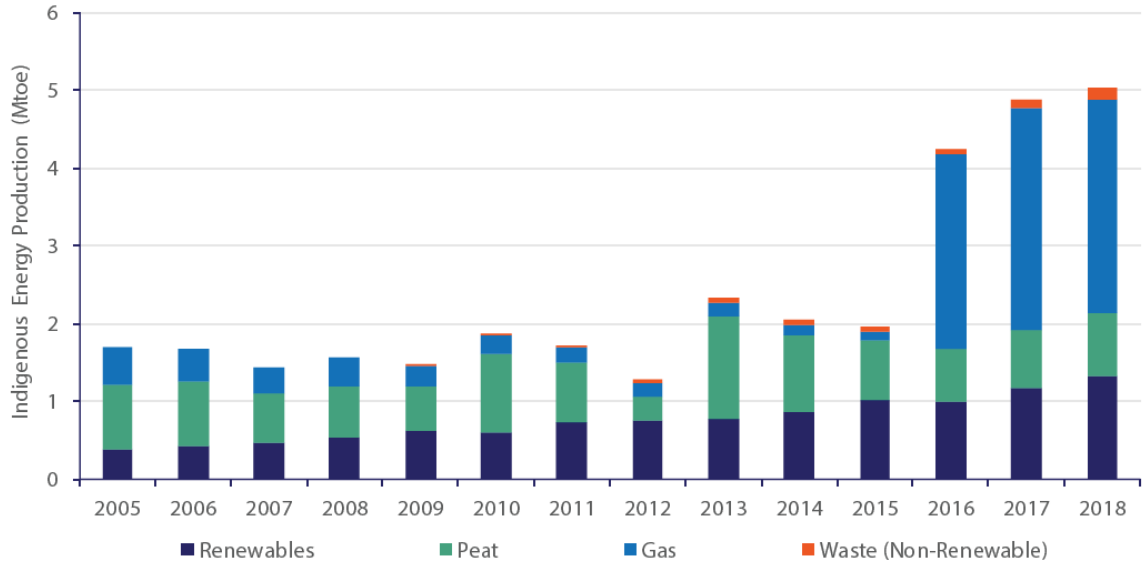


Figure 15: Indigenous Energy Production

Import Dependency

Figure 16 illustrates the trend in import dependency since 1990, comparing it with that for the EU as a whole and shows the dramatic change in Ireland's import dependency in 2016 resulting from the start of natural gas production from the Corrib gas field. Indigenous production accounted for 32% of Ireland's energy requirements in 1990. However, since the mid-1990s import dependency had grown significantly, due to the increase in energy use together with the decline in indigenous natural gas production at Kinsale since 1995 and decreasing peat production. Ireland's overall import dependency reached 90% in 2006. It varied between 85% and 90% until 2016 when it fell to 69%. It fell further, to 66% in 2017, but increased to 67% in 2018. It is estimated that in 2015 the cost of all energy imports to Ireland was approximately €4.6bn, this fell to €3.4bn in 2016 due mainly to reduced gas imports. It has since increased, to €5bn in 2018.

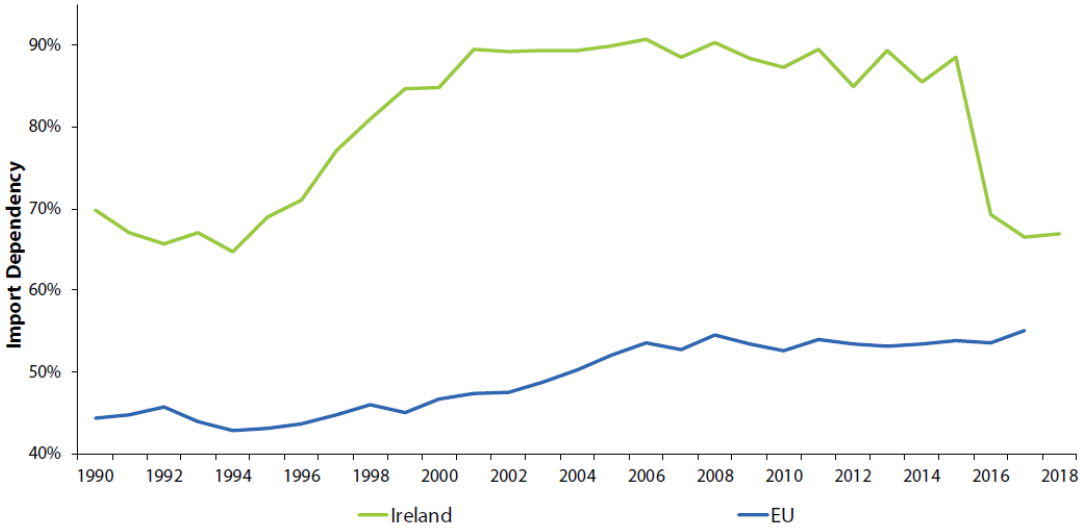


Figure 16: EU and Ireland import dependency

Figure 17 shows the trend for net fuel imports (imports minus exports) over the period 2005 – 2018. The dependence on oil, due largely to energy use in transport, is the most striking feature up until 2008. Between 2008 and 2018 net imports have fallen by 33% with oil imports falling 20%. In 2018 net imports increased by 2.3% but were still 32% below 2005 levels while oil imports were 24% below 2005. In 2018 gas imports increased by 23% to compensate for lower indigenous ouput and the closure of the Inch storage facility.

Coal imports fell by 31% in 2018 because of the reduced operation of Moneypoint electricity generating plant. In 2018, oil, gas and coal accounted for 73%, 17% and 8% of net imports respectively.

Contributions to the increase in import dependency in 2018 were:

- Natural gas imports were up 23% to 1,728 ktoe
- Net oil imports were up 3.6% to 7,382 ktoe

Countering these were:

- Coal imports were down 32% to 830 ktoe
- An 11.4% decrease in renewable energy imports (biomass and biofuels) to 141 ktoe
- Net electricity exports, were down 96% to 2 ktoe

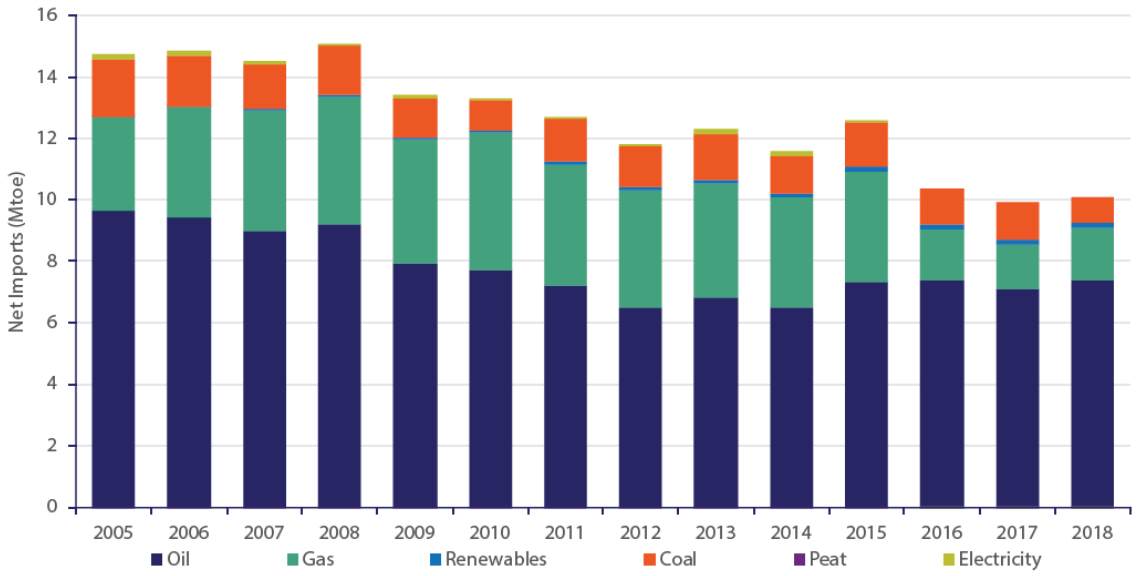


Figure 17: Imported energy by fuel

Relevant Risks – Petroleum Product Availability

Petroleum products will remain part of Ireland's energy mix in the medium term. Ireland, given its import dependency and its geographical position is vulnerable to both domestic supply constraints (for example caused by severe weather) and international oil emergencies (caused by geopolitical or other factors). These risks are mitigated by the State's stockholding of 90 days of petroleum product and by the Oil Emergency Allocation Plan (OEAP), which may be utilised in the event of a prolonged supply constraint.

In the event of a disorderly (no agreement) UK withdrawal from the EU, the British Standards Institute (BSI) is likely to continue to be a member of CEN. As a result, the UK refining industry, due to its domestic use of the relevant aligned BSI standards, is likely to continue to produce product suitable for the Irish market, and for export to the EU as a whole.

ii. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

- Increase in renewable energy in line with scenarios in the final NECP. Potential development of ocean energy technologies, depending on technology developments.
- Further electricity interconnection to France and Britain in line with scenarios in the draft NECP.
- Commercial peat harvesting to end 2028 with generation from peat to end by 2030 and expected well in advance of this.
- 100% oil import dependency unless there is a commercial oil find.
- Corrib gas field – expected lifetime of 15 years to 2030. Declining production from the Corrib gas field as per Table 28 and Figure 18.

Table 28: Ireland's gas production outlook (maximum daily supply)

Maximum Daily Supply Volumes										
GWh/d	**17/18**	**18/19**	**19/20**	**20/21**	**21/22**	**22/23**	**23/24**	**24/25**	**25/26**	**26/27**
Supply										
Corrib	103.8	85.1	80.6	77.9	62.9	51.4	44.5	38.2	34.3	30.0
Inch	10.4	6.9	4.3	0	0	0	0	0	0	0

The anticipated decline in domestic gas production implies Ireland's dependence on imports for gas in the medium term.

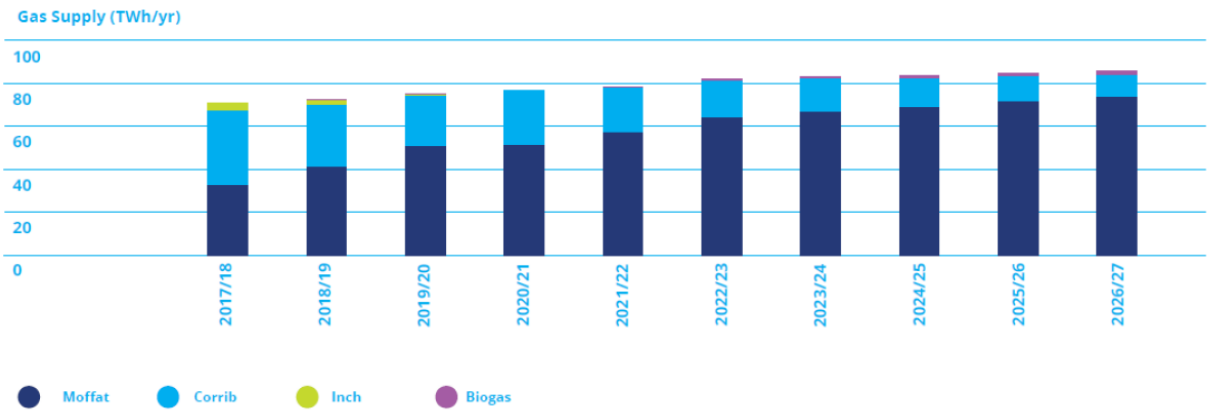


Figure 18: Ireland's gas production outlook (maximum annual supply)

Table 29: Gross inland consumption, domestic energy sources and import (WEM)

Dimension Energy Security	Unit	2018	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
Gross Inland consumption														
Solids	ktoe	1,567	1,892	1,542	1,365	1,413	1,398	1,103	734	719	561	549	536	566
Oil	ktoe	7,248	7,560	7,573	7,574	7,564	7,559	7,545	7,525	7,462	7,353	7,234	7,077	6,757
Natural Gas	ktoe	4,400	4,565	4,787	5,091	4,954	5,024	5,349	5,503	5,512	5,651	5,775	5,739	8,055
Nuclear	ktoe	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricity	ktoe	-2	-90	-71	-146	-137	-193	-288	-264	-269	-284	-335	-311	-539
Renewables	ktoe	1,482	1,985	2,060	2,143	2,290	2,436	2,572	2,701	2,817	2,942	3,066	3,235	4,178
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Domestic Energy Sources														
Solids	ktoe	817	627	623	619	613	606	459	452	446	296	290	285	293
Oil	ktoe	0	0	0	0	0	0	0	0	0	0	0	0	0
Natural Gas	ktoe	2,671	2,445	1,974	1,613	1,199	1,199	1,076	942	746	580	414	247	0
Nuclear	ktoe	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewables	ktoe	1,287	1,781	1,864	1,953	2,254	2,254	2,396	2,534	2,661	2,796	2,931	3,111	4,086
% Import dependency		67%	69%	72%	73%	74%	74%	75%	75%	75%	76%	76%	76%	75%

4.5. Dimension Internal Energy Market

4.5.1. Electricity Interconnectivity

i. Current interconnection level and main interconnectors

- East West Interconnector (EWIC) – Ireland to Great Britain – 500MW
- North South – Ireland to Northern Ireland – 300MW

ii. Projections of interconnector expansion requirements (including for the year 2030)

Table 30: Estimated levels of interconnection (WEM**)**

Electricity interconnectivity	Unit	2018	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
Northern-Ireland and Republic of Ireland	MW	450	450	450	450	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Republic of Ireland and England	MW	500	500	500	500	500	500	500	500	500	500	500	500	500
Republic of Ireland and France	MW	0	0	0	0	0	0	0	0	0	0	0	0	0

4.5.2. Energy Transmission Infrastructure

i. Key characteristics of the existing transmission infrastructure for electricity and gas

Gas Transmission System

Gas Networks Ireland (GNI) operates both the transmission (2,427 km) and distribution networks (11,527 km) in Ireland. The transmission network transports gas from the entry points at Moffat, Inch and Bellanaboy to the distribution networks and connected loads (e.g. gas-fired power generators).

The Moffat entry point connects GNI's network to the National Grid gas network in the United Kingdom and allows for gas imports to Ireland via two subsea interconnectors (IC1 and IC2). The existing interconnectors do not allow Ireland to export gas to the United Kingdom as they are unidirectional. The landfall installations for the interconnectors entering Ireland are located close to Loughshinny for IC1 and Gormanston for IC2 in the East of Ireland. The Inch entry point connects Kinsale and Seven Heads gas fields to the onshore GNI network; the Bellanaboy entry point connects the Corrib gas field to the onshore GNI network. The Northern Ireland gas network connects to GNI's network at Twynholm in Scotland and delivers gas to Northern Ireland via the Scotland Northern Ireland Pipeline (SNIP). The South North Pipeline (SNP) is an onshore gas transmission pipeline from Gormanston to Northern Ireland.

The distribution network currently delivers gas to circa 700,000 customers across Ireland and the network.

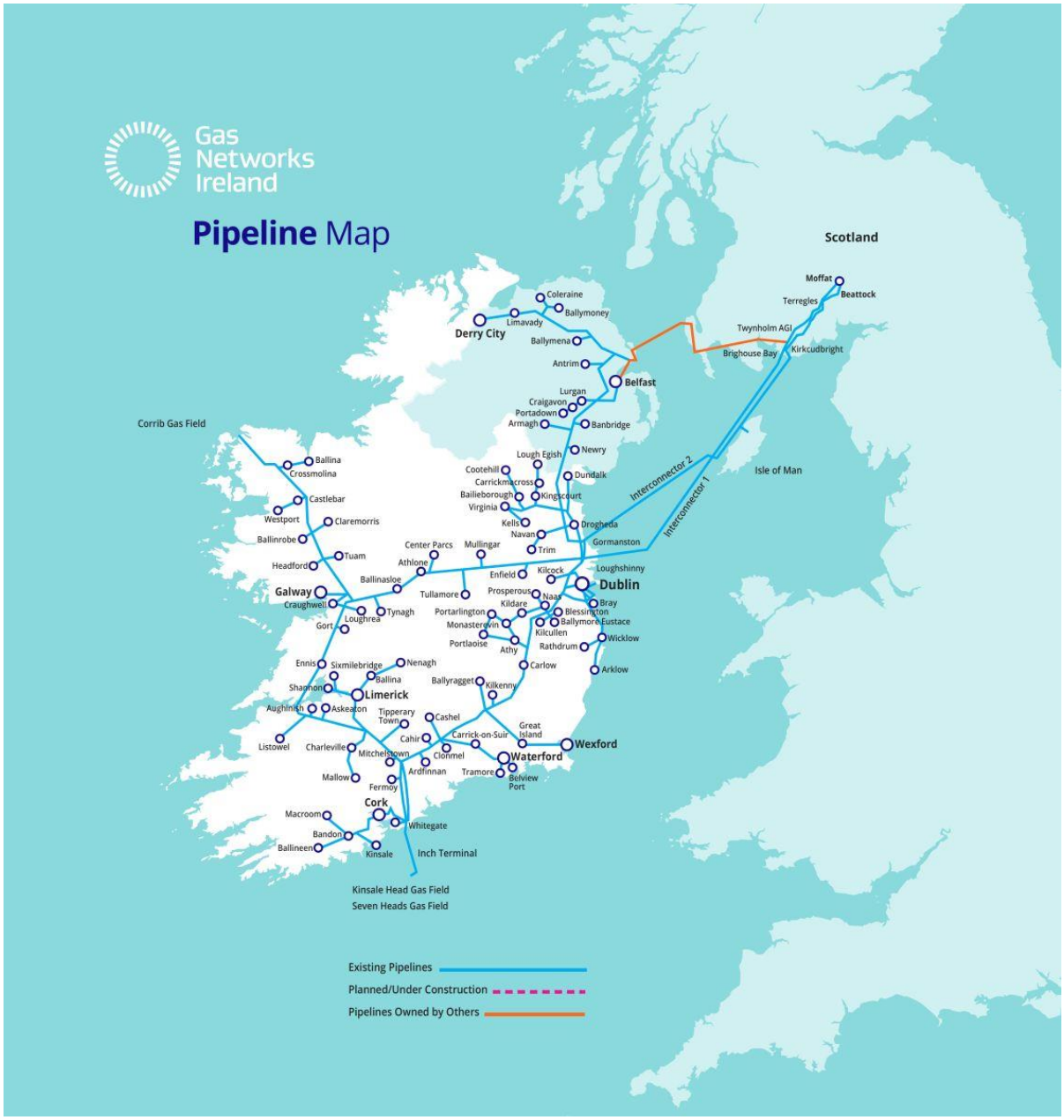


Figure 19: Map of natural gas infrastructure

Table 31: Major gas network infrastructure in Ireland

Infrastructure	Function	Capacity
Moffat Entry Point (Scotland, UK)	Entry point to GNI system serving Ireland via the onshore system in Scotland and sub-sea interconnectors, IC1 & IC2. It also serves Northern Ireland via Twynholm installation and SNIP pipeline. Physically unidirectional.	385 GWh/d
South North CSEP (Ireland)	Exit point to Northern Ireland, supplied from IC2	66.3 GWh/d
Corrib Gas Field (Ireland)	Domestic production facility that began commercial operation in December 2015	60GWh/d

Ireland has no LNG terminal, although there are a number of commercial proposals, one of which was included in the EU's fourth list of PCIs. Future applications by LNG or other infrastructure projects for EU Connecting Europe Facility (CEF) funding will be considered in context of national and EU climate policy objectives.

Electricity Transmission

The transmission system comprises approximately 6,400 kilometres (km) of high voltage (HV) overhead lines and underground cables and over 200 substations. Electricity generated in power plants is transformed to higher voltage levels – 110kV; 220 kV; 275 kV and 400 kV – and fed into the transmission system. The Dublin area is an exception as the 100kV lines and cables and some of the 220/110kV transformer stations belong to the distribution system.

Ireland's geographical location brings challenges in terms of interconnection with neighbouring countries. Ireland is currently exclusively connected to the United Kingdom through two electricity interconnectors: The 300 MW North-South interconnector, linking the electricity systems of Ireland and Northern Ireland, and the 500 MW East-West Interconnector connecting Ireland and Wales (United Kingdom). EirGrid owns and operates both interconnectors. Ireland is currently not meeting the indicative EU electricity interconnection target of at least 10% of installed capacity by 2020; its current level of interconnection is 7.4%. When the UK leaves the EU, Ireland will have no direct electrical interconnection with the rest of the EU until the planned connection of the Celtic interconnector with France in 2026 (as assumed in WAM). Higher RES-E penetration levels,

foreseen as part of the NECP, will necessitate further interconnection which is explored in the WAM scenario.

Figure 20: Map of Ireland's electricity infrastructure

ii. Projections of network expansion requirements at least until 2040 (including for the year 2030)

Gas

There are currently no major plans for gas network expansion in Ireland. Gas Networks Ireland completes a Ten Year Network Development Plan on an annual basis.

Electricity

EirGrid is currently working on two major extensions to the transmission system both related to expected strong demand increase in the greater Dublin area. The West Dublin Project includes the installation of a 220/110kV gas insulation switchgear substation that will connect

to an existing 220kV double circuit line. The project responding to a significant increase in demand associated with the growth of major multinational companies in a business park in western Dublin. This project is scheduled for completion in 2019 and is sized to accommodate potential future demand growth.

The Kilkenny-Laois reinforcement project will address security of supply problems resulting from strongly growing demand and projected further growth. The project comprises a new 400/110 kV substation near Portlaoise which will be connected to the existing 400 kV and 110 kV lines, a new 110kV/38kV substation in Kilkenny and new110kV overhead lines that links with the new substation near Portlaoise. The project is scheduled for completion in 2021.

Table 32: Proposed electricity interconnector projects

Proposed Infrastructure	Capacity (MW)	Countries	Project Promoter	Expected Start Date
Second North-South interconnector	1500	Connecting Ireland and the UK (Northern Ireland)	Eirgrid	2023 (planning permission received)
Greenlink interconnector **(EU project of common interest)**	500	Connecting Ireland and the UK (Wales)	Greenlink	2025
Celtic interconnector **(EU project of common interest)**	700	Connecting Ireland and France	Connecting Ireland and France	2026

Electricity Interconnector Projects

Ireland is pursuing three new projects for interconnectors; a second North-South interconnector, the Greenlink interconnector and the Celtic interconnector. All three projects are on the fourth list of EU Projects of Common Interest (PCI). Only the Celtic interconnector would however, ensure continuous market coupling with the European Union once the United Kingdom has exited the EU.

The existing North-South interconnector is running at full capacity and creates a market bottleneck. The construction of a new 400 kV AC 1500 MW overhead line, the North-South interconnector, is currently planned to improve the security of electricity supply across the

island of Ireland, and improve the capacity and reliability of both grids. The increased capacity will also facilitate the connection of additional renewable capacity to the grid and help reduce curtailment.

The Celtic interconnector is a proposed 700 MW connection between the south coast of Ireland and the north-west coast of France. EirGrid is developing this project in partnership with the French Transmission System Operator, RTE. The length of the Celtic interconnector would be almost 600 km; about three times longer than the existing East-West interconnector. In December 2019 the two TSO's received confirmation of EU funding for the project. When built, following the UK's exit from the EU, this project will be the only direct electricity connection between Ireland and the EU's electricity market. The Greenlink project is a proposed 500 MW interconnector between Ireland and the United Kingdom. The proposed route is running from the Great Island substation, in Ireland, to the Pembroke substation, in Wales. Element Power, a private investor, is promoting the project. The construction is planned to start in 2020 with the interconnector becoming operational in 2023. The CRU has made an initial assessment on the Greenlink project in October 2018 and determined that it is in the public interest. Following the submission of sufficiently detailed financial and technical information from the Greenlink developer, the CRU expects to undertake consultation in 2020 on the proposed regulatory regime to support Greenlink. CRU is also closely liaising with the regulator for gas and electricity markets in Great Britain to explore the potential for a final project assessment process.

EirGrid's all-island generation capacity statement 2019-2028 provides further data on potential demand increases which will have network implications. EirGrid assumes that due to the expected growth in demand from large energy users, the electricity demand in Ireland could grow by up to 52.6% in the next 10 years in a high demand forecast. To be prudent, in the generation capacity statement, there is also a scenario where this growth is much lower, at 27.8% in a low demand forecast.

4.5.3. Electricity and Gas Markets, Energy Prices

i. Current situation of electricity and gas markets, including energy prices

Consistent with the evolution of EU energy policy, the regulation of retail market prices for electricity in Ireland ended in 2011 and for gas in 2014. Price setting is wholly a commercial and operational matter for electricity suppliers with no regulatory approval involved. Accordingly, Government policy on energy costs is focused on the competitive market and the provision of supports for energy efficiency. In this regard, government policy has supported competition to drive down prices, with data from approved price comparison sites (www.bonkers.ie, www.powertoswitch.ie and www.switcher.ie) also consistently

highlighting that consumers can make significant savings by switching energy suppliers in the competitive market.

The thrust of national energy policy on prices has been to create the conditions for competition in electricity and gas markets, on the basis that competition among producers and suppliers will ultimately lead to lower consumer prices. The competitiveness of the Irish electricity retail market is illustrated by pan-EU switching data, which highlight that Ireland has consistently enjoyed amongst the highest regional switching rates. For instance, the most recent Retail Market Monitoring Report published by the Council of European Energy Regulators (CEER) and the Agency for the Cooperation of Energy Regulators (ACER) in December 2018 highlighted that Ireland had the fourth highest external switching rate in the EU during 2017 and third highest rate during 2012-2016. Also regarding market competition, it is important to note the number of new suppliers that have entered the Irish market since the end of price controls and incumbent utility unbundling.

Notwithstanding the above, there are a number of longstanding headwinds that have historically placed, and will likely continue to place, upward pressure on costs and consumer prices relative to many other EU member states. These factors include a lack of natural resources, as well as Ireland's peripheral geographical location, small market size, and dispersed thinly spread population, which have served to place upward pressure on network costs.

The Sustainable Energy Authority of Ireland (SEAI), acting on behalf of EU statistics agency, Eurostat, is responsible for collecting and evaluating statistics on Irish electricity and gas prices, on which it publishes a regular six monthly report, including analysis of recent trends and a comparison between Ireland with EU and Euro Area averages. The most recent SEAI report covered the period January - June 2019.

A number of factors influence energy prices in Ireland. These include, but are not limited to, imported fuel prices, energy infrastructure investment costs, electricity generating fuel mix and non-energy costs that affect energy prices (for example, taxes levied, employment costs, raw material and shipping costs).

Business Electricity

The weighted average price of electricity to business consumers in Ireland has been above both Europe and Euro Area averages since the second half of 2011. In the current semester (January to June 2019) the weighted average price in Ireland increased by 2% and was 7% and 8% above the EU and Euro Area average respectively.

Table 33: Electricity consumption bands for business - January to June 2019

Band	Band Share	Ireland c/kWh	Ireland Relative to:		Ranking* in:		Semester Price Change:		
			EU	Euro Area	EU	Euro Area	Ireland	EU	Euro Area
IA (<0.02)	6.9%	20.5	103%	96%	6	6	-2.7%	5.2%	7.1%
IB (0.02 - 0.5)	26.5%	16.4	110%	105%	5	4	1.6%	6.2%	6.6%
IC (0.5 - 2.0)	13.5%	14.0	113%	109%	5	4	3.8%	7.8%	7.8%
ID (2.0 - 20)	25.5%	11.7	109%	107%	7	6	5.6%	8.7%	8.9%
IE (20 - 70)	6.6%	10.1	113%	115%	5	4	-1.8%	8.3%	8.7%
IF (70 - 150)	5.1%	9.2	110%	115%	7	6	-4.7%	7.0%	5.5%
IG (>150)	15.8%	8.5	119%	133%	3	2	-	0.3%	-1.7%
Weighted Avg.	**-**	**14.0**	**107%**	**108%**	**-**	**-**	**2.0%**	**7.0%**	**7.4%**

***A ranking of 1 means most expensive** **Source:** Eurostat and SEAI

Table 33 summarises the key changes for the electricity consumption bands for business in Ireland for the period January to June 2019 and compares with the changes across the EU and Euro Area.

Since July to December 2018, consumption bands IB to ID experienced increases in the price of electricity to business in Ireland ranging from an increase of 1.6% in band IB to 5.6% in band ID. Price fell in bands IA, IE and IF in Ireland by 2.7%, 1.8% and 4.7% respectively. Price increased in all consumption bands in both the EU and the Euro Area with the exception of band IG in the Euro Area where it fell by 2%.

Ireland's ranking in the EU varied from seventh most expensive for bands ID and IF to fifth most expensive for bands IB, IC and IE.

Business Gas

Since S2 2016, the weighted average price of gas to business consumers in Ireland has been above the EU and Euro Area average until S1 2019 when it dipped below the Euro Area average. In the current semester it decreased by 11.5% and was 2% above the EU average and 4% below Euro Area average.

Table 34: Gas consumption bands for business - January to June 2019

Band	Band Share	Ireland c/kWh	Ireland Relative to:		Ranking in:		Semester Price Change:		
			EU	Euro Area	EU	Euro Area	Ireland	EU	Euro Area
I1 (<0.28}	11.9%	4.8	99%	95%	11	8	-13.5%	-1.4%	-2.0%
I2 (0.28 - 2.8)	19.1%	4.1	100%	95%	10	8	-16.4%	0.2%	0.7%
I3 (2.8 - 28)	20.7%	3.4	104%	101%	7	5	-11.9%	4.8%	5.0%
I4 (28 - 280)	36.8%	2.5	95%	94%	22	12	-11.5%	0.8%	0.4%
I5 (280 - 1,100)	11.6%	1.9	80%	79%	19	10	-29.8%	-5.9%	-6.2%
Weighted Avg.	**-**	**3.4**	**102%**	**96%**	**-**	**-**	**-11.5%**	**1.5%**	**1.2%**

***A ranking of 1 means most expensive** **Source:** Eurostat and SEAI

Table 34 summarises the key changes for the consumption bands in Ireland for the period January to June 2019 and compares with the changes across the Europe and EU Area.

Prices fell in all consumption bands in Ireland, ranging from 11.5% in band I4 to 30% in band I5. Prices increased in all bands in the EU and Euro Area with the exception of bands I1 and I5. Ireland's highest ranking in the EU was seventh most expensive in band I3 and the lowest was in band I4 at 22nd most expensive.

Household Electricity

The weighted price of electricity to household consumers in Ireland was above the EU over the period with the exception of S1 2011. It fluctuated above and below the Euro Area over the period with it being roughly half the semesters both above and below. It was 3% above the EU average and 3% below the Euro Area.

Table 35: Electricity consumption bands for households - January to June 2019

Band	Band Share	Ireland c/kWh	Ireland Relative to:		Ranking in:		Semester Price Change:		
			EU	Euro Area	EU	Euro Area	Ireland	EU	Euro Area
DA (<1.0)	2.7%	36.3	92%	82%	12	9	-6.5%	5.2%	4.6%
DB (1.0 - 2.5)	9.8%	30.0	123%	116%	4	3	-8.3%	1.7%	1.2%
DC (2.5 - 5.0)	34.5%	24.2	113%	107%	4	3	-4.6%	1.6%	1.2%
DD (5.0- 15)	44.5%	20.6	105%	98%	7	6	-4.4%	0.8%	0.8%
DE (>15)	8.4%	17.8	96%	89%	11	9	1.2%	2.2%	2.6%
Weighted Avg.	**-**	**23.0**	**103%**	**97%**	**-**	**-**	**-5.7%**	**1.8%**	**1.6%**

***A ranking of 1 means most expensive** **Source:** Eurostat and SEAI

Table 35 summarises the key changes for the electricity consumption bands for households in Ireland for the period January to June 2019 and compares with the changes across the EU and EU Area.

The price fell in all bands in Ireland, except for band DE, ranging from 4.4% in band DD to 8.3% in band DB. Price increased by 1.2% in band DE in Ireland in the semester January to June 2019. Price increased in all bands in Europe and the Euro Area. Ireland was 13% and 5% above the EU average in DC and DD respectively and was fourth and seventh most expensive respectively in the EU in these bands.

Household Gas

The weighted price of gas to household consumers in Ireland was below the Euro Area average over the whole period and below the EU average between S1 2010 and S1 2013. It was 5% above the EU average and 7% below the Euro Area average.

Table 36: Gas consumption bands for households - January to June 2019

Band	Band Share	Ireland c/kWh	Ireland Relative to:		Ranking in:		Semester Price Change:		
			EU	Euro Area	EU	Euro Area	Ireland	EU	Euro Area
D1 (<5.6)	7.3%	7.3	77%	67%	15	10	-22.3%	-11.4%	-12.3%
D2 (5.6 - 56)	86.3%	6.8	108%	96%	8	6	-10.2%	-5.7%	-6.6%
D3 (>56)	6.4%	6.3	109%	96%	5	3	-5.2%	-0.5%	1.1%
Weighted Avg.	**-**	**6.8**	**105%**	**93%**	**-**	**-**	**-11.2%**	**-5.9%**	**-6.7%**

*A ranking of 1 means most expensive

Source: Eurostat and SEAI

Table 36 summarises the key changes for the consumption bands in Ireland for the period January to June 2019 and compares with the changes across the EU and EU Area.

In the main gas band, D2, the price fell in Ireland at a higher rate than the EU and the Euro Area. Price decreased by 10.2% in Ireland compared with falls of 5.7% and 6.6% in the EU and the Euro Area respectively. Ireland's ranking 8th most expensive in the EU and was 8% above the EU average and 4% below the Euro Area in band D2.

Table 37: Key electricity and gas price data

Business Electricity Prices - 1st Semester 2019					
Business Electricity Prices (ex VAT) Weighted Average Across All Suppliers	**c/kWh S1 2019**	**Change Since S2 2018**	**Change in 12 Months**	**Ranking EU (30)**	**Band Share of Market**
Band IA Consumption < 20 MWh	20.5	-2.7%	1.3%	6	6.9%
Band IB 20 MWh < Consumption < 500 MWh	16.4	1.6%	4.5%	5	26.5%
Band IC 500 MWh < Consumption < 2,000 MWh	14.0	3.8%	6.0%	5	13.5%
Band ID 2,000 MWh < Consumption < 20,000 MWh	11.7	5.6%	8.2%	7	25.5%
Band IE 20,000 MWh < Consumption < 70,000 MWh	10.1	-1.8%	0.3%	5	6.6%
Band IF 70,000 MWh < Consumption < 150,000 MWh	9.2	-4.7%	0.5%	7	5.1%
Band IG > 150,000 MWh	8.5	-	-	3	15.8%
Weighted Average	**14.0**	**-2.0%**	**4.4%**	**-**	**-**

Business Gas Prices - 1st Semester 2019					
Business Gas Prices (ex VAT) Weighted Average Across All Suppliers	**c/kWh S1 2019**	**Change Since S2 2018**	**Change in 12 Months**	**Ranking EU (27)**	**Band Share of Market**
Band I1 Consumption < 1,000 GJ	4.8	-13.5%	8.8%	11	11.9%
Band I2 1,000 GJ < Consumption < 10,000 GJ	4.1	-16.4%	7.1%	10	19.1%
Band I3 10,000 GJ < Consumption < 100,000 GJ	3.4	-11.9%	0.0%	7	20.7%
Band I4 100,000 GJ < Consumption < 1,000,000 GJ	2.5	-11 .5%	-5.2%	22	36.8%
Band I5 1,000,000 GJ < Consumption < 4,000,000 GJ	1.9	-29.8%	-	19	11.6%
Weighted Average	**3.4**	**-11.5**	**0.3%**	**11**	**-**

Residential Electricity Prices - 1st Semester 2019					
Household Electricity Prices (All Taxes Included) Weighted Average Across All Suppliers	**c/kWh S1 2019**	**Change Since S2 2018**	**Change in 12 Months**	**Ranking EU (30)**	**Band Share of Market**
Band DA Consumption < 1,000 kWh	36.3	-6.5%	-5.4%	12	2.7%
Band DB 1,000 kWh < Consumption < 2,500 kWh	30.0	-8.3%	-2.0%	4	9.8%
Band DC 2,500 kWh < Consumption < 5,000 kWh	24.2	-4.6%	2.3%	4	34.5%
Band DD 5,000 kWh < Consumption < 15,000 kWh	20.6	-4.4%	5.3%	7	44.5%
Band DE Consumption > 15,000 kWh	17.8	1.2%	9.9%	11	8.4%
Weighted Average	**23.0**	**-5.7%**	**5.2%**	**-**	**-**

Residential Electricity Prices (Purchasing Power Parities) - 1st Semester 2019					
Household Electricity Prices (All Taxes Included) Weighted Average Across All Suppliers	**c/kWh S1 2019**	**Change Since S2 2018**	**Change in 12 Months**	**Ranking EU (30)**	**Band Share of Market**
Band DA Consumption < 1,000 kWh	32.1	-7.7%	-6.7%	15	2.7%
Band DB 1,000 kWh < Consumption < 2,500 kWh	26.5	-9.5%	-3.3%	8	9.8%
Band DC 2,500 kWh < Consumption< 5,000 kWh	21.4	-5.8%	0.9%	14	34.5%
Band DD 5,000 kWh < Consumption < 15,000 kWh	18.2	-5.7%	3.9%	18	44.5%
Band DE Consumption > 15,000 kWh	15.7	-0.1%	8.4%	21	8.4%

Residential Gas Prices - 1st Semester 2019					
Household Gas Prices (All Taxes Included) Weighted Average Across All Suppliers	**c/kWh S1 2019**	**Change Since S2 2018**	**Change in 12 Months**	**Ranking EU (30)**	**Band Share of Market**
Band D1 Consumption < 20 GJ	7.3	-22.3%	5.3%	15	7.3%
Band D2 20 GJ < Consumption< 200 GJ	6.8	-10.2%	8.1%	8	86.3%
Band D3 Consumption > 200 GJ	6.3	-5.2%	5.0%	5	6.4%
Weighted Average	**6.8**	**-11.2%**	**7.5%**	**-**	**-**

Residential Gas Prices - 1st Semester 2019					
Household Gas Prices (All Taxes Included) Weighted Average Across All Suppliers	**c/kWh S1 2019**	**Change Since S2 2018**	**Change in 12 Months**	**Ranking EU (30)**	**Band Share of Market**
Band D1 Consumption < 20 GJ	6.5	-23.4%	3.9%	22	7.3%
Band D2 20 GJ < Consumption < 200 GJ	6.0	-11.5%	6.7%	17	86.3%
Band D3 Consumption > 200 GJ	5.6	-6.5%	3.5%	16	6.4%
Source: Eurostat					

Bands mentioned in Table 37 refer to consumption bands defined in the Transparency of Gas and Electricity Prices Regulation.

Regarding price developments in the Irish energy retail markets, the CRU publishes regular quarterly and annual market monitoring reports, which include analysis of recent and long-term price trends. The latest CRU Market Monitoring annual report is for 2018.

In addition to the aforementioned SEAI and CRU publications covering prices in the Irish energy retail markets, the SEMC Market Monitoring Unit publishes a quarterly report analysing, inter alia, price trends within the all-island wholesale market. The latest such report covering the period July-September 2019 can be located on the SEMC website.

ii. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

Design of energy wholesale and retail markets will continue to evolve in line with EU and national policy objectives to facilitate increased levels of energy system decarbonisation, consistent with security of supply and price competitiveness.

4.6. Dimension Research, Innovation and Competitiveness

i. Current situation of the low-carbon-technologies sector and, to the extent possible, its position on the global market (that analysis is to be carried out at Union or global level)

The SEAI Low Carbon Technologies team provides energy/low carbon technology sector market support and technology-related policy support to DCCAE. It covers areas such as wind & electricity, heat & bioenergy, solar, ocean and smart grids. The group develops technology roadmaps (informed by SEAI modelling), promotes the growth of relevant supply chains, represents Ireland in technology fora, develops guidance relevant to technology sub-sectors for suppliers, installers, manufacturers and consumers, and supports critical supply chain development, often in collaboration with partner state agencies such as the Industrial Development Authority of Ireland (IDA Ireland) and Enterprise Ireland.

SEAI, in partnership with Irish enterprise state agencies the Industrial Development Authority of Ireland (IDA Ireland) and Enterprise Ireland performed an analysis of Ireland's Energy Supply Chain Opportunity in 2014. The analysis estimated that the total average annual investment required in sustainable energy technologies and services in Ireland up to 2020 in Ireland would be between €2.2bn and €2.9bn. Between €1bn and €1.2bn of total annual expenditure was expected to be in the energy efficiency construction sector, €865m to €1.2bn in renewable energy technologies and €335m to €420m in development of the electricity grid infrastructure. The analysis found that over 70% of the total anticipated expenditure in the energy supply chain up to 2020 was estimated to be within areas of the supply chain where Irish organisations are very well positioned or well positioned to capture investment in goods and services markets. The existing Irish supply chains in these areas did not foresee any significant barriers to expanding their business as the market grows. However, the report found that some support may be needed to help them maintain competitive advantage; for example, continued RD&D supports, financial supports, investment in training, and support for export market development.

SEAI conducted a technology mapping exercise in 2019, mapping the current position of energy/low carbon technologies against a selected number of EU comparator countries. The following countries were chosen for the comparison: Austria, Belgium, Czech Republic, Denmark, Finland, Netherlands, Portugal, Slovakia and United Kingdom. The rationale for choosing these comparator countries was as follows:

- 8 potential comparator countries selected for indicator collection after excluding countries with the following characteristics:
    - <=20% or >=500% the size of Ireland in terms of population, area, and GDP
    - Forecast % increase in Renewables between 2017 and 2030 <=5%
    - GDP per capita <=15,000 Euros in 2017
- The UK was included as an additional comparator country as it is Ireland's nearest neighbouring country and has a similar legislative landscape

At EU level, Ireland is ranked 20th by population numbers but second on a GDP per population basis, signalling that Ireland's economy focuses on high valued goods and services. However, from an environmental and energy analysis Ireland is ranked 26th in the EU for emissions per capita and 15th for renewables penetration. Four of the eight comparator countries reduced their GHG emissions below the 2017 interim target, whilst four did not. Three of these countries need to make the largest % reduction in GHG emissions by 2030. Table 38 shows the percentage renewable energy achieved by each country by 2017

and calculated by the Effort Sharing Regulation Formula for 2030. It also shows the greenhouse gas reductions targeted and achieved by 2017 and targeted in 2030.

Table 38: Country Comparison of RES and GHG

Member State	Percentage Renewable Energy		Percentage GHG Emissions Reduction		
	%RE in 2017* (Achieved)	%RE in 2030 (ESR Formula)	%GHG Emission in 2017 (Interim Target)	%GHG Emission in 2017 (Achieved)	%GHG Emission Target in 2030 (ESR)
Austria	32.6	46	-13	-10	-36
Belgium	9.1	25	-10	-10	-35
Czech Rep	14.8	23	-6	-4	-14
Denmark	35.8	46	-19	-13	-39
Finland	41	51	-11	-9	-39
Ireland	10.7	31	-13	-6	-30
Netherlands	6.6	26	-11	-21	-36
Portugal	28.1	42	-1	-14	-17
Slovakia	11.5	24	-9	-14	-12
United Kingdom	10.2	27	-14	-21	-37

According to the European Innovation scorecard, measures, on a yearly basis, the innovation performance of Member States, drawing on statistics from a variety of sources, Ireland is considered a strong innovator, above the EU average index and ranked 10th. Relative to other comparator countries, Ireland is ranked 7th out of the 10 selected comparator countries. Table 39 summarises average innovation performance of each comparator country using a composite indicator called the summary innovation index. Summary Innovation Index, which is a composite indicator obtained by taking an unweighted average of the 27 indicators.

Ireland is the strongest in Impacts Area which looks at employment impacts and sales impacts of innovation. Impacts captures the effects of firms' innovation activities. Employment impacts measures the impact on employment and includes two indicators measuring employment in knowledge-intensive activities and employment in fast-growing firms in innovative sectors. *Sales impacts* measures the economic impact of innovation and includes three indicators measuring exports of medium and high-tech products, exports of knowledge-intensive services and sales due to innovation activities.

Ireland's ranking mid-range in the Framework Conditions section which is comprised of three indicators. The Human resources dimension includes three indicators and measures the availability of a high-skilled and educated workforce. Attractive research systems includes three indicators and measures the international competitiveness of the research base by focusing on international scientific co-publications, most cited publications, and foreign doctorate students. Innovation-friendly environment captures the environment in which enterprises operate and includes two indicators, Broadband penetration among enterprises and Opportunity-driven entrepreneurship, measuring the degree to which individuals pursue entrepreneurial activities as they see new opportunities. Ireland has the highest level of completed third-level education in the EU. Whilst the data indicate that the ratio of doctorate graduates to third-level graduates is somewhat lower, it is still relatively high in the EU context and when compared to the selected comparator countries. Ireland has a highly-skilled and educated workforce, complementing the focus on high-value products and service seen above in the impact area.

Investments captures investments made in both the public and business sector and differentiates between two innovation dimensions: Finance and support includes two indicators and measures the availability of finance for innovation projects by venture capital expenditures, and the support of governments for research and innovation activities by R&D expenditures in universities and government research organisations. Firm investments includes three indicators of both R&D and Non-R&D investments that firms make to generate innovations and the efforts enterprises make to upgrade the ICT skills of their personnel. Ireland scored below the EU average on this and is ranked 6th amongst the comparator countries, signifying a below average level of investment in RD&D.

Innovation activities captures different aspects of innovation in the business sector and differentiates between three dimensions: *Innovators* includes three indicators measuring the share of firms that have introduced innovations onto the market or within their organisations, covering both product and process innovators, marketing and organisational innovators, and SMEs that innovate in-house. *Linkages* includes three indicators measuring innovation capabilities by looking at collaboration efforts between innovating firms, research collaboration between the private and public sector, and the extent to which the private sector finances public R&D activities. *Intellectual assets* captures different forms of Intellectual Property Rights (IPR) generated in the innovation process, including PCT patent applications, Trademark applications and Design applications. Ireland scored relatively high for innovators but low for, linkages and intellectual assets, again reinforcing the point of having a high-skilled, highly educated workforce that do not go on to pursue research activities, but innovate out in the field and supply chains.

Table 39 provides a composite indicator (comparison index from 0 to 1) for each of the comparator countries. The colour indexing indicates the lowest performing (red) to the highest performing (green) across each indicator.

Table 39: European Innovation Scorecard (2019)

	EU	AT	BE	CZ	DK	FI	IE	NL	PT	SK	UK
Summary Innovation Index	0.52	0.60	0.62	0.43	0.68	0.70	0.57	0.65	0.47	0.33	0.62
Human resources	0.46	0.54	0.49	0.35	0.84	0.73	0.61	0.66	0.37	0.33	0.69
Research systems	0.47	0.62	0.71	0.31	0.87	0.64	0.62	0.80	0.49	0.20	0.74
Innovation-friendly environment	0.55	0.43	0.58	0.41	1.00	1.00	0.54	0.91	0.71	0.32	0.54
Finance and support	0.62	0.53	0.68	0.29	0.67	0.71	0.45	0.74	0.47	0.15	0.64
Firm investments	0.55	0.64	0.66	0.52	0.57	0.71	0.47	0.39	0.45	0.37	0.53
Innovators	0.53	0.80	0.79	0.52	0.51	0.90	0.70	0.67	0.91	0.22	0.55
Linkages	0.47	0.78	0.74	0.40	0.65	0.71	0.37	0.68	0.26	0.27	0.60
Intellectual assets	0.42	0.61	0.38	0.27	0.69	0.64	0.22	0.52	0.31	0.17	0.34
Employment impacts	0.56	0.37	0.43	0.67	0.57	0.45	0.94	0.64	0.44	0.61	0.83
Sales impacts	0.66	0.55	0.66	0.61	0.49	0.56	0.84	0.61	0.36	0.73	0.75

The analytical approach used to benchmark the position of low carbon technologies in Ireland, in the context of the selected comparator countries was to evaluate and map the

low-carbon technology focus areas within the Research, Innovation & Competitiveness dimension of the 2019 NECP of each of the comparator countries and benchmark this against Ireland's NECP. This analysis evaluated the following areas: renewable energy technologies, energy efficiency technologies, sustainable transport technologies and energy infrastructure focus areas of the NECPs, SETPlan, IEA Technology Collaboration Programmes and Mission innovation participation.

The individually analysed technologies are shown in Table 40 using a traffic light system. High (Green) indicating either full or comprehensive focus on the technology areas across the four-research programme/policy areas (NECP, SETPlan, IEA TCP or Mission Innovation). Medium (orange) indicating participation or focus in a number of those programme/polices, low (red) indicating a limited focus. It is important to note that this analysis was carried out based on the best available data and therefore it is highly likely that in a number of cases, countries will have a Research, Innovation or Competitiveness focus on technology areas which was not apparent as part of this analysis.

Table 40: Individual technology coverage

Technology Area	Technologies	AT	BE	CZ	DK	FI	IE	NL	PT	SK	UK
Renewable Energy	Solar PV	High	Med	Low	High	Med	Low	High	High	Low	Low
	Wind (Offshore/Onshore)	Med	Med	Low	High	Low	Med	High	High	Low	High
	Solid Biomass	High	Med	Low	Med	High	Med	High	Low	Med	High
Energy Efficiency	Industrial	High	Med	Low	Med	Med	High	High	High	Low	Med
	Buildings	High	High	Low	High	High	Med	High	Low	Low	Med
Sustainable Transport	Electric Vehicles	High	High	Low	Med	Med	High	High	Med	Low	Med
	Renewable Fuels	High	Med	Med	Med	High	Low	Med	Low	Low	Med
	Batteries	High	High	Med	Low	Low	Low	Low	Low	Low	Med
Infrastructure	Smart Grid	High	Med	Low	High	High	Med	High	Low	Low	High
	Smart Cities & Communities	Med	High	Low	Med	Med	Med	Med	Low	Low	High
	Energy Storage (Large Scale)	High	High	Low	Med	Med	Low	Med	Low	Low	High
	Hydrogen Technologies	High	High	Med	Med	Med	Med	High	Low	High	High
	CCS/CCU	Low	Low	Low	Low	Med	Low	Med	Low	Low	High
	Energy Security	High	High	Low	Low	High	Low	Low	Low	Low	Low

	Overall Country RD&D coverage	High	High	Low	Med	Med	Med	High	Low	Low	High

This analysis was used in order to rank the comparator countries based on the extent to which the collective group low-carbon technologies analysed form a specific part of 2019 NECP's RIC dimension.

Table 41: Comparator Country Research coverage

Country	Ranking
Austria	1
United Kingdom	2
Belgium	3
Netherlands	4
Finland	5
Denmark	6
Ireland	7
Portugal	8
Czech Republic	9
Slovakia	10

ii. Current level of public and, where available, private research and innovation spending on low-carbon-technologies, current number of patents, and current number of researchers

A key metric for the assessment of innovative activity is R&D intensity (R&D expenditure as a percentage of GNP) which reflects the extent of research and innovation activities undertaken in a country in terms of resources input. Ireland's intensity rate in 2016 was 1.84% of GNI. The *Europe 2020* strategy (a 10-year strategy developed by the European Commission in 2010) sets a 3% objective for R&D intensity. The Irish Government has adopted an R&D intensity target for Ireland of 2.5% of GNP to be achieved by 2020.

A three-year average (2016 to 2018), equal to approximately €20M reflects Ireland's approximate level of annual public investment in energy RD&D. There is a shared vision of continuing to develop the Irish energy research, development & demonstration community to one which is considered to be world class.

Ireland has one of the lowest levels of general R&D expenditure relative to selected comparator countries on the basis of public expenditure on R&D as a percentage of GDP as shown in the Table 42. The table also shows the level of R&D expenditure by which countries are targeting by 2020. It shows the target set by Ireland (2%) is below the level set by most of the selected comparator countries.

Table 42: Overall and LCT R&D investment

Member State	All R&D Expenditure as % GDP	
	2017	2020 Target
Austria	3.2	3.8
Denmark	3.1	3
Finland	2.8	4
Belgium	2.6	3
Netherlands	2	2.5
Czech Rep	1.8	1
United Kingdom	1.7	2.4 by 2027
Portugal	1.3	2.7
Ireland	1.1	2
Slovakia	0.9	1.2
EU-28	2.1	3

Table 43 shows the level of investment in energy RD&D by each of the comparator countries in 2017, and the ratio of energy RD&D investment per thousand units of GDP. This shows that Ireland ranks 8th out of the 10 comparator countries on the basis of the ratio of energy RD&D investment per thousand units of GDP.

Table 43: Ranked countries by Energy RD&D per GDP

Member State	Energy RD&D Investment in 2017 (millions €)	Ratio of Energy RD&D Investment per thousand units GDP in 2017	Ranking (selected countries)
Finland	186.34	0.816	1
Austria	141.56	0.377	2
Belgium	161.93	0.365	3

United Kingdom	752.66	0.319	4
Denmark	85.5	0.291	5
Netherlands	153.99	0.204	6
Czech Rep	21.20*	0.11	7
Ireland	20.01	0.067	8
Portugal	8.36**	0.044	9
Slovakia	2.1	0.024	10

***Data from 2016 (2017 unavailable)**

****Data from 2015 (2016 and 2017 unavailable)**

State aid for environmental protection per GDP unit basis is an indicator of the amount of support provided to the uptake of environmental protection. For example, the support scheme for renewable heat (SSRH) funded by DCCAE and administered by SEAI and other similar schemes provide market support activation to assist the deployment of technologies within a particular sector. The table below shows that Ireland ranks 7th out of the 10 selected comparator countries for State Aid for environmental protection as a proportion of GDP.

Table 44: State aid per GDP ranking

Member State	State Aid for Environmental Protection (including Energy Saving) in 2017 (millions €)	State Aid for Environmental Protection (millions €) per thousand units GDP
Denmark	2,957.50	10.1
Czech Rep	1,752.00	9.14
Finland	1,310.00	5.8
Austria	1,337.60	3.61
United Kingdom	3,910.40	1.67
Netherlands	1145.9	1.55
Ireland	324.2	1.09
Slovakia	65.3	0.77
Belgium	93.1	0.21
Portugal	0.1	0

The number of patents registered within a country one measure of the research and innovation activity. Whilst Ireland's is ranked 20th in the EU in terms of population size, it

ranks 13th in terms of the number of patents registered across all domain areas and 16th for climate mitigation related patents. An analysis of Ireland's Revealed Technology Advantage (RTA) (ratio of patents in climate change mitigation technologies to all patents in environmental technology) indicates that Ireland's RTA is low in EU terms. However, detailed analysis of revealed technology advantage indicates that Ireland is in the top 5 EU countries that have generated patents between 2000-2016 in a small number of technology areas – e.g. marine/ocean energy.

Table 45: Ranked Patent Analysis filed 2000-2016 in climate change mitigation

Member State	Climate Mitigation Patents	EU Ranking by number of Patents	Revealed Technology Advantage (RTA)	EU Ranking by RTA
Denmark	5,140	8	2	1
Portugal	528	18	1.42	4
Slovakia	332	19	1.39	5
Belgium	4,275	9	1.15	14
Czech Rep	1,078	13	1.14	15
Finland	3,386	10	1.03	18
United Kingdom	15,467	3	0.97	20
Austria	2,559	12	0.89	24
Netherlands	5,982	6	0.88	25
Ireland	679	16	0.68	27
EU-28	158,518		1.08	

Combining the analysis of both the research technology mapping and the RD&D investment, patent analysis and state aid, reveals the following ranking for each of those indicators. The higher the ranking (i.e. the lower the number in the Table below), the more advantageous their position in RIC development, with 1 being the most advantageous.

Table 46: Overall RIC ranking

Countries	Research Coverage	Energy RD&D investment	Revealed Technology Advantage	State Aid	Median Score	Overall Ranking
Austria	1	2	8	4	3	1
Denmark	6	5	1	1	3	1
Belgium	3	3	4	9	3.5	3
Finland	5	1	6	3	4	4
United Kingdom	2	4	7	5	4.5	5
Czech Republic	9	7	5	2	6	6
Netherlands	4	6	9	6	6	6
Ireland	7	8	10	7	7.5	8
Portugal	8	9	2	10	8.5	9
Slovakia	10	10	3	8	9	10

iii. Breakdown of current price elements that make up the main three price components (energy, network, taxes/levies)

The tables below provide details on the electricity and gas price components for household and non-household consumers for 2018 based on data from the Eurostat databank. Price components are broken down into those associated with energy & supply; network costs; taxes, fees, levies & charges; value added tax; renewable taxes; capacity taxes; environmental taxes; nuclear taxes and other costs. In the second semester of 2018 household electricity prices in Ireland increased by 12%, while household gas prices increased by 21%.

Electricity Price to Business

Table 47 shows the disaggregation of electricity prices to business (non-household) weighted across all consumption bands for 2018.

- The energy and supply component in Ireland was 7.95 c/kWh or 57% of the total price. This was the third highest in Europe after Malta and Cyprus
- Network costs accounted for 31% of the price or 4.33 c/kWh in absolute terms. This was the highest in Europe
- Renewable energy taxes accounted for 6.9% of the price or 0.96 c/kWh. This was the 13th highest in Europe

- Environment taxes accounted for 0.4% of the electricity price to business in Ireland and ranked 16th highest in Europe

Table 47: Electricity price breakdown to business in Ireland in 2018 (c/kWh)

Energy & Supply	Network Costs	Renewable Taxes	Capacity Charges	Environment Taxes	Other
7.95	4.33	0.96	0.33	0.05	0.25

Electricity Price to Households

Table 48 shows the disaggregation of electricity prices to household weighted across all consumption bands for 2018.

- The energy and supply component in Ireland was 10.9 c/kWh or 47% of the total price. This was the 4th highest in Europe
- Network costs accounted for 32% of the price or 7.34 c/kWh in absolute terms. This was the 3rd highest in Europe
- Value added tax (VAT) accounted for 11.8% of the price or 2.73 c/kWh. This was the 11th highest in Europe
- Renewable supports taxes accounted for 5.6% of the electricity price to households in Ireland and ranked 13th highest in Europe

Table 48: Electricity price breakdown to households in Ireland in 2018 (c/kWh)

Energy & Supply	Network Costs	Value-added Tax	Renewable Taxes	Capacity Charges	Other
10.90	7.34	2.73	1.31	0.52	0.25

Gas Price to Business

Table 49 shows the disaggregation of gas prices to business (non-household) weighted across all consumption bands for 2018.

- The energy and supply component in Ireland was 2.12c/kWh or 60% of the total price. This was the 18th highest in Europe
- Network costs accounted for 31% of the price or 1.09 c/kWh in absolute terms. This was the highest in Europe

- Environment taxes accounted for 8.5% of the electricity price to business in Ireland and ranked 8th highest in Europe

Table 49: Gas price breakdown to business in Ireland in 2018 (c/kWh)

Energy & Supply	Network Costs	Capacity Charges	Environment Taxes	Other
2.12	1.09	0	0.30	0

Gas Price to Households

Table 50 shows the disaggregation of gas prices to household weighted across all consumption bands for 2018.

- The energy and supply component in Ireland was 3.04 c/kWh or 44% of the total price. This was the 7th highest in Europe
- Network costs accounted for 10% of the price or 2.77c/kWh in absolute terms. This was the third highest in Europe
- Value added tax accounted for 10.4% of the price or 0.72 c/kWh. This was ranked 16th in Europe
- Environment taxes accounted for 5.4% of the gas price to households in Ireland and ranked 8th highest in Europe

Table 50: Gas price breakdown to households in Ireland in 2018 (c/kWh)

Energy & Supply	Network Costs	Value-Added Tax	Renewable Taxes	Capacity Charges	Environment Taxes	Other
3.04	2.77	0.72	0	0	0.37	0

iv. Description of energy subsidies, including for fossil fuels

The Public Service Obligation (PSO) levy has been in place since 2001. It is the overall support mechanism for peat generation, for certain conventional generation constructed for security of supply purposes, and for the development of renewable electricity. The levy compensates electricity suppliers for the additional costs they incur by purchasing electricity generated by these producers.

This levy is vital to enable Ireland to meet its 40% target for electricity generated from renewable sources by 2020. This is important for Ireland's 16% EU 2020 target for renewable energy.

The Commission for Regulation of Utilities (CRU) determines the PSO levy which is a charge on all electricity customers without exception. Regulations made under the Electricity Regulation Act 1999 (as amended) provide the legal basis for the levy. The levy applies to all electricity customers and is reviewed annually. It should be noted that PSO levy supports for peat generation ceased at the end of 2019.

As part of the Climate Action Plan, it is planned to carry out an assessment of the impact of the current structure of electricity bill charges, including PSO charges on consumers, in 2020.

Ireland’s proposed new Renewable Electricity Support Scheme (RESS**)** will provide support to renewable electricity projects in Ireland. With a primary focus on cost effectiveness, the RESS will deliver a broader range of policy objectives, including:

- An Enabling Framework for Community Participation through the provision of pathways and supports for communities to participate in renewable energy projects
- Increasing Technology Diversity by broadening the renewable electricity technology mix (the diversity of technologies)
- Delivering an ambitious renewable electricity policy to 2030
- Increasing energy security, energy sustainability and ensuring the cost effectiveness of energy policy

RESS auctions will be held at frequent intervals throughout the lifetime of the scheme. This will allow Ireland to take advantage of falling technology costs and by not auctioning all the required capacity at once; Ireland will not be 'locking in' higher costs for consumers for the entirety of the scheme.

The Scheme will provide for a renewable electricity (RES-E) ambition of up to a maximum of 55% by 2030 subject to determining the cost-effective level. RESS auctions will be designed in line with trajectory targets identified in Ireland's NECP. In addition, the first RESS auction will deliver 'shovel ready' projects, reducing the gap to 2020 targets and assisting in the early delivery for Ireland’s trajectory towards 2030 targets. Applications for the first RESS auction qualification will be accepted in March 2020, with the auction bidding process to commence in Summer 2020.

Ireland's recently launched Support Scheme for Renewable Heat (SSRH) is a government funded initiative designed to increase the energy generated from renewable sources in the heat sector. The scheme is open to commercial, industrial, agricultural, district heating, public sector and other non-domestic heat users.

The primary objective of the support scheme for renewable heat is to increase the level of renewable energy in the heat sector. This will contribute to meeting Ireland's 2020 renewable energy targets whilst also reducing greenhouse gas emissions. The government funded scheme will support the adoption of renewable heating systems by commercial, industrial, agricultural, district heating, public sector and other non-domestic heat users not covered by the emissions trading system. The scheme aims to bridge the gap between the installation and operating costs of renewable heating systems and the conventional fossil fuel alternatives; and incentivise the development and supply of renewable heat.

The scheme opened for applications relating to installation grants for air source heat pumps, ground source heat pumps and water source heat pumps in September 2018. The operational support component of the scheme opened in June 2019, including support for biomass boiler/biomass HE CHP heating systems and biogas (anaerobic digestion).

Ireland's Central Statistics Office (CSO) published a statistical release on 'Details of Environmental Subsidies and Similar Transfers' in Ireland in May 2019. The statistical release indicates that in 2017, €895 million was paid in environmental subsidies and similar transfers to Irish corporations, households and public bodies, as well as to international environmental organisations under Irish government commitments. This was 31% higher than the amount paid in 2016 but 25% lower than the €1.2bn provided in 2008.

Environmental protection activities were subsidised to a value of €524m, or 59% of the total, while €371m, or 41%, was used to support resource management activities. In 2016, 31% of environmental transfers went to renewable energy production, 26% to wastewater management, 23% to biodiversity protection and 9% to heat and energy saving measures. Other activities, such as waste management and protection of air and climate, accounted for the remaining 10%. The largest subsidy to renewable energy generation in 2017 was worth €278m and came from funds collected through the PSO (Public Service Obligation) Levy on electricity consumers.

In the previous 2016 statistical release by the CSO referred to above, provisional data was provided on Potentially Environmentally Damaging Subsidies (PEDS) or other Government support measures that have social or economic objectives which may also incentivise behaviour that could be damaging to the environment. For example, transport fuel tax rebates encourage the consumption of fossil fuels. Table 51 provides details of the

Potentially Environmentally Damaging Subsidies provided by the Irish Government in 2016. The data indicate that 75% of environmental subsidies provided in Ireland are directed to Potentially Environmentally Damaging Subsidies.

Table 51: Potentially Environmentally Damaging Subsidies (2016)

Programme	€ ('000)
Agricultural product subsidies: cattle	55,900
PSO Levy: electricity generation from peat	115,400
Fuel allowance	230,921
Electricity allowance	150,729
Gas allowance	19,193
Other supplements (including heating and diet)	3,347
Petroleum Infrastructure Support Group	191
Haulier's diesel rebate scheme	1,300
Total Potentially Environmentally Damaging Subsidies (2016)	**576,981**

Agricultural Product Subsidies: Agricultural subsidies on products are paid per unit of a good produced, e.g. per head of cattle. Many agricultural product subsidies have been phased out and have been replaced by direct payments to farmers such as the Single Payment Scheme.

PSO (Public Service Obligation) Levy: The PSO Levy is charged to electricity consumers in Ireland and is used to subsidise electricity generation from peat and renewable sources as well as for security of supply. The statistical release includes the portions that go towards electricity generation from peat and security of supply as PEDS while the portion that supports electricity generation from renewable sources is included as an environmental subsidy.

Fuel Allowance: The Fuel Allowance Scheme was introduced in 1988. The aim of the scheme is to assist qualified households in receipt of certain social welfare payments with their heating costs. The allowance represents a contribution towards a person's normal heating expenses. It is not intended to meet those costs in full.

Electricity Allowance: The electricity allowance is part of the Household Benefits Package which is available to all householders over 70 and to householders under 70 in certain circumstances.

Gas Allowance: The gas allowance is part of the Household Benefits Package which is available to all householders over 70 and to householders under 70 in certain circumstances.

Other supplements (including Heating and Diet): This is a supplement paid by the Department of Social Protection and the Social Insurance Fund as an income support measure. The statistical release includes 50% of the amount of funding as an estimate of the proportion that went to heating rather than food support.

Petroleum Infrastructure Support Group: Annual contributions to this fund are made by companies with licences for hydrocarbon exploration and development activities off the Irish coast. The fund is administered by the Department of Communications, Climate Action and Environment and its aims are to enhance understanding of the relatively underexplored Irish offshore through funding of new research and data collection activities.

Haulier's Diesel Rebate Scheme: This is a repayment to road transport operators of part of the tax that they pay on diesel purchased for use in the course of business.

As a first step in relation to plans to phase-out energy subsidies, the Climate Action Plan commits to model the impacts, both in terms of the economy and in terms of emissions, of removing fossil fuel subsidies.

5. Impact Assessment of Planned Policies and Measures

5.1. Impacts of planned policies and measures described in section 3 on energy system and GHG emissions and removals, including comparison to projections with existing policies and measures (as described in section 4)

i. Projections of the development of the energy system and GHG emissions and removals as well as, where relevant of emissions of air pollutants in accordance with Directive (EU) 2016/2284 under the planned policies and measures at least until ten years after the period covered by the plan (including for the last year of the period covered by the plan), including relevant Union policies and measures

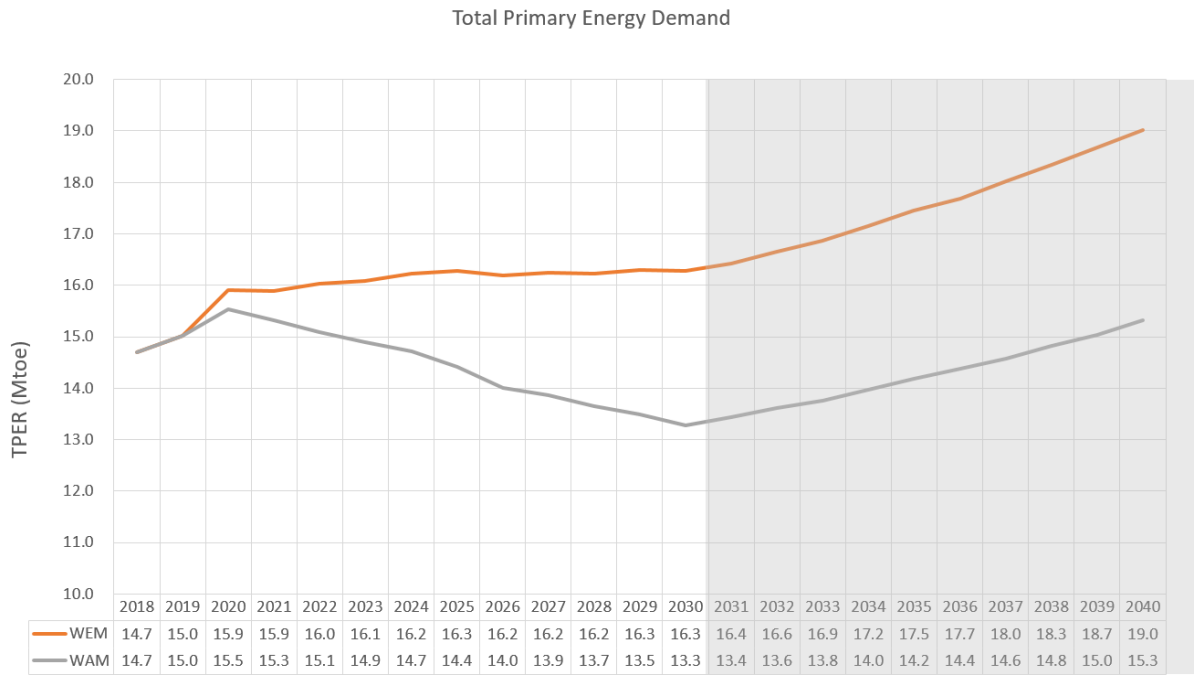
Ireland's final NECP 2021-2030 is based on two scenarios – a baseline (With Existing Measures) and an advanced polices and measures scenario (With Additional Measures) as follows:

With Existing Measures (WEM) – a low oil price (constant 2016 prices) scenario based on the United Kingdom's Department of Business, Energy and Industrial Strategy (BEIS) price projections and fixed carbon tax of €20 per tonne. Policies and measures in place by the end of December 2018 are modelled in this scenario.

With Additional Measures – a low oil price (constant 2016 prices) based on the same BEIS price projections as included in the WEM scenario with a varying carbon tax that increases to €80 per tonne by 2030 as announced in the 2020 Budget. The WAM includes the policies and measures announced in Ireland's 2019 Climate Action Plan.

Total Primary Energy Demand

Projections for the total primary energy demand trajectories in for the WEM and WAM scenarios are presented in Figure 21, facilitating a quantitative examination of the impacts of planned policies and measures.



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
WEM	14.7	15.0	15.9	15.9	16.0	16.1	16.2	16.3	16.2	16.2	16.2	16.3	16.3	16.4	16.6	16.9	17.2	17.5	17.7	18.0	18.3	18.7	19.0
WAM	14.7	15.0	15.5	15.3	15.1	14.9	14.7	14.4	14.0	13.9	13.7	13.5	13.3	13.4	13.6	13.8	14.0	14.2	14.4	14.6	14.8	15.0	15.3

Figure 21: Total primary energy requirement by scenario

Notable observations when comparing total primary energy demand trajectories are:

- A divergence in trends from 2020 onwards resulting in almost 18% less primary energy demand in the WAM scenario in 2030. The divergence in primary energy demand is mostly driven by the increase in the carbon tax in 2020 from €20 per tonne to €26 per tonne, and an annual year-on-year increase of €6 per tonne until a price of €80 per tonne is reached in 2030

- In the WAM scenario primary energy demand falls year-on-year from 2020-2030, however projected trends post 2030 suggest that without a further increase in the carbon tax and ongoing policy impacts post-2030 demand could again increase in both scenarios. This is an outcome of modelled macroeconomic and population growth in the absence of Government policy. It is not anticipated that Government policy will cease in 2030, however only stated Government policy to 2030 has been modelled here
- Additional policy measures in the WAM scenario contributing to a divergence in primary energy demand are detailed in Ireland's Climate Action Plan, and include:
    - Increased biofuels blending and more electric vehicles in transport.
    - A higher level of RES-E achievement (70% by 2030 in the WAM, whereas 55% by 2030 in the WEM), primarily met by more onshore and offshore wind installed capacity
    - Additional supports for the deployment of heat pumps and greater ambition in national energy efficiency programmes

Total Primary Energy Demand by Fuel

Projections for the total primary energy demand by fuel trajectories in for the WEM and WAM scenarios are presented in Figures 22 and 23.

Oil

Oil demand falls by a third (in absolute terms) in the WAM scenario, but still dominates the fuel mix in 2030, accounting for 35% of total primary energy demand. The majority of oil demand is for the transport sector, which shows strong growth in both scenarios in line with economic growth projected to 2030.

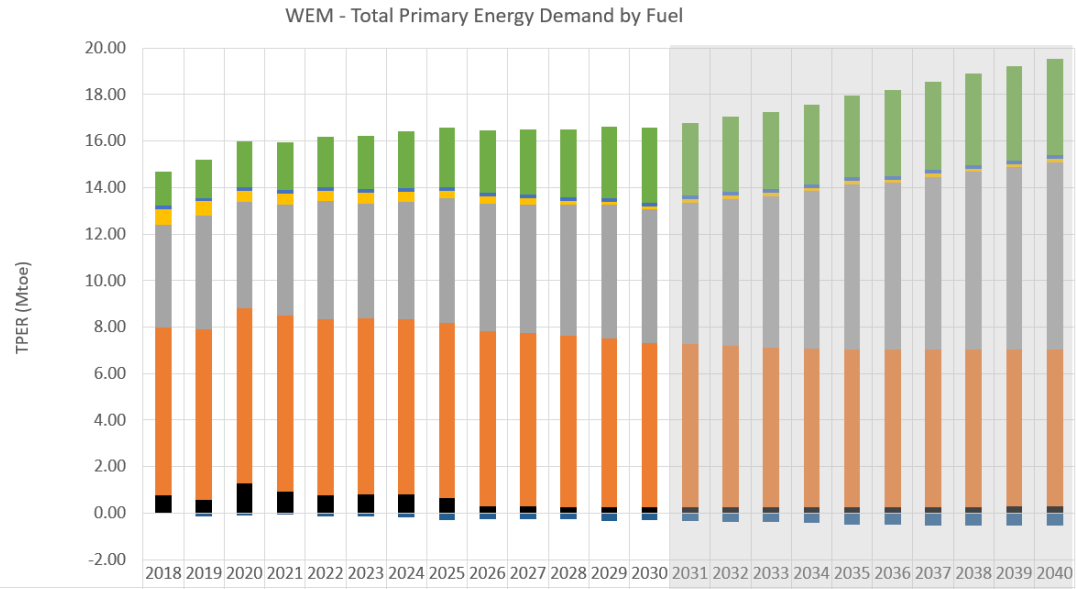
The increasing carbon tax in the WAM results in a slower transport energy demand growth relative to the fixed carbon tax, with 24% less transport energy demand by 2030 in the WAM. The impact of greater numbers of electric vehicles in the WAM scenario (936,363 by 2030) also contributes to a fall in oil demand post-2025, as electric drive trains are more efficient than internal combustion vehicles.

Even though aviation is included in the Emissions Trading Scheme (ETS) since 2013, the increasing carbon tax in the WAM scenario leads to a fall in aviation transport demand through less consumer spending. By 2030, there is a fifth less aviation transport in the WAM scenario relative to the WEM scenario.

Oil use for space-heating in the residential sector declines further in the WAM scenario relative to the WEM, due to a proposed ban on oil boilers from 2022, the deployment of heat pumps, as well as greater and deeper energy efficiency upgrades in buildings.

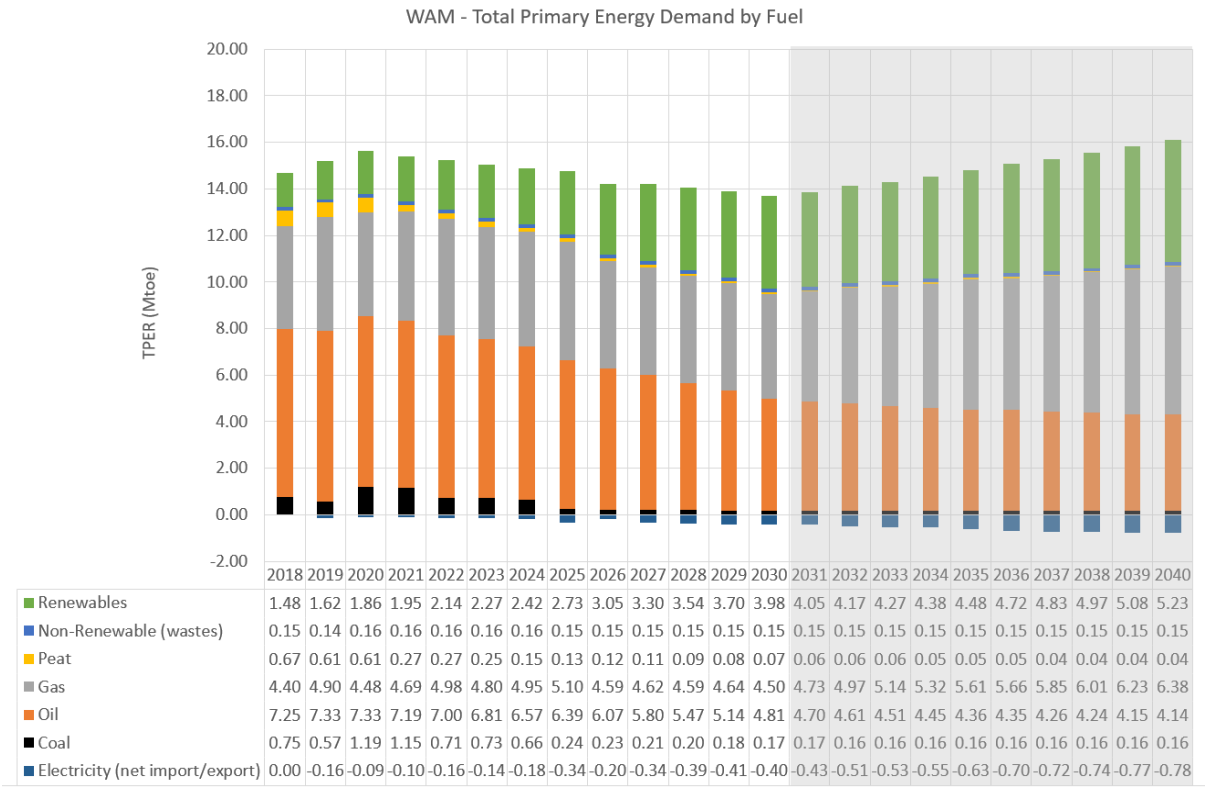
In industry and services, the deployment of biomass energy and heat pumps also reduces the dependency on oil products and account for a further fall in oil demand in the WAM scenario relative to the WEM, beyond the impact of the varying carbon tax.

Government policy has been set out for the period to 2030 in Ireland's Climate Action Plan. A detailed policy package will be defined for the post-2030 period at a future date. Due to continued economic and population growth post-2030 modelled, without any reductions for the impact of future Government intervention post-2030, primary energy trends are observed to increase here. This is not an anticipated outcome, but only illustrative of a scenario without ongoing policy effort post 2030.



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Renewables	1.48	1.62	1.98	2.06	2.14	2.29	2.44	2.57	2.70	2.82	2.94	3.07	3.24	3.13	3.24	3.33	3.43	3.53	3.71	3.81	3.93	4.04	4.18
Non-Renewable (wastes)	0.15	0.14	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Peat	0.67	0.62	0.47	0.47	0.46	0.46	0.45	0.30	0.30	0.29	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.14
Gas	4.40	4.91	4.57	4.79	5.09	4.95	5.02	5.35	5.50	5.51	5.65	5.78	5.74	6.11	6.34	6.51	6.75	7.09	7.17	7.45	7.66	7.86	8.06
Oil	7.25	7.33	7.56	7.57	7.57	7.56	7.56	7.55	7.53	7.46	7.35	7.23	7.08	7.00	6.93	6.87	6.83	6.79	6.77	6.76	6.75	6.75	6.76
Coal	0.75	0.57	1.26	0.92	0.75	0.80	0.79	0.64	0.28	0.27	0.26	0.26	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.27	0.27	0.27
Electricity (net import/export)	0.00	-0.16	-0.09	-0.07	-0.15	-0.14	-0.19	-0.29	-0.26	-0.27	-0.28	-0.34	-0.31	-0.35	-0.39	-0.38	-0.41	-0.50	-0.51	-0.54	-0.55	-0.54	-0.54

Figure 22: Total primary energy requirement by fuel (WEM)



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Renewables	1.48	1.62	1.86	1.95	2.14	2.27	2.42	2.73	3.05	3.30	3.54	3.70	3.98	4.05	4.17	4.27	4.38	4.48	4.72	4.83	4.97	5.08	5.23
Non-Renewable (wastes)	0.15	0.14	0.16	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Peat	0.67	0.61	0.61	0.27	0.27	0.25	0.15	0.13	0.12	0.11	0.09	0.08	0.07	0.06	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.04
Gas	4.40	4.90	4.48	4.69	4.98	4.80	4.95	5.10	4.59	4.62	4.59	4.64	4.50	4.73	4.97	5.14	5.32	5.61	5.66	5.85	6.01	6.23	6.38
Oil	7.25	7.33	7.33	7.19	7.00	6.81	6.57	6.39	6.07	5.80	5.47	5.14	4.81	4.70	4.61	4.51	4.45	4.36	4.35	4.26	4.24	4.15	4.14
Coal	0.75	0.57	1.19	1.15	0.71	0.73	0.66	0.24	0.23	0.21	0.20	0.18	0.17	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Electricity (net import/export)	0.00	-0.16	-0.09	-0.10	-0.16	-0.14	-0.18	-0.34	-0.20	-0.34	-0.39	-0.41	-0.40	-0.43	-0.51	-0.53	-0.55	-0.63	-0.70	-0.72	-0.74	-0.77	-0.78

Figure 23: Total primary energy requirement by fuel (WAM)

Gas

The second most dominant primary energy fuel is natural gas, accounting for just over a third of all demand in both the WEM and WAM scenarios in 2030. Oil and natural gas together account for almost 70% of total primary energy requirement in 2030 in the WAM scenario, down from a 79% share in the WEM scenario due to the additional policies and measures included in the WAM.

The overall total primary energy demand for natural gas is projected to grow from 2020 to 2030, in both scenarios. However, between 2025 and 2030 the demand for gas increases in the WEM scenario but falls in the WAM scenario.

Over half of all natural gas is used for electricity generation and currently just over half of all electricity generated is from natural gas power plants. However, a greater contribution of variable renewables to electricity generation and more interconnection in the WAM scenario sees the natural gas demand for inputs into electricity generation and the share of electricity generated fall in the WAM scenario. There is 20% less gas input to electricity generation in the WAM scenario.

Solid Fossil Fuels

Coal and peat are mostly used for electricity generation in Ireland. Coal-fired generation is due to cease in 2025 in the WEM scenario and a year earlier in the WAM scenario, driven by

market forces. In the WEM scenario, post-2020 there is peat use in electricity generation with biomass cofiring until 100% biomass generation from 2028. It should be noted however, the recent announcement of the closure of two of the three existing peat plants at the end of 2020 sees earlier displacement of peat in electricity generation in the WAM scenario.

Both coal and peat are likely to continue to be used for residential space heating in a low energy price environment, albeit with ever diminishing absolute consumption. While the increasing carbon tax alone results in 13% less coal and 6% less peat in the WAM scenario, the impact of additional energy efficiency and renewable energy policies and measures results in a more significant fall in demand. In the WAM scenario residential sector, an overall 69% drop in coal demand and a 64% drop in peat demand over the decade 2020 to 2030 is observed.

Import Dependency

The overall dependency on fossil fuels does not fall below 76% of total primary energy demand in the WEM to 2030. The impact of additional planned policies and measures reduces that dependency to approximately two thirds of or 65% total primary energy demand in the WAM scenario by 2030.

In terms of import dependency, all crude oil and oil products are imported in Ireland. Similarly, all coal used in Ireland is imported. Ireland currently produces approximately 60% of the natural gas primary energy demand, but in the absence of another gas field coming on stream, that rate will decline annually to 2030, and with increasing gas demand, only a fifth (20%) of all natural gas is projected to be indigenous by 2025. The majority of biofuels for transport are also currently imported– a trend that is also likely to continue if the absence of planned development of the industry in Ireland.

While peat is an indigenous energy source, its usage is projected to fall amid growing environmental concerns and the expected closure of two of the three peat-fired power plants at the end of 2020.

Ireland has significant resources of variable renewable energy sources – such as wind, ocean energy and, to a lesser extent, solar. Indigenous combustible renewables include some sources of biomass, biogas, the renewable portion of municipal solid wastes (MSW) and solid recovered wastes, landfill gas and sewage sludge gas.

The current share of biomass resources for energy that are imported is 37% and this is expected to fall to 17% in the WAM scenario by 2030, with the assumption that domestic forestry, agricultural residues and waste resources are harnessed for growing demands in heat and transport. Despite the projected growth in indigenous biomass consumption

through heat supply and biofuel blending, the overall energy import dependency is likely to lie between 65% and 76% by 2030, where the former relates to the WAM scenario.

Exports

An interesting recent trend is that since 2016 Ireland is now a net exporter of electricity. This trend is likely to continue throughout the period projected with greater exports in the WAM scenario measures - which has greater renewable electricity generation and interconnection.

Electricity Generation and Demand

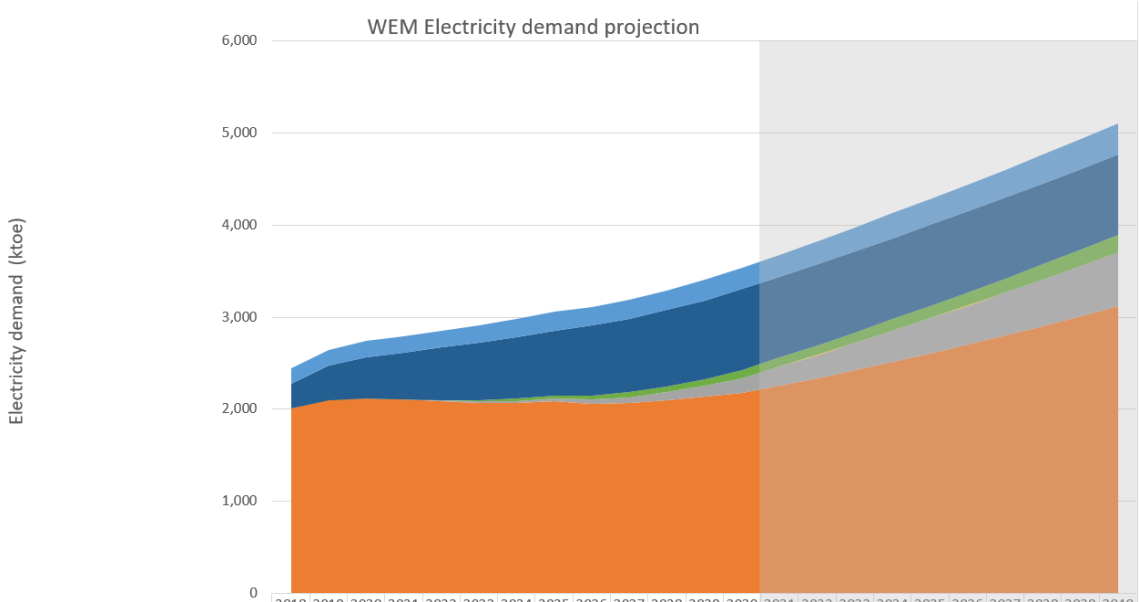
Figures 24 and 25 show how the electricity demand projected is an amalgamation of a macro-economic demand projected and the net effect of:

- Additional modelled demand growth from data centres and large industrial users
- Additional policy driven demand such as heat pumps, electric vehicles, LUAS and metro
- Modelled demand savings from electricity demand-side efficiency savings and smart meter savings

It should be noted that the heat pump demand shown in the graphs below is additional heat pump demand net of electricity displaced from the housing mix with counterfactual electric heating. Two broad factors are at play between the WEM and WAM scenario for electricity generation and demand, namely: the higher carbon tax and the increased policy ambition in WAM.

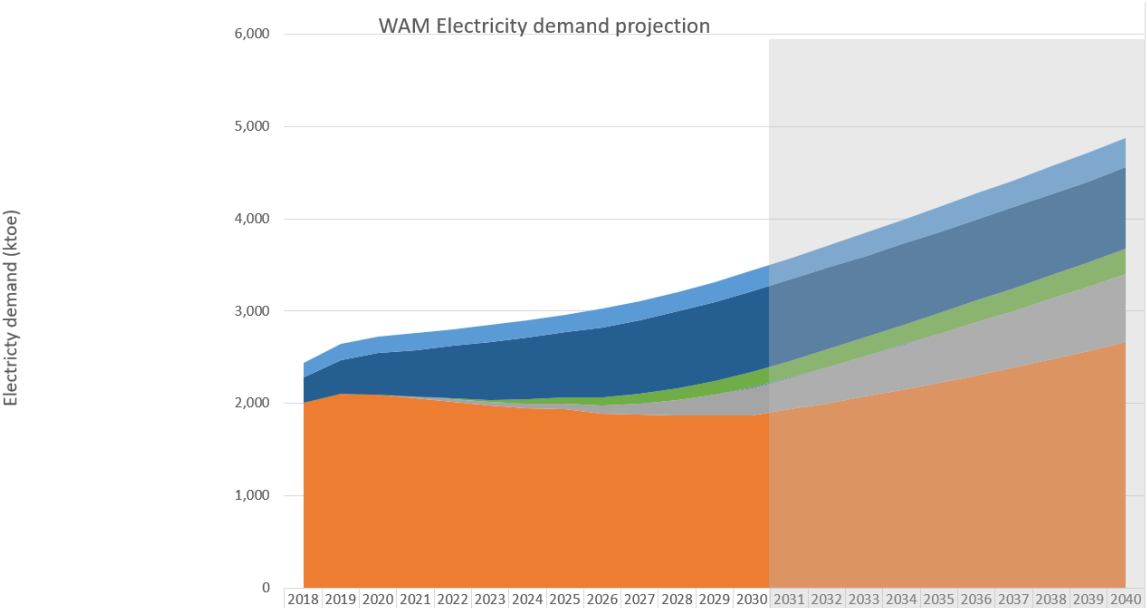
- The higher carbon tax in the WAM scenario drives down the base macro-economic electricity demand projected compared to WEM, due to the macro-economic effect of a higher consumer price
- On the other hand, there is increased additional demand contributions in WAM from electric vehicles and heat pumps due to increased ambition for these policies. Albeit, the increased demand is somewhat offset by increased efficiency ambition in WAM

The low demand trajectory for data centres from the TSO's (EirGrid) All Island Generation Capacity Statement 2019 -2028 is assumed in both WEM and WAM scenarios. Despite the increased demand contributions for electric vehicles and additional heat pumps in WAM, the amalgamated electricity demand projected for WAM is slightly less than the WEM scenario. This is driven in part by the higher efficiency gains in WAM but also the impact of the higher carbon tax in giving a lower base macro-economic demand projected for WAM.



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Transmission losses	160	173	180	183	187	191	195	200	204	209	215	223	231	241	250	260	270	280	291	301	312	323	334
Total Data centres and large energy users ktoe	271	370	447	502	568	623	670	706	758	796	826	852	879	879	879	879	879	879	879	879	879	879	879
Additional Heat pumps ktoe	-3	-7	-10	-4	5	14	25	36	46	56	66	76	86	96	106	116	126	136	146	156	166	176	186
Metro north ktoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Luas crosstown ktoe	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Electric vehicles ktoe	1	4	6	8	12	16	23	31	43	60	84	117	163	208	252	296	340	384	425	465	504	543	581
Macro-economic forecast net of efficiency ktoe	2,011	2,105	2,123	2,108	2,086	2,068	2,070	2,084	2,062	2,069	2,100	2,137	2,175	2,255	2,337	2,423	2,511	2,604	2,700	2,800	2,904	3,012	3,123

Figure 24: Electricity demand projected (WEM)



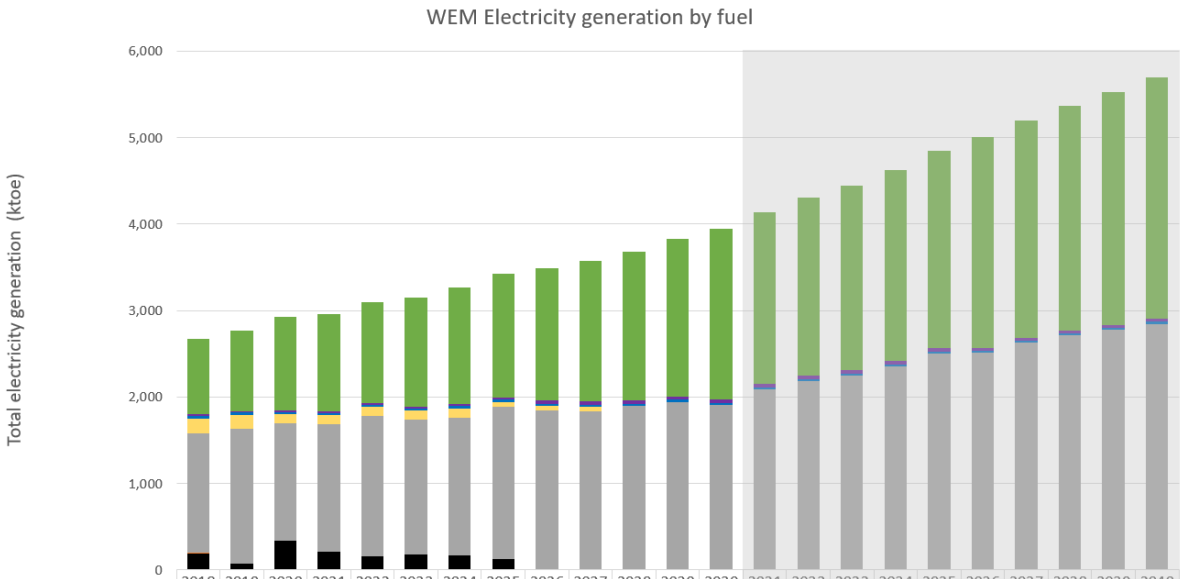
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Transmission losses ktoe	160	173	178	181	184	186	190	194	198	203	210	217	225	234	243	251	261	270	279	289	299	309	319
Total Data centres and large energy users ktoe	271	370	447	502	568	623	670	706	758	796	826	852	879	879	879	879	879	879	879	879	879	879	879
Additional Heat pumps ktoe	-3	-7	-10	-5	5	25	46	69	89	110	131	151	172	182	193	203	214	225	235	246	256	267	277
Metro north ktoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Luas crosstown ktoe	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Electric vehicles ktoe	1	9	16	23	30	38	47	55	87	119	166	221	297	341	391	435	485	528	574	613	657	695	738
Macro-economic forecast net of efficiency ktoe	2,010	2,102	2,092	2,061	2,020	1,976	1,952	1,941	1,892	1,878	1,871	1,871	1,871	1,936	2,003	2,073	2,146	2,223	2,304	2,388	2,475	2,567	2,662

Figure 25: Electricity Demand Projected (WAM)

The gross electricity demand projections are input to a PLEXOS electricity system model, which outputs the generation plant mix likely to be dispatched to meet that demand. The generation projections for WEM and WAM are shown in Figures 26 and 27.

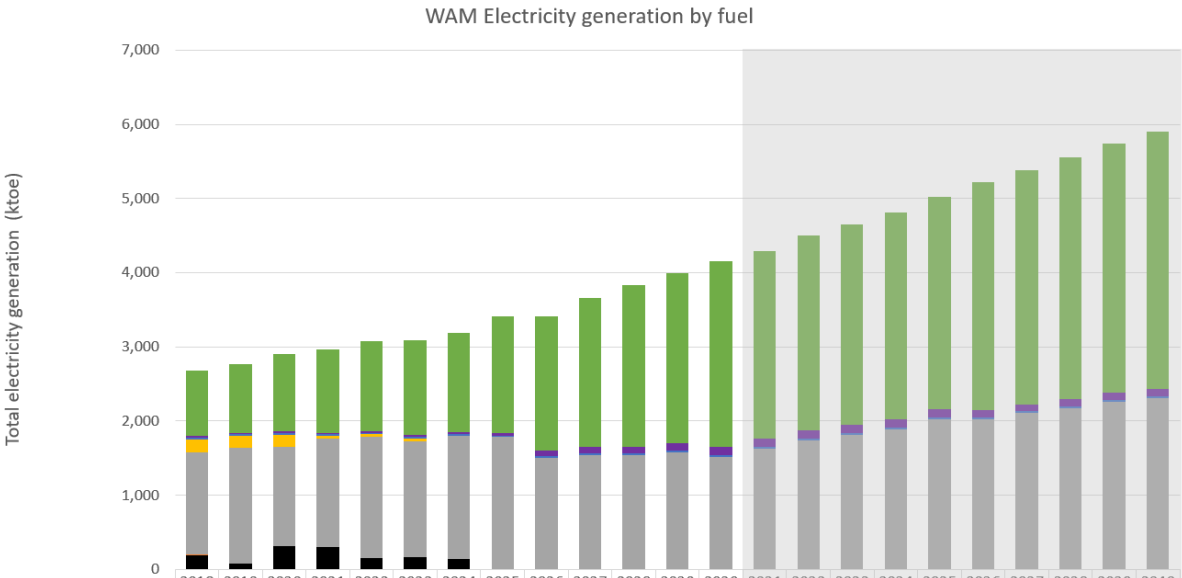
A number of observations between the two scenarios can be made:

- Despite lower electricity demand input into the WAM scenario, there is marginally more electricity generated in the WAM. This is driven by higher electricity exports arising from the greater share of renewable electricity (70% by 2030) and increased interconnection in WAM
- A low oil price environment results in declining generation from coal from 2020 onwards, as it is pushed out by a small differential between coal and gas price and an increased ETS carbon price. By 2025, coal is no longer used for electricity generation in both scenarios
- There is continued peat-fired plant operation out to 2030 in the WEM scenario, with an assumed increasing ratio of co-firing across the decade and the ending of firing with peat by 2028 as included in Ireland's 2019 Climate Action Plan. The WAM peat assumptions are in line with recent (December 2019) closure announcements for two of the three peat-fired plants at the end of 2020
- In the WAM scenario, battery storage (included with pumped storage in the figures) provides increased flexibility with additional battery capacity from 2025 onwards.
- The remaining difference between the scenarios relates to the ratio of shares of renewables and gas. The WAM scenario has a higher RES-E policy ambition and so, consequently, has a greater share of renewables and more displaced gas generation than WEM. In absolute terms, 20% less gas is used for electricity generation in the WAM scenario
- Beyond 2030, the ratio of shares between gas and renewables is maintained, as it is assumed that RES-E share is maintained post 2030 (in the absence of modelled policy support post 2030)



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Renewables ktoe	877	936	1,080	1,122	1,164	1,256	1,346	1,430	1,532	1,623	1,722	1,826	1,974	1,979	2,058	2,129	2,208	2,284	2,437	2,511	2,600	2,687	2,793
Pumped storage ktoe	20.4	15.0	16.9	19.9	21.0	25.0	28.1	24.0	39.2	38.7	39.8	39.3	41.9	43.4	40.1	40.4	39.9	39.0	35.9	35.9	34.7	34.1	36.0
Waste ktoe	25.9	23.1	23.1	23.0	23.1	23.0	23.1	23.1	23.0	23.0	23.1	23.0	23.1	23.1	23.1	23.0	23.1	23.0	23.1	23.0	23.1	23.0	23.1
Peat ktoe	178	159	106	106	106	106	106	53	53	53	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas ktoe	1,377	1,560	1,359	1,470	1,627	1,561	1,592	1,765	1,836	1,825	1,887	1,938	1,899	2,078	2,175	2,240	2,342	2,498	2,506	2,621	2,702	2,771	2,838
Oil ktoe	11.7	0.3	0.6	0.7	0.8	0.8	1.2	3.9	6.6	9.2	6.4	6.2	7.0	7.9	6.8	7.3	9.5	5.1	4.1	5.1	6.3	7.0	8.0
Coal ktoe	185	77	337	215	153	173	170	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 26: Electricity generation by fuel (WEM)



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Renewables ktoe	877	936	1,049	1,118	1,216	1,285	1,338	1,575	1,811	2,012	2,175	2,285	2,497	2,538	2,634	2,706	2,794	2,868	3,077	3,156	3,264	3,354	3,471
Pumped storage ktoe	20.4	15.0	18.5	17.9	21.0	21.7	22.9	36.7	72.1	80.7	89.7	100.4	115.2	111.9	110.4	108.6	110.2	105.2	96.3	94.2	97.7	96.0	95.1
Waste ktoe	25.9	23.1	23.1	23.0	23.1	23.0	23.1	23.1	23.0	23.0	23.1	23.0	23.1	23.1	23.1	23.0	23.1	23.0	23.1	23.0	23.1	23.0	23.1
Peat ktoe	178	159	159	35	35	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas ktoe	1,377	1,560	1,341	1,464	1,635	1,570	1,667	1,778	1,505	1,540	1,538	1,575	1,511	1,619	1,734	1,810	1,887	2,025	2,028	2,105	2,168	2,260	2,310
Oil ktoe	11.7	0.3	0.5	0.6	0.9	1.1	1.3	5.2	3.4	3.3	3.6	4.7	4.5	4.7	3.1	2.9	3.6	2.9	1.3	1.7	3.8	3.2	3.1
Coal ktoe	185	77	315	301	148	159	136	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 27: Electricity generation by fuel (WAM)

Total Final Energy Demand

The impacts of planned policies and measures on total final energy demand can be observed in Figure 28 comparing the trajectories for WEM and WAM scenarios. Some notable observations when comparing the aggregate impacts of the different scenario policies and measures:

- There is 19% less final energy demand in the WAM scenario relative to the WEM. The difference is explained by:
    - The increase in the carbon tax in the WAM scenario, which accounts for two-thirds of the difference between the scenarios
    - All energy efficiency grant programmes in all sectors continue to the end of 2040 in the WAM scenario compared with to the end of 2022 in the WEM scenario
    - Greater roll out of low carbon technologies such as electricity vehicles, heat pumps and smart meters in the WAM scenario
    - A higher proportion of renewable energy in the WAM scenario

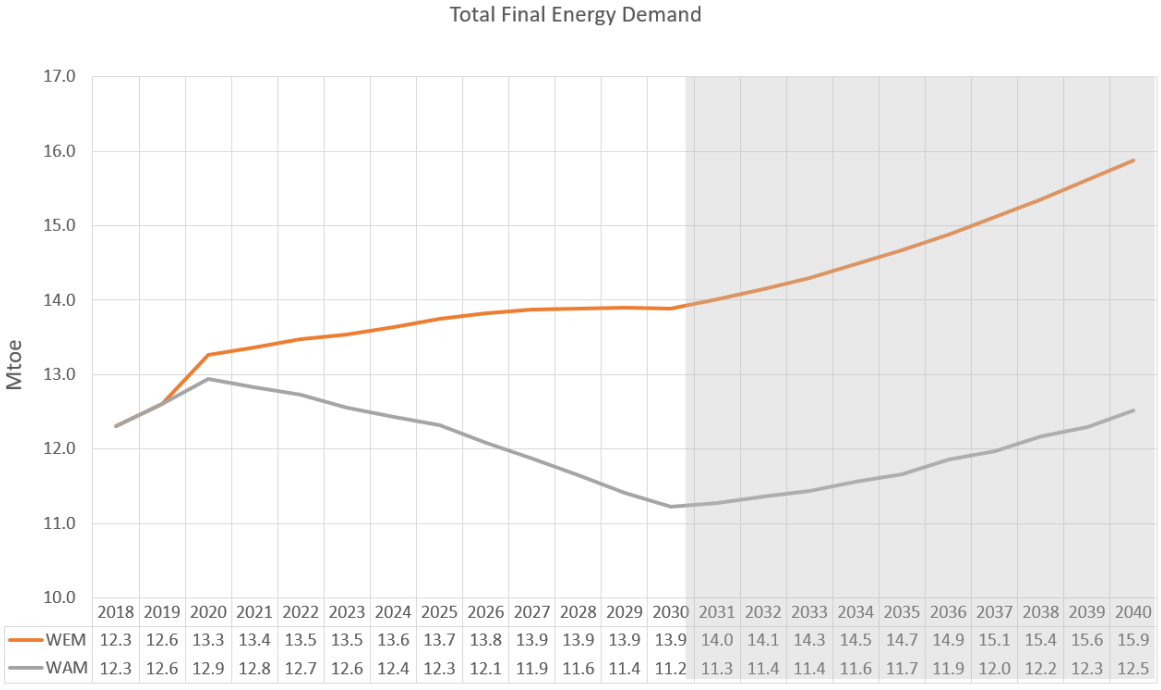


Figure 28: Total final energy demand (WEM & WAM)

Government policy has been set out for the period to 2030 in Ireland's Climate Action Plan. A detailed policy package will be defined for the post-2030 period at a future date. Due to

continued economic and population growth post-2030 modelled, without any reductions for the impact of future Government intervention post-2030, final energy trends are observed to increase here. This is not an anticipated outcome, but only illustrative of a scenario without ongoing policy effort post 2030.

Total Final Energy Consumption by Sector

The impacts of planned policies and measures can be observed at a sectoral level by comparing the scenarios in Figures 29 and 30. Some notable observations when comparing the impacts in each sector:

Transport

- The greatest source of disparity in absolute terms is in the transport sector, where the carbon tax increase is responsible for over two-thirds of the 24% less final energy demand in the WAM scenario
- Transport energy demand (including aviation) is projected to fall year-on-year from 2021 to 2030 and post-2030 in the WAM scenario, even though growth in transport activity demand is anticipated

Industry

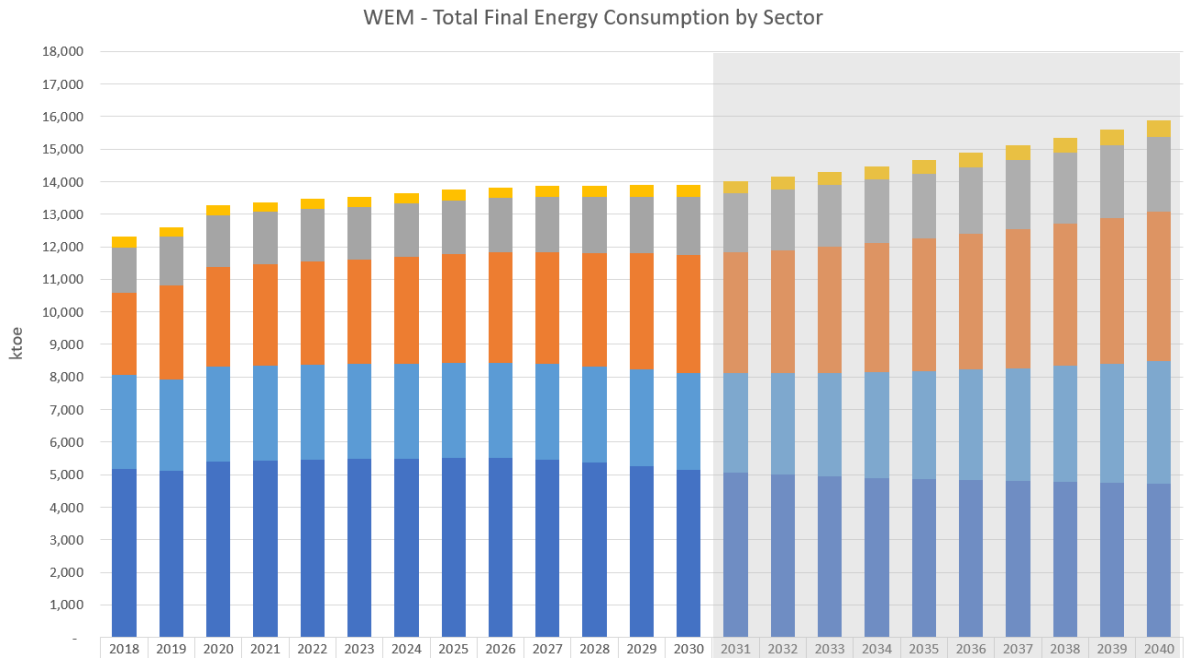
- The increasing carbon tax is responsible for a 10% fall in final energy demand in the industry sector, the impact of the Support Scheme for Renewable Heat (SSRH) and energy-efficiency measures sees a further fall to a difference of 11% less demand in the WAM scenario by 2030
- Industry energy demand is projected to grow steadily throughout the period 2020-2030 and post-2030 in the WAM scenario

Residential

- In the residential sector, the increasing carbon tax in the WAM accounts for almost half of the difference between the scenarios in 2020 (9 percentage points). A further 11 percentage points is due to a much higher level of ambition for energy-efficiency retrofits (a greater number of homes meeting higher energy-efficiency performance levels) and greater deployment of heat pumps
- Residential energy demand is projected to fall year-on-year throughout the period 2020-2030 in the WAM scenario but post-2030 there is a return to growth in the absence of policy details and with continuing projected population growth

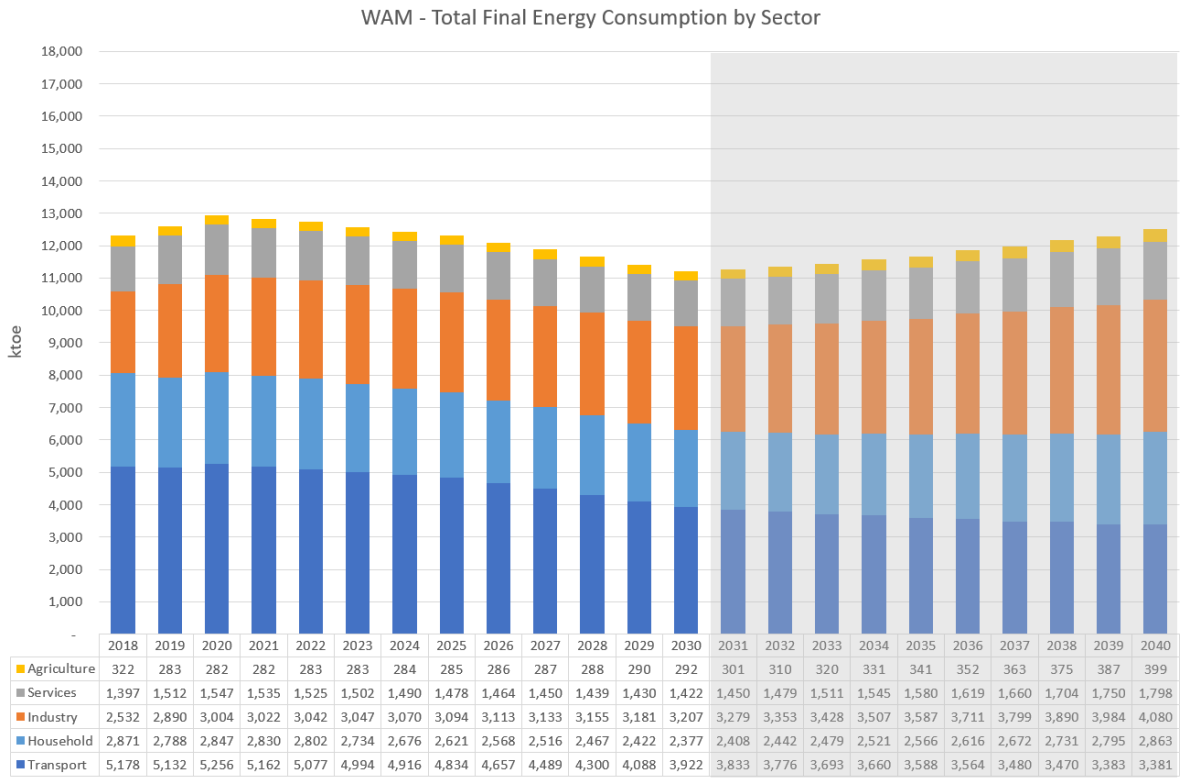
Services

- The increasing carbon tax is responsible for a 9% fall in final energy demand in the services sector. The impact of the Support Scheme for Renewable Heat (SSRH) and energy-efficiency measures sees a further fall to a difference of 20% less demand in the WAM scenario by 2030
- In the services sector, while final energy consumption grows in the early part of the decade to 2025, it declines by 3% between 2025 and 2030. This is achieved through additional ambition in national energy efficiency programmes, including a goal set out in Ireland's 2019 Climate Action Plan, to improve the energy efficiency of existing commercial and public building stock
- Progress in the services sector is against the backdrop of increasing electricity demand in that sector driven by deployment of data centres. By 2030, data centres could account for approximately a quarter (25%) of all final electricity demand in the services sector.



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Agriculture	322	283	295	301	307	314	320	327	334	341	349	356	364	376	388	400	413	426	440	454	468	483	499
Services	1,397	1,514	1,585	1,597	1,609	1,613	1,633	1,654	1,674	1,696	1,720	1,745	1,772	1,814	1,858	1,904	1,953	2,003	2,057	2,114	2,173	2,235	2,299
Industry	2,532	2,892	3,070	3,121	3,172	3,212	3,272	3,333	3,386	3,441	3,498	3,558	3,618	3,703	3,791	3,881	3,973	4,068	4,168	4,271	4,377	4,486	4,598
Household	2,871	2,789	2,899	2,910	2,924	2,919	2,919	2,923	2,930	2,939	2,952	2,970	2,990	3,046	3,106	3,170	3,239	3,311	3,390	3,474	3,562	3,655	3,753
Transport	5,178	5,128	5,414	5,438	5,460	5,478	5,496	5,507	5,503	5,451	5,365	5,269	5,144	5,071	5,004	4,946	4,899	4,863	4,831	4,802	4,775	4,750	4,726

Figure 29: Total final energy consumption by sector (WEM)



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Agriculture	322	283	282	282	283	283	284	285	286	287	288	290	292	301	310	320	331	341	352	363	375	387	399
Services	1,397	1,512	1,547	1,535	1,525	1,502	1,490	1,478	1,464	1,450	1,439	1,430	1,422	1,450	1,479	1,511	1,545	1,580	1,619	1,660	1,704	1,750	1,798
Industry	2,532	2,890	3,004	3,022	3,042	3,047	3,070	3,094	3,113	3,133	3,155	3,181	3,207	3,279	3,353	3,428	3,507	3,587	3,711	3,799	3,890	3,984	4,080
Household	2,871	2,788	2,847	2,830	2,802	2,734	2,676	2,621	2,568	2,516	2,467	2,422	2,377	2,408	2,442	2,479	2,521	2,566	2,616	2,672	2,731	2,795	2,863
Transport	5,178	5,132	5,256	5,162	5,077	4,994	4,916	4,834	4,657	4,489	4,300	4,088	3,922	3,833	3,776	3,693	3,660	3,588	3,564	3,480	3,470	3,383	3,381

Figure 30: Total final energy consumption by sector (WAM)

Total Final Energy Consumption by Fuel

The impacts of planned policies and measures on final energy consumption by fuel can be observed by comparing the scenarios in Figures 31 and 32. Some notable observations when comparing the impacts in each sector:

Oil

- Oil demand as a share of total final energy has already peaked in both scenarios. The peak in absolute terms is 2023 in the WEM scenario and 2020 in the WAM scenario. By 2030 oil accounts for just under half of all energy demand in the WEM scenario (49%), but this nine percentage points lower (~41% share) in the WAM scenario
- The planned increasing carbon tax, the effective ban in oil boilers in new dwellings from 2022 and increased energy efficiency improvement ambition in the WAM scenario see the absolute oil demand between scenarios fall from 3% less (in absolute terms) in the WAM scenario in 2020 to 33% less by 2030.
- The majority of oil demand is used in the transport sector and there is less oil demand in transport in the WAM scenario due to greater biofuels blending and electric vehicles targets. The fossil fuel dependency in transport falls from 94% in 2020 to 91 % in 2030 in the WAM scenario.

Electricity

- Electricity is the second most dominant final energy demand source. Electricity demand is projected to grow from a fifth of final energy demand (20%) to 23% in the WEM scenario by 2030 and 29% in the WAM scenario. In absolute terms, there is growth of ~2% -4% per annum expected in both scenario to 2030
- The industry sector is responsible for ~45% of all electricity use in Ireland currently, and this share is projected to grow to over 60% in both scenarios by 2030. In absolute terms, the electricity demand in industry is projected to grow by around 2% per annum to 2030. Currently the most dominant energy source for industry, the electricity share in total industry energy demand is due to grow from just under a third to just under 40% in the WAM scenario by 2040
- The residential sector is responsible for just over a third of all electricity demand currently. Electricity demand is expected to grow in the WEM scenario at a rate of just over 2% per annum, but slightly less than 2% per annum in the WAM scenario due to additional efficiency measures in that scenario. This is the case even though more heat pumps are deployed in the WAM scenario. Electricity is projected to become the most dominant energy source in the residential sector from 2025 onwards in the WAM scenario
- Electricity dominates the services sector energy demand, with a current share of 43%, a trend that is projected to continue. In the WAM scenario, the growth in electricity demand is less than the WEM scenario resulting in 9% less electricity required in the WAM services sector by 2030
- The transport share in total electricity demand is set to grow from less than 1% to 5% by 2030 in the WEM scenario and 10% in the WAM scenario with the increased roll out of electric vehicles. The electricity share in transport energy demand increases from almost zero to 3% in the WEM scenario by 2030 and 8% in the WAM scenario

Gas

- Gas demand grows in absolute terms to 2040 in the WEM scenario, whereas in the WAM it peaks in 2020 and falls by approximately 7% per annum until 2030. In the absence of policy detail, post-2030 gas demand could potentially grow again post-2030 in the WAM scenario driven by economic growth, especially in the industry sector
- The share of gas final energy demand currently 15% only increases by one and two percentage points in the WAM and WEM scenarios respectively by 2030. The

increasing carbon tax, the effective ban in gas boilers in new dwellings from 2025 and increased energy efficiency improvement ambition in the WAM scenario sees the absolute gas demand between scenarios fall from 5% less demand than the WEM scenario in 2025 to 20% less in 2030

- The majority of gas demand is used in industry, and this share grows from around 40% currently to accounting for half of all energy in both scenarios by 2030. The residential sector currently accounts for just under a third of total final gas demand but that share falls to just over a quarter by 2030. Whereas the services sector gas demand remains close to a quarter of total final gas demand over the period 2020 to 2030 in both scenarios

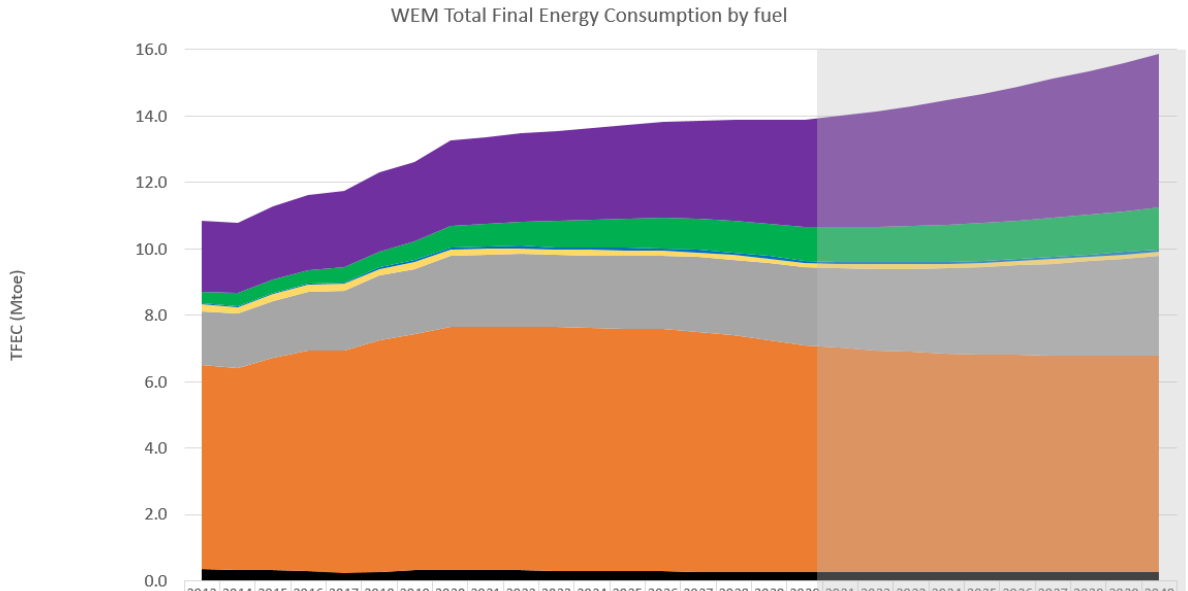
Solid Fossil Fuels

- Currently approximately 60% of coal use is in the residential sector and 40% in industry. This is expected to change to a 50:50 split by 2030 in the WEM scenario and flip to 65% of coal use to be in industry and 35% in the residential sector in the WAM scenario. In absolute terms coal demand falls by 23% in 2030 in the WEM scenario and by 46% in the WAM scenario, accounting for less than 2% of final energy demand by 2030 in both scenarios
- Peat is only used in the residential sector where it has a current share of approximate 7% of total residential energy use. By 2030, the share of peat in the residential sector falls to approximately 3% of total demand in that sector

Renewables

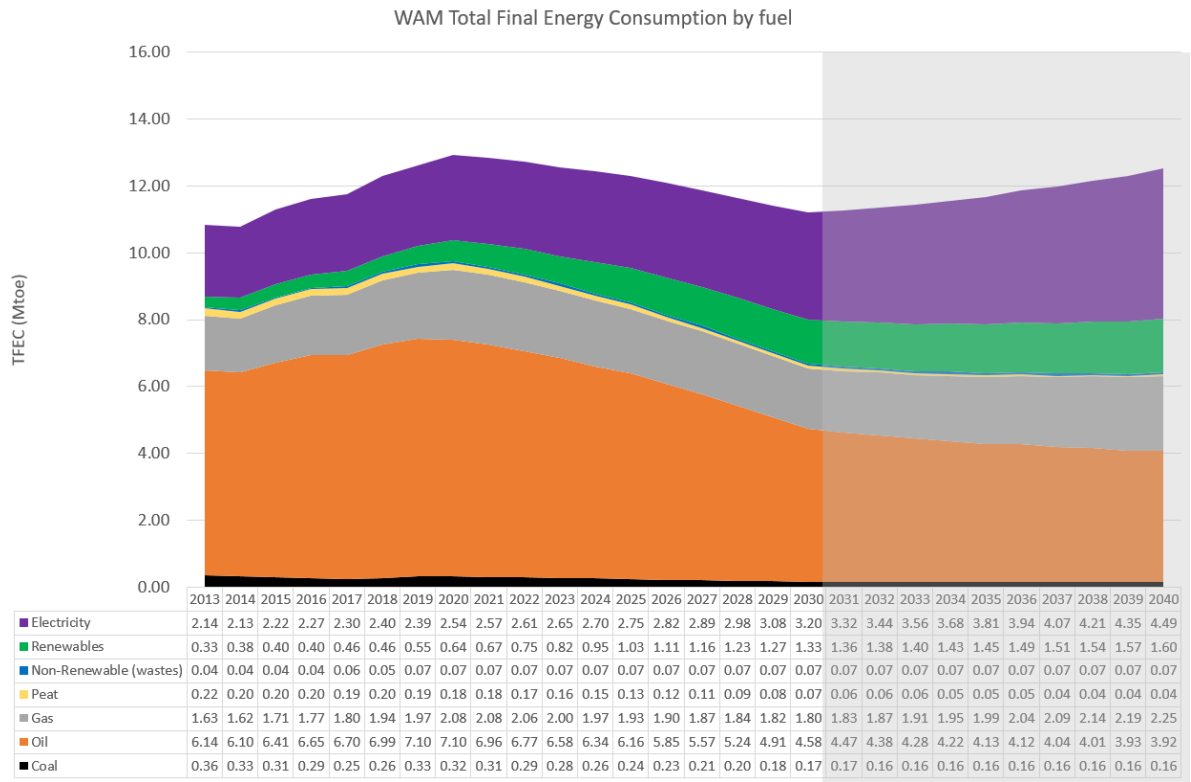
- The share of renewables in total final energy demand increases from the current level of just under 5% to 7% by 2030 in the WEM scenario and 12% in the WAM scenario. In the residential sector the roll out of heat pumps and energy efficiency measures increase the 2030 renewables share for 9% in the WEM scenario to 20% in the WAM. The difference is less pronounced in the services sector, where the share increases from the current level of 5% to 10% by 2030 in the WEM and 16% in the WAM due to additional heat pumps and energy efficiency. The renewables share in industry grows from the current level of 8% predominately from biomass to 10% by 2030 in the WEM scenario and 12% in the WAM scenario. In absolute terms, industry renewable energy grows by 56% over the period 2020 to 2030 and is 13% higher than the WEM scenario by 2030
- The share of renewable energy from bioliquids and biogas is currently 4% of all transport energy demand excluding aviation. The share increases to 5% in the WEM

scenario and 9% in WAM scenario by 2030. The introduction of electric vehicles and transport modal shift and energy efficiency measures means that in absolute terms the quantity of bioenergy does not grow in the WEM scenario. There is strong growth of 27% from 2020 to 2025 in the WAM scenario, before declining in line with the falling share of internal combustion engine vehicles in the stock post 2025



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Electricity	2.1	2.1	2.2	2.3	2.3	2.4	2.4	2.6	2.6	2.7	2.7	2.8	2.8	2.9	3.0	3.0	3.1	3.2	3.4	3.5	3.6	3.8	3.9	4.0	4.2	4.3	4.5	4.6
Renewables	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.7	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.3
Non-Renewable (wastes)	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Peat	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Gas	1.6	1.6	1.7	1.8	1.8	1.9	2.0	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.4	2.5	2.5	2.6	2.6	2.7	2.8	2.8	2.9	3.0
Oil	6.1	6.1	6.4	6.7	6.7	7.0	7.1	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.2	7.1	7.0	6.8	6.8	6.7	6.6	6.6	6.6	6.5	6.5	6.5	6.5	6.5
Coal	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

Figure 31: Total final energy consumption by fuel (WEM)



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Electricity	2.14	2.13	2.22	2.27	2.30	2.40	2.39	2.54	2.57	2.61	2.65	2.70	2.75	2.82	2.89	2.98	3.08	3.20	3.32	3.44	3.56	3.68	3.81	3.94	4.07	4.21	4.35	4.49
Renewables	0.33	0.38	0.40	0.40	0.46	0.46	0.55	0.64	0.67	0.75	0.82	0.95	1.03	1.11	1.16	1.23	1.27	1.33	1.36	1.38	1.40	1.43	1.45	1.49	1.51	1.54	1.57	1.60
Non-Renewable (wastes)	0.04	0.04	0.04	0.04	0.06	0.05	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Peat	0.22	0.20	0.20	0.20	0.19	0.20	0.19	0.18	0.18	0.17	0.16	0.15	0.13	0.12	0.11	0.09	0.08	0.07	0.06	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.04
Gas	1.63	1.62	1.71	1.77	1.80	1.94	1.97	2.08	2.08	2.06	2.00	1.97	1.93	1.90	1.87	1.84	1.82	1.80	1.83	1.87	1.91	1.95	1.99	2.04	2.09	2.14	2.19	2.25
Oil	6.14	6.10	6.41	6.65	6.70	6.99	7.10	7.10	6.96	6.77	6.58	6.34	6.16	5.85	5.57	5.24	4.91	4.58	4.47	4.38	4.28	4.22	4.13	4.12	4.04	4.01	3.93	3.92
Coal	0.36	0.33	0.31	0.29	0.25	0.26	0.33	0.32	0.31	0.29	0.28	0.26	0.24	0.23	0.21	0.20	0.18	0.17	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16

Figure 32: Total final energy consumption by sector (WAM)

Overall Renewable Share

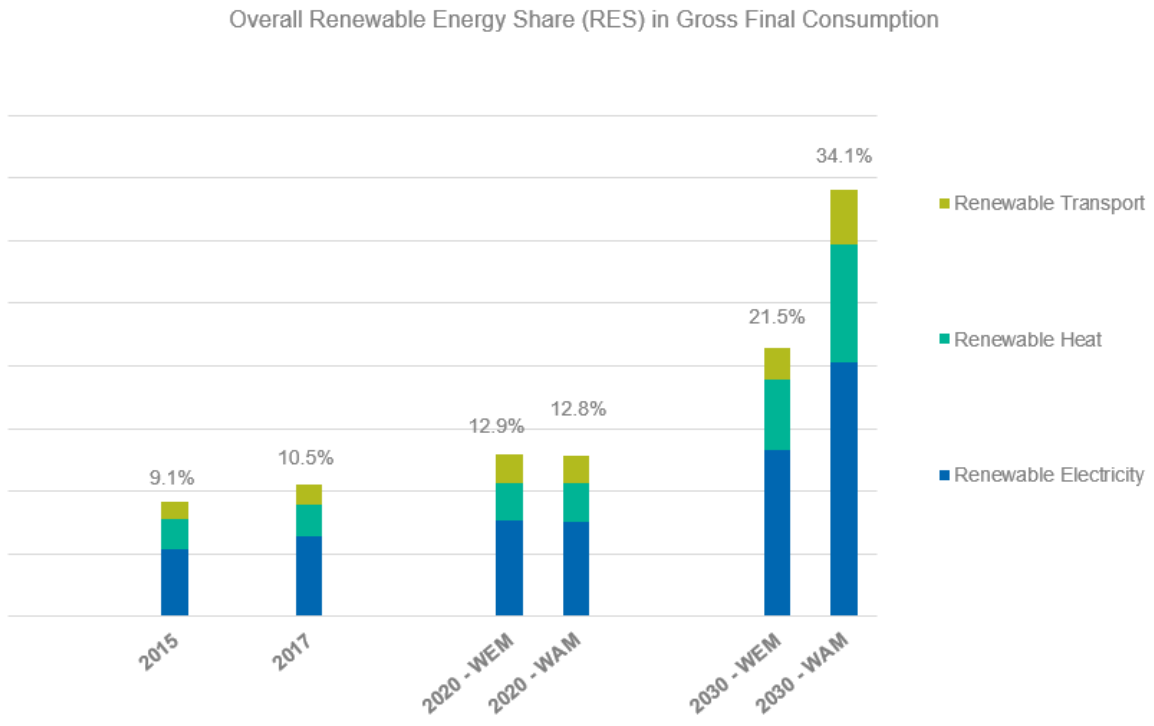


Figure 33: Overall RES shares in gross final consumption

Figure 33 indicates Ireland's overall renewable energy share (RES) of gross final energy consumption across electricity, heat and transport, historically and for 2020 and 2030. The impact of planned policies and measures can be observed by comparing the WEM scenario with the WAM scenario.

Impact of Planned Policies

- By 2020 the planned policies deliver an overall RES share of approximately 13%, falling short of Ireland's 16% 2020 target. The difference between the WEM and WAM scenarios is due in part to a lower RES-E contribution which had less co-firing in 2020 than the WEM scenario
    - Renewable electricity - RES-E will provide the biggest contribution towards the overall renewable energy target in 2020.
    - In 2020 the biggest impact in the transport sector will be from biofuels
    - The Support Scheme for Renewable Heat (SSRH) will only make a 1-year contribution to the overall target
- In 2030, the impact of planned policies across the sectors on overall RES share is significant. It is anticipated that planned polies will deliver a RES share of 34.1 % by 2030 in the WAM scenario
    - The biggest contributions is from RES-E (20.2% towards overall RES) along with Corporate Power Purchase Agreements are assumed to deliver almost 70% RES-E by 2030 (2/3 RESS and 1/3 CPPAs)
    - RES-H contributes 9.3% towards overall RES, with the full implementation of the Support Scheme for Renewable Heat (SSRH), and heat pump uptake through building regulations driving growth of renewables
    - Transport makes up the balance of the 2030 overall RES share, contributing 4.36 percentage points primarily through the biofuels obligation scheme

Further detail on the impacts of planned policies on renewable target achievement for each sector are provided in the sections that follow.

Renewable Transport – RES-T

The impacts of planned policies and measures in the transport sector can be observed by comparing the scenarios and in Figure 34.

- By 2020 in WAM the statutory biofuel obligation is increased to require 11 litres of biofuel in every 100 litres of fuel (with the contribution of multiple counting included in

this figure). The corresponding average blend levels by volume are 5% in petrol and 6.9% in diesel'. This brings the standalone RES-T target (i.e. the target including multiple counting factors, rather than the contribution to the overall renewables share) to 11.3% in the WAM scenario. This compares with 10.9% RES-T in 2020

- By 2030 the planned policies and measures included in WAM have an even more significant impact, delivering an additional 15.8 percentage points to the regulation RES-T target compared with the WEM scenario. Through increased ambition in Ireland's Biofuel Obligation Scheme, average biofuel blends of E10 and B12 reached by 2030 (compared with E5.0 and B7 in the WEM scenario). All of the biodiesel supplied in the WAM scenario is assumed to come from feedstocks listed in Annex IX parts A and B and their contribution will therefore count twice towards the standalone RES-T target. The WAM scenario also includes just over 936,000 electric vehicles on the road in 2030 compared with just under 489,000 in the WEM scenario, with the greater ambition supported by the provisions in Ireland's 2019 Climate Action Plan

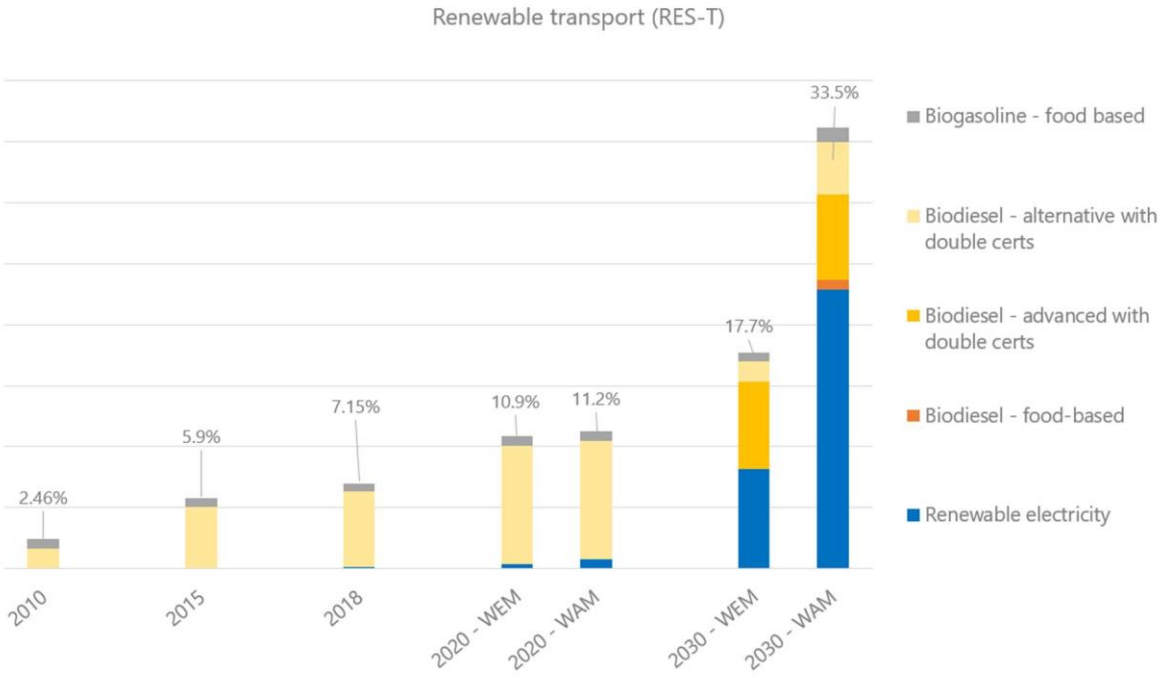


Figure 34: Renewable transport (RES-T)

Renewable Electricity – RES-E

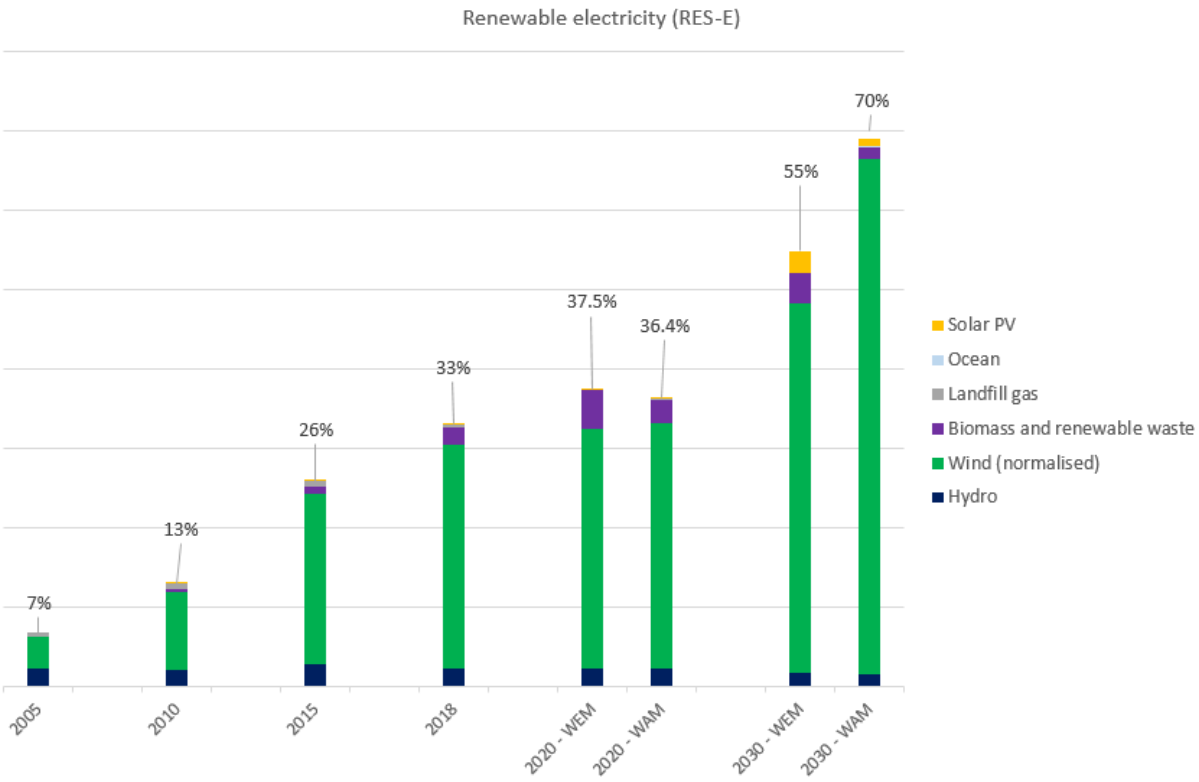


Figure 35: Renewable Electricity (RES-E)

Figure 35 shows the evolution of the RES-E share, over the two modelled scenarios, historically and projected for 2020 and 2030. This figure is discussed comparing the impact of planned policies between the WEM and the WAM.

- It is anticipated in 2020 that a RES-E of 37.6% is achieved in the WAM scenario compared to 36.3% in the WEM scenario. This 1.3 percentage point difference is driven in part by less co-firing in 2020 in the WAM scenario, which assumes two of the peat plants will not be co-firing in 2020 because of unsuccessful planning application for co-firing. However, it should be noted that less biomass used for electricity generation in the WAM scenario leads to a slight increase of renewable heat in that year and approximately the same for overall renewable energy share
    - in 2020, wind (primarily onshore) is the predominant contributor to renewable electricity (making up approximately a third of all electricity generation)
    - The installed capacities for renewables for wind and solar in 2020 are informed by the Regulator (CRU) ECP1 decision (Enduring Connection Policy)

    - biomass renewables making up 2.1 percentage points of 2020 RES-E with policies. This is due to 40 % co-firing up to REFIT threshold for biomass support in one peat plant (Edenderry) and also generation from biomass CHP

- In 2030 there is a more prominent impact of RES-E policies, with achievement of 70 % RES-E in the WAM scenario. This compares with the assumed deployment of renewables to reach 55% RES-E in 2030 in the WEM and as per Ireland's draft NECP
    - The growth in renewables in WAM is driven by a new Renewable Energy Support Scheme (RESS) approved by the Government in July 2018. Under the Government's Climate Act, this scheme aims to achieve a 70% RES-E by 2030 through an auction-based mechanism
    - To achieve this 70% RES-E in 2030 it requires an increase by 324% in renewables capacity between 2018 and 2030 (or average of 740 MW additional capacity per year). This compares with a historical onshore wind deployment rate of 200 MW. This acceleration in the wind deployment rate is also driven by an additional 37% increase in electricity demand projected between 2018 and 2030
    - In 2030 there is a broader mix of renewables, with growing shares for both solar and offshore wind
    - Deployment of offshore wind capaciy is assumed to grow from 2025 onwards in line with assumptions from Ireland's 2019 Climate Action Plan.
    - Hydro capacity remains unchanged over the time horizon and sees a reducing share as other renewables in the mix grow
    - Deployment of 30 MW of ocean energy is modelled in WAM by 2030 to take account of planned deployment of demonstration projects

Renewable Heat – RES-H

The impacts of planned policies and measures on renewable heat can be observed by comparing the scenarios in Figures 36 and 37:

- Planned policies deliver an additional 0.2 percentage points of renewable heat by 2020 in the WAM scenario
- Planned policies contribute an additional 10 percentage points to RES-H by 2030 in the WAM scenario relative to the WEM. The increase is driven by the full delivery of the SSRH in the non-ETS industry and services sectors, growth in use of biogas, and

the impact of the heat pump grant for homes switching from oil boilers with assumed 377,000 heat pumps deployed in existing homes by 2030 and 178,000 deployed in new homes. The uptake of low carbon heating technologies in new buildings is driven by building regulations and an effective ban on oil boilers (2022) and gas boilers (2025) in new dwellings in the WAM scenario

- Uptake of low carbon heating solutions in industry and service sectors is modelled using SEAI's BioHEAT model that captures the investment decision making process, factoring in fuel and technology prices, attitudes of investors and building stock characteristics. In that, the WAM scenario uptake of biomass boilers and heat pumps continues to grow in these sectors in the latter half of the 2020s (after SSRH supports come to an end)
- The BioHEAT model also keeps track of the allocation of biomass resource across all energy end-use sectors. It accounts for the impact of biomass use in electricity on the availability of biomass resource for heating and the consequent impact on the price of biomass fuels. The WEM scenario has a higher level of biomass co-firing in Ireland's peat power stations out to 2030, therefore resulting in higher biomass prices in the heating sector and thus uptake of biomass heating technologies is partly curtailed. This explains why the contribution of biomass to RES-H is slightly higher in the WAM scenario compared with the WEM in 2020 with the disparity increase by just over two percentage points by 2030 (as the WAM includes the most recent assumptions based on the closure of two of the peat plants at the end of 2020)

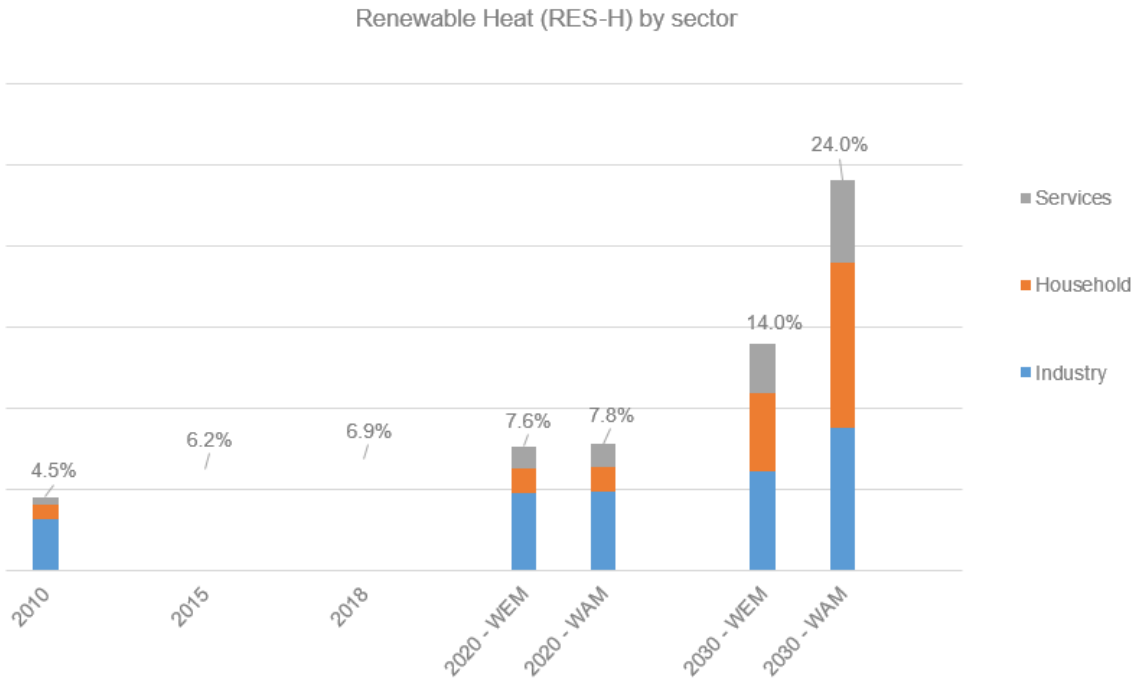


Figure 36: Renewable heat by sector (RES-H)

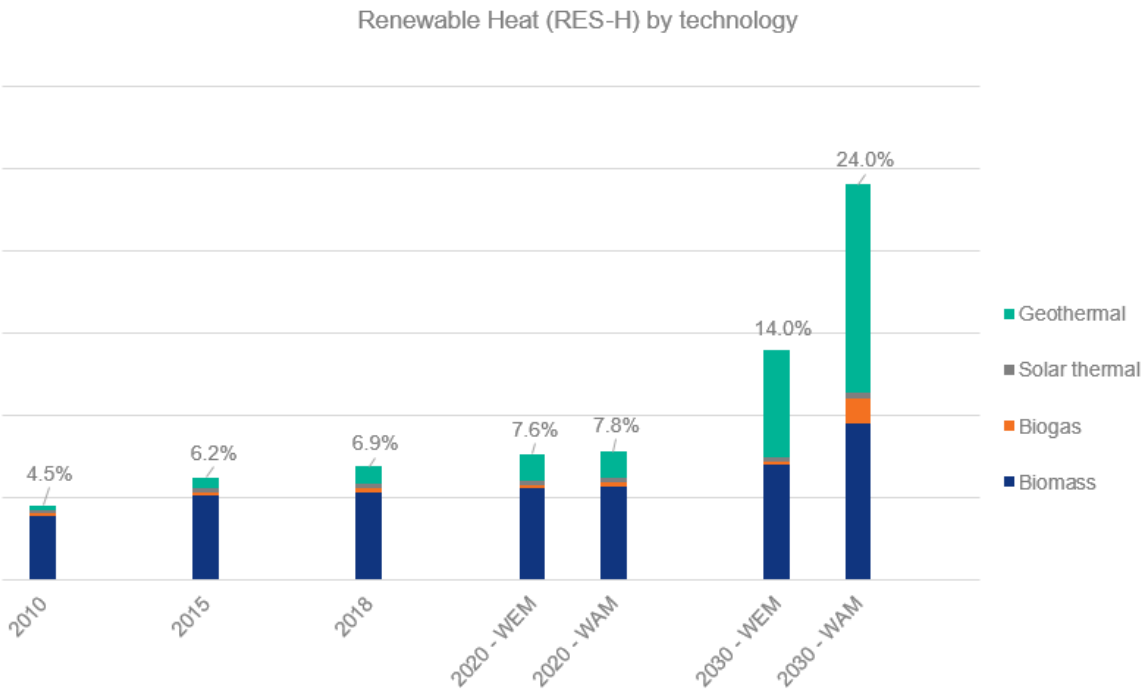


Figure 37: Renewable heat by technology

Projections in Total Greenhouse Gas

The greenhouse gas emissions projections prepared for the National Energy and Climate Plan take into account projected activity data provided by a number of key data providers including:

- Updated energy projections provided by the Sustainable Energy Authority of Ireland (SEAI) in January 2020.
- Agricultural projections provided by Teagasc in November which consider the impact of Food Wise 2025 for the agriculture sector.

The emissions projections that have been prepared for the National Energy and Climate Plan are projecting from the 2018 inventory baseline year (February 2020 version).

The Projections with planned policies and measures scenario assumes implementation of the existing policies and measures and additional policies and measures that are included in Ireland's Climate Action Plan.

In terms of sectors covered by the Effort Sharing Decision under this scenario Ireland is projected to cumulatively exceed its compliance obligations by approximately 12.6 Mt CO_2 equivalent over the period 2013-2020.

In terms of the same sectors covered under the Effort Sharing Regulation the projections indicate that Ireland will have a surplus of approximately 27.8 Mt CO_2eq over the 2021-2030 period assuming both ETS and LULUCF flexibilities as set out in the Effort Sharing Regulation are fully utilised. If only the LULUCF flexibility were to be utilised that surplus would be reduced to 8.9 Mt CO_2eq.

Under the WAM scenario total emissions (excluding LULULCF) are projected to decrease by 33% and 28.5% by 2030 and 2040 respectively compared to 2005 levels (from the 1990-2018 inventory).

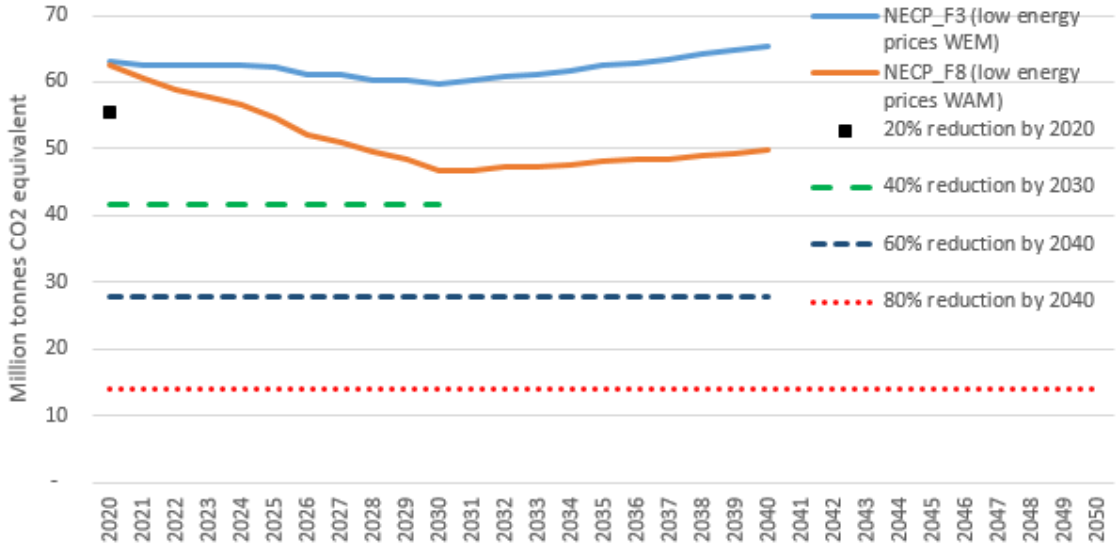


Figure 38: All greenhouse gas emissions with targets

ETS emissions are projected to decrease by 42% and 17.7% by 2030 and 2040 respectively under the WAM scenario compared to 2005 levels.

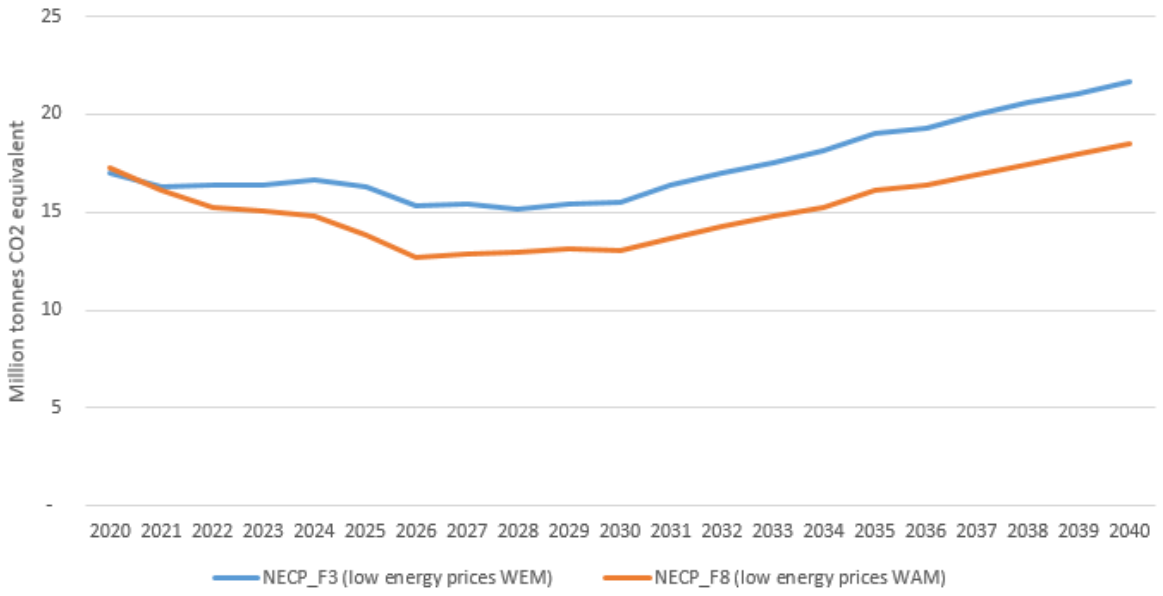


Figure 39: ETS emissions (WEM and WAM)

Total emissions from sectors under the Effort Sharing Regulation are projected to decrease by 28.6% and 33.6% by 2030 and 2040 respectively compared to 2005 levels under the WAM scenario.

- Emissions from Energy Industries (corresponding to IPCC Sector 1.A.1.) are projected to decrease by 56.3% and 34.6% by 2030 and 2040 respectively compared to 2005 levels.

- Emissions from Industry (corresponding to IPCC Sector 1.A.2.) are projected to decrease by 13.9% by 2030 and increase by 8.4% by 2040 compared to 2005 levels.
- Emissions from Residential (corresponding to IPCC Sector 1.A.4.b.) are projected to decrease by 59.6% and 62.2% by 2030 and 2040 respectively compared to 2005 levels.
- Emissions from Tertiary (corresponding to IPCC Sector 1.A.4.a.) are projected to decrease by 44.6% and 39.1% by 2030 and 2040 respectively compared to 2005 levels.
- Emissions from Transport (corresponding to IPCC Sector 1.A.3.) are projected to decrease by 42.1% and 66.4% by 2030 and 2040 respectively compared to 2005 levels.
- Emissions from Agriculture (corresponding to IPCC Sector 3.) are projected to decrease by 7.5% and 6.2% by 2030 and 2040 respectively compared to 2005 levels.
- Emissions from LULUCF are projected to increase by 4.2% and 18.8% by 2030 and 2040 respectively compared to 2005 levels.

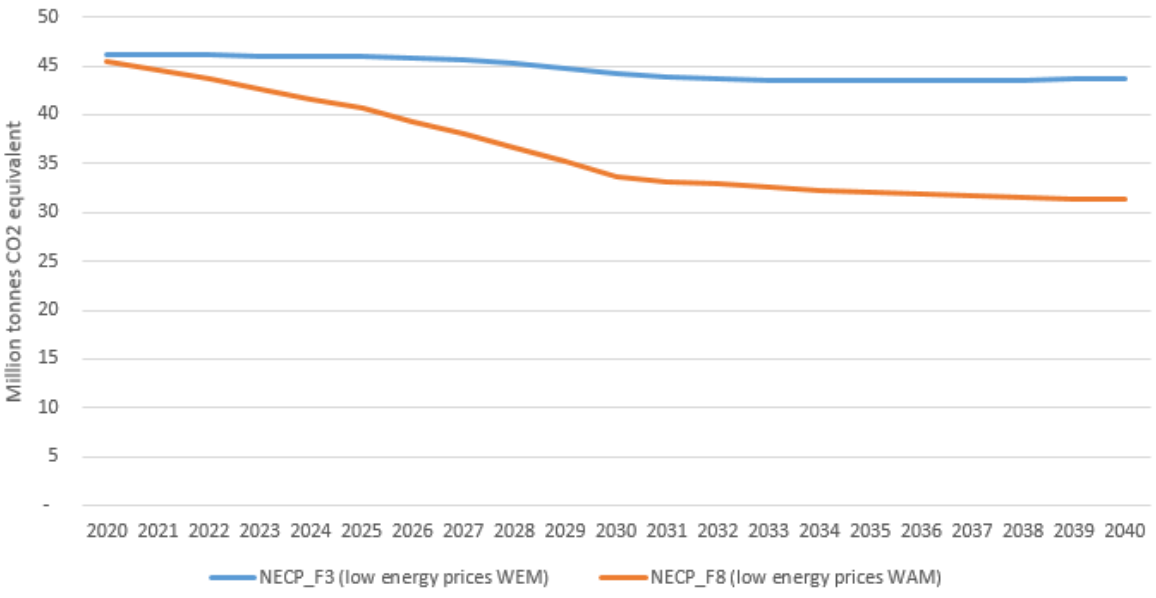


Figure 40: Effort sharing sector total greenhouse gas emissions

	Cumulative emissions from 2021 including non-energy use agriculture, wastes and industrial process emissions, as well as LULUCF									
Non-ETS sectors (kt CO_{2eq})	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
NECP_F3 (low energy prices WEM)	46,181	92,346	138,406	184,431	230,389	276,250	321,854	367,059	411,835	456,009
NECP_F8 (low energy prices WAM)	44,507	88,168	130,870	172,505	213,237	252,603	290,733	327,388	362,566	396,214

Figure 41: Effort sharing sector cumulative greenhouse gas emissions

Projections in Air Pollutant Emissions

Positive changes have been made since 1990, benefiting air quality and human health. Fuel switching from coal and peat to natural gas and kerosene in the residential sector has reduced particulate matter pollution, particularly important in urban areas. A higher penetration of renewables in electricity generation and changes in the age structure of the national vehicle fleet to newer, lower emission class vehicles, have also resulted in a general downward trend in emissions of many pollutants.

Challenges remain for Ireland however in relation to continued compliance with its obligations under the NEC Directive. Whilst currently in compliance with its international ceilings for most gases, the latest trends and projections indicate that Ireland will have to implement significant mitigation measures to remain in compliance out to 2030.Implementing the measures announced in the Climate Action Plan will be important but not sufficient to meet all future ceilings.

Looking towards the future, non-compliance with emission ceilings for NOx and NMVOCs is projected in 2020 and NOx compliance in 2030 will require full implementation of the measures in the Climate Action Plan, including significant electrification of the transport sector. Compliance with the 2030 NMVOC ceiling will require new measures.

Ireland exceeded its emission ceiling for NH3 in 2018, having already done so in 2016 and 2017. The exceedance was driven primarily by increased animal numbers and fertiliser nitrogen. Continued non-compliance with the ammonia ceiling over the entire compliance period to 2030 is currently projected. Widespread adoption of on farm measures aimed at reducing emissions, such as the use of protected urea fertilisers and low emissions slurry spreading, are now required to reverse this trend.

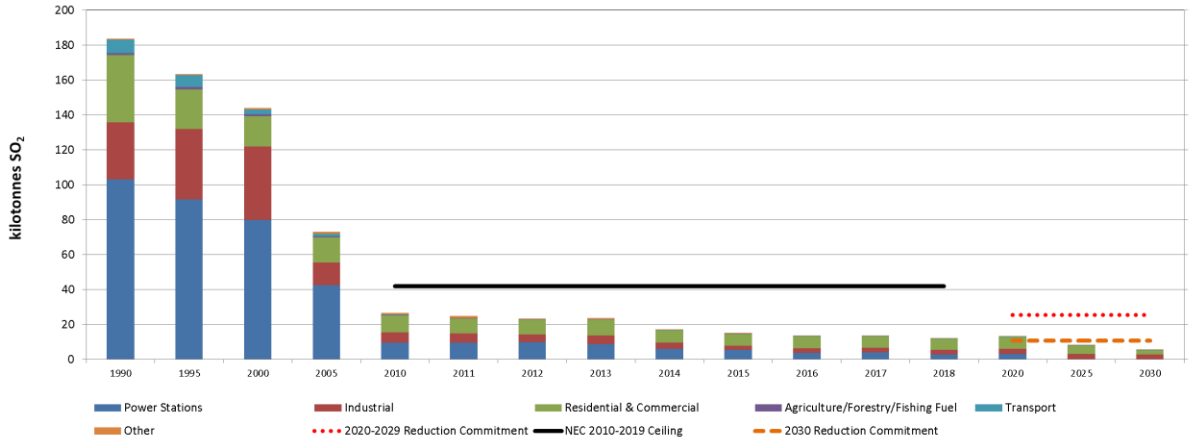


Figure 42: Trends in SO_2 emissions, current and future emission ceilings

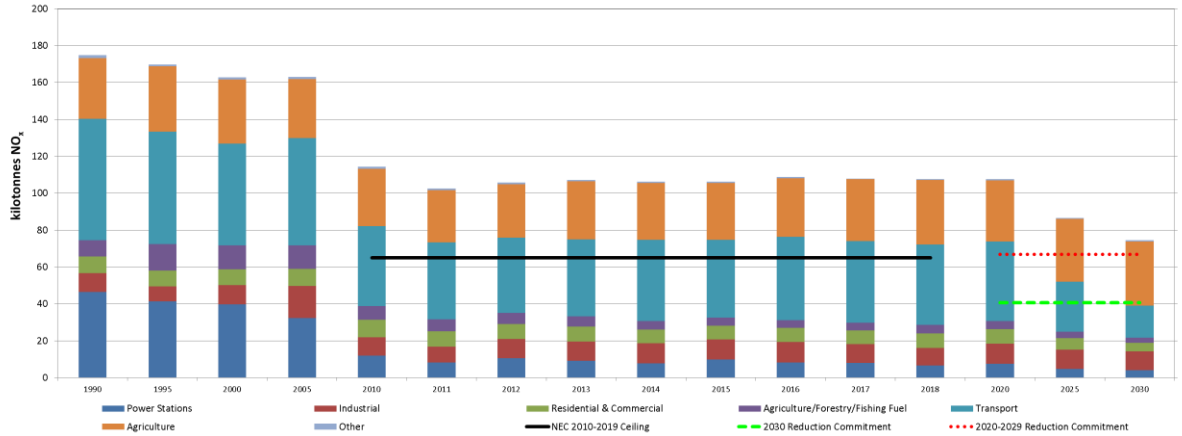


Figure 43: Trends in NO_x emissions, current and future emission ceilings

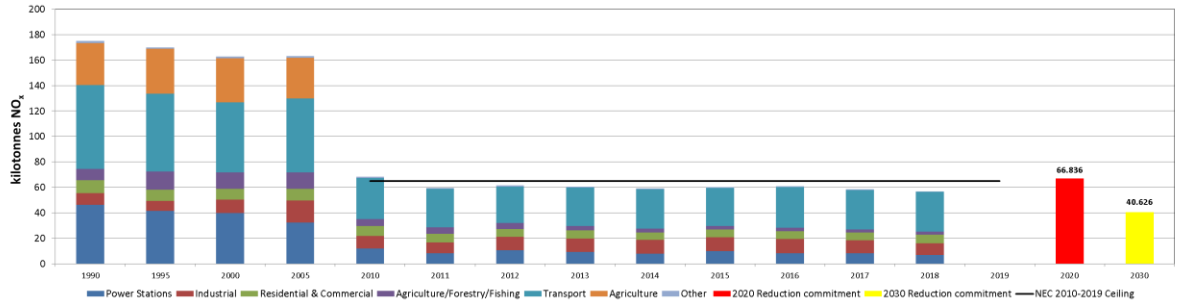


Figure 44: NO_x emissions after use of flexibility mechanism

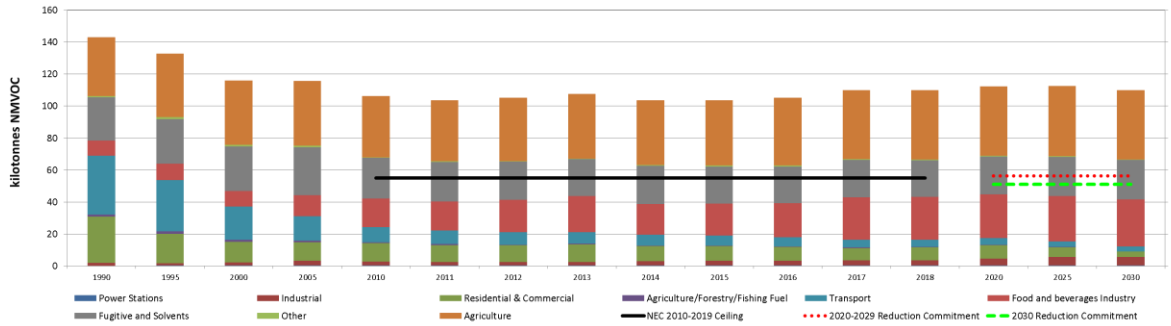


Figure 45: Trends in NMVOC emissions, current and future emission ceilings

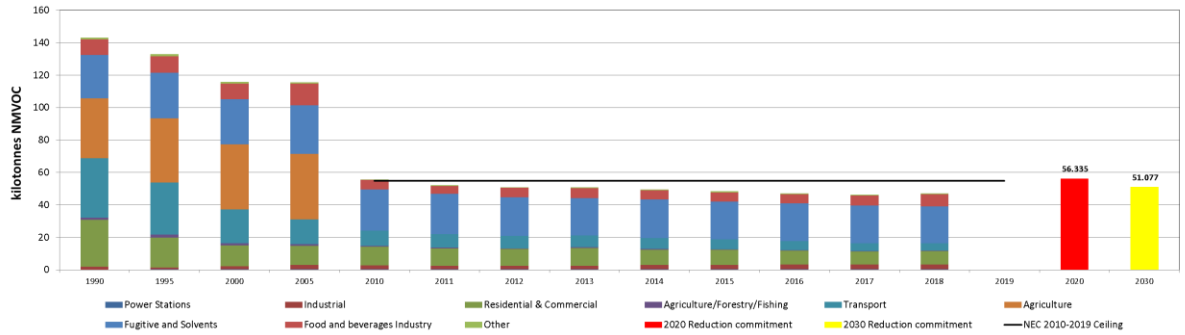


Figure 46: NMVOC emissions after use of flexibility mechanism

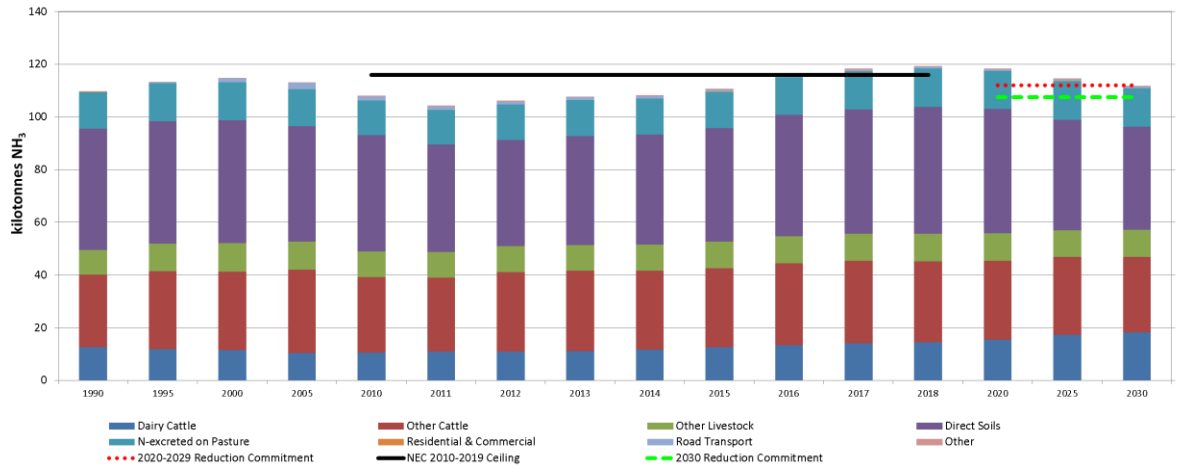


Figure 47: Trends in NH_3 emissions, current and future emission ceilings

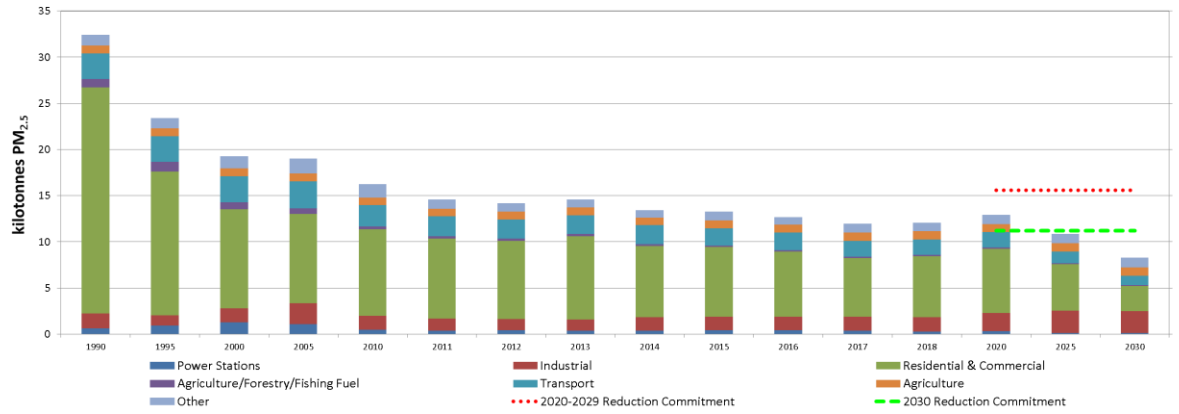


Figure 48: Trends in $PM_{2.5}$ emissions, current and future emission ceilings

ii. Assessment of policy interactions (between existing policies and measures and planned policies and measures within a policy dimension and between existing policies and measures and planned policies and measures of different dimensions) at least until the last year of the period covered by the plan, in particular to establish a robust understanding of the impact of energy efficiency / energy savings policies on the sizing of the energy system and to reduce the risk of stranded investment in energy supply

The Irish Government 2019 Climate Action Plan (CAP) is the main difference between the With Existing Measures scenario (WEM) and the With Additional Measures (WAM) scenario. Published in June 2019, the CAP commits to achieving a net zero carbon energy system by 2050 and a 2030 pathway that is consistent with the 2050 target.

Many of the planned policies and measures affecting the evolution of the energy system are those same policies included in the With Existing Measures scenario (WEM) but with additional levels of ambition assumed in the With Additional Measures (WAM). For example, a Renewable Electricity Support Scheme (RESS) is included in all scenarios but with different levels of ambition for renewable electricity in 2030. Furthermore, a key measure in the CAP is an increasing carbon tax to 2030. The planned increasing carbon tax is an example of a crosscutting measure that will interact with all other policies and measures. Therefore, it is not possible to assess the policy interactions for all policies and measures.

The CAP includes the following policy measures relevant in this context:

- A target of a 30% greenhouse gas emissions reduction by 2030 achieved through
    - A trajectory for the price of carbon increasing annually to 2030 to create incentives that help avoid locking in carbon intensive technologies.

- The carbon tax effectively increases consumer energy costs, thus curtailing energy demand growth and reducing future expansion of the energy system. The carbon tax curtails energy demand increases in all non-Emissions Trading sectors.
    - Energy efficiency ambition
        - 50% energy efficiency improvement in the public sector relative to a 2005 baseline.
        - Increased ambition for national energy efficiency programmes in the residential and services sectors under the WAM scenario deliver additional savings in final energy demand.
        - These additional savings help to reduce the burden on supply-side policies (such as RESS and the Biofuels Obligation Scheme (BOS) in meeting their objectives.
        - Increasing the stringency of building regulations, effectively banning oil boilers from 2022 and gas boilers in new dwellings from 2025, and roll out of heat pump technologies in the residential and services sectors.
        - The overlap between the building regulations, the ban of fossil-fuel boilers and the heat pump rollout is tempered by the intention that over two-thirds of the roll-out of heat pumps designed to be for existing dwellings.
        - Fossil fuel boilers are effectively banned through a move to meet Nearly Zero Energy Building (NZEB) regulations.
        - Heat pumps are more efficient than methods relying on fuel combustion and direct electric heating, so an increasing heat pump share in supplying heat demand slows or eliminates growth in heat demand.
        - There is also an overlap with energy-efficiency improvements, which lower the overall heat demand.
    - Biofuels blending of 12% biodiesel and 10% biogasoline, as well as a 30%-33% share of electric vehicles across the entire vehicle fleet.
        - Electric drive trains are more efficient than their fossil-fuelled counterparts, therefore, a greater number of electric vehicles contributes towards lowering the total transport energy demand.

        - An increasing share of electric vehicles in the fleet also reduces the quantity of biofuels required to meet the target Biofuels Obligation scheme blending rates.
    - 70% renewable electricity share
        - There are inherent efficiency improvements through the process of electrifying heat and transport, that should slow the increase in electricity demand and help to delay or avoid further fossil-fuelled power-plant growth, as well as lowering the renewables installed capacity required to meet a particular share of renewable electricity.

The impact of the additional energy efficiency supports can be noted by comparing the assessment of primary energy savings in the WAM scenario with the WEM scenario in Tables 52 and 53. Most of the additional savings are from reduced oil consumption, particularly in home and the services sector heating demand.

In the With Existing Measure (WEM) scenario, while some of the energy efficiency programmes are assumed to deliver sustained savings out to 2022 others see increased ambition in line with the Irish Government's commitment in the National Development Plan (NDP). In comparison in the WAM scenario there is increased ambition (beyond the NDP) in line with the Government's 2019 Climate Action Plan. The WAM scenario is projected to deliver 15.8 TWh of additional savings above WEM in 2030.

Table 52: Energy efficiency contribution (WEM)

Energy Efficiency Contribution	2018	2020	2030	2040
Primary Energy Savings (GWh)	19,420	23,458	46,362	65,346
Total Primary Energy Consumption (GWh)	170,922	186,100	192,905	227,436
Savings as Share of Total Consumption (%)	11.4%	12.6%	24.0%	28.7%

Table 53: Energy efficiency contribution (WAM)

Energy Efficiency Contribution	2018	2020	2030	2040
Primary Energy Savings (GWh)	19,326	25,103	62,171	85,581
Total Primary Energy Consumption (GWh)	170,922	181,716	159,146	187,254
Savings as Share of Total Consumption (%)	11.3%	13.8%	39.1%	45.7%

iii. Assessment of interactions between existing policies and measures and planned policies and measures, and between those policies and measures and Union climate and energy policy measures

The existing and planned policies and measures set out under Chapters 2 and 3 under the five dimensions will significantly contribute towards the achievement of the EU energy and climate goals. These policies and measures ensure that Ireland is on course to achieving our long term goals towards 2050.

There is potential for overlaps between the Energy Union climate and energy policies and national policy measures. In the Irish approach, the impacts of the Energy Unions measures are usually applied first. Then the impact of additional national measures are calculated sequentially in the model, thereby mitigating overlaps as much as possible.

In particular, the building regulations and efficiency of passenger car regulations are likely to overlap with additional national policies, such as, the effective ban on fossil fuel boilers in new buildings and the roll out of electric vehicles (lowering the average vehicle stock emissions performance). Some national policies will aim to move the markets ahead of EU policies such as happened with the national ban on incandescent light bulbs ahead of a similar European wide ban.

5.2. Macroeconomic and, to the extent feasible, the health, environmental, employment and education, skills and social impacts including just transition aspects (in terms of costs and benefits as well as cost-effectiveness) of the planned policies and measures described in section 3 at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures

The Macroeconomic forecasts published by the Department of Finance, contained in the annual Budget and Stability Programme Updates, take into account policies introduced at an aggregate level over the forecast horizon (typically 3 to 5 years).

In so far as policies impact on economic growth and employment, it is the overall or aggregate impact of the policies that will impact on the economic forecast rather than an individual measure. Ireland's latest macroeconomic forecast notes that a confluence of factors is contributing to an increasingly fragile global economy at present. Rising trade tensions, fading fiscal stimulus in the US, a slowing Chinese economy, emissions-related difficulties in the German auto sector and uncertainty related to the timing and form of the UK's exit from the EU, are all dampening global economic activity. Many of these factors are inter-related and, at least at this stage, appear unlikely to subside in the near-term.

In addition to the contribution of the policies and measures contained in this Plan to achieve our climate and energy targets, many of the changes that are required will have positive economic and societal co-benefits, including cleaner air, warmer homes, and a more sustainable economy for the long term. In line with the UN Sustainable Development Goals, climate action must be seen as complementary to other important policy objectives, such as promoting sustainable economic development pathways, improving energy security, and addressing air pollution impacts on human health. For example, a significant shift away from internal combustion engine vehicles in the transport sector, and the retrofitting of existing buildings with electricity-powered heat pump systems, are expected to result in significant improvements in local air quality metrics and health outcomes.

Rising to this challenge is important not just for Ireland's long term economic and societal interests, but also in relation to the attractiveness of Ireland as a location for Foreign Direct Investment, as a tourism destination, and as a source of safe, high-quality agricultural and food products. In addition, our increased climate ambition will help to secure our international reputation, which in turn will underpin our ability to promote international policy objectives. This includes the priorities set out in Ireland's new international development policy A Better World, which explicitly places climate action as a core policy priority for Ireland's global partnerships, in recognition of the adverse and dangerous impacts that it poses to the realisation of the Sustainable Development Goals.

IEA analysis suggests energy efficiency retrofits in buildings create conditions that support improved occupant health and well-being. In terms of distribution, such benefits are particularly prevalent among vulnerable groups such as children, the elderly and those with pre-existing illnesses. Benefits include improved physical health such as reduced symptoms of respiratory and cardiovascular conditions, rheumatism, arthritis and allergies, as well as fewer injuries. In quantifying these benefits, studies have found benefit to cost ratios of up to 4:1 when health and well-being impacts were included, with health benefits representing up to 75% of overall benefits. Improved mental health (reduced chronic stress and depression) has, in some cases, been seen to represent as much as half of total health benefits. Realised health improvements generate downstream social and economic impacts, including lower public health spending. These health and well-being benefits are being validated in an Irish context under the Warmth and Wellbeing scheme.

Decarbonisation of heat and transport may also lead to health gains where levels of fine particulate matter (PM2.5) air pollution are reduced. Biomass combustion for renewable heat can increase levels of air pollution so careful consideration of this potential negative health impact is required when assessing renewable heat policy. The WHO guidelines recognise

that “no threshold has been identified below which there is no damage to health. Therefore, the WHO recommend aiming for the lowest concentrations of particulate matter possible.”

Therefore, reduced adverse health impacts from reduced air pollution in Ireland can be a significant co-benefit of the decarbonisation of power generation, heat and transport where climate and clean air policy objectives are fully aligned.

Recent research shows that air pollution has greater impacts on human health at lower levels than was previously understood. The impacts of air pollution (in particular nitrogen pollution) on biodiversity and habitats are an area of growing concern. This increased understanding of the importance of air pollution has led to a requirement for strengthening policy responses on air quality for which the Department of Communications, Climate Action and Environment has primary responsibility. The impact of sectoral policies on the quality of the air we breathe, such as energy, transport and agriculture, is becoming clearer. Initiatives to tackle greenhouse gas emissions over the last decade have led to the incentivisation of biomass for heating and diesel for motoring while in the agricultural sector increased livestock numbers has highlighted the impacts of, and challenges in, reducing ammonia emissions as well as greenhouse gases such as methane. These unintended consequences illustrate the need for a means to integrate air quality concerns into broader policy making. They also demonstrate the need to align air quality, climate and energy policy to ensure positive outcomes for human health and the environment.

It is evident that the transition will bring many opportunities, for example:

- Renewables, as the installed renewable power capacity goes from 3.5 GW to 17.5 GW huge opportunities will emerge
- Offshore technologies are only applied at a very small level in Ireland now, but the scale of the opportunity has been estimated at 70 GW
- The 25,000 homes currently participating in energy retrofits represent an estimated €150m for the retrofit sector. This sector is expected to quadruple in size
- Many new technologies – micro-generation, anaerobic digestion, biomass, heat recovery, carbon capture, biomethane – will come to maturity bringing new business opportunities

As set out in Future Jobs Ireland 2019, these opportunities will require clear planning by sectors and agencies. The education and training agencies will be required to develop the professional expertise, the apprenticeship and traineeship and the certification capacity to turn these needs into new start-ups and good livelihoods. Developing the opportunities in a decarbonising economy is a key pillar of our Climate Action Plan. The opportunities

emerging in the areas of retrofitting, new farming methods, soil remediation and the bioeconomy, for example, will be systematically developed through research and innovation, enterprise hubs and skill development both at a national and regional level.

Citizen involvement is a key pillar of our Climate Action Plan. To underpin this plan sets out specific strategies including:

- Engagement Capacity Building and empowering Local Community Action
- Realising the new economic opportunities in communities and regions
- Just Transition for those facing particular challenges in adjusting through reskilling, energy poverty schemes and community participation
- Empowering the new generation to have their voices heard and get access to the science and the opportunity to lead change

Investment in the low carbon economy has the potential to create quality jobs and support local communities and workers in regions most strongly impacted by the on-going transformation to a decarbonised society. Fully realising the economic opportunities in the low carbon economy is vital to ensuring a 'Just Transition'. The Just Transition Review Group will help to improve the resilience of communities and households by providing information and building capacity, taking account of the distinctive needs of urban and rural communities. Improved training and support initiatives will also be provided. The Just Transition Fund will be devoted to those priorities identified by local communities. It is anticipated that energy efficiency investment undertaken will support over 400 environmentally sustainable jobs, with up to 100 more jobs through expanded peatlands rehabilitation. Further detail on the policies and measures regarding the Just Transition are set out at section 3.1.3(iv).

A recent report issued by Irish Wind Energy Association (IWEA) on 'Investment and jobs in Ireland's offshore wind industry' found that delivering on the climate action plan indicated target of 3.5 GW of offshore wind energy by 2030 would equate to a lifetime investment spend worth €17.9bn. Today Irish firms could only capture 22% of this investment but, with the right support, this could quickly grow to 31-36% and eventually as much as half. The report also indicated that meeting this target by 2030 could generate 2500 local development and construction jobs and 700 permanent operations and maintenance jobs. The report recommends that offshore wind enterprise zones are needed urgently to ensure Ireland takes advantage of this opportunity.

Energy efficiency improvements can deliver benefits across the whole economy, with direct and indirect impacts on economic activity, employment, trade balance and energy prices. In

general, analysis of GDP changes due to large-scale energy efficiency policies show positive outcomes with economic growth ranging from 0.25% to 1.1% per year. The potential for job creation ranges from 8 to 27 job years per EUR 1 million invested in energy efficiency measures.

5.3. Overview of Investment Needs

i. Existing investment flows and forward investment assumptions with regard to the planned policies and measures

Building on Ireland's 2017 National Mitigation Plan, Project Ireland 2040, published in 2018, ensures that past patterns of carbon intensive development and growth will not be repeated. The National Development Plan (NDP) 2018-2027 sets out investment priorities of €21.8bn for climate action for the 10 year period of which €7.6bn would come from the Exchequer. The remaining investment would be made by Ireland's semi-state companies and by the private sector. In addition, some €8.6bn funding has been made available for sustainable mobility projects, mostly in public transport. The starting point for the implementation of the NDP was the identification of infrastructure and investment priorities detailed in chapter 5. The evidence in chapter 2, in combination with the prioritisation by departments of projects outlined in chapter 5, provides a comprehensive national picture of critical infrastructural needs. A full mid-term review of the NDP will be undertaken in 2022, to allow Government to take stock of progress in terms of delivery of the planned projects and programmes, and to allow Government to review and reaffirm its investment priorities.

The four Project Ireland 2040 funds, comprising the Climate Action Fund, Disruptive Technologies Innovation Fund, the Urban Regeneration and Development Fund, and the Rural Regeneration and Development Fund, will have a collective budget amounting to an estimated €4bn over the ten-year period. Each of the four funds has been established to pursue distinct objectives, which must also be aligned with the strategic investment priorities and the National Strategic Outcomes of Project Ireland 2040. We will ensure that, within their mandates, the selection criteria for each of the funds will operate to promote low-carbon investments.

The goal of the €500m Climate Action Fund is to leverage investment by public and private bodies to contribute to the achievement of Ireland's energy and climate targets. The Department of Communications, Climate Action and Environment has responsibility for implementing the fund. The Fund is one of four established under the NDP. It will support initiatives that contribute to the achievement of Ireland's climate and energy targets in a cost-effective manner. It also seeks to facilitate projects that contribute to other Government policy priorities including:

- Supporting innovation and capacity building towards the development of climate change solutions capable of being scaled and delivering benefits beyond a once-off impact
- Generating wider socio-economic benefits such as job creation, air quality improvements, reduction in fuel poverty, bio-diversity and community resilience and development

The successful projects for the first round of the Fund were announced in November 2018. Nearly 100 applications were received and €77 million was allocated to 7 projects, leveraging a total investment of €300 million.

The NDP contains important measures to make Ireland's development more climate friendly and established a Climate Action Fund, designed to stimulate innovation and pioneer efforts across Irish society. This provided a solid foundation for Ireland to develop and publish its all of Government Climate Action Plan in 2019, which will deliver a step-change in our emissions performance over the coming decade. The cumulative costs of the commitments included in the Climate Action Plan will be delivered within the normal budgetary and estimates process, and the NDP ceilings.

The modelling underpinning the NECP is based on planned climate and energy measures and investment under Project Ireland 2040 being fully delivered together with delivery of the policies and measures set out under the Climate Action Plan, the 70% RESS renewable electricity objective being achieved (funded via the PSO levy) with the necessary grid enhancements and investment being undertaken in the framework of EirGrid's DS3 programme to permit the grid to accommodate that level of variable generation. The biofuels obligation scheme will continue to be used to ensure increased amounts of biofuels and that funding for the support scheme for renewable heat will be extended beyond the current funding period.

Further detail regarding specific sectoral investment needs, flows and assumptions is set at section A under the five dimensions, some of which is highlighted below.

The Public Service Obligation levy (PSO) is chargeable to electricity consumers and is used to support new electricity projects generated from renewable sources. The amount of the levy varies from year to year depending on the amount of supported generation connected, the wholesale electricity market price and the agreed rate at which the generation is to be supported in accordance with the schemes in place.

The NECP includes two planned electricity interconnectors. The Greenlink interconnector to Wales is a proposed €400m project. Whilst the project is proposed as a private (merchant)

investment, the promoters have sought a “Cap and Floor” regulatory treatment for the interconnector from the Irish and UK regulators. Under such a regulatory arrangement, if revenues from the interconnector operations were to fall below the “floor” price, then the Irish and British consumers would fund the difference.

The Celtic interconnector, proposed by the Irish and French TSOs, is a €930m investment that will be funded in part by a CEF grant of €530m and in part by electricity consumers in Ireland and France. For both interconnectors the consumer portion of the cost would be “socialised” – the costs will be included in the costs of distribution networks in the same way as all other electricity infrastructure investments are paid for.

EirGrid’s latest Generation Capacity Statement and Gas Network Ireland’s Network Development Plan provide insights into investments required in the coming decade.

Figures are published relating to agricultural investment in the Annual Review and Outlook. These amounts are total investment in Agriculture, broken down into Farm Buildings, Land Improvements, Transport Equipment, Agricultural Machinery and Equipment, Other equipment and Breeding Stock.

Investments in critical economic infrastructure, including our transport network, have increased in recent years given Ireland’s continuous economic growth and high levels of employment. This positive growth brings challenges to the sector, particularly in relation to climate change and capacity constraints. Addressing these challenges necessitates improved public transport links and increasingly sustainable mobility. Major sustainable transport projects proposed in Ireland’s National Development Plan include MetroLink, BusConnects and the DART Expansion Programme. Investment in these projects will enable more Irish residents and visitors to choose sustainable travel options and greatly enhance our ability to reduce carbon emissions in the sector.

Budget 2020 provides funding of €707 million for capital investment in public transport in 2020, in four key areas: smarter travel and sustainable urban transport; heavy rail safety and development; public transport infrastructure; and walking and cycling. This is an increase of 32% compared to funding provided in 2019. This allocation facilitates continued progress to be made in addressing congestion issues and emerging capacity constraints across the public transport systems in our cities and towns. An investment of approximately €7.5 million in carbon reduction measures for transport was provided for in Budget 2020. These measures are focused primarily on promoting emissions savings in the land transport sector through supporting modal shift from private cars towards public transport, as well as making public transport more climate friendly; a transition of the private car fleet to alternative fuels; and a reduction in emissions from the heavy duty vehicle and freight sector.

Carbon Tax

The signature Climate Change Measure in Budget 2020 was a 30% increase in Carbon Tax to €26. Pricing carbon in this way is widely recognised as a cost effective means of achieving carbon abatement.

Extensive modelling undertaken by the Economic and Social Research Institute has analysed the distributional impact of increases in carbon tax. It demonstrates that using carbon tax revenue to reduce other distortionary taxes can result in a double dividend, where emissions are reduced and economic growth is boosted. Government have committed to hypothecating carbon tax revenue to fund new climate action measures.

Mobilising Private Sector Investment

There is a growing realisation that financial institutions, when they are funding the acquisition of assets, must pay far greater attention to the climate resilience of assets where they risk locking into high-carbon technologies, or other climate vulnerabilities, and in turn, show a greater willingness to fund investment in changes which can make those assets more climate resilient.

There is a rapidly growing appetite in the financial sector to diversify into green activities. The transition to a low carbon economy and society also brings significant opportunities for the financial sector. Ensuring success will require technological innovation and investment. The Intergovernmental Panel on Climate Change estimate that the world will need to spend around US$900bn annually until 2050 on energy-related mitigation investments if global warming is to be limited to 1.5 degrees.

This investment will cover a range of activities:

- Developing disruptive innovations, including some that we may not already have thought about
- Expanding new types of infrastructures, including for clean sources of energy, not least given the potential increased cost efficiency of these
- Adapting existing infrastructures, such as retrofitting existing homes and offices to make them more energy efficient

This investment will need to be financed. To meet this challenge, the financial sector will need to innovate – just like the rest of the economy. We need to see rapid development of smart finance packages that recognise the constraints facing individuals and enterprises in making the change, with the Central Bank contributing, via its EU participation, to the

creation of a facilitative environment where climate related financial risks can be more efficiently assessed and considered.

The low-carbon transition will require significant private investment alongside Exchequer expenditure on a sustained basis over a number of decades. Through the commercial State sector and other public bodies, we will seek to leverage the significant volumes of private sector capital that is available for well-structured projects, including wind and solar electricity generation, interconnection and major transport infrastructure.

NewERA will work with the commercial state companies, Ireland Strategic Investment Fund (ISIF), Strategic Banking Corporation of Ireland (SBCI) and other public bodies, to identify priority opportunities in key sectors to mobilise private investment towards assisting in meeting our climate objectives.

At a national level, the Ireland Strategic Investment Fund (ISIF) is used to unlock significant co-investment at a ratio of 1:2.8 (against a target of 1:2.0). ISIF's 5 year investment plan, with investments to deliver substantial carbon reduction as one of its priority themes, has invested over €4bn to support total projects of over €11bn.

Existing European funds will be used to mobilise private sector investment. Ireland has won funding in each programme area of Horizon 2020. Ireland has a success rate for receiving project funding under Horizon of 15.3%, 1 percentage point above the average success of the European Union. To date, this amounts to €861 million of funding, of which 35% was won directly by Private Company applications. This funding will support a total project cost of €11.7bn. Ireland will continue to support the private sector in availing of the range of European funding mechanisms available for project financing.

Ireland continues to use Exchequer resources and European financing schemes to support innovative SME's by facilitating access to risk financial. Using a combination of Irish exchequer and EU guarantees (through the EIB Group and the InnovFin loan guarantee scheme), the scheme leverages up to €300m of lending to Irish Enterprises at a maximum interest rate 4%.

The provision and level of funding to promote energy research in Ireland has been improved. The National Energy Research Development and Demonstration (RD&D) call for 2019, administered by the Sustainable Energy Authority of Ireland (SEAI) awarded €11m to 50 research projects. The 2019 RD&D call was the first call to provide for multi-year projects, thereby increasing the scope and depth of possible projects. Overall, the RD&D programme has undergone considerable growth over the past two years, funding more than 100 projects to the value of 21m during 2018 and 2019. This represents a significant increase in activities relative to previous years.

International Financial Services (IFS) are among the most competitive and rapidly changing global industries. We need to be able to maintain and grow our existing IFS sector by exploiting opportunities and meeting any emerging challenges in this very dynamic and very competitive sector. We have published a new IFS strategy, which includes the development of Ireland's sustainable finance sector as a horizontal priority.

European Semester

Based on the 2019 Country Report for Ireland, published on 27 February 2019, the European Commission's recommendation for a Council recommendation for Ireland issued on 5 June 2019. The Commission highlights in particular the need to invest in 'low carbon and energy transition, the reduction of greenhouse gas emissions, sustainable transport'. The Report notes that the Climate Action Plan represents a much-needed breakthrough and a stepping stone in the transition to a climate neutral and circular economy. It states that there is scope for improving energy efficiency, renewables provision and material recycling and finds that the plan constitutes an important step to address these challenges, though its success will depend on the implementation of public measures that could trigger additional private investments.

It is anticipated that the implementation of the policies and measures set out under this plan will trigger significant additional private investment bringing Ireland closer to achieving its climate and energy goals. Ireland welcomes the increased focus as part of the European Semester process on the challenges and opportunities for each country arising from the climate and energy transition

ii. Sector or market risk factors

Public funding is, as in all jurisdictions, dependent on the pace of economic growth and planned tax takes being available to fund planned policies and measures. The ability to harness increased amounts of electricity generated from renewable sources on a relatively isolated grid system such as Ireland's depends on innovation and technical solutions being brought forward and delivered on. Delays arising as a result of legislative appeals under the Spatial Planning System are also a risk to the delivery on time of planned infrastructure projects. It is assumed that EU regulation over the period will ensure that industry deliver products meeting higher environmental standards.

The planned exit of the UK from the EU presents Ireland with challenges. Ireland will be the EU Member State most affected by the UK's decision to leave the European Union.

Decarbonising the transport sector will require a transition away from conventional fuel use to alternative fuels and new technologies. This transition must have the capacity to cater for

increasing travel demand, consequently, it is imperative that investment decisions avoid inflexible 'lock-ins' that would inhibit or delay growth of the transport network. Major operational and infrastructural changes are costly and take time; therefore, an initial transition must not preclude any subsequent transitions between technologies as this will create undesirable and expensive delays in providing for transport expansion.

Alternatively fuelled vehicles are currently still more expensive than conventionally fuelled options. It is also important to note that alternatively fuelled right hand drive vehicles are less readily available; this is a particular risk factor in the bus sector where the number of models available is severely limited. Generally, as greater market availability of low and zero-emission vehicles becomes more pronounced their economic viability should improve in the longer term. Transitioning to alternatively fuelled vehicles potentially requires a significant change in infrastructural and fuel supply requirements. Impact assessments of the capacity and availability of renewable power and gas supplies will be required as more vehicles convert to alternatively fuelled models.

iii. Analysis of additional public finance support or resources to fill gaps identified under point ii

A number of EU supports are available and under Horizon 2020, Ireland has a secured funding of €804.5m across the full range of sectors which include energy, transport and environment. Ireland's success rate under Horizon 2020 of 15.21% is above the EU average of 14.16%.

While research carried out by higher educational institutions accounts for 56.3% of the funding received, the Horizon 2020 programme has assisted in driving research and innovation within the private sector. Private companies accounting for 34.2 % of the funding awarded with almost two thirds of the companies involved classified as small to medium enterprises.

In 2018, Science Foundation Ireland, which supports scientific research to deliver transformative economic and societal impact in Ireland, secured funding of €230m.

This funding came from a variety of sources with the ratio of non-Exchequer to Exchequer funding being 2.5:1. In comparison, the National Development Plan projects seeks to achieve its objections with a funding ratio of calls of 1:3.65.

The Connecting Europe Facility and Projects of Common Interest are also important funding sources in the energy area, as is the ability to borrow from the European Investment Bank.

5.4. Impacts of planned policies and measures described in section 3 on other Member States and regional co-operation at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures

i. Impacts on the energy system in neighbouring and other Member States in the region to the extent possible

In light of the UK's forthcoming exit from the EU, Ireland will be in a position where planned policies and measures have little or no impact on other Member States. The planned Celtic Interconnector is likely to drive down electricity prices for the consumer through increased competition and because Ireland will be able to join the European Internal Energy market, we can maintain higher levels of wind and renewable energy.

Table 54: Projected electricity imports and exports (WEM)

Electricity Interconnection Flows Between Ireland and:	Unit	2018	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
UK Not including NI because of All-Island electricity system on Island of Ireland														
Electricity Imports	GWh	0	613	675	684	748	762	659	788	843	783	765	868	692
Electricity Exports	GWh	0	2,134	2,099	2,134	2,115	2,099	2,209	2,176	2,199	2,148	2,253	2,184	2,773
France														
Electricity Imports	GWh	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricity Exports	GWh	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 55: Projected electricity imports and exports (WAM)

Electricity Interconnection Flows Between Ireland and:	Unit	2018	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2040
UK Not including NI because of All-Island electricity system on Island of Ireland														
Electricity Imports	GWh	0	615	646	711	796	794	1,306	831	797	833	853	993	1,056
Electricity Exports	GWh	0	2,216	2,262	2,194	2,179	2,286	3,950	4,548	4,770	4,892	4,732	4,555	4,750
France														
Electricity Imports	GWh	0	0	0	0	0	0	0	4,099	3,850	3,772	3,693	3,461	1,465
Electricity Exports	GWh	0	0	0	0	0	0	0	1,040	1,354	1,448	1,490	1,656	2,959

ii. Impacts on energy prices, utilities and energy market integration

The planned Celtic Interconnector will connect Ireland's electricity network to France via an underwater connection. Once built, its 700 megawatts capacity will power 450,000 households, and help Ireland achieve its climate and energy goals. As well as the clear benefits in terms of improved security and diversification of electricity supply, the Celtic Interconnector will also facilitate the further development of renewable energy, helping Ireland to meet its 70% target. By providing a direct electricity link with mainland Europe, Ireland will be connected to the EU's Internal Energy Market post the UKs exit**.**

The Celtic Interconnector will help to lower electricity prices, reduce greenhouse gas emissions and provide greater energy security. To achieve its climate and energy goals, Europe needs to further develop cross-border electricity interconnections. The Celtic Interconnector project will help to meet these targets for interconnection which are key to the achievement of Europe's energy transition. Through facilitating more renewable energy to come onto the network, interconnection will also help to reduce greenhouse gas emissions associated with power generation in Europe.

In addition, interconnection will increase the availability of renewable energy for European consumers as well as supporting European solidarity on energy, particularly in the case of unexpected energy events.

iii. Where relevant, impacts on regional co-operation

The Celtic Interconnector will allow Ireland and France to develop closer links and cooperate further in our efforts to achieve the ambitions of the Energy Union.