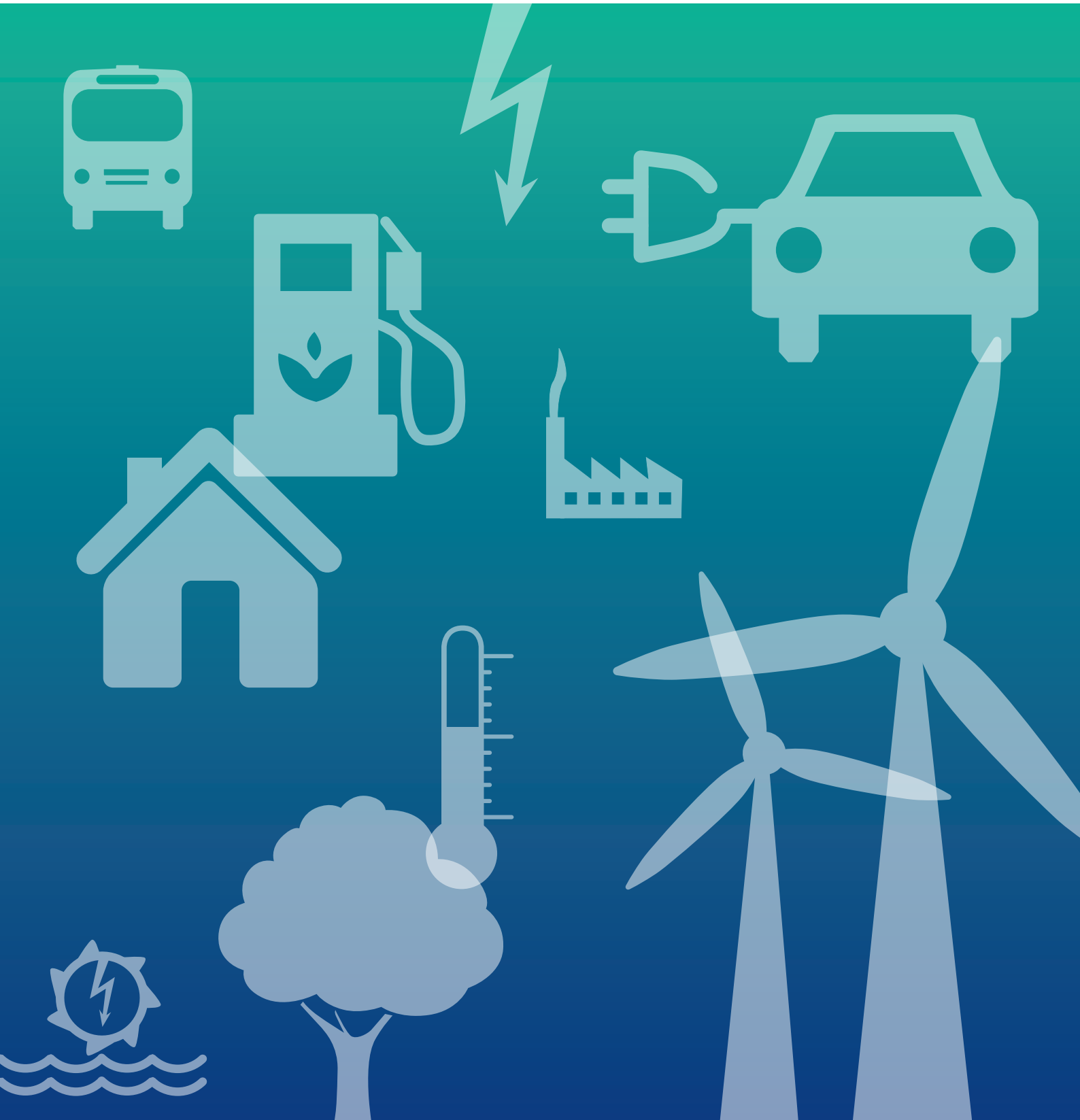
Ireland's Energy Targets

Progress, Ambition & Impacts

SUSTAINABLE ENERGY AUTHORITY OF IRELAND

SUMMARY FOR POLICY-MAKERS



The Sustainable Energy Authority of Ireland

The Sustainable Energy Authority of Ireland (SEAI) was established as Ireland's national energy authority. SEAI's mission is to play a leading role in the transformation of Ireland to a society based on sustainable energy structures, technologies and practices. To fulfil this mission, SEAI aims to provide well-timed and informed advice to Government and deliver a range of programmes efficiently and effectively, while engaging and motivating a wide range of stakeholders and showing continuing flexibility and innovation in all activities. SEAI's actions will help advance Ireland to the vanguard of the global clean technology movement, so that Ireland is recognised as a pioneer in the move to decarbonised energy systems.

SEAI's key strategic objectives are:

- Energy efficiency first – implementing strong energy efficiency actions that radically reduce energy intensity and usage
- Low-carbon energy sources – accelerating the development and adoption of technologies to exploit renewable energy sources
- Innovation and integration – supporting evidence-based responses that engage all actors, supporting innovation and enterprise for Ireland's low-carbon future

Energy Modelling Group

Established in 2009, SEAI's Energy Modelling Group (EMG) provides high-quality analysis and policy advice on a range of energy/climate issues at national and European level.

In the areas of energy efficiency and renewable energy, SEAI supports evidence-based policy formation by assessing the impact of policy measures against baseline energy forecasts. SEAI assessments involve modelling a range of short-term and medium-term scenarios for energy demand and supply growth.

Forecasting future energy demand continues to be a challenging process. Projections for economic growth and fuel price changes, the key drivers behind Ireland's energy demand, are being re-estimated as economic events unfold globally and within the EU. Interpretation of the results, therefore, is focused on medium-and longer-term trends, rather than on any specific events that might occur in the short term.

Given the link between these energy forecasts and macro-economic trends, using the most up-to-date data sources remains a focus of this exercise. The data presented in this paper are based on the most up-to-date assumptions available at the time of modelling. These include projections for a range of macro-economic indicators that have an impact on Ireland's energy demand, together with recent fuel and carbon price assumptions from the European Commission. In addition to estimating these variables, much work is undertaken to estimate the impacts of current demand and supply-side energy policy for incorporation into the projected trends.

The Energy Modelling Group welcomes any comments on the contents of this report. Feedback can be sent directly the group by emailing: **emg@seai.ie**

Report prepared April 2016.

Ireland's Energy Targets

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Summary for policy-makers

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April 2016

Contents

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Insights and challenges

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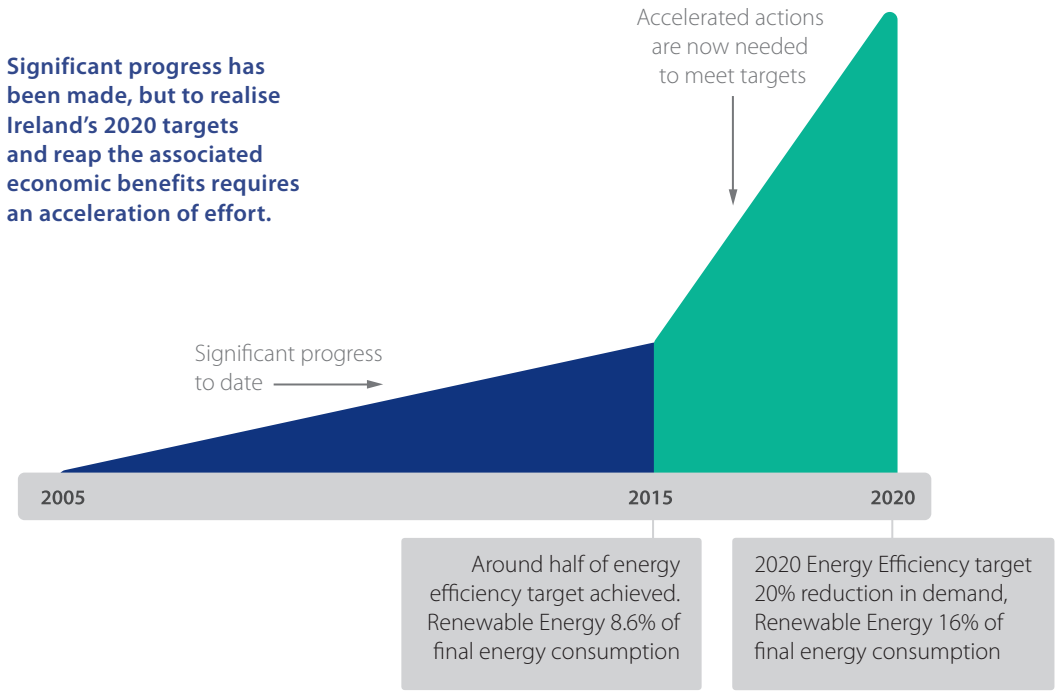
This report presents projections of Ireland's energy use to 2035. The projections use information on the relationships between energy use, economic growth, energy prices and energy policies – as embodied in past energy use trends – as the basis for projecting how future energy use may develop following changes in fossil fuel prices, economic growth and energy policy.

The projections allow an assessment of the technology deployment effort required to meet Ireland's national and EU targets on energy efficiency and renewable energy for 2020. The report aims to provide a sense of the scale of the challenge remaining in order to achieve these targets – how many homes will have to implement energy efficiency measures? How much will businesses have to invest? How many wind turbines, biomass boilers and heat pumps must be installed?

These forecasts were developed in collaboration with the Economic and Social Research Institute (ESRI); they extend beyond 2020 to include a 2035 perspective, and they provide insights into how achieving the 2020 targets could impact on Ireland's longer-term energy use. In addition to such insights, the forecast data contained in this report are also used by the Environmental Protection Agency (EPA) to prepare energy-related projections of greenhouse and transboundary gas emissions.

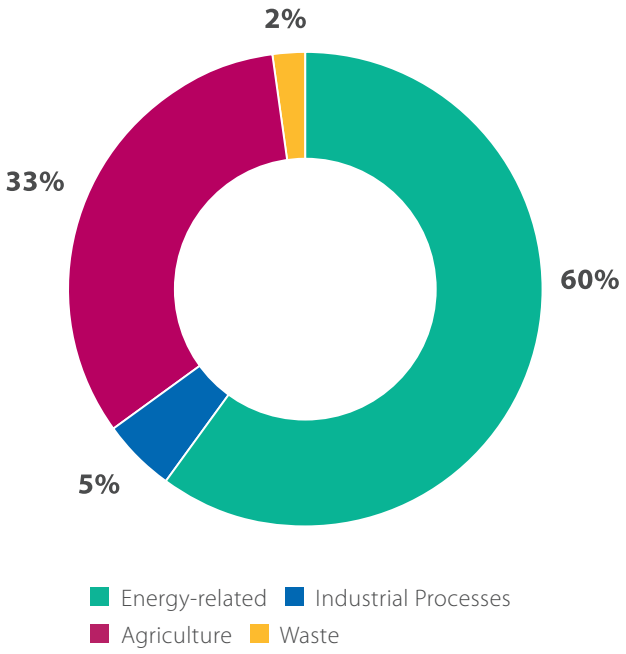
The scale of the challenge to meet 2020 targets is illustrated in **Figure 1**. Ireland has set a national target to reduce energy demand by 20% of the historic average energy use during the period 2000–2005 through energy efficiency measures. The current suite of measures is described in detail in Ireland's National Energy Efficiency Action Plan (NEEAP) and annual reports. A binding EU target for renewable energy use is also established. 16% of final energy use and 10% of energy use in the transport sector must be derived from

Figure 1 – Illustrative depiction of level of effort to meet 2020 targets



Meeting 2020 renewable energy and energy efficiency targets puts Ireland on a low carbon pathway towards meeting future targets.

Figure 2 – Greenhouse Gas emissions in Ireland (2014 provisional)



renewable sources by 2020. In order to achieve Ireland's overall renewable energy target, national sub-targets have also been set in the end-use sectors of heat (12%) and electricity (40%).

Ireland, along with Denmark and Luxembourg, has the most challenging target for greenhouse gas emissions reductions in the EU; Ireland's target is to achieve 20% lower than the 2005 greenhouse gas emissions levels by 2020. Achieving Ireland's energy targets will help meet its binding EU greenhouse gas emissions target in heat and transport, but does not guarantee it. Emissions targets also include emissions from agriculture and waste disposal; such emissions currently account for 35% of Ireland's greenhouse gas emissions, with energy-related emissions accounting for the remainder **(Figure 2)**.

Meeting these targets will create economic, enterprise and environmental benefits for Ireland. Furthermore, meeting 2020 renewable energy and energy efficiency targets could put Ireland on a low-carbon pathway and trajectory in terms of meeting future targets in 2030 and 2050. The EU, along with several other Member States, have set out ambitions to reduce greenhouse gas emissions by 80% to 95% by 2050, compared with 1990 levels, with an EU-wide reduction of 40% by 2030 already agreed by Member States. The Paris Agreement forged at COP21 provides further impetus for strong action on climate change mitigation in Ireland and internationally.

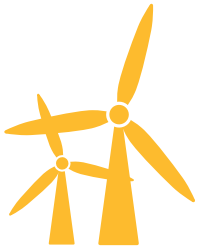
Key insights

Progress to date

To date, significant progress has been made towards achieving Ireland's energy efficiency and renewable energy targets. As follows:

- Ireland has already achieved energy efficiency savings which equate to about half of the country's 2020 energy efficiency target. 300,000 homes as well as 3,500 businesses and public sector bodies have implemented energy efficiency measures that are saving them an estimated €700 million annually.

- Ireland is, on average, just over half way towards meeting its 2020 renewable energy target, with 8.6% of gross final consumption derived from renewables in 2014.
  - More than 40,000 homes and more than 550 businesses use some form of renewable energy for heat. 6.6% of the national 12% heat target has been achieved by end 2014.
  - Since 2003 approximately 190 wind farms, connected across 24 counties, have been installed, equating to 2,375 MW of renewable electricity capacity.[1] These wind farms have been instrumental in driving achievement of 22.7% renewable penetration by end 2014.



  - Every year in Ireland, passenger cars travel an average of 500 km using biofuel that has been created by blending regular petrol and diesel with biofuel. By end 2014, 5.2% of the 10% renewable energy transport target had been achieved.

- In total, more than 6 million tonnes of CO_2 emissions are avoided every year through deployed energy efficiency and renewable energy technologies.

Accelerated effort required

- Approximately 75,000 homes and businesses will need to be upgraded for improved energy efficiency every year between now and 2020, if Ireland is to achieve the 2020 energy efficiency target. This 75,000 figure will reduce if houses/businesses opt for deeper (more extensive) retrofits. In 2014, grant schemes supported energy efficiency upgrades in more than 25,000 homes/businesses in Ireland.[2]

- Energy efficiency improvements are also required in vehicle stocks, in large industry, the public sector and in small and medium enterprises (SMEs).

- Between 200 MW and 250 MW of additional wind capacity must be installed every year to 2020. Approximately 270 MW of wind capacity was installed in 2014. Average installed capacity over the last five years has been 177 MW.

- Supply of between 440 million and 500 million litres of biofuels must be secured for blending with fossil fuels for transport, in order to increase the biofuel consumption level to 8% by 2020. In 2014, 167 million litres of biofuels were used for transport.

- Roll-out of electric vehicles must be greatly accelerated – to the point where within five years electric cars must account for 20% of all new cars sold in Ireland. In 2015, electric cars accounted for 0.23% of new car sales, comprising a total of 562 vehicles sold that year.[3]

- 300,000 homes or 3,000 services/public sector buildings or 200 large industrial sites must be encouraged to install renewable heat options such as biomass boilers, solar thermal, and biomass CHP systems.[4] A Renewable Heat Incentive (RHI) policy has been recommended as part of the Draft Bioenergy Action Plan.[5]

The benefits of target achievement

By 2020, target achievement could result in:

- Delivering significant financial benefits, including a net present value (NPV) of €8 billion for the Irish economy, as a result of achieving the remaining savings required to meet the 2020 energy efficiency target.[6]
- Renewable electricity displacing approximately €750 million worth of imported energy every year
- Avoiding approximately 15 million tonnes of CO_2 emissions, as a result of deployed energy efficiency and renewable energy technologies and actions
- Macroeconomic benefits as well as the creation of thousands of new jobs in Irish supply chains[7,8,9]
- Ireland avoiding the compliance costs associated with renewable energy and emissions reduction targets. In the case of renewable energy compliance, this amounts to between €65 million and €130 million per percentage shortfall on the overall binding target.[10]

Post-2020 outlook

- Scenarios indicate that in the absence of further policy action post-2020, energy demand, particularly for transport, will continue to rise in line with projections for renewed economic growth in Ireland.
- This highlights the crucial role of energy policy in continuing to drive investment in energy efficiency and renewable energy technologies and services post-2020, as Ireland transitions to a low-carbon economy. The Government's energy policy statement *Ireland's Transition to a Low Carbon Energy Future, 2015-2030* (DCENR, 2015) addresses the period post-2020.
- Any shortfall to the 2020 targets will make Ireland's role in contributing to longer-term targets, such as the EU goal to reduce greenhouse gases by 80-95% by 2050, significantly more difficult and costly.

Ireland's energy use and targets

2

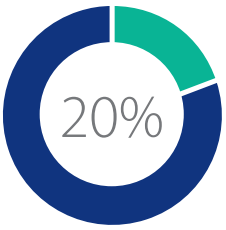
Ireland has a legally binding target for renewable energy deployment as well as a national target for energy efficiency.

The pathways to achieving these targets have been set out in the National Renewable Energy Action Plan (NREAP)[11] and National Energy Efficiency Action Plan.[12] Ireland also has a binding target to reduce greenhouse gas emissions from sectors that are outside the EU Emissions Trading Scheme (called non-ETS emissions).[13]

The overall renewable energy share (RES) target of 16%, the 10% transport target, and the 20% non-ETS emissions reduction target are all binding at EU level. The 20% energy efficiency target is a nationally set target adopted in response to the EU Energy Efficiency Directive.

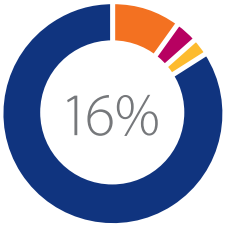
Figure 3 – Headline energy and emissions targets

Energy Efficiency

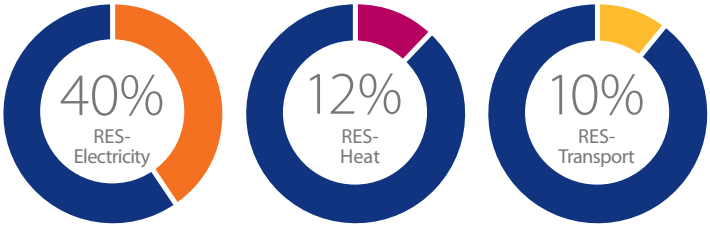


20% energy savings by 2020 (31,925 GWh)

Renewable Energy

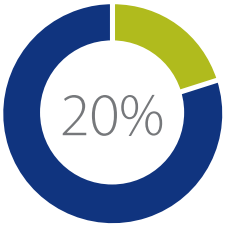


Overall **16% RES** of national consumption



Three sub-targets

Emissions



EU Effort Sharing Decision (2013 – 2020)
- **20% reduction** non-ETS emissions relative to 2005
- Annual limits

The more energy demand is reduced through efficiency measures, the lower the effort required to achieve the renewable energy targets.

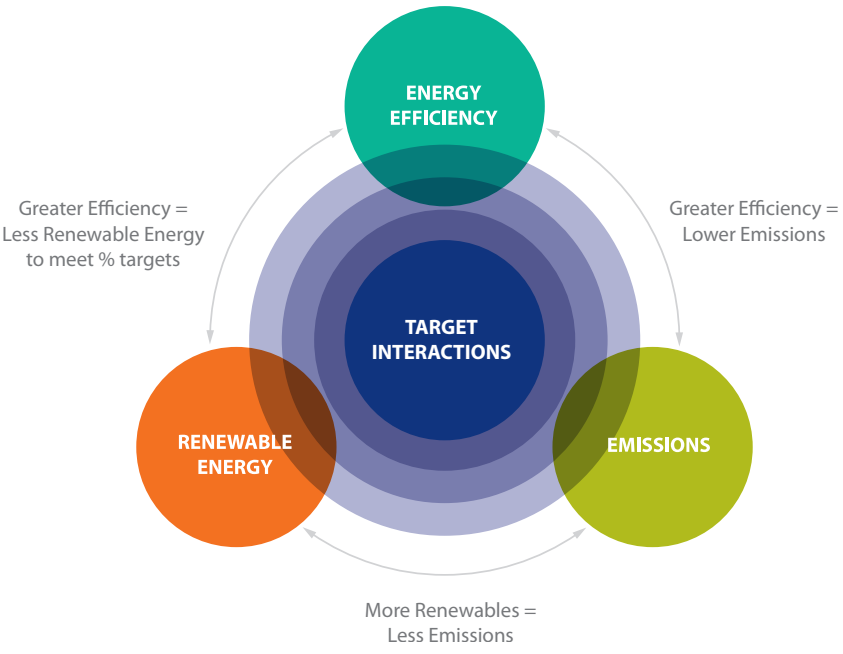
2.1 Target interactions and dependencies

Renewable energy targets are based on a percentage of end-use demand. This means that energy efficiency actions that reduce overall demand play a large part in the achievement of renewable energy targets. The more that demand is reduced through efficiency measures, the lower the effort that will be needed in order to achieve the RES targets (e.g. a reduced number of installed wind turbines or biomass boilers would be required). Conversely, a shortfall in energy efficiency would mean that greater deployment of renewable energy technologies will be needed in order to meet the 2020 targets.

Shifting demand between the end-use sectors of electricity, transport and heat can alter the levels of effort required in each sector to meet the overall RES target. For example, transferring demand from the heat and transport sectors to electricity increases the effort required to meet the electricity component of the RES target, but has the effect of reducing the effort required to meet the heat and transport RES goals. In addition, electrification of the heat and transport sectors could also assist Ireland in complying with its challenging non-ETS emissions reduction target by shifting emissions into the Emissions Trading Scheme (ETS) sector and away from the non-ETS sector.

In light of these target interactions, the costs and benefits of sustainable energy deployment must be analysed, so as to ensure that the most advantageous route to target achievement is taken: in particular, the interaction of the gains from energy efficiency and the targets for renewables merit further consideration. In all cases, the broad range of benefits and costs from sustainable energy investment should be taken into account, with a view to maximising the societal benefits from Government policy interventions to drive achievement of the targets. This is particularly important given uncertainty around what the future will bring in terms of technology change, technology cost change and the myriad economic and social changes that could emerge in the future.

Figure 4 – Target Interactions



Progress to date and the remaining challenges

3

The following presents a snapshot of the achievements to date, and highlights the level of effort (remaining deployment levels) required in order to meet Ireland's 2020 energy efficiency, renewable energy and emissions targets.

During recent years, significant progress has been made towards achieving Ireland's energy efficiency targets and renewable energy targets. This section of the report provides further detail on the level of progress made, and highlights the significant challenges that remain if Ireland is to meet the 2020 targets.

3.1 Energy efficiency target progress

The 2020 energy efficiency target equates to a 20% reduction in final energy demand based on the average energy demand during the period 2001 to 2005.[14] Consequently, the target level is fixed at 31,925 GWh.

By end 2014, approximately half of the energy efficiency target had been accounted for. These savings were achieved through tried and tested solutions across all energy-using sectors of the economy – for example, as a result of improved building regulations, energy management in large industrial installations, more efficient vehicles on Ireland's roads, electricity system efficiencies, and the retrofitting of existing buildings.

The savings achieved at end 2014 represent over €700 million[15] in reduced energy bills for businesses and householders (see **Figure 5**). In addition, it is estimated that approximately 2.8 million tonnes of CO_2 have been saved.

Target achievement in 2020 is possible. In order to meet the national 2020 goal, a range of existing and new actions – and a scaling up of action across all sectors – will be required. The latest government policy statement on sustainable energy, *Ireland's Transition to a Low Carbon Energy Future* (DCENR, 2015) highlights the proposed range of actions and policy priorities.

Specific energy efficiency policy options have recently been explored by SEAI[16]. In the context of the overall target, the eventual mix of measures, some of which are highlighted in **Figure 6**, may change i.e. less savings would be required from transport if more buildings and businesses can be encouraged to improve their energy efficiency and vice versa. The challenge will be to choose an effective mix of complementary policies and measures. The latest analysis on pathways to target achievement is provided in *Unlocking the Energy Efficiency Opportunity* (SEAI, 2015).

Figure 5 – Energy savings per annum and energy saving potential

Energy savings worth over **€700 million** have been achieved through improved energy efficiency but **€2.4 billion** is possible

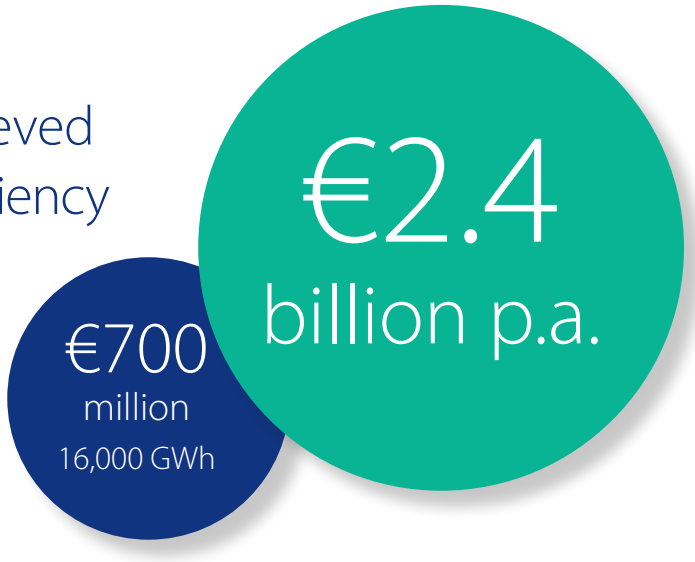
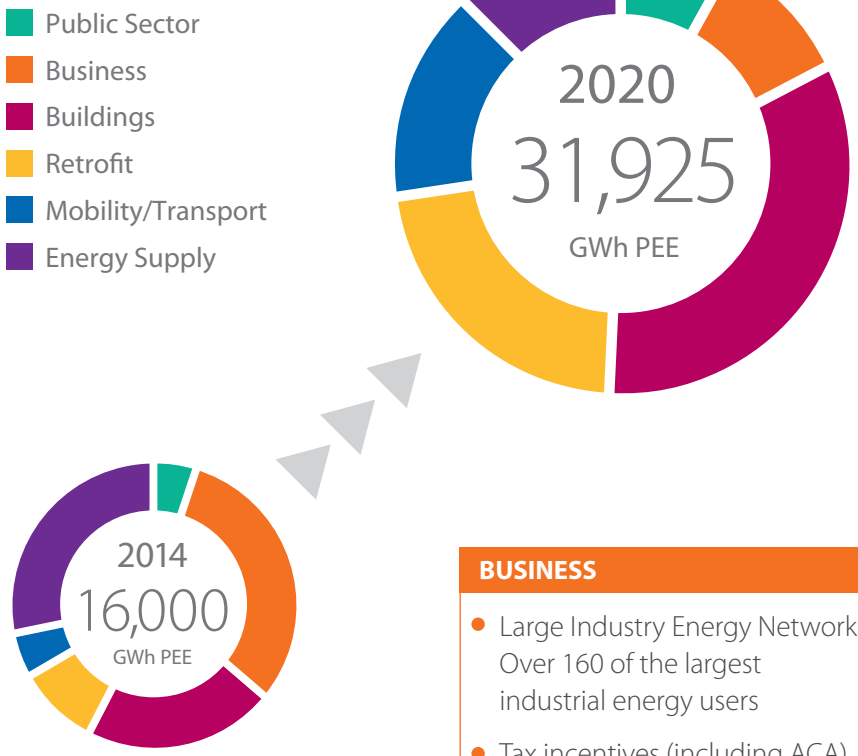


Figure 6 – Energy efficiency progress and target trajectory



ENERGY SUPPLY

- Ongoing investment in efficient electricity supply network and generation plant

MOBILITY/TRANSPORT

- 50,000 EVs on the road in 2020
- Modal shift, eco-driving, land-use planning
- Savings required equivalent to energy used by 450k passenger cars

BUILDINGS

- 25–30k new dwellings to very tight regulations

BUSINESS

- Large Industry Energy Network: Over 160 of the largest industrial energy users
- Tax incentives (including ACA)
- Audits for non-SMEs

RETROFIT

- 75,000 buildings per annum at current level of retrofit, less if deeper retrofit

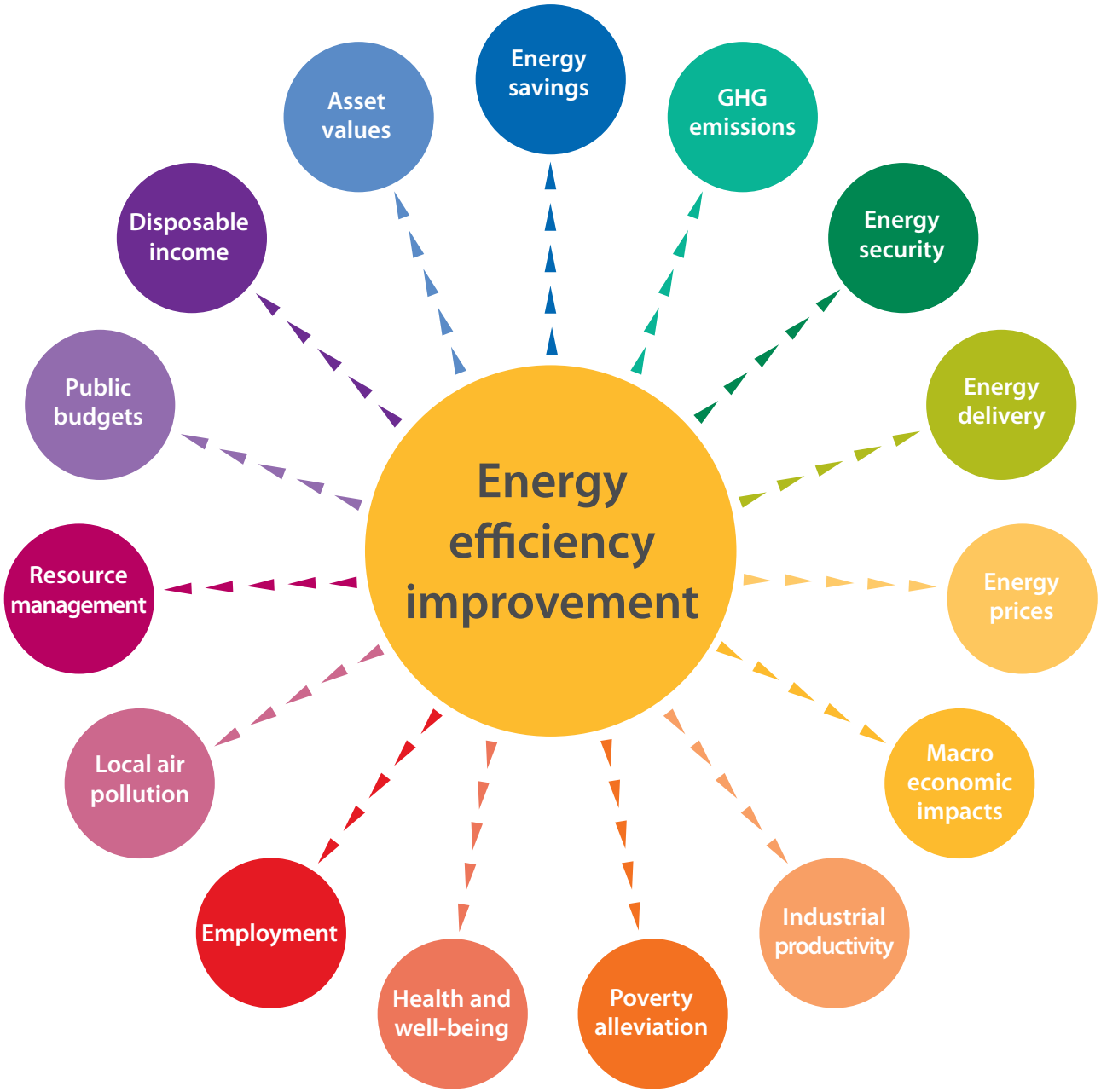
PUBLIC SECTOR

- 33% savings in public sector

Achieving the 2020 energy efficiency target will deliver total savings of 7.6 million tonnes of CO_2. Furthermore, the value of achieving the target could amount to over €2.4 billion[17] annually in reduced energy bills. Significantly, research shows that the costs of energy efficiency investments are significantly outweighed by the benefits provided over the lifetime of the investment made. It is estimated that the remaining savings can be achieved at a net benefit to society of €8 billion,[18] after the costs of upgrades are taken into account. Furthermore, Government balance sheets could be improved by around €1 billion by 2020.[16]

As highlighted by the International Energy Agency (IEA)[19] and others, in addition to the value of energy savings, achievement of the energy efficiency target will provide a range of benefits beyond the value of energy savings. **Figure 7** outlines these benefits which include health and comfort improvements to householders, increased asset values following efficiency upgrades, improved business competitiveness, and a significant contribution to Ireland's emissions reduction target, thus enhancing the net benefit to society. As noted, achievement of this target is crucial in the context of the parallel requirement to achieve Ireland's renewable energy targets.

Figure 7 – Energy Efficiency Improvements (Source: International Energy Agency (IEA))



The development of alternative finance mechanisms to enhance rates of energy efficiency retrofitting of homes and businesses, together with the ongoing implementation of an Energy Efficiency Obligation (EEO) on energy suppliers, will be crucial to meeting the target. Innovative solutions will also be needed in the transport sector, including continuing to incentivise the uptake of energy-efficient vehicles, promote eco-driving, increase the use of public transport, and reduce the number and length of journeys where possible.

Maximising the impact of actions such as auditing, mandated in the Energy Efficiency Directive, as well as a renewed focus on the role of behavioural change measures, will be important. As we get closer to 2020, the role of regulation requiring action on energy efficiency may be appropriate in order to achieve savings from various sub-sectors.

3.2 Renewable energy targets

Ireland must achieve a 16% RES in overall consumption and a 10% share of renewable energy in transport consumption as set out in the Renewable Energy Directive (2009/28/EC). Up to end 2014, 8.6% of overall energy demand was derived from renewable sources through the following key actions. For example, since 2003, approximately 190 wind farms (2,375 MW) across 24 counties have been installed,[20] more than 40,000 homes and more than 550 businesses have some source of renewable energy for generating heat,[21] and every year every passenger vehicle in Ireland travels an average of 500 km using biofuel.[22]

In addition to avoiding greenhouse gas emissions, renewable energy deployment reduces Ireland's reliance on imported fossil fuels, lowers the potential impact of future energy price shocks, and delivers economic and enterprise benefits to Ireland.[23]

Figure 8 shows the proportion of overall energy demand provided by renewables in 2013, and the trajectory required in order to meet RES-E, RES-H and RES-T sub-targets.[24]

The chart highlights the relative contribution of each sub-target to overall renewable energy supply. Electricity is the smallest sector in terms of demand, and therefore the 40% electricity target contributes proportionately less to the overall renewable energy target than do the lower (percentage) targets for renewable energy in the heat and transport sectors. It is evident that the significant progress in renewable electricity deployment will need to continue – with further contributions required from the heat and transport sectors also.

The level of effort required to meet the renewables targets for electricity, heat and transport is described below.

Figure 8 – Overall renewable energy share (RES) progress and target

Each end use sector has individual renewable usage targets i.e. heat **(RES-H)**, transport **(RES-T)** and electricity **(RES-E)**.

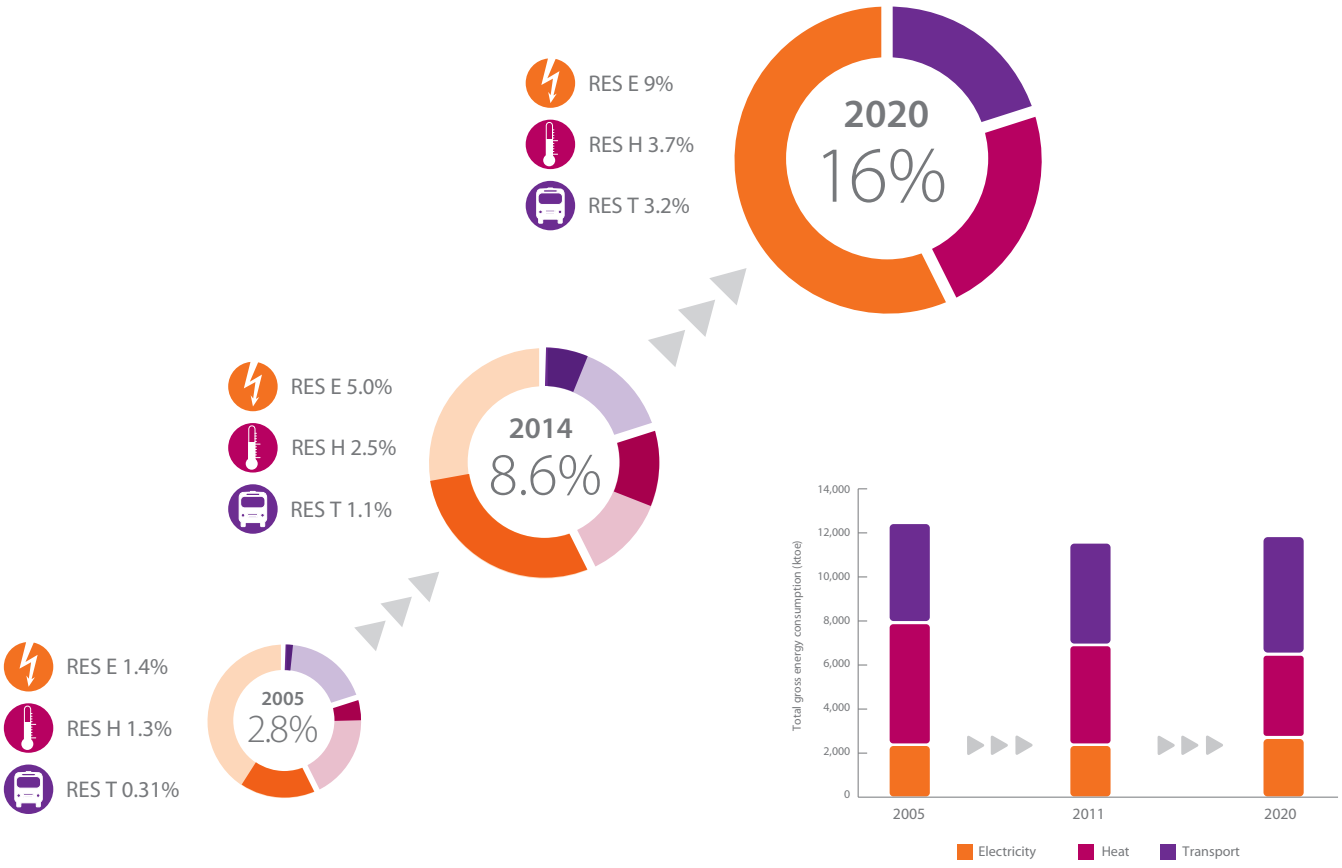
Together these add to the total renewable share **(RES)**.

Achievements to date

- RES-E driven by wind energy deployment and biomass combustion
- RES-H driven by industrial applications
- RES-T driven by biofuels

Future requirements

- Increased rate of wind energy deployment
- Increased penetration of biofuels and Electric Vehicles
- More biomass CHP, new build dwellings requiring renewable heat component.



Renewable energy source – Electricity (RES-E)

Figure 9 outlines the level of achievement to end 2014, and what is required in order to meet the 2020 40% RES-E target. The historic build rate (since 2005) for wind energy deployment (i.e. around 180 MW per year) has made the most significant contribution to RES-E. The existing hydro capacity, which is primarily from large hydro stations such as Ardnacrushna on the river Shannon and Cathleen's Falls on the river Erne, provides a further contribution to RES-E. In addition, biomass (consisting mainly of co-firing of biomass with peat in Edenderry power station, combustion landfill gas and biomass CHP installations) makes a modest contributions.

It is evident that an increased deployment rate of all renewable electricity technologies is required in order to meet the 2020 RES-E target. The annual build rate of on-shore wind needs to increase to approximately 125 turbines (generating between 250 MW and 300 MW) per year – less if larger and more powerful turbines are used. Use of biomass for electricity generation must also increase through the commissioning of waste-to-energy facilities and the growth in the use of biomass CHP. Deployment of 30 MW of ocean energy is also modelled, in order to take account of planned deployment of demonstration projects, together with the continued use of Ireland's existing hydro resources.[25] At present, Ireland does not have any wave or tidal energy-producing installations.

Some of the key dependencies on target achievement rely on the successful resolution of planning and regulatory issues; continued public engagement on wind; grid roll-out; and the development of appropriate market structures for an electricity system with high levels of renewables – currently being supported by the DS3 programme.[26] Significant private investment will be needed, and such investment will be heavily reliant on investor confidence. The Renewable Energy Feed-In Tariff (REFIT) scheme for wind and biomass is currently the primary policy in place to support such investment. These tariffs create increased certainty for potential investors by providing some level of guaranteed return on investment for fixed periods of time. In July 2015, the Department of Communications, Energy and Natural Resources published a consultation paper which examined the requirement and the potential to introduce a new support scheme for electricity from renewable sources from 2016 onwards.

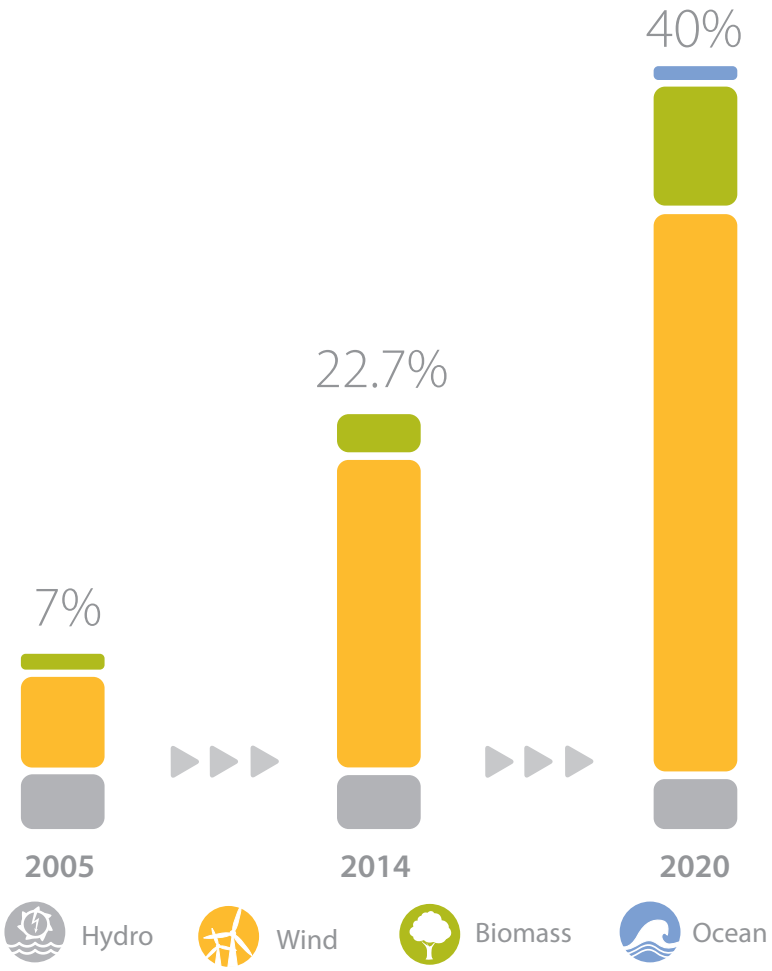
Figure 9 –Renewable electricity (RES-E) progress and target

Achievements to date

- Approximately 190 wind farms, connected across 24 counties, have been installed since 2003 (total capacity 2,375 MW).
- The extent of the large scale hydro power has been harnessed in Ireland.

Future requirements

- Deployment of wind to increase to about 125 turbines per annum (250 – 300MW) – less if larger turbines are used.
- Biomass growth depends on a high uptake of biomass CHP, commissioning of waste to energy units and co-firing in a peat station until 2020.
- Deployment of 25 MW of ocean energy.



Renewable energy source – Transport (RES-T)

Figure 10 indicates Ireland's progress towards the 10% RES-T target – a mandatory target agreed under the EU Renewable Energy Directive (2009/28/EC). Currently, all transport fuel contains approximately 3.1% biofuel by volume (blended with fossil-based petrol and diesel); this means that the average passenger car travels 500 km per year on bioenergy. The calculation rules for RES-T include additional weighting for biofuels derived from waste, for advanced biofuels, and for the renewable proportion of the electricity used in electric vehicles (EVs). When these weightings are applied renewables contribute 5.2% to energy demand in transport. It is important to note that these weightings do not apply in the calculation of the overall RES target.

It is estimated that between 440 and 500 million litres of biofuel will be required in order to meet the 10% RES-T target. This will be largely met the Biofuels Obligation Scheme, in place since 2010, which will increase the percentage of biofuels in transport fuel between now and 2020.

Biofuels are important in helping Ireland to meet its greenhouse gas reduction targets; however, biofuel production typically takes place on cropland that was previously used for other agricultural purposes such as growing food or feed. Since this type of agricultural production is still necessary, it may be partly displaced to previously non-cropland such as grasslands and forests. This process is known as indirect land use change (ILUC). In September 2015, the European Commission published a Directive containing amendments to the Renewable Energy Directive. This was aimed at mitigating the potential effects of ILUC by, for example, limiting the contribution that land-based biofuels can make to 7 percentage points of the 10% RES-T target. The Directive included an indicative 0.5% target for so-called second generation biofuels, whose contribution towards the 10% renewable energy target for transport would be double-counted.

In 2008, the Irish Government set a target of 10% of all vehicles in the transport fleet to be powered by electricity by 2020. This has since been revised to a target of 50,000 EVs in the transport fleet by 2020. Despite their high efficiency, EVs make a relatively small contribution to the overall RES-T target. Nonetheless, they play an important role in the decarbonisation of the transport fleet. With support in the form of Vehicle Registration Tax (VRT), motor tax concessions and demonstration projects, EV uptake rates could be further encouraged. As of September 2015, the number of EVs in Ireland was over 1,000. Meeting the 2020 target would mean that EVs would account for 20% of all new cars sold in Ireland by 2020.

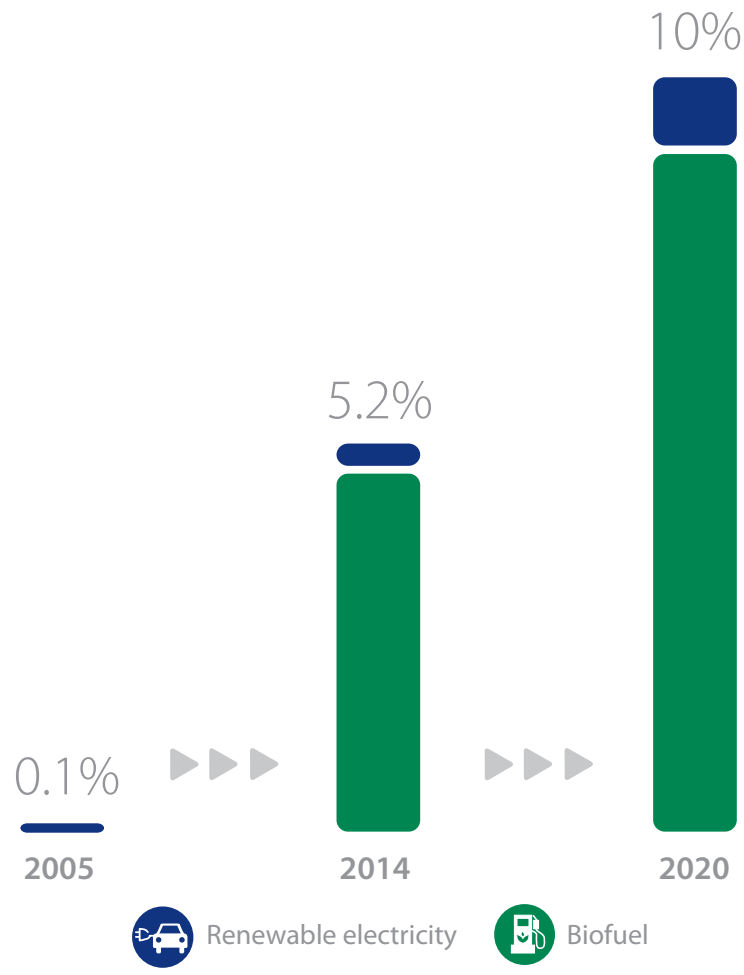
Figure 10 – Renewable transport (RES-T) progress and target

Achievements to date

- Average private motorist travels about 500 km each year using biofuel.
- The majority of the 5.2% renewable contribution to transport energy use is from biofuels.
- Over 1,000 EVs are currently on the road in Ireland (September 2015).

Future requirements

- Between 440 million and 500 million litres of biofuels must be secured for blending with fossil fuels.
- Roll-out of electric vehicles must be greatly accelerated –within five years electric cars must account for 20% of all new cars sold in Ireland.
- Key dependencies: vehicle technology development and rapid growth in supply of acceptable liquid biofuels internationally.
- The RES-T target is binding under the EU renewable energy directive and is separate to the overall binding requirement. It has its own accounting rules for the calculation that gives extra weightings to the more sustainable sources of biofuel and EVS. The RES-T target is a percentage of total road, rail and inland water ways transport demand.



Renewable energy source – Heat (RES-H)

In Ireland the most significant contribution towards the 12% RES-H target has come from the industrial sector, with more modest contributions from the household and services sectors (**Figure 11**).[27] Deployment of renewable heat sources such as biomass boilers and solar thermal systems has to date been supported primarily by grants for renewable heating sources (e.g. ReHeat Scheme 2009–2011 targeted at commercial and industrial applications and the Greener Homes Schemes 2008–2011[28] for the residential sector). In addition, the Building Regulations (2011) include a minimum threshold requirement for renewable energy supply for new residential buildings that can be met via renewable heat technologies.

The target achievement scenario for RES-H assumes that the historic rate of deployment of biomass use for heat (e.g. biomass boilers) will continue to 2020. Further additional biomass CHP installations are also assumed to be deployed; this would be driven by a Renewable Energy Feed-In Tariff (REFIT) scheme for biomass CHP, as is currently supported, and the expected contribution from the Building Regulations (2011).

On the basis of these assumptions, a gap to target has been identified i.e. these measures alone will not be sufficient to meet the renewable heat target with current levels of forecast energy demand.[29] Detailed SEAI analysis[30] has found that the estimated shortfall is between one and five percentage points across three scenarios that consider future changes in fossil fuels prices, biomass resource availability and heat demand growth. The gap to the RES-H target could be closed by the installation of renewable technologies in 300,000 homes or 3,000 service sector buildings or 200 large industrial sites. This would need to be supported by a Feed-In Tariff similar to the Renewable Heat Incentive that is (at the time of publishing) undergoing a process of public consultation led by the Department of Communications, Energy and Natural Resources.

The SEAI analysis found that under certain assumptions, biomass boilers would replace oil in large industrial and commercial sites as the most cost-effective options. Additional uptake of heat pumps in the commercial sector would also occur. Biomass and anaerobic digestion combined heat and power uptake rates remain low. A steady increase in renewable heat output was observed in the residential sector, driven by the Building Regulations (2011).

It is worth bearing in mind, in the context of the RES targets in general, that the overall level of effort can be reduced by increasing the extent to which energy efficiency impacts on overall demand.[31] With specific reference to renewable heat, electrification of heat and the impact on the level of effort required to meet the renewable heat target is the subject of ongoing research.

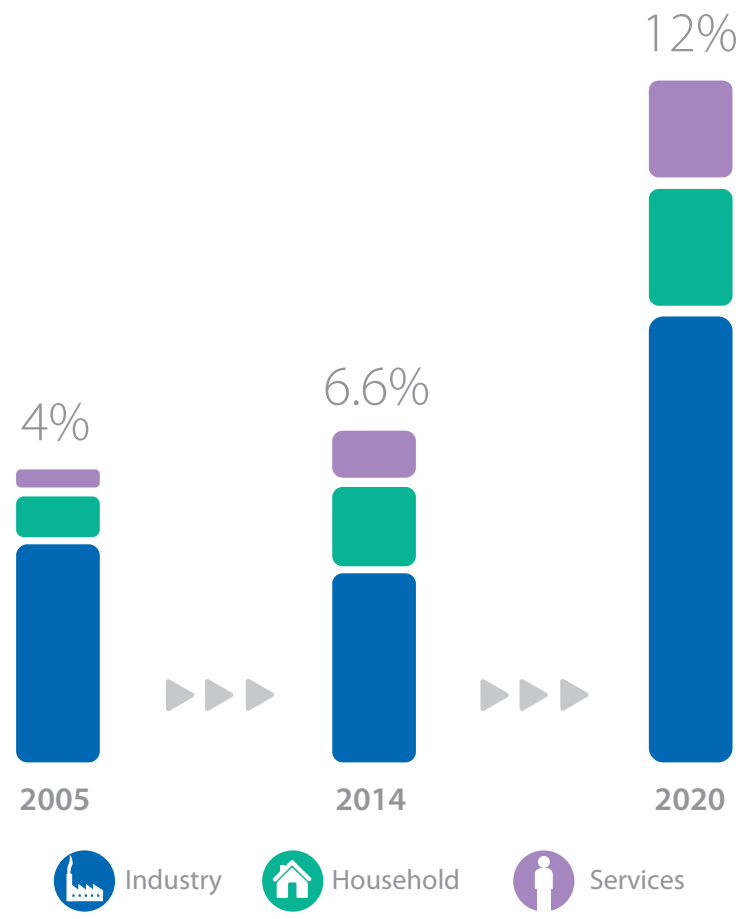
Figure 11 – Renewable heat (RES-H) progress and target

Achievements to date

- Penetration currently about 5% – over 40,000 homes and over 550 businesses using some source of renewable energy for heat – deployed largely through SEAI grant schemes.
- The main technologies are direct combustion of biomass, solar heating and heat pumps.

Future requirements

- New policies and measures are required to bridge the gap to the RES-H 12%.
- The gap to achieving the target is equivalent to about 300,000 homes, 3,000 services/public sector buildings or 200 large industrial sites installing a renewable heating technology – or a mix of installations across each sector.
- Improving energy efficiency greatly assists meeting the heat target. A high proportion of the savings targets in the NEEAP act to reduce the demand for heat energy.
- Potential for accelerating the electrification of heat through technologies such as heat pumps.

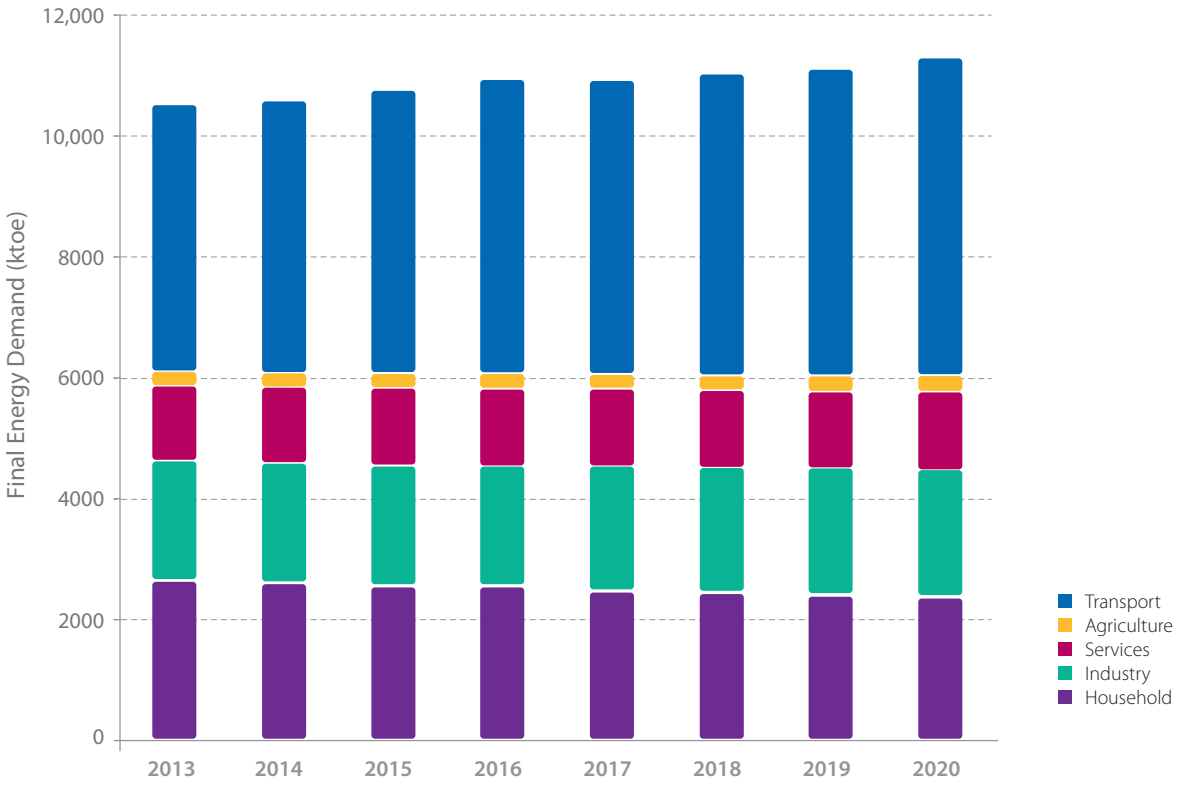


3.3 Impact of target achievement on energy demand and fuel use

Final energy demand in each sector is influenced by economic growth, fuel prices and the impact of energy efficiency policy. **Figure 12** shows the forecast growth in energy demand in Ireland to 2020 in each sector.

The transport sector is currently the largest energy-using sector and is the sector most reliant on imported fossil fuels. In the future scenarios examined, the share of total energy consumed by the transport sector is set to grow even further. This is mitigated to some extent by efficiency gains in transport technologies, and can also be influenced by consumer choices i.e. how we travel. The plans for energy efficiency action in the industrial and commercial sectors will serve to mitigate some of the impact of increased economic growth. The planned improvements to the residential building stock through tighter building regulations and retrofits of existing dwellings could reduce energy demand in the sector to 2020.

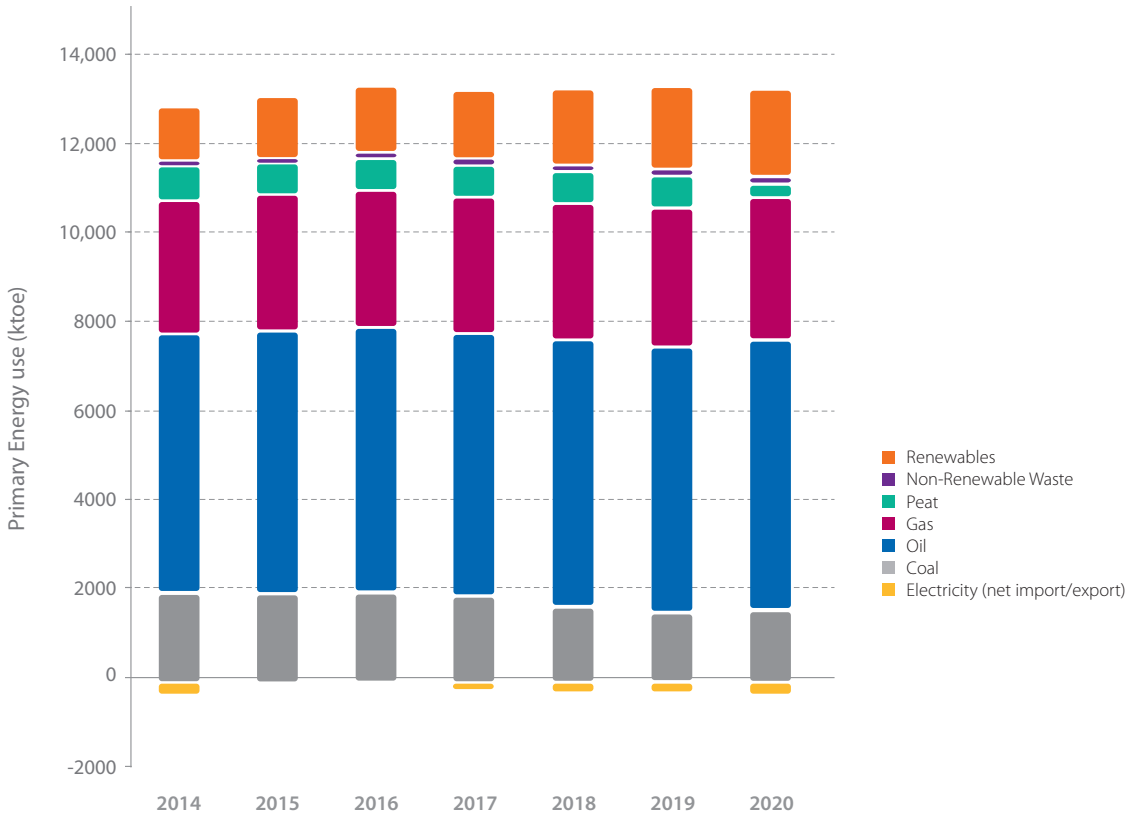
Figure 12 – Forecasted growth in energy demand in Ireland to 2020 by sector



The impact of target achievement on the primary energy fuel requirement for Ireland is shown in **Figure 13**. Should the levels of deployment outlined in previous sections be achieved, renewable energy is set to grow strongly to 2020. Renewable energy from sources such as wind also reduces the overall quantity of primary fuel input required. Unlike the fuels that are combusted to release energy, these sources do not lose energy in the conversion process to final energy.

The projections show that even with target achievement, Ireland is still heavily reliant on fossil fuels. Oil remains the dominant fuel, driven by demand in the transport sector as well as residential, commercial and industrial heating applications. Much of the demand for oil heating is in rural areas that do not have access to the gas grid. Gas combustion to generate electricity and heat is responsible for 24% of primary energy demand by 2020. Coal combustion to generate electricity makes up a sizable proportion of fuel use. The use of peat declines, as policy support for burning peat ends in early 2020. Over the period to 2020, the projections show that Ireland remains a net importer of electricity.

Figure 13 – Target achievement scenario – primary energy by fuel



3.4 Non-ETS emissions target

As noted above, the EU Effort Sharing Decision[32] establishes a binding greenhouse gas emissions target for Ireland that is equivalent to a 20% reduction in emissions relative to a 2005 baseline (for the non-ETS sectors). **Figure 14** represents Ireland's total emissions (2014) with the red segment comprising emissions covered by the EU ETS (i.e. large industry and power stations). EU ETS emissions occur within the cap and trade system established by the European Commission, and therefore are outside the scope of the Effort Sharing Decision target. The 20% emissions reduction target must be achieved in the non-ETS (green and yellow segments in **Figure 14**) portion of Ireland's overall emissions; these include emissions from the residential, commercial and public sector as well as the small industry, agriculture and waste sectors.

Of total emissions, approximately 60% are energy related; of this 60%, 37% of emissions are in the non-ETS sector (which covers transport, residential and waste), and 27% is covered by the EU ETS. A further 36% of emissions are related to the agriculture and waste sectors.

The preceding sections of this report have focused on policies and measures that impact only on the energy-related emissions depicted in **Figure 14**.

Modelling of the target achievement scenario indicates that if all policies and measures are implemented as detailed in both the National Energy Efficiency Action Plan (NEEAP) and NREAP, energy-related non-ETS emissions reduces by 24% compared to 2005 levels (**Figure 15**). The emissions forecasts are combined with non-ETS emissions forecasts for the agriculture[33] and waste sectors by the EPA for the purpose of reporting on compliance with the Effort Sharing Decision.[34]

Figure 14 – Total emissions (2014) EU ETS and non-ETS

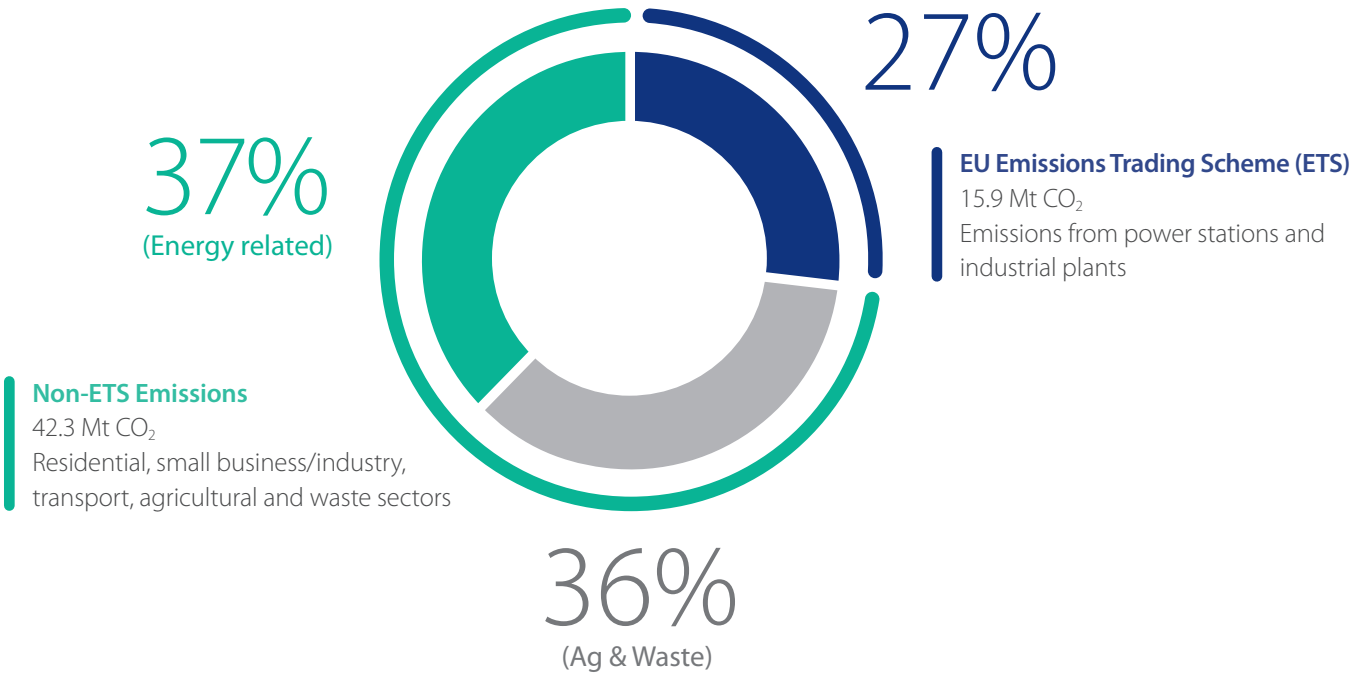
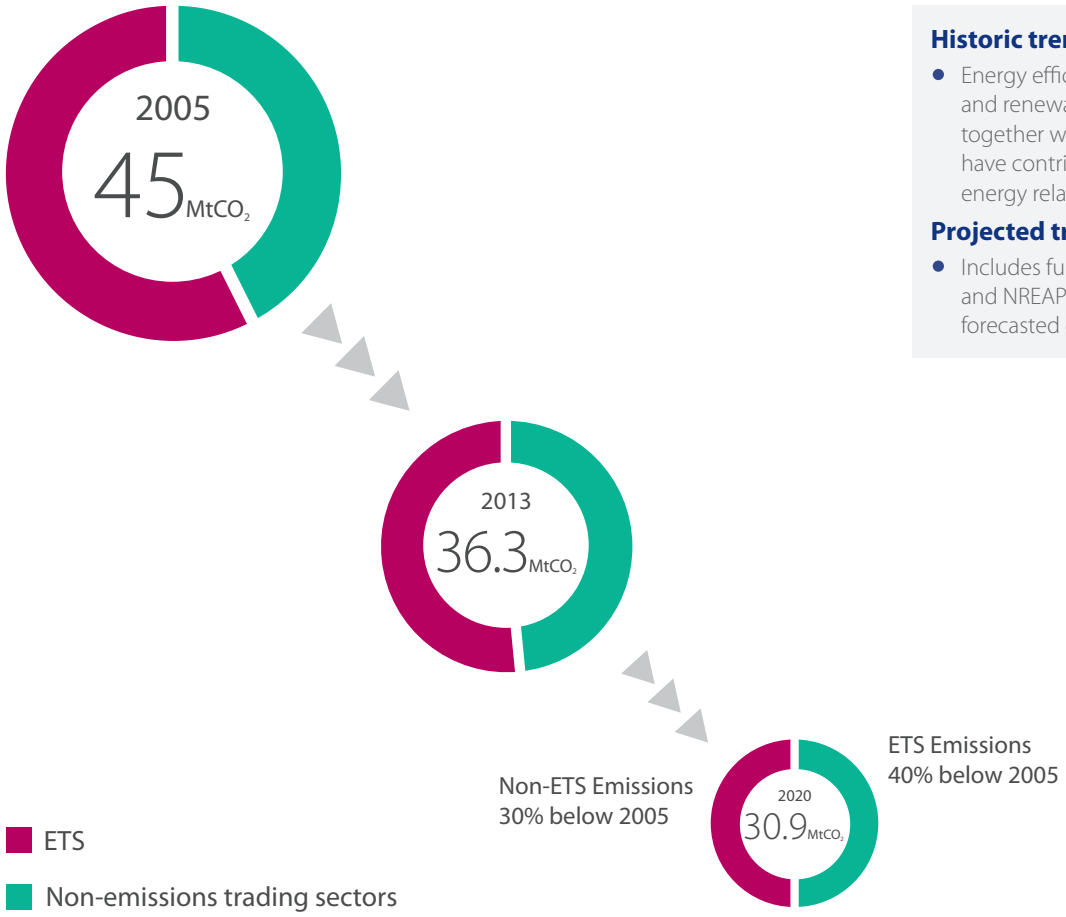


Figure 15 – Energy related emissions only (2005 to 2020)



Historic trend

- Energy efficiency improvements and renewable energy deployment together with economic decline have contributed to the reduction in energy related emissions.

Projected trend

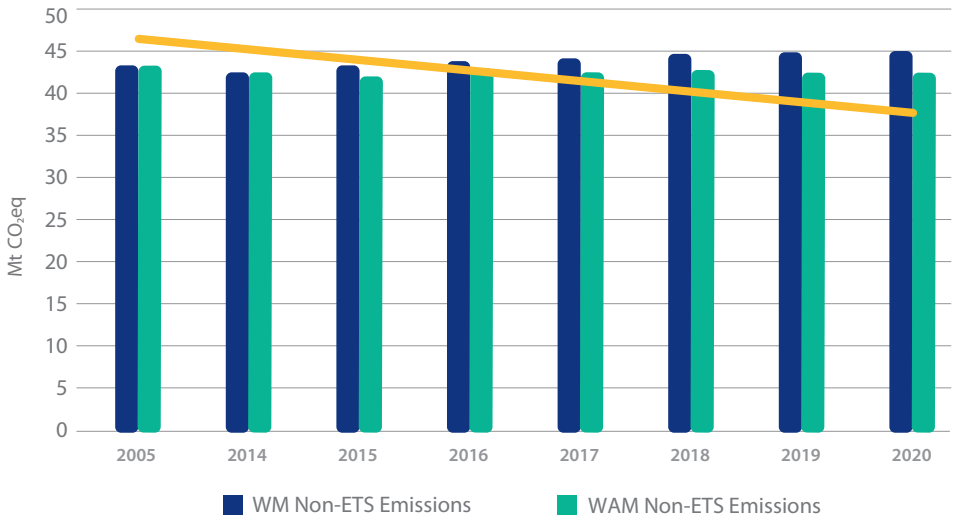
- Includes full delivery of the NEEAP and NREAP combined with forecasted economic growth.

Figure 16 shows two scenarios based on the modelling of expected impacts of policies and measures impacting on non-ETS emissions in Ireland. The baseline case (blue columns) depict a possible outcome on the assumption that no additional policies or measures are implemented post-2014. The comparison case (green columns) include an assumption that the targets addressed in the NEEAP and NREAP are met in full i.e. the target achievement scenario (as described above), together with agricultural emissions projections associated with Food Wise 2025[35] and waste sector emissions.

The results of this modelling indicate that from 2016/2017 onwards, in the absence of additional emissions reductions, annual reduction targets will not be met. On the basis of accounting rules associated with the Effort Sharing Decision (ESD) the net (cumulative) gap to target under the baseline scenario could be in the order of 12 Mt CO_2 for the 'with measures' scenario, in which it is assumed that no further policy progress is made post-2014. Under the target achievement (with additional measures) scenario, it is projected that Ireland could miss its cumulative target by around 3 MT CO_2. This scenario already includes an assumption that the required acceleration of deployment of renewable energy and energy efficiency technologies over the period to 2020 occurs. Any under-compliance in 2020 will result in fines at EU level and lead to a more arduous trajectory in the context of (yet to be defined) post-2020 targets – both in terms of future deployment and potential future compliance costs – an issue that is highlighted in the next section of this report (Section 4). Full details on the emission projections for Ireland are available at **www.epa.ie**.

The option to over-comply with targets exists. This would lead to a potential additional (gross) revenue stream for Ireland in the form of saleable renewable energy credits and or emissions allowances. However, given the challenges highlighted above, such a scenario would not be possible without concerted cross-governmental effort towards sustainable energy deployment in all sectors of the economy.

Figure 16 – Forecast emissions trajectory for two scenarios of future policy action (Source: EPA)



The target achievement scenario (With Additional Measures) requires an acceleration of deployment of renewable energy and energy efficiency technologies over the period to 2020.

Post-2020

4

4.1 Policy context

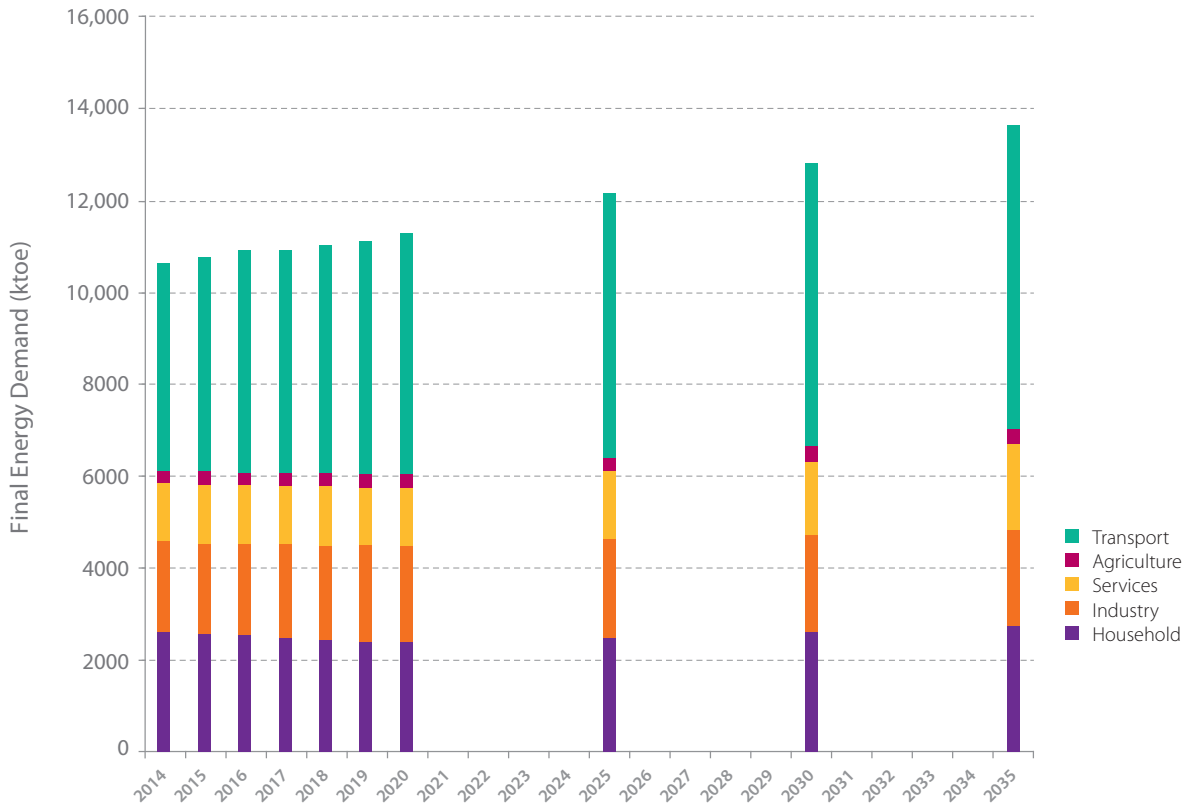
The European Commission has proposed a roadmap to move to a low-carbon economy by 2050. The roadmap aims to reduce EU-wide emissions by 80% to 95%, compared with 1990 levels. The roadmap sets out milestones for a 40% emissions reduction by 2030 and 60% emissions reduction by 2040. EU leaders have agreed to reduce emissions by at least 40% by 2030, with a 27% target for renewable energy penetration. Negotiations are taking place to determine how the burden of this reduction is to be shared among Member States.

Ireland has significant potential to improve the energy efficiency of its building stock and its transport sector while also harnessing its abundance of domestic renewable energy resources. Overcoming the challenges of widespread delivery of sustainable energy technologies and practices can help reduce emissions as well as improve security of supply and competitiveness. Irish companies active in sustainable energy supply chains will also have the opportunity to develop skills and products that can compete to capture a portion of the estimated €300 billion per year market for sustainable energy technologies and services internationally.[36]

4.2 Post-2020 projections

Achievement of the 2020 targets could position Ireland to meet the challenges of future targets from a more advantageous starting point. **Figure 17** illustrates a scenario where Ireland achieves all 2020 energy targets but does not implement any further policies from 2020 onwards. The purpose of this hypothetical scenario is to show what could happen to Ireland's energy demand and supply in the absence of further policy action post-2020. Renewable energy deployment in the electricity and heat sectors are

Figure 17 – Forecast 2020 targets met, but no further policy action post-2020

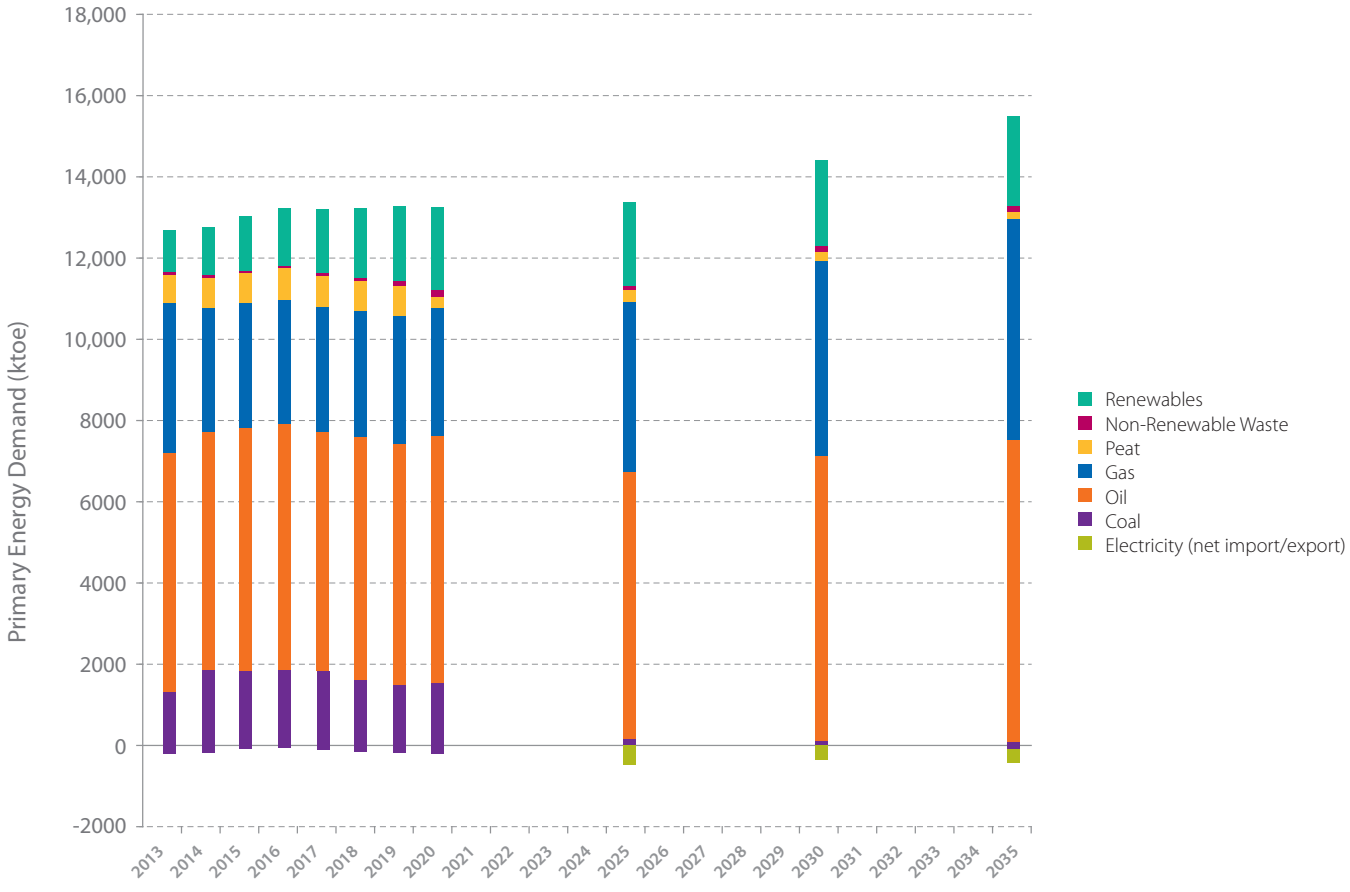


assumed to remain at their 2020 levels, whereas the amount of renewable energy used in transport is fixed at 10% of transport demand. It is further assumed that some energy efficiency regulations continue to have an impact post-2020 (for example, building regulations stipulating the requirement for more energy-efficient homes).

The result of modelling future trends without the impact of future energy policy is an increasing trend in energy use post-2020 that would clearly have negative consequences for future energy-related emissions. The recently published White Paper, Ireland's Transition to a Low Carbon Energy Future, published by the Department of Communications, Energy and Natural Resources in late 2015, provides an update on the Governments energy policy framework to guide energy policy between now and 2030. These policy options and any future targets set for post-2020 at the national level will be modelled in future energy forecasts, in order to provide a more realistic picture of forecasted energy demand post-2020.

Coal use will drop significantly should Moneypoint power station close at the end of its useful life. More gas will be combusted to meet the electricity demand previously supplied by coal generation, and also due to increasing demand from the larger housing stock. Oil is used primarily for transport, but is also used by many homes that are not connected to the gas grid. In the absence of future policy action, renewable energy supply remains close to 2020 levels and reduces as a proportion of total fuel use.

Figure 18 – Forecast 2020 targets met, but no further policy action post-2020



Deep decarbonisation of the energy sector needs to start now if 2050 benchmarks are to be achieved.

Figure 19 – Energy-related emissions only (ETS and non-ETS)

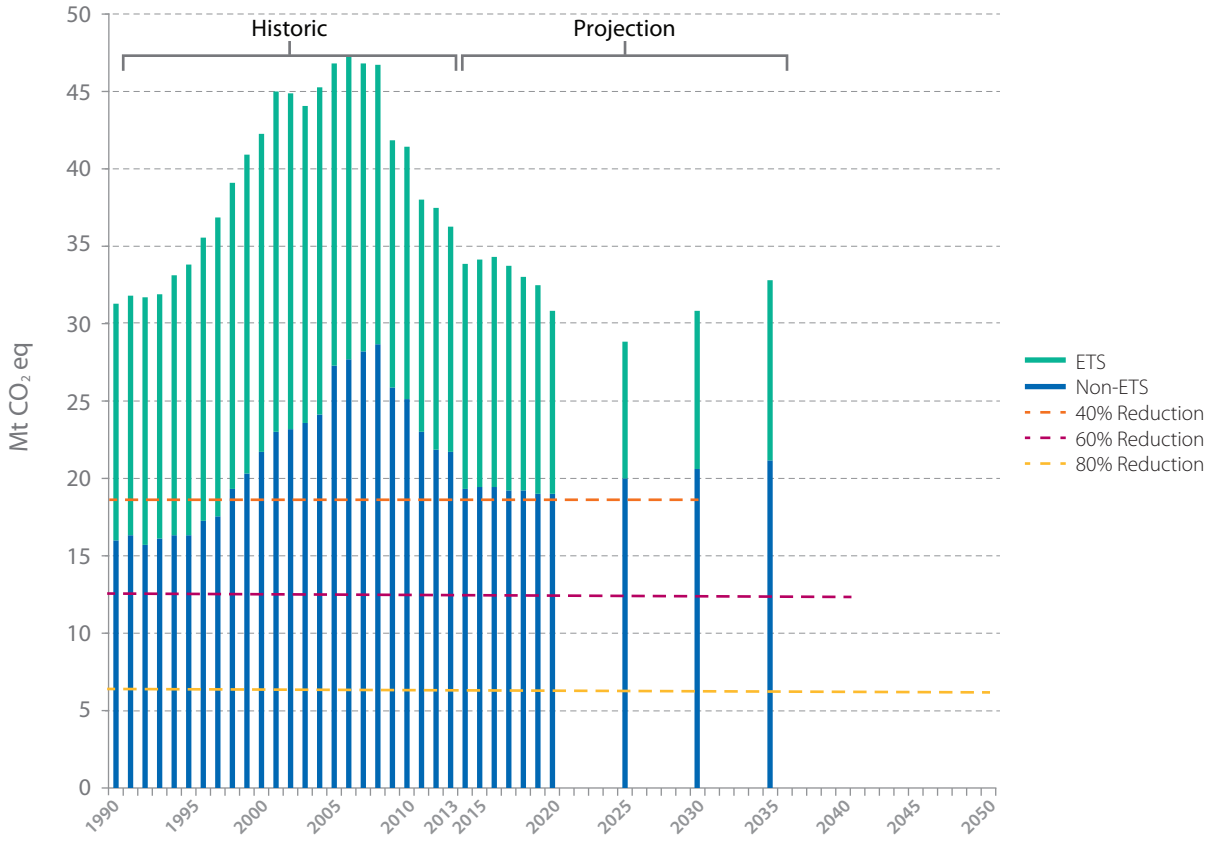


Figure 19 shows the impact of the energy use trends on energy-related emissions only, given the assumptions described above. These do not include agricultural and waste emissions, which currently account for 35% of total greenhouse gas emissions. Projections for those emissions are generated separately by the EPA.

Highlighted in **Figure 19** are the emissions reduction levels required to meet the 40%, 60% and 80% benchmarks (on 1990 levels) as indicated by the ambition for Europe. The chart emphasises the crucial role of ongoing policy action on sustainable energy.

Conclusion

5

To date, significant progress has been made towards achieving Ireland's energy efficiency and renewable energy targets.

Ireland needs to continue to expand its efforts in terms of meeting its renewable energy and energy efficiency targets, which will in turn deliver macroeconomic benefits and environmental benefits, and will ensure compliance with legislative targets.

This forecast report provides an assessment of the technology deployment effort required to meet both national and EU targets on energy efficiency and renewable energy for 2020. The aim is to provide a sense of the scale of the challenges remaining in order to achieve these targets: How many homes will have to implement some energy efficiency improvement measures? How much will businesses have to invest? How many wind turbines, biomass boilers and heat pumps must be installed?

The increased level of effort required by Ireland to achieve its energy efficiency and renewable energy targets has been highlighted. As follows:

- Approximately 75,000 homes and businesses must be upgraded for improved energy efficiency every year – depending on the depth of retrofit opted for.
- Between 200 MW and 250 MW of additional wind capacity must be installed every year.
- Supply of between 440 million and 500 million litres of biofuels must be secured for blending with fossil fuels for transport – increasing biofuel penetration in existing fuel supplies to 8%.
- Roll-out of electric vehicles must be greatly accelerated – to the point where the 20% of new cars sold in Ireland must be electric within 5 years.
- 300,000 homes or 3,000 services/ public sector buildings or 200 large industrial sites must be encouraged to install renewable heat options such as biomass boilers, solar thermal, and biomass CHP systems.

These actions are in line with the targets set out in the National Energy Efficiency Action Plan (NEEAP) and the National Renewable Energy Action Plan (NREAP) which will, with ongoing development, refinement and expansion, continue Ireland's drive towards target achievement. Ongoing analysis of the impacts of these actions will be required in order to ensure that any policy gaps are filled in an efficient way.

SEAI will continue to support the Government through the provision of robust evidence and analysis, as provided in this report, and through the delivery of Government programmes, as required. In addition to providing research, data and analysis to inform decision-making, some specific SEAI actions will include:

- investigate alternative finance models to encourage widespread uptake of energy efficiency measures
- carry out behavioural analysis and how it impacts on the uptake of energy efficiency measures
- undertake empirical energy use studies
- develop least-cost modelling and cost-benefit analysis
- research and advise on appropriate structures to ensure social acceptance of renewable electricity infrastructure

The actions listed above are specific to the work of SEAI. Further details on Government actions in on sustainable energy policy and measures are available in the latest Government energy policy statement 'Ireland's Transition to a Low Carbon Energy Future, 2015 – 2030' (DCENR, 2015), and at **www.seai.ie** and **www.dcenr.gov.ie** under the relevant headings. Specific and comprehensive detail is provided in Ireland's latest National Energy Efficiency Action Plan and National Renewable Energy Action Plan, which are available from the Department of Communications, Energy and Natural Resources.

The broad range of benefits highlighted in this report should provide further incentives to potential investors. Work aimed at understanding these benefits in more detail is currently ongoing. Such benefits include significant comfort and health gains for households; increased asset values following energy efficiency improvements; increased competitiveness for large and small businesses, and improved energy security through reduced reliance on imported fossil fuels. Importantly, concerted action on sustainable energy could provide significant employment in the short to medium term.

Associated reference documents

Many supporting publications are available at **www.seai.ie**

1. *Unlocking the Energy Efficiency Opportunity* (2015)
2. *Macroeconomic and Net Employment Impacts of Ireland's Renewable Heat and Electricity Targets in 2020* (2015)
3. *Renewable Heat in Ireland to 2020* (2015)
4. *Ireland's Sustainable Energy Supply Chain Opportunity* (2014)
5. *The Case for Sustainable Energy – A review and analysis of the economic and enterprise benefits* (2012)
6. *Bioenergy Supply Curves for Ireland (2010 – 2020)* (2012)
7. *Impact of Wind Generation on Wholesale Electricity Prices in 2011* (2012)
8. *Quantifying Ireland's Fuel and CO_2 Emissions Savings from Renewable Electricity in 2012 (2014) Better Energy Homes Impact Report – Billing Analysis* (2011)
9. *Economic Analysis of Residential and Small-Business Energy Efficiency Improvements* (2011)
10. SEAI 2050 Energy Roadmaps (Ocean Energy, Bioenergy, Residential Energy, Wind Energy, Smartgrid, Electric Vehicles).

Text footnotes

[1] ESB Networks/Eirgrid or EPSSU

[2] Efforts are underway to increase uptake rates across all sectors. See details in *Ireland's Transition to a Low Carbon Energy Future 2015 – 2030* (DCENR, 2015)

[3] Over 500 sold by November 2015

[4] Further details are available at **http://www.seai.ie/Publications/Statistics_Publications/Energy_Modelling_Group_Publications/Achieving-Ireland-s-2020-Renewable-Heat-Target.pdf**

[5] **http://www.dcenr.gov.ie/energy/en-ie/Renewable-Energy/Pages/Bio-Energy.aspx**

[6] *Unlocking the Energy Efficiency Opportunity*, SEAI (2015)

[7] *A Macroeconomic Analysis of Bioenergy Use to 2020. Sustainable Energy Authority of Ireland.* (2015)

[8] *A Macroeconomic Analysis of Onshore Wind Deployment to 2020. Sustainable Energy Authority of Ireland.* (2015)

[9] *Ireland's Sustainable Energy Supply Chain Opportunity*, SEAI (2014)

[10] The broad range of this estimate reflects uncertainty around compliance costs in the as yet non-existent compliance market for renewable energy target compliance.

[11] *National Renewable Energy Action Plan, Ireland*. Submitted to the European Commission under Article 4 of Directive 2009/28/EC. Department of Communications, Energy and Natural Resources, 2010

[12] *Maximising Ireland's Energy Efficiency. The National Energy Efficiency Action Plan 2009-2020*. Department of Communications, Energy and Natural Resources, 2014; *Ireland's third National Energy Efficiency Action Plan to 2020*. Department of Communications, Energy and Natural Resources, 2014.

[13] Effort Sharing Decision (Decision No 406/2009/EC)

[14] Reflecting methodology set out by the European Commission in the context of the Energy Services Directive (2006/32/EC).

[15] €2013

[16] *Unlocking the Energy Efficiency Opportunity*. Sustainable Energy Authority of Ireland. (2015)

[17] €2013

[18] Net present value (NPV)

[19] *Capturing the Multiple Benefits of Energy Efficiency,* IEA (2014) **http://www.iea.org/topics/energyefficiency/energyefficiencyiea/multiplebenefitsofenergyefficiency/**

[20] Source EPSSU – Renewable energy in Ireland and SEAI GIS

[21] Data from SEAI greener homes and ReHeat schemes

[22] Based on the current 2.8% blend (by energy unweighted) of biofuel with all petrol and diesel

[23] See, for example: *Macroeconomic and Net Employment Impacts of Ireland's Renewable Heat and Electricity Targets in 2020*, SEAI (2015), *Quantifying Ireland's Fuel and CO_2 Emissions Savings from Renewable Electricity in 2012*, SEAI (2014), *Impact of Wind Generation on Wholesale Electricity Prices in 2011* (SEAI, 2011).

[24] RES is the acronym for renewable energy source, and is the terminology used in the EU Renewable Energy Directive to describe the level of renewable penetration required in each of the end-use sectors.

[25] The target achievement scenario represents one possible scenario; the eventual technology mix deployed for target achievement could change.

[26] **http://www.eirgrid.com/operations/ds3/**

[27] The RES_H target is reported on a sectoral basis given the complexity of modelling technology use in the sector.

[28] At the time of publication of this report, a grant for solar heating is included under the Better Energy Homes grant scheme, whereas biomass boilers are not currently supported.

[29] A detailed assessment is presented in *Renewable Heat in Ireland to 2020* (SEAI, 2015).

[30] *Achieving Ireland's 2020 Renewable Heat Target*. Sustainable Energy Authority of Ireland. (2015)

[31] Noting the interaction of demand reduction through energy efficiency and other aspects impacting on energy demand, including energy prices, GDP etc.

[32] For details, see **http://ec.europa.eu/clima/policies/effort/index_en.htm**

[33] Emissions forecasts based on Food Harvest 2020 expectations.

[34] A function managed by the EPA. Latest report available at: **http://www.epa.ie/pubs/reports/air/airemissions/#.Ve6uz5iFPcs**

[35] For the full EPA report, see: **http://www.epa.ie/pubs/reports/air/airemissions/#.Ve7mfZiFPct**

[36] Based on estimates of the market size for the EU and the US.

Notes

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