SUSTAINABLE ENERGY AUTHORITY OF IRELAND

First Look: Renewable Energy in Ireland 2023

Visualising renewable energy data from SEAI's national energy balance

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Sustainable Energy Authority of Ireland
SEAI is Ireland's national energy authority investing in, and delivering, appropriate, effective and sustainable solutions to help Ireland's transition to a clean energy future. We work with the public, businesses, communities and the Government to achieve this, through expertise, funding, educational programmes, policy advice, research and the development of new technologies.

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Background and Scope

This report is part of the new *'First Look'* series of publications from the Energy Statistics Team in SEAI. These *First Look* publications aim to rapidly highlight and visualise the key energy insights from SEAI's data releases. *First Look* publications effectively disseminate timely and trusted energy and energy-related emission data, to better inform evidence-led energy policy, and to measure the pace of progress against binding energy and climate targets.

Based on the latest data from SEAI's full national Energy Balance, this *First Look* report provides a detailed breakdown of renewable energy use in Ireland over the last 10-years:

- Supply – Indigenous production, imports, and exports
- Capacity – Maps of wind, solar-PV, and hydro-electric generation capacity
- Transformation – Input to electricity generation
- Demand – Direct end-user consumption

Additionally, this report provides provisional estimates[1] of Ireland's 2023 renewable energy share (RES) results against renewable electricity, transport, and heat targets set-out under the EU's renewable energy directives, and Ireland's climate action plan (CAP) and national energy climate plan (NECP).

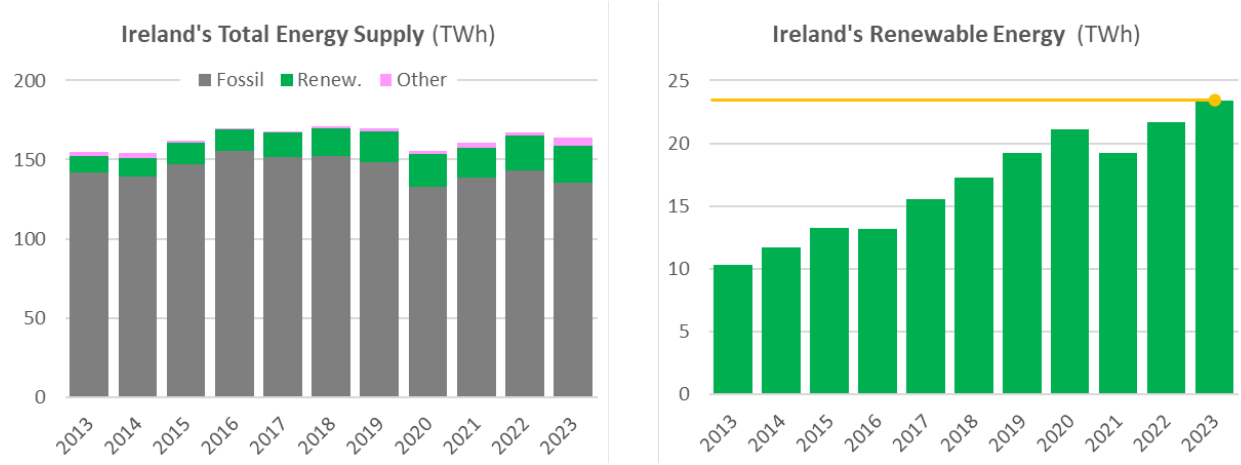
[1] The official RES results of all EU member states are centrally calculated for the European Commission by Eurostat. Ireland's official RES results will be based on annual energy questionnaire submissions to Eurostat in October, and Ireland's EU-SHARES submissions in November, both made on Ireland's behalf by SEAI.

1 Key Trends and Observations

1.1 Renewable Energy Supply

Ireland's energy supply remains heavily dependent on imported fossil fuels. In 2023, 82.6% of Ireland's energy came from fossil fuels. Ireland set a record high of 23.38 TWh in renewable energy use across electricity, transport, and heat for 2023, however its overall renewable energy share (RES-overall) was just 14.6%[2]. Under the EU's binding Renewable Energy Directive, Ireland has a minimum baseline RES-overall target of 16% every year out to 2030 and needs to achieve a RES-overall result of 43% by 2030.

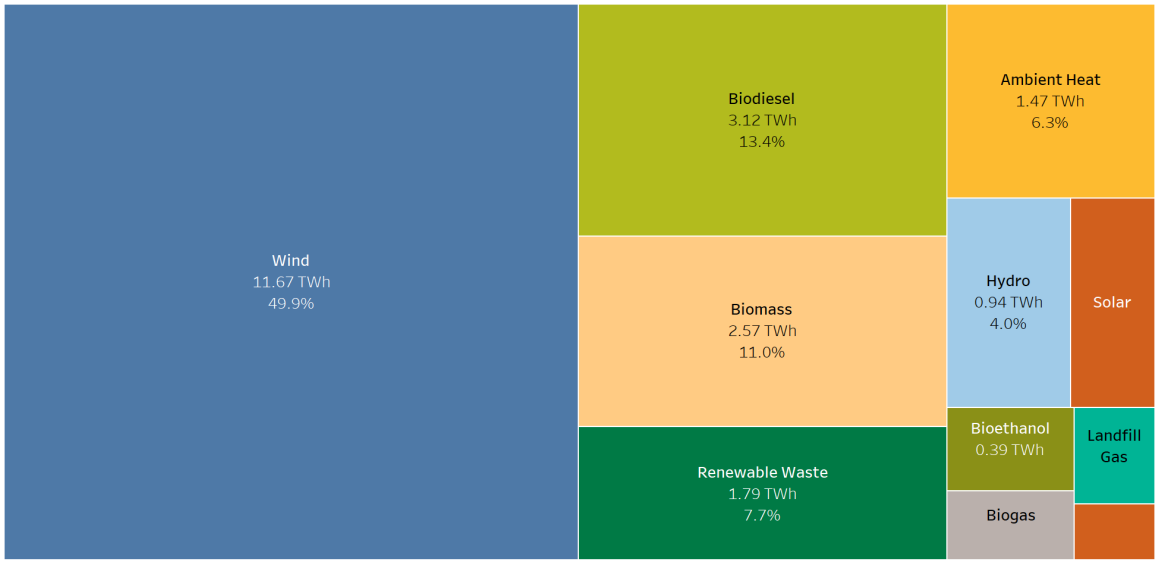
Figure 1.1 – Trends in Ireland's total energy requirement and renewable energy use over the last 10-years.



Increasing Ireland's use of indigenous renewable energy helps improve the security of our energy supply and acts to avoid energy-related emissions. Ireland's use of renewables in 2023 helped avoid 7.4 $MtCO_2$ of emissions. By way of comparison, Ireland's national energy-related emissions in 2023 were 30.1 $MtCO_2$, highlighting that our use of renewable energy avoids significant levels of emissions. Further reducing energy-related emissions through accelerated displacement of fossil fuels by renewable energy, coupled with energy demand reduction is key to achieving our carbon budgets.

[2] Provisional value for the *share of energy from renewable sources in gross final consumption of energy* (RES-overall) in Ireland in 2023, calculated at the time of publication in accordance with the EU's recast Renewable Energy Directive (RED II), Directive (EU) 2018/2001, and associated guidance from Eurostat.

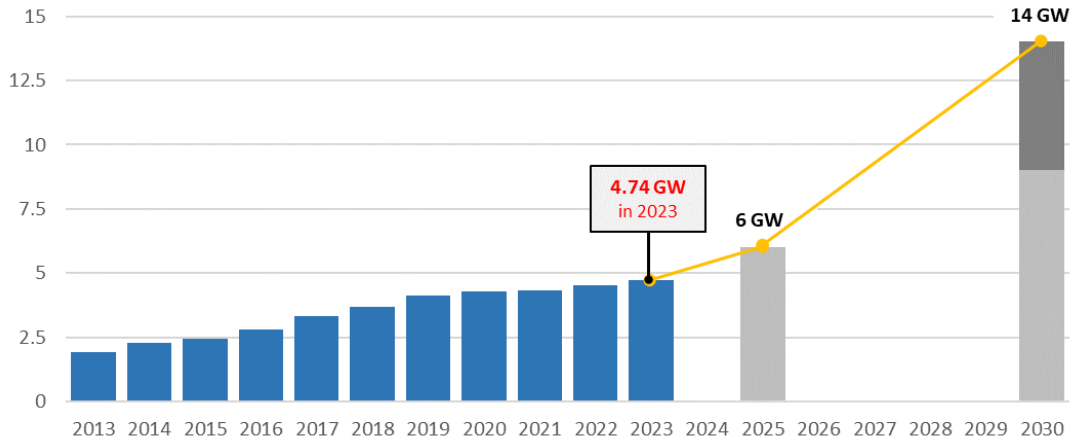
Figure 1.2 – Ireland's 23.38 TWh renewable energy requirement in 2023 broken down by renewable energy type.



Ireland used 23.38 TWh of renewable energy in 2023, up from 21.68 TWh in 2022. Wind accounted for just under half (49.9%) of that renewable energy, followed by biodiesel (13.4%) and biomass (11.0%). Together, these three renewable sources account for approximately three-quarters (74.3%) of Ireland's renewable energy. While 2023 saw much progress in renewable energy use, with new records sets for wind, solar-PV, biofuel blending, and renewable ambient heat from heat-pumps, Ireland cannot deliver on its commitments to reducing emissions and increasing renewable energy share without an unprecedented increase in the rate of roll-out of renewable resources and energy demand reduction measures.

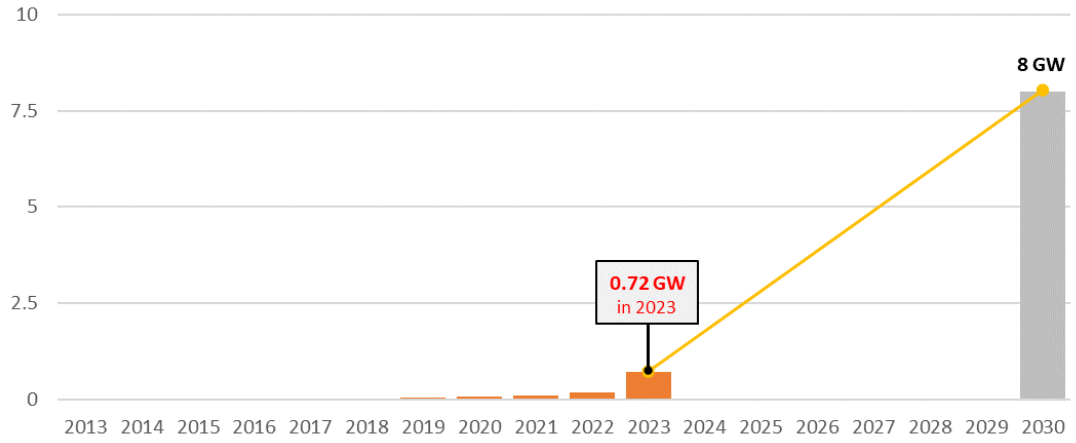
Ireland's Climate Action Plan (CAP) targets significant infrastructure investment to increase the indigenous supply of renewable energy by 2025 and 2030, particularly for wind and solar energy.

Figure 1.3 – Ireland's installed wind capacity to the end of 2023 in GW and its CAP targets for 2025 and 2030.



Ireland's total installed wind capacity at the end of 2023 was 4.74 GW, after adding 0.20 GW of capacity during 2023. In its most recent climate action plan (CAP), Ireland has set itself a target of 6 GW of installed wind capacity by the end of 2025. To achieve this target, Ireland will need to add an average of 0.63 GW of installed capacity in both 2024 and 2025. Ireland's target for 2030 is 15 GW of installed wind capacity, with 9 GW of onshore wind and 5GW of offshore wind. Achieving this target will require adding an average of 1.47 GW of installed capacity every year for the next seven years.

Figure 1.4 – Ireland's installed solar-PV capacity to the end of 2023 in GW and its CAP target for 2030.



Ireland's total installed solar-PV capacity (AC) at the end of 2023 was 0.72 GW, after adding 0.53 GW of capacity during 2023. Ireland has set itself a target of 8GW of installed solar-PV capacity by the end of 2030. Achieving this target will require adding an average of 1.04 GW installed capacity every year for the next seven years, most of which will likely be backloaded into the late-2020s.

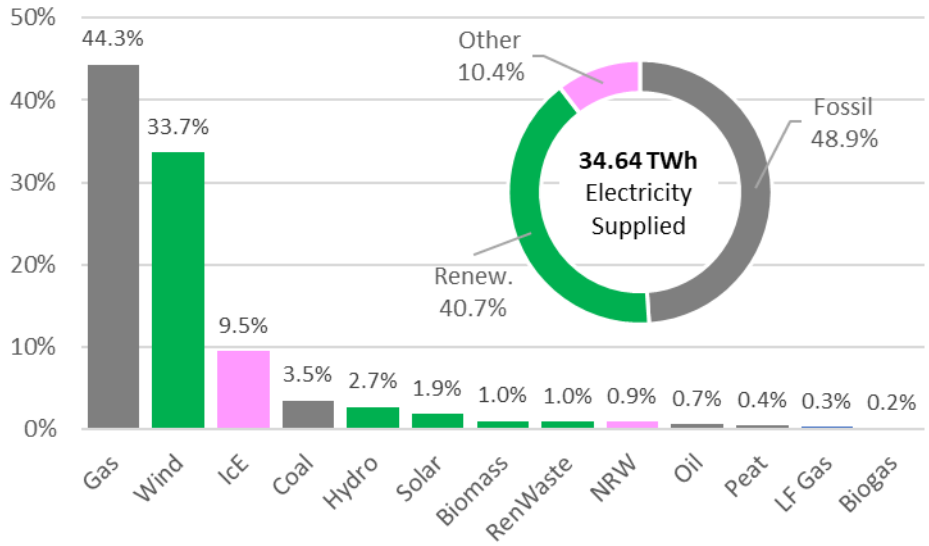
1.2 Renewable Energy Use

Some types of renewable energy, like biodiesel and bioethanol, are consumed directly by an end-user. Some types of renewable energy, like wind or landfill gas, are first transformed or exchanged into electricity before reaching an end-user. Some types of renewable energy, like biomass, can be both directly and indirectly consumed by end-users:

- Direct consumption – for example, wooden logs and wood chips burned for space-heating in a home.
- Indirect consumption - biomass combusted in a public thermal power plant to generate electricity that powers a heat-pump that delivers space-heating in a home.

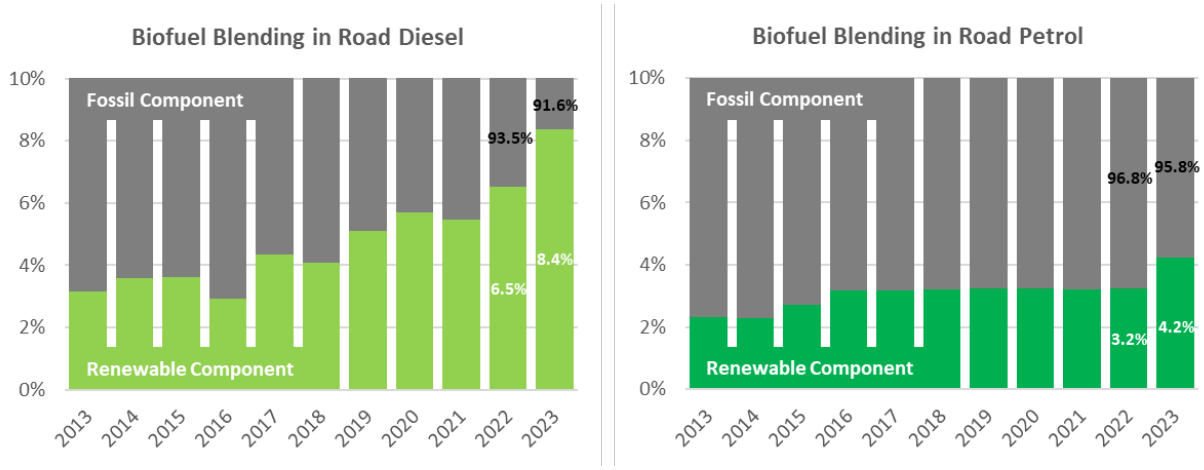
In 2023, about two-thirds (67.4%) of Ireland's renewable energy went to electricity generation, and one-third (32.6%) was directly consumed by end-users.

Figure 1.5 – Percentage-breakdown Ireland's electricity supply in 2023 by generation / supply source (Note: IcE stands for interconnector electricity and NRW stands for non-renewable waste).



In 2023, 40.7% of Ireland's electricity supply came from renewable energy, up from 38.6% in 2022. Just over a third (33.7%) of our electricity came from wind in 2023. Solar-PV generation accounted for 1.9% of electricity supply in 2023, which is the equivalent of providing all the country's electricity needs for 1 full week. Ireland has set itself a renewable energy share of electricity (RES-E) target of 80% by 2030, while reducing electricity generation emissions by 75% in the same period. Achieving these targets will require rolling-out renewable generation at a rate not seen before, while developing new approaches to energy storage and demand-side management, along with the integration of increased international interconnector flows.

Figure 1.6 – Energy-share of renewable biofuel blending into road diesel and road petrol over the last 10 years.



A substantial fraction of renewable energy directly consumed by end-users is due to biofuel blending into road transport fuels. Ireland set new records for biofuel blending in both road petrol and road diesel in 2023. The annualised average biofuel-blend in road diesel was 8.4% in 2023, up from 6.5% in 2022. The average biofuel-blend in road petrol was 4.2% in 2023, up from 3.2% in 2022. Despite this progress, Ireland's energy mix for road transport remains heavily dependent on fossil fuel. In 2023, 91.9% of Ireland's road transport demand came from fossil fuels, and this value increases to 93.8% when the energy demand from aviation, navigation, and rail transport are included.

Ireland has set itself targets of achieving blend-rates of 10% biofuel in petrol (E10) and 12% biofuel in diesel (B12) by 2025, with the blend-rate in diesel to reach 20% (B20) by 2030. To achieve the necessary emission reductions in the transport sector, improvements beyond simply further increasing the biofuel blending rate are also needed, including:

- Greater uptake of active travel and public transport.
- Increased roll-out of electric vehicles (EVs), particularly battery-only EVs, to ultimately phase out petrol- and diesel-powered vehicles.

1.3 Renewables Energy Targets

Ireland's renewable energy share, and that of all EU member states, is calculated and monitored by the European Commission under different iterations of the Renewable Energy Directive (RED). The renewable energy share of EU member states is monitored through four key metrics:

- RES-overall Overall renewable energy share
- RES-E Renewable energy share in electricity
- RES-T Renewable energy share in transport
- RES-H Renewable energy share in heating (and cooling)

The methodology for calculating the four RES results and setting their targets - which can include applying multipliers, limits, normalisations, and sustainability-checks on specific energy sub-products - is specified through the relevant iteration of the directive for a given year. To date, there have been three iterations of the Renewable Energy Directive:

- RED-I 2010 to 2020
- RED-II 2021 to 2024 *(RED-II transposition deadline was end of June 2021)*
- RED-III 2025 to 2030

While Ireland's official RES results are calculated and published by Eurostat (based on data submitted by SEAI on Ireland's behalf), provisional RES results for 2023 can already be calculated, based on the best data currently available to SEAI from the National Energy Balance and other annual data.

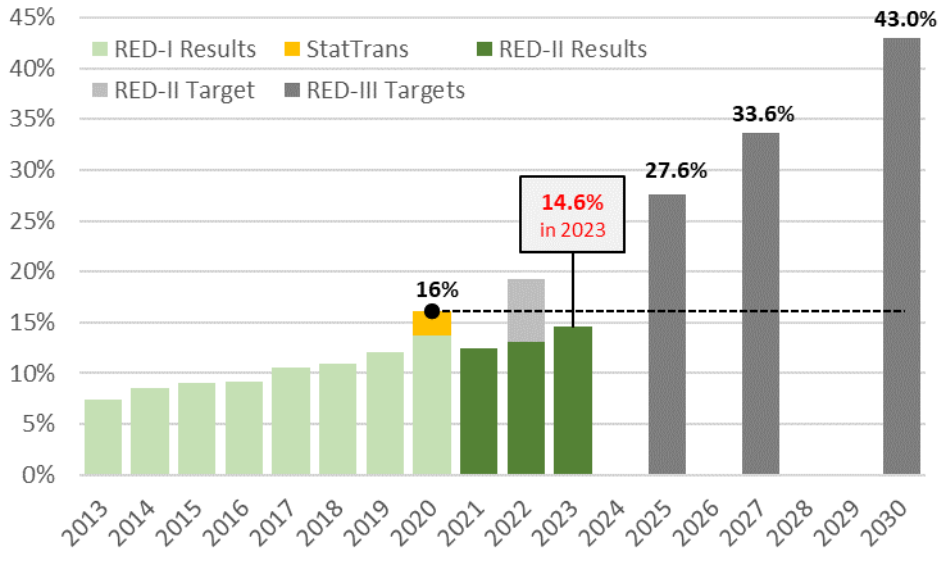
1.3.1 Overall Renewable Energy Share (RES-Overall)

Ireland fell short of its 2020 RES-overall target of 16% in 2020 under RED-I, but achieved compliance with the Directive with the help of 2.5 percentage points of statistical transfer of renewable energy from Denmark and Estonia. Statistical transfers are an established cooperation mechanism within RED. Statistical transfers are based on agreements between EU Member States, in which no energy is physically exchanged, but one Member State transfers renewable energy (statistically) from its RES-overall to that of another Member State.

Ireland's RES-overall targets out to 2030 are defined through the National Energy Climate Plan (NECP) prepared under the EU Regulation on the Governance of the Energy Union[3], RED II and RED III. In addition to a 'baseline' RES-overall target of 16% in all years, Ireland has a series of reference points for specific milestone years:

- 2022 19.3% (RED-II) and 20.9% (RED-III)
- 2025 27.6% (RED-III)
- 2027 33.6% (RED-III)
- 2030 43.0% (RED-III)

Figure 1.7 – Ireland's RES-overall results over the last decade and its targets out to 2030 under RED-II and RED-III (with a provisional RES-overall result for 2023).



In 2023, Ireland's provisional RES-overall result was 14.6%, up from 13.1% in 2022. Ireland's RES-overall result in 2023 was the highest achieved to date without the use of statistical transfers, but remains below its baseline target of 16%, and below the indicative trajectory set by the reference points. The national energy climate plan proposes a portfolio of policies and measures in support of achieving the RES-overall target of 43% by 2030, including:

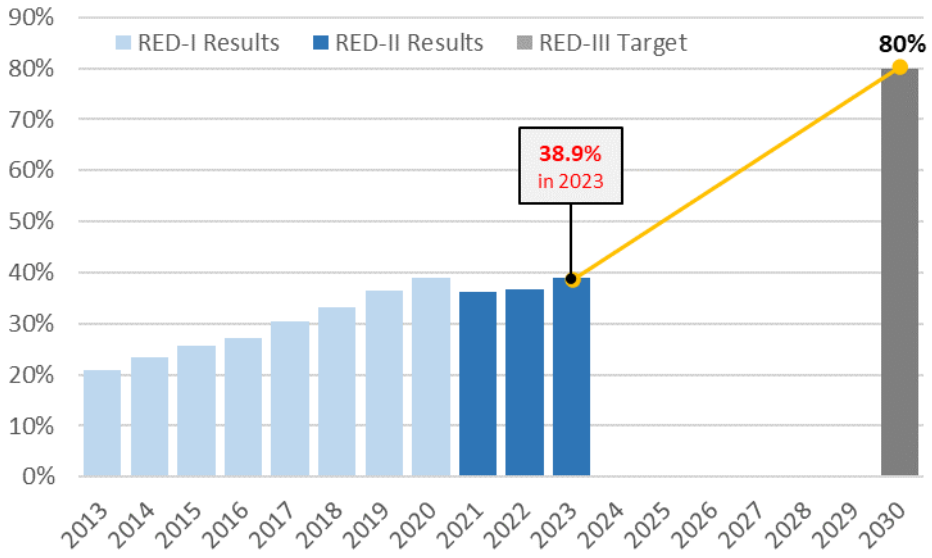
- Increased wind and solar generation of electricity.
- Increased renewable heating through the roll-out of heat-pumps and district heating.
- Increased active travel, public transport, electrification of transport, and biofuel blending.

[3] *Regulation (EU)_2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action*

1.3.2 Renewable Energy Share in Electricity (RES-E)

Increasing the availability of renewable electricity - and shifting fossil-fuel based transport and heating demand to that renewable electricity – is core to achieving Ireland's legally binding climate targets. Through the Climate Action Plan, Ireland set itself a RES-E target of 40% for 2020 (under RED-I) and a target of 80% for 2030 (under RED-II and RED-III).

Figure 1.8 – Ireland's RES-E results over the last decade and its target out to 2030 under the RED-III directive (with a provisional RES-E result for 2023).



In 2023, Ireland's provisional RES-E result was 38.9%, up from 36.8% in 2022. Ireland's RES-E result has been relatively constant over the last five years, bounded by a minimum of 36.3% in 2021 and a maximum of 39.0% in 2020, due to several factors:

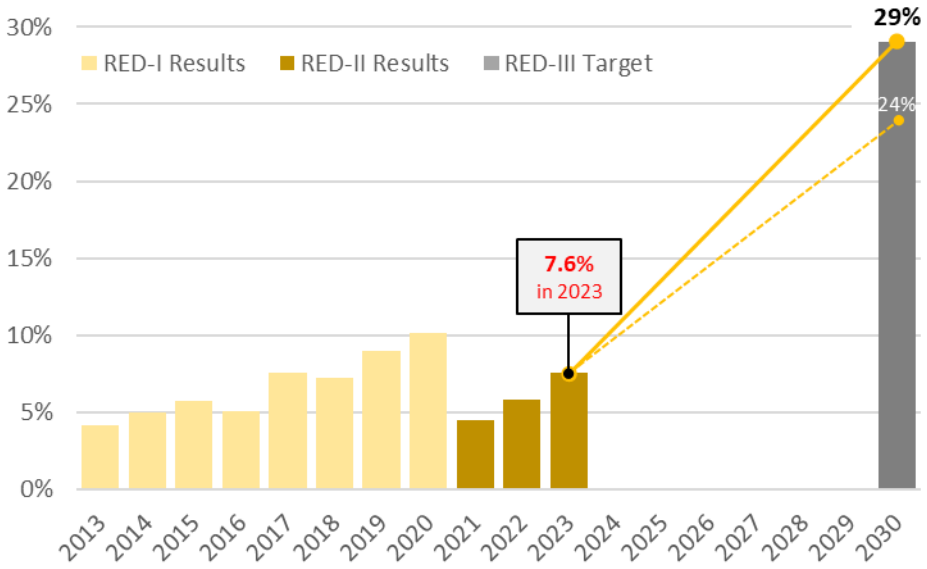
- Multi-year averaging of wind capacity factor in the RES-E calculation methodology.
- RED-I to RED-II methodology change that brought additional sustainability criteria on biomass.
- Slowdown in addition of installed wind capacity between 2020 and 2023.
- Relatively poor wind conditions in 2021.
- Electricity demand increasing faster than the pace at which renewable generation is being added.

To align to a RES-E target of 80% by 2030, Ireland will need to deliver against its installed capacity targets of 9 GW onshore wind, 5 GW offshore wind, and 8 GW solar-PV capacity, while investing in the systems and infrastructure needed to securely distribute and balance the increased and intermittent electricity supply.

1.3.3 Renewable Energy Share in Transport (RES-T)

Ireland had a RES-T target of 10% for 2020 under RED-I and a target of 14% for 2030 under RED-II. The introduction of RED-III increases Ireland's 2030 RES-T target to 29% (or to opt instead for a 14.5% reduction in the greenhouse gas intensity of transport). If Ireland's fraction of crop-based biofuels is kept to less than 2%, then it may be possible to make an application to the EU to reduce the 2030 target from 29% to 24%.

Figure 1.9 – Ireland's RES-T results over the last decade and its target out to 2030 under the RED-III directive (with a provisional RES-T result for 2023).



In 2023, Ireland's provisional RES-T result was 7.6%, up from 5.8% in 2022.

Ireland's RES-T results from 2021 to 2023 (RED-II) are below the results seen in 2019 and 2020 (RED-I), mainly due to a new limit introduced by the RED-II methodology. Under RED-II, the amount of renewable biofuel sourced from used cooking oil and animal fats that can be deemed countable towards the RES-T result is limited to 1.7%. Ireland's share of biofuel from those feedstock sources is between 4-5%, which means that not all biofuels being used for transport in Ireland is countable towards the RES-T calculation. However, this biofuel remains countable towards the RES-overall result and does act to reduce transport emissions by displacing fossil fuel.

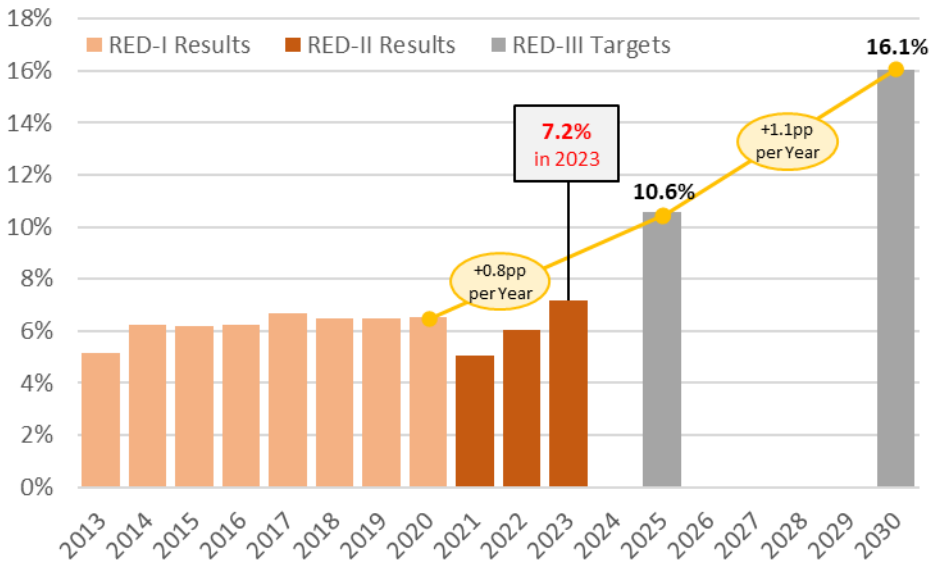
Transport is the single largest sector in Ireland for energy demand. In 2023, 43.2% of Ireland's end-user energy demand came from the transport sector, and 93.8% of that energy came from fossil fuels. As one of the largest and most carbon intensive sectors in the economy, increasing the renewable energy share in transport is key to satisfying Ireland's climate targets. Ireland's climate action plan proposes a framework of avoiding, shifting, and improving our transport energy demand, to meet our climate targets:

- Develop services, communities, and infrastructure to avoid the need to travel, especially by private car.
- Shift away from private car use by improving the attractiveness of sustainable travel modes such as public transport and active travel, including cycling and walking.
- Improve the efficiency of the national fleet through electrification of cars, road freight, and public transport.

1.3.4 Renewable Energy Share in Heating (RES-H)

According to official EU statistics published by Eurostat, Ireland had the lowest renewable energy share in heating in Europe in 2022. Ireland's 2022 RES-H result was 6.1%, which was approximately four times lower than the EU-average of 25% for RES-H. Under RED-III, each EU member state, including Ireland, must increase its RES-H result by at least 0.8 percentage points per year from 2021 to 2025 (as an annual average over that period), and by at least 1.1 percentage points per year from 2026 to 2030, starting from the RES-H result achieved in 2020. For Ireland, this is equivalent to a RES-H trajectory target of 10.6% in 2025 and a RES-H trajectory target of 16.1% in 2030.

Figure 1.10 – Ireland's RES-H results over the last decade and its targets out to 2030 under the RED-III directive (with a provisional RES-H result for 2023).



In 2023, Ireland's provisional RES-H result was 7.2%, up from 6.1% in 2022. Ireland's RES-H result in 2023 was the highest achieved to date but remains below the trajectory needed in the 2021 to 2025 period. Ireland's RES-H results from 2021 and 2022 (RED-II) are below the results seen in the preceding decade (RED-I), mainly due to new sustainability checks on biomass introduced by the RED-II methodology. Under RED-II, only biomass fuels consumed in installations below certain size thresholds (thermal input less than 20 MW for solid biomass or less than 2 MW for gaseous biomass fuel) or biomass fuels that meet the sustainability & GHG-saving criteria (and are verified as such) can be counted towards the RES-H result.

Switching heat demand to renewably powered heat pumps, while switching homes in towns and cities to district heating, will be key solutions to improving Ireland's RES-H result. Reducing overall heat demand through improved building fabric will also be critical. The climate action plan calls for the following:

- District heating — Up to 0.8 TWh of installed capacity by 2025 (up to 2.7 TWh by 2030)
- Heat pumps — 170,000 new dwellings using heat pumps by 2025 (280,000 by 2030)
  45,000 existing dwellings using heat pumps by 2025 (400,000 by 2030)
- Biomethane — Up to 0.6 TWh of heat provided by biomethane by 2025 (up to 1.1 TWh by 2030)

The recently announced renewable heat obligation (RHO) scheme will further support increased use of renewable energy in satisfying heat demand. The RHO will place a legal obligation on those suppliers of fossil fuels for heating to ensure that a proportion of the energy they supply is renewable.

2 Ireland's Renewable Energy Types

This section provides individual details on the 11 distinct types of renewable energy currently contributing to the national energy portfolio. It uses flow-charts to fully map the 'journey' of each renewable energy type from the sourcing of its supply, through any transformation and exchanges, to final end-user consumption:

- Wind
- Biodiesel
- Biomass
- Renewable Wastes
- Ambient Heat
- Hydro Power
- Solar Photovoltaic
- Bioethanol
- Landfill Gas
- Biogas
- Solar Thermal

Where available, this section also provides details on the installed capacity of key renewable infrastructure, with maps of (currently active) connected maximum exported capacities, and (future pipeline) contracted export capacities.

2.1 Wind

All of Ireland's wind energy is indigenously produced. All wind energy is 'exchanged' into electricity, for the purpose of national energy accounting. Wind energy acts to increase supply of electricity available to end-users and increases the renewable energy share of that electricity supply.

Figure 2.1 – Ireland's wind energy in 2023 mapped from supply to transformation and final consumption.

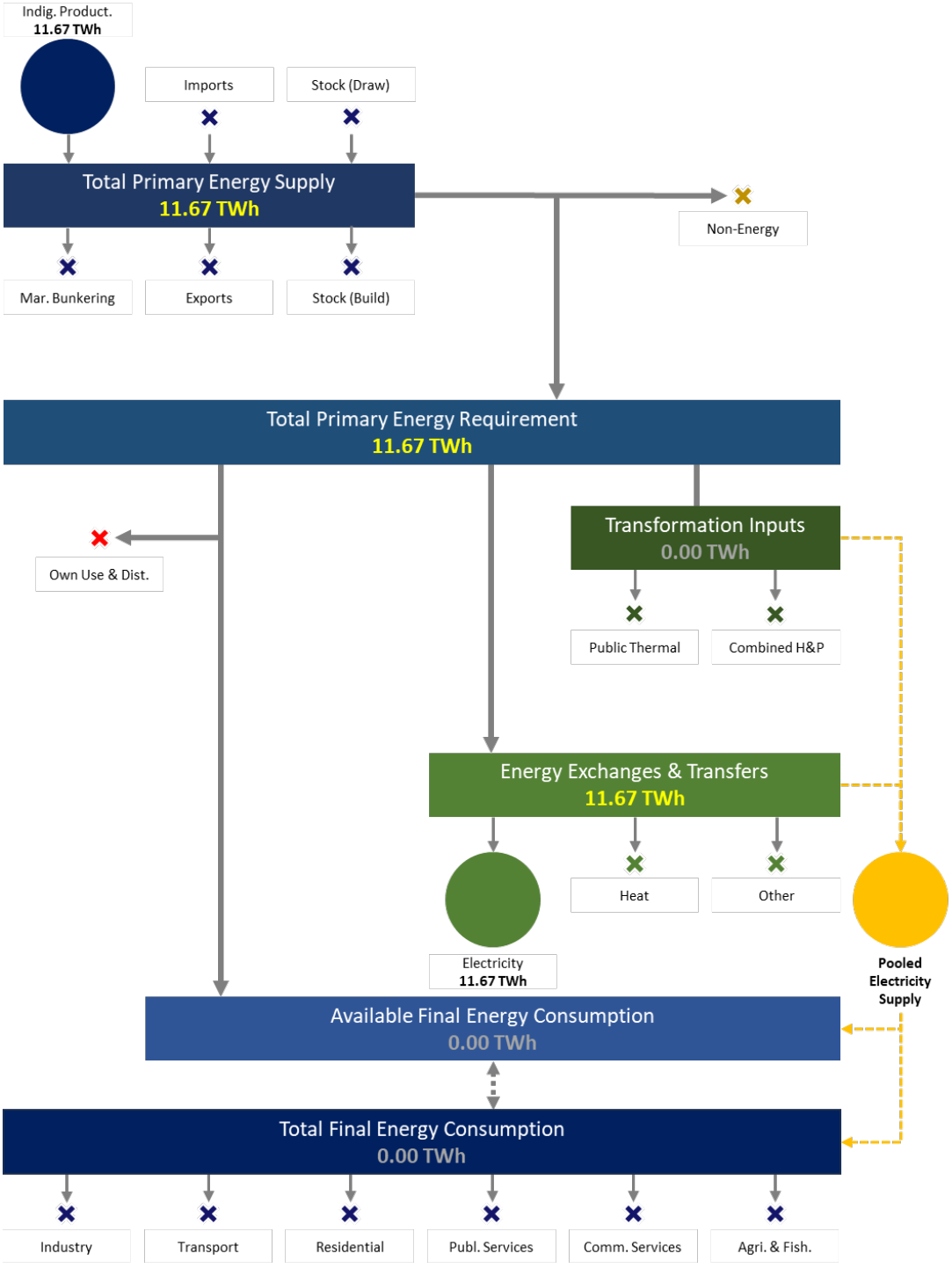
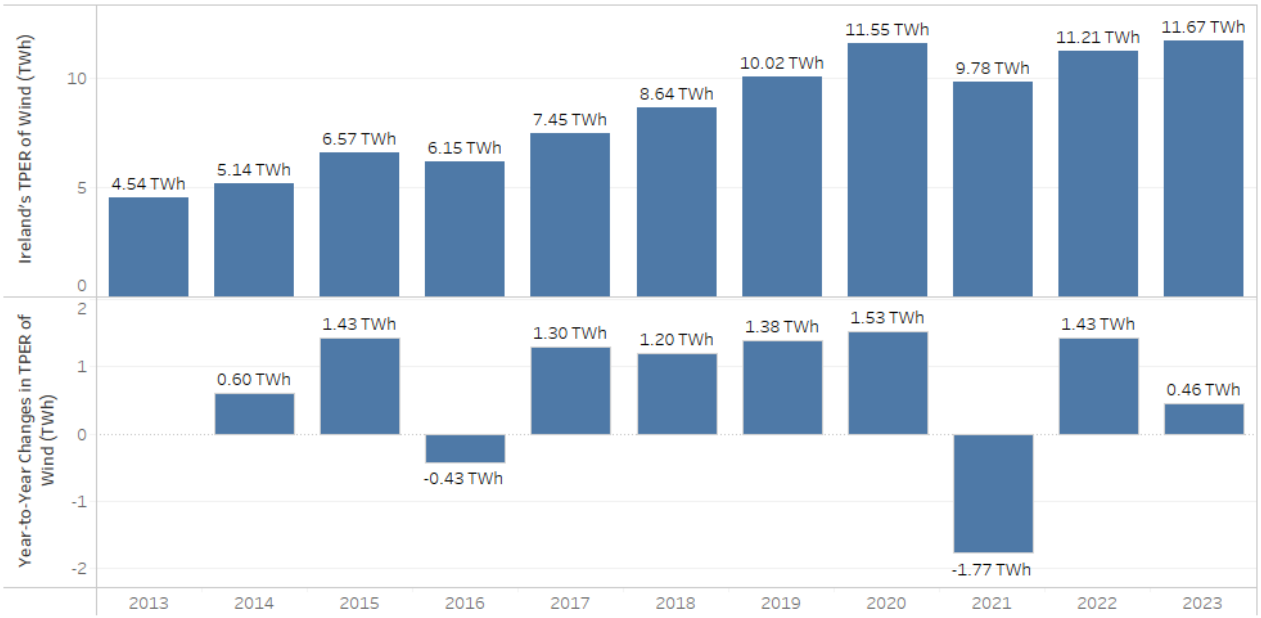
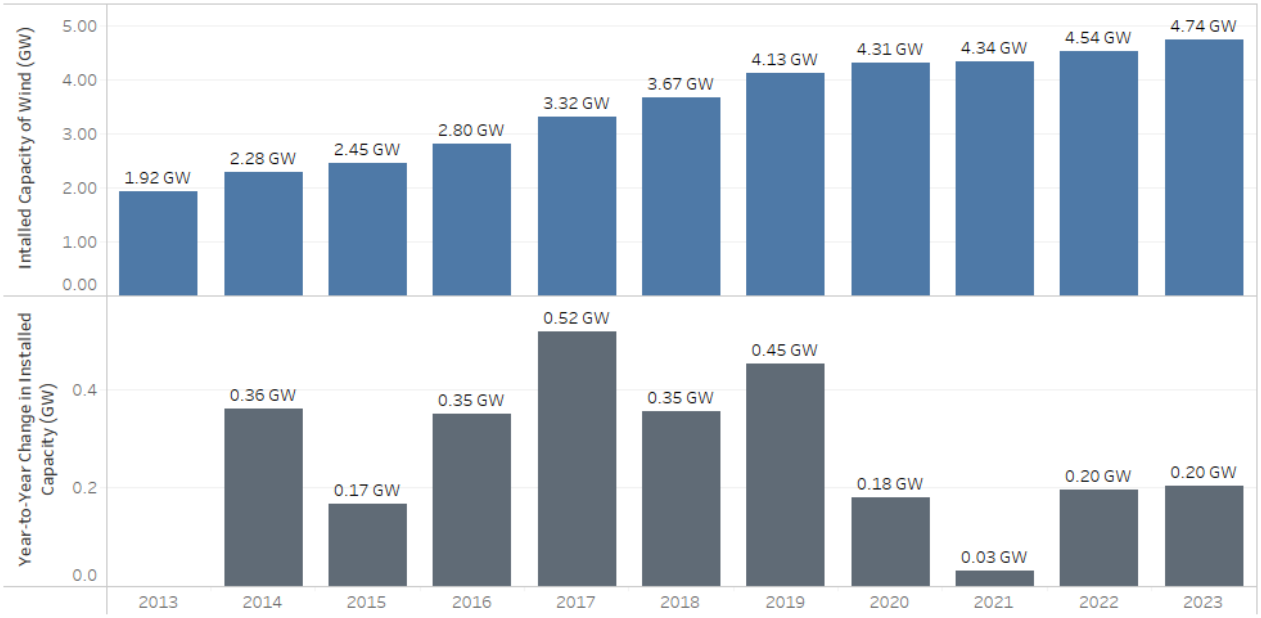


Figure 2.2 – TPER of wind energy over the last 10-years with year-to-year changes.



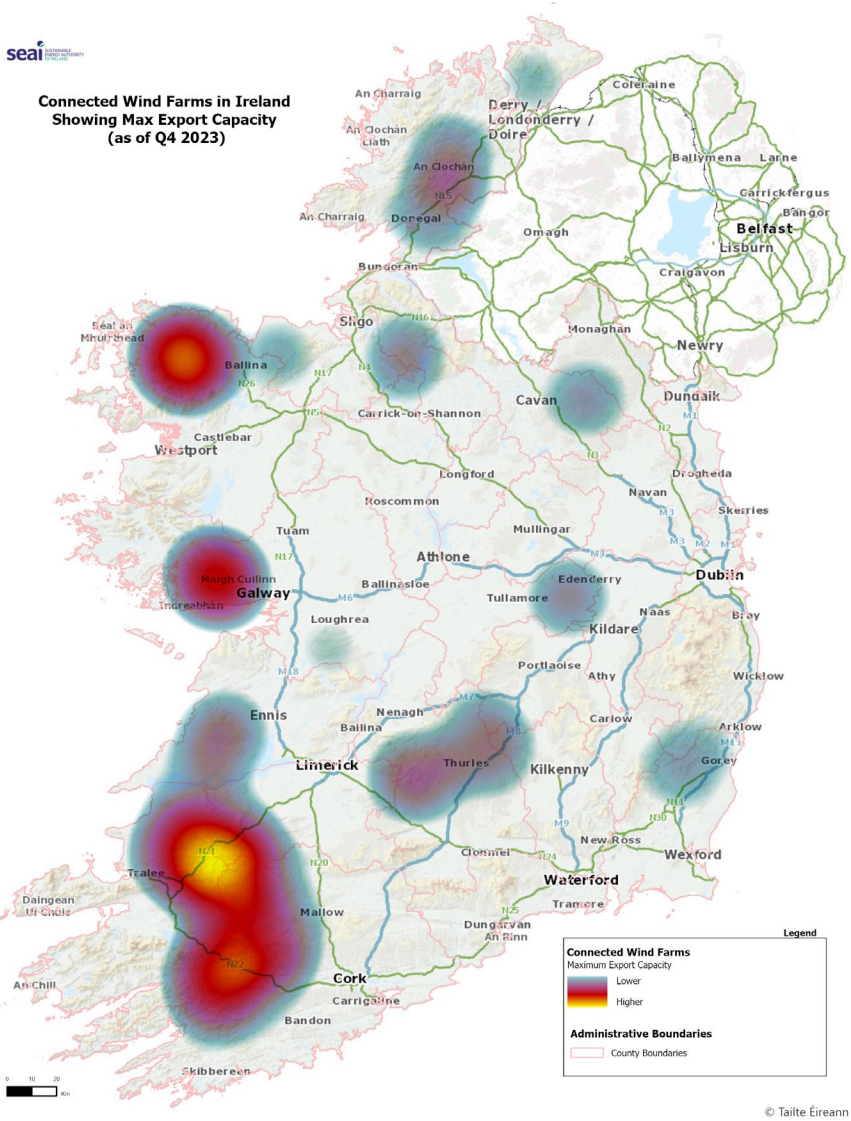
The amount of wind energy in Ireland is increasing. In 2023, Ireland used 11.67 TWh of wind, up 0.46 TWh on the previous year. Over the last 10-years, Ireland's wind energy has increased on average by 0.71 TWh each year.

Figure 2.3 – Installed capacity for wind energy over the last 10-years with year-to-year changes.



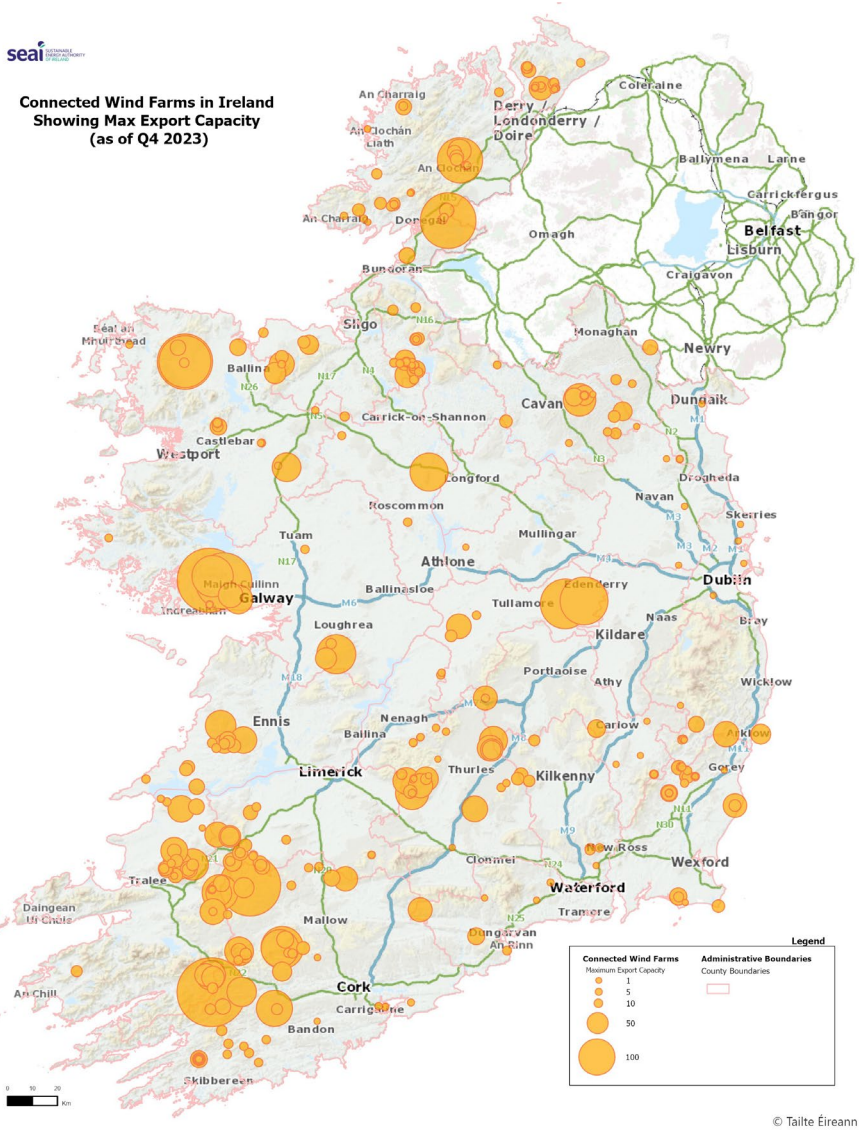
Wind energy and wind capacity measure two different things. Wind capacity measures the rate at which wind energy could be generated under ideal circumstances. The wind energy recorded in a calendar year is the actual amount of energy generated by the installed capacity under real-world conditions that year. At the end of 2023, Ireland had 4.74 GW of installed wind capacity, an increase of 0.20 GW on the previous year. Over the last 10-years, Ireland has added an average of 0.28 GW of wind capacity each year.

Figure 2.4 – Heat map of grid-connected wind farms in Ireland at the end of 2023. The colour of the heat map scales with the density of maximum export capacity (MEC) of the underlying wind farms, with a 'radius-of-effect' arbitrarily chosen for the purpose of optimising the data visualisation.



A 'heat map' based on the maximum export capacity (MEC) of the underlying grid-connected wind farms provides a useful qualitative overview of which regions in Ireland are currently providing the most wind energy. At the end of 2023, most of Ireland's grid-connected wind capacity was located towards the west coast, with concentrations in county Kerry, county Galway, and county Mayo.

Figure 2.5 – Site map of the grid-connected wind farms in Ireland at the end of 2023. The size of the circles scales with the maximum export capacity (MEC) of the wind farms, and the centre of the circles corresponds to the location of the wind farms.

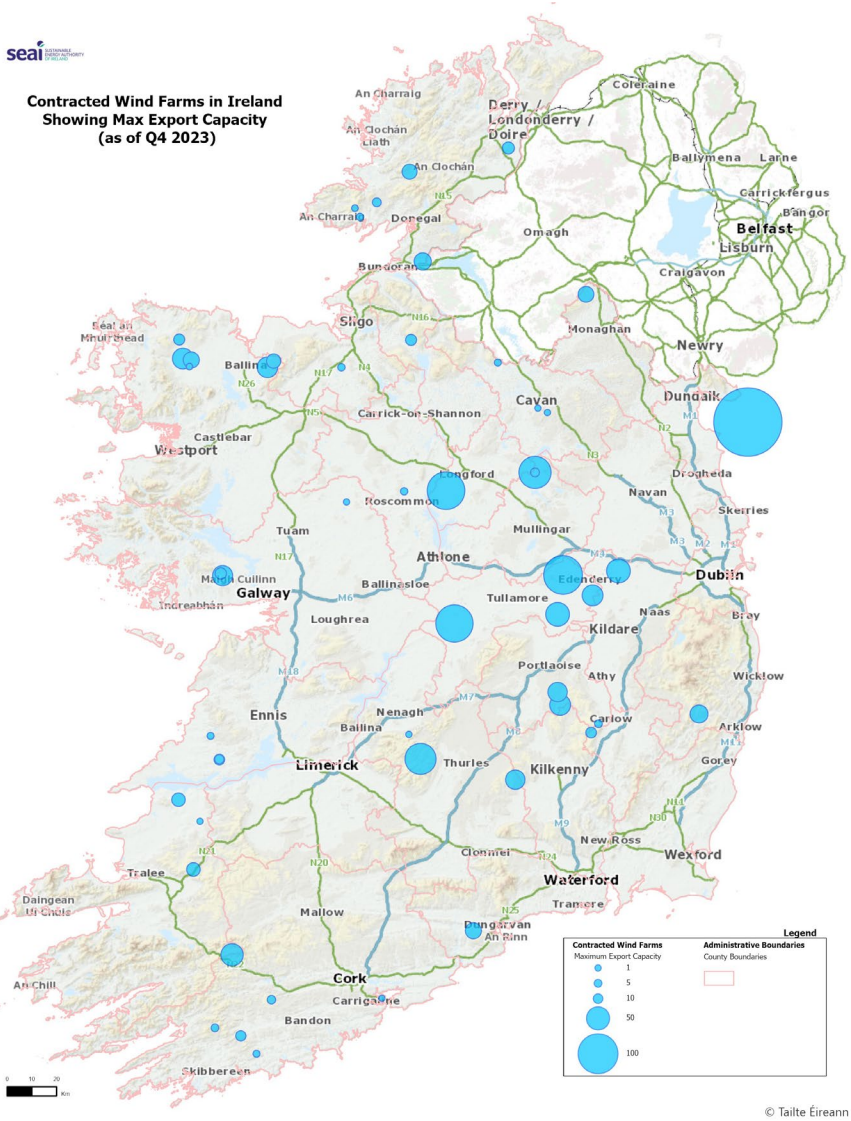


While a 'heat map' provides a useful regional overview, a 'site map' based on the maximum export capacity (MEC) of the grid-connected wind farms provides a more quantitative visualisation of the number and size of the sites providing wind energy to Ireland. Grid-connected wind farms have been built, secured a connection to the national grid, and are contracted to sell electricity into the single integrated single electricity market (I-SEM) for Ireland.

Technical details regarding the site map of the grid-connected wind farms:

- Where the wind farm grid coordinates are not available in the planning application information available to SEAI, the grid coordinates of the relevant substation(s) have been used. Note that the relevant substation may not be located within the site of the wind farm itself.
- Stand-alone projects, not intended for grid-connection, are not included in the map.
- Not all map entries are discrete wind farms. Some map entries are formal extensions to existing wind farms, and some are formal additions to previously registered capacity, involving no physical addition of infrastructure.

Figure 2.6 – Site map of the contracted (but not connected) wind farms in Ireland at the end of 2023. The size of the circles scales with the maximum export capacity (MEC) of the wind farms, and the centre of the circles corresponds to the location of the wind farms.



Contracted (but not connected) wind farms are contracted to sell electricity into the single integrated single electricity market (I-SEM) for Ireland in the future, but may not yet have been built, secured planning permission, or secured a connection to the national grid. Not all contracted wind farms will progress to connected wind farms.

Technical details regarding the site map of the contracted wind farms:

- Contracted wind farm sites are identified based on grid-connection offers from the Transmission System Operator (TSO) or the Distribution Network Operator (DNO).
- Contracted wind farms represent a pipeline of potentially viable projects proposed by developers, but do not reflect the status of planning permission for those projects.
- Not all contracted wind farm sites will translate to connected wind farms.
- Some contracted wind farm sites in the map correspond to future extensions to existing connected wind farms, rather than discrete new wind farms.

2.2 Biodiesel

Multiple supply streams contribute to Ireland's TPER of biodiesel – imports, exports, indigenous production, and stock-draws/builds. Essentially, all of Ireland's biodiesel supply goes directly to end-users, without undergoing any transformations or exchanges. Practically all of Ireland's biodiesel goes to the transport sector, for biofuel-blending into road diesel.

Figure 2.7 – Ireland's biodiesel energy in 2023 mapped from supply to transformation and final consumption.

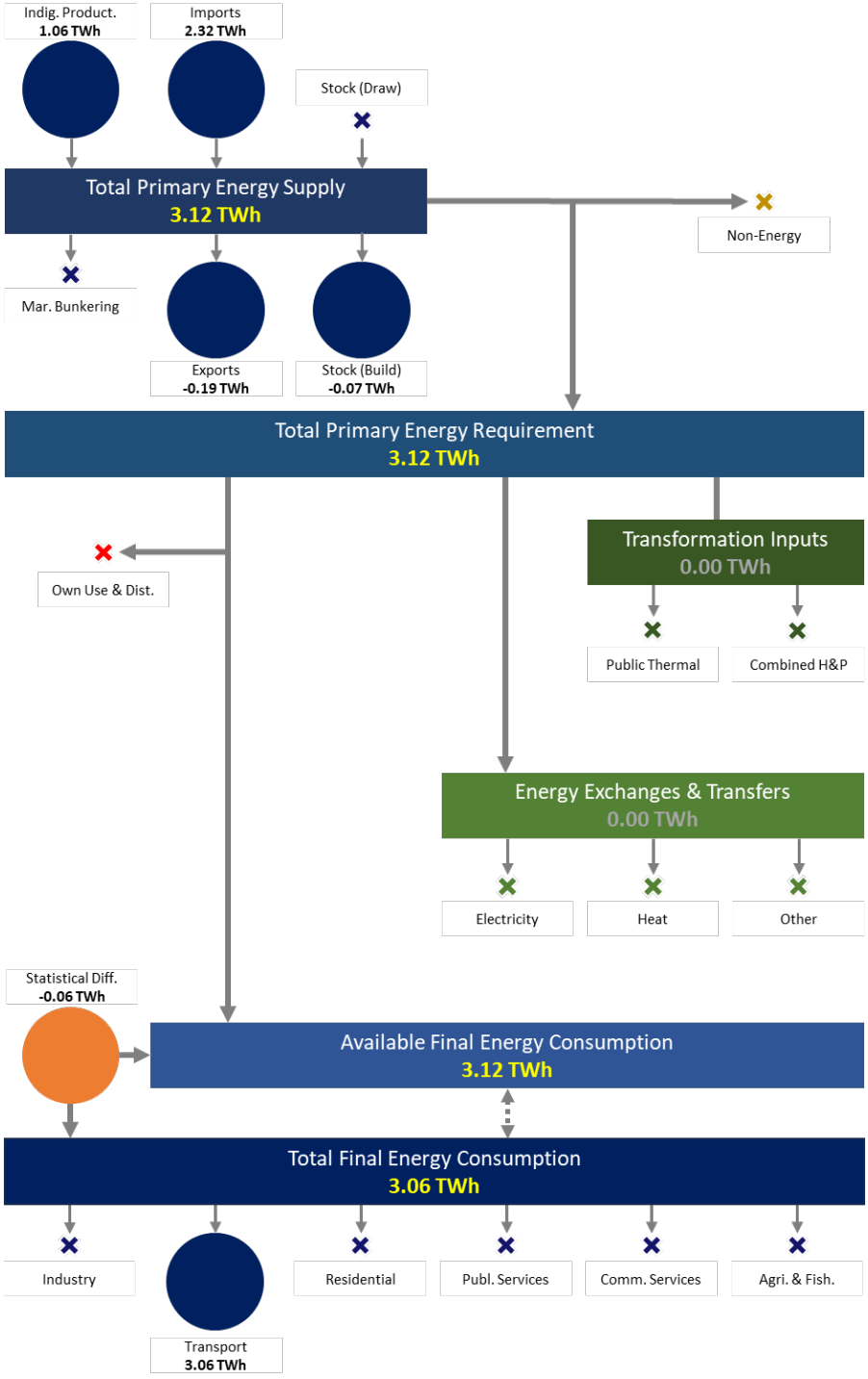
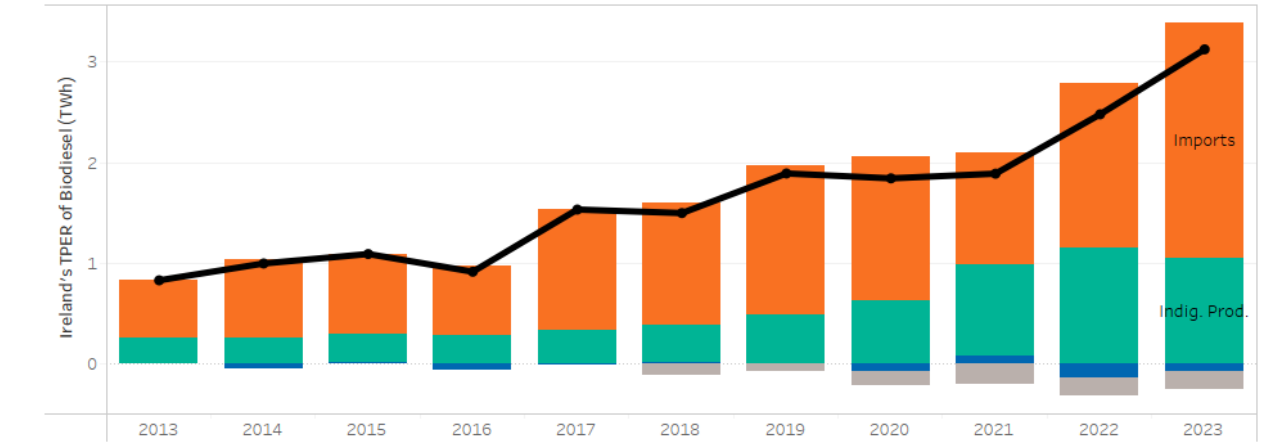


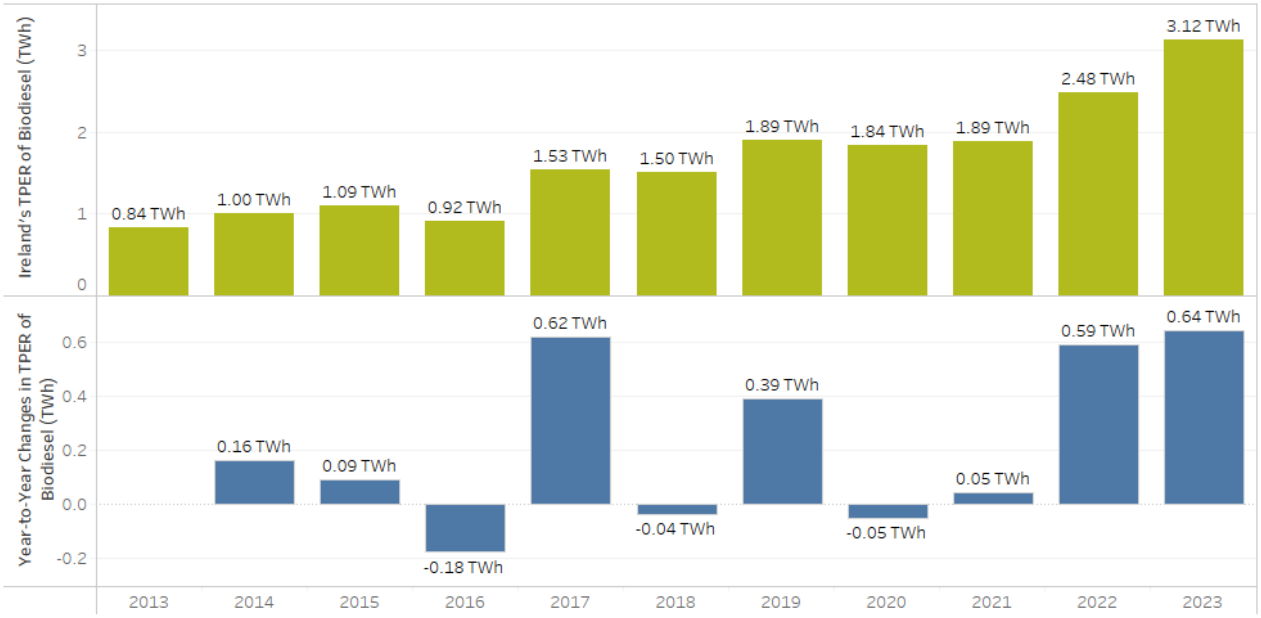
Figure 2.8 – TPER of biodiesel over the last 10-years, broken-down by imports, exports, indigenous production, and stock build/draw.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Imports	0.58	0.78	0.79	0.69	1.20	1.22	1.48	1.43	1.11	1.63	2.32
Indig. Prod.	0.25	0.26	0.28	0.28	0.33	0.36	0.48	0.63	0.90	1.16	1.06
Stock Chng.		-0.04	0.02	-0.06	0.01	0.02	0.01	-0.07	0.09	-0.14	-0.07
Exports						-0.11	-0.08	-0.15	-0.20	-0.17	-0.19
Total	**0.83 TWh**	**1.00 TWh**	**1.09 TWh**	**0.92 TWh**	**1.53 TWh**	**1.50 TWh**	**1.89 TWh**	**1.84 TWh**	**1.89 TWh**	**2.48 TWh**	**3.12 TWh**

Most of Ireland's biodiesel is imported. In 2023, Ireland used a total of 3.12 TWh of biodiesel, of which 2.32 TWh came from imports and 1.06 TWh was produced indigenously in Ireland.

Figure 2.9 – TPER of biodiesel over the last 10-years with year-to-year changes.



The amount of biodiesel use in Ireland is increasing, due to increased targets for biofuel blending into road diesel. In 2023, Ireland used 3.12 TWh of biodiesel, up 0.64 TWh on the previous year.

2.3 Biomass

Multiple supply streams contribute to Ireland's TPER of biomass – imports, indigenous production, and stock-draws/builds. Ireland's biomass supply goes both directly to end-users in the industry, residential, services, *etc*., and to transformation inputs (public thermal power plants and CHP plants).

Figure 2.10 – Ireland's biomass energy in 2023 mapped from supply to transformation and final consumption.

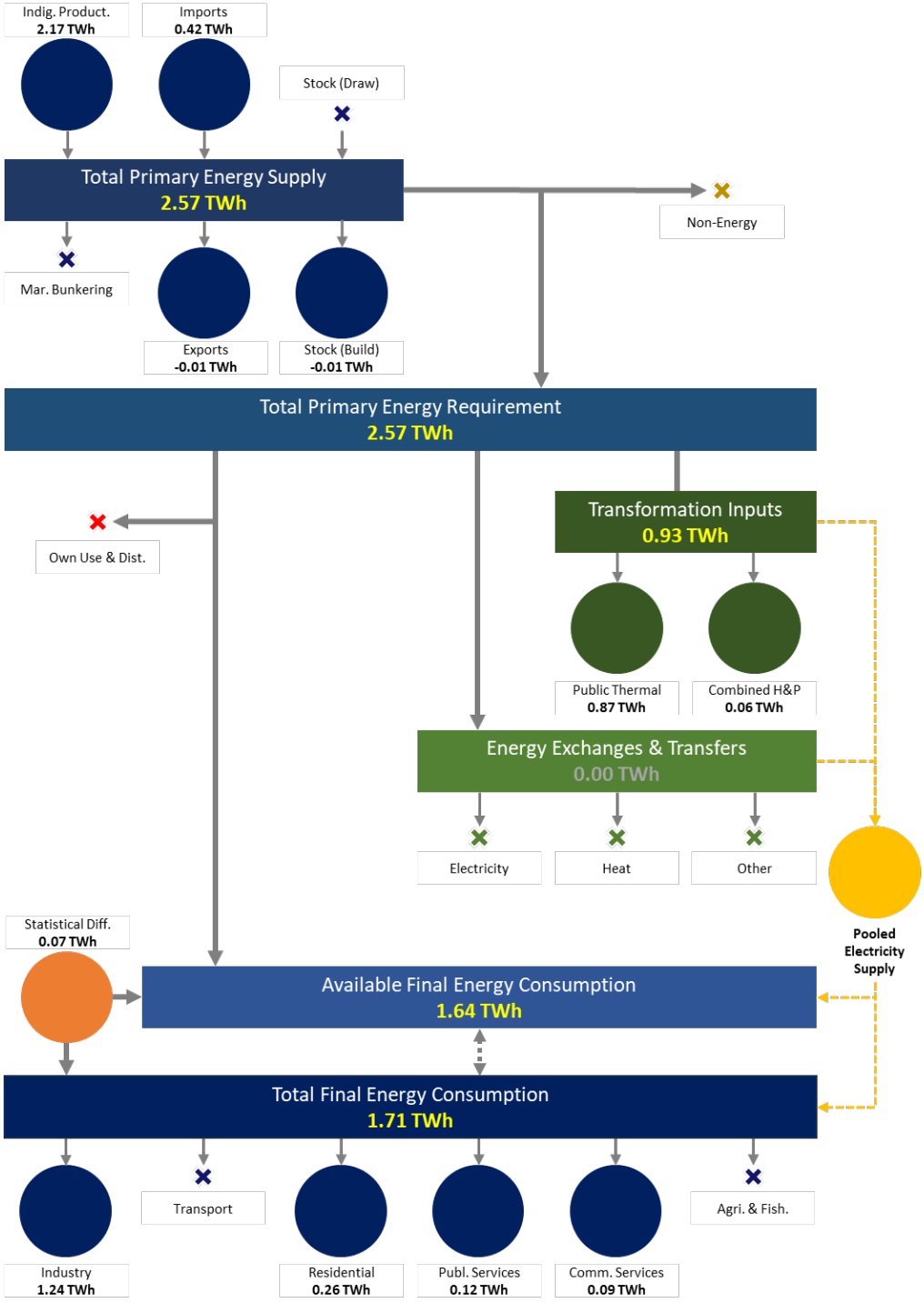
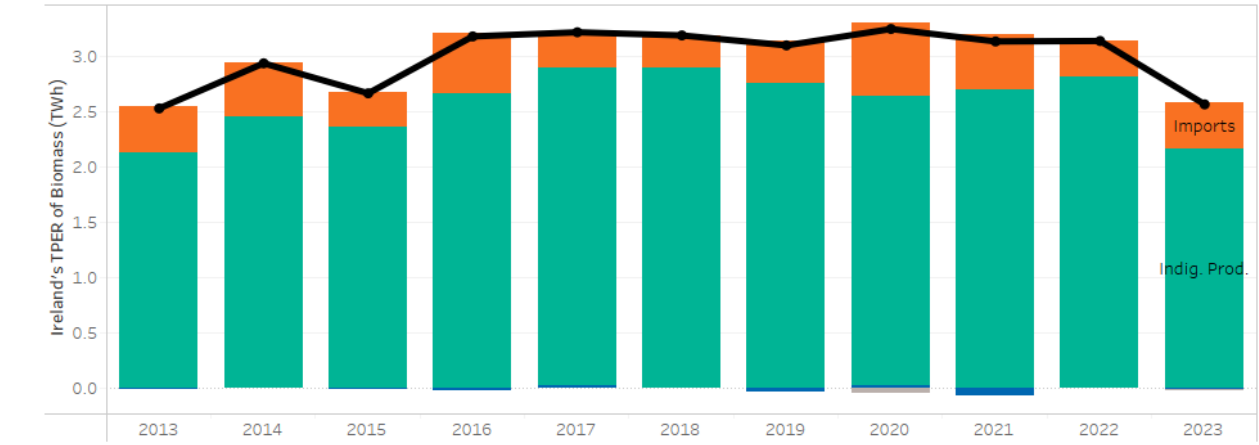


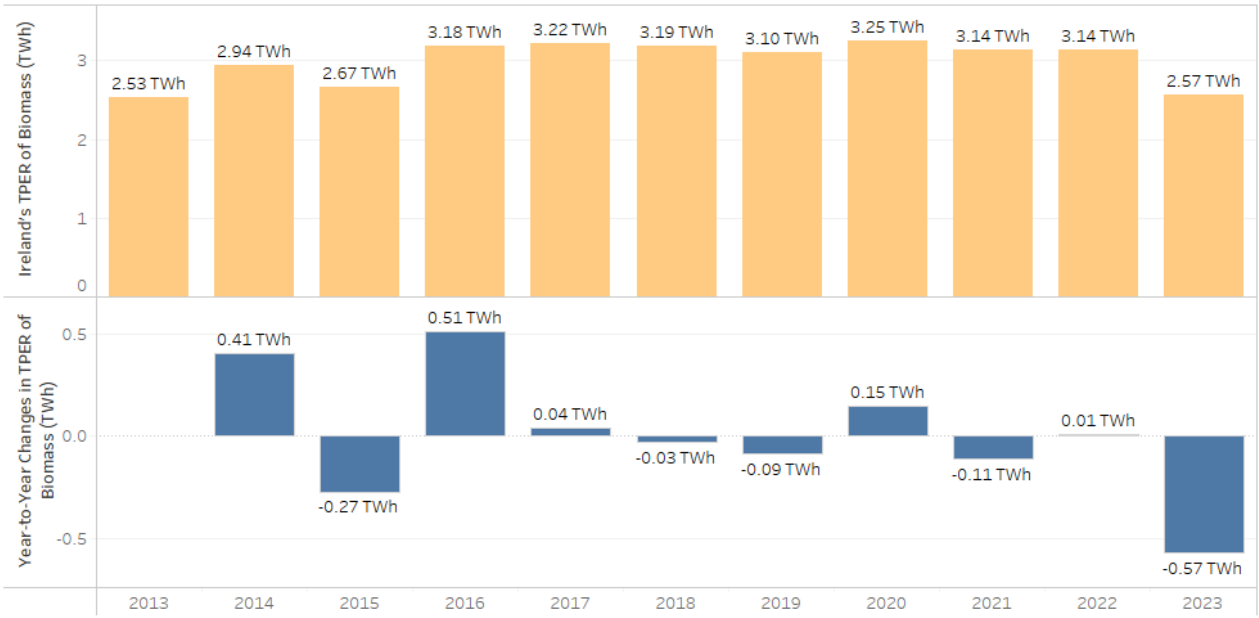
Figure 2.11 – TPER of biomass over the last 10-years, broken-down by imports, exports, indigenous production, and stock build/draw.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Imports	0.42	0.49	0.32	0.54	0.32	0.30	0.38	0.66	0.50	0.33	0.42
Indig. Prod.	2.13	2.45	2.36	2.66	2.88	2.89	2.76	2.61	2.70	2.81	2.17
Stock Chng.	-0.01		-0.01	-0.02	0.02		-0.03	0.03	-0.06		-0.01
Exports								-0.05			-0.01
Total	**2.53 TWh**	**2.94 TWh**	**2.67 TWh**	**3.18 TWh**	**3.22 TWh**	**3.19 TWh**	**3.10 TWh**	**3.25 TWh**	**3.14 TWh**	**3.14 TWh**	**2.57 TWh**

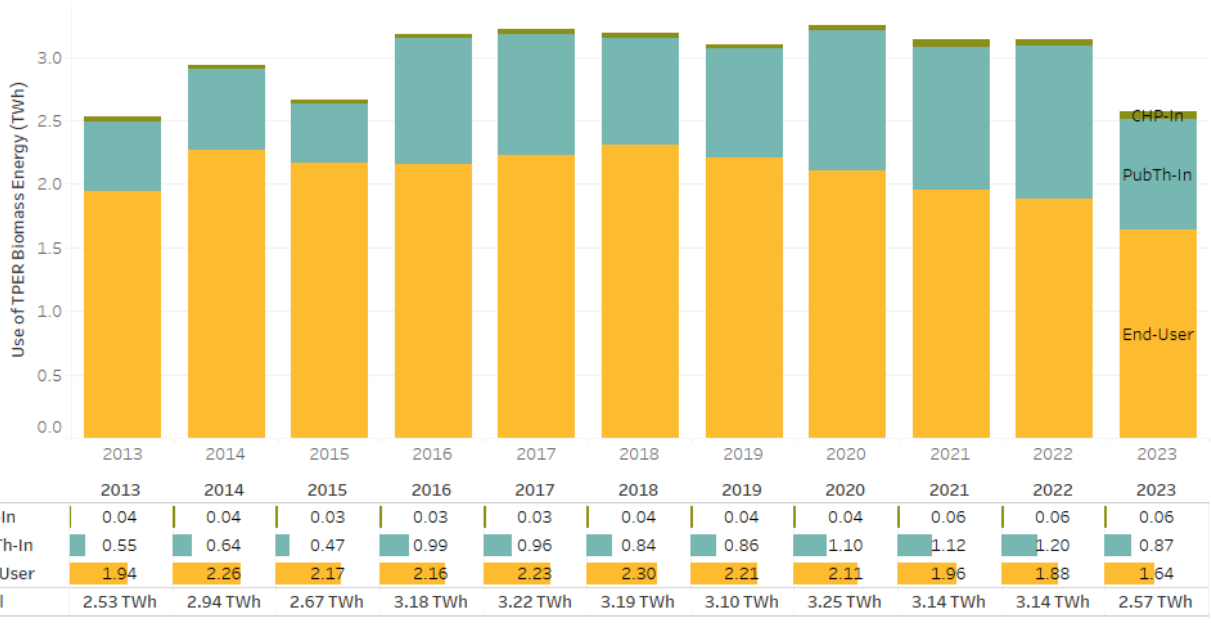
Most of Ireland's biomass is produced indigenously in Ireland. In 2023, Ireland used a total of 2.57 TWh of biomass, of which 2.17 TWh was from indigenous production, and 0.42 TWh was imported.

Figure 2.12 – TPER of biomass over the last 10-years with year-to-year changes.



In 2023, Ireland used 2.57 TWh of biomass, down 0.57 TWh on the previous year. Over the preceding 7-years, Ireland's biomass energy use has been relatively consistent at approximately 3.2 TWh each year.

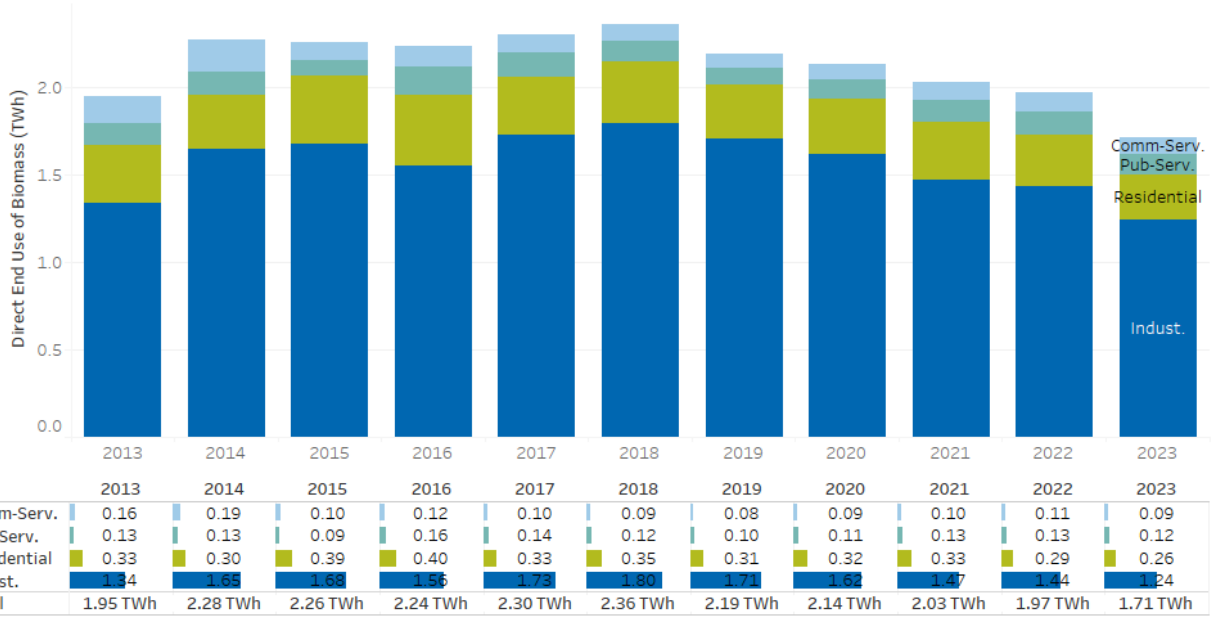
Figure 2.13 – Use of biomass over the last 10-years, broken-down by transformation inputs, energy exchanges, and direct end-user consumption.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
CHP-In	0.04	0.04	0.03	0.03	0.03	0.04	0.04	0.04	0.06	0.06	0.06
PubTh-In	0.55	0.64	0.47	0.99	0.96	0.84	0.86	1.10	1.12	1.20	0.87
End-User	1.94	2.26	2.17	2.16	2.23	2.30	2.21	2.11	1.96	1.88	1.64
Total	2.53 TWh	2.94 TWh	2.67 TWh	3.18 TWh	3.22 TWh	3.19 TWh	3.10 TWh	3.25 TWh	3.14 TWh	3.14 TWh	2.57 TWh

Most of Ireland's biomass is directly consumed by end-users. In 2023, Ireland used a total of 2.57 TWh of biomass, of which 1.64 TWh went directly to end-users, and 0.87 TWh went to public thermal power plants for electricity generation.

Figure 2.14 – Direct end-user consumption of biomass over the last 10-years, broken-down by sector.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Comm-Serv.	0.16	0.19	0.10	0.12	0.10	0.09	0.08	0.09	0.10	0.11	0.09
Pub-Serv.	0.13	0.13	0.09	0.16	0.14	0.12	0.10	0.11	0.13	0.13	0.12
Residential	0.33	0.30	0.39	0.40	0.33	0.35	0.31	0.32	0.33	0.29	0.26
Indust.	1.34	1.65	1.68	1.56	1.73	1.80	1.71	1.62	1.47	1.44	1.24
Total	1.95 TWh	2.28 TWh	2.26 TWh	2.24 TWh	2.30 TWh	2.36 TWh	2.19 TWh	2.14 TWh	2.03 TWh	1.97 TWh	1.71 TWh

Most end-use of biomass in Ireland occurs in the industry sector. In 2023, total direct end-use of biomass was 1.71 TWh, of which 1.24 TWh was in Industry, and 0.26 TWh was in the residential sector.

2.4 Renewable Wastes

All of Ireland's renewable waste energy is indigenously produced. Ireland's renewable waste supply goes both directly to end-users in industry, and to transformation inputs (public thermal power plants).

Figure 2.15 – Ireland's renewable waste energy in 2023 mapped from supply to transformation and final consumption.

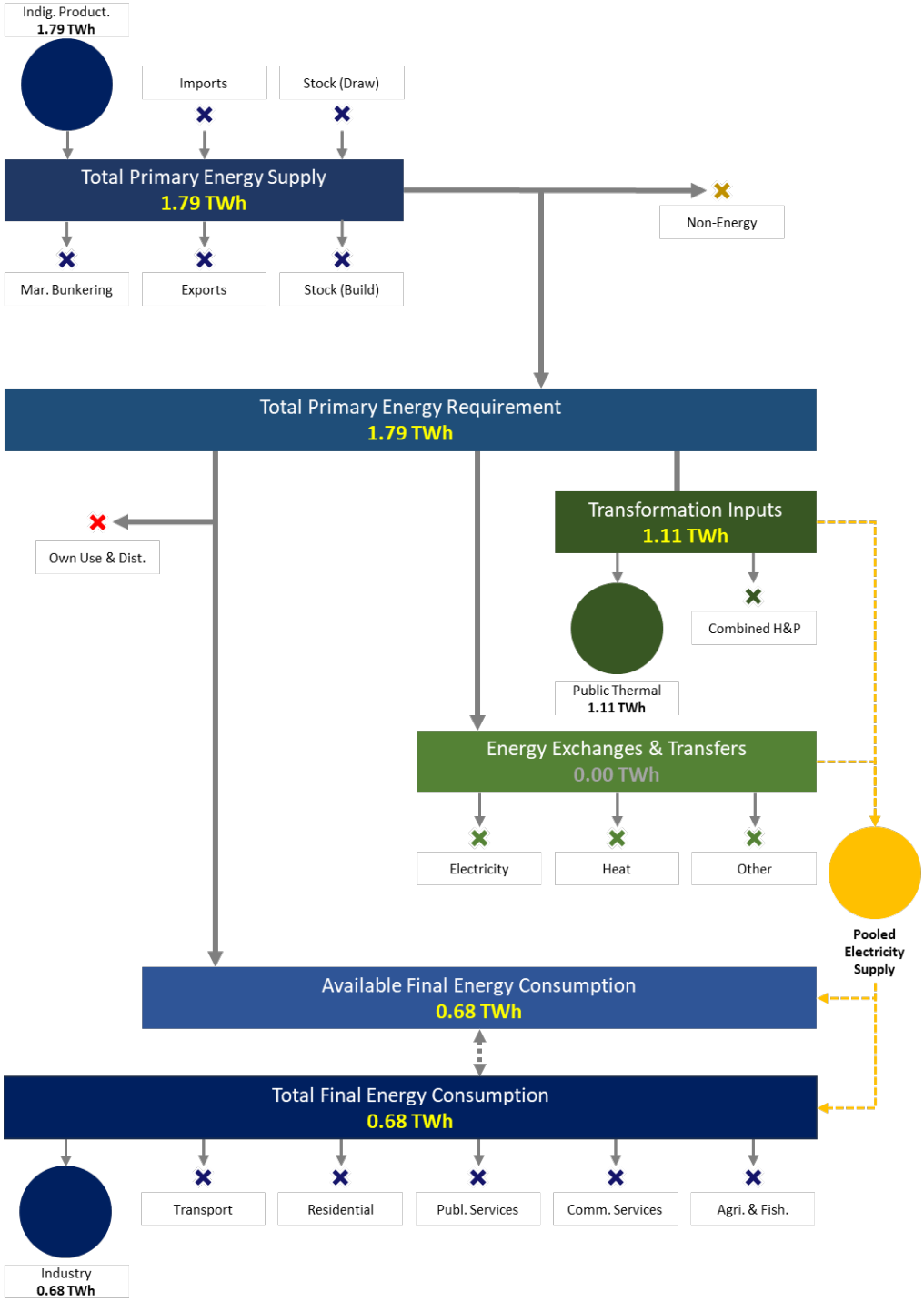
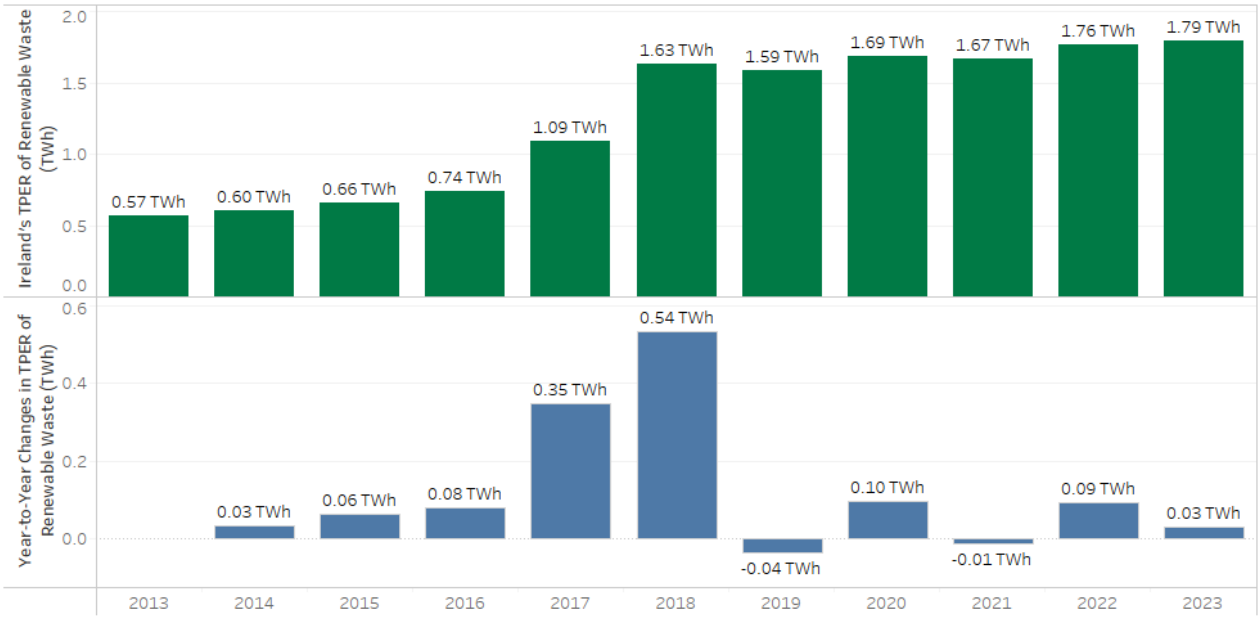
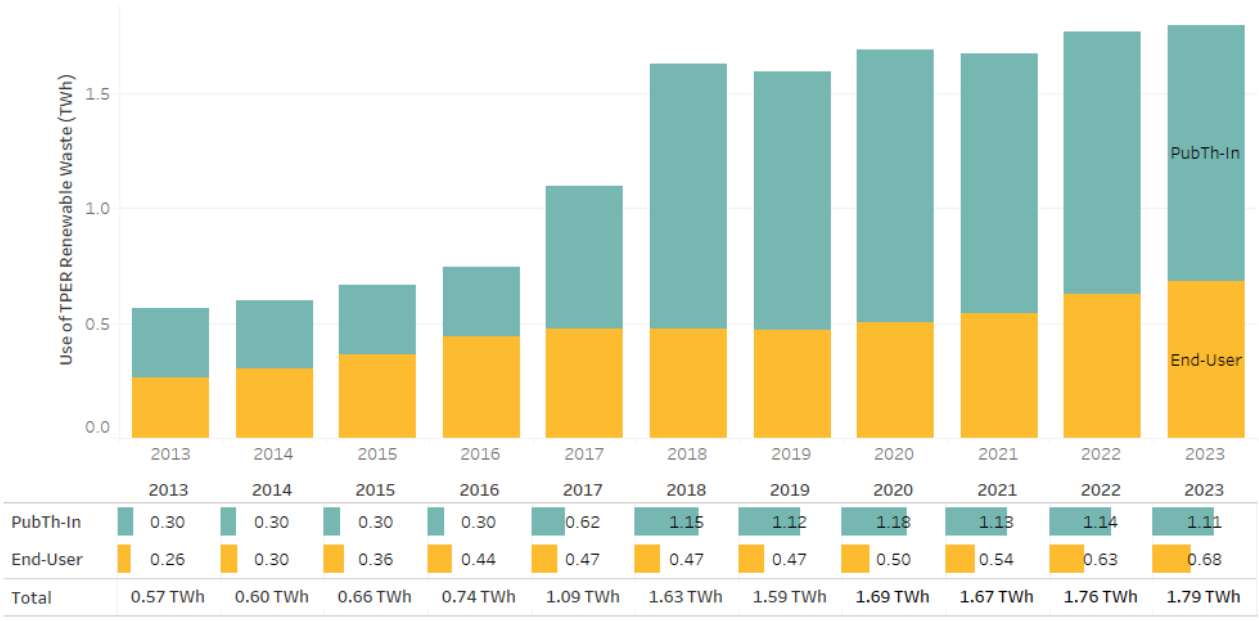


Figure 2.16 – TPER of renewable waste over the last 10-years with year-to-year changes.



In 2023, Ireland used 1.79 TWh of renewable waste energy, up 0.03 TWh on the previous year. Over the last preceding 6-years, Ireland's renewable waste energy use has been relatively consistent at approximately 1.7 TWh each year.

Figure 2.17 – Use of renewable waste over the last 10-years, broken-down by transformation inputs, energy exchanges, and direct end-user consumption



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
PubTh-In	0.30	0.30	0.30	0.30	0.62	1.15	1.12	1.18	1.13	1.14	1.11
End-User	0.26	0.30	0.36	0.44	0.47	0.47	0.47	0.50	0.54	0.63	0.68
Total	0.57 TWh	0.60 TWh	0.66 TWh	0.74 TWh	1.09 TWh	1.63 TWh	1.59 TWh	1.69 TWh	1.67 TWh	1.76 TWh	1.79 TWh

Most of Ireland's renewable waste energy goes to electricity generation. In 2023, Ireland used a total of 1.79 TWh of renewable waste energy, of which 1.11 TWh went to public thermal power plants for electricity generation, and 0.68 TWh went directly to end-users.

2.5 Ambient Heat

All of Ireland's ambient heat energy is indigenously produced. All of Ireland's ambient heat energy goes directly to end-users, without undergoing any transformations or exchanges. Practically all ambient heat energy consumption occurs within the residential and services sectors.

Figure 2.18 – Ireland's ambient heat energy in 2023 mapped from supply to transformation and final consumption.

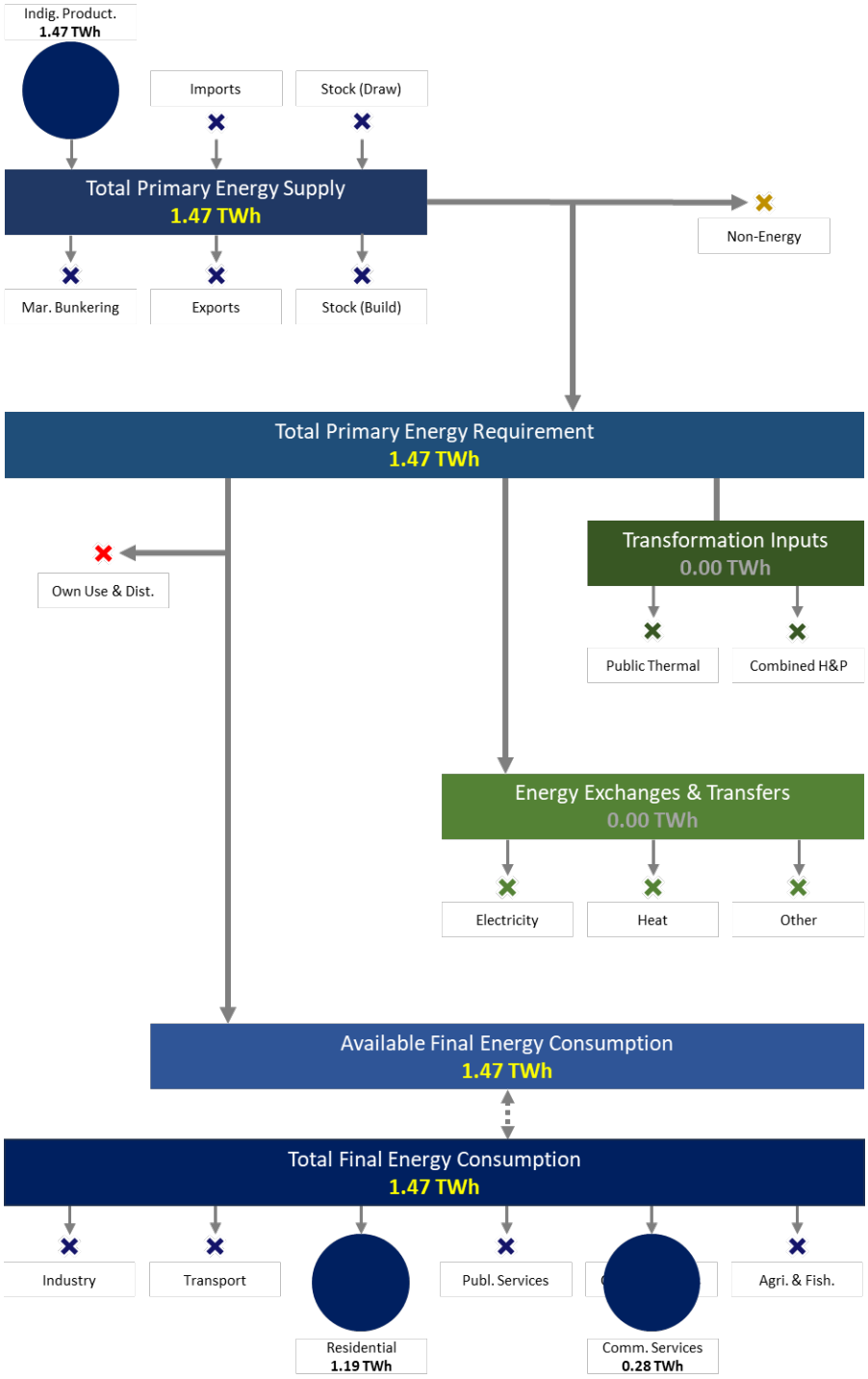
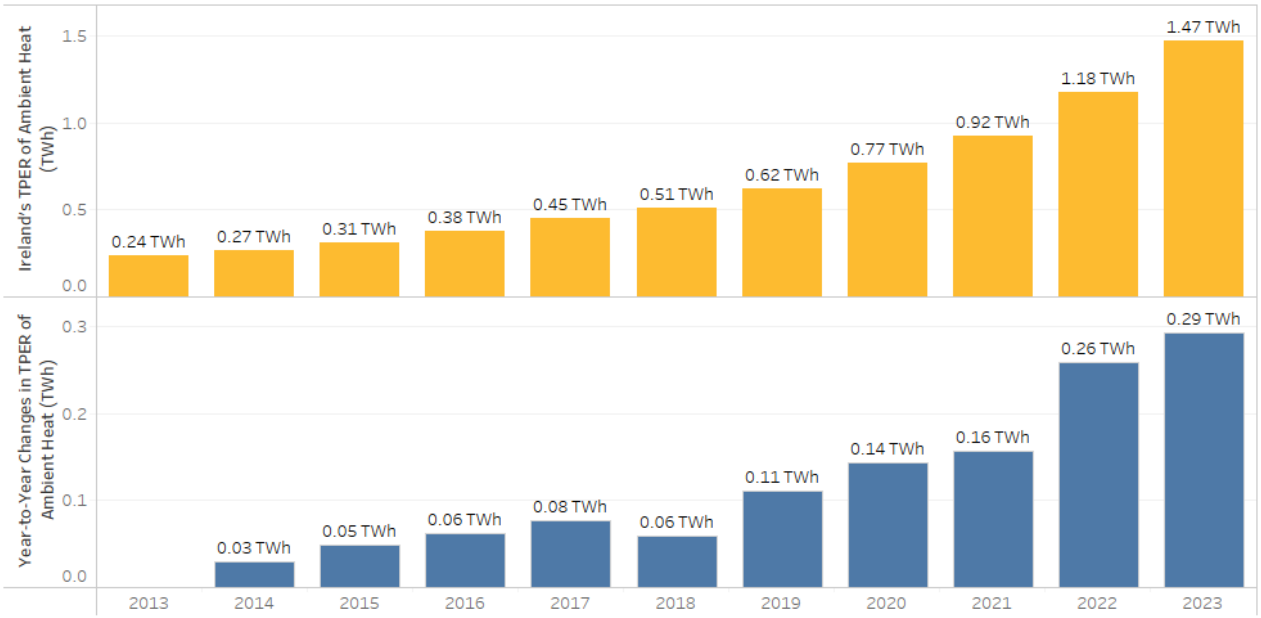
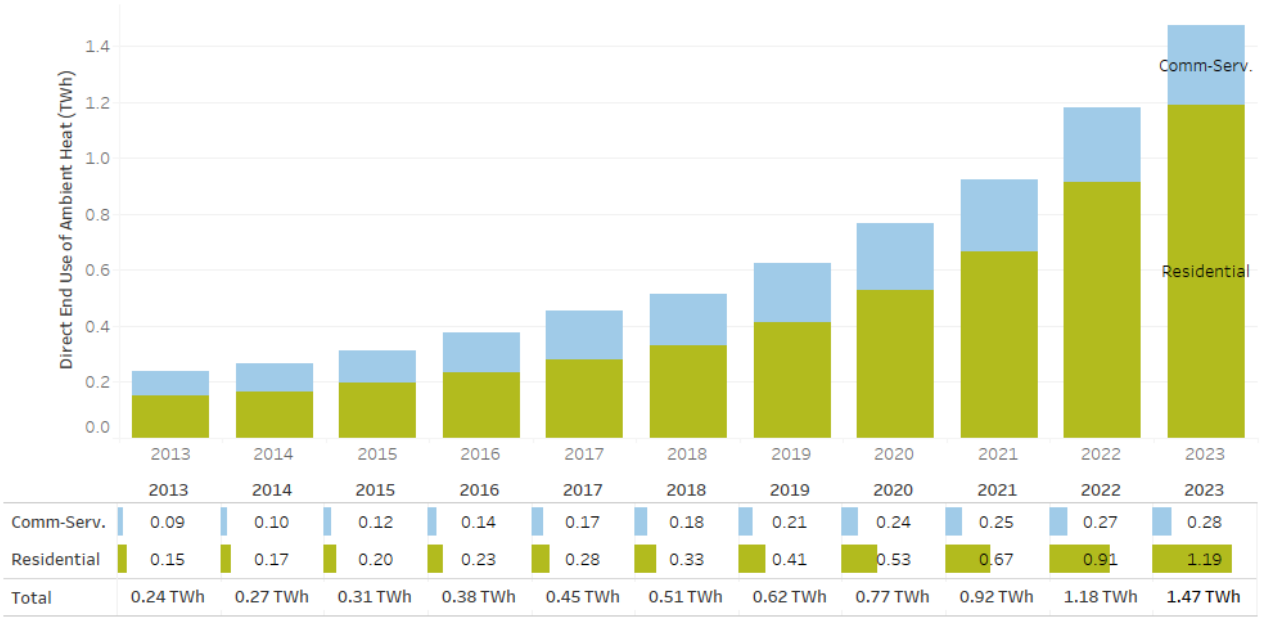


Figure 2.19 – TPER of ambient heat over the last 10-years with year-to-year changes.



Ireland's use of ambient heat is increasing at an accelerating rate. In 2023, Ireland used 1.47 TWh of ambient heat, up 0.29 TWh on the previous year.

Figure 2.20 – Direct end-user consumption of ambient heat over the last 10-years, broken-down by sector



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Comm-Serv.	0.09	0.10	0.12	0.14	0.17	0.18	0.21	0.24	0.25	0.27	0.28
Residential	0.15	0.17	0.20	0.23	0.28	0.33	0.41	0.53	0.67	0.91	1.19
Total	0.24 TWh	0.27 TWh	0.31 TWh	0.38 TWh	0.45 TWh	0.51 TWh	0.62 TWh	0.77 TWh	0.92 TWh	1.18 TWh	1.47 TWh

All of Ireland's supply of ambient heat goes directly to end-users. In 2023, Ireland's total use of ambient heat was 1.47 TWh, of which 1.19 TWh was in the residential sector, and 0.28 TWh was in the commercial services sector.

2.6 Hydro Power

All of Ireland's hydro power is indigenously produced. All hydro energy is 'exchanged' into electricity, for the purpose of national energy accounting. Hydro energy acts to increase supply of electricity available to end-users and increases the renewable energy share of that electricity supply.

Figure 2.21 – Ireland's hydro energy in 2023 mapped from supply to transformation and final consumption.

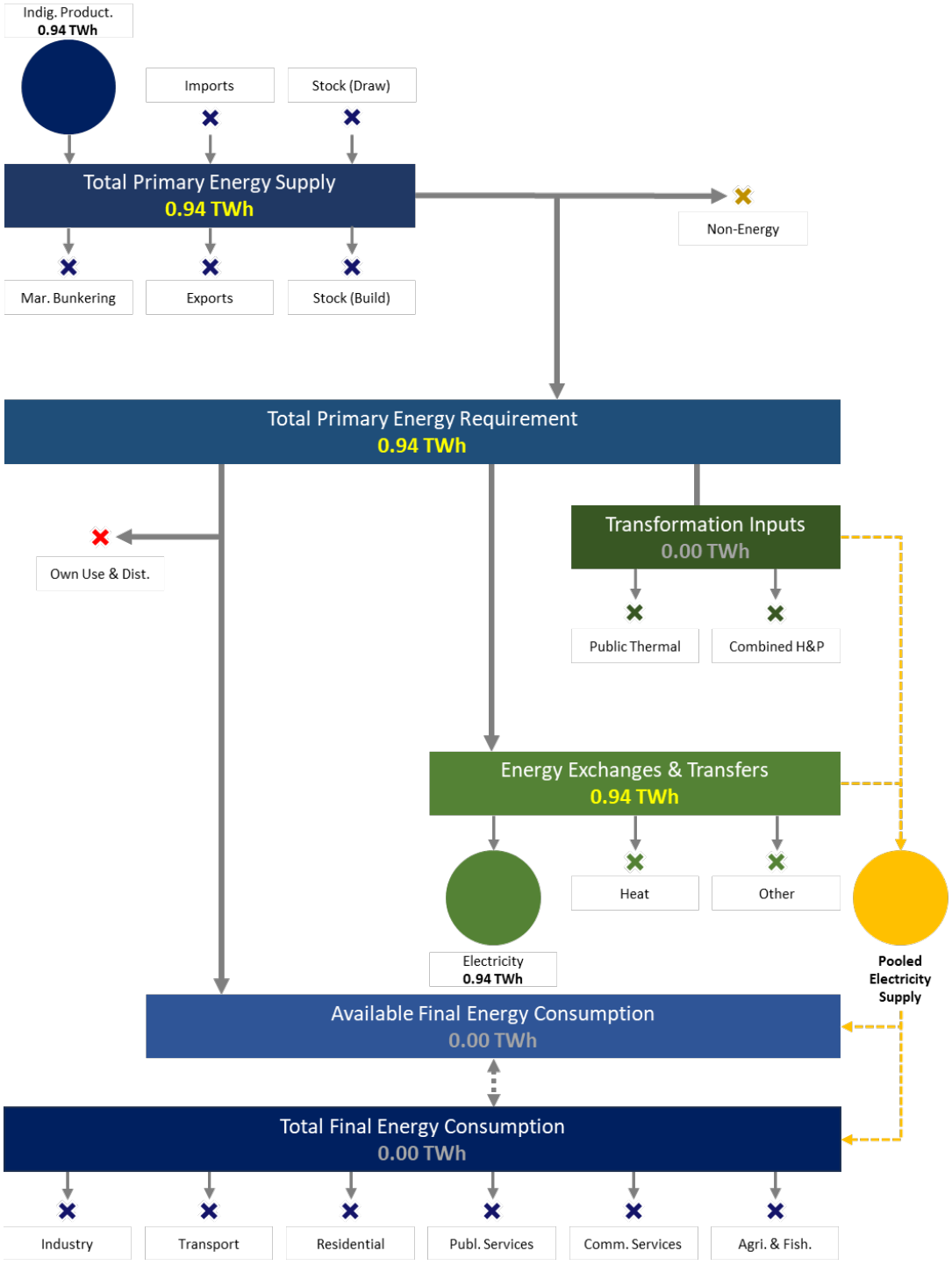
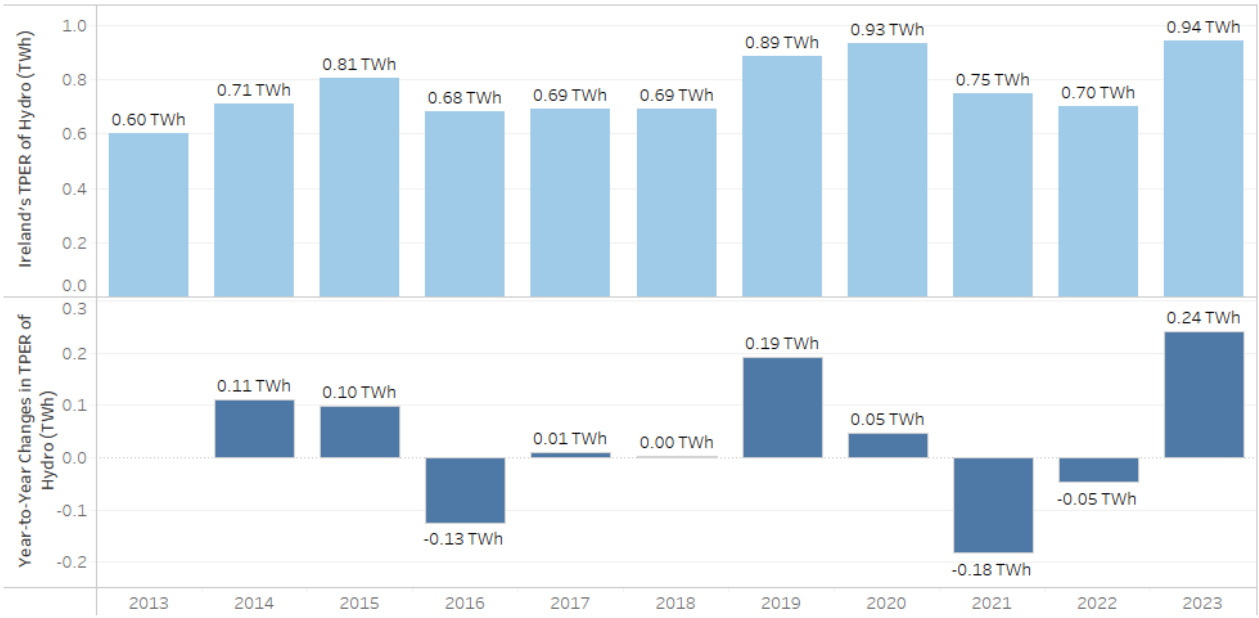


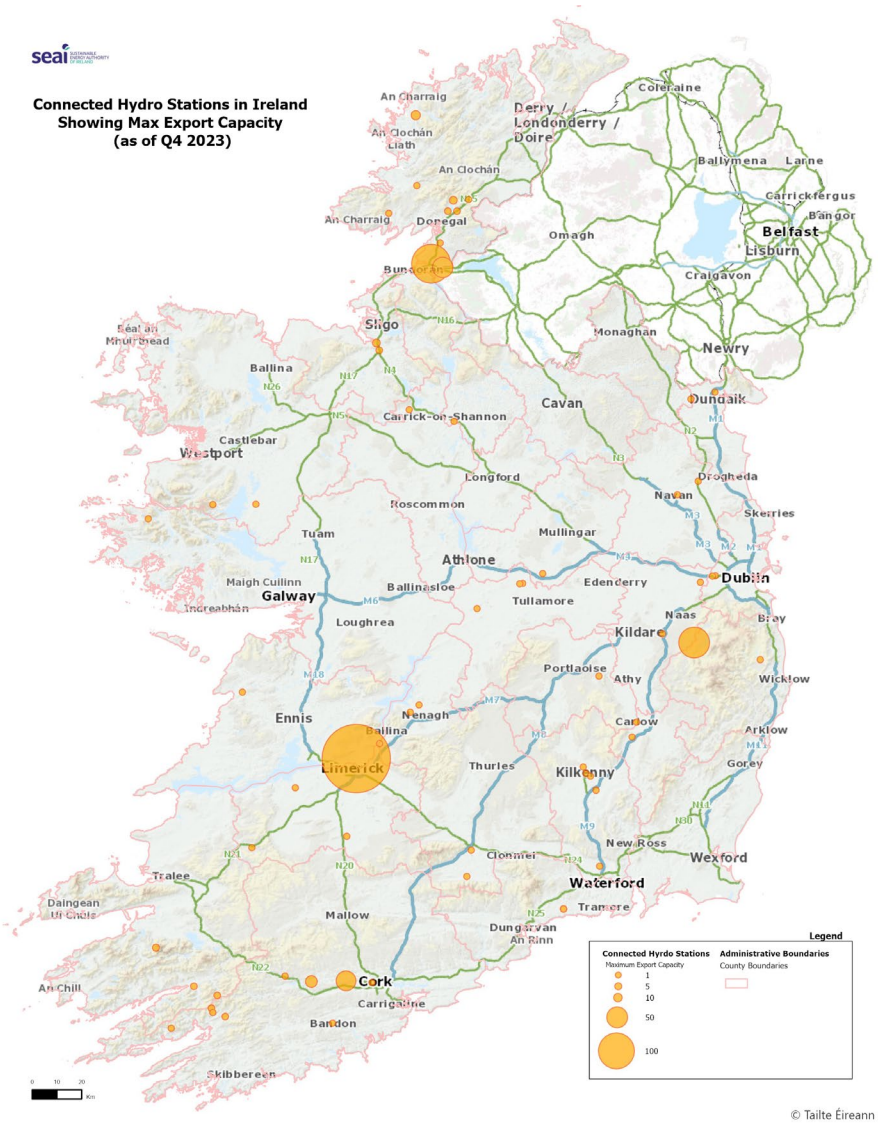
Figure 2.22 – TPER of hydro power over the last 10-years with year-to-year changes.



In 2023, Ireland used 0.94 TWh of hydro power, up 0.24 TWh on the previous year. Over the last 10-years, Ireland's hydro power use has been relatively consistent at approximately 0.75 TWh each year.

Ireland's installed capacity for hydro power has been consistent at approximately 0.24 GW for over a decade.

Figure 2.23 – Site map of the hydro power site in Ireland at the end of 2023. The size of the circles scales with the maximum export capacity (MEC) of the sites, and the centre of the circles corresponds to the location of the sites.



The Ardnacrusha hydropower plant operating on the River Shannon remains Ireland's largest generator of hydroelectric energy. Other significant hydroelectric installations exist in Donegal (Cathleen's Fall and Cliff) and in Wicklow (Poulaphouca). Turlough Hill in Wicklow is Ireland's only pumped-storage hydropower plant – it operates by storing and releasing energy, rather than as a net-generator of hydroelectricity, and so is excluded from the above site map.

2.7 Solar Photovoltaic

All of Ireland's solar photovoltaic energy is indigenously produced. All solar photovoltaic energy is 'exchanged' into electricity, for the purpose of national energy accounting. Solar photovoltaic energy acts to increase Ireland's electricity supply and to increase the renewable energy share of that electricity supply.

Figure 2.24 – Ireland's solar-PV energy in 2023 mapped from supply to transformation and final consumption.

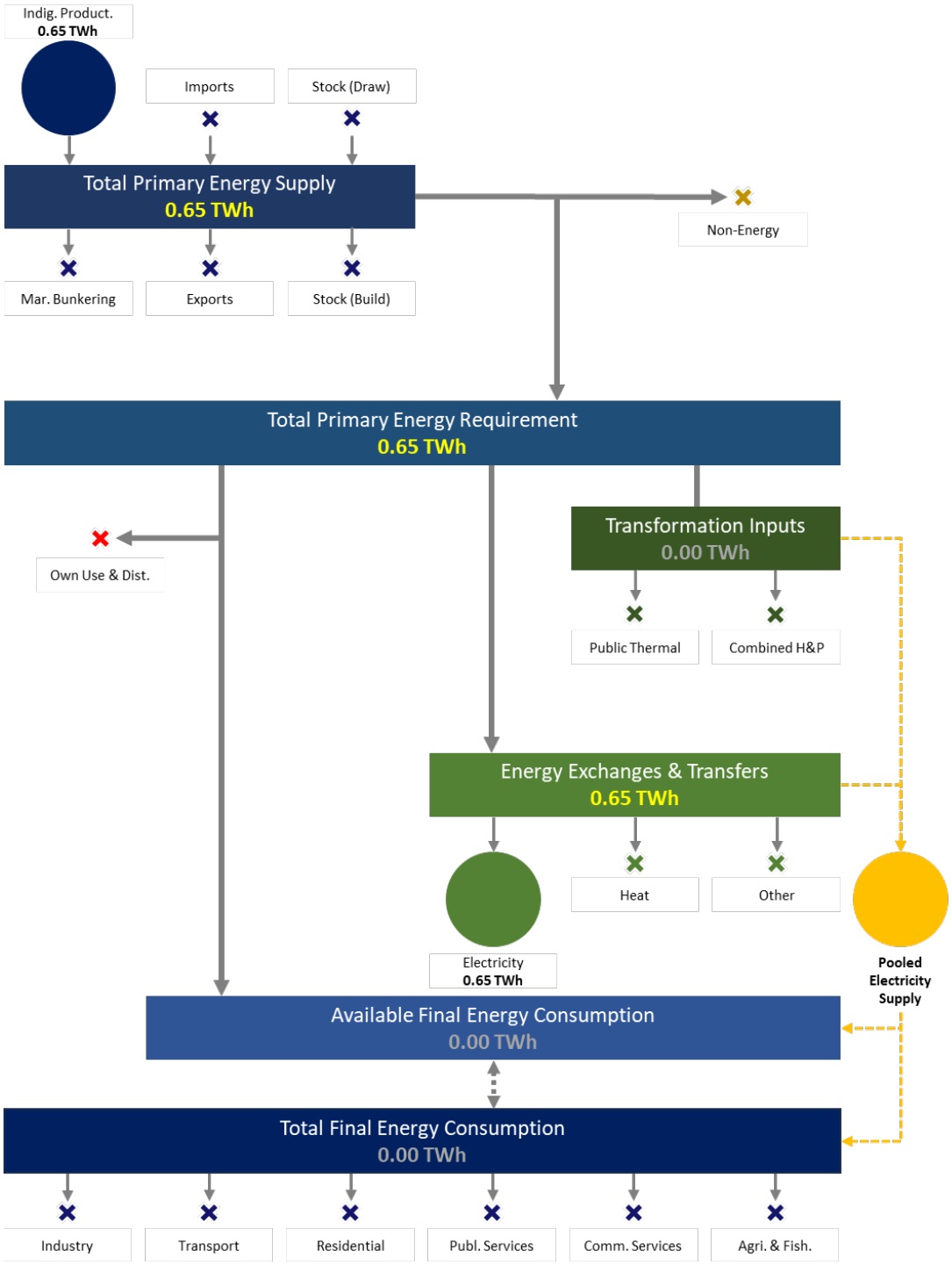
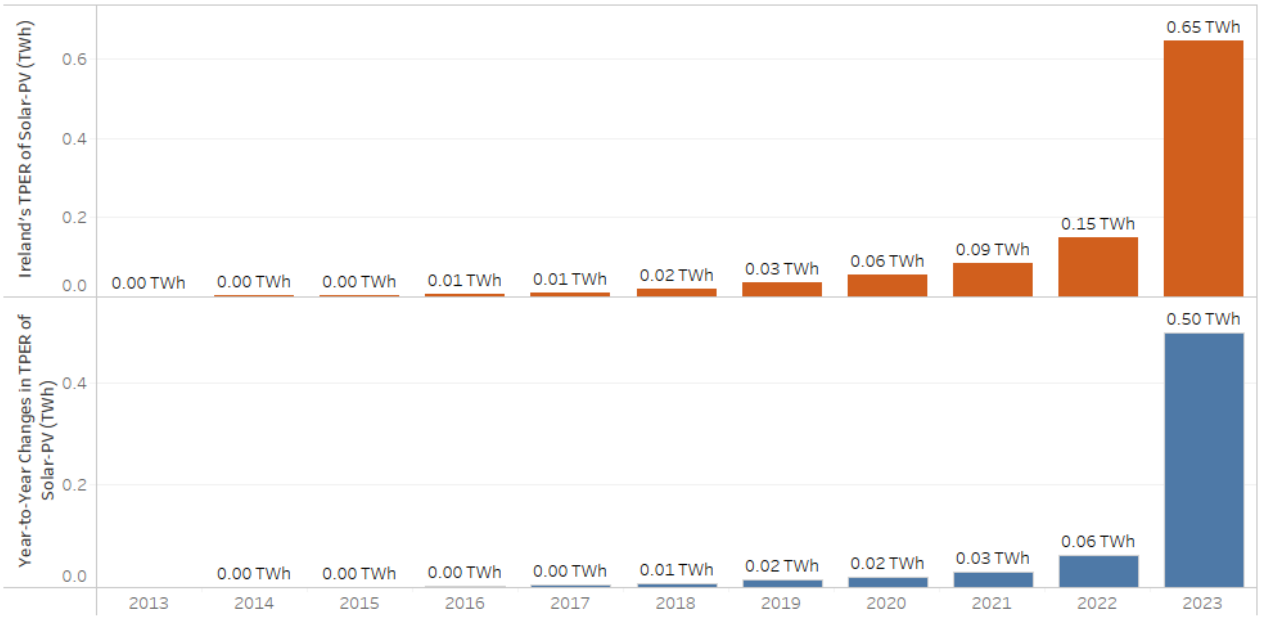
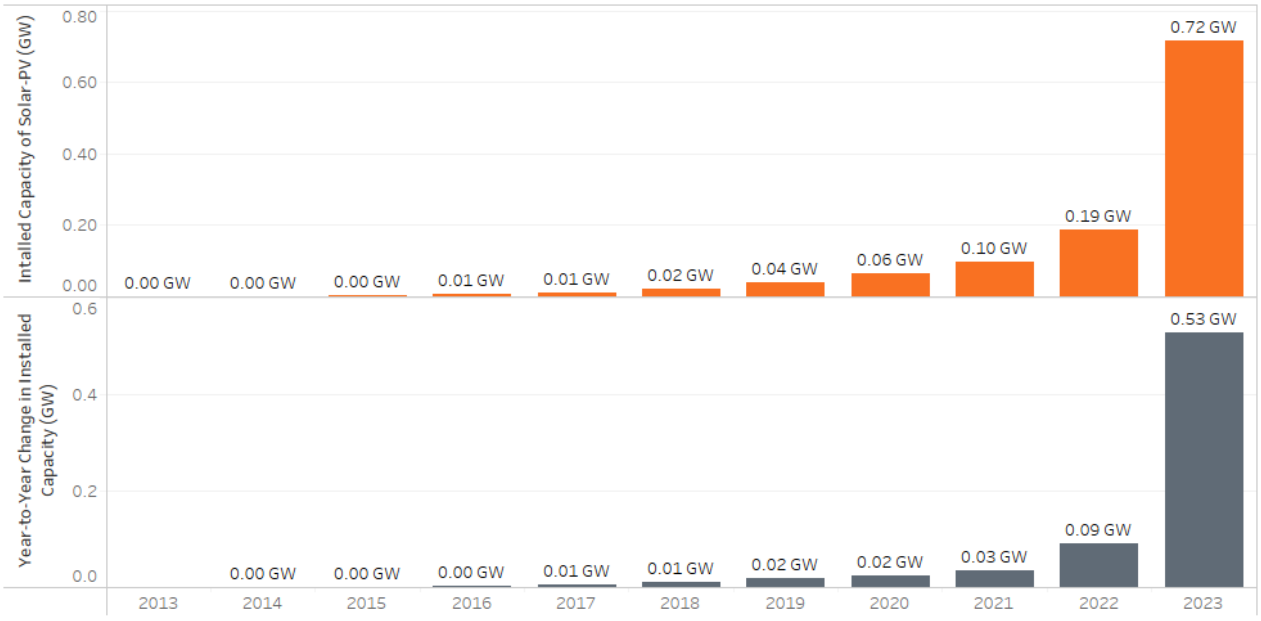


Figure 2.25 – TPER of solar-PV over the last 10-years with year-to-year changes.



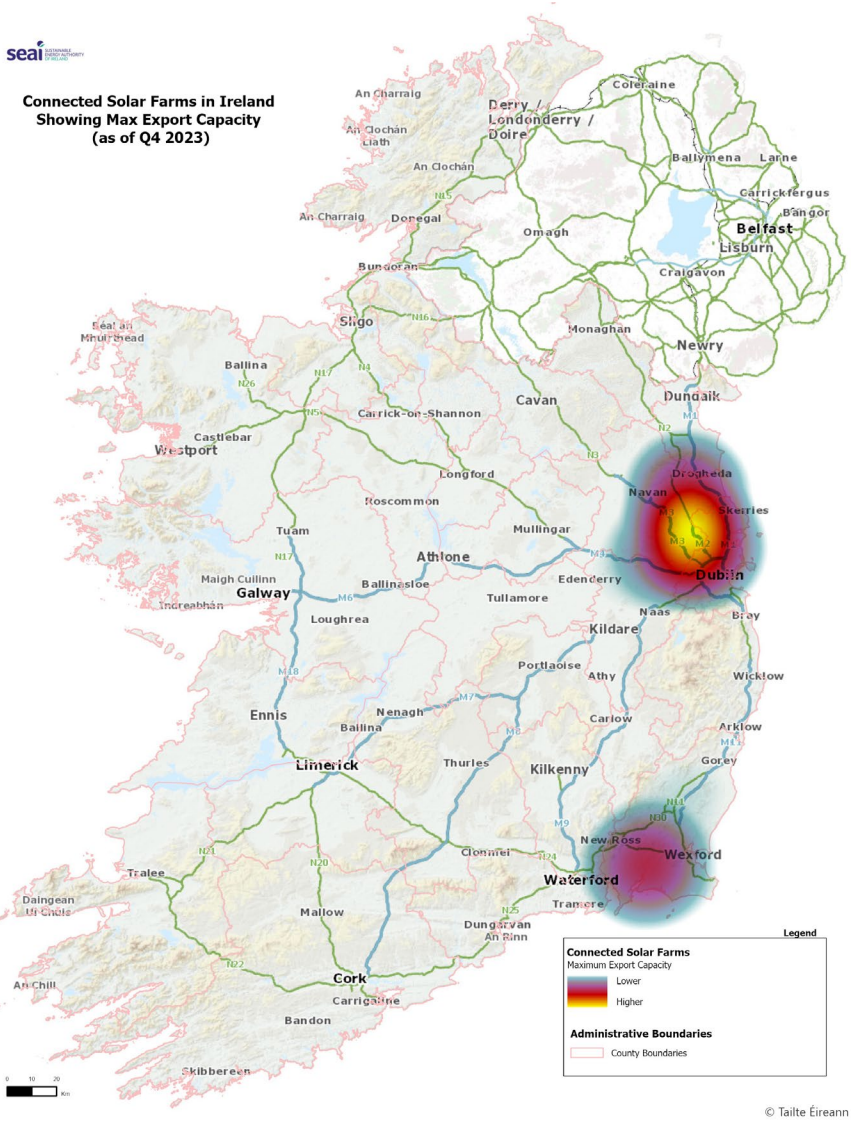
Ireland's use of solar-PV is increasing at an accelerating rate. In 2023, Ireland used 0.65 TWh of solar-PV, up 0.50 TWh on the previous year.

Figure 2.26 – Installed capacity for solar-PV over the last 10-years with year-to-year changes.



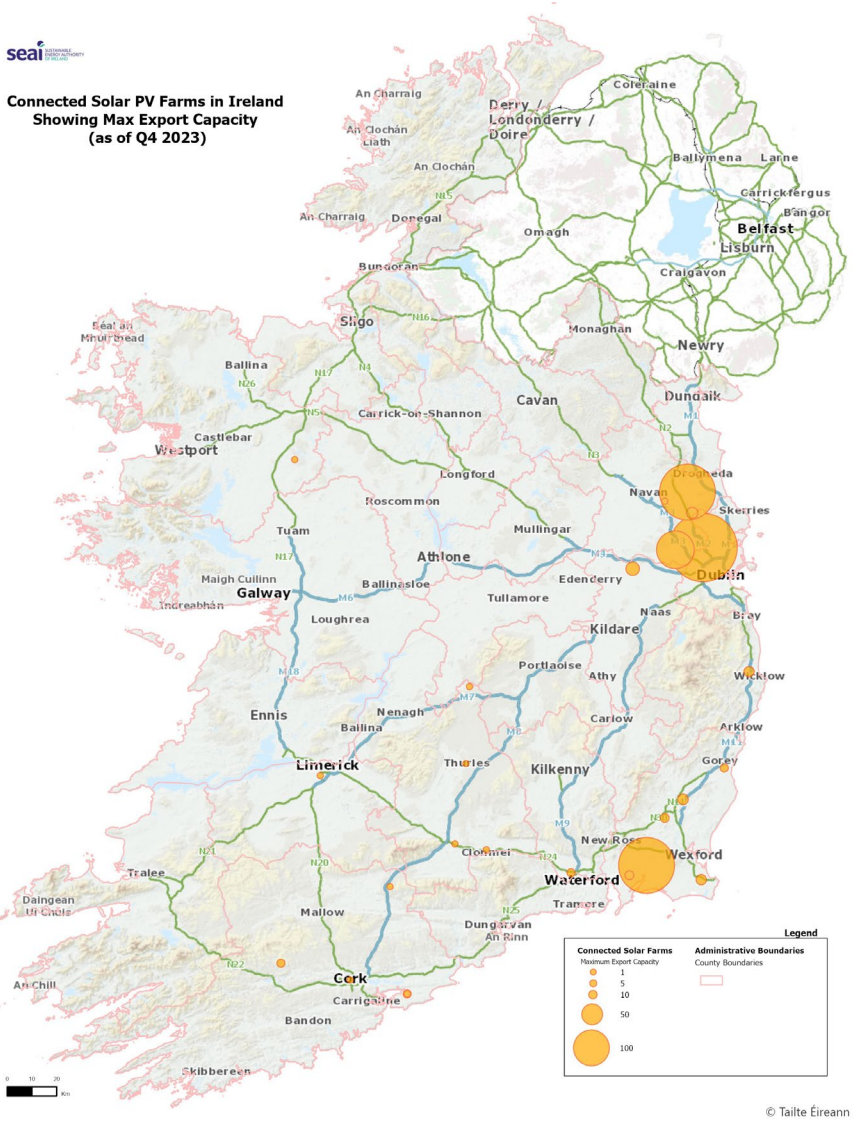
Solar-PV energy and solar-PV capacity measure two different things. Solar-PV capacity measures the rate at which solar-PV energy could be generated under ideal circumstances. The Solar-PV energy recorded in a calendar year is the actual amount of energy generated by the installed capacity under real-world conditions that year. At the end of 2023, Ireland had 0.72 GW of installed solar-PV capacity, an increase of 0.53 GW on the previous year.

Figure 2.27 – Heat map of grid-connected solar farms in Ireland at the end of 2023. The colour of the heat map scales with the density of maximum export capacity (MEC) of the underlying solar farms, with a 'radius-of-effect' arbitrarily chosen for the purpose of optimising the data visualisation.



A 'heat map' based on the maximum export capacity (MEC) of the underlying grid-connected solar farm provides a useful qualitative overview of which regions in Ireland are currently providing the most solar-PV energy. At the end of 2023, most of Ireland's grid-connected solar farm capacity was located towards the east coast, with concentrations in county Meath and county Wexford.

Figure 2.28 – Site map of grid-connected utility-scale solar farms in Ireland at the end of 2023. The size of the circles scales with the maximum export capacity (MEC) of the sites, and the centre of the circles corresponds to the location of the sites.

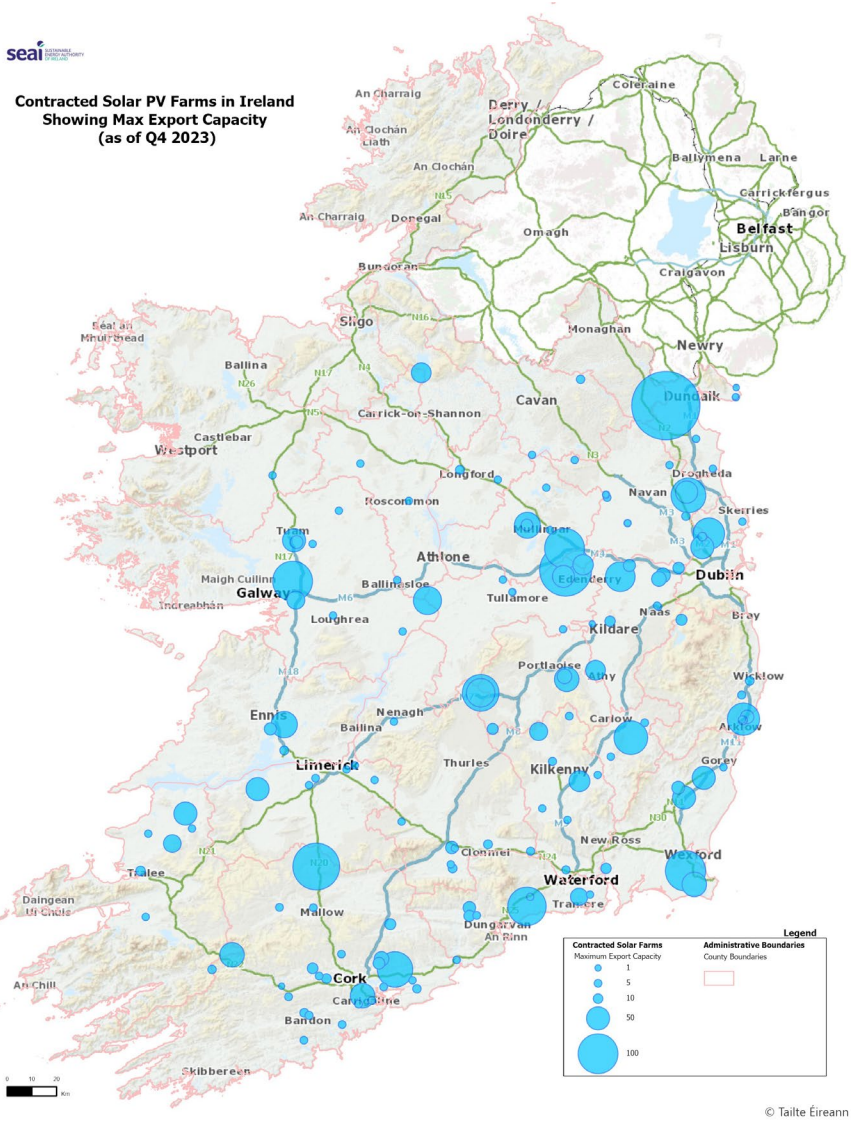


While a 'heat map' provides a useful regional overview, a 'site map' based on the maximum export capacity (MEC) of the grid-connected solar farms provides a more quantitative visualisation of the number and size of the sites providing solar-PV energy to Ireland. Grid-connected solar farms have been built, secured a connection to the national grid, and are contracted to sell electricity into the single integrated single electricity market (I-SEM) for Ireland.

Technical details regarding the site map of the grid-connected solar farms:

- Where the solar farm grid coordinates are not available in the planning application information available to SEAI, the grid coordinates of the relevant substation(s) have been used. Note that the relevant substation may not be located within the site of the solar farm itself.
- Stand-alone projects, not intended for grid-connection, are not included in the map.
- Not all map entries are discrete solar farms. Some map entries are formal extensions to existing solar farms, and some are formal additions to previously registered capacity, involving no physical addition of infrastructure.

Figure 2.29 – Site map of contracted utility-scale solar farms in Ireland at the end of 2023. The size of the circles scales with the maximum export capacity (MEC) of the sites, and the centre of the circles corresponds to the location of the sites.



Contracted (but not connected) solar farms are contracted to sell electricity into the single integrated single electricity market (I-SEM) for Ireland in the future, but may not yet have been built, secured planning permission, or secured a connection to the national grid. Not all contracted solar farms will progress to connected wind farms.

Technical details regarding the site map of the contracted solar farms:

- Contracted solar farm sites are identified based on grid-connection offers from the Transmission System Operator (TSO) or the Distribution Network Operator (DNO).
- Contracted solar farms represent a pipeline of potentially viable projects proposed by developers, but do not reflect the status of planning permission for those projects.
- Some contracted solar farm sites in the map correspond to future extensions to existing connected solar farms, rather than discrete new solar farms.

2.8 Bioethanol

Multiple supply streams act on Ireland's TPER of bioethanol – imports, exports, indigenous production, and stock-draws/builds. Essentially, all of Ireland's bioethanol supply goes to end-users, without undergoing any transformations or exchanges. Practically all of Ireland's bioethanol goes to the transport sector, for biofuel-blending into road petrol.

Figure 2.30 – Ireland's bioethanol energy in 2023 mapped from supply to transformation and final consumption.

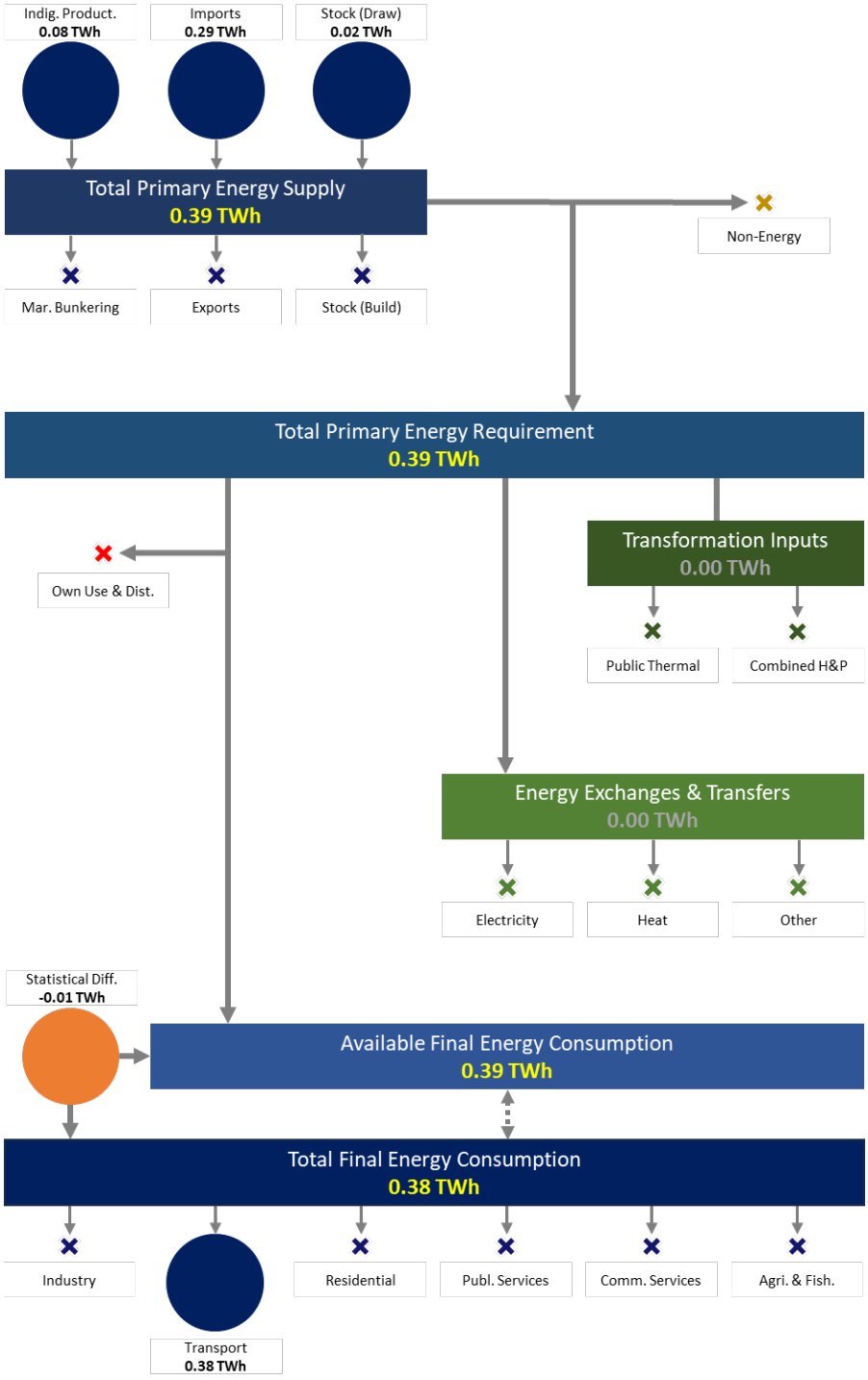
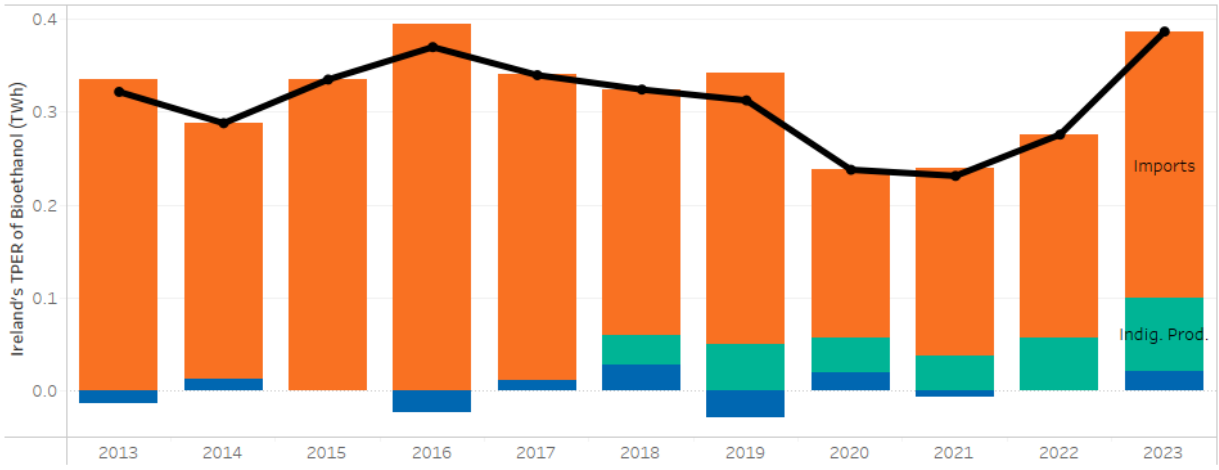


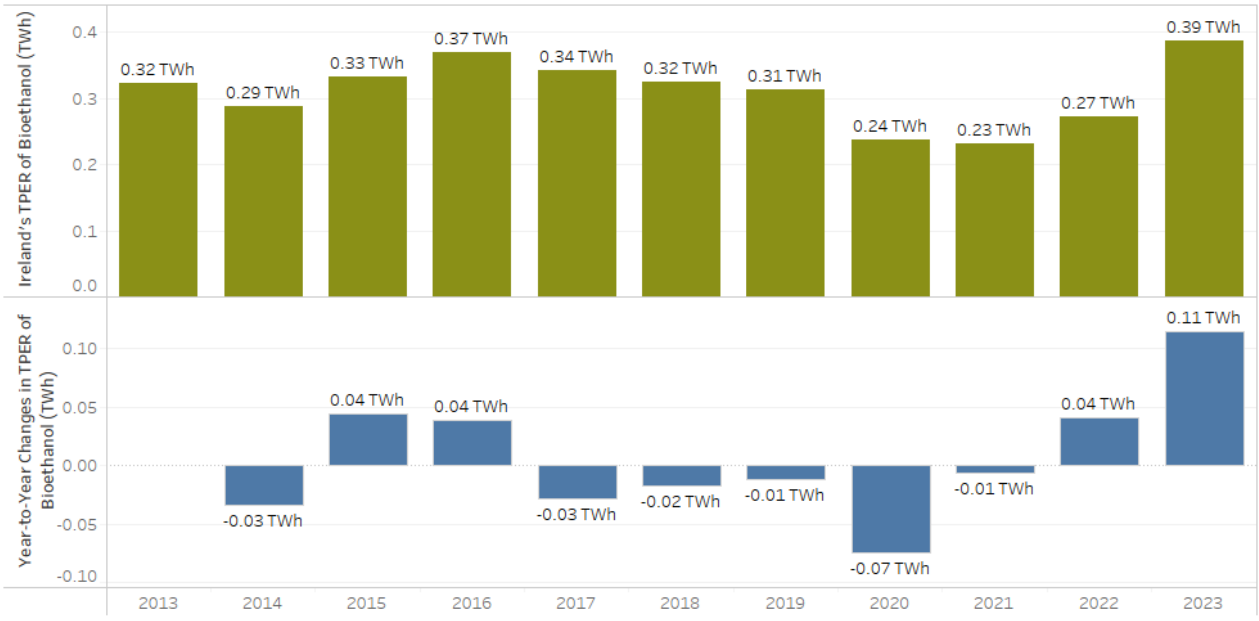
Figure 2.31 – TPER of bioethanol over the last 10-years, broken-down by imports, exports, indigenous production, and stock build/draw.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Imports	0.34	0.28	0.34	0.39	0.33	0.27	0.29	0.18	0.20	0.22	0.29
Indig. Prod.						0.03	0.05	0.04	0.04	0.06	0.08
Stock Chng.	-0.01	0.01		-0.02	0.01	0.03	-0.03	0.02	-0.01		0.02
Total	**0.32 TWh**	**0.29 TWh**	**0.34 TWh**	**0.37 TWh**	**0.34 TWh**	**0.32 TWh**	**0.31 TWh**	**0.24 TWh**	**0.23 TWh**	**0.28 TWh**	**0.39 TWh**

Most of Ireland's bioethanol is imported. In 2023, Ireland used a total of 0.39 TWh of bioethanol, of which 0.29 TWh were from imports, and 0.08 TWh was from indigenous production in Ireland.

Figure 2.32 – TPER of bioethanol over the last 10-years with year-to-year changes.



The amount of bioethanol use in Ireland is increasing, due to increased targets for biofuel blending into road diesel. In 2023, Ireland used 0.39 TWh of bioethanol, up 0.11 TWh on the previous year.

2.9 Landfill Gas

All of Ireland's landfill gas is indigenously produced. All of Ireland's landfill gas supply goes to energy transformation inputs. Landfill gas energy therefore acts to increase Ireland's electricity supply, and to increase the renewable energy share of that electricity supply.

Figure 2.33 – Ireland's landfill gas energy in 2023 mapped from supply to transformation and final consumption.

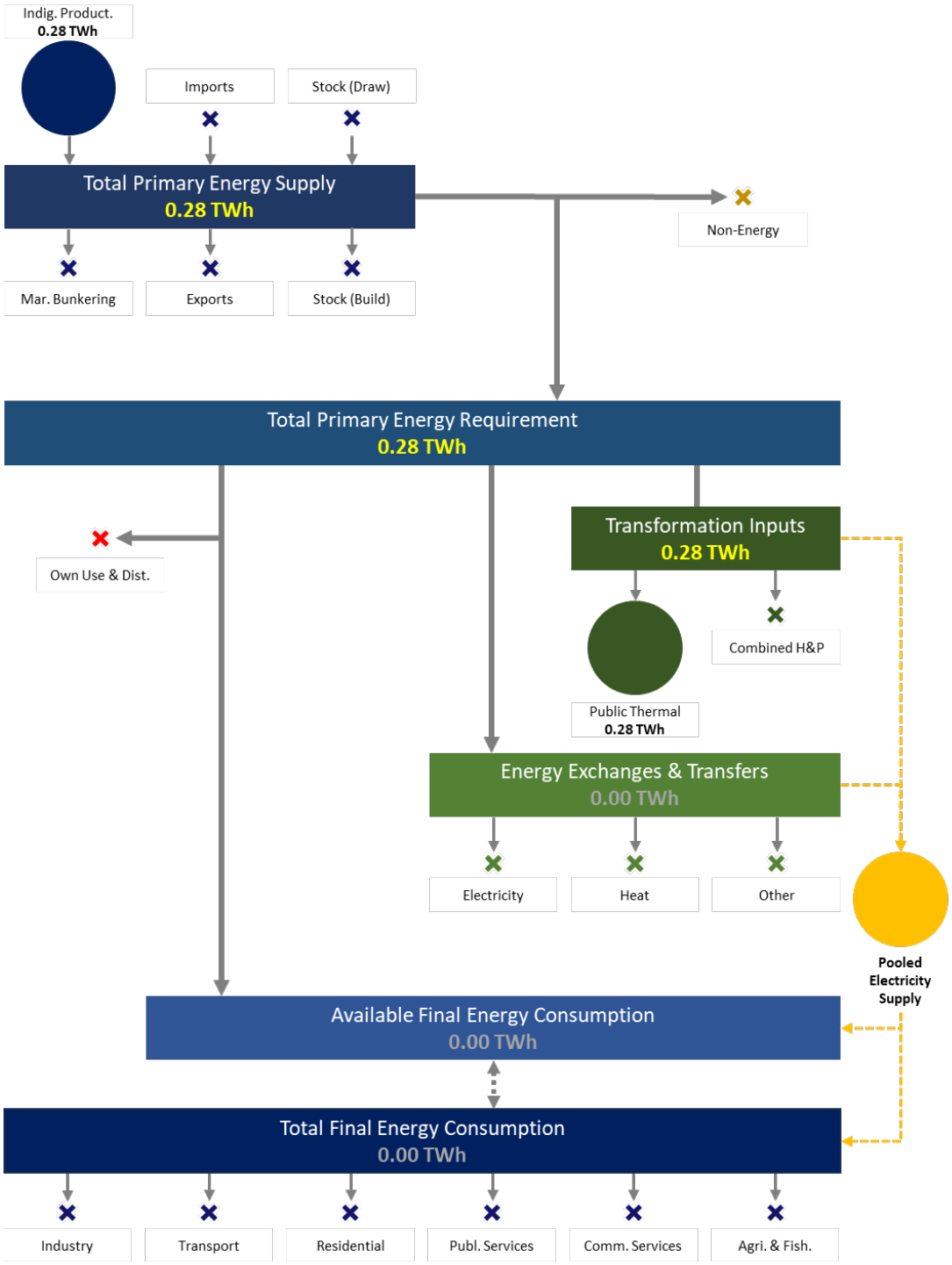
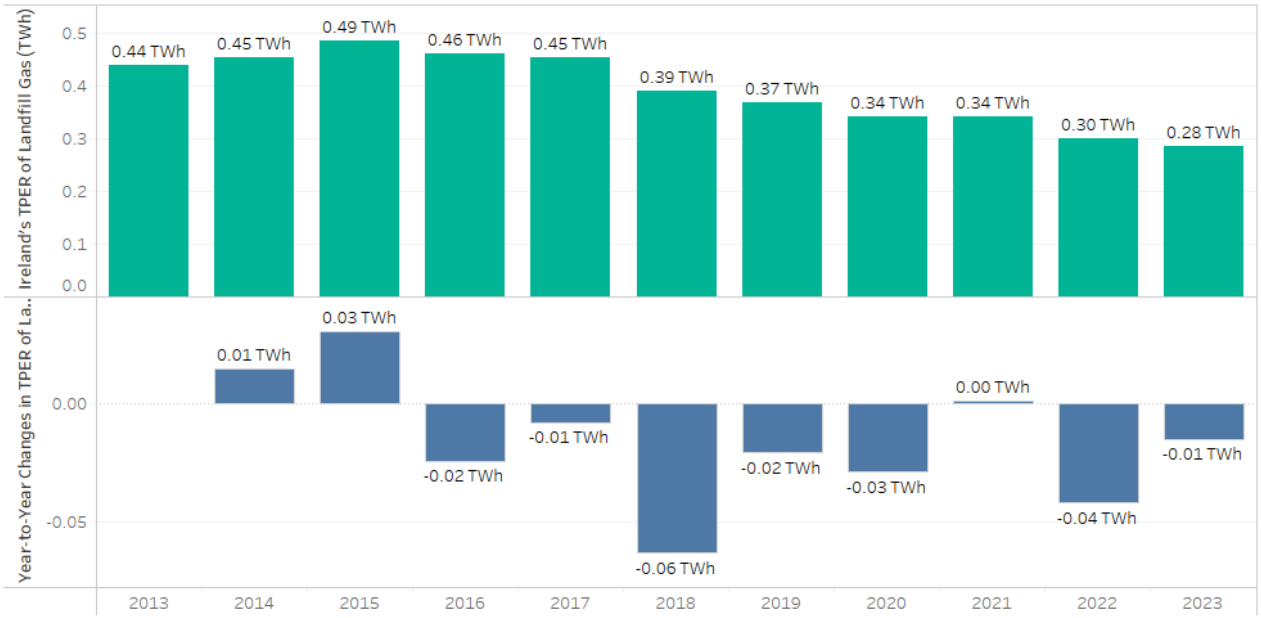


Figure 2.34 – TPER of landfill gas over the last 10-years with year-to-year changes.



Ireland's use of landfill gas is gradually decreasing. In 2023, Ireland used 0.28 TWh of landfill gas, down 0.02 TWh on the previous year.

2.10 Biogas

Essentially all of Ireland's biogas is indigenously produced. Ireland's biogas supply goes both directly to end-users in the industry and services sectors, and to transformation inputs (CHP plants).

Figure 2.35 – Ireland's biogas in 2023 mapped from supply to transformation and final consumption.

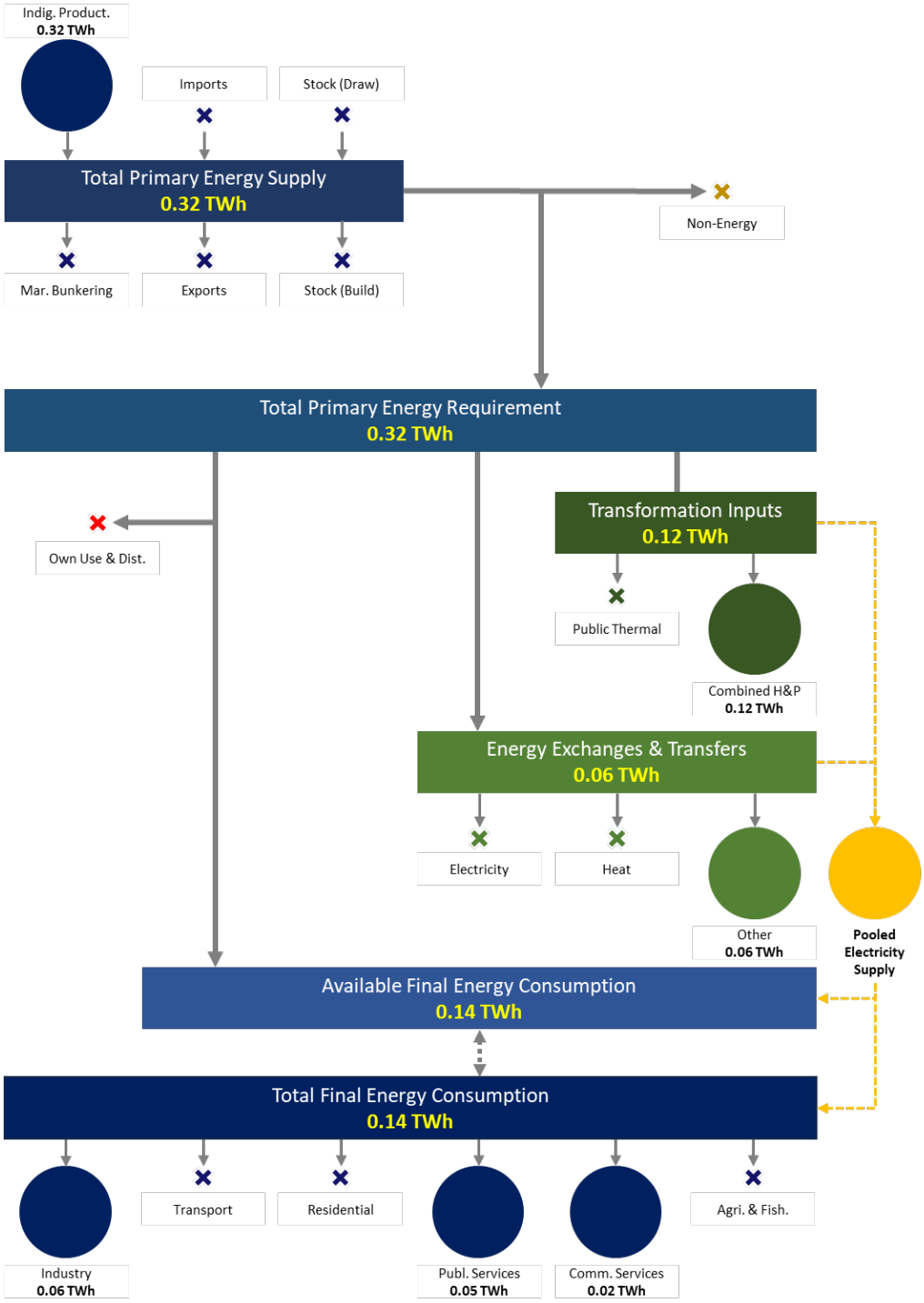
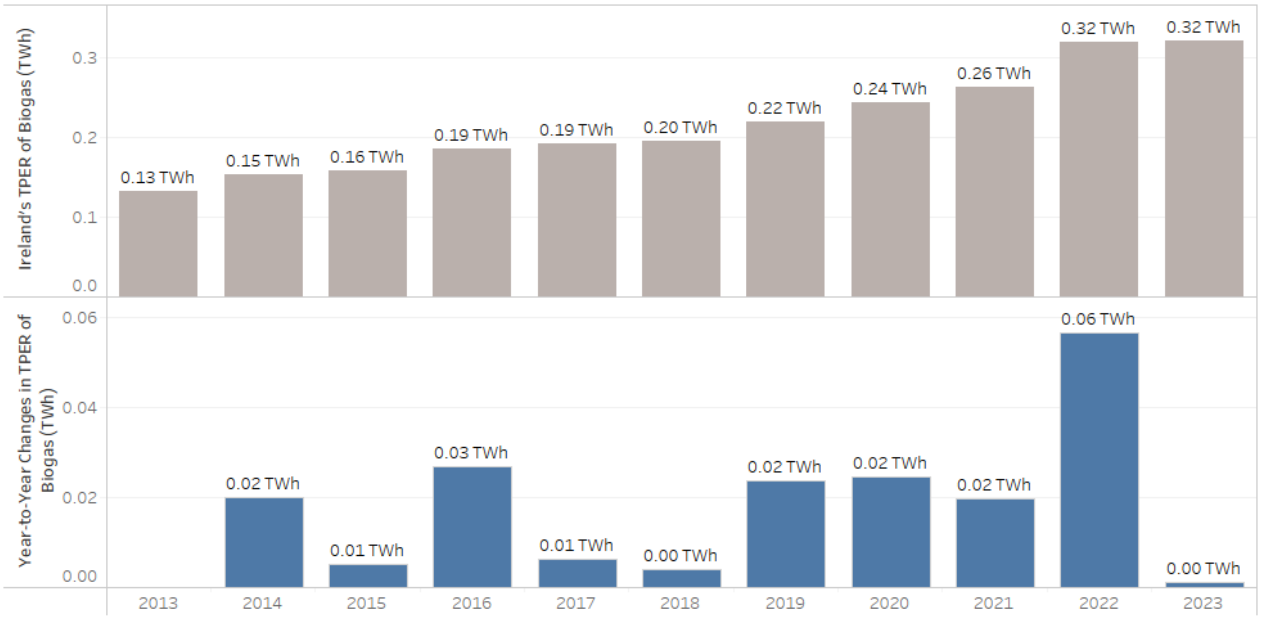
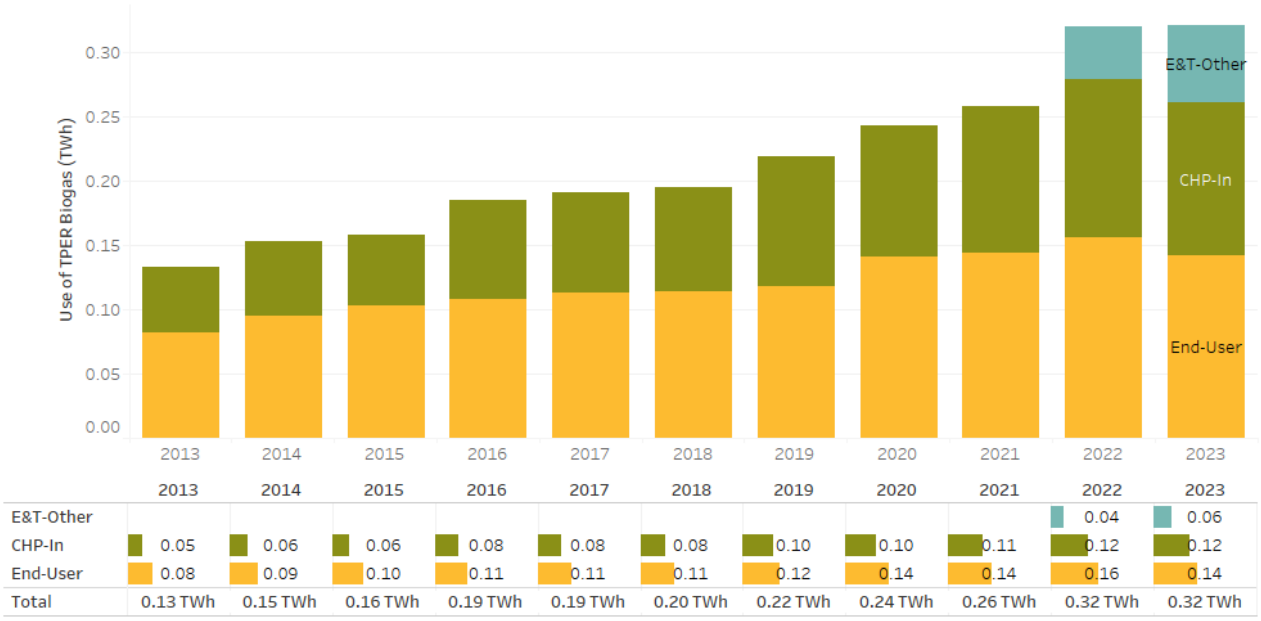


Figure 2.36 – TPER of biogas over the last 10-years with year-to-year changes.



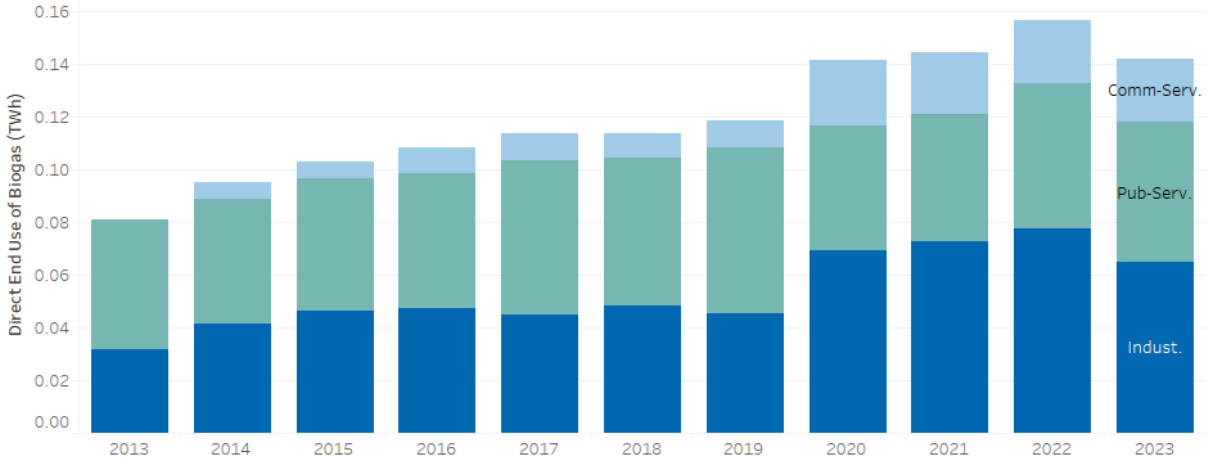
Ireland's use of biogas is generally increasing. In 2023, Ireland used 0.32 TWh of biogas.

Figure 2.37 – Use of biogas over the last 10-years, broken-down by transformation inputs, energy exchanges, and direct end-user consumption



Most of Ireland's biogas is directly consumed by end-users. In 2023, Ireland used a total of 0.32 TWh of biogas, of which 0.14 TWh went directly to end-users, and 0.12 TWh went to CHP plants for electricity and heat generation.

Figure 2.38 – Direct end-user consumption of biogas over the last 10-years broken-down by sector



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Comm-Serv.		0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
Pub-Serv.	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.05	0.05	0.06	0.05
Indust.	0.03	0.04	0.05	0.05	0.04	0.05	0.05	0.07	0.07	0.08	0.06
Total	0.08 TWh	0.09 TWh	0.10 TWh	0.11 TWh	0.11 TWh	0.11 TWh	0.12 TWh	0.14 TWh	0.14 TWh	0.16 TWh	0.14 TWh

Most end-use of biogas in Ireland occurs in the industry sector. In 2023, total direct end-use of biogas was 0.14 TWh, of which 0.06 TWh was in Industry, and 0.05 TWh was in the public services sector.

2.11 Solar Thermal

All of Ireland's solar thermal energy is indigenously produced. All of Ireland's solar thermal energy goes directly to end-users, without undergoing any transformations or exchanges. Essentially all solar thermal energy consumption occurs within the residential sector.

Figure 2.39 – Ireland's solar thermal energy in 2023 mapped from supply to transformation and final consumption.

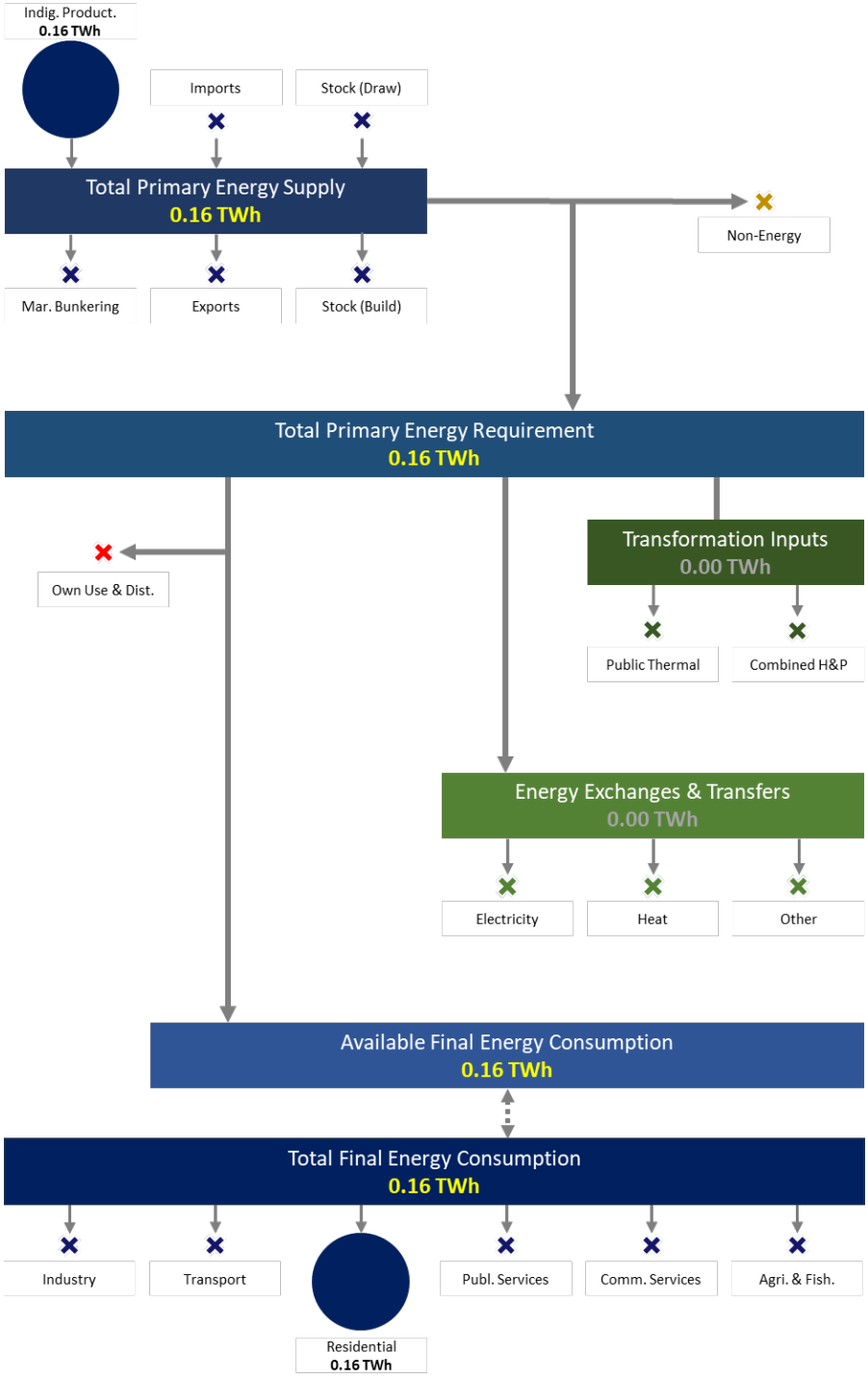
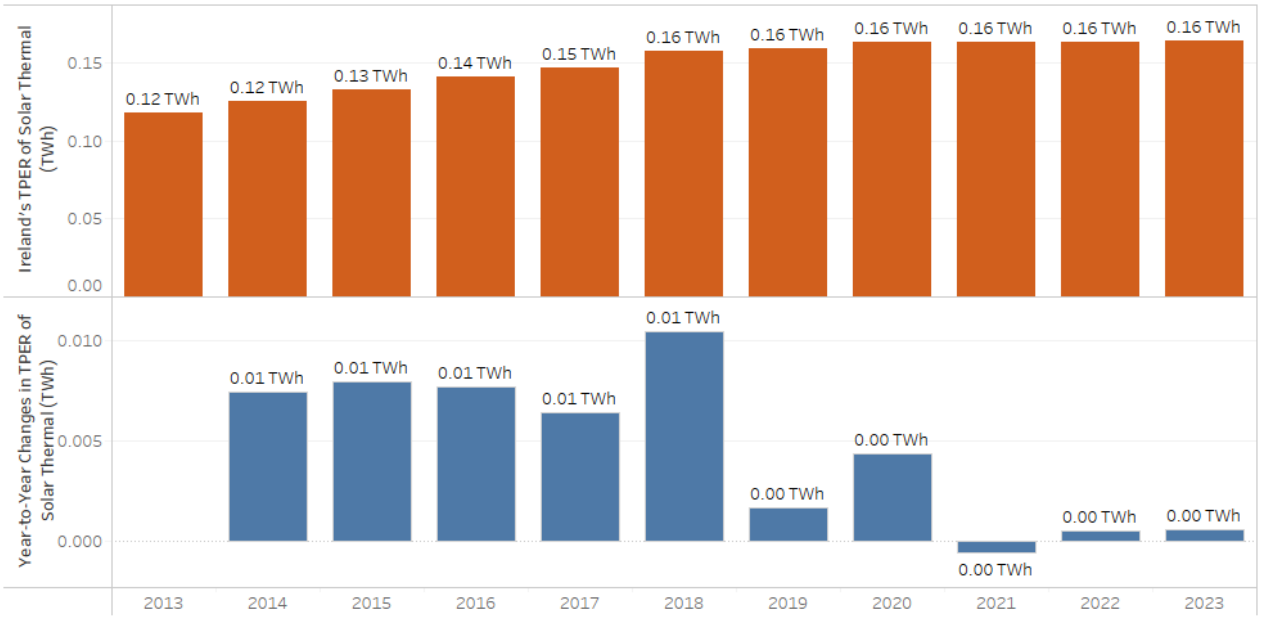


Figure 2.40 – TPER of solar thermal over the last 10-years with year-to-year changes.



In 2023, Ireland used 0.16 TWh of solar thermal energy. Ireland's use of solar thermal energy has been relatively consistent at approximately 0.16 GW for the last 6-years.

3 Ireland's Renewable Energy Supply

The previous section provides individual details on the 11 distinct types of renewable energy currently contributing to the national energy portfolio.

This section identifies the relative contributions of those 11 types of renewable energy to Ireland's overall energy supply, together and separately. The plots in this section illustrate how much of Ireland's total primary energy requirement (TPER) came from renewable energy, and if this was imported or indigenously produced in Ireland.

3.2 Renewables in Total Primary Energy Requirement

Ireland's total primary energy requirement (TPER) is heavily fossil dependent. In 2023, 82.6% of Ireland's TPER came from fossil fuels. In 2023, renewable energy accounted for 14.2% of Ireland's energy requirement.

Figure 3.1 – Ireland's 2023 TPER broken-down by the fossil, renewable, and 'other' energy groups (Note: the 'other' energy group includes interconnector electricity and non-renewable waste).

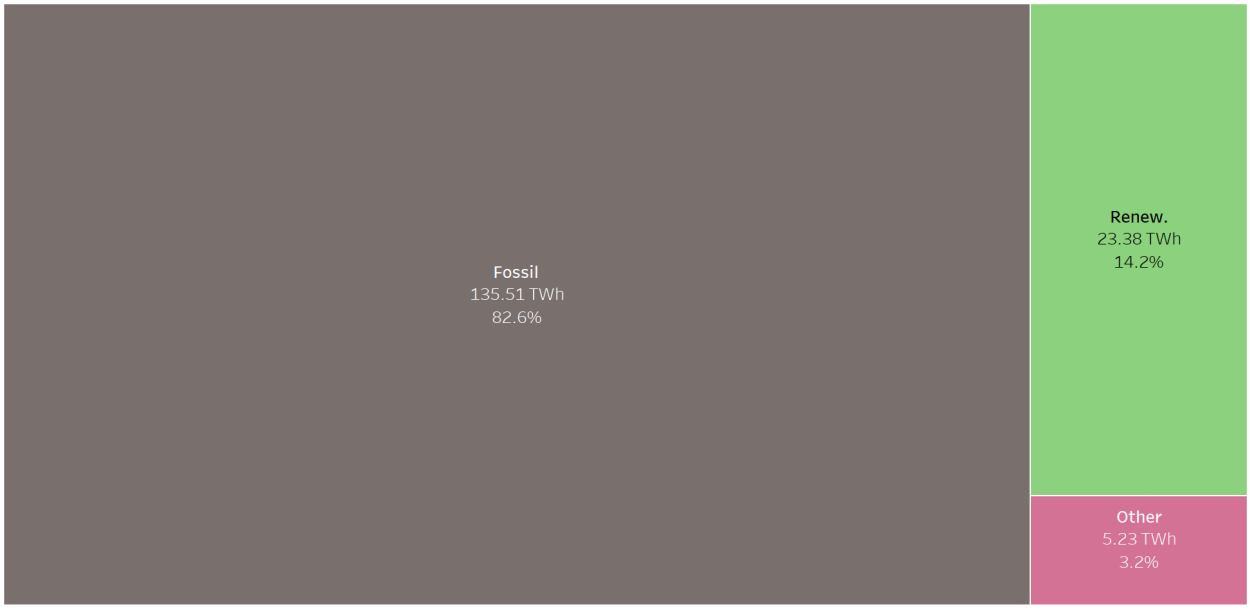
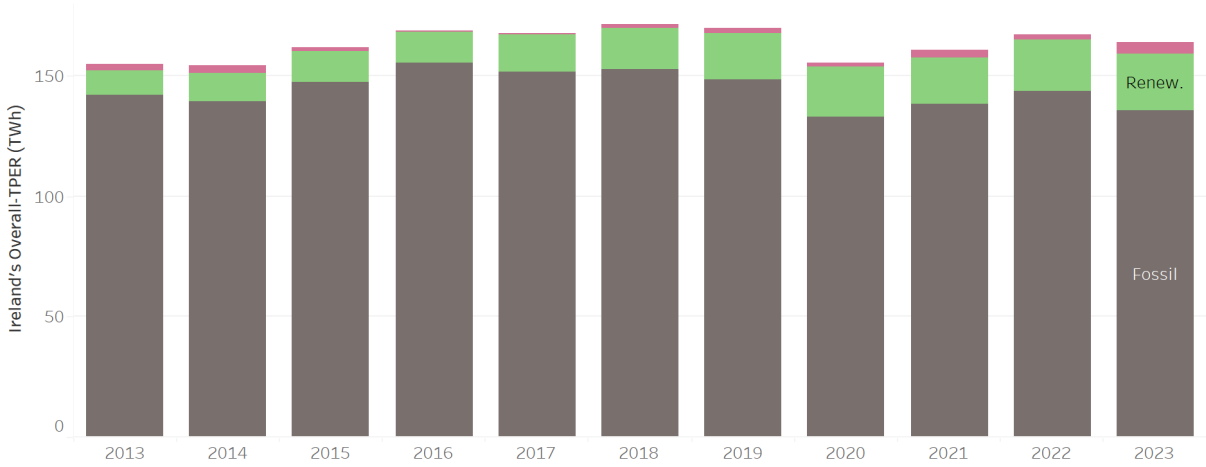


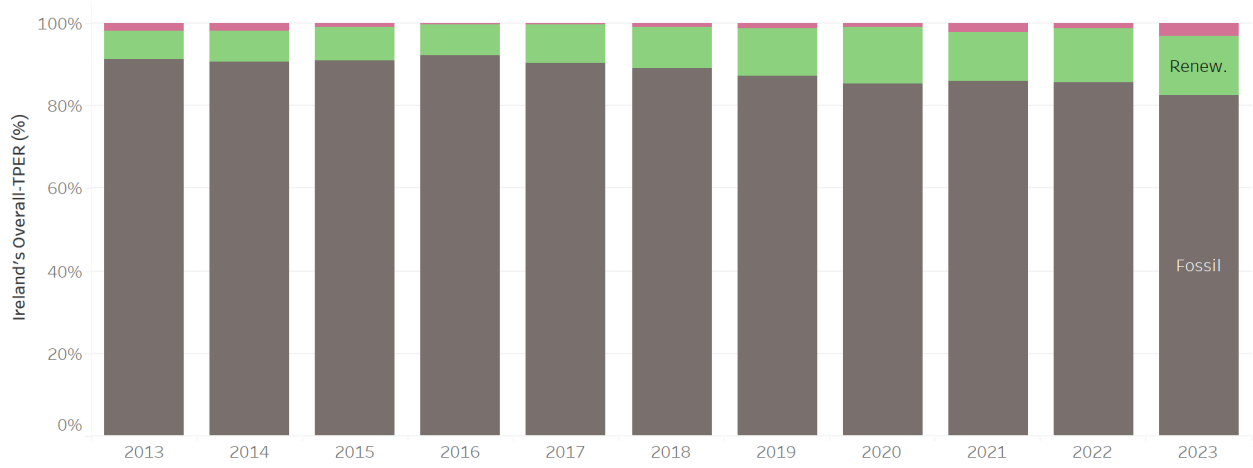
Figure 3.2 – Ireland's TPER over the last 10-years broken-down by the fossil, renewable, and 'other' energy groups.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Other	2.96	2.92	1.47	0.06	0.64	1.66	2.33	1.55	3.25	1.98	5.23
Renew.	10.33	11.68	13.23	13.21	15.58	17.25	19.21	21.07	19.24	21.68	23.38
Fossil	141.77	139.51	147.17	155.62	151.39	152.45	148.49	132.72	138.37	143.40	135.51
Total	**155.06 TWh**	**154.10 TWh**	**161.88 TWh**	**168.89 TWh**	**167.61 TWh**	**171.36 TWh**	**170.03 TWh**	**155.35 TWh**	**160.86 TWh**	**167.06 TWh**	**164.12 TWh**

The amount of renewable energy in Ireland's TPER is increasing. In 2023, there was 23.38 TWh of renewable energy, up from 21.68 TWh in 2022, and 19.24 TWh in 2021.

Figure 3.3 – The percentage-breakdown of Ireland's TPER over the last 10-years by the fossil, renewable, and 'other' energy groups.



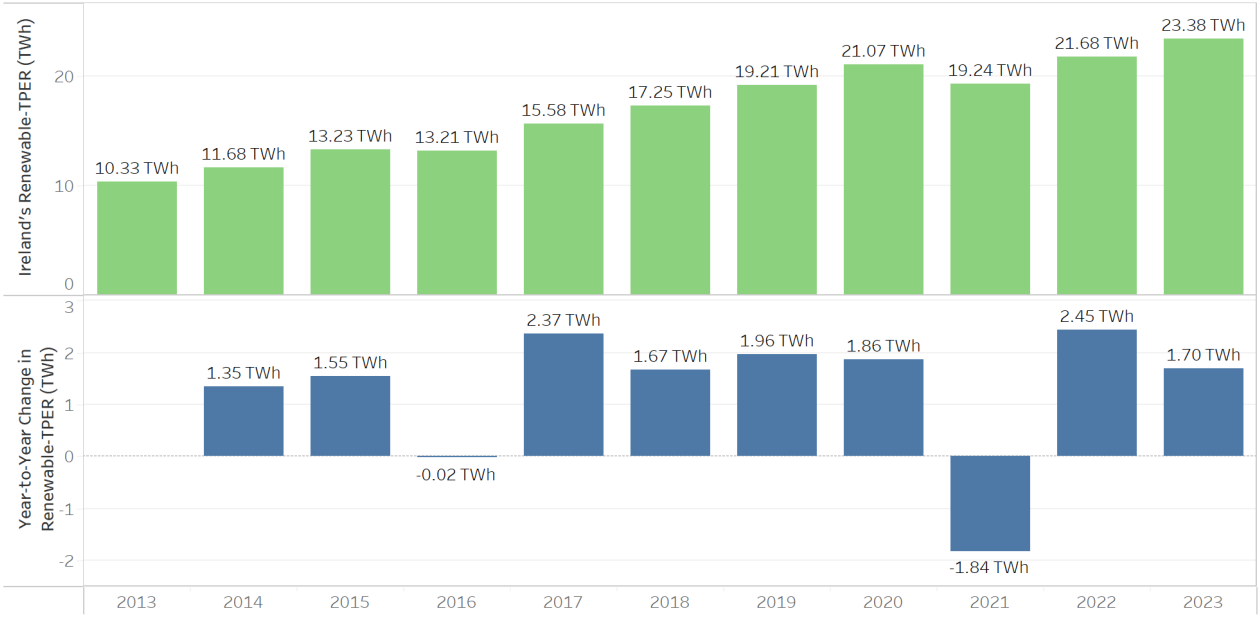
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Other	1.9%	1.9%	0.9%	0.0%	0.4%	1.0%	1.4%	1.0%	2.0%	1.2%	3.2%
Renew.	6.7%	7.6%	8.2%	7.8%	9.3%	10.1%	11.3%	13.6%	12.0%	13.0%	14.2%
Fossil	91.4%	90.5%	90.9%	92.1%	90.3%	89.0%	87.3%	85.4%	86.0%	85.8%	82.6%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

The percentage contribution of renewable energy to Ireland's TPER is also increasing. In 2023, renewable energy accounted for 14.2% of TPER, up from 13.0% in 2022, and 12.0% in 2021.

3.3 Total Primary Energy Requirement of Renewables

The amount of renewable energy in Ireland is increasing. In 2023, the supply of renewable energy to Ireland increased by 1.70 TWh on the previous year. Over the last 10-years, Ireland has typically added between 1.5 TWh and 2.0 TWh of renewable energy to the national energy portfolio each year.

Figure 3.4 – Ireland's renewable-TPER over the last 10-years with year-to-year changes.



Wind is the largest source of renewable energy for Ireland, accounting for 49.9% of Ireland's renewable-TPER in 2023. The next two largest sources are biodiesel (13.4%) and biomass (11.0%). Together these three sources account for 74.3% of Ireland's renewable energy.

Figure 3.5 – Ireland's 2023 renewable-TPER broken-down by renewable sub-product.

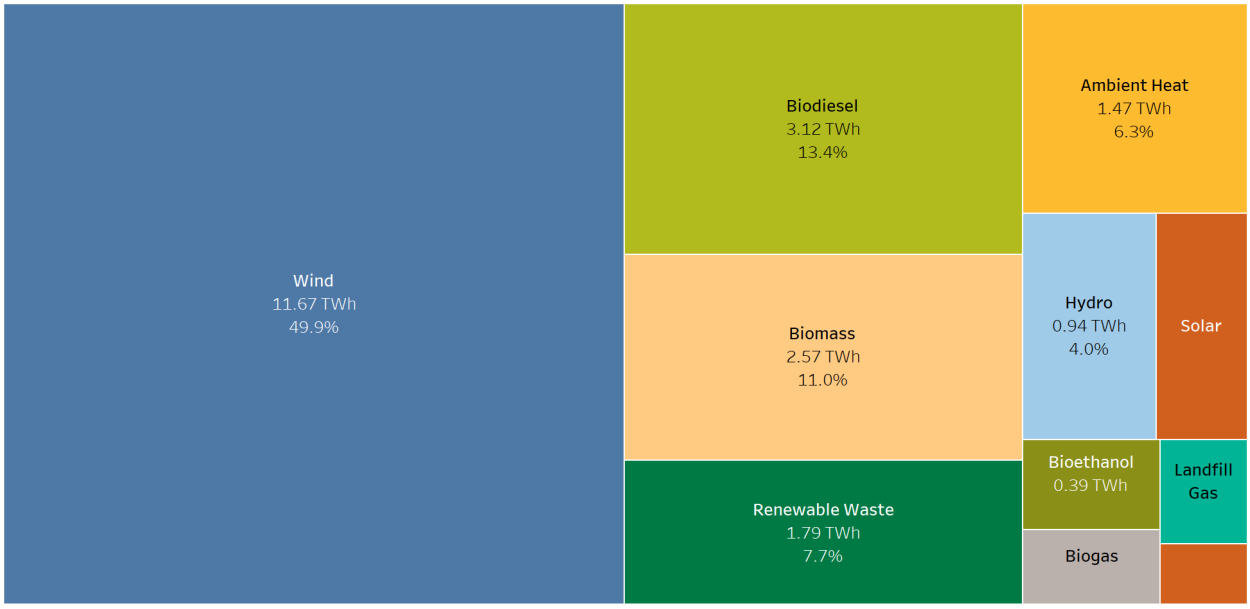
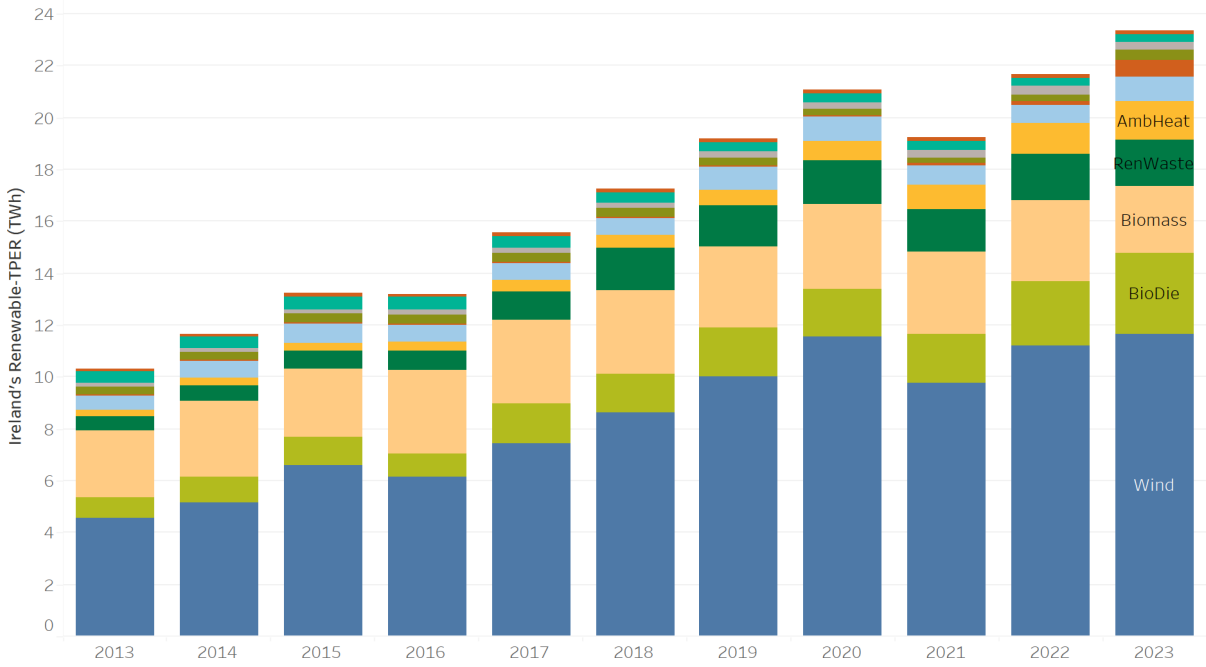


Figure 3.6 – Ireland's renewable-TPER over the last 10-years broken-down by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Solar-Th	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.16	0.16	0.16	0.16
LF-Gas	0.44	0.45	0.49	0.46	0.45	0.39	0.37	0.34	0.34	0.30	0.28
Biogas	0.13	0.15	0.16	0.19	0.19	0.20	0.22	0.24	0.26	0.32	0.32
BioEth	0.32	0.29	0.33	0.37	0.34	0.32	0.31	0.24	0.23	0.27	0.39
Solar-PV	0.00	0.00	0.00	0.01	0.01	0.02	0.03	0.06	0.09	0.15	0.65
Hydro	0.60	0.71	0.81	0.68	0.69	0.69	0.89	0.93	0.75	0.70	0.94
AmbHeat	0.24	0.27	0.31	0.38	0.45	0.51	0.62	0.77	0.92	1.18	1.47
RenWaste	0.57	0.60	0.66	0.74	1.09	1.63	1.59	1.69	1.67	1.76	1.79
Biomass	2.53	2.94	2.67	3.18	3.22	3.19	3.10	3.25	3.14	3.14	2.57
BioDie	0.84	1.00	1.09	0.92	1.53	1.50	1.89	1.84	1.89	2.48	3.12
Wind	4.54	5.14	6.57	6.15	7.45	8.64	10.02	11.55	9.78	11.21	11.67
Total	**10.33 TWh**	**11.68 TWh**	**13.23 TWh**	**13.21 TWh**	**15.58 TWh**	**17.25 TWh**	**19.21 TWh**	**21.07 TWh**	**19.24 TWh**	**21.68 TWh**	**23.38 TWh**

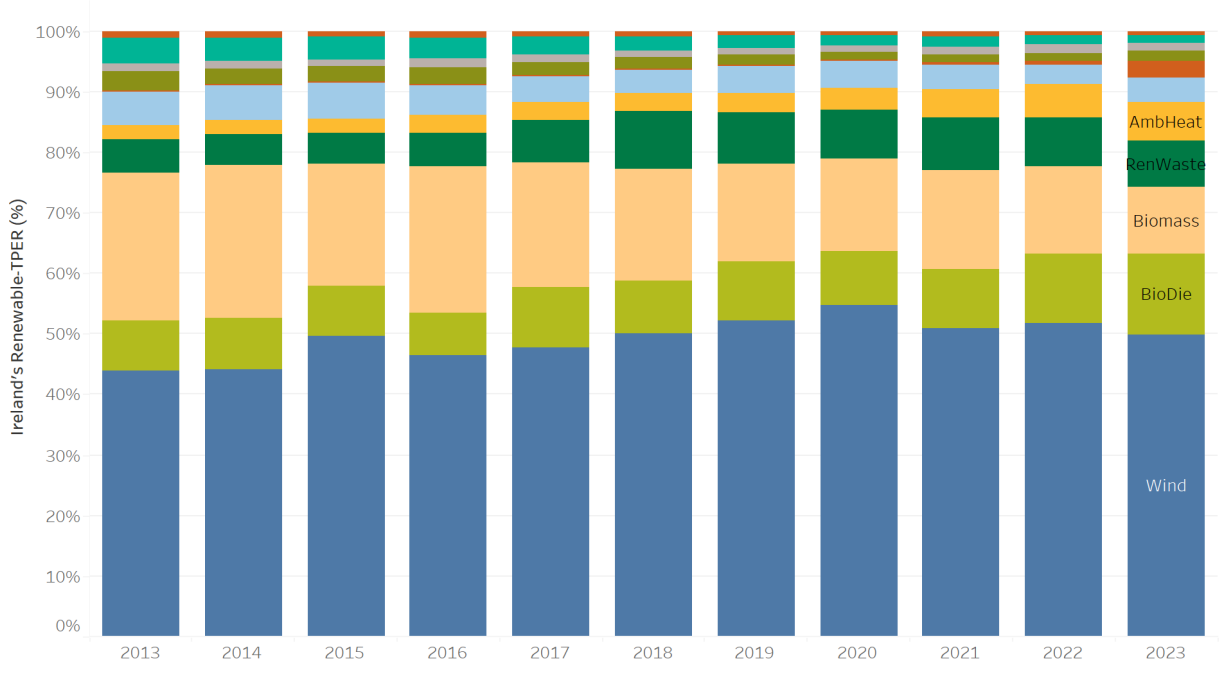
Supply of the following renewable energy sub-products increased in 2023:

- Biodiesel (+0.64 TWh)
- Solar-PV (+0.50 TWh)
- Wind (+0.46 TWh)
- Ambient Heat (+0.29 TWh)
- Hydro Power (+0.24 TWh)
- Bioethanol (+0.12 TWh)
- Renewable Wastes (+0.03 TWh)

Supply of the following renewable energy sub-products decreased in 2023:

- Biomass (-0.57 TWh)
- Landfill Gas (-0.02 TWh)

Figure 3.7 – The percentage-breakdown of Ireland's renewable-TPER over the last 10-years by renewable sub-product

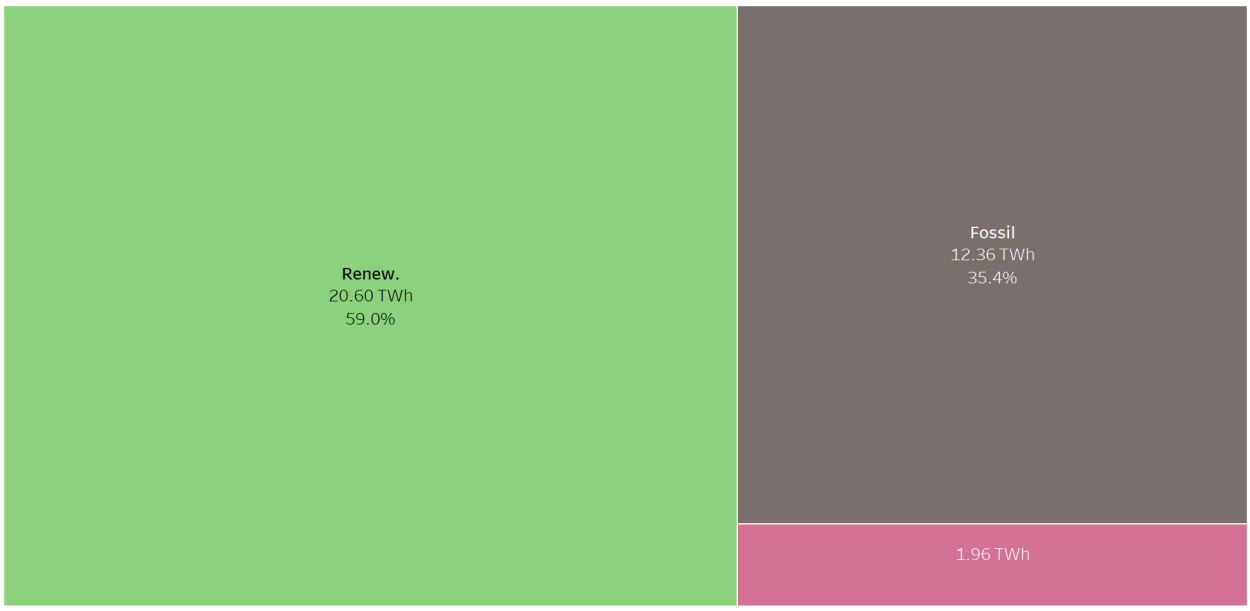


	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Solar-Th	1.1%	1.1%	1.0%	1.1%	0.9%	0.9%	0.8%	0.8%	0.8%	0.8%	0.7%
LF-Gas	4.3%	3.9%	3.7%	3.5%	2.9%	2.3%	1.9%	1.6%	1.8%	1.4%	1.2%
Biogas	1.3%	1.3%	1.2%	1.4%	1.2%	1.1%	1.1%	1.2%	1.4%	1.5%	1.4%
BioEth	3.1%	2.5%	2.5%	2.8%	2.2%	1.9%	1.6%	1.1%	1.2%	1.3%	1.7%
Solar-PV	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.3%	0.4%	0.7%	2.8%
Hydro	5.8%	6.1%	6.1%	5.2%	4.4%	4.0%	4.6%	4.4%	3.9%	3.2%	4.0%
AmbHeat	2.3%	2.3%	2.4%	2.8%	2.9%	3.0%	3.2%	3.6%	4.8%	5.4%	6.3%
RenWaste	5.5%	5.1%	5.0%	5.6%	7.0%	9.4%	8.3%	8.0%	8.7%	8.1%	7.7%
Biomass	24.5%	25.2%	20.1%	24.1%	20.6%	18.5%	16.1%	15.4%	16.3%	14.5%	11.0%
BioDie	8.1%	8.6%	8.3%	6.9%	9.9%	8.7%	9.9%	8.8%	9.8%	11.4%	13.4%
Wind	44.0%	44.0%	49.7%	46.5%	47.8%	50.1%	52.2%	54.8%	50.8%	51.7%	49.9%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

3.4 Renewables in Indigenous Production of Energy

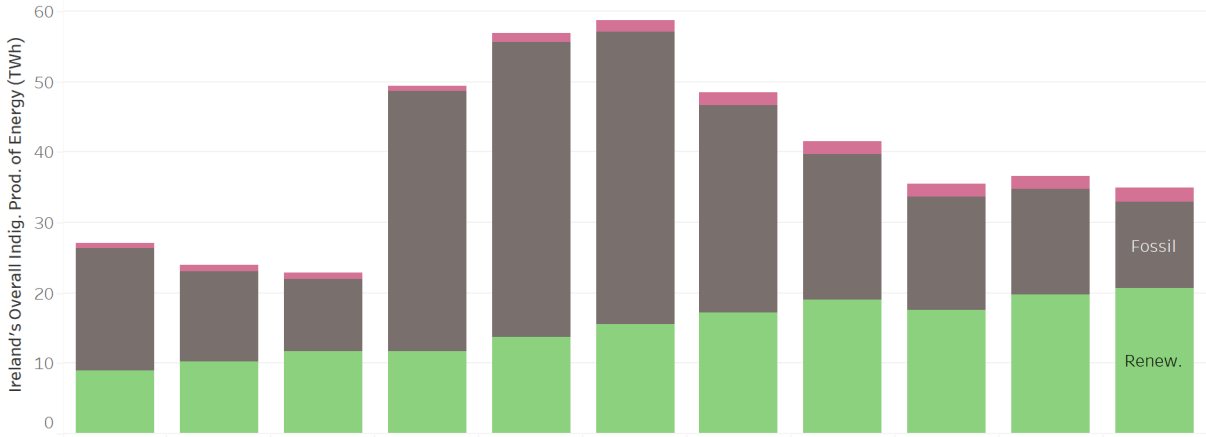
Ireland's indigenous production of energy contains a significant renewable component. In 2023, 59.0% of Ireland's indigenous production of energy came from renewables, with 35.4% coming from fossil fuel.

Figure 3.8 – Ireland's indigenous production of energy in 2023 broken-down by the fossil, renewable, and 'other' energy groups (Note the 'other' energy group includes interconnector electricity and non-renewable waste).



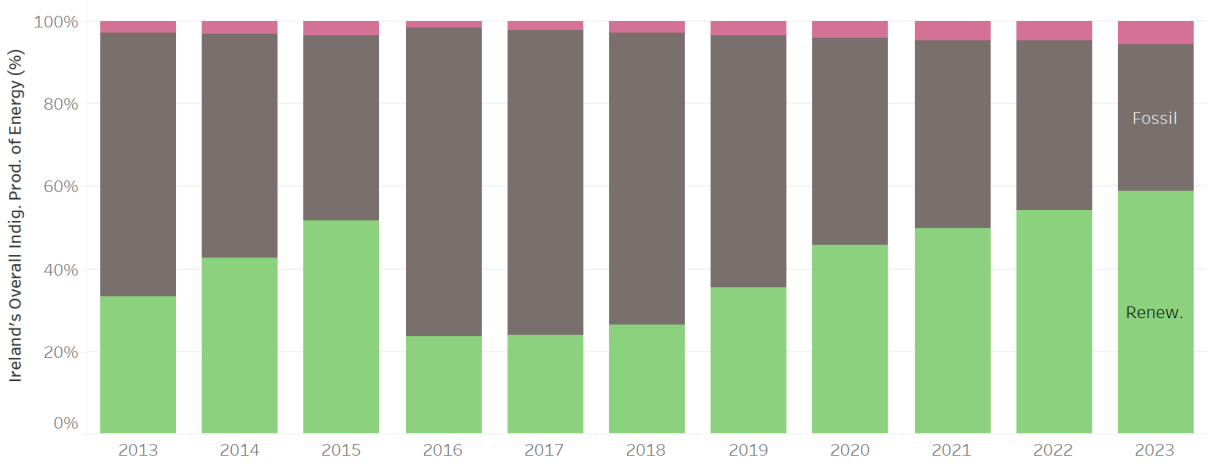
The amount of renewable energy in Ireland's indigenous production of energy is increasing. In 2023, there was 20.60TWh of renewable energy, up from 19.81 TWh in 2022, and 17.62 TWh in 2021.

Figure 3.9 – Indigenous production of energy over the last 10-years broken-down by the fossil, renewable, and 'other' energy groups.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Other	0.71	0.77	0.80	0.78	1.32	1.69	1.69	1.71	1.66	1.73	1.96
Fossil	17.33	12.95	10.26	36.89	41.84	41.49	29.51	20.73	16.12	15.03	12.36
Renew.	9.02	10.16	11.78	11.69	13.69	15.52	17.19	19.02	17.62	19.81	20.60
Total	**27.06 TWh**	**23.89 TWh**	**22.83 TWh**	**49.35 TWh**	**56.85 TWh**	**58.71 TWh**	**48.40 TWh**	**41.45 TWh**	**35.40 TWh**	**36.57 TWh**	**34.91 TWh**

Figure 3.10 – The percentage-breakdown of indigenous production of energy over the last 10-years by the fossil, renewable, and 'other' energy groups.



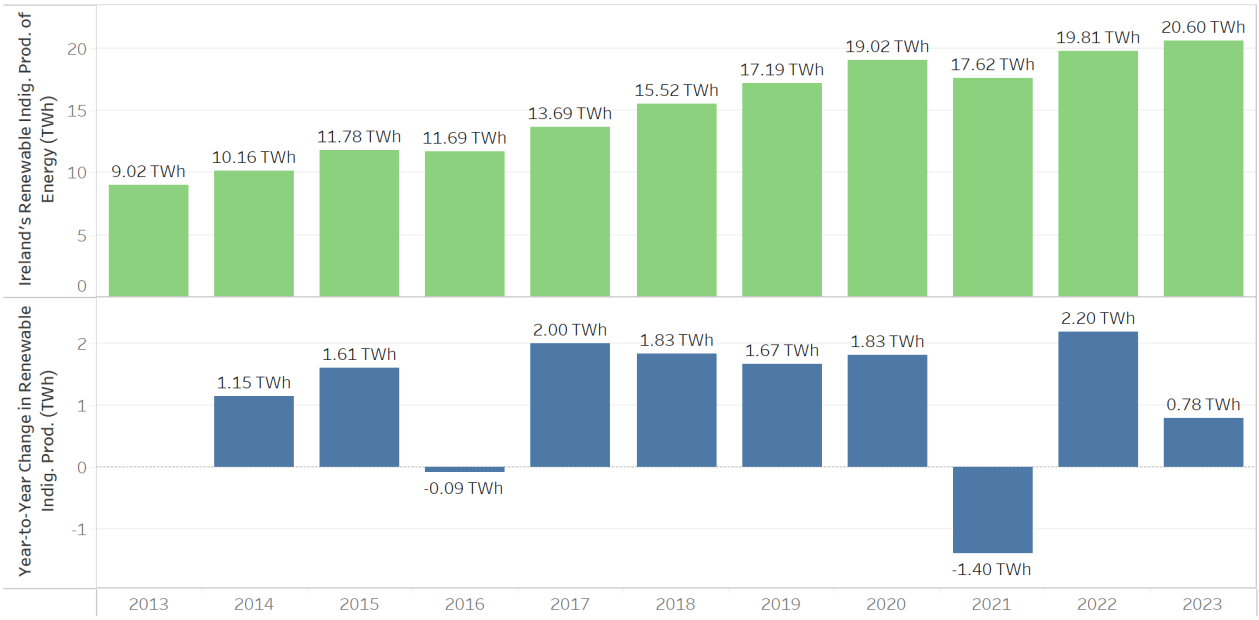
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Other	2.6%	3.2%	3.5%	1.6%	2.3%	2.9%	3.5%	4.1%	4.7%	4.7%	5.6%
Fossil	64.0%	54.2%	44.9%	74.7%	73.6%	70.7%	61.0%	50.0%	45.5%	41.1%	35.4%
Renew.	33.3%	42.6%	51.6%	23.7%	24.1%	26.4%	35.5%	45.9%	49.8%	54.2%	59.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

The percentage contribution of renewable energy to Ireland's indigenous production of energy is also increasing. In 2023, renewable energy accounted for 59.0% of indigenous production, up from 54.2% in 2022, and 49.8% in 2021.

3.5 Indigenous Production of Renewable Energy

The amount of renewable energy indigenously produced in Ireland is increasing. In 2023, the indigenous production of renewable energy increased by 0.78TWh on the previous year. Over the last 10-years, Ireland has typically added between 1.0TWh and 2.0TWh of indigenously produced renewable energy each year.

Figure 3.11 - Indigenous production of renewable over the last 10-years, with year-to-year changes.



Wind is the largest source of indigenously produced renewable energy in Ireland, accounting for 56.7% of Ireland's renewable indigenous production in 2023. The next two largest sources are biomass (10.5%) and renewable waste (8.7%). Together these three sources account for 75.9% of indigenous renewable energy.

Figure 3.12 – Indigenous production of renewable energy in 2023 broken-down by renewable sub-product.

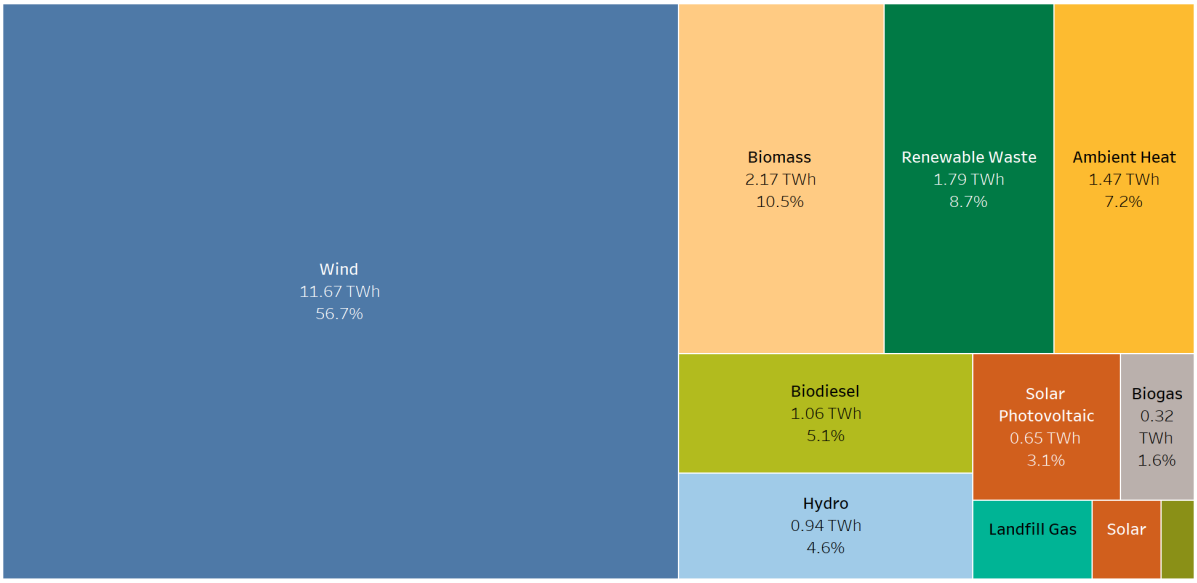
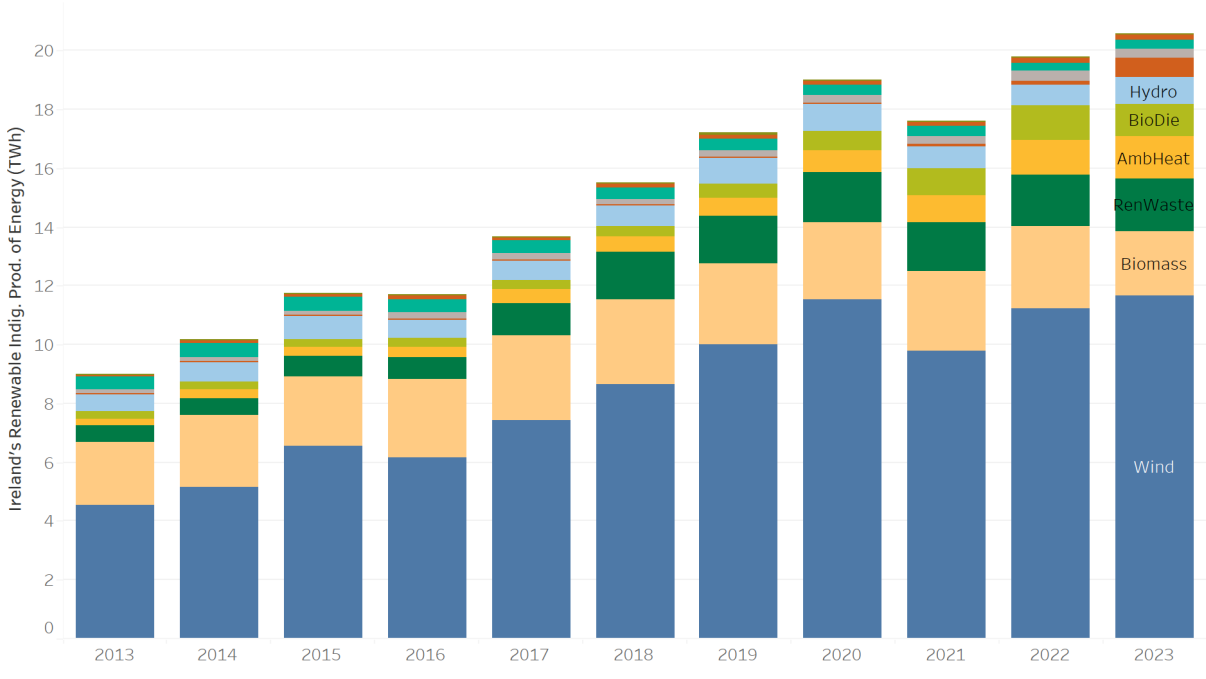


Figure 3.13 – Indigenous production of renewable energy over the last 10-years by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BioEth	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.04	0.04	0.06	0.08
Solar-Th	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.16	0.16	0.16	0.16
LF-Gas	0.44	0.45	0.49	0.46	0.45	0.39	0.37	0.34	0.34	0.30	0.28
Biogas	0.13	0.15	0.16	0.19	0.19	0.20	0.22	0.24	0.26	0.32	0.32
Solar-PV	0.00	0.00	0.00	0.01	0.01	0.02	0.03	0.06	0.09	0.15	0.65
Hydro	0.60	0.71	0.81	0.68	0.69	0.69	0.89	0.93	0.75	0.70	0.94
BioDie	0.25	0.26	0.28	0.28	0.33	0.36	0.48	0.63	0.90	1.16	1.06
AmbHeat	0.24	0.27	0.31	0.38	0.45	0.51	0.62	0.77	0.92	1.18	1.47
RenWaste	0.57	0.60	0.66	0.74	1.09	1.63	1.59	1.69	1.67	1.76	1.79
Biomass	2.13	2.45	2.36	2.66	2.88	2.89	2.76	2.61	2.70	2.81	2.17
Wind	4.54	5.14	6.57	6.15	7.45	8.64	10.02	11.55	9.78	11.21	11.67
Total	**9.02 TWh**	**10.16 TWh**	**11.78 TWh**	**11.69 TWh**	**13.69 TWh**	**15.52 TWh**	**17.19 TWh**	**19.02 TWh**	**17.62 TWh**	**19.81 TWh**	**20.60 TWh**

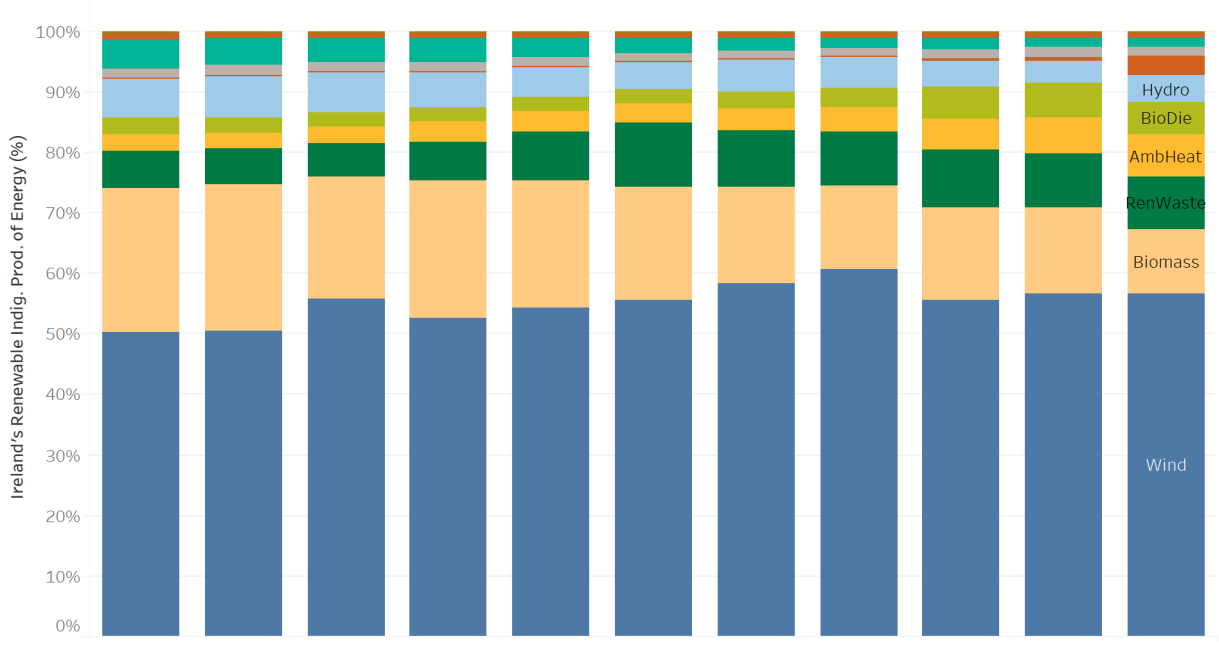
Indigenous production of the following renewable energy sub-products increased in 2023:

- Solar-PV (+0.50 TWh)
- Wind (+0.46 TWh)
- Ambient Heat (+0.29 TWh)
- Hydro Power (+0.24 TWh)
- Renewable Wastes (+0.03 TWh)
- Bioethanol (+0.02 TWh)

Indigenous production of the following renewable energy sub-products decreased in 2023:

- Biomass (-0.65 TWh)
- Biodiesel (-0.10 TWh)
- Landfill Gas (-0.02 TWh)

Figure 3.14 – The percentage-breakdown of indigenous production of renewable over the last 10-years by renewable sub-product



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BioEth	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.3%	0.2%	0.2%	0.3%	0.4%
Solar-Th	1.3%	1.2%	1.1%	1.2%	1.1%	1.0%	0.9%	0.9%	0.9%	0.8%	0.8%
LF-Gas	4.9%	4.5%	4.1%	3.9%	3.3%	2.5%	2.1%	1.8%	1.9%	1.5%	1.4%
Biogas	1.5%	1.5%	1.3%	1.6%	1.4%	1.3%	1.3%	1.3%	1.5%	1.6%	1.6%
Solar-PV	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.3%	0.5%	0.8%	3.1%
Hydro	6.6%	7.0%	6.8%	5.8%	5.1%	4.5%	5.2%	4.9%	4.3%	3.5%	4.6%
BioDie	2.8%	2.6%	2.4%	2.4%	2.4%	2.3%	2.8%	3.3%	5.1%	5.8%	5.1%
AmbHeat	2.6%	2.6%	2.7%	3.2%	3.3%	3.3%	3.6%	4.0%	5.2%	6.0%	7.2%
RenWaste	6.3%	5.9%	5.6%	6.4%	8.0%	10.5%	9.3%	8.9%	9.5%	8.9%	8.7%
Biomass	23.6%	24.1%	20.0%	22.8%	21.0%	18.6%	16.0%	13.7%	15.3%	14.2%	10.5%
Wind	50.4%	50.6%	55.8%	52.6%	54.4%	55.7%	58.3%	60.7%	55.5%	56.6%	56.7%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

3.6 Imports of Renewable Energy

Renewables make up only a small fraction of Ireland's energy imports. In 2023, fossil fuel accounted for 95.5% of Ireland's energy imports, with renewable energy only accounting for 2.0% of energy imports.

Figure 3.15 – Ireland's 2023 energy imports broken-down by the fossil, renewable, and 'other' energy groups (Note: the 'other' energy group includes interconnector electricity and non-renewable waste).

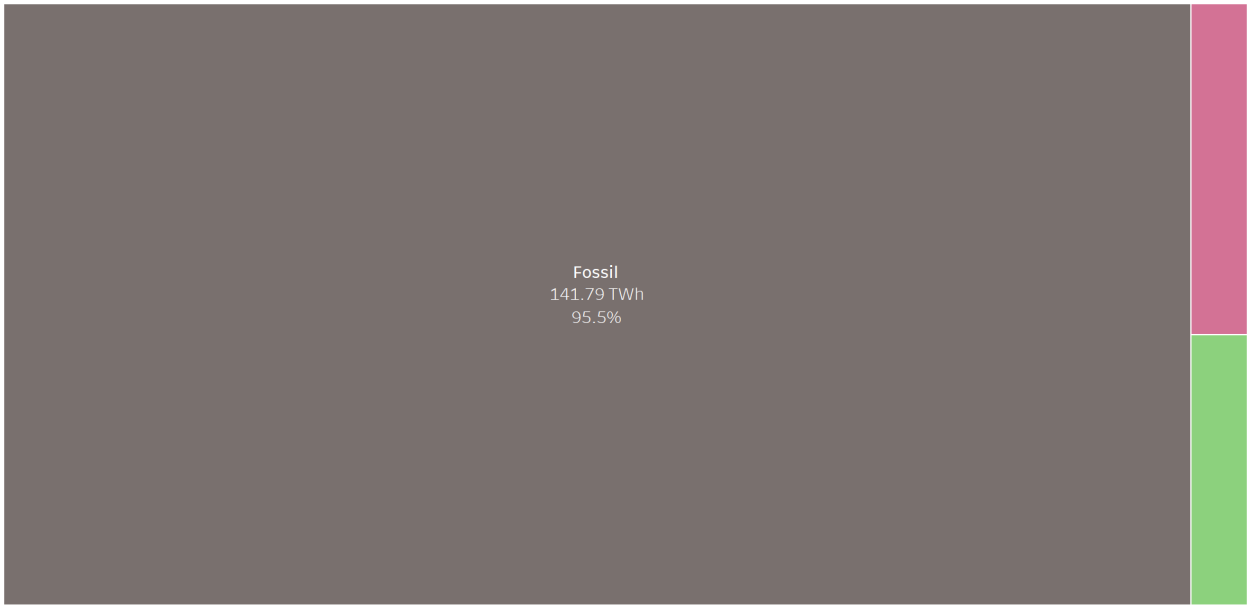
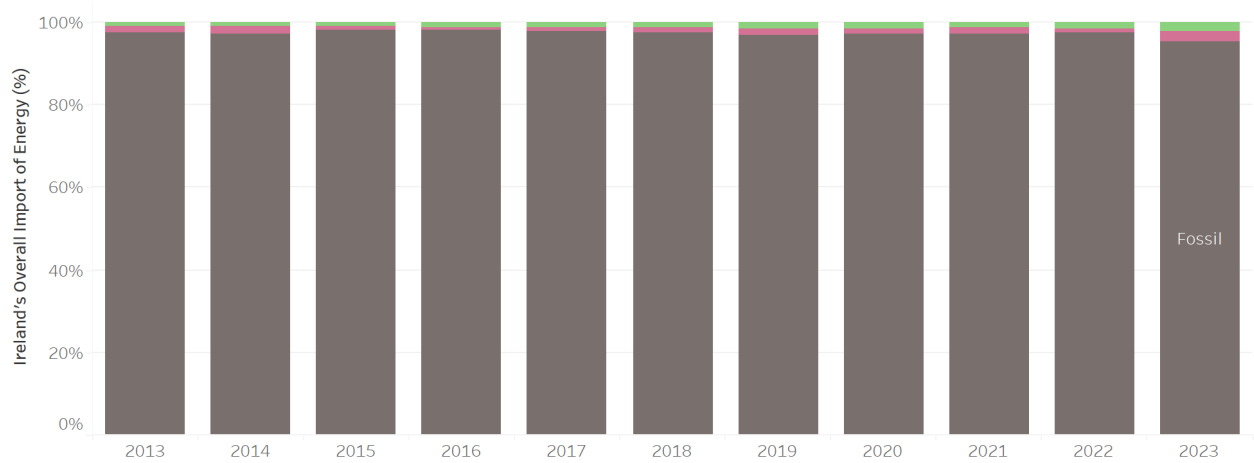
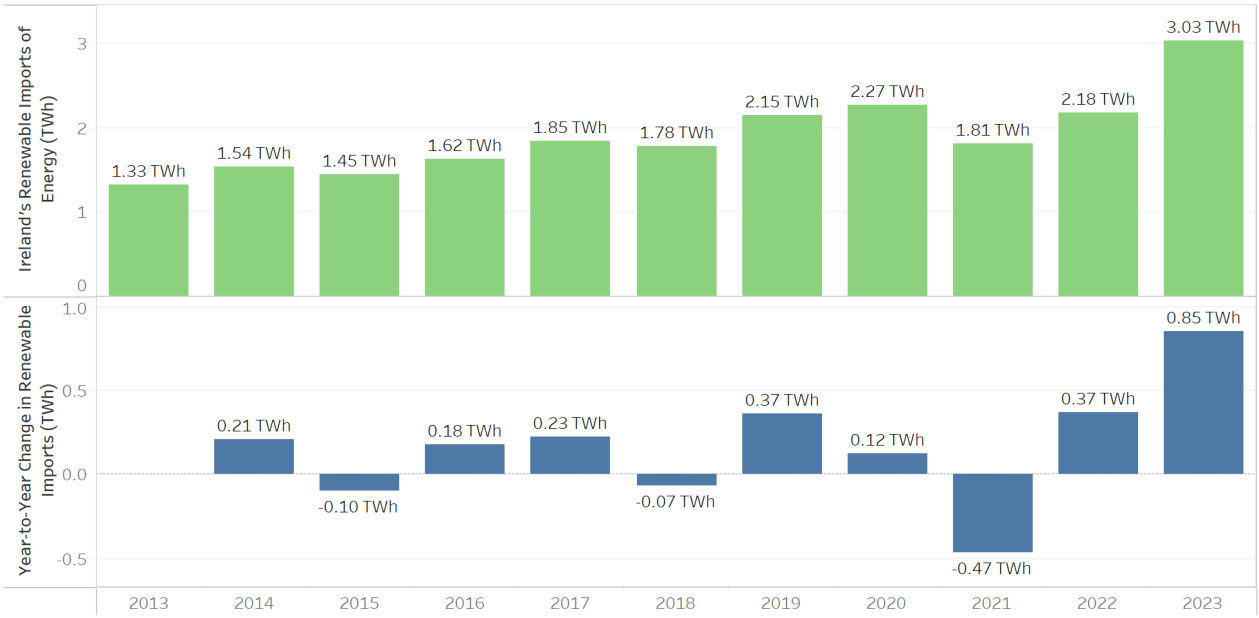


Figure 3.16 – The percentage-breakdown of energy imports over the last 10-years by the fossil, renewable, and 'other' energy groups.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Renew.	0.8%	1.0%	0.9%	1.1%	1.3%	1.3%	1.5%	1.6%	1.2%	1.4%	2.0%
Other	1.6%	1.9%	1.0%	0.6%	0.8%	1.2%	1.5%	1.3%	1.6%	1.0%	2.5%
Fossil	97.5%	97.1%	98.1%	98.2%	97.9%	97.6%	96.9%	97.1%	97.2%	97.6%	95.5%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Figure 3.17 – Imports of renewable energy over the last 10-years with year-to-year changes.

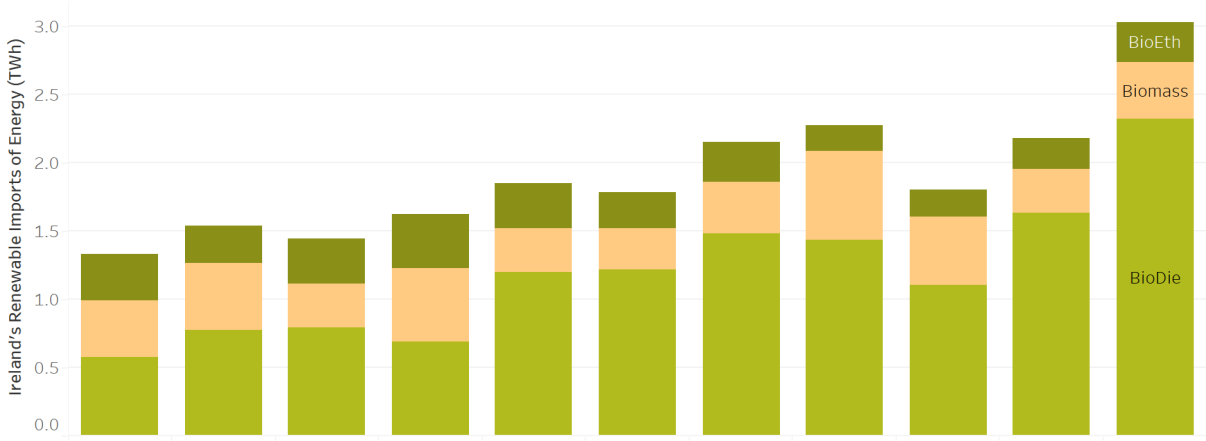


Over the last 10 years, the amount of renewable energy imported into Ireland has generally increased. In 2023, the import of renewable energy increased by 0.85 TWh on the previous year.

Figure 3.18 – Imports of renewable energy in 2023 broken-down by renewable sub-product.

Biodiesel accounted for 76.6% of renewable energy imported into Ireland in 2023. The next two largest sources of renewable energy imports are biomass (13.9%) and bioethanol (9.5%).

Figure 3.19 – Imports of renewable energy over the last 10-years broken-down by renewable sub-product.

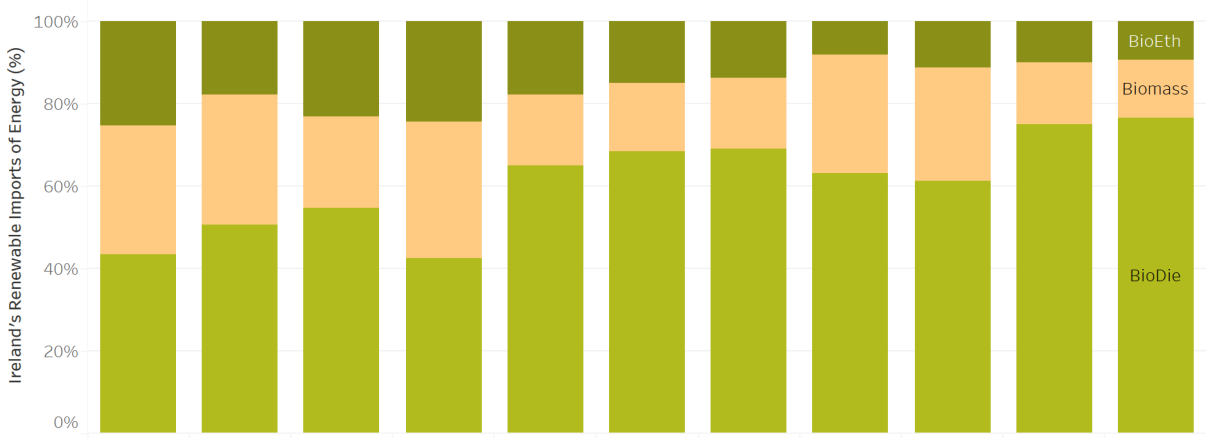


	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BioEth	0.34	0.28	0.34	0.39	0.33	0.27	0.29	0.18	0.20	0.22	0.29
Biomass	0.42	0.49	0.32	0.54	0.32	0.30	0.38	0.66	0.50	0.33	0.42
BioDie	0.58	0.78	0.79	0.69	1.20	1.22	1.48	1.43	1.11	1.63	2.32
Total	**1.33 TWh**	**1.54 TWh**	**1.45 TWh**	**1.62 TWh**	**1.85 TWh**	**1.78 TWh**	**2.15 TWh**	**2.27 TWh**	**1.81 TWh**	**2.18 TWh**	**3.03 TWh**

The quantity of imported renewable energy increased across all three sub-products in 2023:

- Biodiesel (+0.69 TWh)
- Biomass (+0.09 TWh)
- Bioethanol (+0.07 TWh)

Figure 3.20 – The percentage-breakdown of imported renewable energy over the last 10-years by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BioEth	25.3%	17.9%	23.2%	24.3%	17.8%	14.9%	13.6%	8.0%	11.2%	10.1%	9.5%
Biomass	31.2%	31.6%	22.0%	33.2%	17.4%	16.6%	17.5%	29.0%	27.6%	15.0%	13.9%
BioDie	43.5%	50.5%	54.8%	42.4%	64.9%	68.5%	68.9%	63.0%	61.3%	74.9%	76.6%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

4 Ireland's Renewable Energy Use

This section details how Ireland's renewable energy is used. Some types of renewable energy, like biodiesel and bioethanol, are consumed directly by an end-user. Some types of renewable energy, like wind or landfill gas, are first transformed or exchanged into electricity before reaching an end-user. And some types of renewable energy, like biomass, can be both directly and indirectly consumed by end-users:

- Direct consumption - wood logs and wood chips burned for space-heating in a home.
- Indirect consumption - biomass combusted in a public thermal power plant to generate electricity that powers a heat-pump that delivers space-heating in a home.

Figure 4.1 – Ireland's renewable-TPER in 2023 split by direct consumption by end-users and indirect consumption through electricity generation.

In 2023, about two-thirds (67.4%) of Ireland's renewable energy went to electricity generation, and one-third (32.6%) was directly consumed by end-users.

4.1 Renewable Energy for Electricity Generation

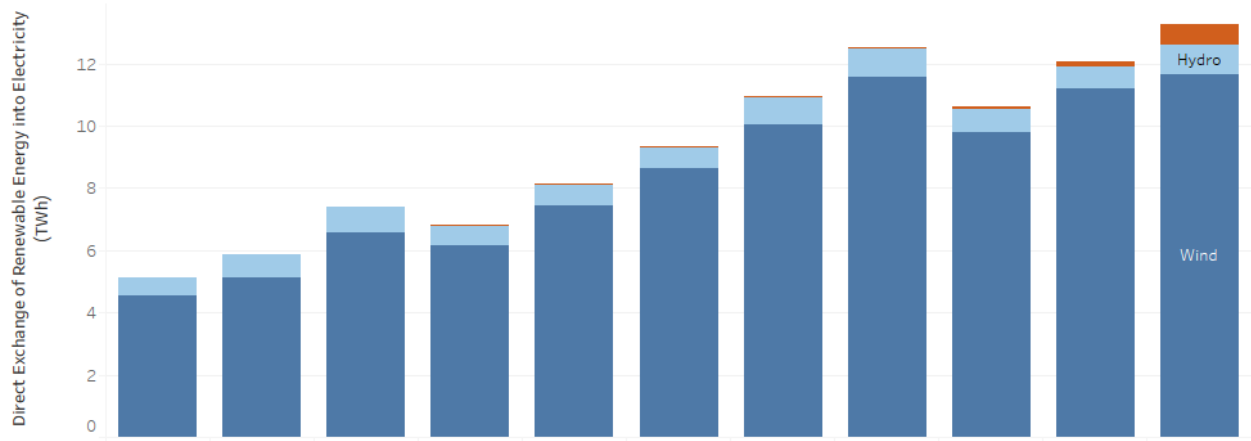
Renewable energy currently contributes to Ireland's electricity supply through three channels:

1. As a fuel input to Public Thermal Power Plants for transformation into electricity
2. As a fuel input to Combined Heat and Power (CHP) plant for transformation into electricity and useful heat
3. Through the direct one-to-one 'exchange' of wind energy, solar-PV energy, and hydro energy into electricity for the purpose of consistent national energy accounts across the EU member states.

Figure 4.2 – Renewable energy for electricity generation in 2023 broken-down by channel.

In 2023, 84.4% of the renewable energy used for the purpose of generating electricity was directly exchanged into electricity for the purpose of national energy accounts (*i.e.* wind energy, solar-PV energy, and hydro energy), 14.5% went to public thermal power plants, and 1.1% went to CHP plants.

Figure 4.3 – Direct exchange of renewable energy into electricity generation over the last 10-years broken-down by renewable sub-product.



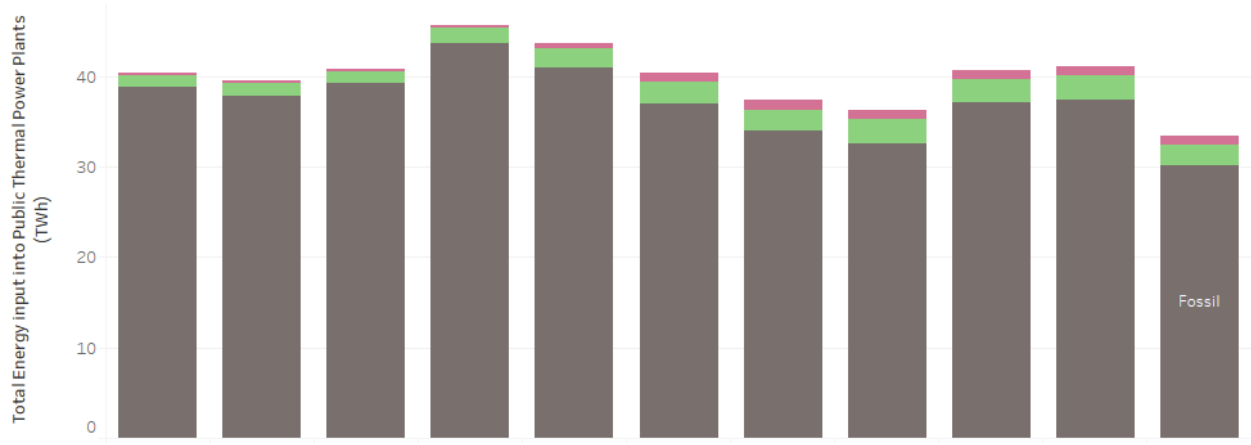
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Solar-PV				0.01	0.01	0.02	0.03	0.06	0.09	0.15	0.65
Hydro	0.60	0.71	0.81	0.68	0.69	0.69	0.89	0.93	0.75	0.70	0.94
Wind	4.54	5.14	6.57	6.15	7.45	8.64	10.02	11.55	9.78	11.21	11.67
Total	**5.14 TWh**	**5.85 TWh**	**7.38 TWh**	**6.83 TWh**	**8.15 TWh**	**9.35 TWh**	**10.94 TWh**	**12.54 TWh**	**10.61 TWh**	**12.06 TWh**	**13.26 TWh**

In 2023, 13.26 TWh of renewable energy was directly exchanged into electricity for the purpose of national energy accounts, with 11.67 TWh coming from wind, 0.94 TWh coming from hydro energy, and 0.65 TWh coming from solar-PV.

Figure 4.4 – Transformation input into public thermal power plants in 2023 broken-down by channel by the fossil, renewable, and 'other' energy groups (Note: the 'other' consists of non-renewable waste).

The energy input into Ireland's public thermal power plants is mainly fossil fuel. In 2023, 90.0% of input into public thermal power plants was fossil fuel, with 6.8% coming from renewable energy.

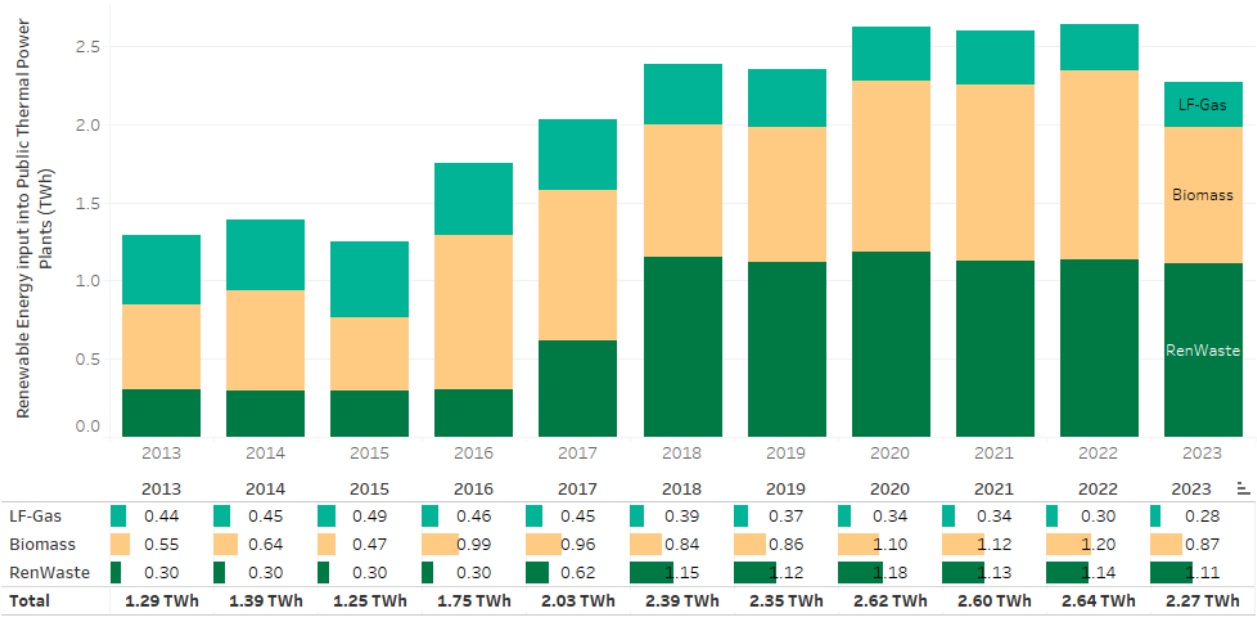
Figure 4.5 – Transformation input into public thermal power plants over the last 10-years broken-down by the fossil, renewable, and 'other' energy groups.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Other	0.27	0.29	0.29	0.29	0.66	1.06	1.03	1.08	1.04	1.05	1.09
Renew.	1.29	1.39	1.25	1.75	2.03	2.39	2.35	2.62	2.60	2.64	2.27
Fossil	38.79	37.82	39.19	43.58	40.98	36.96	33.93	32.57	37.06	37.45	30.07
Grand Total	**40.35 TWh**	**39.49 TWh**	**40.73 TWh**	**45.62 TWh**	**43.66 TWh**	**40.40 TWh**	**37.31 TWh**	**36.28 TWh**	**40.69 TWh**	**41.13 TWh**	**33.43 TWh**

The total energy input into Ireland's public thermal power plants was 33.43 TWh in 2023, down from 41.13 TWh in 2022. Renewable energy input into public thermal power plants was 2.27 TWh in 2023, down from 2.64 TWh in 2022.

Figure 4.6 – Transformation input of renewable energy into public thermal power plants over the last 10-years broken-down by renewable sub-product.



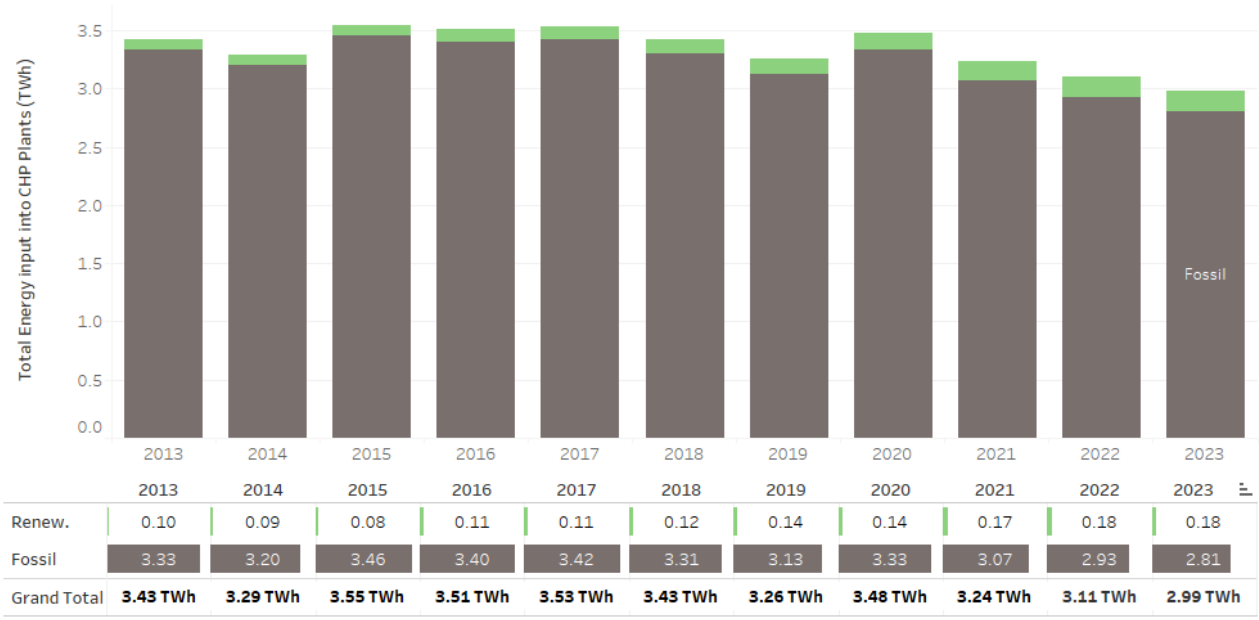
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
LF-Gas	0.44	0.45	0.49	0.46	0.45	0.39	0.37	0.34	0.34	0.30	0.28
Biomass	0.55	0.64	0.47	0.99	0.96	0.84	0.86	1.10	1.12	1.20	0.87
RenWaste	0.30	0.30	0.30	0.30	0.62	1.15	1.12	1.18	1.13	1.14	1.11
Total	**1.29 TWh**	**1.39 TWh**	**1.25 TWh**	**1.75 TWh**	**2.03 TWh**	**2.39 TWh**	**2.35 TWh**	**2.62 TWh**	**2.60 TWh**	**2.64 TWh**	**2.27 TWh**

Of the 2.27 TWh of renewable energy going to public thermal power plants in 2023, 1.11 TWh was renewable waste, 0.87 TWh was biomass, and 0.28 TWh was landfill gas.

Figure 4.7 – Transformation input into CHP plants in 2023 broken-down by channel by the fossil, and renewable energy groups.

The energy input into Ireland's CHP plants is mainly fossil fuel. In 2023, 94.1% of input into CHP plants was fossil fuel, with 5.9% coming from renewable energy.

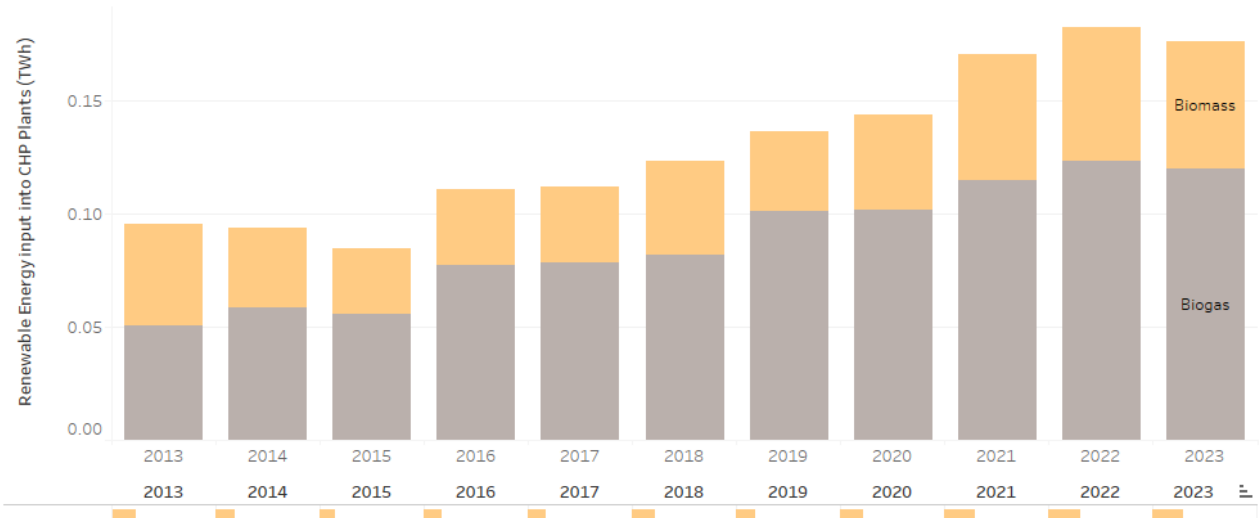
Figure 4.8 – Transformation input into CHP plants over the last 10-years broken-down by the fossil, and renewable energy groups.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Renew.	0.10	0.09	0.08	0.11	0.11	0.12	0.14	0.14	0.17	0.18	0.18
Fossil	3.33	3.20	3.46	3.40	3.42	3.31	3.13	3.33	3.07	2.93	2.81
Grand Total	**3.43 TWh**	**3.29 TWh**	**3.55 TWh**	**3.51 TWh**	**3.53 TWh**	**3.43 TWh**	**3.26 TWh**	**3.48 TWh**	**3.24 TWh**	**3.11 TWh**	**2.99 TWh**

The total energy input into Ireland's CHP plants was 2.99 TWh in 2023, down from 3.11 TWh in 2022. Renewable energy input into CHP plants was 0.18 TWh in 2023 and 2022.

Figure 4.9 – Transformation input of renewable energy into CHP plants over the last 10-years broken-down by renewable sub-product.



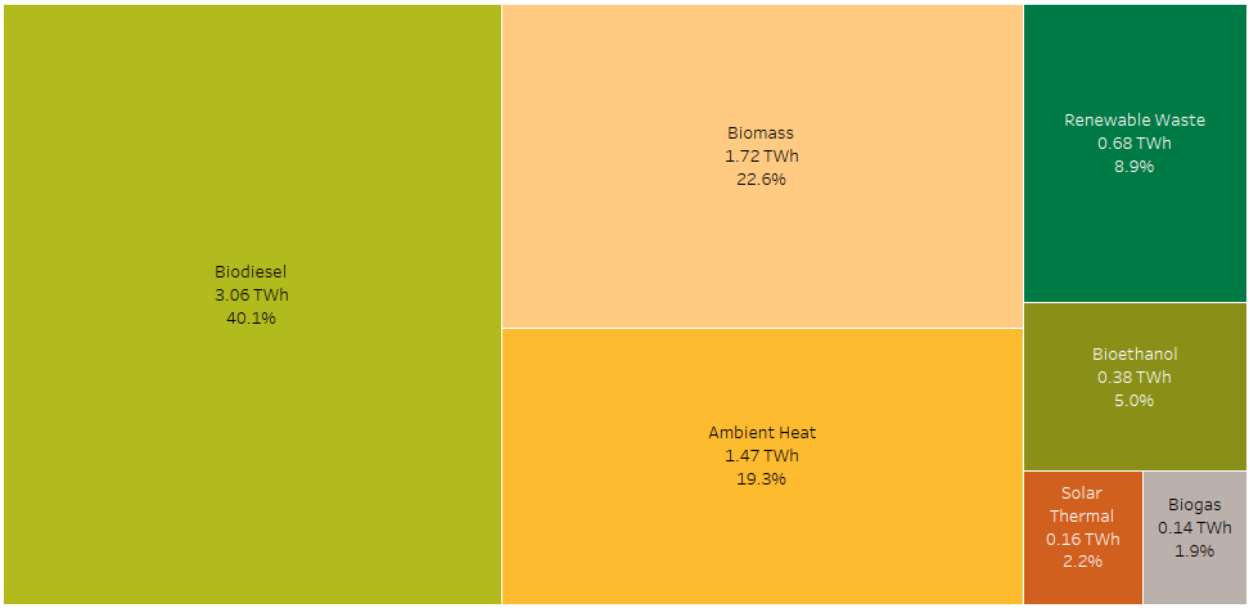
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Biomass	0.04	0.04	0.03	0.03	0.03	0.04	0.04	0.04	0.06	0.06	0.06
Biogas	0.05	0.06	0.06	0.08	0.08	0.08	0.10	0.10	0.11	0.12	0.12
Total	**0.10 TWh**	**0.09 TWh**	**0.08 TWh**	**0.11 TWh**	**0.11 TWh**	**0.12 TWh**	**0.14 TWh**	**0.14 TWh**	**0.17 TWh**	**0.18 TWh**	**0.18 TWh**

Of the 0.18 TWh of renewable energy going into CHP plants in 2023, 0.12 TWh was biogas, and 0.06 TWh was biomass.

4.2 4.2 Direct End-User Consumption of Renewable Energy

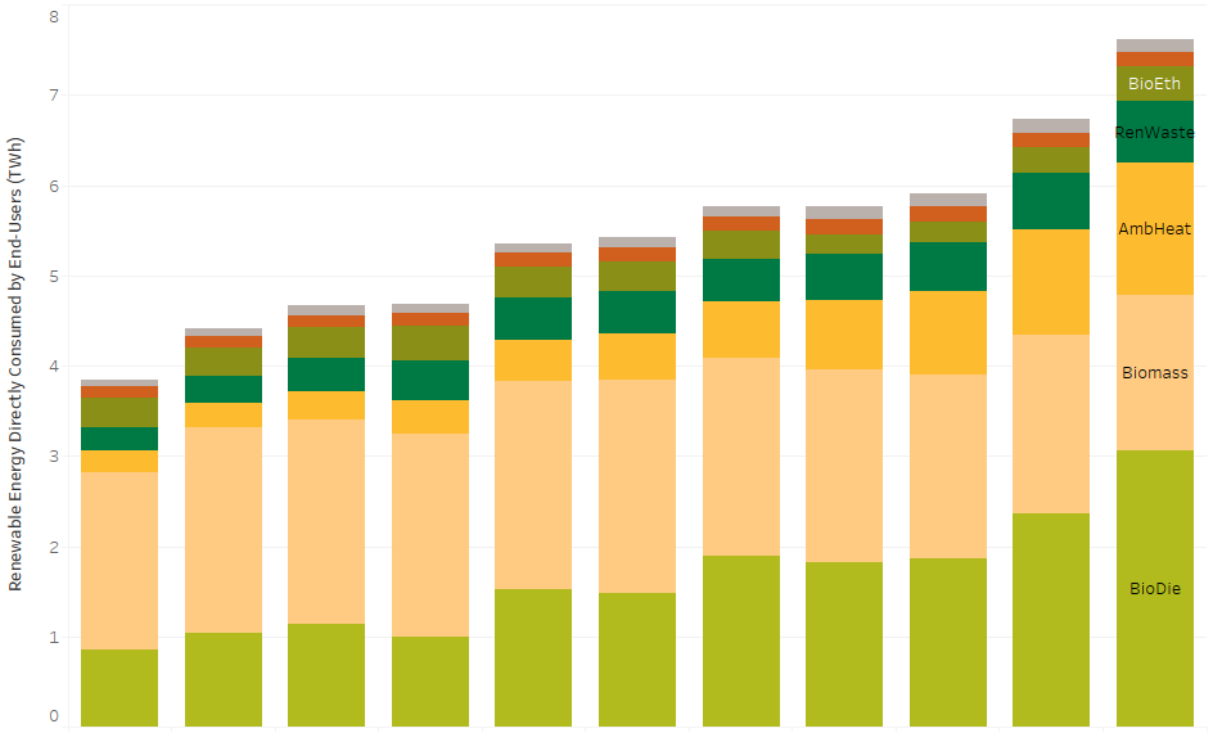
Renewable energy for direct end-user consumption includes the biofuels blended into the petrol and diesel available at Irish garage forecourts, the ambient heat brought into our homes by heat-pumps, the woody biomass we burn in our homes for heating, *etc.*

Figure 4.10 – Renewable energy directly consumed by an end-user in 2023 broken-down by renewable sub-product.



In 2023, biodiesel accounted for 40.1% of all renewable energy directly consumed by an end-user, followed by biomass (22.6%) and ambient heat (19.3%). Together, these three renewable sources account for 82.0% of all renewable energy directly consumed by an end-user.

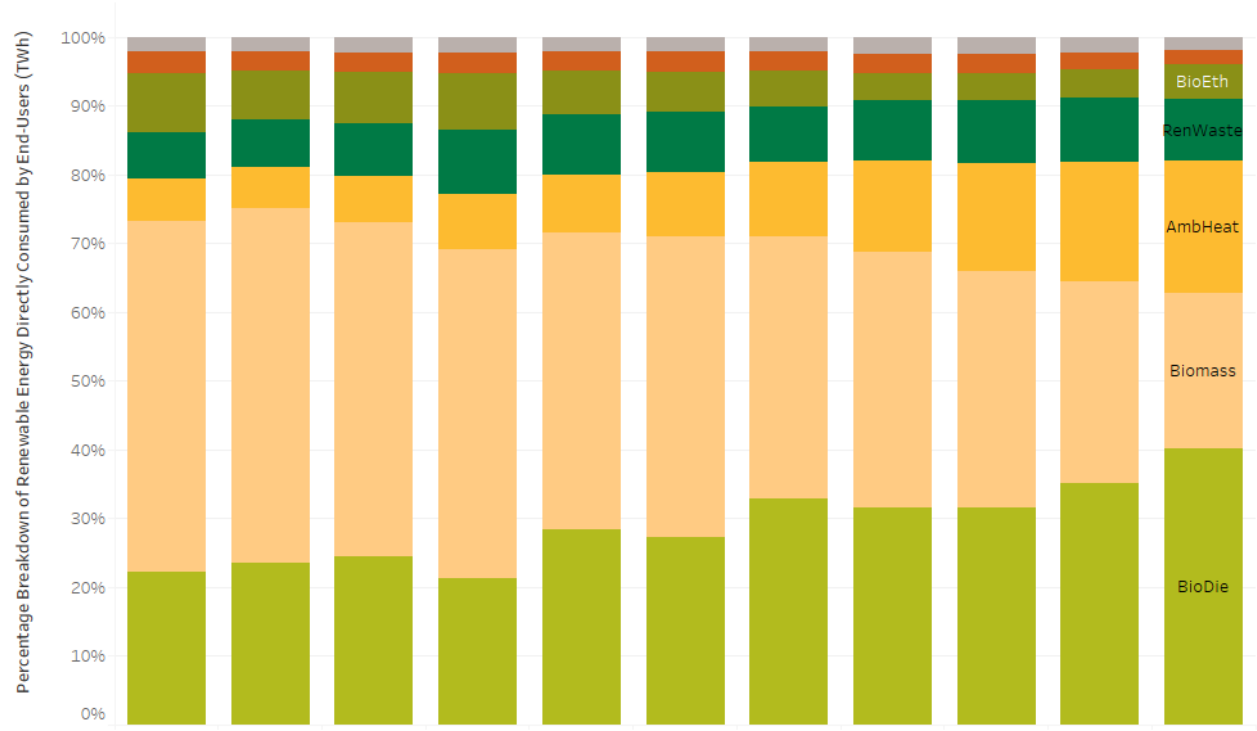
Figure 4.11 – Renewable energy directly consumed by an end-user over the last 10-years by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Biogas	0.08	0.09	0.10	0.11	0.11	0.11	0.12	0.14	0.14	0.16	0.14
Solar-Th	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.16	0.16	0.16	0.16
BioEth	0.33	0.31	0.35	0.38	0.34	0.32	0.30	0.23	0.24	0.27	0.38
RenWaste	0.26	0.30	0.36	0.44	0.47	0.47	0.47	0.50	0.54	0.63	0.68
AmbHeat	0.24	0.27	0.31	0.38	0.45	0.51	0.62	0.77	0.92	1.18	1.47
Biomass	1.96	2.28	2.26	2.24	2.31	2.37	2.20	2.14	2.03	1.98	1.72
BioDie	0.86	1.04	1.14	1.00	1.52	1.48	1.90	1.82	1.87	2.36	3.06
Total	**3.85 TWh**	**4.42 TWh**	**4.66 TWh**	**4.69 TWh**	**5.36 TWh**	**5.42 TWh**	**5.77 TWh**	**5.77 TWh**	**5.91 TWh**	**6.73 TWh**	**7.62 TWh**

The direct consumption of renewable energy by an end-user is increasing. In 2023 the direct end-user consumption of renewable energy was 7.62 TWh, up from 6.73 TWh in 2022. In 2023, the biggest changes in the direct consumption of renewable energy were a 30% increase in biodiesel and a 13% decrease in biomass.

Figure 4.12 - The percentage-breakdown of renewable energy directly consumed by an end-user over the last 10-years by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Biogas	2.1%	2.1%	2.2%	2.3%	2.1%	2.1%	2.1%	2.4%	2.4%	2.3%	1.9%
Solar-Th	3.0%	2.8%	2.8%	3.0%	2.7%	2.9%	2.8%	2.8%	2.8%	2.4%	2.2%
BioEth	8.6%	7.0%	7.4%	8.1%	6.4%	5.9%	5.3%	3.9%	4.0%	4.0%	5.0%
RenWaste	6.9%	6.9%	7.8%	9.4%	8.8%	8.7%	8.1%	8.7%	9.2%	9.3%	8.9%
AmbHeat	6.1%	6.0%	6.7%	8.0%	8.4%	9.4%	10.8%	13.3%	15.6%	17.5%	19.3%
Biomass	50.9%	51.6%	48.5%	47.9%	43.0%	43.7%	38.1%	37.1%	34.4%	29.3%	22.6%
BioDie	22.3%	23.6%	24.5%	21.3%	28.4%	27.3%	32.9%	31.6%	31.6%	35.1%	40.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

The portfolio of directly consumed renewable energy by an end-user is changing. Over the last 10-years, the proportional size of biomass directly consumed has fallen, while the share of biodiesel and ambient heat has increased.

Figure 4.12 – Directly consumed renewable energy in 2023 broken-down by sector and renewable sub-product.

A large fraction of renewable energy for direct end-user consumption goes to the transport sector. In 2023, 3.44 TWh of directly consumed renewable energy went to transport, of which 3.06 TWh was biodiesel and 0.38 TWh was bioethanol. In 2023, 1.99 TWh of directly consumed renewable energy went to industry, which used 1.25 TWh of biomass, 0.68 TWh of renewable waste, and 0.06 TWh of biogas. In the residential sector, the largest source of renewable energy for direct consumption was ambient heat (1.19 TWh), followed by biomass (0.26 TWh) and solar thermal energy (0.16 TWh). For the purposes of national energy accounts, the electricity generated by rooftop solar panels on houses is accounted towards the renewable electricity consumption/production of the house, rather than as direct consumption of solar-PV.

5 Provisional Renewable Energy Share Results

Ireland's renewable energy share, and that of all EU member states, is calculated and monitored by the European Commission in accordance with the Renewable Energy Directive (RED), which has been amended (or recast) multiple times since it was first passed in 2009. The renewable energy share of EU member states is monitored through four key metrics:

- RES-overall Overall renewable energy share
- RES-E Renewable energy share in electricity
- RES-T Renewable energy share in transport
- RES-H Renewable energy share in heating (and cooling)

The methodology for calculating the four RES results and setting their targets - which can include applying multipliers, limits, normalisations, and sustainability-checks on specific energy sub-products - is specified through the relevant iteration of the directive for a given year. To date, there have been three iterations of the renewable energy directive:

- RED-I 2010 to 2020
- RED-II 2021 to 2024
- RED-III 2025 to 2030

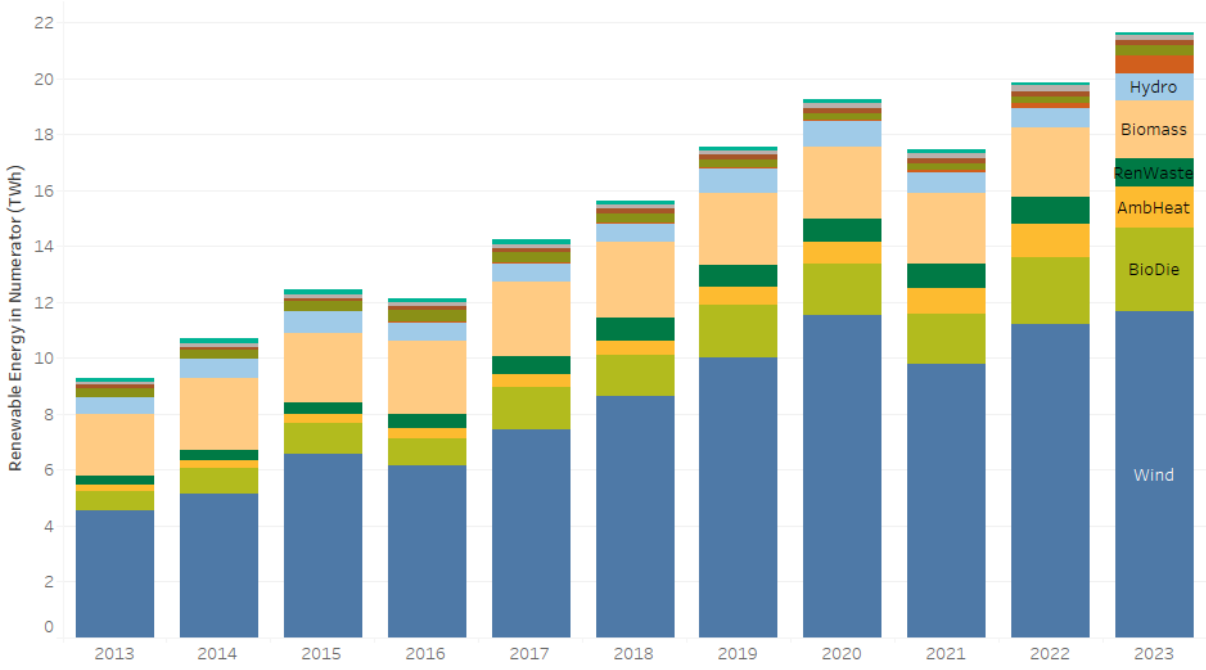
This section details the values that go into the numerator and denominator of the four RES results for Ireland, and how those values are impacted by the application of the multipliers, limits, normalisation, and sustainability criteria required by the RED-I / RED-II methodology.

While Ireland's official RES results are calculated and published by Eurostat (based on data submitted by SEAI on Ireland's behalf), provisional RES results for 2023 can already be calculated, based on the latest data currently available to SEAI from the national energy balance and other annual data.

5.1 Overall Renewable Energy Share (RES-Overall)

This section provides detailed illustrations of the renewable energy sub-products contributing to the numerator of Ireland's RES-Overall, the energy products contributing to the denominator of Ireland's RES-Overall, and how their values are impacted by the application of the limits, normalisation, and sustainability criteria required by the RED-II methodology.

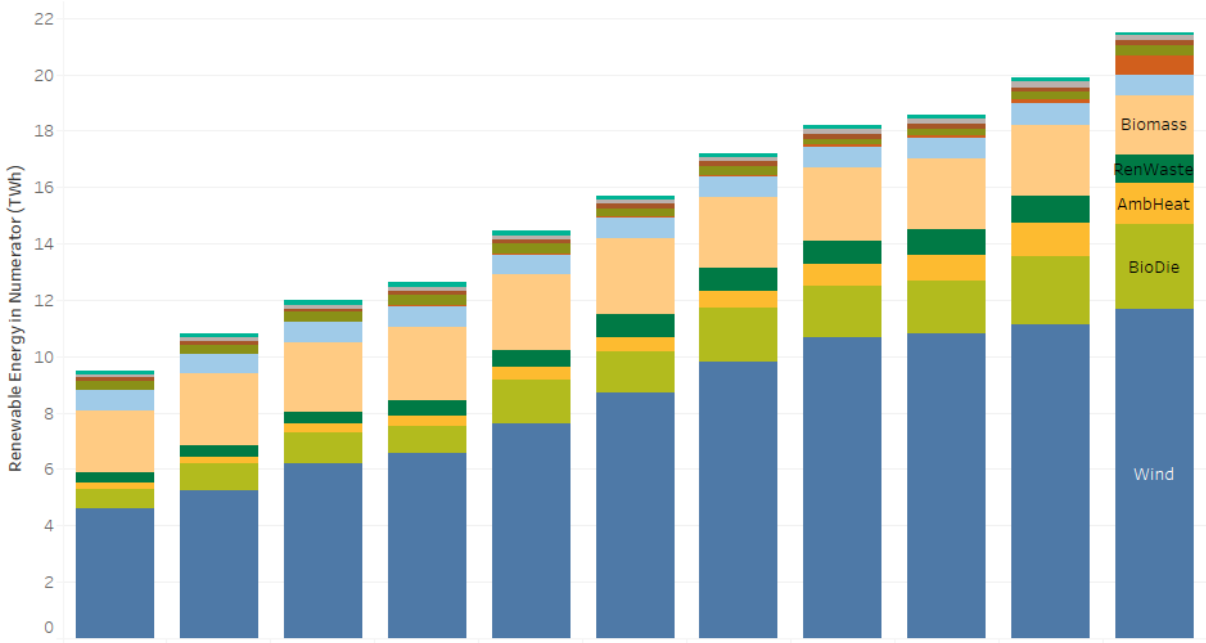
Figure 5.1 – Numerator of Ireland's RES-Overall result, without the application of the multipliers, limits, normalisation, and sustainability criteria required by RED-II, broken down by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
LF-Gas	0.16	0.17	0.18	0.16	0.16	0.14	0.13	0.12	0.12	0.10	0.10
Solar-Th	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.16	0.16	0.16	0.16
Biogas	0.11	0.13	0.13	0.15	0.16	0.16	0.17	0.19	0.20	0.23	0.22
BioEth	0.33	0.31	0.34	0.38	0.34	0.31	0.30	0.22	0.23	0.27	0.38
Solar-PV				0.01	0.01	0.02	0.03	0.06	0.09	0.15	0.65
Hydro	0.60	0.71	0.81	0.68	0.69	0.69	0.89	0.93	0.75	0.70	0.94
RenWaste	0.34	0.38	0.44	0.52	0.62	0.80	0.79	0.83	0.89	0.97	1.01
AmbHeat	0.24	0.27	0.31	0.38	0.45	0.51	0.62	0.77	0.92	1.18	1.47
Biomass	2.19	2.55	2.46	2.64	2.69	2.70	2.55	2.58	2.51	2.49	2.07
BioDie	0.69	0.94	1.09	0.96	1.53	1.49	1.91	1.83	1.80	2.40	2.99
Wind	4.54	5.14	6.57	6.15	7.44	8.64	10.02	11.55	9.78	11.21	11.67
Total	**9.31 TWh**	**10.71 TWh**	**12.47 TWh**	**12.16 TWh**	**14.25 TWh**	**15.63 TWh**	**17.58 TWh**	**19.24 TWh**	**17.46 TWh**	**19.86 TWh**	**21.67 TWh**

Before the limits, normalisation, and sustainability compliance required by the RED-II methodology are applied to the numerator of Ireland's RES-Overall result, there was a total of 21.67 TWh of renewable energy in gross final consumption in 2023.

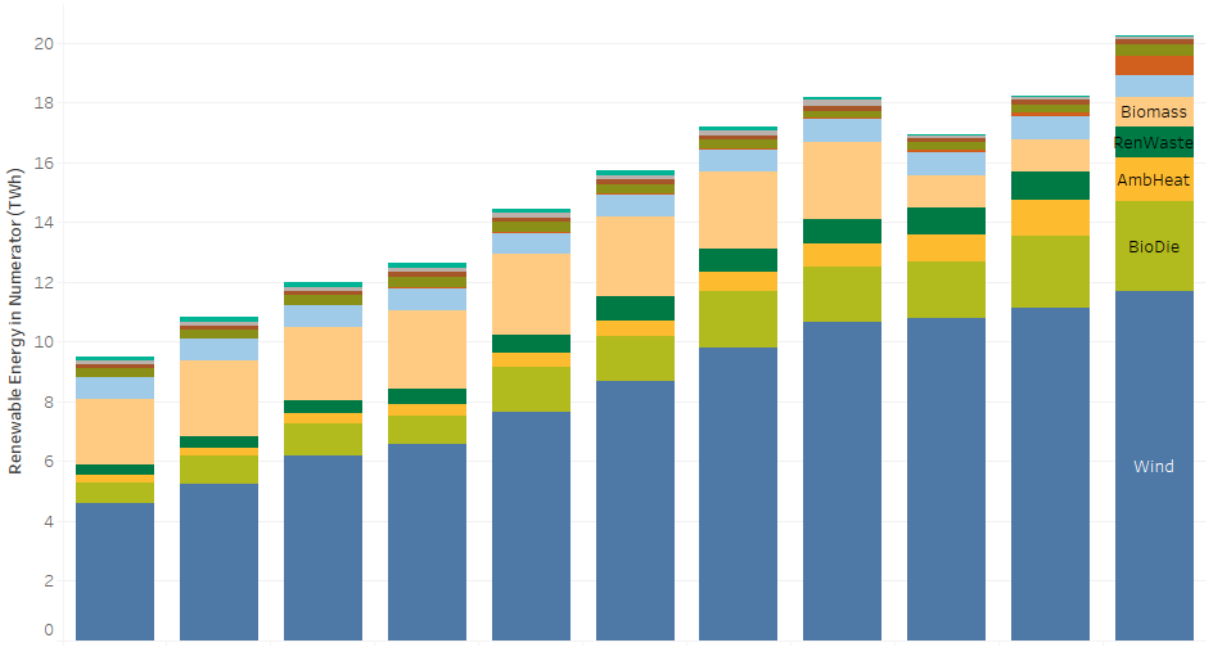
Figure 5.2 – Numerator of Ireland's RES-Overall result, with the application of the multipliers, limits, and normalisation, but without the sustainability criteria required by RED-II, broken down by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
LF-Gas	0.16	0.17	0.18	0.16	0.16	0.14	0.13	0.12	0.12	0.10	0.10
Solar-Th	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.16	0.16	0.16	0.16
Biogas	0.11	0.13	0.13	0.15	0.16	0.16	0.17	0.19	0.20	0.23	0.22
BioEth	0.33	0.31	0.34	0.38	0.34	0.31	0.30	0.22	0.23	0.27	0.38
Solar-PV				0.01	0.01	0.02	0.03	0.06	0.09	0.15	0.65
Hydro	0.74	0.73	0.72	0.73	0.72	0.72	0.74	0.76	0.76	0.76	0.76
RenWaste	0.34	0.38	0.44	0.52	0.62	0.80	0.79	0.83	0.89	0.97	1.01
AmbHeat	0.24	0.27	0.31	0.38	0.45	0.51	0.62	0.77	0.92	1.18	1.47
Biomass	2.19	2.55	2.46	2.64	2.69	2.70	2.55	2.58	2.51	2.49	2.07
BioDie	0.69	0.94	1.09	0.96	1.53	1.49	1.91	1.83	1.88	2.40	2.99
Wind	4.61	5.25	6.20	6.57	7.63	8.69	9.80	10.68	10.79	11.15	11.69
Total	**9.51 TWh**	**10.84 TWh**	**12.01 TWh**	**12.63 TWh**	**14.46 TWh**	**15.71 TWh**	**17.21 TWh**	**18.20 TWh**	**18.56 TWh**	**19.87 TWh**	**21.51 TWh**

After the limits and normalisation required by the RED-II methodology are applied to the numerator of Ireland's RES-Overall result, but before the sustainability criteria is applied, there was a total of countable 21.51 TWh of renewable energy in gross final consumption in 2023.

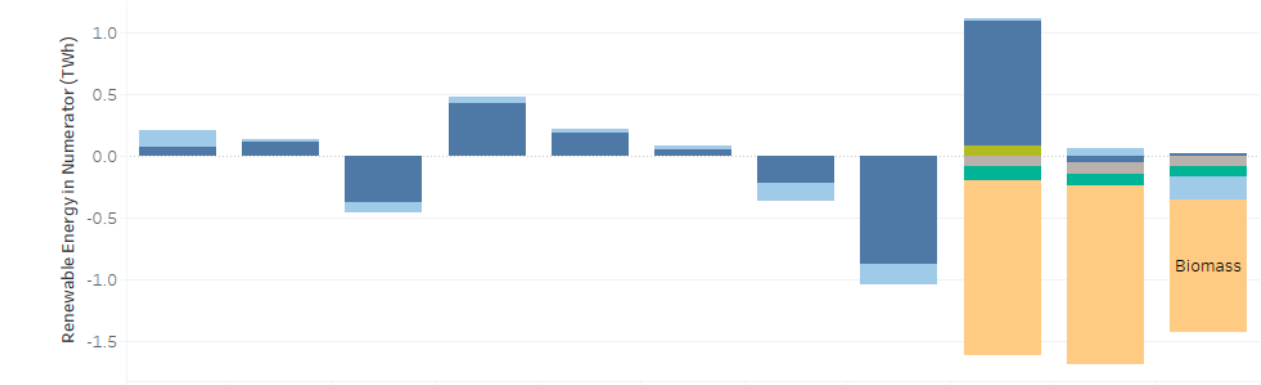
Figure 5.3 – Numerator of Ireland's RES-Overall result, with the application of the limits, normalisation, and sustainability criteria required by RED-II, broken down by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
LF-Gas	0.16	0.17	0.18	0.16	0.16	0.14	0.13	0.12	0.01	0.01	0.01
Biogas	0.11	0.13	0.13	0.15	0.16	0.16	0.17	0.19	0.11	0.14	0.14
Solar-Th	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.16	0.16	0.16	0.16
BioEth	0.33	0.31	0.34	0.38	0.34	0.31	0.30	0.22	0.23	0.27	0.38
Solar-PV				0.01	0.01	0.02	0.03	0.06	0.09	0.15	0.65
Hydro	0.74	0.73	0.72	0.73	0.72	0.72	0.74	0.76	0.76	0.76	0.76
Biomass	2.19	2.55	2.46	2.64	2.69	2.70	2.55	2.58	1.09	1.05	1.00
RenWaste	0.34	0.38	0.44	0.52	0.62	0.80	0.79	0.83	0.89	0.97	1.01
AmbHeat	0.24	0.27	0.31	0.38	0.45	0.51	0.62	0.77	0.92	1.18	1.47
BioDie	0.69	0.94	1.09	0.96	1.53	1.49	1.91	1.83	1.88	2.40	2.99
Wind	4.61	5.25	6.20	6.57	7.63	8.69	9.80	10.68	10.79	11.15	11.69
Total	**9.51 TWh**	**10.84 TWh**	**12.01 TWh**	**12.63 TWh**	**14.46 TWh**	**15.71 TWh**	**17.21 TWh**	**18.20 TWh**	**16.94 TWh**	**18.24 TWh**	**20.26 TWh**

After the limits, normalisation, and sustainability criteria required by RED-II are applied to the numerator of Ireland's RES-Overall result, there was a total of 20.26 TWh of renewable energy in gross final consumption in 2023. This is the value used in the calculation of the RES-Overall result in 2023.

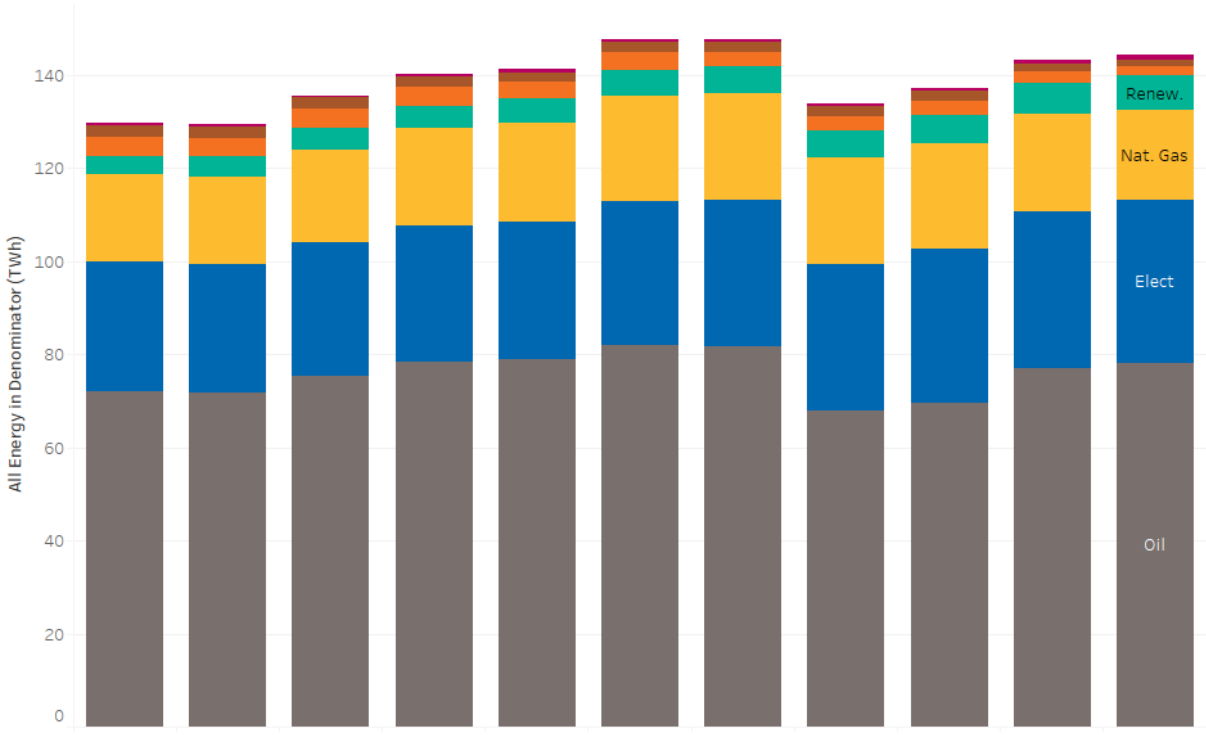
Figure 5.4 – Difference in the numerator of Ireland's RES-Overall result, with-and-without the application of the limits, normalisation, and sustainability criteria required by RED-II, broken down by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BioDie									0.08		
Biomass									-1.42	-1.45	-1.07
Hydro	0.14	0.02	-0.08	0.05	0.03	0.03	-0.15	-0.17	0.01	0.06	-0.18
LF-Gas									-0.11	-0.09	-0.09
Biogas									-0.09	-0.09	-0.08
Wind	0.07	0.11	-0.38	0.42	0.19	0.05	-0.22	-0.87	1.02	-0.06	0.02
Total	**0.20 TWh**	**0.13 TWh**	**-0.46 TWh**	**0.47 TWh**	**0.21 TWh**	**0.08 TWh**	**-0.36 TWh**	**-1.05 TWh**	**-0.51 TWh**	**-1.63 TWh**	**-1.41 TWh**

After the limits, normalisation, and sustainability criteria required by RED-II are applied to the numerator of Ireland's RES-Overall result, there was a total of 1.41 TWh less countable renewable energy in 2023, than before the application of the limits, normalisation, and sustainability criteria.

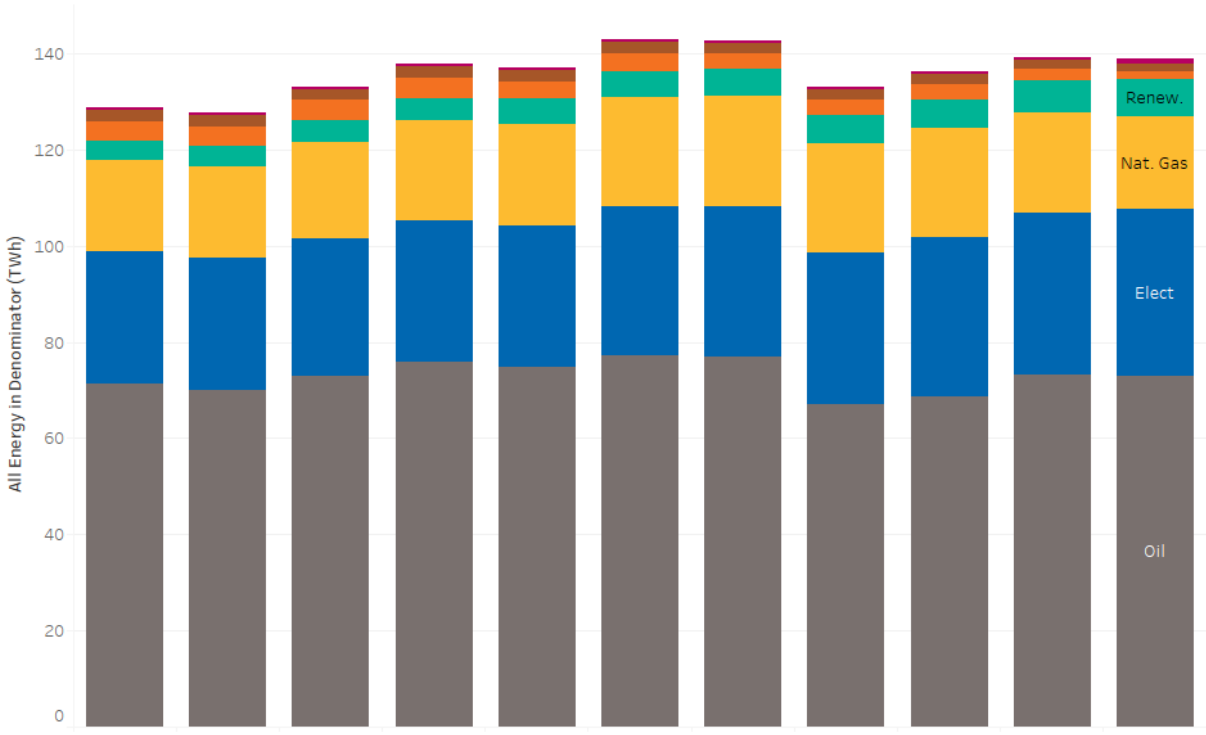
Figure 5.5 – Denominator of Ireland's RES-Overall result, without the application of the limits required by RED-II, broken down by energy product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
NRW	0.4	0.5	0.5	0.5	0.7	0.6	0.7	0.6	0.6	0.7	0.9
Peat	2.5	2.3	2.3	2.3	2.2	2.3	2.1	2.2	2.1	1.9	1.6
Coal	4.1	4.0	4.1	4.2	3.5	3.8	3.1	3.2	3.2	2.3	1.7
Renew.	3.9	4.4	4.7	4.7	5.4	5.4	5.8	5.8	5.9	6.7	7.6
Nat. Gas	18.9	18.8	19.9	20.8	21.1	22.8	22.9	22.7	22.6	21.0	19.3
Elect	27.7	27.6	28.6	29.3	29.6	30.9	31.4	31.7	33.2	33.6	34.8
Oil	72.1	71.6	75.4	78.3	78.8	81.9	81.7	67.7	69.5	77.0	78.2
Total	**129.68 TWh**	**129.28 TWh**	**135.59 TWh**	**140.19 TWh**	**141.23 TWh**	**147.68 TWh**	**147.58 TWh**	**133.93 TWh**	**137.17 TWh**	**143.18 TWh**	**144.18 TWh**

Before the limits required by the RED-II methodology are applied to the denominator of Ireland's RES-Overall result, there was a total of 144.18 TWh of countable energy in 2023.

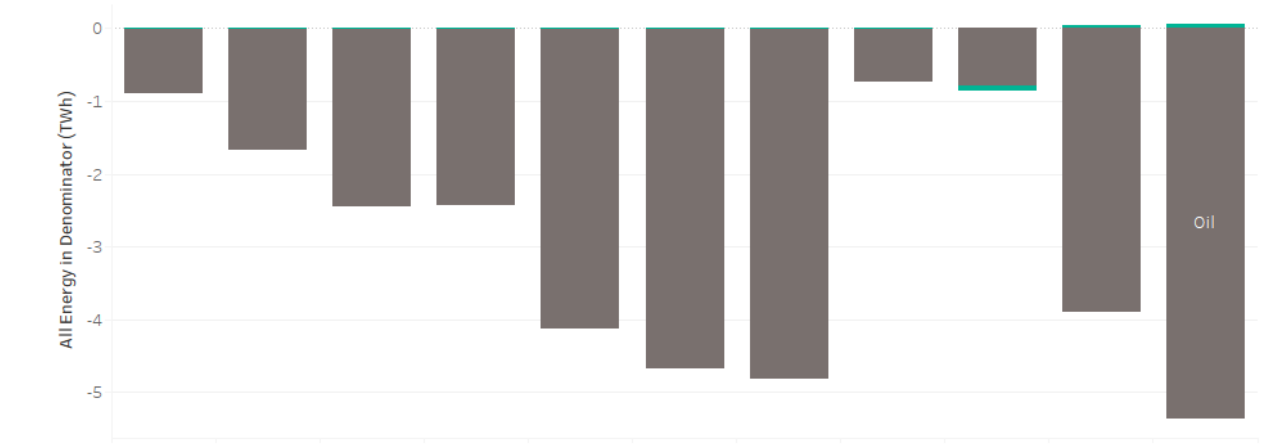
Figure 5.6 – Denominator of Ireland's RES-Overall result, with the application of the limits required by RED-II, broken down by energy product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
NRW	0.4	0.5	0.5	0.5	0.7	0.6	0.7	0.6	0.6	0.7	0.9
Peat	2.5	2.3	2.3	2.3	2.2	2.3	2.1	2.2	2.1	1.9	1.6
Coal	4.1	4.0	4.1	4.2	3.5	3.8	3.1	3.2	3.2	2.3	1.7
Renew.	3.9	4.4	4.7	4.7	5.4	5.4	5.8	5.8	5.8	6.8	7.7
Nat. Gas	18.9	18.8	19.9	20.8	21.1	22.8	22.9	22.7	22.6	21.0	19.3
Elect	27.7	27.6	28.6	29.3	29.6	30.9	31.4	31.7	33.2	33.6	34.8
Oil	71.2	70.0	72.9	75.9	74.7	77.3	76.9	67.0	68.7	73.1	72.9
Total	**128.79 TWh**	**127.61 TWh**	**133.14 TWh**	**137.75 TWh**	**137.12 TWh**	**143.02 TWh**	**142.78 TWh**	**133.20 TWh**	**136.32 TWh**	**139.32 TWh**	**138.87 TWh**

After the limits required by the RED-II methodology are applied to the denominator of Ireland's RES-Overall result, and Ireland's country-specific net calorific values for biofuels, gasoline, and diesel are replaced with the default values in the directive, there was a total of 138.87 TWh of countable energy in 2023. This is the value used in the calculation of the RES-Overall result in 2023.

Figure 5.7 – Difference in the denominator of Ireland's RES-Overall result, with-and-without the application of the limits required by RED-II, broken down by energy product.



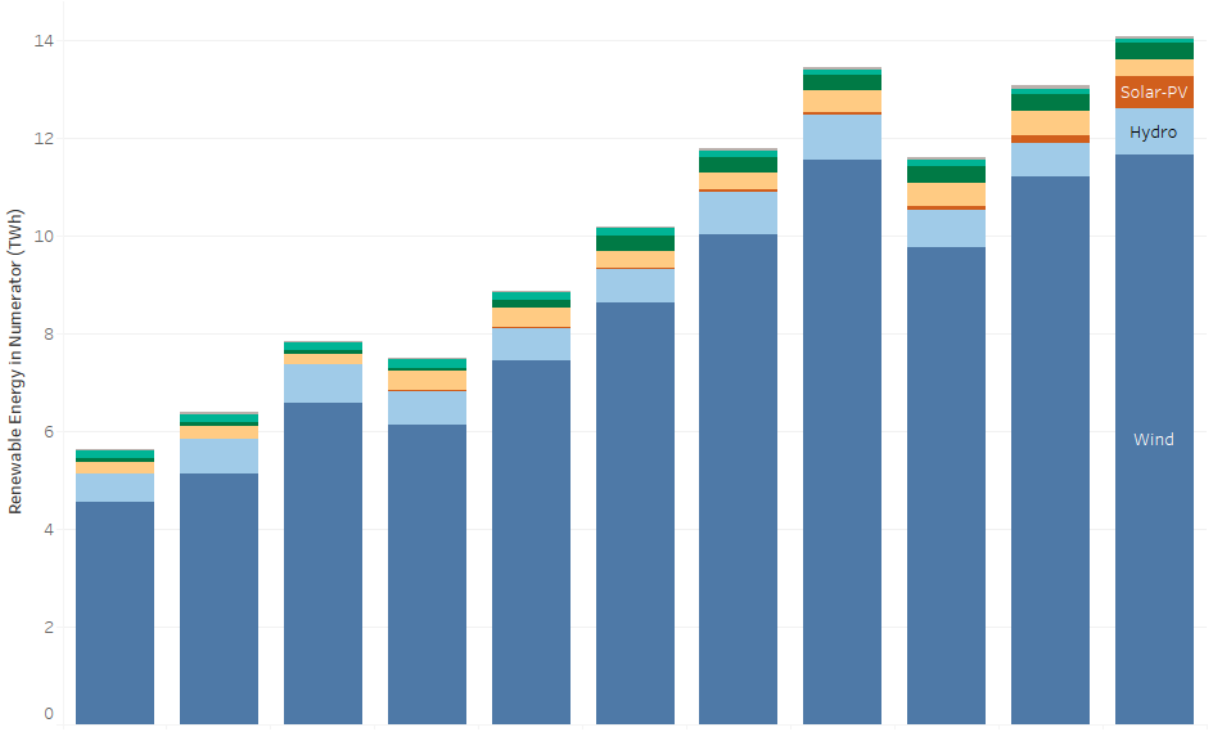
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Renew.	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-0.06	0.03	0.05
Oil	-0.89	-1.67	-2.45	-2.44	-4.12	-4.67	-4.81	-0.74	-0.79	-3.89	-5.36
Total	**-0.89 TWh**	**-1.67 TWh**	**-2.44 TWh**	**-2.43 TWh**	**-4.11 TWh**	**-4.66 TWh**	**-4.80 TWh**	**-0.73 TWh**	**-0.85 TWh**	**-3.86 TWh**	**-5.30 TWh**

After the limits and net calorific values required by the RED-II methodology are applied to the denominator of Ireland's RES-Overall result, there was a total of 5.30 TWh less countable energy in 2023, than before the application of the limits and net calorific values.

5.2 Renewable Energy Share in Electricity (RES-E)

This section provides detailed illustrations of the renewable energy sub-products contributing to the numerator of Ireland's RES-E, the energy products contributing to the denominator of Ireland's RES-E, and how their values are impacted by the application of the normalisation and sustainability criteria required by RED-II.

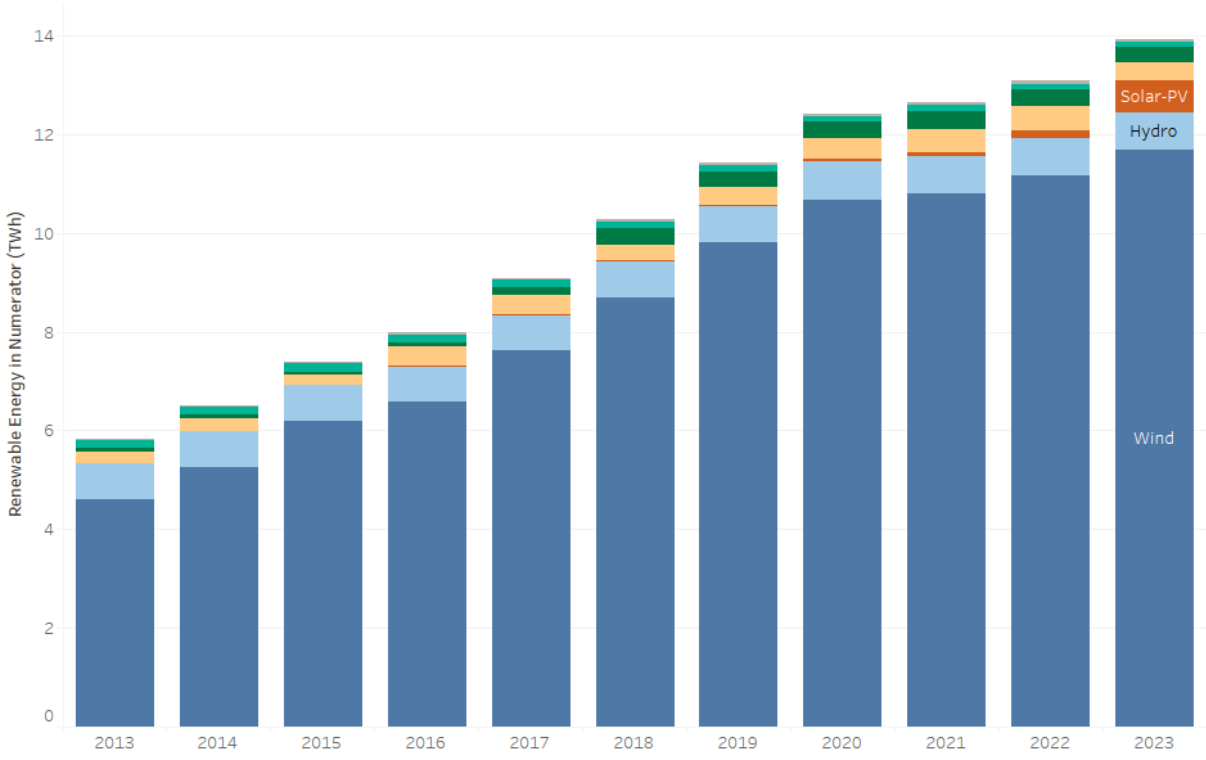
Figure 5.1 – Numerator of Ireland's RES-E result, without the application of the limits, normalisation, and sustainability criteria required by RED-II, broken down by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Biogas	0.03	0.04	0.03	0.04	0.04	0.04	0.06	0.05	0.05	0.06	0.05
LF-Gas	0.16	0.17	0.18	0.16	0.16	0.14	0.13	0.12	0.12	0.10	0.10
RenWaste	0.07	0.07	0.08	0.08	0.15	0.33	0.32	0.33	0.35	0.35	0.33
Biomass	0.23	0.26	0.20	0.40	0.38	0.33	0.35	0.43	0.47	0.51	0.35
Solar-PV				0.01	0.01	0.02	0.03	0.06	0.09	0.15	0.65
Hydro	0.60	0.71	0.81	0.68	0.69	0.69	0.89	0.93	0.75	0.70	0.94
Wind	4.54	5.14	6.57	6.15	7.44	8.64	10.02	11.55	9.78	11.21	11.67
Total	**5.63 TWh**	**6.39 TWh**	**7.86 TWh**	**7.51 TWh**	**8.88 TWh**	**10.20 TWh**	**11.80 TWh**	**13.46 TWh**	**11.61 TWh**	**13.07 TWh**	**14.09 TWh**

Before the multipliers, limits, normalisation, and sustainability criteria required by the RED-II methodology are applied to the numerator of Ireland's RES-E result, gross final consumption of electricity from renewable sources was 14.09 TWh in 2023.

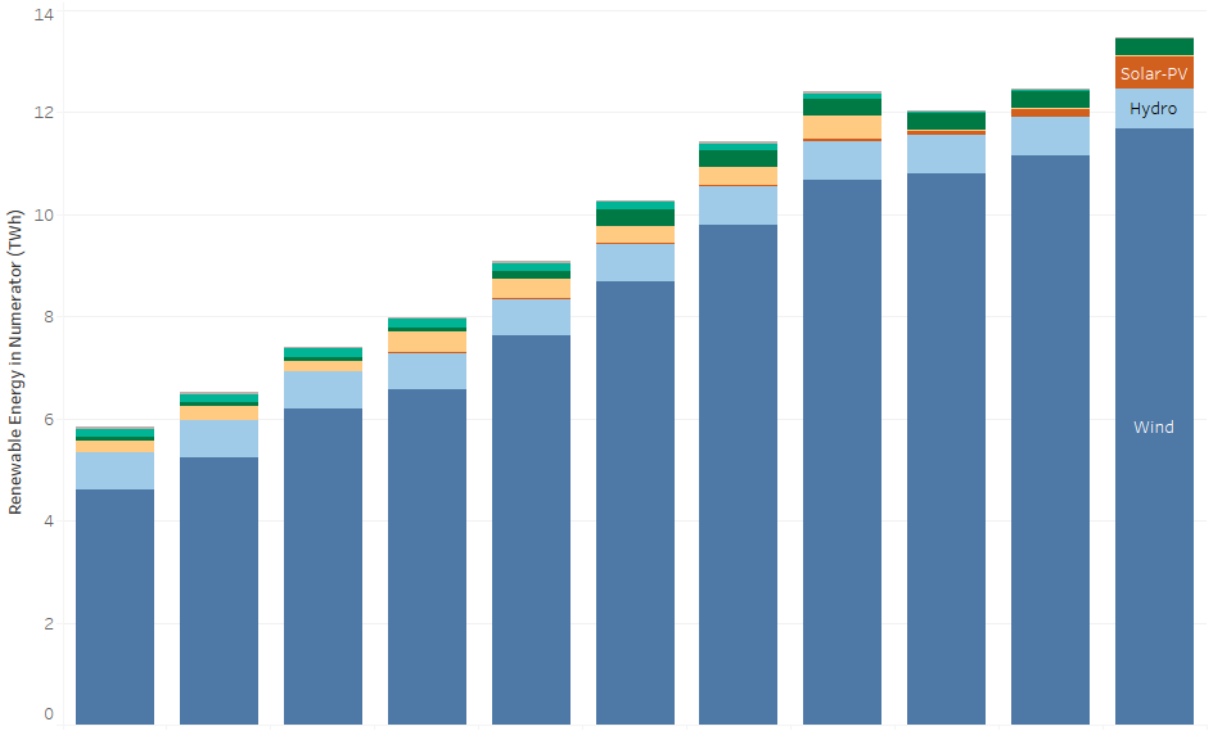
Figure 5.2 – Numerator of Ireland's RES-E result, with the application of the limits, and normalisation, but without the sustainability criteria required by RED-II, broken down by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Biogas	0.03	0.04	0.03	0.04	0.04	0.04	0.06	0.05	0.05	0.06	0.05
LF-Gas	0.16	0.17	0.18	0.16	0.16	0.14	0.13	0.12	0.12	0.10	0.10
RenWaste	0.07	0.07	0.08	0.08	0.15	0.33	0.32	0.33	0.35	0.35	0.33
Biomass	0.23	0.26	0.20	0.40	0.38	0.33	0.35	0.43	0.47	0.51	0.35
Solar-PV				0.01	0.01	0.02	0.03	0.06	0.09	0.15	0.65
Hydro	0.74	0.73	0.72	0.73	0.72	0.72	0.74	0.76	0.76	0.76	0.76
Wind	4.61	5.25	6.20	6.57	7.63	8.69	9.80	10.68	10.79	11.15	11.69
Total	**5.83 TWh**	**6.52 TWh**	**7.40 TWh**	**7.99 TWh**	**9.09 TWh**	**10.28 TWh**	**11.43 TWh**	**12.42 TWh**	**12.64 TWh**	**13.08 TWh**	**13.93 TWh**

After the multipliers, limits, and normalisation required by RED-II are applied to the numerator of Ireland's RES-E result, but before and sustainability criteria are applied, gross final consumption of electricity from renewable sources was 13.93 TWh in 2023.

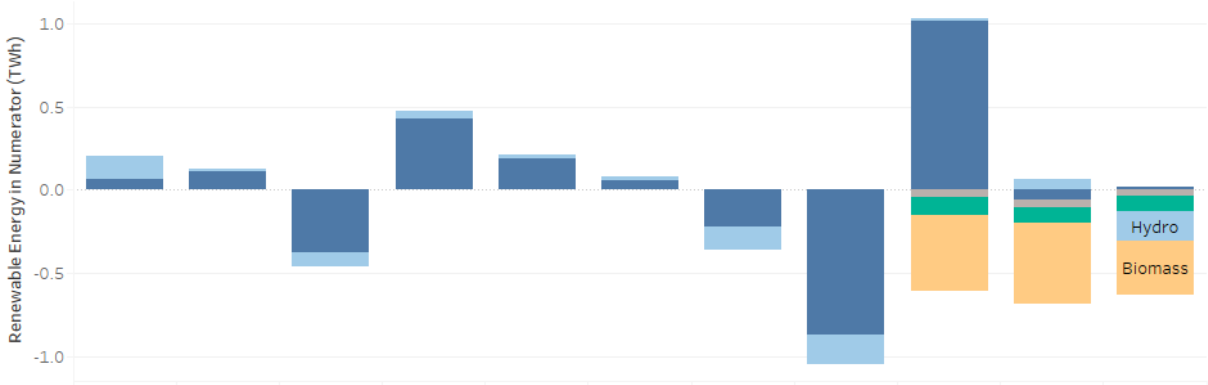
Figure 5.3 – Numerator of Ireland's RES-E result, with the application of the limits, normalisation, and sustainability criteria required by RED-II, broken down by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
LF-Gas	0.16	0.17	0.18	0.16	0.16	0.14	0.13	0.12	0.01	0.01	0.01
Biogas	0.03	0.04	0.03	0.04	0.04	0.04	0.06	0.05	0.01	0.01	0.02
Biomass	0.23	0.26	0.20	0.40	0.38	0.33	0.35	0.43	0.02	0.02	0.02
RenWaste	0.07	0.07	0.08	0.08	0.15	0.33	0.32	0.33	0.35	0.35	0.33
Solar-PV				0.01	0.01	0.02	0.03	0.06	0.09	0.15	0.65
Hydro	0.74	0.73	0.72	0.73	0.72	0.72	0.74	0.76	0.76	0.76	0.76
Wind	4.61	5.25	6.20	6.57	7.63	8.69	9.80	10.68	10.79	11.15	11.69
Total	**5.83 TWh**	**6.52 TWh**	**7.40 TWh**	**7.99 TWh**	**9.09 TWh**	**10.28 TWh**	**11.43 TWh**	**12.42 TWh**	**12.03 TWh**	**12.45 TWh**	**13.47 TWh**

After the multipliers, limits, normalisation, and sustainability criteria required by RED-II are applied to the numerator of Ireland's RES-E result, gross final consumption of electricity from renewable sources was 13.47 TWh in 2023. This is the value used in the calculation of the RES-E result in 2023.

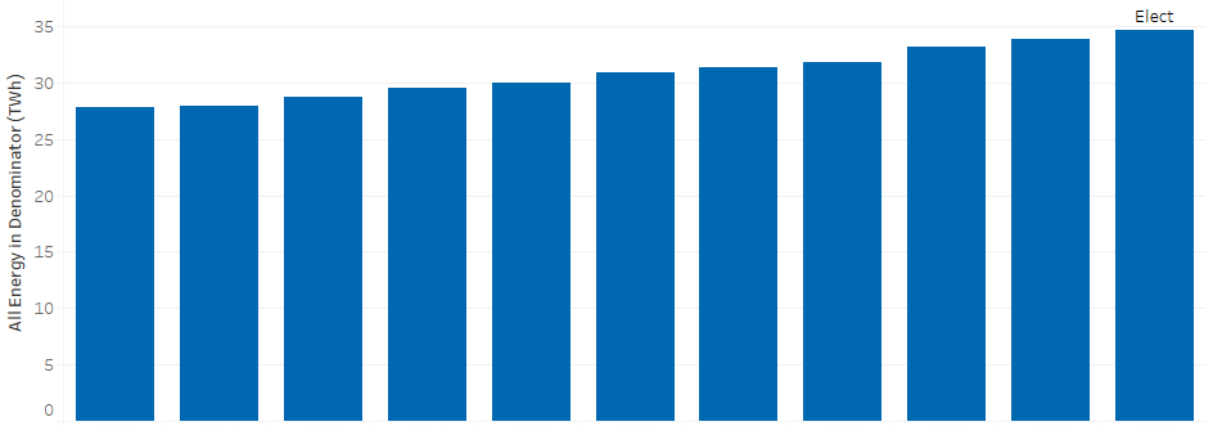
Figure 5.4 – Difference in the numerator of Ireland's RES-E result, with-and-without the application of the multipliers, limits, normalisation, and sustainability criteria required RED-II methodology, broken down by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Wind	0.07	0.11	-0.38	0.42	0.19	0.05	-0.22	-0.87	1.02	-0.06	0.02
Biogas									-0.04	-0.05	-0.04
LF-Gas									-0.11	-0.09	-0.09
Hydro	0.14	0.02	-0.08	0.05	0.03	0.03	-0.15	-0.17	0.01	0.06	-0.18
Biomass									-0.45	-0.49	-0.33
Total	**0.20 TWh**	**0.13 TWh**	**-0.46 TWh**	**0.47 TWh**	**0.21 TWh**	**0.08 TWh**	**-0.36 TWh**	**-1.05 TWh**	**0.42 TWh**	**-0.62 TWh**	**-0.62 TWh**

After the multipliers, limits, normalisation, and sustainability criteria required by RED-II are applied to the numerator of Ireland's RES-E result, there was a total of 0.62 TWh less electricity from renewable sources countable in the numerator of the RES-E in 2023, than before the application of the multipliers, limits, normalisation, and sustainability compliance.

Figure 5.5 – Denominator of Ireland's RES-Overall result, which is simply the gross final consumption of electricity in each year, and independent of multipliers, limits, normalisation, or sustainability compliance checks.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Elect	27.82	27.96	28.78	29.51	29.99	30.87	31.36	31.83	33.17	33.86	34.63
Total	**27.82 TWh**	**27.96 TWh**	**28.78 TWh**	**29.51 TWh**	**29.99 TWh**	**30.87 TWh**	**31.36 TWh**	**31.83 TWh**	**33.17 TWh**	**33.86 TWh**	**34.63 TWh**

Under the RED-II methodology for the denominator of Ireland's RES-E result, the gross final consumption of electricity was 34.63 TWh in 2023. This is the value used in the calculation of the RES-E result in 2023.

5.3 Renewable Energy Share in Transport (RES-T)

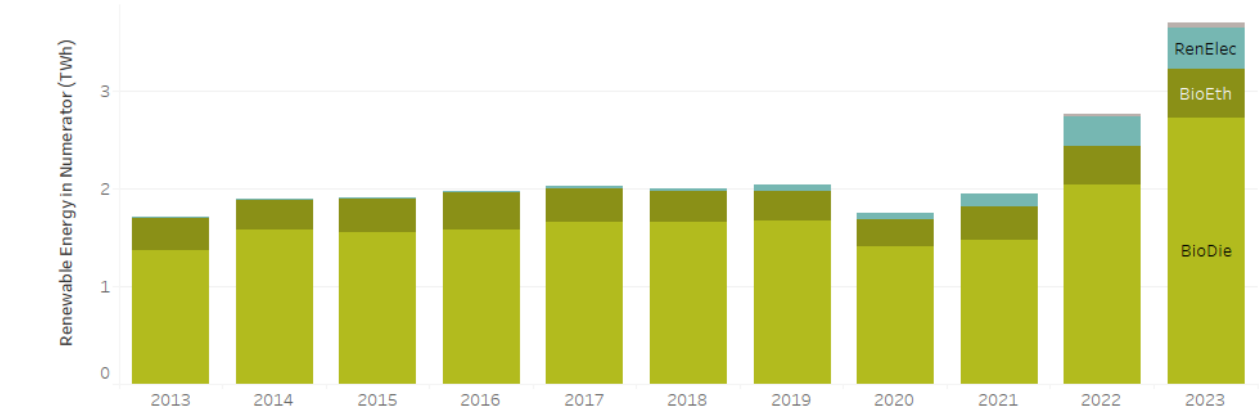
This section provides detailed illustrations of the renewable energy sub-products contributing to the numerator of Ireland's RES-T, the energy products contributing to the denominator of Ireland's RES-T, and how their values are impacted by the application of the multipliers, limits, and sustainability criteria required by RED-II.

Figure 5.1 – Numerator of Ireland's RES-T result, without the application of the multipliers and limits required by RED-II, broken down by renewable sub-product.

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Biogas										0.01	0.02
RenElec	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.03	0.04	0.09	0.12
BioEth	0.33	0.31	0.34	0.38	0.34	0.31	0.30	0.22	0.23	0.27	0.38
BioDie	0.69	0.94	1.09	0.96	1.53	1.49	1.91	1.83	1.80	2.40	2.90
Total	**1.03 TWh**	**1.26 TWh**	**1.44 TWh**	**1.35 TWh**	**1.89 TWh**	**1.82 TWh**	**2.24 TWh**	**2.08 TWh**	**2.07 TWh**	**2.77 TWh**	**3.42 TWh**

Before the multipliers and limits required by RED-II are applied to the numerator of Ireland's RES-T result, there was a total of 3.42 TWh of countable renewable energy in transport in 2023.

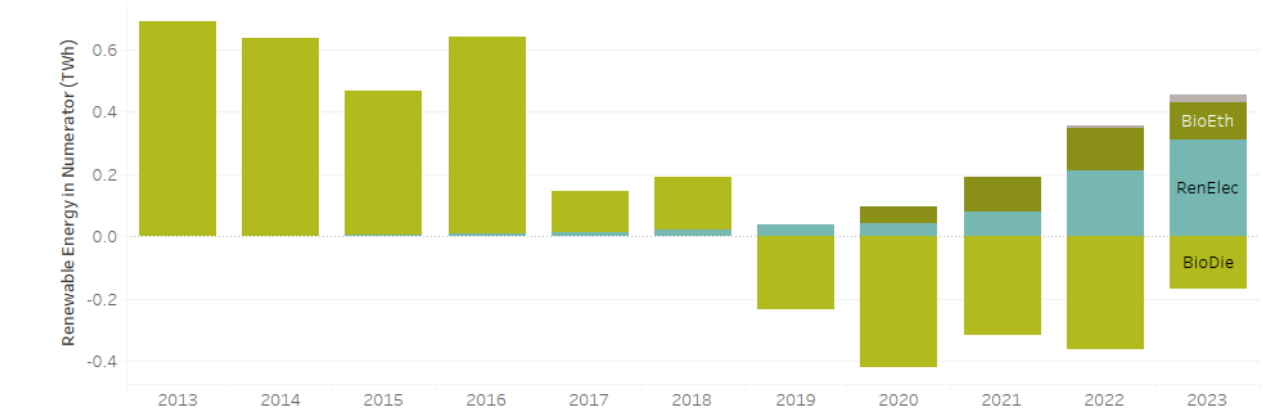
Figure 5.3 – Numerator of Ireland's RES-T result, with the application of the multipliers, limits, and sustainability criteria required by RED-II, broken down by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Biogas										0.02	0.05
RenElec	0.01	0.01	0.02	0.02	0.03	0.04	0.07	0.07	0.12	0.30	0.43
BioEth	0.33	0.31	0.34	0.38	0.34	0.31	0.30	0.28	0.34	0.40	0.50
BioDie	1.38	1.58	1.55	1.59	1.67	1.66	1.67	1.41	1.48	2.04	2.73
Total	**1.72 TWh**	**1.90 TWh**	**1.91 TWh**	**1.98 TWh**	**2.03 TWh**	**2.01 TWh**	**2.04 TWh**	**1.76 TWh**	**1.95 TWh**	**2.76 TWh**	**3.70 TWh**

After the multipliers, limits and sustainability compliance required by RED-II are applied to the numerator of Ireland's RES-T result, there was a total of 3.70 TWh of countable renewable energy in 2023. This is the value used in the calculation of the RES-T result in 2023.

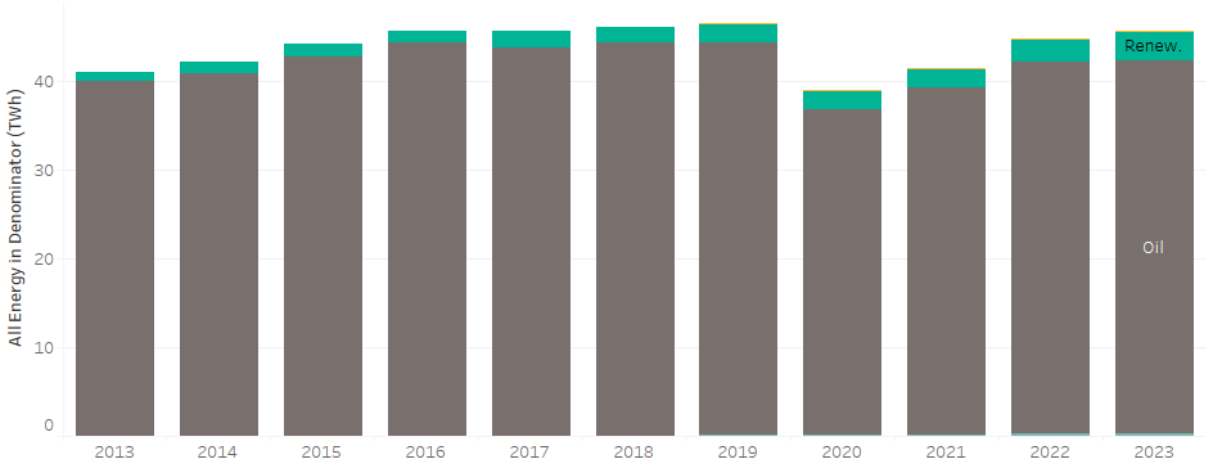
Figure 5.4 – Difference in the numerator of Ireland's RES-T result, with-and-without the application of the multipliers and limits required by RED-II, broken down by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BioDie	0.69	0.64	0.46	0.63	0.13	0.17	-0.24	-0.42	-0.32	-0.36	-0.17
Biogas										0.01	0.02
BioEth								0.05	0.11	0.13	0.12
RenElec			0.01	0.01	0.01	0.02	0.04	0.04	0.08	0.21	0.31
Total	**0.69 TWh**	**0.64 TWh**	**0.47 TWh**	**0.64 TWh**	**0.15 TWh**	**0.19 TWh**	**-0.20 TWh**	**-0.32 TWh**	**-0.13 TWh**	**-0.01 TWh**	**0.28 TWh**

After the multipliers, limits, normalisation, and sustainability compliance required by RED-II are applied to the numerator of Ireland's RES-T result, there was a total of 0.28 TWh more countable renewable energy in 2023, than before the application of the multipliers, limits, and sustainability criteria.

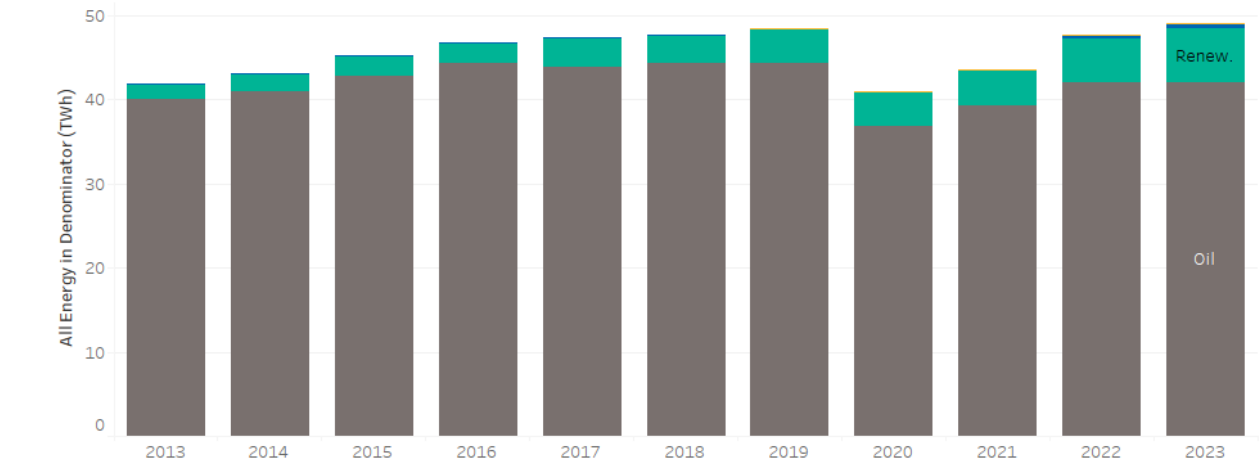
Figure 5.5 – Denominator of Ireland's RES-T result, without the application of the limits and multipliers required by RED-II, broken down by energy product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Nat. Gas							0.01	0.01	0.02	0.01	0.01
RenElec	0.04	0.04	0.04	0.05	0.05	0.07	0.09	0.08	0.11	0.22	0.33
Renew.	1.02	1.25	1.43	1.33	1.87	1.80	2.21	2.06	2.03	2.68	3.30
Oil	40.07	40.92	42.72	44.34	43.82	44.32	44.26	36.83	39.26	41.94	42.04
Total	**41.13 TWh**	**42.20 TWh**	**44.19 TWh**	**45.72 TWh**	**45.75 TWh**	**46.19 TWh**	**46.56 TWh**	**38.98 TWh**	**41.42 TWh**	**44.85 TWh**	**45.67 TWh**

Before the limits required by RED-II are applied to the denominator of Ireland's RES-T result, there was a total of 45.35 TWh of countable energy in 2023.

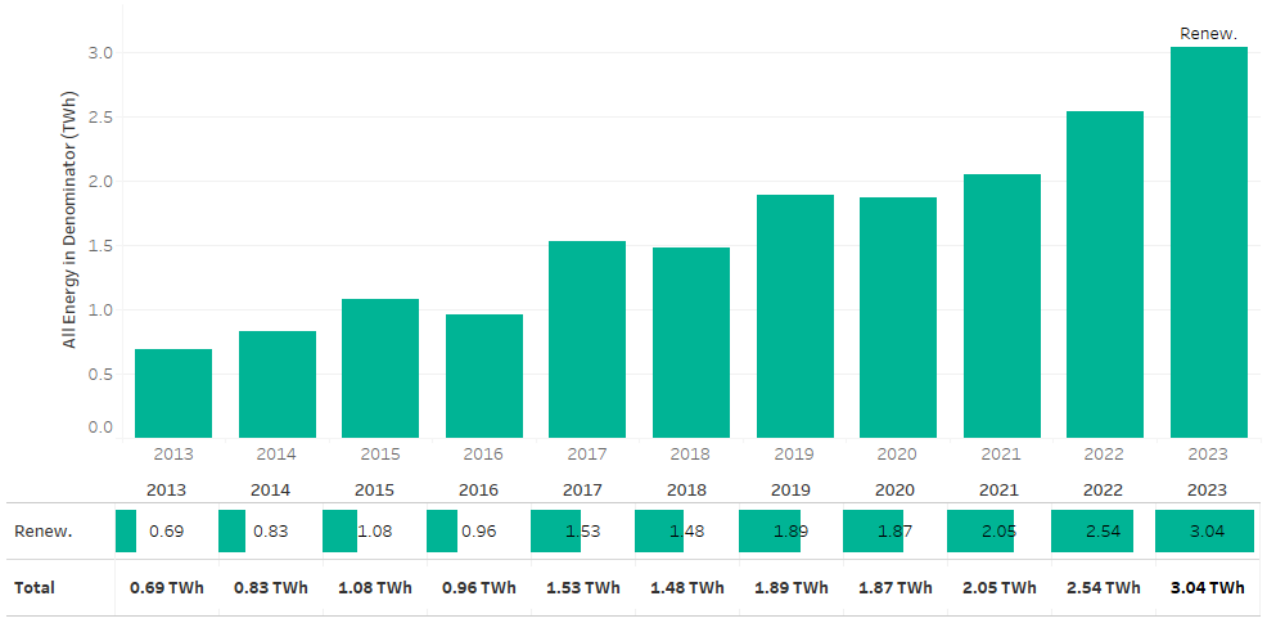
Figure 5.6 – Denominator of Ireland's RES-T result, with the application of the limits and multipliers required by RED-II, broken down by energy product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Nat. Gas							0.01	0.01	0.02	0.01	0.01
Elect	0.05	0.04	0.05	0.06	0.07	0.09	0.13	0.12	0.19	0.43	0.64
Renew.	1.71	2.07	2.51	2.29	3.40	3.29	4.10	3.93	4.08	5.22	6.34
Oil	40.07	40.92	42.72	44.34	43.82	44.32	44.26	36.83	39.26	41.94	42.04
Total	**41.82 TWh**	**43.04 TWh**	**45.28 TWh**	**46.69 TWh**	**47.29 TWh**	**47.70 TWh**	**48.50 TWh**	**40.89 TWh**	**43.55 TWh**	**47.60 TWh**	**49.03 TWh**

After the limits and multipliers required by RED-II are applied to the denominator of Ireland's RES-T result, there was a total of 49.03 TWh of countable energy in 2023. This is the value used in the calculation of the RES-T result in 2023.

Figure 5.7 – Difference in the denominator of Ireland's RES-T result, with-and-without the application of the multipliers and limits required by RED-II, broken down by energy product.



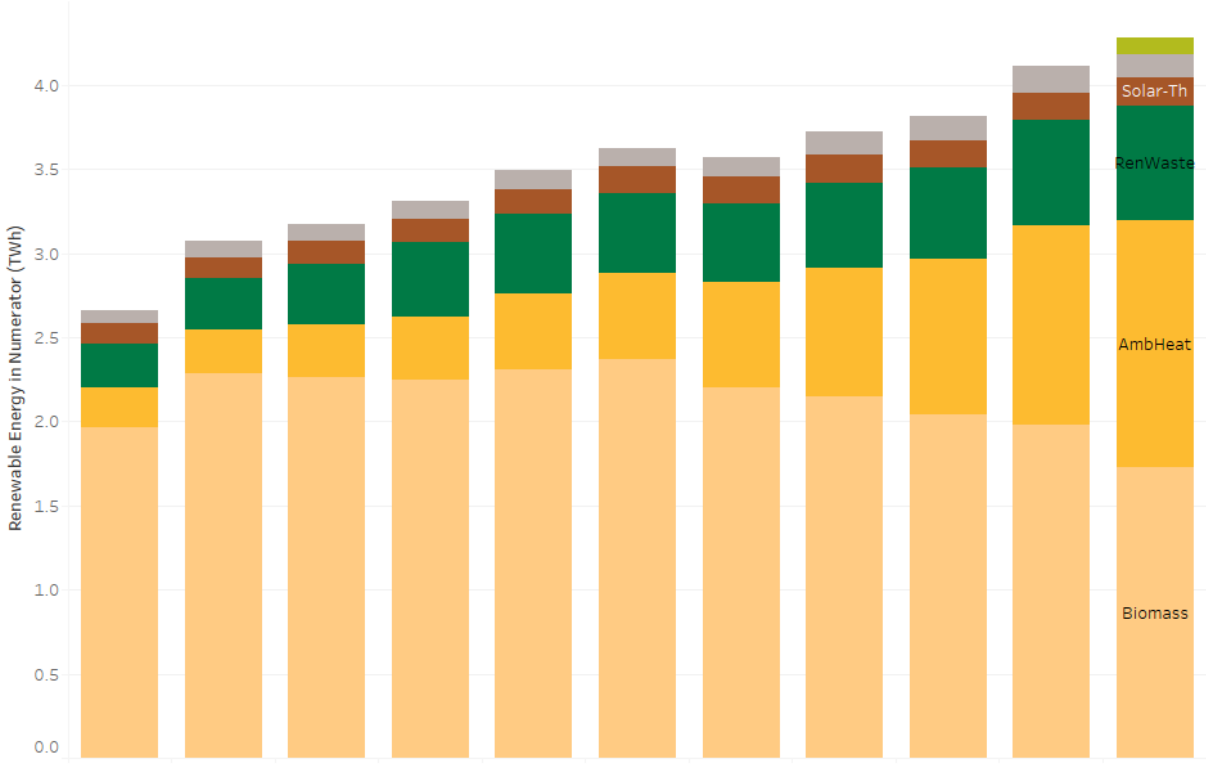
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Renew.	0.69	0.83	1.08	0.96	1.53	1.48	1.89	1.87	2.05	2.54	3.04
Total	**0.69 TWh**	**0.83 TWh**	**1.08 TWh**	**0.96 TWh**	**1.53 TWh**	**1.48 TWh**	**1.89 TWh**	**1.87 TWh**	**2.05 TWh**	**2.54 TWh**	**3.04 TWh**

After the limits and multipliers required by RED-II are applied to the denominator of Ireland's RES-T result, there was a total of 3.04 TWh more countable energy in 2023, than before the application of the limits and multipliers.

5.4 Renewable Energy Share in Heating (RES-H)

This section provides a detailed illustrations of the renewable energy sub-products contributing to the numerator of Ireland's RES-H, the energy products contributing to the denominator of Ireland's RES-H, and how their values are impacted by the application of the multipliers, limits, normalisation, and sustainability criteria required by RED-II.

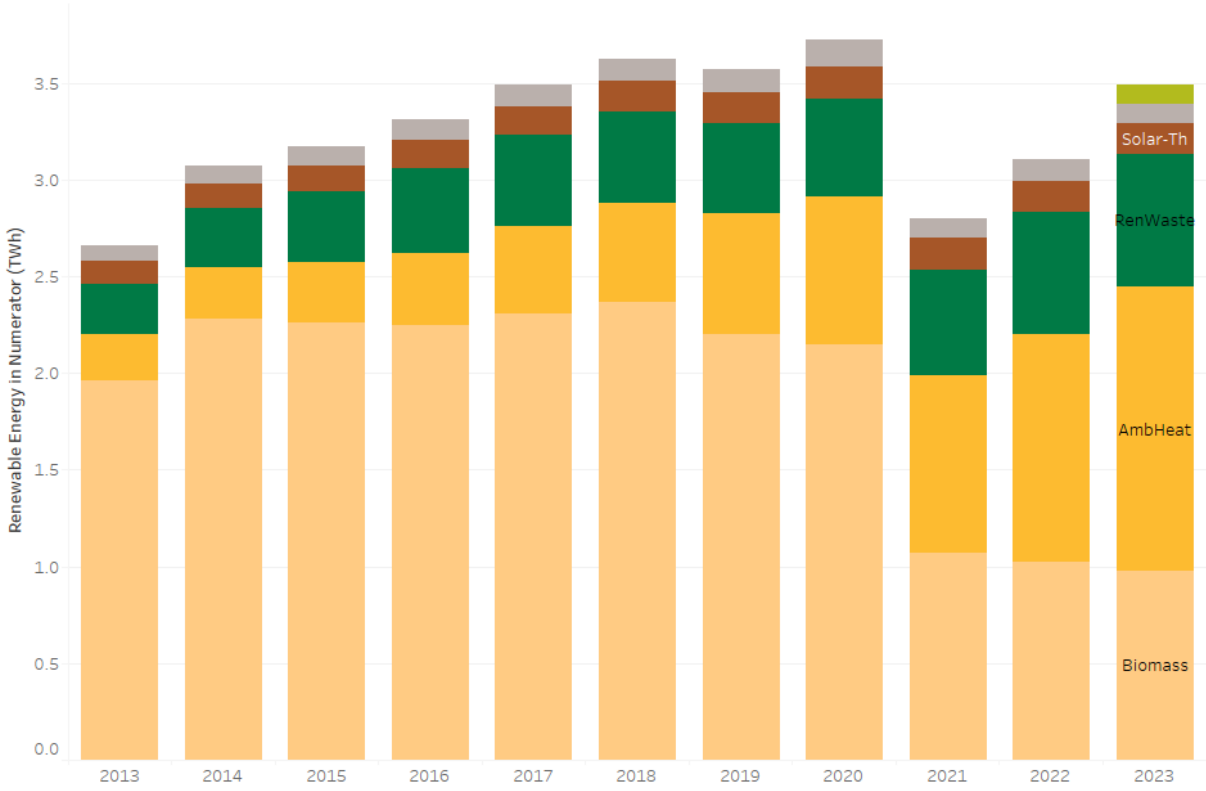
Figure 5.1 – Numerator of Ireland's RES-H result, without the application of the sustainability criteria required by RED-II, broken down by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BioDie											0.10
Biogas	0.08	0.09	0.10	0.11	0.11	0.11	0.12	0.14	0.14	0.16	0.14
Solar-Th	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.16	0.16	0.16	0.16
RenWaste	0.26	0.30	0.36	0.44	0.47	0.47	0.47	0.50	0.54	0.63	0.68
AmbHeat	0.24	0.27	0.31	0.38	0.45	0.51	0.62	0.77	0.92	1.18	1.47
Biomass	1.96	2.28	2.26	2.24	2.31	2.37	2.20	2.15	2.04	1.98	1.72
Total	**2.66 TWh**	**3.07 TWh**	**3.17 TWh**	**3.31 TWh**	**3.49 TWh**	**3.63 TWh**	**3.57 TWh**	**3.72 TWh**	**3.82 TWh**	**4.11 TWh**	**4.28 TWh**

Before the sustainability compliance required by RED-II are applied to the numerator of Ireland's RES-H result, there was a total of 4.28 TWh of countable renewable energy in 2023.

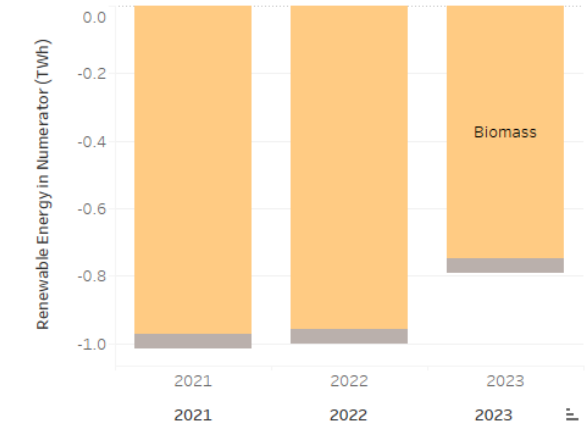
Figure 5.3 – Numerator of Ireland's RES-H result, with the application of the sustainability compliance required by RED-II, broken down by renewable sub-product.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BioDie											0.10
Biogas	0.08	0.09	0.10	0.11	0.11	0.11	0.12	0.14	0.10	0.11	0.10
Solar-Th	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.16	0.16	0.16	0.16
RenWaste	0.26	0.30	0.36	0.44	0.47	0.47	0.47	0.50	0.54	0.63	0.68
Biomass	1.96	2.28	2.26	2.24	2.31	2.37	2.20	2.15	1.07	1.02	0.98
AmbHeat	0.24	0.27	0.31	0.38	0.45	0.51	0.62	0.77	0.92	1.18	1.47
Total	**2.66 TWh**	**3.07 TWh**	**3.17 TWh**	**3.31 TWh**	**3.49 TWh**	**3.63 TWh**	**3.57 TWh**	**3.72 TWh**	**2.80 TWh**	**3.11 TWh**	**3.49 TWh**

After the sustainability compliance required by RED-II are applied to the numerator of Ireland's RES-H result, there was a total of 3.49 TWh of countable renewable energy in 2023. This is the value used in the calculation of the RES-H result for 2023.

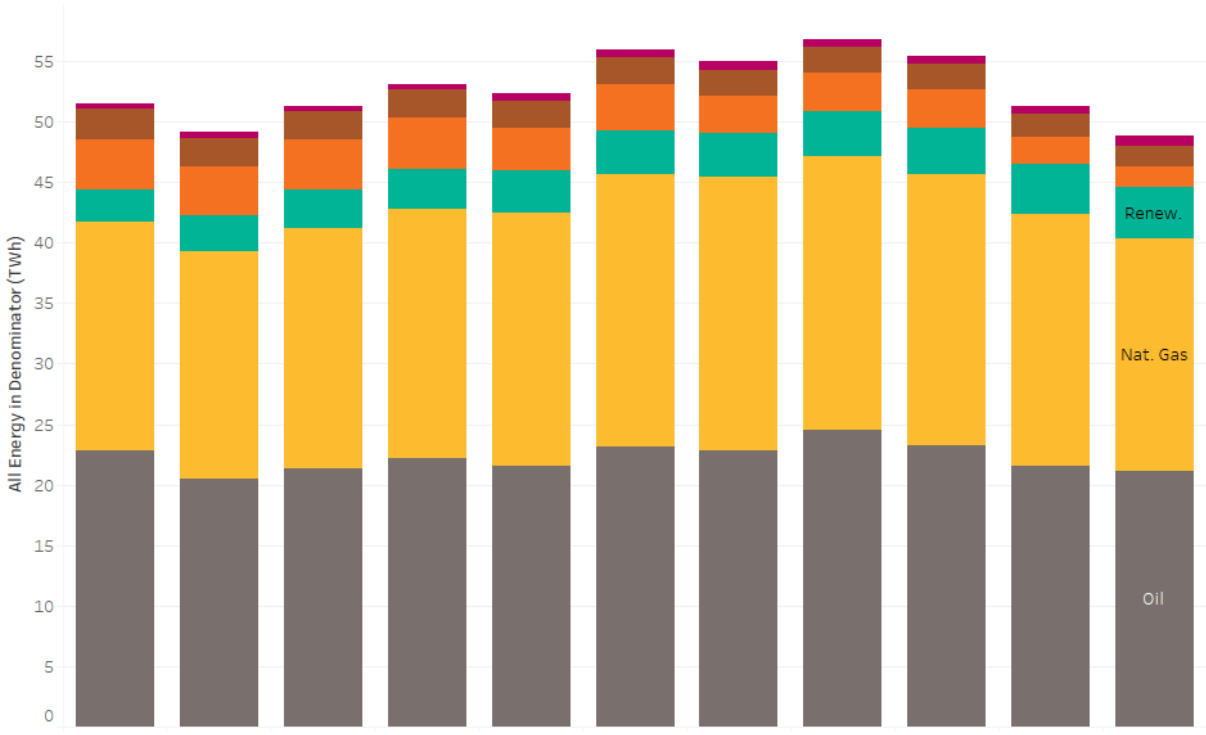
Figure 5.4 – Difference in the numerator of Ireland's RES-H result, with-and-without the application of the sustainability compliance required by RED-II, broken down by renewable sub-product.



	2021	2022	2023
Biomass	-0.97	-0.96	-0.75
Biogas	-0.04	-0.04	-0.04
Total	**-1.02 TWh**	**-1.00 TWh**	**-0.79 TWh**

After the and sustainability criteria required by RED-II are applied to the numerator of Ireland's RES-H result, there was a total of 0.79 TWh less countable renewable energy in 2023, than before the application of the sustainability compliance.

Figure 5.5 – Denominator of Ireland's RES-H result, which independent of multipliers, limits, normalisation, or sustainability criteria checks.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
NRW	0.45	0.48	0.51	0.48	0.66	0.64	0.66	0.62	0.63	0.68	0.87
Peat	2.54	2.33	2.34	2.30	2.20	2.30	2.13	2.20	2.10	1.87	1.63
Coal	4.08	4.00	4.11	4.24	3.47	3.75	3.09	3.16	3.20	2.27	1.74
Renew.	2.66	3.07	3.17	3.31	3.49	3.63	3.57	3.72	3.82	4.11	4.28
Nat. Gas	18.90	18.76	19.87	20.56	20.89	22.50	22.69	22.56	22.45	20.80	19.12
Oil	22.84	20.47	21.31	22.22	21.60	23.19	22.80	24.55	23.20	21.55	21.17
Total	**51.47 TWh**	**49.11 TWh**	**51.32 TWh**	**53.11 TWh**	**52.31 TWh**	**55.99 TWh**	**54.94 TWh**	**56.82 TWh**	**55.39 TWh**	**51.27 TWh**	**48.81 TWh**

Under the RED-II methodology for the denominator of Ireland's RES-H result, there was a total of 48.81 TWh of countable energy in 2023. This is the value used in the calculation of the RES-H result for 2023.

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SEAI gratefully acknowledges the co-operation of the many different organisations, national agencies, energy-suppliers and -distributors that all provide key energy data to SEAI, to help strengthen the quality and coverage of Irelan's national energy statistics.

This co-operation has been especially appreciated in recent years, when the detail and pace of SEA's data requests have increased, due to expanding international reporting obligations, and the need to produce ever-more-timely energy insights to support evidence-based discussions and decisions on government policy.

Version Control

Version	Description / Notes
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SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Rialtas na hÉireann
Government of Ireland

Sustainable Energy Authority of Ireland
Three Park Place
Hatch Street Upper
Dublin 2
Ireland
D02 FX65

e info@seai.ie
w www.seai.ie
t +353 1 808 2100