



**All-Island Fuel Mix Disclosure and CO₂
Emissions 2021**

Information Paper

SEM-22-065

23 September 2022

EXECUTIVE SUMMARY

Information Paper

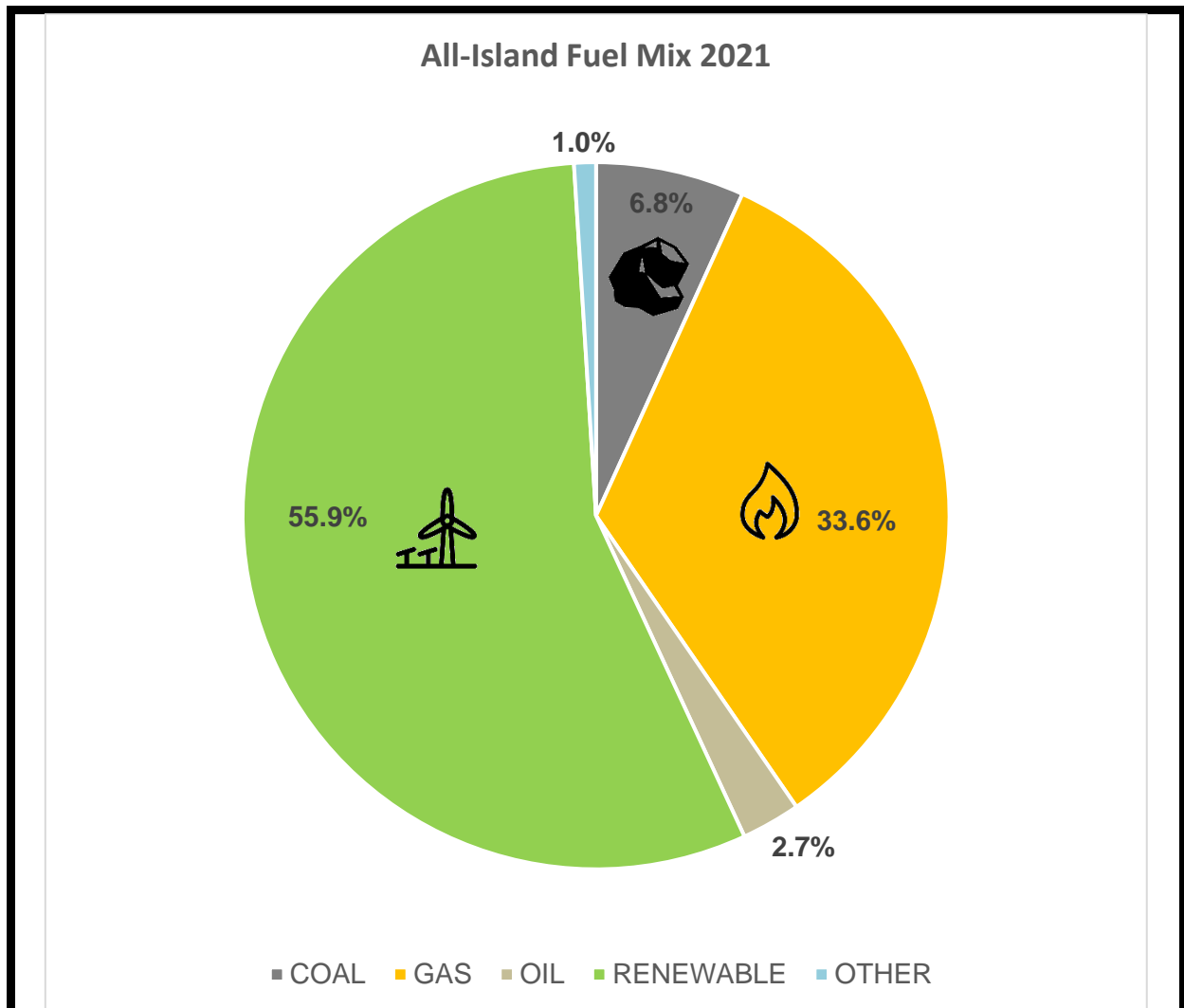
The fuel mix and carbon dioxide (CO₂) emissions disclosures for 2021 allow consumers to understand the recent environmental impact of the electricity that they buy, compared to the all-island average, and to choose between suppliers on this basis. It should be noted that the fuel mix of each supplier (outlined in this paper) does not necessarily represent metered generation in Ireland or Northern Ireland, as suppliers may claim the attributes of renewable electricity generated outside of the SEM through electronic certificates known as Guarantees of Origin (GOs), some of which are imported from other EEA Member States¹, which do not need to follow the physical flow of electricity.

The SEM Committee decision paper [SEM/11/095](#) outlines the calculation methodology and assumptions that have been used to calculate the fuel mix and CO₂ emissions for 2021. It should be noted that all figures here include GOs and not only metered generation.

For 2021, the predominant fuels in the final residual mix were gas, renewables, and coal. Coal has climbed back to near 2018 levels due to low wind speeds and power plant closures. Peat generation has decreased significantly since 2017. Renewables for 2021 has decreased marginally by 1.96% bringing it to 55.9%. A large proportion (57%) of the renewables were made up of imports claimed from outside of the SEM. In total, 17,350,039 GOs were imported into Ireland in 2021, a 6% increase from the previous year.²

¹ The European Economic Area (EEA) is made up of the Member States in the EU and additionally Norway, Lichtenstein, and Iceland.

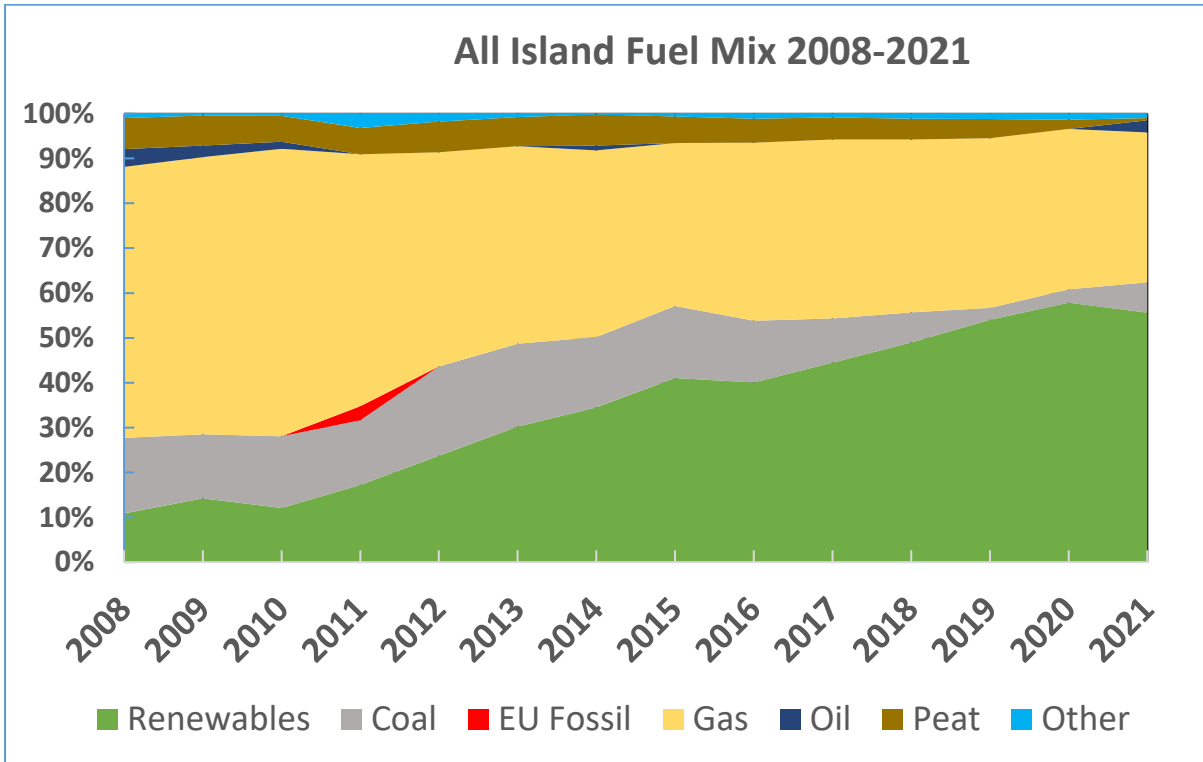
² Note that 1,132,539 of these were imported for cancellation for NI Supply companies. In total, NI supply companies cancelled 1,134,135 EU GOs for FMD 2021.



Fuel Mix Disclosure in 2021				
Coal	Gas	Oil	Renewable	Other ³
6.8%	33.6%	2.7%	55.9%	1.0%
Fuel Mix Disclosure in 2020 (for comparison)				
3.0%	35.8%	0.4%	57.9%	3.0%

³ For this report in 2021 Waste to Energy and Peat meet the criteria for inclusion in the "Other" category.

All-Island Fuel Mix 2008-2021



The average All-Island CO₂ emissions per kWh of electricity has increased by 9.3% between 2020 and 2021, from 236 g/kWh in 2020 to 258 g/kWh in 2021. This increase is predominantly driven by an increase in the reliance on coal-based generation and reduced renewable generation due to lower wind speeds in 2021.

Average All-Island CO₂ Emissions

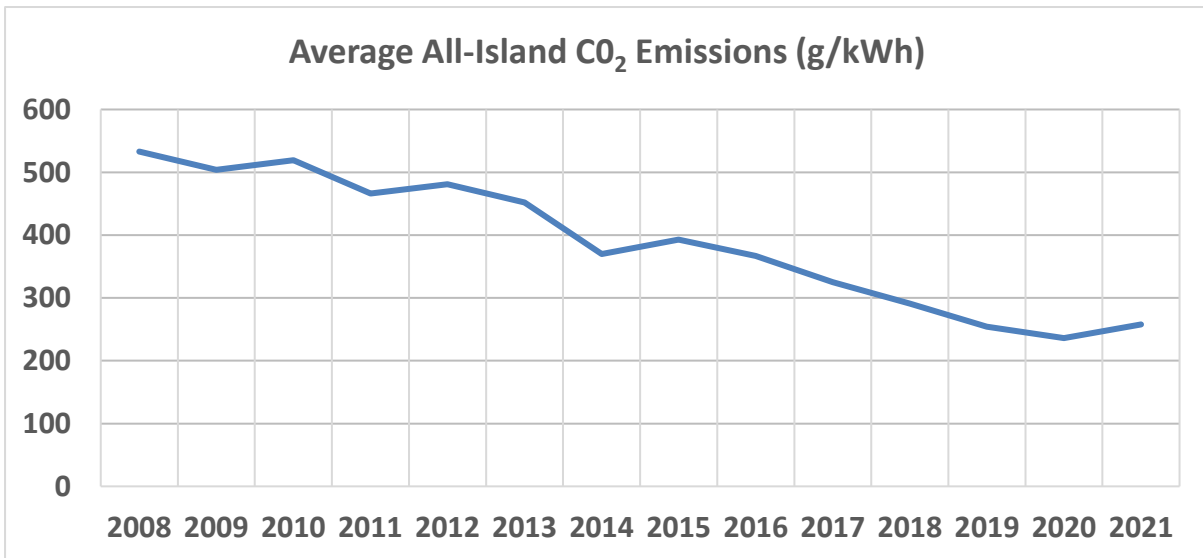


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Glossary of Terms and Abbreviations

Abbreviation or term	Definition or meaning
AIB	Association of Issuing Bodies
BEIS	Department for Business, Energy and Industrial Strategy
CO₂	Carbon dioxide
DAERA	Department of Agriculture, Environment and Rural Affairs
EEA	European Economic Area
EPA	Environmental Protection Agency
EU	European Union
FMD	Fuel Mix Disclosure
GO	Guarantees of Origin
GB	Great Britain
gCO₂/kWh	grams of carbon dioxide per kilowatt hour
MWh	Megawatt hour
NBDFW	Non-Biodegradable Fraction of Waste
Q	Quarter
RA	Regulatory Authority
REGO	Renewable Energy Guarantees of Origin
SEM	Single Electricity Market
SEMO	Single Electricity Market Operator
UK	United Kingdom

1. Introduction

1.1 Background

The purpose of this Information paper from the Regulatory Authorities (RAs) is to set out the 2021 fuel mix and carbon dioxide (CO₂) emissions figures for electricity suppliers operating in the all-island wholesale Single Electricity Market (SEM). This is shown on average across the island in Sections 2 and 3 of this paper, along with year-on-year trends, and per supplier in Section 4. The fuel mix and CO₂ emissions disclosures are taken from data provided to the RAs by the Single Electricity Market Operator ([SEMO](#)). The disclosures must be published on bills from suppliers to electricity customers in Ireland and Northern Ireland no later than two months from the publication of this paper.

The fuel mix and CO₂ emissions disclosures for 2021 allow consumers to understand the recent environmental impact of the electricity that they buy, compared to the all-island average, and to choose between suppliers on this basis - see Appendix 1. It should be noted that the fuel mix of each supplier (outlined in this paper) does not necessarily represent metered generation in Ireland or Northern Ireland, as suppliers may claim the attributes of renewable electricity generated outside of the SEM through electronic certificates known as Guarantees of Origin (GOs), some of which are imported from other EEA Member States⁴, which do not need to follow the physical flow of electricity.

The publication of the fuel mix of suppliers and the provision of information regarding the environmental impact of electricity produced from that fuel mix is required by Article 18(6) and point 5 of Annex I of [Directive \(EU\) 2019/944](#)⁵. It is the role of SEMO to administer and calculate the fuel mix figures from the information provided by suppliers. The supplier fuel mix and associated environmental impact information (emissions) is calculated by SEMO in accordance with the SEM Committee's methodology. This methodology can be found in the SEM Committee Decision Paper "*Fuel Mix Disclosure in the Single Electricity Market: Calculation Methodology Decision Paper*" ([SEM/11/095](#)).

At a high level, and in accordance with [SEM/11/095](#), the fuel mix figure for a supplier consists of non-renewable generation attributes, GOs and renewable generation attributes assigned to a supplier that are not included in the GO scheme and the Residual Mix⁶ or

⁴ The European Economic Area (EEA) is made up of the Member States in the EU and additionally Norway, Lichtenstein, and Iceland.

⁵ The requirements in Article 3(9) of [Directive 2009/72/EC](#), which is now repealed, is recast as [Directive \(EU\) 2019/944](#).

⁶ The Residual Mix is the mix of all unclaimed electricity in the system. It is measured by taking the total metered generation both In-SEM and Out-of-SEM, and deducting from this the four categories of energy that can be claimed by a supplier, in the following order: Public Service Obligation (PSO) energy; Guarantees of Origin (GOs); Renewable Energy Guarantees of Origin (REGOs); Generator Attributes – total amount of non-renewable generation from a fossil-fuelled unit registered by a supplier to be tracked by the calculating body.

European Union (EU) Residual Mix. GOs are electronic certificates issued for energy generated from renewable sources in EEA Member States and are issued to renewable generators that are not in support schemes⁷. These are tradeable instruments at European level and do not need to follow the physical flow of energy. The Association of Issuing Bodies ([AIB](#))⁸ operates a hub where such certificates can be traded between countries. This allows suppliers to purchase the renewable benefit of certain generators across Europe and include it in their total fuel mix. GOs are both exported from SEM and imported into SEM, to and from the rest of Europe.

Renewable generators that are signed up to the AIB's GO scheme are issued GOs per megawatt hour (MWh) of generation which can then be transferred to suppliers to use in their fuel mix disclosure. Each year, suppliers submit a completed fuel mix declaration form to SEMO which then performs the fuel mix disclosure (FMD) calculations on behalf of the RAs.

Attention is drawn to the following when considering the fuel mixes and emission intensities set out in this document:

- Firstly, **the all-island and jurisdictional fuel mixes - resulting from the application of trading in GOs - have the potential to vary significantly from the actual renewable generation produced within each jurisdiction.** This depends on the quantity of GOs imported or exported⁹ to or from Ireland and Northern Ireland in respect of the 12-month period for which the calculated fuel mix applies. The sole function of the GO is to prove that a given share of quantity of energy was produced from a renewable source in the EEA. A single GO is issued per MWh of electricity generated and this one GO can only be used once for the purposes of the fuel mix disclosure. Hence there is no double-counting of the same unit of European renewable electricity generation in the fuel mix disclosure.
- Secondly, in the event that there is a deficit of generation attributes to meet overall All-Island demand, the European Residual Mix will be used to meet the deficit. This also – but to a lesser extent - has the ability to lead to a fuel mix that differs from actual metered generation.

⁷ Note that in NI generators who accredited for the Northern Ireland Renewables Obligation (NIRO) scheme can also receive REGOs/GOs.

⁸ The EU Residual Mix was calculated by REDISS from 2011 to 2014, and by AIB from 2015.

⁹ A total of 17.35 million imported GO certificates were declared by suppliers for disclosure in the 2021 fuel mix. One GO represents 1 MWh of electricity produced from a renewable source. The equivalent 17.35 TWhs imported accounted for 57% of the overall renewable figure of 30.2 TWh.

It should be noted that for the reasons above, the FMD figures for a given disclosure period may not necessarily be representative of the actual all-island Production Fuel Mix for a given calendar year.

The fuel mix information should be presented (“disclosed”) on electricity bills in accordance with [SEM/11/095](#). A template for this purpose is reproduced in Appendix 1 of this paper. In particular the RA would like to remind suppliers of the following:

- Where fuel mix information is on the back of a bill, reference must be made to it on the front of the bill;
- While radioactive waste information is required by of [Directive \(EU\) 2019/944](#), this figure is zero for all suppliers in 2021 and therefore need not be included with the 2021 FMD information on bills;
- To ensure consistency across suppliers, percentages should be rounded to one decimal place;
- CO₂ emissions information should be given in the unit grams of CO₂ per kilowatt hour (gCO₂/kWh);
- Where separate products associated with a particular fuel mix are offered to certain customers, all the supplier’s customers should receive information, on request, regarding the fuel mix associated with their electricity (not simply the supplier’s average fuel mix) in accordance with [SEM/11/095](#); and
- The 2021 fuel mix information must be on all bills within two months of the publication of this paper.

Note that the widely used unit of measure¹⁰ gCO₂/kWh is the preferred unit of measure for reporting on emissions intensity associated with electricity generation. For consistency, the unit gCO₂/kWh should be used in billing, advertising, and promotional material of suppliers, including on website presentations, customer bills, infographics, annual reports, etc.

As a result of Brexit, REGOs from the UK are not acceptable as renewable certificates within EU Member States (including Ireland) since 1 Jan 2021. The following is from the notification from the European Commission¹¹:

¹⁰ The unit of measure tCO₂/MWh was used in the 2018 report and for some years before that. Use of the unit gCO₂/kWh was re-introduced for the 2019 report for disclosures and continues.

¹¹ [Notification](#) from the European Commission, issued on 7 March 2018.

“Guarantees of origin that have been issued by designated bodies in the United Kingdom in accordance with Article 15(2) of Directive 2009/28/EC will no longer be recognised by the EU-27 Member States as of the withdrawal date.”

In November 2020, SEMO – in conjunction with the RAs - provided an update on fuel mix disclosure. This is summarised as follows:

- **For Suppliers licensed in Northern Ireland:** Until such time as the United Kingdom (UK) reviews the continuation of eligibility of EU GOs, they are accepted for import or cancellation in Northern Ireland. Ofgem has stated that:

‘[UK] Government has indicated its intention to review this in 2021 so that, longer term, domestic recognition of Guarantees of Origin issued in EU countries will take place only on a reciprocal basis’.

- **For Suppliers licensed in Ireland:** From 1 January 2021, UK Renewable Energy Guarantees of Origin (REGOs) are not accepted for import or cancellation for FMD in Ireland.

The above arrangement is still in place, should subsequent communications or agreements from either the EU or UK authorities indicate a change in this position, both RAs in conjunction with SEMO, will provide market participants with an update on any changes to FMD processes.

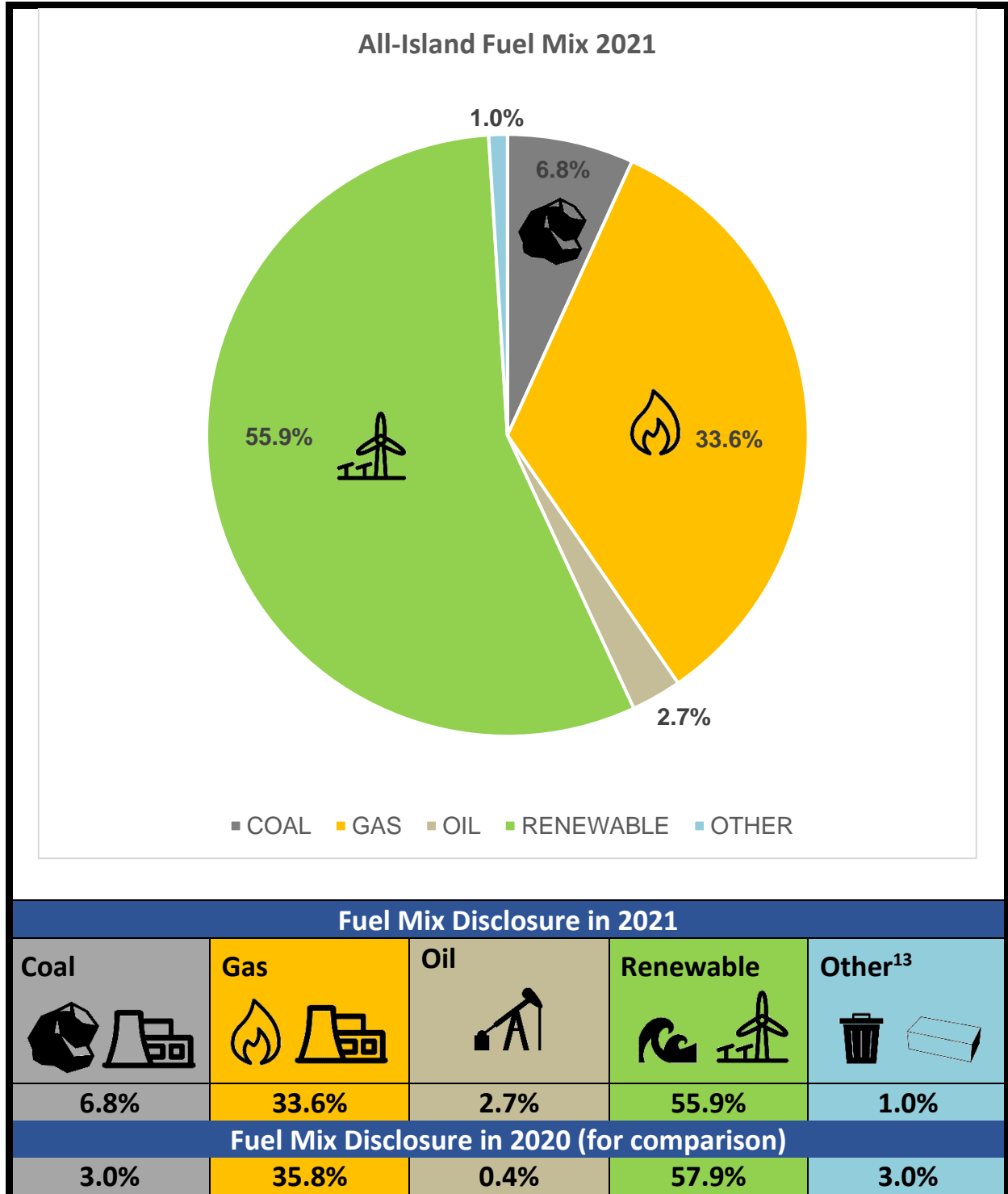
Additionally, there may be changes to the approach for the 2022 FMD as a result of consultations that are ongoing by the Department for Business, Energy, and Industrial Strategy (BEIS) and Ofgem in GB, or the Department for the Economy (DfE) in NI¹². Any changes will be reflected in future FMD processes.

¹² [Revocation of EU Guarantees of Origin \(GoOs\) and Combined Heat and Power GoOs | Department for the Economy \(economy-ni.gov.uk\)](https://www.economy-ni.gov.uk)

2. Average All-Island Fuel Mix

This section sets out the 2021 and year-on-year fuel mix for the all-island SEM, i.e., on average across the island.

Figure 1: All-Island Fuel Mix 2021



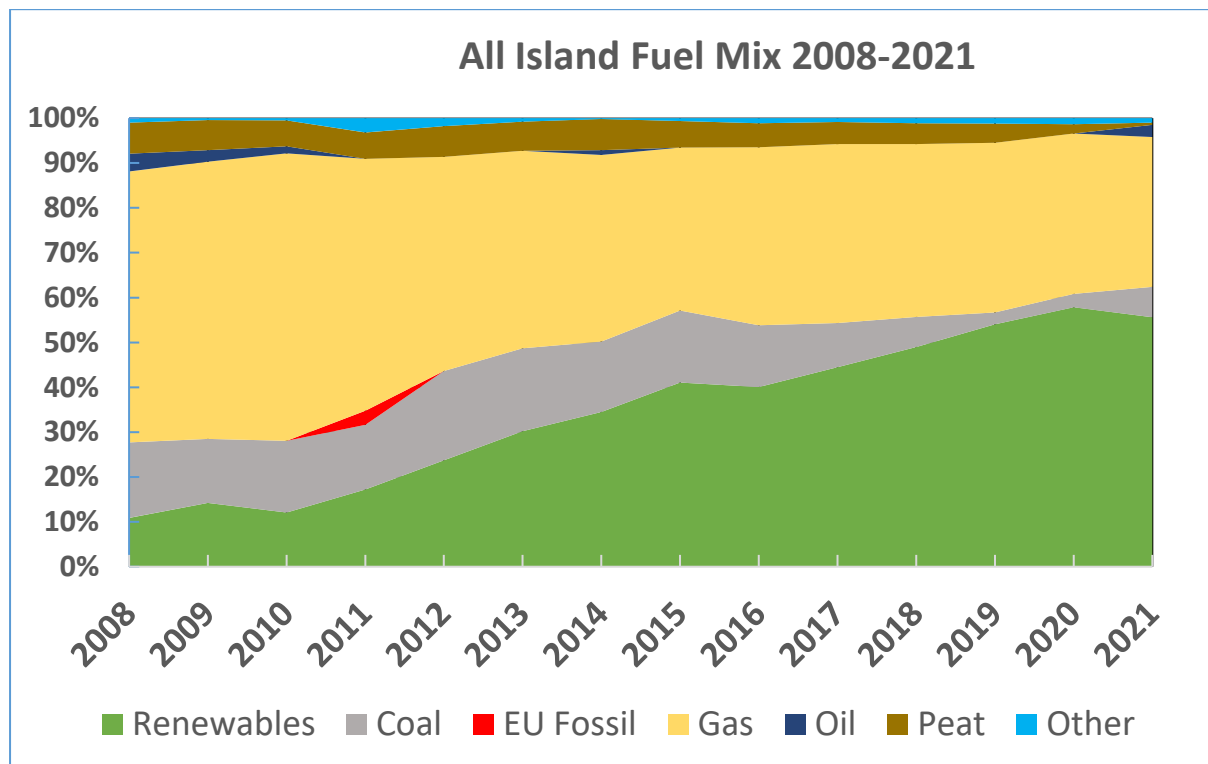
Source: SEMO data

¹³ For this report in 2021 Waste to Energy and Peat meet the criteria for inclusion in the "Other" category.

The SEM Committee decision paper [SEM/11/095](#) outlines the calculation methodology and assumptions that have been used to calculate the fuel mix and CO₂ emissions for 2021. It should be noted that all figures here include GOs and not only metered generation.¹⁴

For 2021, the predominant fuels in the final residual mix were gas, renewables, and coal. Coal has climbed back to near 2018 levels due to low wind speeds and power plant closures. Peat generation has decreased significantly since 2017. Renewables for 2021 has decreased marginally by 1.96% bringing it to 55.9%. A large proportion (57%) of the renewables were made up of imports claimed from outside of the SEM. In total, 17,350,039 GOs were imported into Ireland in 2021, a 6% increase from the previous year.¹⁵

Figure 2: All-Island Fuel Mix 2008-2021



Source: SEMO data

In accordance with [SEM/11/095](#), the “Other” category consists of the aggregate of all fuels in a given year that individually represent less than 1% of the final overall generation. For this report in 2021 waste to energy (0.5%) and peat (0.5%) meet the criteria for inclusion in the “Other” category. Table 1 below compares the “Other” category by year.

¹⁴ See Section 1 above.

¹⁵ Note that 1,132,539 of these were imported for cancellation for NI Supply companies. In total, NI supply companies cancelled 1,134,135 EU GOs for FMD 2021.

Table 1: Fuel-Types Comprising “Other” Category by Year

<u>Year</u>	<u>Fuel Type</u>
2015	Waste to Energy, Oil
2016	Waste to Energy, Oil
2017	Waste to Energy, Oil
2018	Waste to Energy, Oil
2019	Waste to Energy, Oil
2020	Waste to Energy, Oil
2021	Waste to Energy, Peat

Source: SEMO data

As for previous years, the combined and significant renewable and gas claims meant that there was a surplus of claims and indigenous generation compared to supplier demand leading to a net surplus of Residual Demand. This meant that there was no need to use the EU Residual Mix for 2021 leading to zero values for Nuclear and EU Fossil which are components of the EU Residual Mix. Table 2 below provides the All-Island Mix by year.

Table 2: All-Island Mix by Year

<u>Fuel</u>	<u>2021</u>	<u>2020</u>	<u>2019</u>	<u>2018</u>	<u>2017</u>	<u>2016</u>	<u>2015</u>
Coal	6.8%	2.98%	2.63%	6.77%	9.83%	13.76%	16.02%
EU Fossil	0.0%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Gas	33.6%	35.75%	37.86%	38.51%	39.96%	39.66%	36.36%
Nuclear	0.0%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Oil	2.7%	0.41%	0.66%	0.59%	0.60%	0.99%	0.49%
Peat	0.5%	2.07%	4.25%	4.63%	4.86%	5.35%	5.90%
Renewable	55.9%	57.86%	54.04%	48.95%	44.47%	40.09%	41.06%
Waste Energy	0.5%	0.94%	0.56%	0.55%	0.28%	0.15%	0.17%

Source: SEMO data

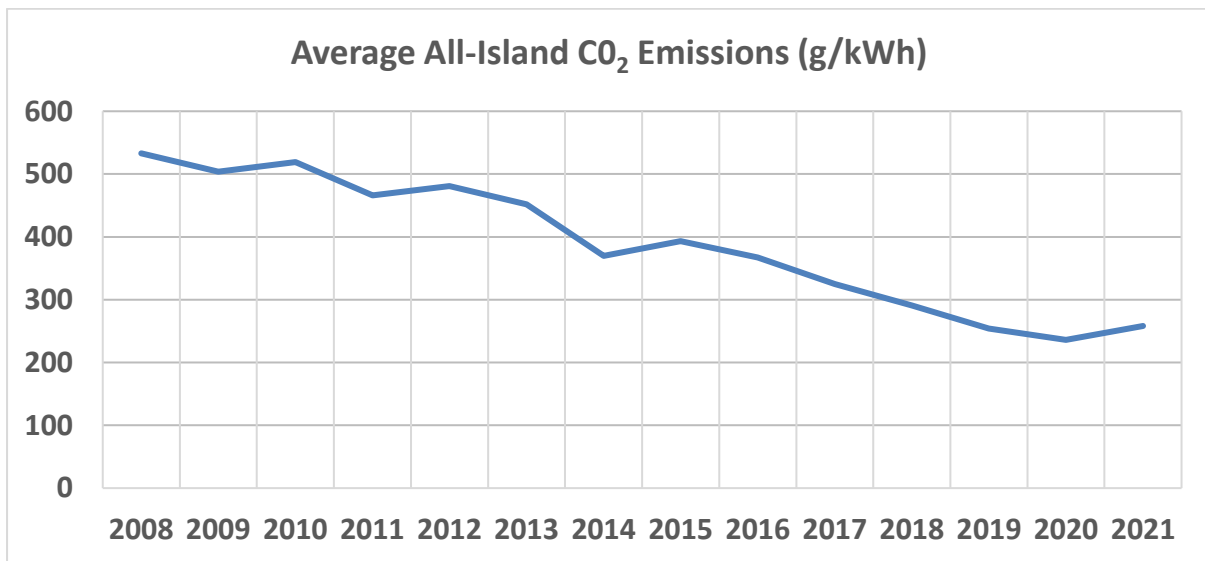
3. Average All-Island CO₂ Emissions

Emissions data for each generator in the SEM is supplied annually to SEMO by the EPA (Environmental Protection Agency) for Ireland and the DAERA (Department of Agriculture, Environment and Rural Affairs) for Northern Ireland.

The emission figures are grouped according to fuel type and divided by metered generation to give specific emission factors for each fuel. These values and imported GOs are then used to calculate the average all-island CO₂ Emissions Factor and each individual supplier's CO₂ Emissions Factor.

The average All-Island CO₂ emissions per kWh of electricity has increased by 9.3% between 2020 and 2021, from 236 g/kWh in 2020 to 258 g/kWh in 2021. This increase is predominantly driven by an increase in the reliance on coal-based generation and reduced renewable generation due to lower wind speeds in 2021.

Figure 3: Average All-Island CO₂ Emissions



Source: SEMO data


4. Suppliers' Fuel Mix and CO2 Emissions 2021

Following the information in Sections 2 and Section 3 above, this section sets out the fuel mix and CO₂ emissions for each electricity supplier.

The fuel mix calculation is carried out on an individual licence basis. Up to and including the 2021 year, where a supplier operates as a single company but holds separate licences (such as a supplier that operates in both jurisdictions) those licences that have excess generation attributes are distributed among the licences with excess demand: the generation attributes can be distributed to the excess demand within the single company prior to using the Residual Mix if the company holds multiple licences.

Table 3 below shows the individual fuel mixes and carbon dioxide emissions in grams per kWh of electricity for each supplier. The average All-Island fuel mix, as declared by the supply companies, (as per section 2) is also provided for reference.

Table 3: Declared Suppliers' Fuel Mix by Fuel Type in 2021

Supplier	Jurisdiction	Coal	Gas	Renewable	Oil	Other	gCO ₂ /kWh
	All-Island	6.8%	33.6%	55.9%	2.7%	1.0%	258
Bord Gais Energy	ROI	11.5%	41.1%	41.1%	4.5%	1.8%	363
Budget Energy	NI	0.0%	0.0%	100.0%	0.0%	0.0%	0
Electric Ireland¹⁶	All-Island	2.4%	31.0%	65.3%	0.9%	0.4%	179
	ROI	2.8%	25.2%	70.5%	1.1%	0.4%	158
	NI	0.0%	66.9%	33.1%	0.0%	0.0%	306
Energia	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0

¹⁶ Note that all of ESB's electricity supply licences (both ROI and NI) are branded as Electric Ireland.

Panda Power	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0
Go Power	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0
	NI	15.6%	48.6%	27.3%	6.1%	2.4%	460
Power NI	NI	0.0%	69.1%	30.9%	0.0%	0.0%	316
Click Energy	NI	10.0%	30.9%	53.7%	3.9%	1.5%	293
SSE Airtricity	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0
	NI	0.0%	41.9%	58.1%	0.0%	0.0%	191
Flogas Enterprise Solutions	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0
	NI	0.0%	0.0%	100.0%	0.0%	0.0%	0
Pinergy	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0
Arden Energy	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0
Orsted Ireland Green Energy	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0
Captured Carbon	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0
Cenergise Trading	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0
Ecopower	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0
Community Power	ROI	13.0%	40.2%	39.8%	5.0%	2.0%	381

ElectroRoute Energy Supply	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0
Flogas Natural Gas	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0
Iberdrola Ireland	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0
3T Power	NI	0.0%	0.0%	100.0%	0.0%	0.0%	0

Source: SEMO data

Suppliers who did not submit a fuel mix declaration to SEMO have been assigned the Residual Mix, adapted with the PSO adjustment where applicable. and are highlighted as such in Table 4.

Table 4: Suppliers assigned the Residual Mix in 2021

Suppliers assigned All Island Residual Mix	Jurisdiction	Coal	Gas	Renewable	Oil	Other	gCO ₂ /kWh
Glowpower	ROI	16.9%	52.6%	21.3%	6.6%	2.6%	498
PrePay Power	ROI	16.9%	52.6%	21.3%	6.6%	2.6%	498
Waterpower Engineering	ROI	16.9%	52.6%	21.3%	6.6%	2.6%	498

Source: SEMO data

Two self-suppliers¹⁷ made a declaration for the purposes of fuel mix disclosure. These associated fuel mixes have been included in Table 5 below.¹⁸

¹⁷ A self-supplier is a supply company which supplies electricity only to its own site and which does not compete to supply energy to any third party.

¹⁸ It should be noted that the purpose of this paper is to provide information to customers on the fuel mix of their electricity supply. Only suppliers serving electricity customers are required to disclose their assigned fuel mix.

Table 5: Self-Suppliers' Fuel Mix by Fuel Type in 2021

Self-Supplier	Jurisdiction	Coal	Gas	Renewable	Oil	Other	gCO ₂ /kWh
Axpo UK	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0
Statkraft Markets GmbH	ROI	0.0%	0.0%	100.0%	0.0%	0.0%	0

Source: SEMO data

Appendix 1: Presentation of Information on Bills

Default Presentation of Information¹⁹

The fuel mix information should be presented on electricity bills in accordance with [SEM/11/095](#). For this purpose, a template from this decision paper is reproduced below.²⁰

Suppliers who offer green source products in Ireland should refer to Section 3.5.3 of the CRU's Decision paper, [CER/15/205](#), on the "Regulation of Green Source Products in the Electricity Retail Market".

SUPPLIER Z Disclosure Label		
Applicable Period: January 2021 to December 2021		
Electricity supplied has been sourced from the following fuels:	% of total	
	Electricity supplied by SUPPLIER Z	Average for All Island Market (for comparison)
Coal	X %	X %
Natural Gas	X %	X %
Nuclear	X %	X %
Renewable	X %	X %
Peat	X %	X %
Oil	X %	X %
EU Fossil	X %	X %
Other	X %	X %
Total	100 %	100 %
Environmental Impact		
CO ₂ Emissions	X g/kWh	X g/kWh
Your specific fuel mix may differ from the fuel mix shown because SUPPLIER Z offers green source products. For information on your fuel mix and on the environmental impact of your electricity supply visit www.SUPPLIER Z.ie or, for further details call 00XXX X XXX XXXXX		

¹⁹ Refer to [SEM/11/095](#) for further detail on presentation requirements. Note that the fuel categories used each year can vary.

²⁰ Please refer to Section 1.7 of [SEM/11/095](#) for further details.

Appendix 2: All-Island Fuel Mix 2005-2021

Fuel Mix 2005-2021 (Percentage share of total)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Coal %	24.00	19.00	18.00	17.00	14.24	15.98	14.44	19.89	18.42	15.71	16.02	13.76	9.83	6.77	2.63	2.98	6.80
EU Fossil %	0.00	0.00	0.00	0.00	0.00	0.00	3.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gas %	46.00	50.00	55.00	61.00	61.85	64.06	56.16	47.74	44.09	41.6	36.36	39.66	39.9	38.51	37.86	35.75	33.60
Oil %	12.00	9.00	6.00	4.00	2.53	1.59	0.00	0.00	0.00	1.06	0.00	0.00	0.00	0.00	0.00	0.00	2.70
Renewables %	9.00	11.00	11.00	11.00	14.23	12.11	17.21	23.74	30.24	34.46	41.06	40.09	44.47	48.95	54.04	57.86	55.90
Peat %	8.00	7.00	6.00	7.00	6.70	5.78	5.88	6.86	6.49	6.95	5.90	5.35	4.86	4.63	4.25	2.07	0.00
Other %	1.00	4.00	4.00	1.00	0.45	0.48	3.18	1.77	0.75	0.17	0.65	1.14	0.88	1.15	1.22	1.34	1.00

Note:

- Figures from 2005 to 2007 relate to Ireland-only and calculations are based on a pre-SEM methodology.
- Figures for 2008, 2009 and 2010 relate to Ireland and Northern Ireland and are based on the Interim Arrangements Methodology ([SEM/09/081](#)).
- Figures for 2011 onwards relate to Ireland and Northern Ireland and are based on the SEM Committee Decision Paper Fuel Mix Disclosure in the Single Electricity Market: Calculation Methodology Decision Paper ([SEM/11/095](#)), referenced in the Related Documents section of this paper.
- The “Other” category consists of oil (only for those years in which it is below the 1% threshold), Non-Biodegradable Fraction of Waste (NBDFW), and EU Fossil (only for 2011).