



# Cutting Carbon, Cutting Bills

Analysis of savings in gas consumption  
delivered by wind farms in 2023

January 2024



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# While wholesale electricity prices remained high through 2023, wind generation in Ireland and Northern Ireland played a significant role in reducing the impact on consumer bills

## Context of our Study

- Throughout early 2023, gas prices fell significantly from the high levels seen in 2022 following the Russian Invasion of Ukraine. As a result, power prices have also fallen, however they still remain above historic norms keeping electricity prices relatively high – the average wholesale price for 2023 was still more than double the 2019 level.
- Historically, Ireland and Northern Ireland have relied on fossil fuel-fired generation for electricity, exposing end consumers to movements in the price of imported commodities.
- However, investment in renewable generation technologies has resulted in a steady increase in zero-carbon electricity over the last two decades, dominated by wind power. Ireland and Northern Ireland have among the highest penetration of intermittent renewable generation (wind and solar) in Europe, with around 39% of domestic electricity in Ireland being served by renewable sources in 2022<sup>1</sup>.
- Wind generation can displace gas-fired generation from the day-ahead wholesale electricity market with low-cost renewable electricity, avoiding the cost of fossil gas and carbon credits.
- In this study we have explored the savings for consumers and operators in the Single Electricity Market (SEM), the unified power system that spans Ireland and Northern Ireland, by this displacement in 2023.
- This study has focused on cost savings unlocked over 2023 and does not quantify the cost savings in previous years or avoided CO<sub>2</sub> emissions, noting a similar study was carried out last year focusing on 2022. We have also previously explored the carbon emission saving unlocked by wind power over the 2000 – 2020 period in our *Wind for a Euro*<sup>2</sup> study.

## Methodology and Assumptions

- In our estimation of the fossil gas and carbon savings for consumers and operators in the SEM, we have used historical data at an hourly granularity:
  - Outturn wind generation data, sourced from EirGrid;
  - Outturn electricity demand in Ireland and Northern Ireland, sourced from EirGrid;
  - Day-ahead wholesale NBP<sup>3</sup> gas prices, sourced from Argus; and
  - Traded daily EUA<sup>4</sup> carbon prices, sourced from Argus.
- We have assumed an average higher heating value (HHV) efficiency of 49.1% for the fossil gas-fired fleet across the SEM, consistent with EirGrid and SONI.
- We have assumed a marginal ‘fuel’ cost for wind generation of 0 €/MWh.
- Based on these assumptions we have calculated the volume of gas and carbon credits that would be required to ‘replace’ the historical outturn wind generation in the day-ahead schedule at an hourly granularity.
- We have allocated the fuel and carbon cost savings to Ireland and Northern Ireland on a demand-weighted basis, in line with the treatment of electricity cost components on end consumer bills.
- Our methodology assumes that wind power displaces exclusively fossil gas-fired generation. Although fossil gas is dominant in the SEM, other technologies such as coal and oil-fired assets may be displaced by wind generation, with different savings.

<sup>1</sup> [Energy-in-Ireland-2023.pdf \(seai.ie\)](#)

<sup>2</sup> [Wind for a Euro](#)

<sup>3</sup> National Balancing Point, a virtual trading hub for fossil gas based in the United Kingdom.

<sup>4</sup> European Union Allowances, carbon credits used within the EU Emissions Trading System (EU ETS).

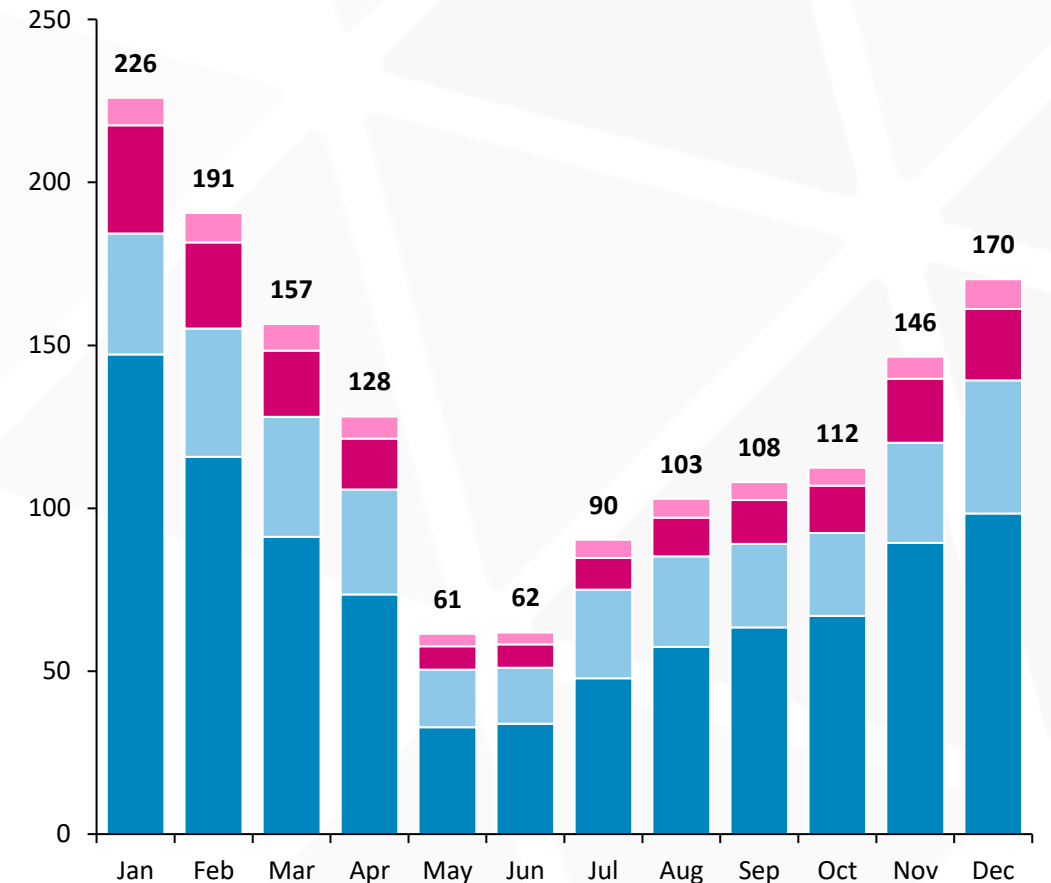
# Wind generation in Ireland and Northern Ireland displaced a total of €1.6 billion worth of gas and carbon credits in the wholesale market

## Results of our Analysis

- Our analysis reveals that a total of 13.7 terawatt-hours<sup>1</sup> (TWh) of outturn wind generation – around 35% of Ireland's electricity generation over the year – was able to displace a total of almost €1.6 billion worth of fossil gas and carbon in 2023.
- Around 2.2 billion cubic meters (bcm) of fossil gas was displaced in Ireland at a total avoided cost of over €900 million. A further £176 million (€201 million) of gas was displaced in Northern Ireland, totalling almost 0.5 bcm in volume.
- The resulting reduction in emissions equates to 4.2 and 0.9 million tonnes of CO<sub>2</sub> emissions for Ireland and Northern Ireland respectively.
- In addition, nearly €360 million and almost £70 million (€78 million) worth of carbon credits were displaced from the wholesale market in Ireland and Northern Ireland respectively.
- December saw the greatest monthly wind generation, with a total cost saving of €170 million across the island. High fossil gas prices at the beginning of the year resulted in the greatest monthly saving from wind power in January, totalling over €226 million.
- A combination of high winds and relatively high fossil gas prices on the 12<sup>th</sup> of January resulted in a total avoided cost of €14 million on a single day.
- The displaced revenues are partially replaced by payments to wind farm operators who are typically funded through the PSO levy or directly by corporate buyers.

## Monthly Cost Savings | January – December 2023

€m, nominal



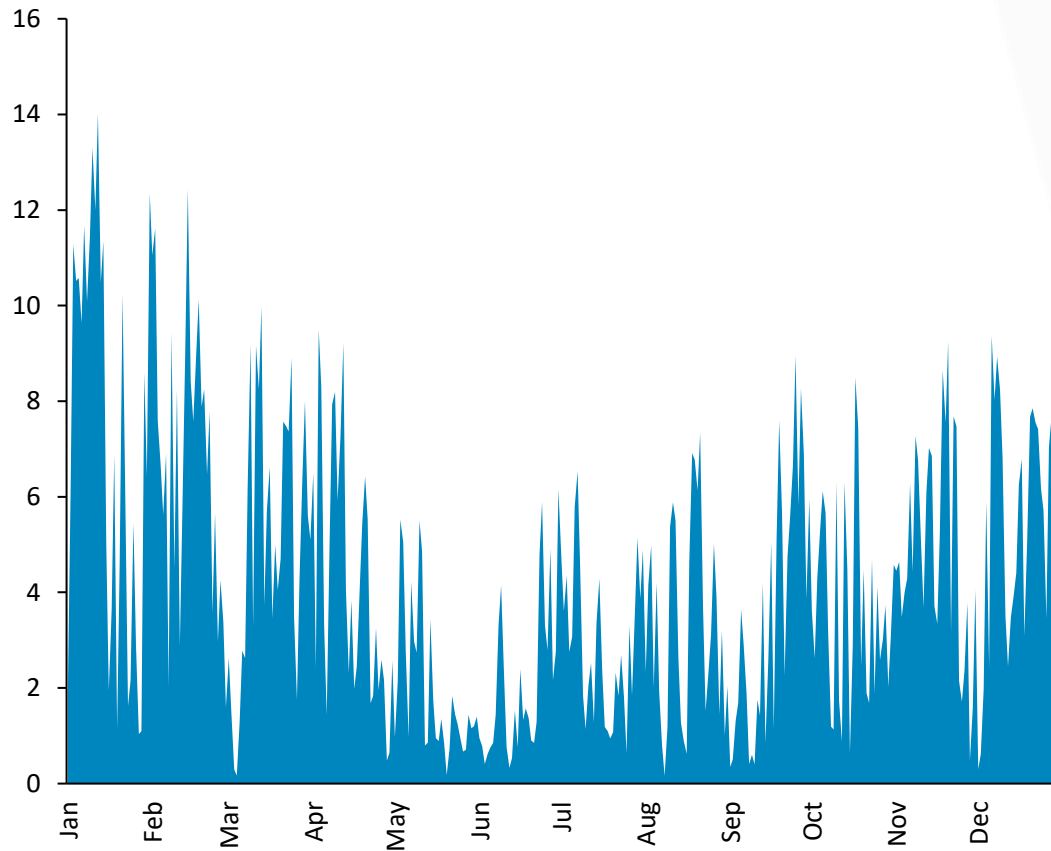
■ Ireland - Gas ■ Ireland - Carbon ■ Northern Ireland - Gas ■ Northern Ireland - Carbon

<sup>1</sup> A terawatt-hour is equal to 1,000 gigawatt-hours (GWh), or 1,000,000 megawatt-hours (MWh).

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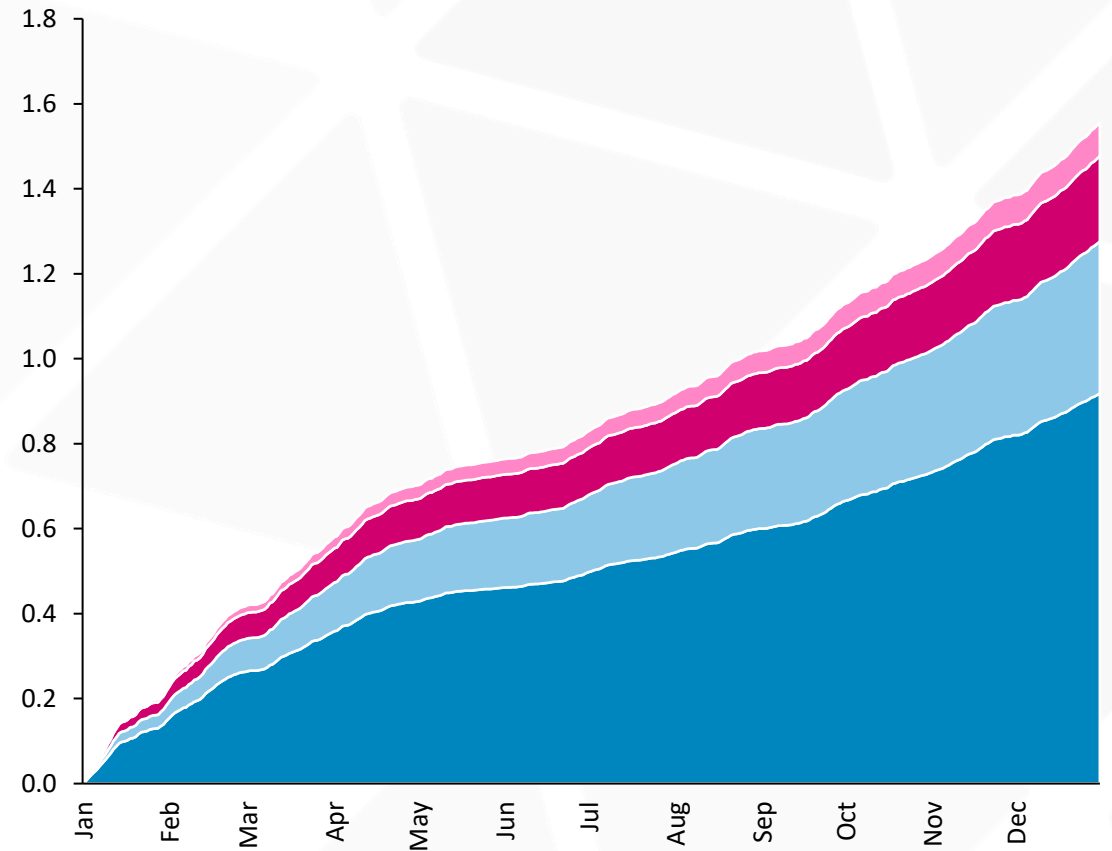
Daily Total Savings | January – December 2023

€m, nominal



Cumulative Savings | January – December 2023

€b, nominal

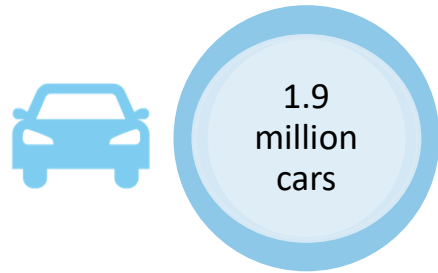


■ Ireland - Gas ■ Ireland - Carbon ■ Northern Ireland - Gas ■ Northern Ireland - Carbon

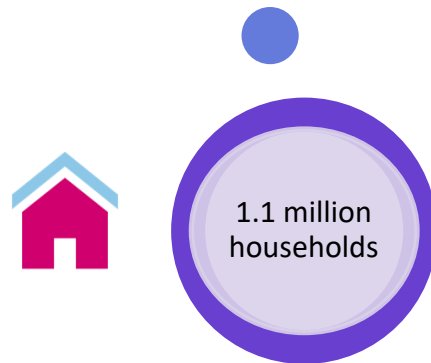
## Wind generation in Ireland and Northern Ireland displaced a total of €1.6 billion worth of fossil gas and carbon credits in the wholesale market

Key Results of our Analysis	Unit	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
<b>Day-Ahead Market Costs</b>													
Wholesale power price	€/MWh	162	159	145	126	105	117	96	106	112	126	123	88
NBP gas price	€/MWh	60	51	43	39	28	31	28	33	36	41	42	33
EUA carbon price	€/t	83	95	92	93	86	87	88	86	83	82	76	73
<b>Day-Ahead Market Schedule</b>													
All-island wind generation	GWh	1,479	1,362	1,303	1,112	666	634	995	1,041	999	1,013	1,304	1,816
Ireland demand	GWh	2,950	2,618	2,932	2,643	2,608	2,476	2,535	2,564	2,568	2,757	2,870	2,868
Northern Ireland demand	GWh	686	609	667	576	575	540	527	551	555	608	646	639
<b>Avoided Costs in Ireland</b>													
Displaced gas cost	€m	147	116	91	74	33	34	48	57	63	67	89	98
Displaced carbon cost	€m	37	39	37	32	18	17	27	28	26	25	31	41
Total cost saving	€m	184	155	128	106	51	51	75	85	89	92	120	139
<b>Avoided Costs in Northern Ireland</b>													
Displaced gas cost	€m	33	26	20	16	7	7	10	12	13	15	20	22
Displaced carbon cost	€m	8	9	8	7	4	4	6	6	5	6	7	9
Total cost saving	€m	42	35	28	22	11	11	15	18	19	20	26	31
Displaced gas cost	£m	29	23	18	14	6	6	8	10	12	13	17	19
Displaced carbon cost	£m	7	8	7	6	3	3	5	5	5	5	6	8
Total cost saving	£m	37	31	25	20	10	9	13	15	16	17	23	27
<b>Avoided Emissions in Ireland</b>													
Avoided Emissions	kt	452	415	399	344	205	196	310	323	309	311	400	556
<b>Avoided Emissions in Northern Ireland</b>													
Avoided Emissions	kt	102	95	89	73	44	42	63	67	65	68	88	124

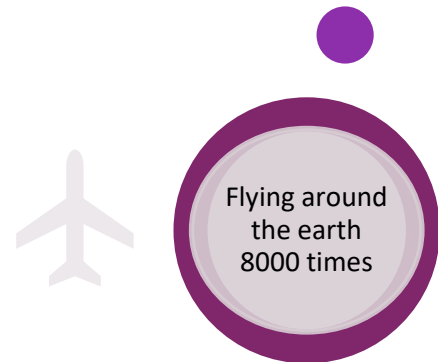
## These carbon savings have a real impact on Ireland's measures to combat climate change – here is what they are equivalent to:



The annual emissions of 1.9 million cars across Ireland and Northern Ireland, considering the average car in Ireland produces 2.75 tonnes of CO<sub>2</sub> per year



The annual emissions of 1.1 million households across Ireland and Northern Ireland, considering an average household emissions of 4.6 tonnes annually



The CO<sub>2</sub> released by flying around the Earth more than 8000 times, considering an emissions of 24 kg per mile of passenger flight



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### Commissioned by Wind Energy Ireland

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