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WIND ENERGY IRELAND

# Cutting Carbon, Cutting Bills

## Analysis of savings in gas consumption delivered by wind farms in 2022

**January 2023**

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# **Cutting Carbon, Cutting Bills |** Savings in gas use delivered by wind farms in 2022

## In a year of spiralling costs, Ireland and Northern Ireland's fleet of wind farms generated low-cost renewable electricity – reducing the financial burden imposed on consumer bills by record fossil fuel prices

**Context of our Study**

- Over the last two years, the cost of wholesale electricity in Ireland and Northern Ireland has been driven to extremes by a sustained surge in the price of fossil gas throughout Europe. Record prices were observed throughout 2022, in which the Russian Invasion of Ukraine catalysed a decoupling of Western Europe from Russian fossil gas supplies.
- 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 2020[1].
- Wind generation is able to displace fossil 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 conferred to consumers and operators in the Single Electricity Market (SEM), the unified power system that spans Ireland and Northern Ireland, by this displacement in 2022.
- This study has focused on cost savings unlocked over 2022 and does not quantify the cost savings in previous years or avoided $CO_2$ emissions. We have previously explored the carbon emission saving unlocked by wind power over the 2000 – 2020 period in our *Wind for a Euro*[2] study.

**Methodology and Assumptions**

- In our estimation of the fossil gas and carbon savings afforded to consumers and operators in the SEM, we have used historical data at an hourly granularity:
  - Wind generation data at the day-ahead stage, sourced from SEMO;
  - Electricity demand in Ireland and Northern Ireland at the day-ahead stage, sourced from SEMO;
  - Day-ahead wholesale NBP[3] fossil gas prices, sourced from Argus; and
  - Traded daily EUA[4] 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 fossil 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.

[1] *Energy in Ireland 2021*
[2] *Wind for a Euro*

[3] National Balancing Point, a virtual trading hub for fossil gas based in the United Kingdom.
[4] European Union Allowances, carbon credits used within the EU Emissions Trading System (EU ETS).

 

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# Fossil gas and carbon costs displaced by wind power in 2022

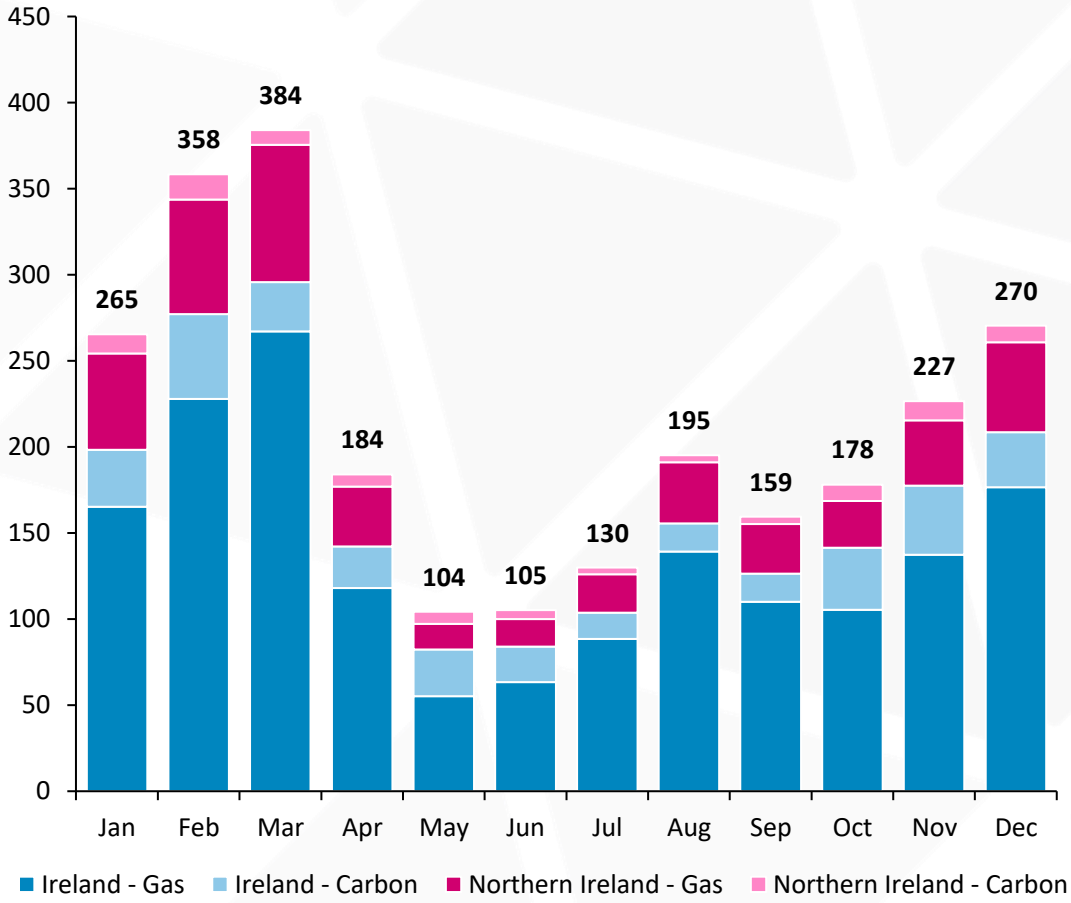
## Wind generation in Ireland and Northern Ireland displaced a total of €2,570 million worth of fossil gas and carbon credits in the wholesale market – reducing the island's $CO_2$ emissions and reliance on fossil fuels

**Results of our Analysis**

- Our analysis reveals that a total of 14.3 terawatt-hours[1] (TWh) of wind generation at the day-ahead stage was able to displace a total of almost €2.6 billion worth of fossil gas and carbon credits from the wholesale market in 2022.
- Around 2.4 billion cubic meters (bcm) of fossil gas was displaced in Ireland at a total avoided cost of €1,650 million. A further £410 million of fossil gas was displaced in Northern Ireland, totaling almost 0.7 bcm in volume.
- In addition, a total of €340 million and £85 million worth of carbon credits were displaced from the wholesale market in Ireland and Northern Ireland respectively.
- February saw the greatest monthly wind generation, with a total cost saving of €360 million across the island. A surge in fossil gas prices in March resulted in the greatest monthly saving from wind power, totaling over €380 million.
- A combination of high winds and extreme fossil gas prices on the 8th of March resulted in a total avoided cost of over €43 million on a single day.

**Monthly Cost Savings** | January – December 2022

€m, nominal




[1] A terawatt-hour is equal to 1,000 gigawatt-hours (GWh), or 1,000,000 megawatt-hours (MWh).

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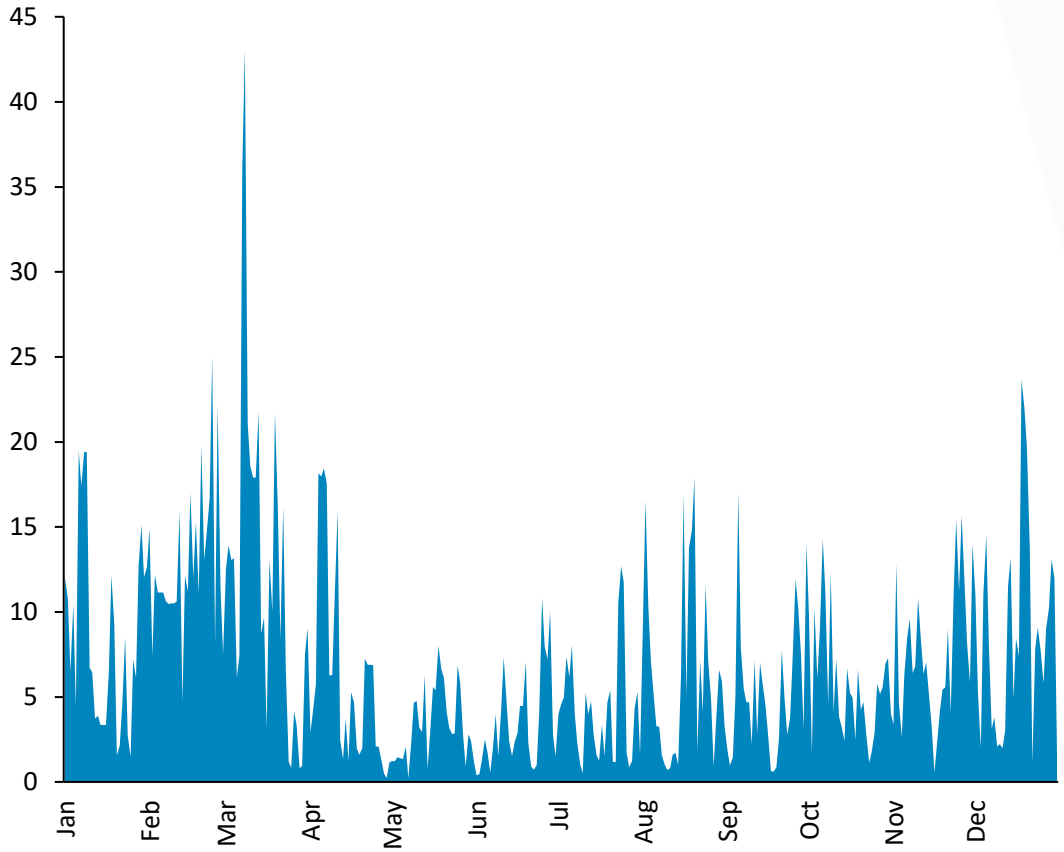
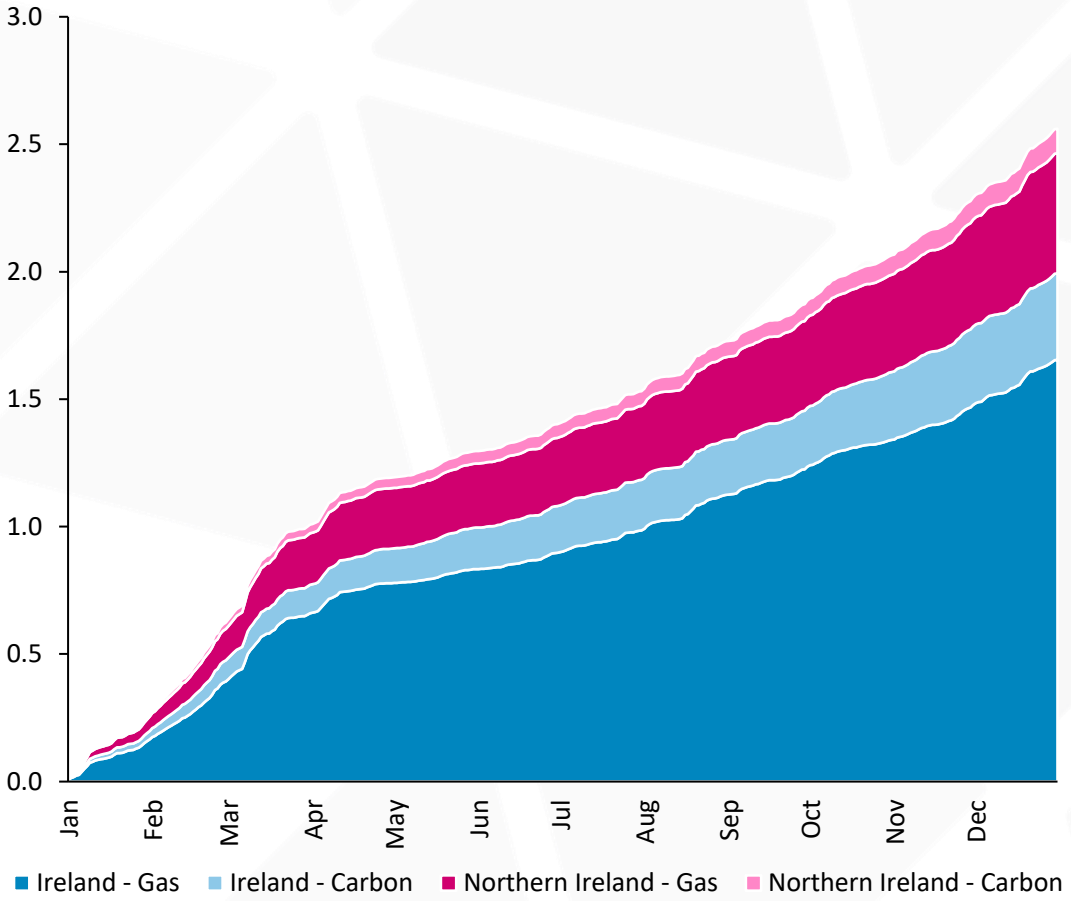
**Daily Total Savings |** January – December 2022

€m, nominal




**Cumulative Savings |** January – December 2022

€b, nominal



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| Key Results of our Analysis | Unit | Jan-22 | Feb-22 | Mar-22 | Apr-22 | May-22 | Jun-22 | Jul-22 | Aug-22 | Sep-22 | Oct-22 | Nov-22 | Dec-22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Day-Ahead Market Costs** | | | | | | | | | | | | | |
| Wholesale power price | *€/MWh* | 201 | 175 | 293 | 219 | 143 | 182 | 267 | 388 | 283 | 136 | 143 | 277 |
| NBP gas price | *€/MWh* | 79 | 77 | 123 | 66 | 37 | 50 | 90 | 147 | 94 | 40 | 50 | 103 |
| EUA carbon price | *€/t* | 85 | 91 | 75 | 81 | 86 | 84 | 82 | 89 | 71 | 71 | 76 | 87 |
| **Day-Ahead Market Schedule** | | | | | | | | | | | | | |
| All-island wind generation | *GWh* | 1,392 | 1,885 | 1,339 | 1,027 | 1,064 | 828 | 619 | 612 | 792 | 1,705 | 1,793 | 1,271 |
| Ireland demand | *GWh* | 2,852 | 2,705 | 2,856 | 2,643 | 2,645 | 2,537 | 2,591 | 2,600 | 2,574 | 2,761 | 2,855 | 2,960 |
| Northern Ireland demand | *GWh* | 964 | 837 | 858 | 716 | 673 | 622 | 628 | 668 | 680 | 736 | 839 | 904 |
| **Avoided Costs in Ireland** | | | | | | | | | | | | | |
| Displaced gas cost | *€m* | 165 | 228 | 267 | 118 | 55 | 63 | 89 | 139 | 110 | 105 | 137 | 177 |
| Displaced carbon cost | *€m* | 33 | 49 | 29 | 24 | 27 | 21 | 15 | 16 | 16 | 36 | 40 | 32 |
| Total cost saving | *€m* | 198 | 277 | 296 | 142 | 82 | 84 | 104 | 156 | 126 | 141 | 177 | 208 |
| **Avoided Costs in Northern Ireland** | | | | | | | | | | | | | |
| Displaced gas cost | *€m* | 56 | 66 | 80 | 35 | 15 | 16 | 22 | 35 | 29 | 27 | 38 | 52 |
| Displaced carbon cost | *€m* | 11 | 15 | 9 | 7 | 7 | 5 | 4 | 4 | 4 | 10 | 11 | 10 |
| Total cost saving | *€m* | 67 | 81 | 88 | 42 | 22 | 21 | 26 | 40 | 33 | 37 | 49 | 62 |
| Displaced gas cost | *£m* | 48 | 54 | 74 | 31 | 14 | 13 | 19 | 30 | 25 | 24 | 33 | 46 |
| Displaced carbon cost | *£m* | 10 | 12 | 8 | 6 | 7 | 4 | 3 | 4 | 4 | 8 | 10 | 8 |
| Total cost saving | *£m* | 58 | 66 | 82 | 37 | 21 | 17 | 22 | 33 | 29 | 32 | 43 | 54 |

 

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**Commissioned by Wind Energy Ireland**


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