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Role of gas in Ireland's energy system resilience

How does Ireland's energy system respond to low winds and cold weather?

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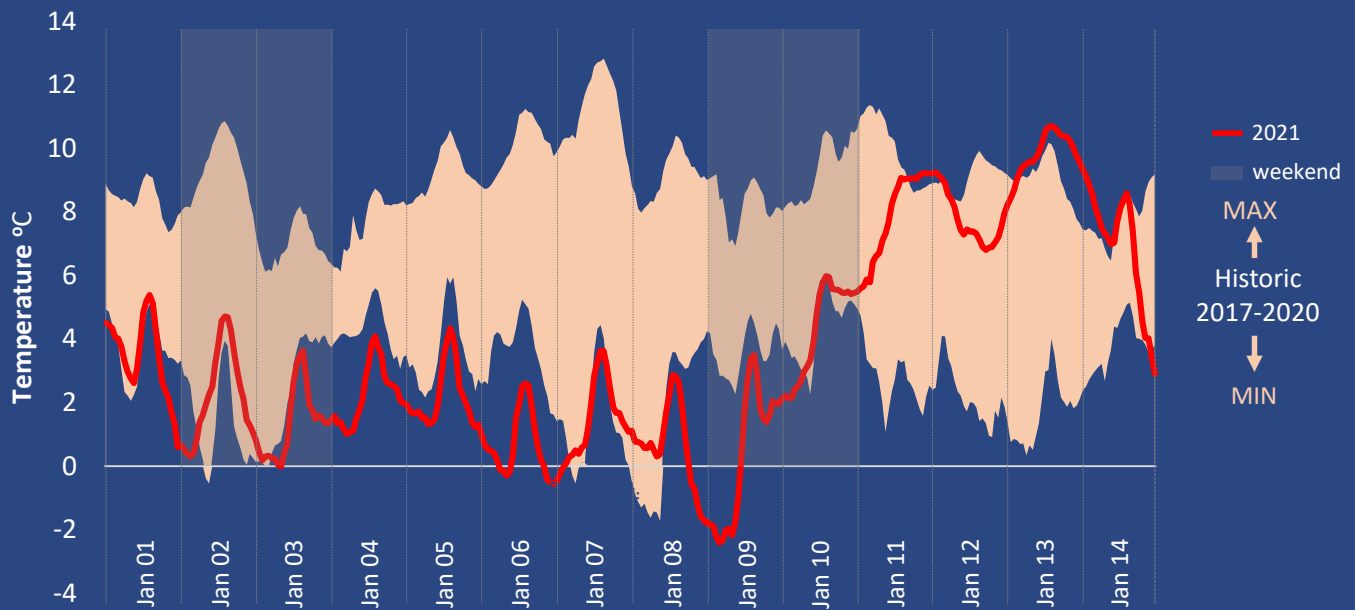




Ireland is currently world leading in integrating the highest levels of wind power into a synchronous power system. As Ireland further develops wind energy, this infographic raises valid questions about what happens when the wind is not blowing.

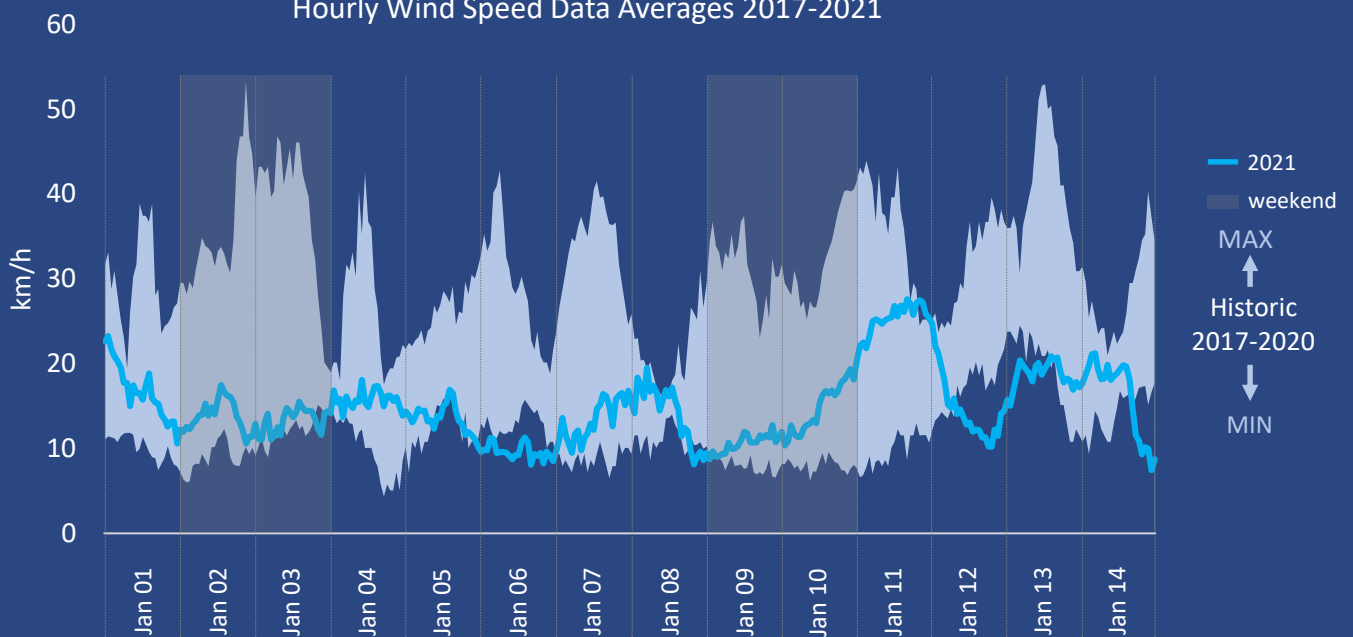
During the first two weeks in January 2021, Ireland experienced both low winds and cold weather. The power system responded by compensating for the low levels of wind power with increases in electricity generation from natural gas. In addition, the cold weather increased the demand for heating in our homes and the gas system was also able to provide sufficient increased heating.

Hourly Temperature Data Averages 2017-2021



Temperatures in early January 2021 were colder across Ireland relative to the same period for the last four years (2017-2020). This increased the demand for electricity until temperatures began to rise from Jan 9th.

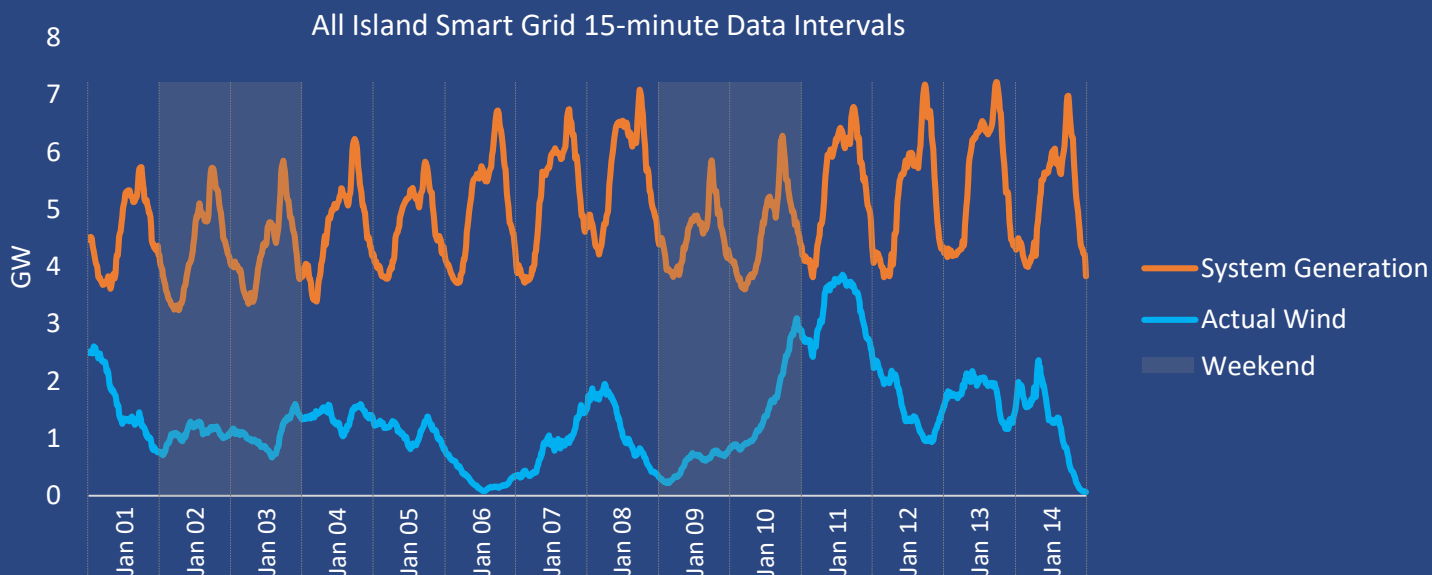
Hourly Wind Speed Data Averages 2017-2021



The cold also corresponded with low wind speeds across the country compared with previous years which affected the availability of wind generated electricity during this period.

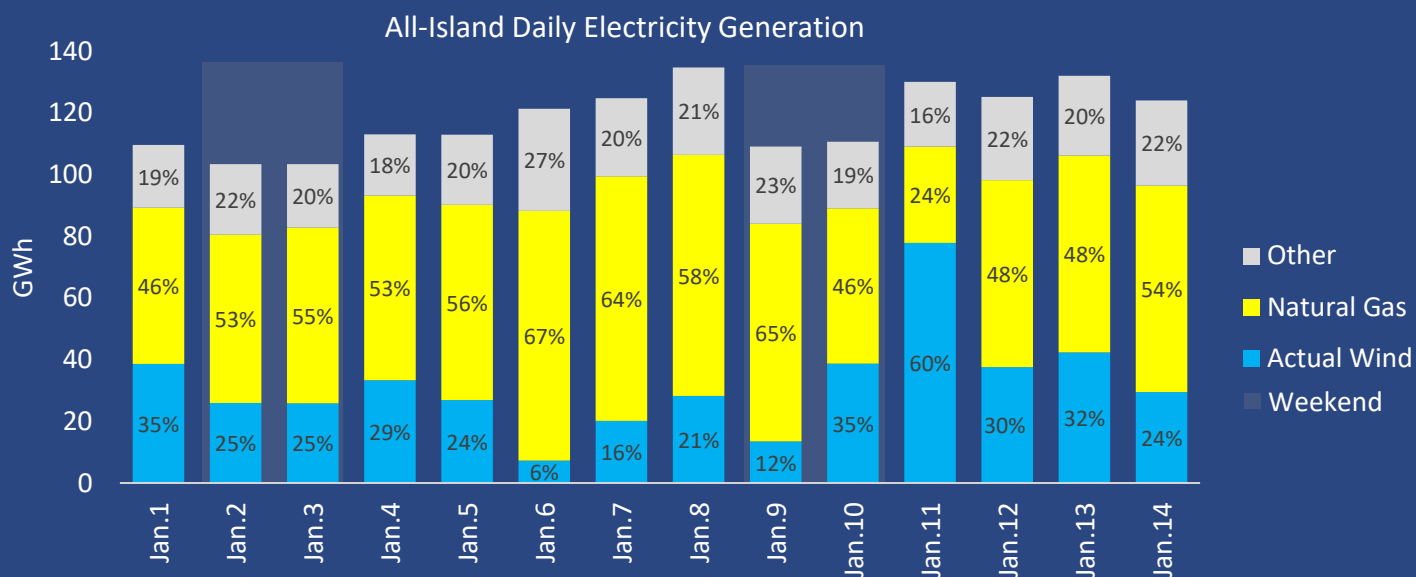


Ireland's energy resilience was tested and proved robust in responding to the cold weather combined with low wind speeds. Energy systems resilience is invisible to most and can be taken for granted until there is a shortage in supply or sharp rise in price. The failings in the electricity, gas and water systems in Texas demonstrate clearly the need for vigilance. As Ireland transitions to an energy system with increased electrification of heat and transport, coupled with increasing levels of variable renewable energy, it is essential that robust mechanisms are put in place to ensure continued energy system resilience.



During this two week period we observe record demands and generation of electricity due to a combination of weather conditions and other factors.

We saw significant variations in wind power, varying from 6% (7 GWh) of total system generation on January 6th to 59% (78 GWh) on January 11th for the All-Island system.

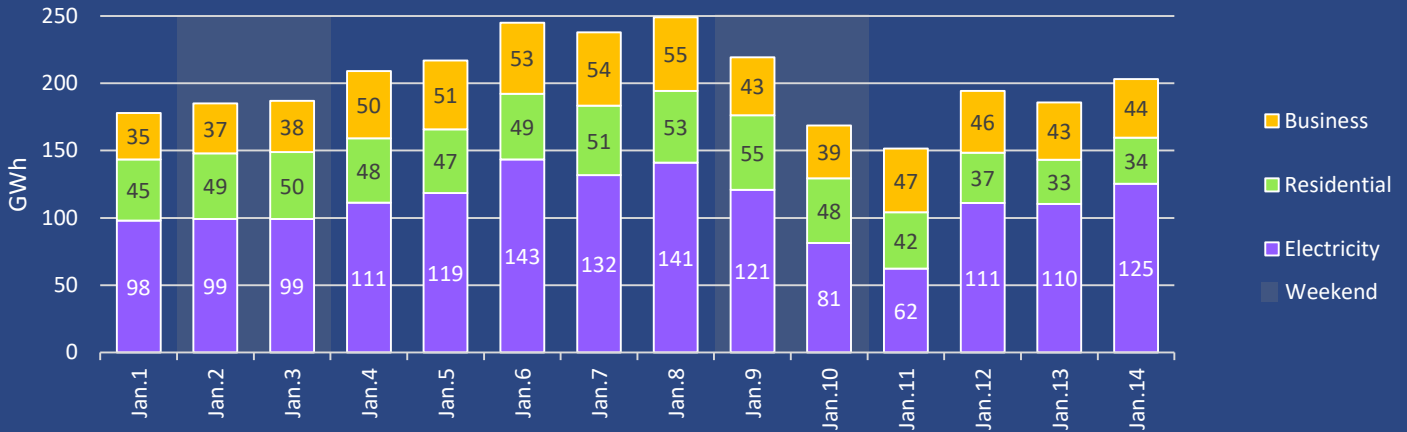


Natural Gas was the main source of power to balance out the variation in wind and meet the required demand levels. Electricity from natural gas varied from 67% (81 GWh) to 24% (31 GWh) over this period.

The electricity system demonstrated resilience in successfully meeting demand requirements despite the cold weather and wind variations.



Natural Gas Daily Usage

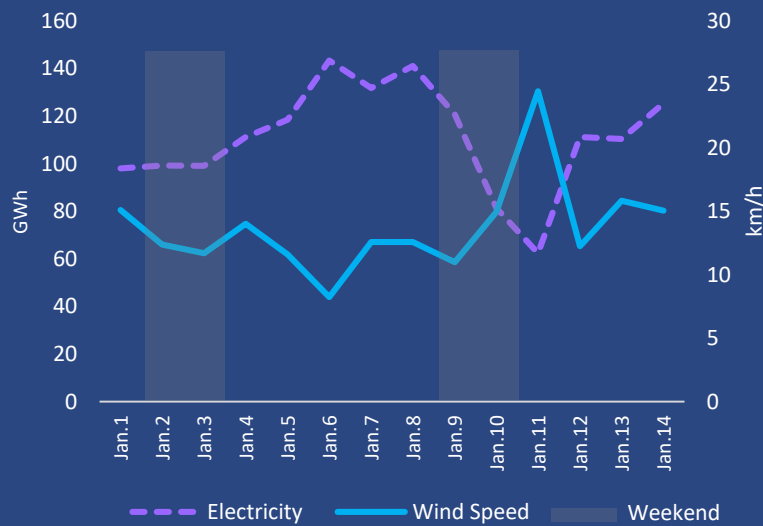


Natural gas is used to generate electricity and also to produce thermal energy for heat in buildings and in industry. Daily natural gas consumption in Ireland varied considerably from 151 GWh to 249 GWh over this two week period.

Gas usage for electricity generation varied between 62 GWh on Jan 11th to 143 GWh on Jan 6th, in response to high and low wind speeds respectively.

Gas usage for heating in the residential sector varied according to temperature changes, from 33 GWh on January 13th to 55 GWh on January 9th. The variations in gas usage for business are less weather dependent, the lowest occurring on New Years Day (35 GWh) and the highest on Friday January 8th (55 GWh).

Natural Gas Consumption for Power

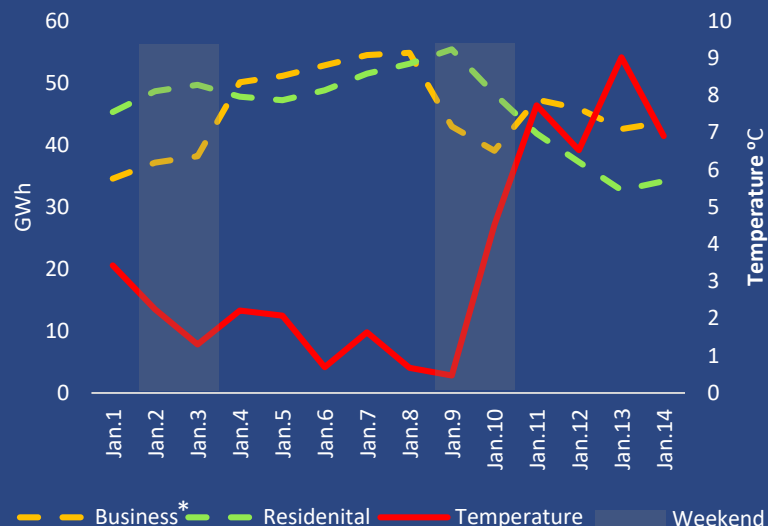


The variation in gas usage for electricity with wind speed is very apparent.

The need for electricity generated from natural gas decreases as the availability of electricity generated from renewable sources increases in line with wind speed increases.

We are grateful to Metostat, Eirgrid and GNI for providing the temperature, wind speed, (15 minute) All-Island smart grid and (daily) gas consumption data used in this infographic.

Natural Gas Consumption for Heat



The variation in natural gas consumption for home heating is heavily dependent on temperature as demand changes in cold conditions.

Gas consumption for space heating and process heat in manufacturing, commercial services and public services is dependent on economic activity with weekday and weekend variations clearly apparent.

*Business here consists of (Public & Commercial) Services and Manufacturing daily natural gas consumption.