

Smart Grid Dashboard

Carbon Clock User Guide

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1. Carbon Clock

Ireland and Northern Ireland are committed to becoming global leaders in our push for a greener energy future, which will be critical in combating the effects of climate change. The goal of this Carbon Clock is to make it easy for consumers to plan their energy usage on a day-to-day basis. Knowing the best time to use electricity will help reduce personal carbon footprints and contribute towards a greener energy future for the island of Ireland.

EirGrid Group publishes this carbon forecast in the form of a Carbon Clock on its Smart Grid Dashboard.

1.1 Using the Carbon Clock

On the Carbon Clock tab in the Smart Grid Dashboard, there will be two clocks showing the best and worst time to use electricity for the current day (*Figure 1*). The clock hands denote the current time.

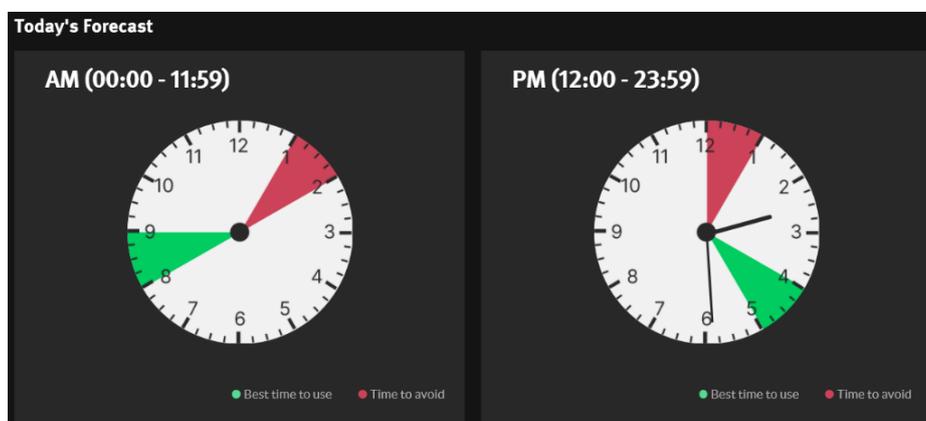


Figure 1 - Current Day Forecast

Looking at the clocks, there are various colour wedges that correspond with the specific times on the clock. These are extremely important:

- **Green Area** - This is the BEST time to use electricity. During this period, there is the lowest carbon intensity for electricity being used. We highly encourage people to use electricity during this period.
- **Red Area** - This is the WORST time to use electricity. The carbon intensity is at its highest during these periods. We encourage people to minimise electricity usage during this time, as it contributes the most to carbon emissions.
- **White Area** - This is an OKAY time to use electricity. During these periods, electricity is at a moderate carbon intensity. If possible, it would be better if you could defer your usage to the green area periods.

Tomorrow's CO₂ forecast appears from 3-6pm today. This is visualised with the four clocks seen in *Figure 2*. The two top clocks show today's forecast while the bottom two show tomorrow's forecast. At the end of the current day (circa midnight), the bottom two clocks will become

today's forecast, replacing the top two clocks. From here, the process repeats with tomorrow's forecast appearing around 3-6pm again. Note there is a period from 22:30-23:00 where data is unavailable. This is because the LTS operates on CET (where it would be 00:00) which is an hour ahead of IST.

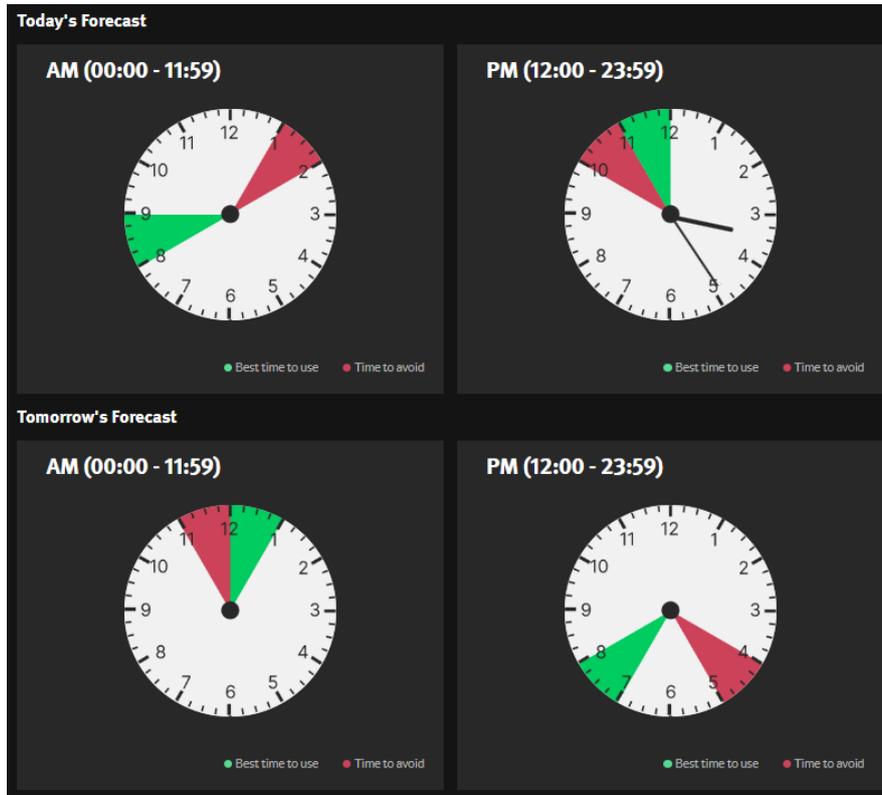


Figure 2 - Today and Tomorrow Forecast

2 Calculation of CO₂ Values

Through the Smart Grid Dashboard, an estimate of CO₂ production from electricity generation in Ireland and Northern Ireland is frequently updated. These emissions are also presented as a CO₂ Intensity which is the amount of CO₂ per unit of electricity demand. The CO₂ Intensity is a key piece of data that helps the Carbon Clock decide what times are best for electricity use.

The CO₂ intensity forecast is based on the scheduled output of the generation and forecast demand. This is based on the Long-Term Schedule (LTS) produced by the control rooms in Ireland and Northern Ireland. This gets frequently updated throughout the day as conditions on the system change. The forecast schedules are published on the SEMO website - [here](#).

In the CO₂ tab of the original SGDB, only historical data for CO₂ intensity in 15-minute intervals was provided. However, with the introduction of the “Carbon Clock” and the aim of providing users with transparent information on energy usage, it was deemed necessary to provide users with a CO₂ forecast for the day. The day's historical data can be seen by highlighting the green line and works in 15-minute intervals. The CO₂ forecast for the day can be seen by highlighting the yellow line and works in 30-minute intervals. Note there is a period of time between the green and yellow lines where no data is available as it is close to real time and the data still needs to be processed.

2.1 What's Included in These CO₂ Values

The important variable that indicates the severity of CO₂ being produced is CO₂ intensity. CO₂ intensity normalizes the emissions of power stations per unit of electricity generated (gCO₂/kWh). To calculate this, the total CO₂ production must first be totalled.

The CO₂ emissions that are counted only relate to electricity generation from all large-metered power stations. The generated megawatt (MW) output of each generation unit is taken and is converted to fuel energy output in gigajoules (GJ). The fuel energy output (GJ) is then converted to the CO₂ produced depending on each fuel type. Finally, to calculate the total system CO₂ production from all generated energy, the CO₂ emissions from the individual power stations are all added together.

With the total CO₂ emissions from the system, the CO₂ Intensity is then calculated as:

$$CO_2 \text{ Intensity} = \frac{CO_2 \text{ Production}}{System \text{ Demand}}$$

Where System Demand is defined as the following

$$System \text{ Demand} = System \text{ Generation (All Local Generation)} - Exports + Imports$$

2.2 Carbon Intensity Forecast

The forecast CO₂ intensity is calculated using the same methodology as the CO₂ intensity with CO₂ production for each forecasted timeslot (*t*) calculated using the scheduled MW output of each generator for that timeslot.

$$CO_2 \text{ Production}_t = \sum_{Power \text{ Stations}} CO_2 \text{ generating station},t$$

$$CO_2 \text{ Intensity}_t = \frac{CO_2 \text{ Production}_t}{System \text{ Demand}_t}$$

Actual CO₂ intensity, calculated on the actual output of generation on the island, can be found in the CO₂ tab left of the carbon clock on the Smart Grid Dashboard.

2.3 Interconnection

CO₂ emissions from other countries are not included in these calculations. Imported electricity is considered as zero carbon from Ireland's perspective as emissions are counted in the jurisdiction in which they are emitted.

2.4 Open Data Licence

The terms and conditions of the EirGrid Open Data Licence are available at <http://www.smartgriddashboard.com/#all/open-data-licence>

2.5 Contact Us

For any suggestions, comments, or queries, please contact info@eirgrid.ie or info@soni.ltd.uk.

NOTE: The purpose of this User Guide is to offer transparent detail on the carbon intensity forecast. The information within is subject to change and may be updated accordingly.