

Improving Accuracy in Electrical Carbon Calculations: In Depth Review

During research and development on guarantees of origin and different figures available for the carbon content of electricity, several different documents from both Irish and EU bodies were reviewed. Below, key findings from the most important literature is laid out to aid any members of the EcoMerit community how we arrived at the conclusion to no longer accept CRU figures for the carbon content of electricity and use the SEAI figures instead.

A note on carbon content figures

Firstly, note that all the figures of carbon content of electricity are averaged throughout the course of the year. We will match each year's average with the respective yearly electricity bill of our members. The actual carbon content is subject to large variations (between extremes of around 200 to 600 gCO₂/kWh) depending on time of day, demand for electricity, amount of wind-electricity on the grid as well as other factors. Quarter hourly intervals of carbon content of electricity are available on the Smart Grid Dashboard site ([EirGrid Group plc - Smart Grid Dashboard](#)). For simplicity, the average is used as to try and match it in real time would require a local smart meter on site, and it also does not make a huge difference to the overall carbon content of electricity (unless there is a large electrical manufacturing onsite).

EU – Article 19 of Directive 2018.2001

This is the source document from the EU that lays out the purpose of guarantees of origin. It is quite lengthy. When the CRU were questioned by EcoMerit on their use of guarantees of origin in calculating the average carbon content of electricity, they quoted the following segments of Article 19.

“1. For the purposes of demonstrating to final customers the share or quantity of energy from renewable sources in an energy supplier's energy mix and in the energy supplied to consumers under contracts marketed with reference to the consumption of energy from renewable sources, Member States shall ensure that the origin of energy from renewable sources can be guaranteed as such within the meaning of this Directive, in accordance with objective, transparent and non-discriminatory criteria.” – In essence, a guarantee of origin is to show to the end consumer how much of their electricity (in this specific context, you can also get guarantees for heating from renewable sources) comes from renewable sources.

“8. Where an electricity supplier is required to demonstrate the share or quantity of energy from renewable sources in its energy mix for the purposes of point (a) of Article 3(9) of Directive 2009/72/EC, it shall do so by using guarantees of origin [...]” – Backing up their right to use guarantees of origin in calculating the carbon content of electricity

“9. Member States shall recognise guarantees of origin issued by other Member States in accordance with this Directive [...]” – Backing up their right to use guarantees of origin in calculating the carbon content of electricity

In our response the CRU, we pointed out the following excerpt from Article 19.

“2. The guarantee of origin shall have no function in terms of a Member State's compliance with Article 3. Transfers of guarantees of origin, separately or together with the physical transfer of energy, shall have no effect on the decision of Member States to use statistical transfers, joint projects or joint support schemes for compliance with Article 3 or on the calculation of the gross final consumption of energy from renewable sources in accordance with Article 7” - It is EcoMerit's understanding that this means you cannot use GOs to cover for how green a country's electricity supply is, or to try and shirk a countries duty to reduce its carbon footprint. EcoMerit would then argue the point that as the CRU figures show the average CO₂ intensity across Ireland, you are no longer looking at individual's green supply, and that they should not be used for a country wide measure of CO₂ intensity.

Article 19 goes on further to say that the distance between the place where the electricity was produced and the time it was produced at relative to the place where the electricity was claimed to be used and the time that it was claimed to be used at should be ignored, so long as the location it was claimed to be used in was within the EU and the time it was claimed to be used at was within one year of the generation of electricity. EcoMerit disagrees with this concept, as laid out in our official policy documentation, which is attached to the same email this was received in.

CRU – 2019 Fuel Mix Disclosure

This report was used to understand exactly how the CRU calculate their carbon intensity of electricity. As seen from the following excerpts, they use guarantees of origin to increase the amount of perceived energy from renewables, as well as to remove produced CO₂ from various companies' carbon accounts

Page 7

“After taking into account the electronic certificates known as Guarantees of Origin (see later), the calculated Fuel Mix Disclosure figures for an individual supply company presents a higher percentage share of renewable electricity than otherwise would be shown if it was based solely on the actual physical electricity generated from renewable sources.” – shows that the use of GOs to increase the amount of renewables that are perceived to be on the grid, despite the physical generated electricity coming from non-renewable sources in Ireland.

Page 11

“we note that all figures here include GOs and not only the metered electricity produced by generators in Ireland” – confirms that they use GOs in calculating the all island mix of electricity to offset the sources of the actual electricity produced by Irish generators.

Page 13

“These values are then used in the calculation of the average All-Island CO₂ emissions intensity and in each individual supplier's CO₂ emissions intensity which take into account both indigenous generation in the SEM and supplier claims (i.e. generation attributes, GOs/REGOs and PSO-supported generation)” – proof of the use of GOs to offset carbon produced by Irish generators.

SEAI Renewable Energy In Ireland 2020

This report was used to understand exactly how the SEAI calculate their carbon intensity of electricity. As seen from the following excerpts, they do not use guarantees of origin at all in their

calculation of carbon content of electricity. Nowhere in the document do the word “guarantee of origin” appear.

Page 14

“The methodology used to calculate the fossil fuels displaced by renewable energy is described in Appendix 2. The main assumptions are as follows:

- *Renewable hydro and wind electricity generation displace electricity production from natural gas, which is assumed to be the marginal fossil fuel generator. We further assume that wind-generation results in a 5% increase in the energy intensity of the remaining fossil fuel electricity generation mix, due to cycling and ramping effects.*
- *Biomass used for electricity generation in combined heat and power plants (CHP) is assumed to displace electricity production from gas, as the marginal generator.*
- *Biomass used for heat generation in CHP is assumed to displace heat from oil-fired boilers.*
- *Biomass used for co-firing with peat was assumed to displace peat up until 2015, when Public Service Obligation support for peat ended. From 2016 electricity generated from burning biomass is assumed to displace electricity generated by natural gas.*
- *Renewable heat energy is assumed to displace heat energy from oil-fired boilers. The exception is the use of solid biomass in the wood processing industry. In this case we assume that the biomass used does not displace fossil fuel, as biomass has traditionally been used for heat in this sector. This is significant because solid biomass used in the wood processing industry accounted for 58% of all renewable heat energy in 2017.*
- *Renewable liquid biofuels used for transport (biodiesel and biogasoline) displace diesel and petrol.*
- *For combustible renewables, such as solid biomass and liquid biofuels, we use the standard carbon dioxide accounting rules that are used to calculate Ireland’s greenhouse gas emissions targets. Therefore, as long as a biofuel meets the minimum sustainability requirements set out in the RED, it is counted as zero carbon at the point of combustion.”*

– lays out all of the assumptions that the SEAI make when calculating the carbon content of electricity. It is described as *“the fossil fuels displaced by renewable energy”* because they are calculating the reduction of carbon content of electricity year on year and have to assume what fossil fuel is being removed from the grid when a new renewable is added to the grid. It is unrealistic to assume that any renewable is offsetting peat for example, as peat is the most carbon intensive fuel on the grid. That is why the above assumptions are made for what fossil fuel would be burning instead of a renewable that has been placed on the grid.

Note that guarantees of origin are not mentioned.

EcoMerit do have some thoughts on the way that the SEAI calculate the offsets, such as if they account biodiesel and biopetrol as “carbon neutral” fuel sources, or the minimum sustainability requirements set out in the RED (Renewable Energy Directive). However, as this document pertains primarily to GOs, they are not set out in full here. As further research is undertaken on these assumptions, our stance may change in the future.

[EPA – Ireland’s Environment: An Integrated Assessment 2020](#)

This document is reviewed just to show the reader what the exact break up of electricity generation looks like on average throughout the year.

Page 313 – the below table shows (in the second column) shows the percentage total of generated electricity by its source for the year of 2018. You can see that wind only makes up 28% and hydro power 2.2% of the total produced electricity in Ireland, with the rest coming from carbon-producing fuels.

Table 12.2 Breakdown of energy by electricity generation and use in 2018 (Source: SEAI)

| ELECTRICITY GENERATION | INPUT | GENERATED | LOSSES |
|------------------------|---------------------------|--------------------------|--------|
| Total energy | 191,086GJ (53,079 MWh) | 91,565GJ (25,435 MWh) | |
| Hydropower | 1.3% | 2.2% | |
| Biogas | 6.7% | 3.8% | |
| Wind | 16.3% | 28.0% | 52% |
| Fossil gas | 53.9% | 51.8% | |
| Coal | 10.7% | 7.0% | |
| Peat | 10.3% | 6.8% | |
| Oil | 0.8% | 0.5% | |

Page 315

“Losses in electricity generation, transmission and processing made up about 50 per cent of the total energy consumed in electricity generation” – just to show that there are significant losses due to transmission that GOs do not account for. Transmissions and processing are by far much smaller losses than the losses in generation, but they should be accounted for and are ignored by guarantees of origin.