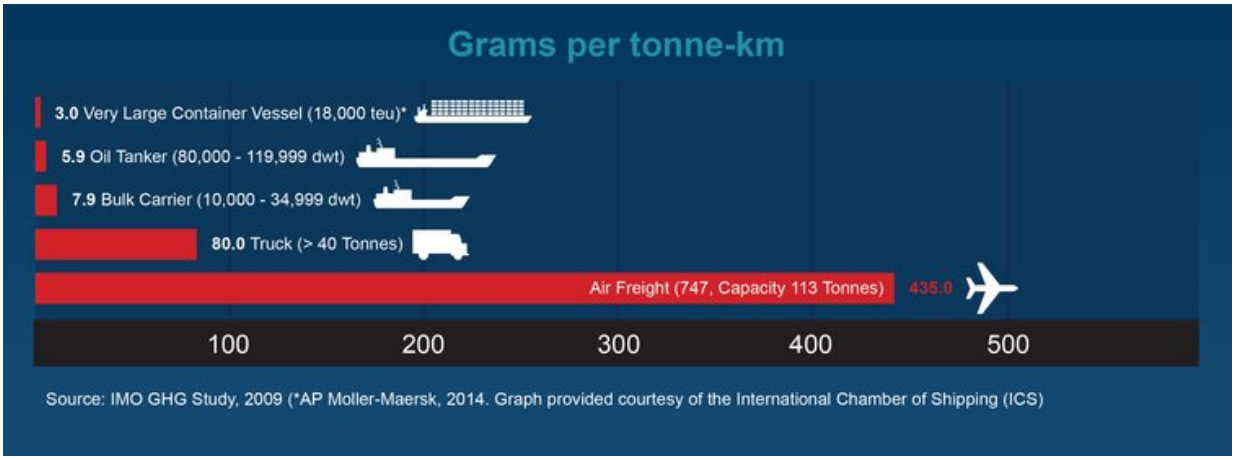
Should Ireland fuel its power stations with wood shipped from Australia?

November 12 2019, by Dylan Ryan



Carbon emissions by transport method. Credit: International Chamber of Shipping, https://www.ics-shipping.org/docs/co2

In Ireland, there has recently been some controversy over a proposal to transition a number of the country's dirtiest power stations away from burning peat bogs, which emits even more carbon than coal. Instead, the plan is to burn "biomass" – that is, wood. However, because Ireland has relatively little forestry, there is not enough wood available to meet demand. That's why Bord na Mona, a semi-state body that manages several peat burning power plants, proposed to source the wood from Australia.

This angered conservation groups, who pointed to the very high carbon footprint of hauling timber all the way from the other side of the world, just to burn it for electricity. And over the summer Irish planning authorities refused permission for one peat-burning power plant in County Offaly to be converted to biomass, putting the plans on hold.

Burning Australian wood in Ireland does indeed sound daft, at first. But the true carbon footprint isn't always as straightforward as it would seem at first glance (just look at how, for example, cutting plastic packaging can sometimes lead to more food spoiling and thus higher carbon emissions, or how cotton or paper bags can sometimes work out worse than a plastic bag). Therefore, since Bord Na Mona has been slow to release details on the potential carbon emissions, I thought it would be useful to try and estimate them myself.

First I want to clear up one thing: burning trees doesn't necessarily count as emissions. Though trees are made of carbon, if at least one is planted for every one cut down then the overall amount of carbon in the atmosphere should remain roughly neutral.

There are many other sources of carbon emissions related to forestry though, including land use changes, forest management or processing of the wood after harvest. But in this particular case, the main source of carbon emissions would be transport.

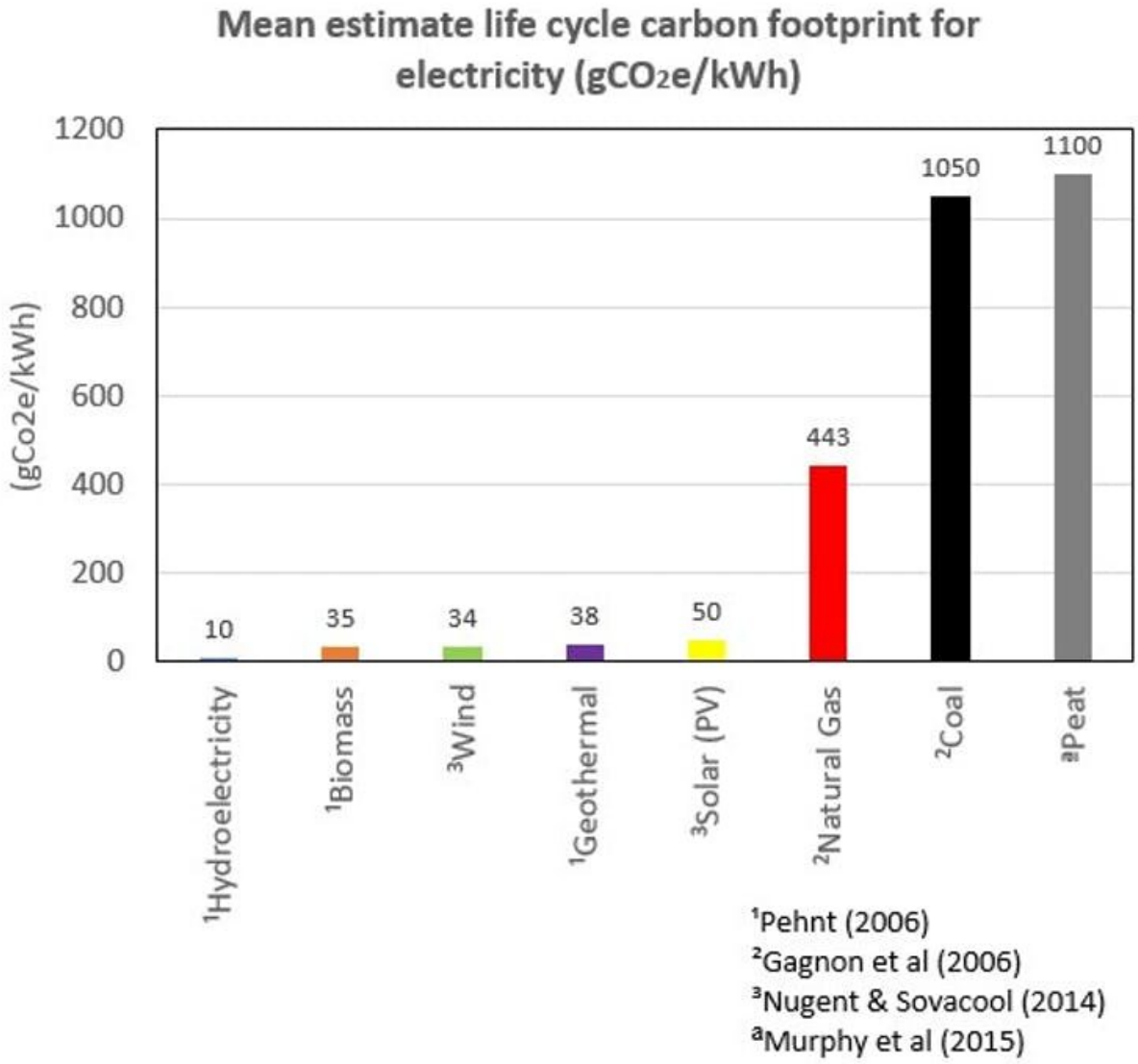
Calculating the footprint

To make the calculations simple, let's assume a shipment of exactly 1,000 tonnes of logs from Australia to Ireland, a distance of about 21,000km by sea. We'll also assume another 500km by lorry to and from the port. The carbon footprint of a cargo ship depends on the type of ship, fuel used, route, speed, and so on, but for a bulk carrier it works out to about 8 grams of CO_2 per km per tonne of cargo.

For trucks it varies between 40 to 90 grams, but 55 grams per km per tonne would be a reasonable estimate. Do the maths and that works out at 168 tonnes of CO_2 emitted by the ship, and 27.5 tonnes by truck, giving a combined total of 195.5 tonnes of CO_2.

Whether these emissions are worthwhile depends on how much energy the timber contains, and that depends on the type of wood and its moisture content (wood absorbs water, making it heavier and less energy dense). A fast growing and moderately wet hardwood such as eucalyptus has an energy content of 3,500 kilowatt hours per tonne. We then have to assume the power plant will lose around 70% of all that energy (mostly as heat) when burning it to make electricity.

What this means is 1,000 tonnes of eucalyptus will yield around 1.05m kilowatt hours of electricity (the full calculation is at the end of the article). And when you take the total carbon emitted in transporting those logs to Ireland, and divide it by that total electricity generated, you get a carbon footprint of 186 grams of CO_2 per kilowatt hour.



The carbon footprint of electricity from selected sources. Credit: Nugent & Sovacool, 2014

It is worth emphasising that there is considerable sensitivity in these estimates. If any of the key variables change—if the distance to port increases, if we use a different type of wood with less moisture, and so on—it can have a big impact.

By comparison, the carbon footprint of importing biomass from North America to the UK has been estimated at 122 gCO_2/kWh. One 2014 study found that a more conventional biomass operation using locally sourced timber would have a footprint of 30 gCO_2/kWh, compared to 34 gCO_2/kWh for wind and 50 gCO_2/kWh for solar.

(Almost) anything is better than peat

So hauling biomass such a long distance doesn't look like a great idea. However, the carbon footprint of peat is at least 1,100 gCO_2/kWh, nearly five times higher, and coal is very similar. And even these figures ignore the enormous environmental destruction that comes from peat extraction or coal mining.

So the critics certainly have a point—bringing wood from Australia is indeed considerably worse than any other renewable option. But it's still better than burning peat and destroying more of Ireland's diminishing bog lands. Yes, the country could develop other sources of biomass such as agricultural or municipal waste, or fast-growing crops like willow or hemp. But factories take time to build and trees or crops take time to grow, and nobody is going to develop such resources if demand for the fuel simply isn't there.

This is the reality of sustainability: we are often faced with trade offs between least worst options. In fact, Ireland will soon face an even bigger decision. Moneypoint, a coal burning power station and the country's single largest source of carbon emissions, will hit the end of its service life in 2025 and there is a big question mark about what's going to replace it.

Ultimately, there is no perfect solution to climate change. If there was, we'd have already implemented it. Options need to be carefully evaluated, for the devil is truly in the detail and small tweaks to a process

can potentially lead to big changes in carbon emissions. This also shows the importance of long-term planning. After all, had the unsustainable nature of peat burning been acknowledged decades ago, we'd not be in this situation.

The full calculation:

Total generated from 1,000 tonnes of eucalyptus logs: 1,000 tonnes x 3,500 kilowatt hours per tonne = 3,500,000 kwh x 0.3 (because the other 70% is lost and not converted to electricity) = 1,050,000 kwh

Transport emissions: 195.5 tonnes of CO_2 are emitted in transporting 1,000 tonnes of logs from Australia to Ireland, or 195,500,000 grams.

Divide the carbon emissions by the generated electricity to get a carbon footprint of 186 gCO2/kWh (195,500,000 / 1,050,000 = 186)

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