

CANADA'S WOOD PELLETS

COMPARING GHG EMISSIONS

Canada-Japan Greenhouse Gas Study

Over the next five years, it is estimated that the demand for wood pellets will increase 40 percent to nearly 51 million metric tonnes per year. The growing demand is driven in large part due to countries around the world seeking ways to meet ambitious climate targets in the face of an ever-warming planet.

END-TO-END GHG STUDY: FIRST OF ITS KIND RESEARCH



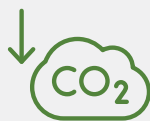
17 PELLET PLANTS



END-TO-END
TRANSPORTATION



3 PORTS



91.1 PERCENT LESS
EMISSIONS THAN COAL

In Japan, Prime Minister Yoshihide Suga declared that the nation will aim for net zero greenhouse gas emissions by 2050. This means revising Japan's policy on coal-fired power plants and establishing a platform for national and regional governments to achieve decarbonization.

Over the next decade, through its Renewable Energy Directive, the European Union hopes to reduce GHG emissions by 55 percent and increase its use of renewable energy to 27 percent. One of the goals of the program as it relates to biomass is to deliver optimal GHGs savings compared to fossil fuels.

However, not all biomass is created equal and steps are being taken to ensure biomass is delivering on its promise to displace coal and fossil energy with an immediately available and renewable fuel source.

DELIVERING TRANSPARENCY

With the second largest land mass in the world and as one of the leading global suppliers of forest products, Canada is well-positioned to offer global customers a responsible energy product. However, delivering on that commitment requires transparency, including demonstrating the environmental credentials of our energy products with science and data.

For several decades now, Canada has demonstrated a strong commitment to sustainability with some of the most stringent forest regulations in the world, all backed by third party global forest certification standards.

On top of this, WPAC members are committed to using only waste material and low grade by-products from sawmilling and forest harvesting activities.

Today more than 90 percent of all of Canada's wood pellets are exported; with the nearest Asian customer, Japan, nearly 4600 nautical miles away. Customers, as end users, are already tracking and reporting their GHG emissions.

The question is how do Western Canada's wood pellets compare to coal when it comes to emissions savings?



SEA DISTANCE:
ALABAMA – JAPAN: 9,491 NAUTICAL MILES
VANCOUVER – JAPAN: 4,619 NAUTICAL MILES
PRINCE RUPERT – JAPAN: 4,186 NAUTICAL MILES

With data contributed by WPAC members and with funding from the federal government, WPAC engaged Laborelec to examine wood pellets versus coal in respect to total GHG emissions.

Laborelec is a global research and solutions organization that supports and accelerates efforts to transition towards a carbon-neutral world through reduced energy consumption and more environmentally-responsible solutions. Laborelec

belongs to Engie, who are amongst the world’s largest power generating companies.

Working with Laborelec’s Chief Technical Officer, Yves Ryckmans, WPAC collected data from its member wood pellet producers and landed on a single calculation methodology. Third party audited GHG reports for each of the 17 plants and the most widely accepted default values (gCO₂/MJ) from the European Union’s Joint Research Centre were used.

THE FOLLOWING EMISSIONS CALCULATION FORMED THE BASIS OF THE WORK:

$$E = e_{ec} + e_1 + e_p + e_{td} + e_u - e_{sca} - e_{ccs} - e_{ccr'}$$

- E** = total emissions from the production of the fuel before energy conversion

e_{ec} = emissions from the extraction or cultivation of raw materials

e₁ = annualised emissions from carbon stock changes caused by land-use change

e_p = emissions from processing

e_{td} = emissions from transport and distribution

e_u = emissions from the fuel in use

e_{sca} = emissions savings from soil carbon accumulation via improved agricultural management

e_{ccs} = emissions savings from CO₂ capture and geological storage

e_{ccr'} = emissions savings from CO₂ capture and replacements

PUTTING IT ALL TOGETHER

For the purposes of the study, the supply chain calculations for all 17 mills were collected and produced a combined weighted average for all biomass producers contributing to bulk exports from Western Canada. The results showed that wood pellets fired in Japan produced only

8.37 percent of the GHG emissions produced by coal (more than a 91 percent reduction). Wood pellets from the Southern US State of Alabama, a much longer sea journey, still only produced 20.08 percent of the emissions produced by coal (nearly an 80 percent reduction).

SEA VESSEL ROUTE	gCO ₂ /MJ PELLETS HANDYSIZE	gCO ₂ /MJ COAL HANDYSIZE	PELLET GHG REDUCTION OVER COAL
Western Canada > Japan	9.40	112.30	91%
Alabama > Japan	22.55	112.30	80%

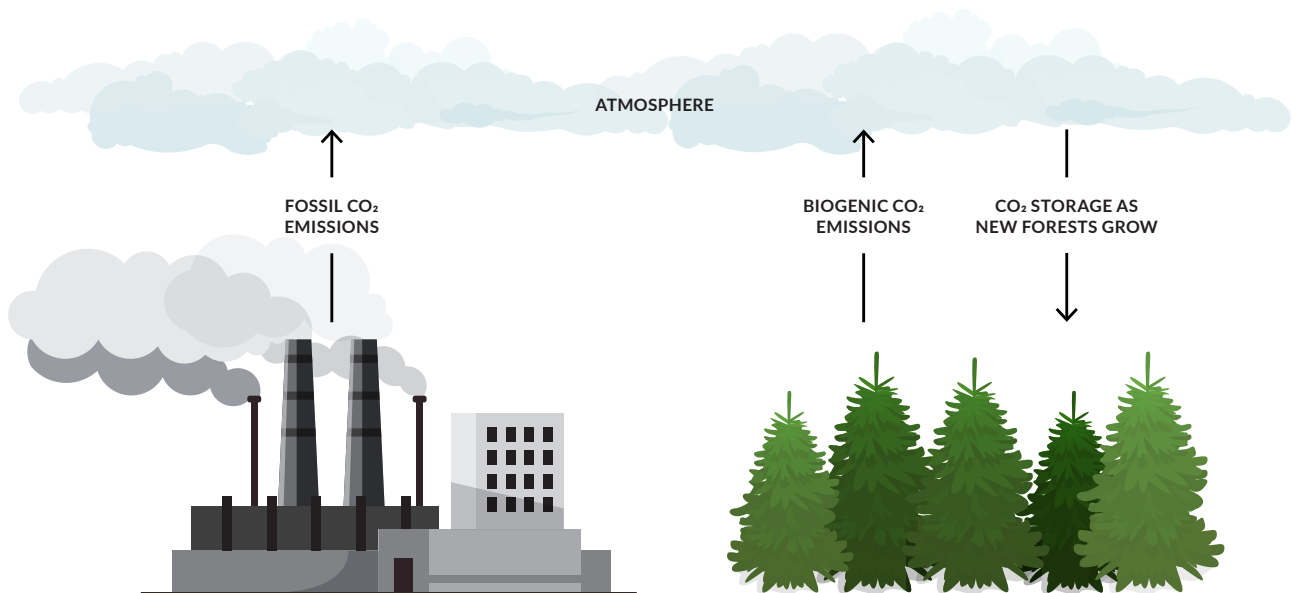
IN THE BIG PICTURE

The study provides credible data to support the ongoing demand for wood pellets. While both fossil fuels such as coal and biological materials like wood pellets emit carbon dioxide (CO₂), it's ultimately the source of that CO₂ which determines the impact it will have on the atmosphere.

Coal is a very efficient fuel, in that it provides more energy per kilogram than biomass, but it is not a renewable fuel. Coal is mined from carbon sinks that took millions of years to form, so when it is burned to produce energy it increases the total amount of CO₂ and other potent GHGs in the atmosphere.

Energy made from woody biomass comes from burning carbon drawn out of the atmosphere by trees within the last 150 years; much of the carbon from those trees remains locked in long-life forest products, such as lumber or mass timber.

Western Canada's government oversight of forest management activities ensures harvested areas are reforested and newly-planted trees start drawing in CO₂ from the atmosphere, most within a year or two of harvesting. Those factors make woody biomass a renewable energy source and an important alternative in the transition away from fossil fuels.



Based on analysis of: Natural Resources Canada, Canadian Forest Service. (2020). State of Canada's Forests 2019 Annual Report. <https://cfs.nrcan.gc.ca/pubwarehouse/pdfs/40084.pdf>

NEXT STEPS

The study confirms that regardless of the length of the journey, when it comes to GHG emissions, bioenergy from wood pellets is the winner hands down. While wind and solar power remain important solutions in our efforts to tackle climate change, wood pellets provide an immediate and reliable form of energy on demand that supplements the intermittent wind and solar renewable sources and provides much needed stability to the electrical grid.

WPAC and its members are completing a more detailed technical report on this important study, which will be released in the coming months. This data will provide important information for global energy producers, their stakeholders, and regulators who are still developing sustainability criteria for biomass energy generation.

For more information, watch the [presentation](#) on this study by Joseph Aquino, Director of Sustainability at Drax Group.

The data was then pulled together in categories applicable to the supply chain. Below are example calculations from one of the 17 mills used in the study:

e_{ec}	DEFAULT VALUE gCO ₂ /MJ	gCO ₂ /MJ PELLETS	PROPORTION FEEDSTOCK
Forest harvesting/residues including stemwood/logs	1.7	0.38	22.2%
Forest residues excluding stemwood	0.3	0.02	6.7%
Sawmill residues	0.3	0.21	71.1%
TOTAL CARBON EMISSIONS FROM HARVESTING		0.610	

e_p	DEFAULT VALUE gCO ₂ /MJ	gCO ₂ /MJ PELLETS	PROPORTION FEEDSTOCK
Diesel	95.1	0.438	83.12
Propane	78.06	0.019	4.49
Natural gas	66	0.000	0.00
Electricity - British Columbia	3.6	0.114	573.04
Biomass fuel used for drying: forestry/harvesting	1.90	0.380	3604.97
Biomass fuel used for drying: transport	3.60	0.719	3604.97
Biomass fuel used for drying: non CO ₂ combustion emissions	0.50	0.100	3604.97
TOTAL GHG EMISSIONS PROCESSING		1.771	11475.55

e_{td}	DEFAULT VALUE gCO ₂ /MJ	gCO ₂ /MJ PELLETS
Diesel	95.1	1.409
Power	3.6	0.000
Heavy Fuel Oils	94.2	3.890
TOTAL EMISSIONS TRANSPORT		5.298

e_u	DEFAULT VALUE gCO ₂ /MJ	gCO ₂ /MJ PELLETS
Non CO ₂ emissions at the power plant	0.30	0.300