



7 January 2020

Hon. Ranj Pillai,
Minister of Energy Mines and Resources

and

Hon. Pauline Frost
Minister of Environment
Government of Yukon
Box 2703
Whitehorse, YT Y1A 2C6

Re: Promotion of Biomass Energy supply in the Government Draft Strategy for Climate Change, Energy, and a Green Economy: *Our Clean Future*.

Dear Ministers Pillai and Frost,

The Yukon Territorial Government is currently promoting the combustion of wood biomass as a “clean” source of energy in its recently publicized Draft Strategy for Climate Change, Energy and a Green Economy: *Our Clean Future*. As scientists with Wildlife Conservation Society Canada¹ we are writing to bring forward a more thorough understanding of the science regarding biomass combustion, and argue that its promotion is not a good public policy option.

Overall, WCS Canada understands, based on the scientific evidence, that the expansion of energy production through wood burning (biomass energy) would work against the highest priority policy for climate change mitigation, reduction of carbon emissions. This is because wood combustion is not a low-carbon source of energy. The draft *Our Clean Future* document includes frequent assertions that biomass energy is “low-carbon”, being lumped with wind, solar, and hydro power as a valid alternatives to burning fossil fuels. It also repeatedly promotes increased burning of wood for space heating in private and public buildings (Actions 45 and 47 through 52). However, if increased through government incentives, biomass heating and energy production will produce long-term, net increases to Yukon’s carbon footprint making it more difficult to reach net-zero carbon emissions by 2050. Further, a

¹ WCS Wildlife Conservation Society Canada is a non-profit, charitable organization working at a national scale in Canada. Our mission is to save wildlife and wild places through science, conservation action, and inspiring people to value nature. WCS Canada scientists have been working in Yukon since 2004 on land use and protected areas planning, land and water management, and wildlife conservation research and policy applications.



substantive expansion of the biomass industry would threaten the intactness of Yukon's forest landscapes which have large current value for climate mitigation because they are absorbing and storing large volumes of carbon annually, and because they are the habitats that wildlife will use to adapt to climate change. We explain our reasoning in more detail in the following.

The carbon cycle context. The scientific consensus is that overheating of the atmosphere is caused by large increases in greenhouse gases, especially carbon dioxide². During most of human evolution until the industrial revolution, carbon dioxide concentrations in the atmosphere ranged between 180 and 300 parts per million. They are now around 410 ppm and have been increasing fast in parallel with our massive burning of fossil fuels³. It is clear that absorption of carbon dioxide in the planet's oceans and lakes, and into plants, is not keeping up with what we send into the air from the various fuels we burn, the huge numbers of animals we raise, and our continued removal of native vegetation. This imbalance is the heart of the climate crisis, and leads to two principle policy imperatives: (i) reduce and stop the net emissions of carbon dioxide to the atmosphere, and (ii) find ways to remove carbon more quickly from the atmosphere.

What is the carbon budget of burning biomass for energy? Biomass energy is created by burning organic materials that have quite recently been alive. In Yukon, these are mainly wood products from trees. When burned, the carbon that makes up much of the wood goes directly into the atmosphere. Also, there are additional carbon emissions from the harvest, transportation, and processing of the wood.

The effect of this burning on the carbon budget depends on the time and spatial scales of accounting. When all of the carbon dioxide released from burning can be absorbed by new growth of plants *at the same sites in the same annual cycle*⁴, there is no net contribution to the atmospheric carbon pool from the burning (i.e., the energy source is carbon neutral). Carbon neutrality can only be achieved when just one year's worth of growth is burnt in the annual cycle (i.e., carbon payback time of one year). Carbon neutrality is not achieved, however, when the biomass fuel stock has many years and often decades of carbon accumulation through growth. Such is the case with burning whole trees (whether green or already dead), or wood residue and slash, as we do in Yukon. New plant growth, on sites where

² Stocker et al. 2013. Climate change 2013: the physical science basis. Intergovernmental panel on climate change, working group contribution to the IPCC fifth assessment report (AR5). IPCC, New York.

³ National Oceanographic and Atmospheric Administration. 2019. Climate Change: Atmospheric carbon dioxide. <https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide>

⁴ An annual accounting period should be applied to biomass as this is the accounting period applied to all other forms of human activity that create carbon emissions, such as burning of fossil fuels and raising livestock. New growth of plants "at the same sites" is required because carbon absorption at all other sites is already maximized given that the atmospheric carbon pool keeps increasing.



the fuel trees previously grew, cannot absorb all of the many years and often decades of tree growth in one annual cycle. The net effect is a large contribution of carbon dioxide to the atmosphere annually, creating a “carbon debt” that has to be recovered in the future⁵, with carbon payback time of many years and even many decades⁶. This is in direct contradiction to the major policy imperative to reduce such carbon emissions year by year.

The fate of carbon dioxide from burnt wood should be compared to the fate of that same carbon if the wood were not burnt. If left on the land, dead wood slowly decomposes releasing carbon dioxide. Burning that dead wood to produce power or heat accelerates the release of carbon dioxide compared to decomposition⁷.

The amount of carbon dioxide emitted by burning wood also needs to be compared to that from other fuel sources. Burning wood produces greater carbon emissions than coal or natural gas for the same amount of energy produced⁸. Depending on the wood type and combustion process, burning wood can produce higher carbon emissions per unit energy obtained than some fossil fuels⁹.

Policy direction towards biomass globally and in Yukon. Jurisdictions as large as the European Union and the USA have historically promoted biomass energy as carbon neutral¹⁰. Policy initiatives here in Yukon such as the Biomass Energy Strategy (2016) and the draft Whitehorse and Southern Lakes Forest Resources Management Plan (2019) have also made this assertion. In the *Our Clean Future* document, biomass is now labelled as “low-carbon”.

The notion that burning biomass for energy is carbon neutral or low-carbon is increasingly challenged by scientists and policy makers¹¹. The Scientific Advisory Board to the U.S. Environmental Protection Agency stated in March 2019 that emissions created by burning recently living wood stocks cannot be assumed to be carbon neutral and have substantial net carbon emissions¹². The Science Advisory Council of the European Academies warned the European Commission in 2017 and 2018¹³ that burning wood

⁵ Fargione et al. 2008. *Science* 319:1235-1238.

⁶ Birdsey et al. 2018 *Environmental Research Letters* 13:050201. <https://doi.org/10.1088/1748-9326/aab9d5>

⁷ Dymond et al. 2010. *Forest Ecology and Management* 260: 181-192.

⁸ Birdsey et al. 2018. Op. cit.

⁹ Mäkipää, R. et al. 2015. *Canadian Journal of Forest Research* 45: 217–225 dx.doi.org/10.1139/cjfr-2014-0120

¹⁰ For example: <https://www.scientificamerican.com/article/congress-says-biomass-is-carbon-neutral-but-scientists-disagree/>

¹¹ Booth. 2018. *Environmental Research Letters* 13. <https://doi.org/10.1088/1748-9326/aaac88> and

<https://www.euractiv.com/section/energy/opinion/need-for-a-scientific-basis-of-eu-climate-policy-on-forests/>

¹² [https://yosemite.epa.gov/sab/sabproduct.nsf/0/B86C81BACFAF9735852583B4005B3318/\\$File/EPA-SAB-19-002+.pdf](https://yosemite.epa.gov/sab/sabproduct.nsf/0/B86C81BACFAF9735852583B4005B3318/$File/EPA-SAB-19-002+.pdf)

¹³ EASAC 2017. Multi-functionality and sustainability in the European Union’s forests.

https://easac.eu/fileadmin/PDF_s/reports_statements/Forests/EASAC_Forests_web_complete.pdf and in 2018

https://easac.eu/fileadmin/user_upload/180108_Letter_to_President_Juncker.pdf



harvested from forests cannot be considered carbon neutral for the purposes of meeting carbon emissions targets because of substantive net carbon emissions, and therefore the emissions from biomass must be built into the accounting of carbon footprints. Those warnings also stated that classifying biomass energy as carbon neutral (i.e. discounted in carbon accounting) was actually inducing major increases in conversion of the carbon in mature forests to carbon dioxide in the atmosphere at a time when exactly the reverse is required (see also¹⁴).

Although not promoted as carbon neutral in *Our Clean Future*, the label of “low-carbon” implies that the carbon footprint of burning wood is inconsequential. However, the waste wood, and live and dead trees that we burn in biomass installations and individual homes require years if not decades to grow back. The carbon debt happens in the current year; the carbon payback is many years and often decades into the future, varying with factors such as decay rates of dead wood left on site¹⁵. Year by year our wood burning continues to produce more carbon to the atmosphere than can be absorbed. Burning biomass goes directly against our need to balance our carbon accounting as quickly as possible by getting rid of major sources of emissions.

The *Our Clean Future* draft strategy includes a proposed Action (#51: Conduct a lifecycle analysis of biomass energy use in Yukon to identify recommended forest management practices to guide sustainable and low-carbon biomass harvesting) that indicates that the true carbon footprint of this form of energy production has not yet been fully assessed for Yukon. This, along with the growing body of science on this subject, suggests that active promotion of biomass energy in Yukon is at least premature and not warranted.

Consequently, we recommend that the policy direction put forward by Yukon Government of investing in new biomass energy infrastructure¹⁶ be dropped from the government’s priorities, and that the equivalent financial and other resources be directed towards development of energy from renewables that are more aptly described as “low-carbon”.

WCS Canada also notes that burning biomass for energy creates considerable additional environmental impacts. These make it suspect as a “clean” or environmentally-friendly source of fuel. Burning wood, especially as cord wood, generally produces other emissions, such as particulates and volatile organic

¹⁴ Kirschbaum 2003. *Biomass and Bioenergy* 24: 297-310.

¹⁵ Mansuy, N. et al. 2018. Salvage harvesting for bioenergy in Canada: From sustainable and integrated supply chain to climate change mitigation. *WIREs Energy Environ.* 2018;7:e298.
<https://doi.org/10.1002/wene.298>

¹⁶ Yukon Government 2019. “Our Clean Future”, and Renewable Energy and Energy Efficiency Update (2016-2018)
<http://www.energy.gov.yk.ca/pdf/emr-energy-strategy-update-2016-2018.pdf>



compounds, which are already creating negative health impacts in Whitehorse¹⁷. This risk is clearly laid out in the *Our Clean Future* document as requiring more research and response (Actions 50, 102 and 103). Also, salvaging of fire- or beetle-killed wood has negative impacts on biodiversity¹⁸, a subject WCS Canada scientists have investigated in depth. Industrial-scale salvage logging for dead wood in Yukon would make these risks higher.

Burning wood for space heating is well established in Yukon, and will continue to contribute to our energy supply and annual carbon emissions for some years. These emissions from biomass need to be included in the Yukon Government's reporting of annual emissions; they cannot be ignored as being "low-carbon" or "carbon neutral". However, biomass is best viewed as a "bridging" form of energy supply, to be phased out as we progress to truly cleaner sources of energy¹⁹. New investments in capacity and infrastructure to burn biomass are short-sighted at this time of climate crisis because they lock our economy into a mode of energy supply that is not "clean" and will have to be replaced. To hasten a phasing out of wood burning, incentives are needed to make electric or geothermal energy economically more favourable sources of heat than burning wood: that needs to be at the heart of the Government strategy towards a Clean Future.

We would be grateful for the opportunity to meet with you in person to explain these concerns.

Yours sincerely,

A handwritten signature in black ink that reads "Donald G Reid". The signature is written in a cursive style. Below the signature, there is a faint, light blue watermark that reads "WILDLIFE CONSERVATION SOCIETY CANADA".

Donald Reid, PhD

Hilary A. Cooke, PhD

cc by email: Shirley Abercrombie, ADM, Energy, Corporate Policy and Communications
Rebecca World, Director, Climate Change Secretariat

¹⁷ Yukon Initiative for Healthy Air. http://www.yukoncmoh.ca/files/YIHA-CMOH-Recommendations_2019.pdf and Yukon Government 2019. Actions 50 and 103. op.cit.

¹⁸ Cooke, H.A. et al. 2019. Fire and Insects: Managing naturally disturbed forests to conserve ecological values. Conservation Series Report No. 12, Wildlife Conservation Society Canada, Toronto, ON.

<https://www.wcscanada.org/Portals/96/Documents/Reports%20and%20publications/SalvageLogging-highres.pdf>

¹⁹ Project Drawdown. <https://www.drawdown.org/solutions/electricity-generation/biomass>