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TO: Daniel Lemire and Bernard Lupien (Environment and Climate Change Canada)

FROM: Caroline Gaudreault (NCASI)

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SUBJECT: ***NCASI Comments on Proposed Quantification Methods for the Proposed Federal Carbon Pricing System: Output-Based Standards (OBS) – P&P Sector Working Group***

1 INTRODUCTION

NCASI is a non-profit environmental research institute that seeks to create credible scientific information required to address the environmental information needs of the forest products industry in North America. NCASI undertakes primary research, conducts surveys, provides advice regarding technically appropriate methods of conducting environmental field measurements, undertakes technical studies such as scientific literature reviews and research compilations, and sponsors scientific research by universities and others to document the environmental performance of industry facility operations and forest management, and to gain insight into opportunities for further improvement in meeting sustainability goals. NCASI's Climate Change Research Program contains elements that address the complexity of the forest products industry's interactions with climate. This, along with nearly 75 years of experience in reviewing and treating environmental data, provides us with a unique lens on the development of metrics related to documenting the GHG performance of forest products industry operations, and we are pleased to contribute this perspective during the OBS development process.

Environment and Climate Change Canada (ECCC) has requested general comments the Proposed Federal Carbon Pricing System. In this memorandum, we provide comments mainly on the quantification methods (specific to the Pulp and Paper Sector), being considered by ECCC, with focus on areas with limited or very uncertain quantification methodologies. We also discuss the GHG-related benefits of forest industry cogeneration.

2 QUANTIFICATION METHODS

2.1 NCASI GHG Calculation Tool

Pulp and paper industry associations around the globe, working through the International Council of Forest and Paper Associations (ICFPA), jointly supported a project to develop international tools for estimating greenhouse gas (GHG) emissions from pulp and paper mills in 2001. The group retained NCASI to review existing GHG inventory protocols and to develop a calculation tool to assist companies in preparing GHG inventories, as part of that project. NCASI completed this work in 2002, and the tool was released by ICFPA late that year, in association with the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI) (http://www.ghgprotocol.org/calculation-tools). This tool, along with a subsequent one that NCASI produced for wood products (available at the same link) have been updated from time to time. NCASI maintains versions of this tool for different regulatory-related programs, of which one set, for pulp and paper and for wood products, (version 3.3) is aligned with the requirements of the Canadian Greenhouse Gas Reporting Program (GHGRP) requirements. It is NCASI's intent to maintain these tools, and adapt them as necessary based on domestic regulatory requirements, for the use of the forest products sector in Canada.

2.2 Thermal Oxidizers, Gasifiers and Motors

ECCC requested information on potential quantification methods for GHG emissions from thermal oxidizers, gasifiers and motors. While estimating CO_2 based on the fuel input carbon context may be appropriate, NCASI is not aware of credible emission factors for CH_4 and N_2O for these equipment types.

2.3 Wastewater

Pulp and paper industry wastewater treatment operations can release biogenic CO_2 and have the potential to release CH_4 and trace quantities of N_2O. There is a wide variety of wastewater treatment system configurations in the industry, but in general most mills employ primary treatment to remove settleable solid materials followed by biological secondary treatment to remove dissolved organic material. The predominant primary treatment operation in the pulp and paper industry involves clarifiers, although some facilities employ primary settling basins for solids removal. The most common forms of secondary treatment employ aerobic microbial processes and are carried out in aerated treatment operations such as aerated stabilization basins (ASBs) and activated sludge treatment operations (ASTs). Some facilities employ anaerobic treatment (e.g., anaerobic lagoons or anaerobic reactors), but it is less common due to the low concentration of organic materials in untreated wastewaters.

NCASI (2008) carried out extensive multi-altitude air testing around several types of wastewater treatment operations at six pulp and paper mills. Data collected during the study confirmed that mechanical clarifiers do not generate significant amounts of methane. Very limited data from primary settling basins indicated that methane emissions from those operations could be higher. NCASI is not aware of any data on CO_2 emissions from primary treatment operations.

Those operations are not designed to degrade dissolved organic materials and are unlikely to emit biogenic CO_2 in significant quantities (especially mechanical clarifiers due to their short hydraulic residence times). However, even if there were CO_2 emissions, these would be from biomass sources. In aerated treatment operations, such as ASBs and ASTs, degradation of organic constituents in the wastewater is by aerobic microbial pathways, so carbon is primarily converted to biomass CO_2 or to microbial biomass (Grady et al. 1999). There is a potential for CH_4 to be formed in anoxic zones, particularly in ASBs, but guidance from IPCC suggests that methane emissions from "well managed" aerated wastewater treatment operations is near zero (i.e., IPCC recommends a default methane conversion factor [MCF] value of zero for well managed aerobic treatment plants). The limited data collected around aerated systems during the NCASI study described above demonstrated that although some methane was emitted from these systems, quantities were highly variable (for reasons that are not well understood) and that only a minor proportion of the carbon entering the treatment operation was converted to methane.

Trace quantities of N_2O can be formed in some wastewater treatment operations. IPCC provides methods for estimating N_2O emissions (which are used by WCI) from *domestic* wastewaters but does not provide methods for estimating its emissions from industrial wastewater treatment operations, which can differ substantially from domestic wastewater treatment systems. The IPCC guidance points out that direct emissions of N_2O (i.e., those that occur during effluent treatment) originate from nitrification and denitrification, may be considered low-level sources, are much smaller than indirect emissions (i.e., those that occur in receiving water after treated wastewater is discharged), and may only be of interest for advanced centralized wastewater treatment plants with nitrification and denitrification steps. The methods IPCC provides are therefore applicable only for estimating indirect N_2O emissions from advanced domestic wastewater treatment operations and are not applicable to pulp and paper wastewater treatment systems.

While it is required to report GHGs from anaerobic wastewater treatment under the Canadian GHGRP (ECCC 2016), no method is provided. ECCC proposes using WCI.203(g) to quantify emission from wastewater treatment plants (WWTP), which is only applicable to petroleum refineries. There is no requirement under WCI to report GHGs from wastewater treatment plants for pulp and paper facilities. Note also that the emission factor for CH_4 based on BOD_5 listed in WCI.203(g), although also used in the NCASI GHG Calculation Tool, is that recommended by IPCC for domestic wastewater (IPCC 2006). Indeed, IPCC recommends that for industrial wastewaters to the extent possible, data should be collected to determine the maximum CH_4 producing capacity in each industry and the factor for domestic wastewater (based on COD) should only be used in the absence of better information. NCASI is not aware of better emission factors for CH_4 from pulp and paper WWTP. Hence, although it might be reasonable to use this factor for estimating emissions for reporting purposes, its use might be more questionable when tied to financial obligations. Finally, note that WCI.203(g) requires quantifying N_2O emissions based on volume of wastewater treated, quarterly determinations of nitrogen in effluent, and a default N_2O emission factor. These methods are based on IPCC

guidance for domestic wastewater treatment operations and are not appropriate for application to pulp and paper mill industrial wastewater treatment (see details above).

2.4 Residuals

There is a lack of agreement across jurisdictions and programs as to how/whether to quantify emissions from management of residuals from pulp and paper mills. Facilities are required to report GHGs from facilities landfills under the Canadian GHGRP but no specific method is prescribed. The NCASI GHG Calculation Tool provides three different methods, for which the use depends on the available information, for estimating CH_4 emissions from residuals placed in mill landfills. These methods are associated with significant uncertainty (see NCASI (2005)). The releases of methane from wood waste landfills are also quantified in the Canadian GHG Inventory (Environment Canada 2015, p. 181) using a method similar to one of NCASI'S GHG Tool calculation methods. However, ECCC recognized the significant uncertainty estimating these releases (from -60% to +190%) in publishing the inventory. The quantification of methane from the decomposition of industry residuals in landfills is highly uncertain as there are many factors which must be estimated or assumed in the calculations including the quantity of residuals discarded over time, the type of landfill, the type and effectiveness of the landfill cover, the fraction of carbon that is degraded, the decay rate, etc.

WCI does not require reporting emissions from industrial landfills.

Given the substantial uncertainty and lack of standardized guidance, it is clear that approaches for estimating CH_4 releases from industry landfills are not yet robust enough to be used in the context of the proposed carbon pricing system.

2.5 Other Low-Level Sources

In general, greenhouse gas protocols allow companies to ignore emissions that are so small that they do not significantly impact the estimation of overall emissions. This concept of "materiality" is drawn from financial reporting, where a material difference can be taken to be a discrepancy of more than 5%, for instance, between reported and audited values (though this is not an absolute standard) (Loreti et al. 2001). There is no generally accepted standard, however, for materiality in GHG inventories. Under the GHGRP, a facility is allowed to ignore *"emissions from the combustion of one or more of these fuels does not exceed 0.5% of the total facility CO_2 emissions from all fuels combusted" (Government of Canada 2017, p. 5062)* but the GHGRP does not provide guidance pertaining to non-combustion emissions.

Non-Condensable Gases (NCGs) and Condensate Stripper Offgases (SOGs) are dilute mixtures of volatile organic compounds (VOCs), most notably methanol, ethanol, and pinenes, and reduced sulfur compounds in air. None of the individual constituents are considered GHGs, and therefore venting them should not result in significant GHG emissions. NCASI used a semi-quantitative approach to estimate GHG emissions from combustion of NCGs and SOGs and estimated that emissions of CH_4 and N_2O from combustion of these process gases would be well below 0.5% of total releases from a pulp and paper facility. In addition, because all the

carbon contained in these gases originates from wood, CO_2 liberated during combustion is biogenic.

3 BENEFITS OF CHP

The Canadian pulp and paper industry generates significant amounts of electricity for use and sale through the efficient use of onsite combined heat and power (CHP), or "cogeneration", systems. The most common fuels used within forest product CHP systems are pulping liquors, a by-product of the chemical pulp manufacturing process, and other biomass residuals, though some fossil fuels such as natural gas and oil are used as well. Forest products CHP systems firing woody mill residuals or pulping liquors offer GHG mitigation benefits even when compared to advanced natural gas combined cycle systems. It would seem important that the quantification methods used under the proposed federal carbon pricing be designed in a manner that provides incentive for maintaining/increasing these benefits.

4 REFERENCES

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