

Draft Assessment of *Calculation Tools for Estimating Greenhouse Gas Emissions from Pulp and Paper Mills, v 1.1* for Use in Climate Leaders Reporting

EPA is seeking comments on this draft assessment by close of business on February 15, 2007. Please send comments to John Sottong at sottong.john@epa.gov.

Overview

The *Calculation Tools for Estimating Greenhouse Gas Emissions from Pulp and Paper Mills, Version 1.1* (the Pulp and Paper Protocol) provides background and emissions calculation information on pulp and paper specific processes. The Pulp and Paper Protocol does differ in many respects from the Climate Leaders guidance on stationary combustion and purchased electricity factors, primarily due to differences in using international factors versus US-based.

Climate Leaders Partners (Partners) should refer to Climate Leaders specific guidance for their applicable emissions sources, where it exists. Partners can view updated Climate Leaders guidance at www.epa.gov/climateleaders or contact EPA staff or technical contractors for hard copies. The Pulp and Paper Protocol should be used where Climate Leaders guidance does not exist including the following:

- emissions factors for Kraft Mill Lime Kilns & Calciners,
- detailed CH₄ and N₂O emission factors for biomass combustion,
- and methodologies to calculate greenhouse gas emissions from anaerobic treatment of sludge and use of carbonate-based make-up chemicals.

Partners should also note that all sources of greenhouse gas emissions should be included and all six greenhouse gas pollutants (CO₂, CH₄, N₂O, HFCs, PFCs, and SF₆) quantified in their inventory. Finally, Partners should use the discussion below of specific differences between the Pulp and Paper Protocol and the Climate Leaders reporting protocol as a guide in the development of their inventory.

Key Updates to Previous Version of the Pulp and Paper Protocol

Annex G of the the Pulp and Paper Protocol includes detailed information on differences between version 1.0 and version 1.1. Key differences applicable to the Climate Leaders program and/or those that might impact the quality or results of an inventory are summarized below:

- The Climate Leaders Greenhouse Gas Inventory Protocol was added to this guidance as an example of an accepted protocol with which the Pulp and Paper Protocol is intended to be used. The reference, however, is to the June 2003 draft version; Partners should refer to the most recent Climate Leaders guidance published in May 2005.
- A reference to the World Resources Institute (WRI) emissions calculation tool for HFC and PFC emissions from the manufacture, installation, operation, and disposal of refrigeration and air conditioning equipment was added to the Protocol. Partners should refer to Climate Leaders specific

guidance (*Direct HFC and PFC Emissions from Use of Refrigeration and Air Conditioning Equipment and Direct HFC and PFC Emissions from Manufacturing Refrigeration & Air Conditioning Equipment*).

- Wording was added clarifying that emissions associated with exported power, steam, or heated/cooled water are a subset of company direct emissions and must be included in direct emissions totals.
- Sections which reference the WRI GHG Protocol were revised to reflect the 2004 revision.
- The biomass combustion CO₂ emission factors for spent pulping liquors, presented in Annex E (Table E3), were corrected to eliminate an approximate 5% error (error was introduced when incorrectly converting mass of carbon to corresponding mass of carbon dioxide). The footnote to Table E3 was modified. This correction necessitated modifying the example calculation in Table E2.

Differences from Climate Leaders Protocol

Executive summary, pg 1- The Pulp and Paper Protocol indicates emissions attributable to exports of electricity or steam should be explicitly delineated. Emissions from exports (or sales) of electricity must be included in total direct emissions for Climate Leaders reporting; Partners have the option of documenting the portion of emissions attributable to exports or sales as separate line item.

Executive summary, pg 2- The Pulp and Paper Protocol provides guidance for inventories which consider CO₂ emissions only. For Climate Leaders, reporting of CH₄, N₂O, HFC, PFC, and SF₆ are required as well.

Executive summary, pg 2- The Pulp and Paper Protocol recommends that the results of an inventory include a description of boundaries, emission factors, and other key components. The recommendation to document items such as data management and descriptions of sources is repeated throughout the document. Development of an Inventory Management Plan (IMP) that meets the criteria outlined in the Climate Leaders IMP checklist is required under the Climate Leaders program unless a third party audit which meets criteria specified in the *Design Principles* is conducted.

Section 3.0, pg 3- The Pulp and Paper Protocol does not address HFC emissions but Climate Leaders Partners are required to estimate and report these emissions, as discussed in the previous section.

Section 4.1.2, pg 5- The Pulp and Paper Protocol indicates that the tools address indirect emissions from on-site operations not involving power and steam transfers (e.g., outsourced but on-site wastewater treatment operations). Partners should be careful when evaluating these types of sources. An outsourced activity may be a direct source or an optional source depending on the Partners' organizational boundaries as defined in the IMP and based on guidance provided in the *Climate Leaders Design Principles*.

Section 4.1.3, pg 6- Fuel gas system piping and equipment leaks are not addressed in the Pulp and Paper Protocol. Per Climate Leaders guidance, all sources should be included in the base year inventory.

Section 4.3.1, pg 7- The Pulp and Paper Protocol indicates emissions can be reported in carbon equivalents or carbon dioxide equivalents. Values for Climate Leaders inventories should be reported in CO₂ equivalents only.

Section 5.0, pg 9-10- The Pulp and Paper Protocol outlines several cases where emissions might be reported as “indirect”. Partners should take care to differentiate between indirect emissions that must be included in their inventory – such as electricity and steam purchases – and indirect emissions which are optional. Partners should refer to Climate Leaders *Design Principles* for an explanation of direct (Scope 1), indirect (Scope 2), and optional (Scope 3) emissions.

Section 7.0, pg 11- The Pulp and Paper Protocol provides guidance on materiality and insignificant emissions. The guidance indicates companies can decide which emissions are material for the purpose of reporting and which are not. Climate Leaders Partners must estimate emissions from all sources.

Section 7.0, Table 1, pg 13- Table 1 provides emission factor ranges to help identify significant and insignificant sources of GHGs. Partners should use this table as a screen only to check whether a more detailed evaluation will be required.

Section 8.1, Table 2, pg 15- Fossil fuel factors in the Pulp and Paper Protocol are from IPCC. Partners should use Climate Leaders factors available in *Direct Emissions from Stationary Combustion Sources* and *Direct Emissions from Mobile Combustion Sources*.

Section 8.1, Table 3, pg 15- As indicated in Table 3, the recommended correction factor for unoxidized carbon in coal is 98% in the IPCC guidelines and 99% for Climate Leaders. Partners should use the Climate Leaders correction factor. Unoxidized carbon from natural gas and oil are consistent between protocols.

Section 8.1, pg 16- The Pulp and Paper Protocol discusses methods for determining the fossil carbon portion of municipal solid waste (MSW). Partners should note that the fossil carbon portion of burned MSW is included with direct emissions whereas the biomass portion is included in the biomass CO₂ section of the Climate Leaders reporting form. The Pulp and Paper Protocol provides an emission factor of 557 kg CO₂/wet tonne MSW burned, based on IPCC assumptions. Climate Leaders guidance does not include a default factor for MSW combustion, so Partners should work with EPA to develop an emissions factor tailored to the Partners’ MSW use.

Section 8.2, pg 16- The Pulp and Paper Protocol indicates that companies will often be able to use Table 1 to demonstrate that emissions of CH₄ and N₂O from fossil fuel combustion are insignificant compared to CO₂ emissions. Emissions estimates for CH₄ and N₂O must be included in Climate Leaders inventories. Note that the Protocol recommends excluding these emissions several times in the document.

Section 8.2, pg 18- The Pulp and Paper Protocol provides both IPCC Tier 1 and Tier 2 methods for evaluating CH₄ and N₂O emissions from combustion. Climate Leaders Partners are not required to conduct a Tier 2 analysis of these emissions, but are encouraged to do so if they are interested in obtaining a more accurate estimate. The IPCC Tier 1 factors are consistent with Climate Leaders factors except that they are given in lower heating value (LHV). Partners should make sure to convert fuel consumption into a heating value consistent with the factors (e.g. LHV for IPCC factors in the Pulp and Paper Protocol and higher heating value (HHV) for Climate Leaders factors in the *Direct Emissions from Stationary Combustion Sources* are given in higher heating value (HHV). Guidance on how to convert LHV factors into HHV factors is also provided *Direct Emissions from Stationary Combustion Sources*.

Section 11.2, page 28- The Pulp and Paper Protocol indicates that although CO₂ from biomass combustion is excluded from the inventory (or reported as optional); CH₄ and N₂O from biomass combustion are often included. Partners are required to report CO₂ from biomass combustion as a separate line item. CH₄ and N₂O from biomass combustion should be included as part of the direct emissions from stationary combustion sources. Partners may use the emissions factors provided in Table 8 on pg. 29 to augment the Climate Leaders factors in Direct Emissions from Stationary Combustion Sources. Note the factors in Table 8 are given in LHV while Climate Leaders factors are given in HHV.

Section 12.1, page 31- The Pulp and Paper Protocol does not provide specific emission factors for purchased electricity and steam. Climate Leaders Partners should follow the Climate Leaders *Indirect Emissions from Purchases/Sales of Electricity and Steam* for calculating emissions from electricity and steam purchases.

Section 13.0, pg 37- The Pulp and Paper Protocol implies that reporting vehicle emissions is optional. Per Climate Leaders guidance, vehicle emissions must be included in the Partner's inventory.

Section 13.1, pg 37- The Pulp and Paper Protocol guidance for mobile combustion indicates the same emission factors for stationary combustion can be used. Partners should refer to the Climate Leaders guidance, *Direct Emissions from Mobile Combustion Sources*, which includes specific factors for gas and on-road diesel.

Section 13.1, Table 9 and Annex C- The Pulp and Paper Protocol guidance for mobile combustion includes IPCC emission factors for CH₄ and N₂O from non-road mobile sources in units of kg/TJ. The Climate Leaders guidance has taken the IPCC factors and applied a default fuel heat content to obtain factors in units of g/gal. Partners may find this factor more useful if they are tracking gallons of fuel and/or do not have specific fuel heat content information.

Section 14.2.1, Table 10- The Pulp and Paper Protocol gives a default average value for the parameter *k* (methane generation rate constant) to estimate landfill methane emissions. Partners should use Climate Leaders guidance which provides two different default values, one for arid climates and one for non-arid climates, in the absence of site-specific emissions factors.

Calculation Tool, Biomass Combustion, row 23- An emission factor of 109 kg CO₂/ GJ LHV is provided for combustion of biomass (wood or bark). This factor is based on IPCC data and assumptions. Partners should use the Climate Leaders emission factor for biomass which is provided in the guidance *Direct Emissions from Stationary Combustion Sources* as 92.93 kg CO₂/MMBTU or:

$$92.93 \text{ kg CO}_2/\text{MMBTU} / 1.055 \text{ GJ/MMBTU} / 0.95 \text{ LHV/HHV} = 92.72 \text{ kg CO}_2/\text{GJ LHV}$$

The Climate Leaders factor is based on Energy Information Association (EIA) assumptions.

Technical Notes

The following are observations on the technical content/ clarity of the Pulp and Paper guidance:

Section 8.2.1, page 21-22, example calculations - CH₄ emissions - third line references Section 4.4.2. This section does not exist and should be Section 4.3.2.

Section 9.0, page 24-25, example calculation - CH₄ emissions - second line references Section 4.4.2. This section does not exist and should be Section 4.3.2.

The summary of changes (Annex G) indicates that the terminology Climate Neutral is no longer used; however, Climate Neutral is used on page 53.

The following website references on page 57 do not work:

- References, page 57, fifth reference- Environment Canada
- References, page 59, seventh reference- Swedish EPA
- References, page 59, ninth reference- USEPA Protocol for equipment leak estimates
- References, page 60, sixth reference- USEPA Climate Leaders
- References, page 60, ninth and tenth references- World Resource Institute GHG Protocol
- References, page 61, all three references- World Resource Institute GHG Protocol

The following website references in Annex H do not work:

- Annex H, page H-1, first reference- Australian Greenhouse office
- Annex H, page H-1, third reference- Environment Canada
- Annex H, page H-2, ninth reference- Swedish EPA
- Annex H, page H-3, eighth reference- USEPA AP-42 factors for wood residue combustion
- Annex H, page H-3, ninth reference- USEPA Climate Leaders
- Annex H, page H-4, eighth reference- all six references

Calculation Tool, Direct- Fuel Combust., row 85- The Peat CO₂ emission factor (103.9 kg CO₂/ GJ fuel) does not agree with the Protocol text in Table 2, page 15 (104,900 kg CO₂/ TJ). Per page 14, IPCC recommends a default factor of 0.99 for peat to correct for unoxidized carbon. This indicates that the correct value is 104,900 kg CO₂/ TJ fuel:

$$106,000 \text{ kg CO}_2/\text{ TJ} * 0.99 = 104,900 \text{ kg CO}_2/\text{ TJ fuel}$$

Sources Referenced

ICFPA 2005. *Calculation Tools for Estimating Greenhouse Gas Emissions from Pulp and Paper Mills, Version 1.1.*, The Climate Change Working Group of the International Council of Forest and Paper Associations. <http://www.ghgprotocol.org/DocRoot/7wQf4PIwfKqFZjUxZwdF/Pulp%20and%20Paper%20Tool%20Guidance.pdf>

NCASI No Date. *ICFPA/NCASI Spreadhseet for Calculating GHG emissions from pulp and paper manufacturing, Workbook version 1.2*, National Council for Air and Stream Improvement, Inc. http://www.ghgprotocol.org/DocRoot/7wQf4PIwfKqFZjUxZwdF/July%202011%202005%20revised%20pulpandpaperworkbook%20version%201%202_final1.xls

U.S. EPA 2004. *Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance: Direct Emissions from Stationary Combustion Sources.* <http://www.epa.gov/climateleaders/docs/stationarycombustionguidance.pdf>

U.S. EPA 2004. *Climate Leaders Greenhouse Gas Inventory Protocol: Direct Emissions from Mobile Combustion Sources.* <http://www.epa.gov/climateleaders/docs/mobilesourceguidance.pdf>

U.S. EPA 2004. *Climate Leaders Greenhouse Gas Inventory Protocol: Indirect Emissions from Purchases/Sales of Electricity and Steam*. <http://www.epa.gov/climateleaders/docs/indirectelectricityguidance.pdf>

U.S. EPA 2004. *Climate Leaders Greenhouse Gas Inventory Protocol: Direct HFC and PFC Emissions from Use of Refrigeration and Air Conditioning Equipment*.
http://www.epa.gov/climateleaders/docs/refrige_acequipuseguidance.pdf

U.S. EPA 2005. *Climate Leaders Greenhouse Gas Inventory Protocol: Design Principles*.
<http://www.epa.gov/climateleaders/docs/climateleadersdesignprinciples.pdf>