

Draft Assessment of *The Aluminum Sector Greenhouse Gas Protocol, October 2006* 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 *Aluminum Sector Greenhouse Gas Protocol, October 2006* (the Aluminum Protocol) provides useful background and emissions calculation information on aluminum sector specific processes.

Climate Leaders Partners (Partners) should refer to Climate Leaders specific guidance for their applicable 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 Aluminum Protocol should be used where Climate Leaders guidance does not exist. For example, the Aluminum Protocol provides quantification methods for the following aluminum sector-specific processes:

- Söderberg
- Prebaking
- Baking Furnace
- Electrolysis reactions

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

Key Updates to Previous Versions

Key differences applicable to the Climate Leaders program and/or those that might impact the quality or results of an inventory are summarized below:

- Introductory sections were reorganized and additional details were added pertinent to developing an inventory consistent with World Resources Institute (WRI) principles.
- Pictorial examples of scenarios requiring baseline readjustment were added to *Section 5- Tracking Emissions over Time*.
- Section was added to the Introduction- *Section 11: Setting GHG Targets*.
- Section was added to Appendix A- *Section 3: Guidance on Revising Historical Emissions Data and on Dealing with Missing Data in an Inventory Time Series*.
- *Appendix A, page 20*- A Decision Tree graphic was added to help companies identify methods for calculating process GHG emissions.

- *Appendix A, Table 2, page 24-* The guidance no longer includes an industry typical value for net anode consumption. Companies are instructed to use individual facility records.
- *Appendix A, Table 2, pages 24 and 25-* Sulfur and ash content in baked anode emission factors for calculating CO₂ emissions from prebake cells using the Tier 2 or 3 methods were updated to reflect current industry guidance.
- *Appendix A, Table 2, pages 24 and 25-* Current guidance has eliminated the factor for fluorine and other baked anode impurities in the Tier 2 and 3 methods for CO₂ emissions from anode consumption. The guidance does not provide an explanation for the elimination of this factor.
- *Appendix A, page 25-* Added equation to estimate the weight of loaded green anodes.
- *Appendix A, Equation 2, page 25-* Equation was revised to use an industry average value for hydrogen content in the green anodes rather than hydrogen content in pitch multiplied by pitch content in the green anodes. The guidance does not provide an explanation for the revision of this equation.
- *Appendix A, Table 4, page 27-* Emission factors for the calculation of CO₂ emissions from oxidation of bake furnace packing material using the Tier 2 or 3 methods were updated to reflect current industry guidance.
- *Appendix A, Table 4, page 27-* Current guidance does not include a factor for fluorine and other impurities in the Tier 2 and 3 methods for CO₂ emissions from oxidation of bake furnace packing material. The guidance does not provide an explanation for the elimination of this factor.
- *Appendix A, Equation 4, page 27-* A factor was added to account for skimmed dust carbon from Søderberg cells.
- *Appendix A, Table 5, page 28-* The guidance no longer includes an industry typical value for paste consumption. Companies are instructed to use individual facility records.
- *Appendix A, Table 5, page 29-* Hydrogen content in pitch, sulfur content in calcinated coke, and ash content in calcinated coke emission factors for the calculation of CO₂ emissions from Søderberg cells using the Tier 2 or 3 methods were updated to reflect current industry guidance.
- *Appendix A, page 35-* The reactions that result in process PFC emissions were added.
- *Appendix A, Table 9, page 36-* Emission factors for the calculation of PFC emissions using the Tier 1 method were updated to reflect current industry guidance.
- *Appendix A, Table 10, page 36-* Emission factors for the calculation of PFC emissions using the Tier 2 method were updated to reflect current industry guidance.

Differences from Climate Leaders Protocol

The Aluminum Protocol presents three tiered methods for calculating GHG emissions from aluminum sector-specific processes. The guidance recommends the Tier 3 methods, which are based on facility specific data. Climate Leaders Partners are strongly encouraged to use the Tier 3 methods, if possible.

The Aluminum Protocol does not provide guidance on the calculation of indirect emissions from the purchase of electricity or steam. Partners should refer to the Climate Leaders *Indirect Emissions from Purchases/Sales of Electricity and Steam* for calculating emissions from electricity and steam purchases.

Introduction, pg 6- On this page and in several other locations, the Aluminum Protocol refers to WRI/WBCSD guidance and calculation tools for calculation of emissions due to the combustion of fossil fuels associated with the aluminum industry. Partners should refer to Climate Leaders *Direct Emissions from Stationary Combustion Sources* for calculation of these emissions.

Section 9, pg 16- The Aluminum Protocol provides guidelines on the minimum content of a public GHG inventory. The following Inventory Management Plan (IMP) components are required for the Climate Leaders Program in addition to the items listed in the Aluminum Protocol: emission source identification procedures, data management and quality assurance/ control procedures, adjustment methodologies, management tools, and auditing and verification procedures. Partners should develop an IMP that meets the criteria outlined in the Climate Leaders IMP checklist or conduct a third party verification that meets the criteria specified in the *Climate Leaders Design Principles*.

Section 10, pg 18- The Aluminum Protocol provides high-level information on conducting an independent verification of a GHG inventory. Partners should refer to the Climate Leaders *Design Principles* for criteria required in a third-party verification of the inventory.

Appendix A, pg 20- The Aluminum Protocol refers to WRI/WBCSD guidance and calculation tools for calculation of emissions due to mobile combustion associated with the aluminum industry. Partners should refer to Climate Leaders *Direct Emissions from Mobile Combustion Sources* for calculation of these emissions.

Appendix A, pg 41- The Aluminum Protocol provides guidance for revising historical emissions data based on updated emissions factors or revisions of a method. Climate Leaders guidance recommends that Partners determine a significance threshold and include that threshold in their IMP. For example, a Partner may decide that emissions data will be updated if the use of the new emissions factors affects the inventory by more than 2%.

Appendix B, pg 47- The Aluminum Protocol indicates that there are two main greenhouse gases produced during aluminum production - CO₂ and PFCs. Partner should note that combustion of fossil fuels also creates CH₄ and N₂O emissions, which must be included in the inventory. In addition, Partners should include any sources of HFCs or SF₆.

Technical Notes

The following are observations on the technical content and/or clarity of the Aluminum guidance:

The first website reference on page 64 and the first reference on the Calculation Tool Introduction worksheet (WRI GHG Protocol) do not work. The correct website citation (as of January 2007) is as follows:

<http://www.ghgprotocol.org/DocRoot/sA8d8PHg3bcUOqFFYFDO/ghg-protocol-revised.pdf>

Appendix B, pg 56- For Worksheet 5- Columns B, it should be indicated that if no data is entered in Columns B, industry typical values are applied for the calculation.

Calculation Tool, Worksheet 5- Coke Calcination CO₂, row 12- The note for Column B should indicate that if no data is entered in Column B, default industry typical values are applied.

Calculation Tool, Worksheet 8- PFCs Emissions, Equations 1 and 2- The tool includes a column for Anode Effect Frequency (AEF) input but the instructions do not indicate how this data is used. For information

on AEF data use in the absence of anode effect duration (AED) or anode effect overvoltage (AEO) data, refer to Section 3.2.1 in Appendix A.

Calculation Tool, Worksheet 10- Total CO₂ Emissions, Row 11- The summary value on Worksheet 10 from Worksheet 1 does not include emissions from Part B on Worksheet 1- Process Carbon Dioxide Emissions from Anode Baking Furnace.

Calculation Tool, Worksheet 10- Total CO₂ Emissions, Rows 16 and 17- The CO₂ summary values on Worksheet 10 from Worksheets 6 and 7 are not calculating correctly. The values in Rows 16 and 17 on Worksheet 10 remain 0 despite data input into Worksheets 6 and 7.

Sources Referenced

International Aluminum Institute 2006. *The Aluminum Sector Greenhouse Gas Protocol (Addendum to the WRI/WBCSD Greenhouse Gas Protocol): Greenhouse Gas Emissions Monitoring and Reporting by the Aluminum Industry.*

<http://www.ghgprotocol.org/DocRoot/3eGF15glelafoswxP2tH/Aluminium%20Sector%20GHG%20Protocol%20-%20October%202006.pdf>

WRI 2005. *Calculating Direct GHG Emissions from Primary Aluminum Production (Calculation Worksheets).*

<http://www.ghgprotocol.org/DocRoot/3eGF15glelafoswxP2tH/Aluminium%20Sector%20GHG%20Workbook%20-%20October%202006.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>