Determining Adequate GHG Estimation Methods for Mandatory Reporting Under the Western Climate Initiative Cap-and-Trade Program

Presentation to the
2009 International Emissions Inventory Conference

April 15, 2009
Baltimore, Maryland

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Presentation Overview

• Background
• Policy
• Process
• Progress:
  – Reporting Essential Requirements
  – GHG Quantification Methods
• On-Going Work and Challenges
Western Climate Initiative (WCI)

- Launched in February 2007 by the Governors of Arizona, California, New Mexico, Oregon and Washington to develop regional strategies to address climate change
- Montana, Utah, British Columbia, Manitoba, Quebec and Ontario have since joined as partners
- 6 U.S. states, 6 Mexican states & 1 Canadian province are official observers
WCI Goals and Organization

- Regional GHG reduction goal consistent with state-by-state goals
  - 15% below 2005 levels by 2020
- Regional market-based multi-sector mechanism to achieve the regional GHG reduction goal
  - Cap-and-trade
- Participate in a multi-state GHG registry
  - The Climate Registry (TCR)

- Committees lead technical and policy decision making:
  - Cap Setting and Allowances
  - Complementary Policies
  - Economic Modeling
  - Electricity
  - Markets
  - Offsets
  - Reporting
WCI Reporting Requirements: Purpose and Objectives

“Prior to the start of the mandatory reporting program, the WCI Partner jurisdictions will establish the essential requirements for reporting by all entities and facilities required to report in each of the WCI Partner jurisdictions.”

(Design Recommendation for the WCI Regional Cap-and-Trade Program, September 23, 2008)

- Purpose and Objectives of Mandatory Reporting:
  - Is equitable, administratively simple for government and private participants, minimizes administrative costs, and has a clear compliance path;
  - Covers as many sources as is practical, while encouraging pollution reductions beyond the capped sources and sectors;
  - Provides appropriate recognition and incentives for early emissions reductions;
  - Assures a transparent and robust accounting system that will measure and report emissions rigorously and consistently across all sectors and throughout the region; and
  - Facilitates linkage to similarly rigorous regional and international greenhouse gas reduction markets and encourages other states, provinces, and countries to join the market.

(Draft Program Reporting Recommendations, March 31, 2008)
Differences in GHG vs. CAP Reporting

- Inventory Purpose
- Source Types
- Level of Reporting for Industry
- Emission Estimation Methodologies
- Third-Party Verification
WCI GHG Reporting: Policy Issues

- **Deadlines for Adoption by WCI Jurisdictions**
  - 2009 promulgation
  - 2011 reporting of 2010 emissions

- **Cap-and-Trade Reporting Threshold**
  - Cap: 25,000 metric tons CO₂e/year
  - Report: 10,000 metric tons CO₂e/year

- **Differences Between U.S. and Canada**
  - Units of measure
  - Definitions
  - Approach to enforcement

- **Proposed U.S. EPA Mandatory Reporting Rule (MRR)**

- **Point of Regulation (POR) for Fuel Suppliers**

- **Biomass and Biofuels**
  - Reported separately
  - Used to determine applicability

- **Enforcement and Compliance**
  - Defined violations in WCI
  - Enforced by jurisdictions

- **Stakeholder input on GHG quantification and monitoring methods**
WCI GHG Reporting
Essential Requirements (ERs)

- **General Provisions:**
  - Applicability (§WCI.1)
  - General GHG Reporting Requirements and Schedule (§WCI.2)
  - Contents of GHG Emissions Report (§WCI.3)
  - Document Retention and Record Keeping (§WCI.4)
  - Confidentiality
  - Compliance and Enforcement (§WCI.5)
  - Incorporation by Reference (§WCI.6)
  - Designated Representative (§WCI.7)
  - Verification (§WCI.8)
  - Definitions (§WCI.9)
  - Pollutants and GWPs (§WCI.10)

- **Emissions Quantification and Monitoring**
  (Sampling, Analysis, Measurements)
  - By Source Category
  - §WCI.20 - §WCI.xx
## WCI Source Categories

<table>
<thead>
<tr>
<th>Group 1:</th>
<th>Group 4:</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 6, 2009</td>
<td>April 2009</td>
</tr>
<tr>
<td></td>
<td>Future Date to be Determined</td>
</tr>
<tr>
<td>General Stationary Combustion&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Cogeneration&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Electric Generation&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Glass Production</td>
</tr>
<tr>
<td>Petroleum Refineries&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Soda Ash Manufacturing</td>
</tr>
<tr>
<td>Refinery Fuel Gas Combustion&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Ferroalloy Production</td>
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<tr>
<td>Cement Manufacturing</td>
<td>Electronics Manufacturing</td>
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<tr>
<td>Hydrogen production</td>
<td>Petrochemical Production</td>
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<tr>
<td>Iron and Steel Manufacturing</td>
<td>HCFC-22 Production</td>
</tr>
<tr>
<td>Lime Manufacturing</td>
<td>Adipic Acid Manufacturing</td>
</tr>
<tr>
<td>Primary Aluminum</td>
<td>Ammonia Manufacturing</td>
</tr>
<tr>
<td>Lead Production</td>
<td>Magnesium Production</td>
</tr>
<tr>
<td>Zinc Production</td>
<td>Nitric Acid Manufacturing</td>
</tr>
<tr>
<td>Coal Mines</td>
<td>Phosphoric Acid Manufacturing</td>
</tr>
<tr>
<td>Pulp and Paper</td>
<td>SF&lt;sub&gt;6&lt;/sub&gt; from Electrical Equipment</td>
</tr>
<tr>
<td>Coal Storage</td>
<td>Nonroad Equipment at Facilities</td>
</tr>
</tbody>
</table>

<sup>a</sup> Stationary combustion sources (direct, upstream, or downstream); all others sources are non-combustion process emission sources.
Process to Identify Adequate Methods for WCI Reporting Requirements

- **Review Existing GHG Reporting Programs:**
  - CARB
  - IPCC
  - TCR
  - CCAR
  - EU ETS
  - RGGI
  - Various industry associations

- **Summarize Features:**
  - Voluntary, mandatory?
  - Fuel(s) covered
  - Coverage (GHGs)
  - Thresholds
  - Sources included, excluded
  - Protocols
  - Calculation and/or monitoring methods
    - Relative accuracy
    - Cost
    - Compatibility with industry expertise
### Relative Accuracy of Various GHG Quantification Methods

<table>
<thead>
<tr>
<th>Quantification Method type</th>
<th>Combustion Sources</th>
<th>Process Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CO₂</td>
<td>CH₄, N₂O (vary based on how burner is tuned)</td>
</tr>
<tr>
<td>CEMS</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Fuel Flow (Continuous)</td>
<td>Intermediate</td>
<td>Very Low</td>
</tr>
<tr>
<td>Material Balance</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Periodic Monitoring</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>(e.g., weekly or monthly, hand-held; assumes steady state)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-fuel flow Parametric Monitoring</td>
<td>Low</td>
<td>Very Low</td>
</tr>
<tr>
<td>(e.g., measuring something other than fuel flow, such as raw material feed rate or production output rate)</td>
<td></td>
<td></td>
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Case Study: Pulp & Paper Industry

Sources of GHG Emissions:
• CO₂, CH₄, N₂O emissions:
  – Stationary combustion (fossil and biomass fuels)
  – Mobile combustion (harvesting equipment and trucks)
• CO₂ emissions from make-up CaCO₃ or Na₂CO₃ used in the pulp mill
• CH₄ emissions from landfills and WWT
• CO₂ exports and imports
• GHG emissions attributed to power and steam exports

Groups of GHG Emissions:
1. Stationary fuel combustion in boilers, kilns, incinerators
2. Transportation and mobile sources
3. CO₂ imports and exports
4. Electric power and steam imports and exports
5. Anaerobic decomposition in landfills and WWT
6. Process emissions from kilns and recovery furnaces
Process CO₂ Emissions from Kilns and Recovery Furnaces

Emission Estimation Methods for Process Emissions:
- Biogenic CO₂: Carbon_{Black Liquor} from testing
- Fossil CO₂: Carbon_{Make-up Salts} from Factors or Purchase Records

Fossil CO₂ for stationary combustion estimated with other WCI methods
WCI General Stationary Combustion Quantification Methods (CO$_2$)

- **WCI Method 1 (MRR Tier 1):**
  - Emission factor that is multiplied by annual fuel use and a default heating value for that fuel

- **Method 2 (MRR Tier 2):**
  - Emission factor that is multiplied by annual fuel use and a measured heating value of that fuel.
  - WCI: Separate equation based on steam generated for biomass and MSW combustion

- **Method 3 (MRR Tier 3):**
  - Annual fuel use and measured carbon content of that fuel.

- **Method 4 (MRR Tier 4):**
  - Continuous emissions monitoring system (CEMS)

- **Applicability of Methods**
  - WCI: Depends on Whether Subject to Verification (>25,000 MT CO$_2$e)
  - MRR: Depends on Capacity Limits and Other Restrictions
General Stationary Fuel Combustion Requirements for CO₂
Proposed 40 CFR 98 Subpart C

Is the Unit Subject to an Existing CEMS Program?

- NO
  - Does Unit Have Existing CEMS?
    - YES
      - Do CEMS and Unit Meet Certain Conditions?
        - YES
          - Tier 4: Use CEMS to Monitor CO₂
        - NO
          - Tier 3: Measure Fuel Carbon Content
          - NO
          - Tier 2: Use Measured HHV and Default CO₂ Emission Factor
    - NO

- YES
  - Does Unit Burn Any Solid Biomass Fuel (e.g., Wood)?
    - YES
      - Tier 3: Measure Fuel Carbon Content
      - NO
    - NO
      - Is Unit's Rated Heat Input Capacity ≤ 250 mmBtu/h?
        - YES
          - Tier 3: Measure Fuel Carbon Content
          - NO
        - NO
          - Is Measured High Heating Value (HHV) Available?
            - YES
              - Tier 2: Use Measured HHV and Default CO₂ Emission Factor
            - NO
              - Tier 3: Measure Fuel Carbon Content
              - Are Default Emission Factors and HHV for Fuel Provided in the Rule?
                - YES
                  - Tier 2: Use Measured HHV and Default CO₂ Emission Factor
                - NO
                  - Tier 3: Measure Fuel Carbon Content

Tier 1: Use Default HHV and Default CO₂ Emission Factor

Tier 2: Use Measured HHV and Default CO₂ Emission Factor

Tier 3: Measure Fuel Carbon Content

Unit and CEMS requirements:
- Unit capacity: < 250 mmBtu/hr or < 250 tons/day MDW.
- Unit has operated > 1,000 hours/year in any year since 2005.
- Unit has either a Part 60, Part 75, or state-certified gas monitor of any kind or a flow rate monitor (or both).
- The existing CEMS are required by regulation or permit, and are also required to undergo periodic QA/QC testing.
- OR
  - Unit capacity ≤ 250 mmBtu/hr or ≤ 250 tons/day.
  - Unit has operated > 1,000 hours/year in any year since 2005.
  - Unit has both a CO₂ monitor and a flow rate monitor.
  - The existing CEMS are required by regulation or permit, and are also required to undergo periodic QA/QC testing.
- MDW units that do not have CEMS may use Tier 2, using measured annual steam generation in lieu of sampling the fuel HHV.
- Reporters have the option of using any higher Tier methodology.

April 1, 2009
On-Going Work and Remaining Challenges

- Accuracy of GHG Estimation Methods
- Current Lack of Monitoring Methods
- Addressing Stakeholder Comments
- Develop Requirements for Remaining Source Categories in Time for Adoption by Jurisdictions
- Harmonization with Proposed Federal Mandatory Reporting Rule (MRR)
For More Information

http://www.westernclimateinitiative.org