

Accounting Framework for Biogenic CO₂ Emissions

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Presentation Outline



- Accounting Framework purpose & goals
- Background
- Technical description of draft Framework
- Science Advisory Board process
- Questions

Accounting Framework for Biogenic CO₂ Emissions from Stationary Sources



- Purpose: To conduct a “*detailed examination of the science associated with biogenic CO₂ emissions and to consider the technical issues that the Agency must resolve in order to account for biogenic CO₂ emissions in ways that are scientifically sound and also manageable in practice.*” (Letter from EPA Administrator to Members of Congress, January 12, 2011)
- To answer the question:
 - How can EPA account for a stationary source’s onsite CO₂ emissions, taking the biological cycling of carbon into consideration, in a scientifically and technically rigorous manner?

Background



- May 2010: EPA adopted the Tailoring Rule
- July 2010: Call for Information on GHG Emissions Associated with Bioenergy and other Biogenic Sources
- January 2011: EPA grants NAFO’s petition on biogenic CO₂ emissions and details steps to address such emissions
- July 2011: Final Rule: Deferral for CO₂ emissions from Bioenergy and Other Biogenic Sources under the Prevention of Significant Deterioration (PSD) and Title V Programs
- September 2011: Draft Accounting Framework for Biogenic CO₂ Emissions from Stationary Sources submitted to Science Advisory Board (SAB)
- October 2011: SAB review begins

Accounting Framework Policy Context



- Framework generally applicable to all stationary sources:
 - Technical report, not specific to any policy or program
 - Flexible enough to be adapted within various types of programs
- Consistent with existing stationary source regulatory programs:
 - Direct emissions from stationary source as starting point
- Critical link from direct emissions to land supplying feedstocks

Existing Accounting Approaches



- Use IPCC Approach/U.S. Inventory
 - IPCC Approach requires complete coverage of all sources and sinks
 - Inventory results are presented at national scale
- Categorical exclusion
 - Based on assumption that because biogenic feedstocks grow, biogenic CO₂ *never* contributes to atmospheric load
 - No assessment of carbon stocks or link to the land
- Categorical inclusion
 - Biogenic CO₂ and fossil CO₂ emissions at the stationary source treated as equivalent
 - No assessment of carbon stocks or link to the land
- Lifecycle emissions analysis
 - Comprehensive way to assess net GHG emissions from use of biogenic fuel versus fossil fuels

The Need for a New Accounting Framework



A new accounting framework is needed to adjust biogenic CO₂ emissions from stationary sources

A unique framework is needed that:

- Accounts for a stationary source's onsite CO₂ emissions, taking the biological cycling of carbon into consideration, in a scientifically and technically rigorous manner
- Creates an "adjustment factor" that can be applied to direct emissions (Biogenic Accounting Factor (BAF))
 - Multiplying direct biogenic CO₂ emissions by the BAF yields the adjusted emissions of biogenic CO₂ to the atmosphere
 - Accounted CO₂ Emissions = Facility CO₂ Emissions * BAF

Technical Considerations



Key technical considerations necessary for developing any accounting framework for biogenic CO₂ at stationary sources:

- | | |
|---|--|
| • Direct Emissions | • Indirect Land Use Change and Leakage |
| • Feedstock Losses During Transportation and Storage | • Temporal Scale |
| • Carbon Contained in Products and Byproducts | • Spatial Scale |
| • Feedstock Growth: Emissions and Sequestration on Land | • Baselines |
| • Direct Land Use and Management Changes | • Biogenic Feedstock Categorization and Disaggregation |

Technical Considerations



TECHNICAL CONSIDERATION	DESCRIPTION
Direct Emissions	Direct emissions of GHG (e.g., CO ₂ , CH ₄ , N ₂ O) that result from use of biologically based feedstock at a stationary source.
Feedstock Losses During Transportation and Storage	Potential difference in carbon content when feedstocks are measured at the production site versus at the stationary source.
Carbon Contained in Products and Byproducts	A portion of the biogenic feedstock arriving at the gate may be transformed into products, or fuels that contain carbon and exit the stationary source other than out the stack.
Feedstock Growth/ Avoided Emissions	Emissions and sequestration on the land (all five terrestrial carbon pools) supplying the biologically based feedstocks.
Direct Land Use & Management Change	Emissions/sequestration related to direct land-use change may occur when land use or management are changed to produce a biologically based feedstock.

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9

Technical Considerations



TECHNICAL CONSIDERATION	DESCRIPTION
Indirect Land Use Change and Leakage	Demand for biologically-based feedstocks can induce production alterations elsewhere, influencing market prices and including possible land-use change and related emissions/sequestration.
Temporal Scale	Annual, Multi-Year Basic timescale for assessing emissions to the atmosphere and changes in carbon stocks on land.
Spatial Scale	International, National, Regional, Local Spatial scale, land-base and boundaries over which emissions and sequestration are assessed.
Baseline	Reference Point, Anticipated Future, Comparative Datum against which change is measured.
Feedstock Categorization and Disaggregation	Forest-Derived, Agricultural, Waste Materials, Other Groupings of types of biologically-based feedstocks based on similarities in characteristics such as physical properties, typical end uses, and growth patterns.

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10

Baselines



Baselines have been defined in at least three ways, focusing on:

1. The net change from a current reference point
 - **Reference point** baseline
2. The net change from a business-as-usual future
 - **Anticipated future** baseline
3. The net change from an alternative future
 - **Comparative** baseline
 - Includes consideration of alternative energy futures

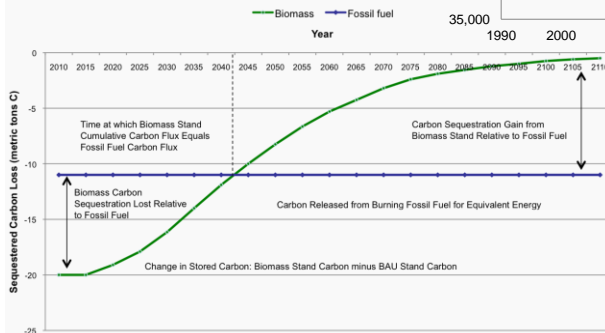
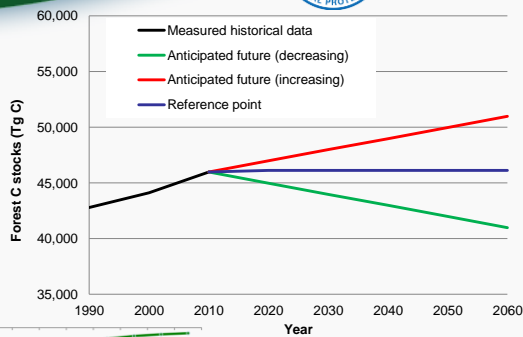
11

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Baseline Comparison



Reference point and Anticipated future baselines



Comparative baseline
(adapted from Exhibit 6-2b, *Manomet Center for Conservation Sciences, 2010*)

12

Biogenic Feedstock Categorization and Disaggregation



- Feedstocks may be grouped according to:
 - Management and harvest characteristics
 - Geographic location
- Three broad categories largely capture all of the biologically based feedstock types that might be used in a stationary source:
 1. Forest-Derived Woody Biomass
 2. Agricultural Biomass
 3. Waste Materials



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13

Accounting Framework: General Description



TECHNICAL CONSIDERATION

STATUS IN EPA FRAMEWORK

Direct Emissions	-----	<i>CO₂ from use of biologically based feedstocks</i>
Feedstock Losses During Transportation and Storage	-----	<i>Included</i>
Carbon Contained in Products and Byproducts	-----	<i>Included</i>
Feedstock Growth/Avoided Emissions	-----	<i>Included</i>
Direct Land Use & Management Change	-----	<i>Included</i>

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14

Accounting Framework: General Description

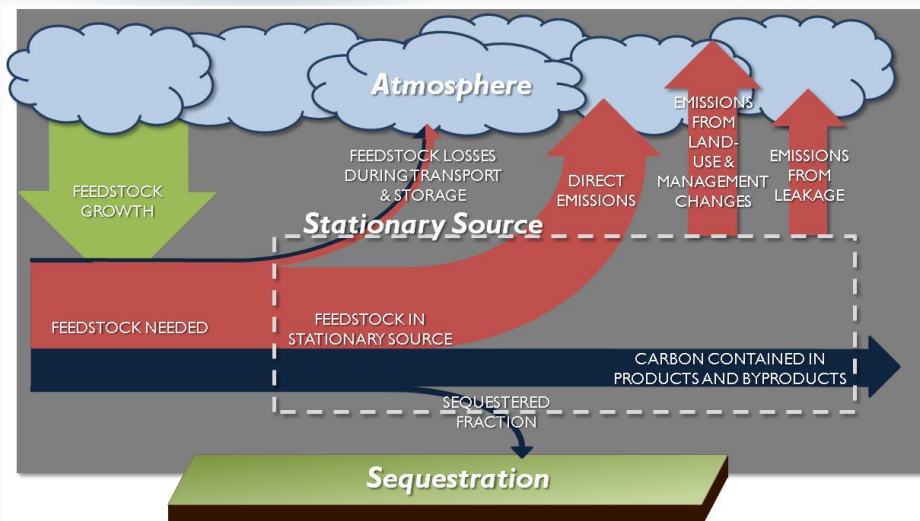


TECHNICAL CONSIDERATION		STATUS IN EPA FRAMEWORK
Indirect Land Use Change & Leakage		<i>Acknowledged</i>
Temporal Scale		<i>Annual, Multi-year (annualized)</i>
Spatial Scale		<i>Regional</i>
Baselines		<i>Reference Point</i>
Feedstock Categorization & Disaggregation		<i>Forest-Derived, Agricultural, Waste Materials</i>

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15

Accounting Framework



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16

BAF Equation



$BAF = \text{Net Biogenic Emissions/Potential Gross Emissions}$

Framework Equation

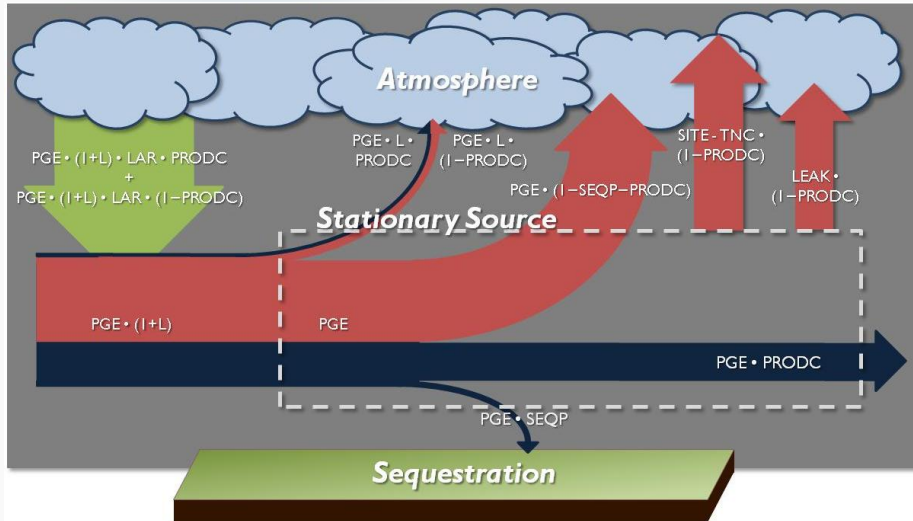
Breaking it down



$$\begin{aligned} \text{NBE} = & \text{[PGE} \times (1 + L) \times (1 - \text{LAR}) \times (1 - \text{PRODC})] \\ & - \text{[PGE} \times \text{SEQP}] + \text{[SITE_TNC} \times (1 - \text{PRODC})] \\ & + \text{[LEAK} \times (1 - \text{PRODC})] \end{aligned}$$

- **Stage 1:** Start with stack emissions **[PGE]**
- **Stage 2:** Add emissions caused by transferring/storing feedstock for stationary source use **[L]**
- **Stage 3:** Subtract carbon stored in feedstock regrowth and in other carbon pools on the land providing the feedstock **[LAR]**
- **Stage 4:** Subtract carbon sequestered in post-combustion materials **[SEQP]**
- **Stage 5:** Add any changes from direct land-use or management change on the production landscape **[SITE_TNC]**
- **Stage 6:** Add any emissions associated with leakage or indirect land-use change **[LEAK]**
- **Throughout:** Adjust terms for share of carbon in products **[PRODC]**

Accounting Framework with Terms



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19

Biogenic Accounting Factor



$$BAF = \text{Net Biogenic Emissions} / \text{Potential Gross Emissions}$$

BAF of:	Means:
0	Biogenic processes do not offset the direct biogenic CO ₂ emissions from a stationary source
1	100% of the biogenic CO ₂ emissions are counted; in other words, biogenic processes offset none of the direct biogenic CO ₂ emissions
0 - 1	Some proportion of the biogenic CO ₂ emissions are offset by sequestration. - For example, a BAF of .2 or .5, biogenic processes offset 80% or 50% of the biogenic CO ₂ emissions
Less than 0	Biogenic processes sequester more than the total of biogenic CO ₂ emissions. - For example, a BAF of -0.2 means biogenic processes sequester 20% more than total biogenic CO ₂ emissions

Adjustment:

$$\text{Accounted Emissions} = \text{Facility Biogenic CO}_2 \text{ Emissions} \times BAF$$

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20

Scientific Advisory Board Peer Review Process



Date	Action
April 2011	SAB announces intent to form panel for peer review of biogenic CO ₂ emissions study, solicits nominations
July 2011	SAB publishes list of nominees for panel, solicits comments
Oct 25-27, 2011	SAB Panel public meeting
January 2012	SAB Panel releases 1 st draft of peer review report and holds 1 st public teleconference
March 2012	SAB Panel releases 2 nd draft of peer review report and has public teleconference
May 2012	SAB Panel releases 2 additional drafts and holds 2 public teleconferences

21

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Summary



- EPA's draft Accounting Framework Report
 - outlines the scientific and technical issues to be addressed to develop an accounting approach for biogenic CO₂ emissions from stationary sources
 - describes a methodology for developing a biogenic accounting factor (BAF) that adjusts onsite CO₂ emissions on the basis of information about growth of the feedstock and/ or avoidance of biogenic emissions and more generally the carbon cycle
- The BAF approach was constructed to be generally applicable to a variety of stationary source programs
 - Each application would require explicit program-specific policy choices
 - Any application of the BAF approach in a regulatory context would require a full public notice and comment rule-making process
- The SAB is anticipated to finalize its review process soon

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22



QUESTIONS?

THANK YOU!

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23