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Question 1

Evaluation of the science of biogenic CO2 emissions

In reviewing the scientific literature on biogenic CO2 emissions, EPA assessed the underlying science of the carbon cycle, characterized fossil and biogenic carbon reservoirs and discussed the implications for biogenic CO2 accounting.

Does the SAB support the EPAs assessment and characterization of the underlying science and the implications for biogenic CO2 accounting?

Timescale

- Accounting method fails recognizes that the climate system is not sensitive to changes in carbon over short timescales (i.e., less than 50 to 100 years)
- Distinction between carbon stock and anyway tons - a continuum, discuss binary approach
- If accounting for longer time scales carbon debt less of an issue

Accounting Scale

- No scientifically justifiable reason for selecting a particular region for accounting, but significant implications
- More defensible to have accounting for feedstock just like all the other factors be specific to the stationary source – stationary source responsible for showing sources are managed for replacement in timescales that matter (50-100 years)

Baseline

- Justification for Reference Point baseline is insufficient
  - Uncertainty doesn't go away, still has significant impacts
- Additional discussion of the factors that impact baseline
  - Climate change impacts, technological/efficiency advances, policy changes
- Discussion of alternative ways for addressing the uncertainties inherent in baseline may be useful
  - Adjusting a reference point baseline overtime
  - Risks and uncertainties of reference vs anticipated baselines
  - If accounting is done for feedstock on site scale, baseline discussion is for sites rather than regions

ProdC

1) What is constraining the discussion to the smoke stack? The atmosphere affected by release from decomposing paper products the same as emissions from smoke stacks.
2) If Prod C is set to 0 for all short lived products because they will be emitted anyway, this would count these emissions at the source (upstream)

Limit to CO_2

Further discussion of the justification of limiting the policy to CO2

- Net GHG impact will be different among feedstock types given N_2O emissions
- N_2O higher warming potential/long lived; though contribution from N_2O relatively small compared to CO_2

Question 2a

- **Does the SAB agree with EPA's concerns about applying the IPCC national approach to biogenic CO_2 emissions at individual stationary sources?**

- The document reasonably explains why the IPCC methodology does not explicitly link biogenic CO_2 emissions and sinks to stationary sources, since energy and land sectors are treated separately but comprehensively in the IPCC accounting approach.

Question 2b

- **Does the SAB support the conclusion that the categorical approaches (inclusion and exclusion) are inappropriate for this purpose, based on the characteristics of the carbon cycle?**

- EPA has developed an accounting method in which net changes in CO_2 emissions resulting from operation of a stationary source on biogenic material are attributed to the stationary source itself. For this purpose and for this purpose only, the SAB agrees that categorical inclusion and categorical exclusion of CO_2 emissions would be inappropriate.

Question 2c

- **Does the SAB support EPA's conclusion that a new framework is needed for situations in which only onsite emissions are considered for non-biologically-based (*i.e.*, fossil) feedstocks?**

- This question appears to be contradicted by a statement made on Page 11 of the Accounting Framework document.

- "The feedstock- or measurement-based methods typically used for estimating CO_2 emissions from fossil fuels at stationary sources are equally suitable for estimating emissions of CO_2 from the combustion, decomposition, and processing of biogenic feedstocks at stationary sources."

Question 2d

- **Are there additional accounting approaches that could be applied in the context of biogenic CO_2 emissions from stationary sources that should have been evaluated but were not?**

- The DOE 1605(b) voluntary greenhouse gas registry targeted to entities has many similar characteristics to the approach proposed by EPA for stationary sources.

- The Climate Action Registry developed in California uses a regional approach to calculate baselines based on inventory data.

- USDA is developing in parallel an accounting approach for forestry and agricultural landowners.

Summary of SAB findings for Question #3

Divergent perspectives.
All are included for consideration.

Perspective 1

Are existing approaches adequate?

- Yes. Facility accountability is not necessary when total forest stocks in a given region remain the same or increase.
    - For example, decreasing forest stocks in one part of the region while increasing in another part of the region is OK.
    - As long as total regional forest stocks don't decrease, then we are not increasing regional emissions due to use of biogenic C for energy purposes.
- Adequate empirical estimates of leakage and anticipatory forest expansion are unattainable.

Categorical exclusion (contingent upon total forest stocks remaining the same or increases). EPA Inventory subdivided into regions meets this need.

Perspective 2

Are existing approaches adequate?

- No. The framework should be based on potential feedstock area not the total regional forest area.
  - For example, total regional forest stocks could be increasing while the facility feedstock supply area is decreasing.
  - If there is a decrease in long-term C stocks in the feedstock supply area (e.g., biomass, soil C), these need to be captured.
- Leakage across US borders is important and is not accounted for in the current EPA Inventory.

The new framework moves from "monitoring" to "management" of biogenic C. Inventory monitors C stocks and flows. Attribution is needed for management.

Based on this perspective, we move on to Charge Questions →

Perspective 3

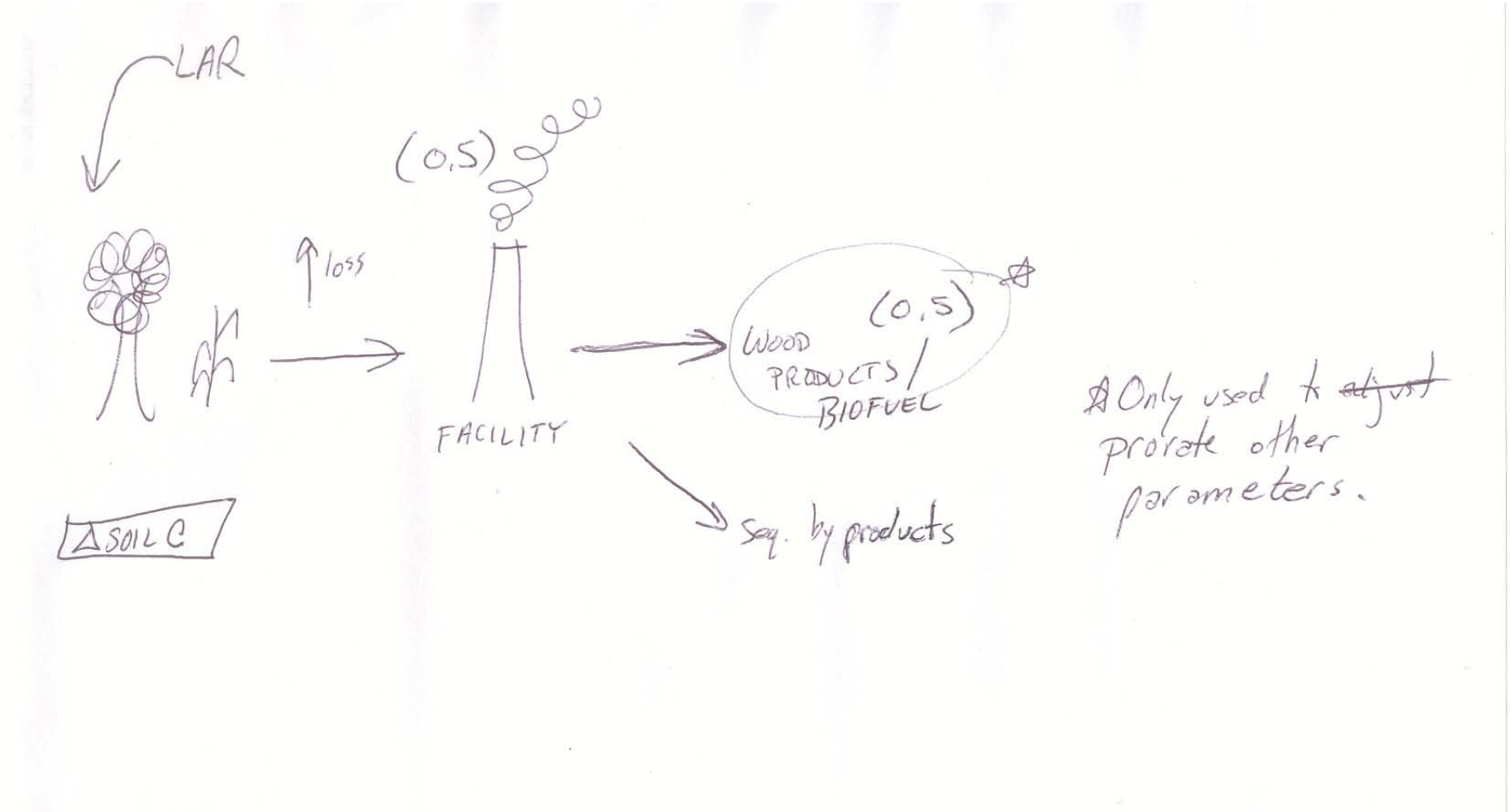
Parameters the in framework equation represent additions and subtractions of emissions in a way that sufficiently represent net emissions associated with emissions at the stationary source (i.e., “facility”).

NBE = [PGE x (1+L) x (1-LAR) x (1-PRODC)]
- [PGE x SEQP]
+ [SITE_TNC x (1-PRODC)]
+ [LEAK x (1 – PRODC)]

Leakage is important, but not adequately addressed.

- Suggest analysis for default values per feedstock.

Perspective 3



*Requires record of land management provided by resource supplier.

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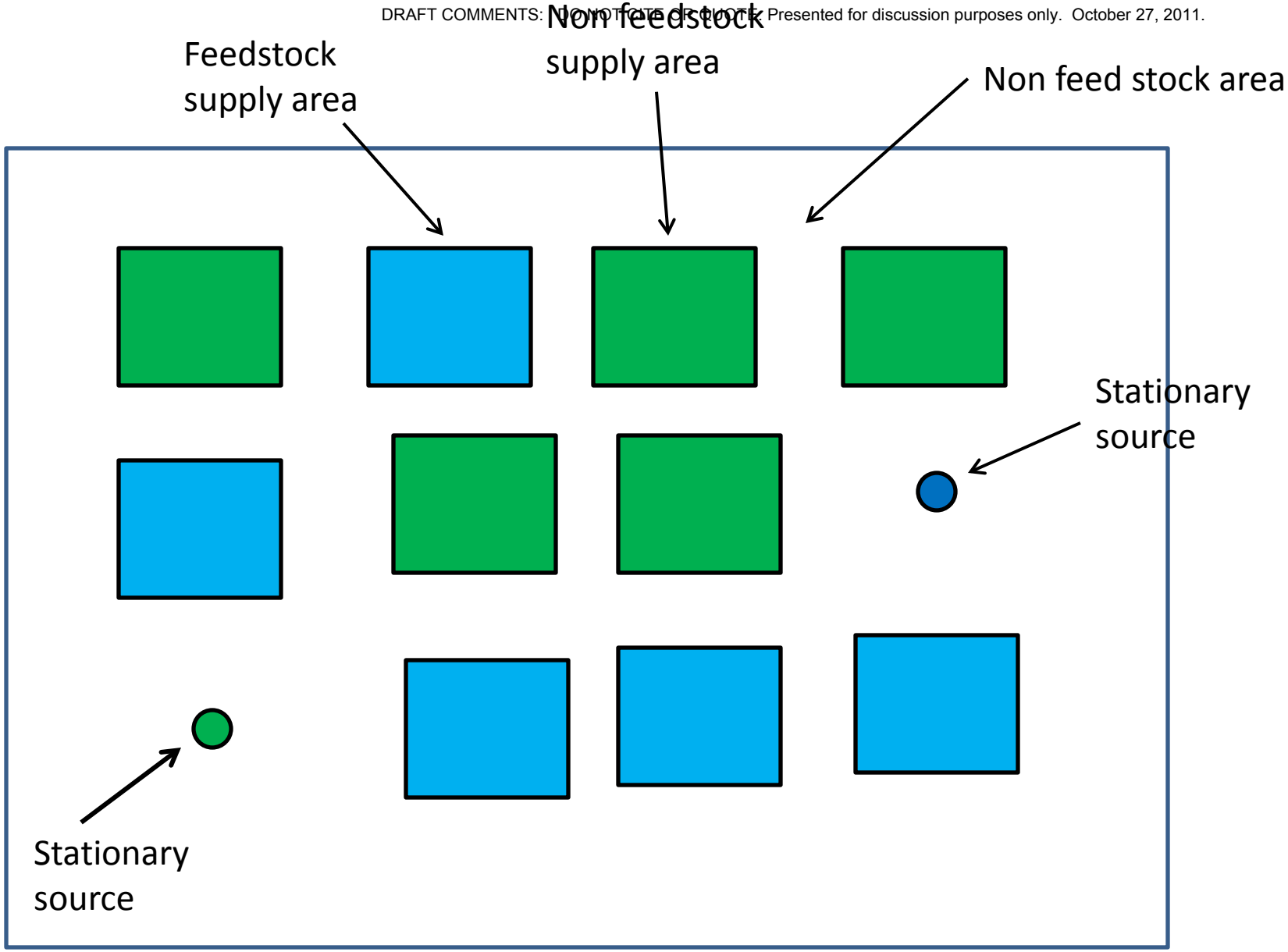
Restructuring of the framework equation and clarification of concepts and terminology

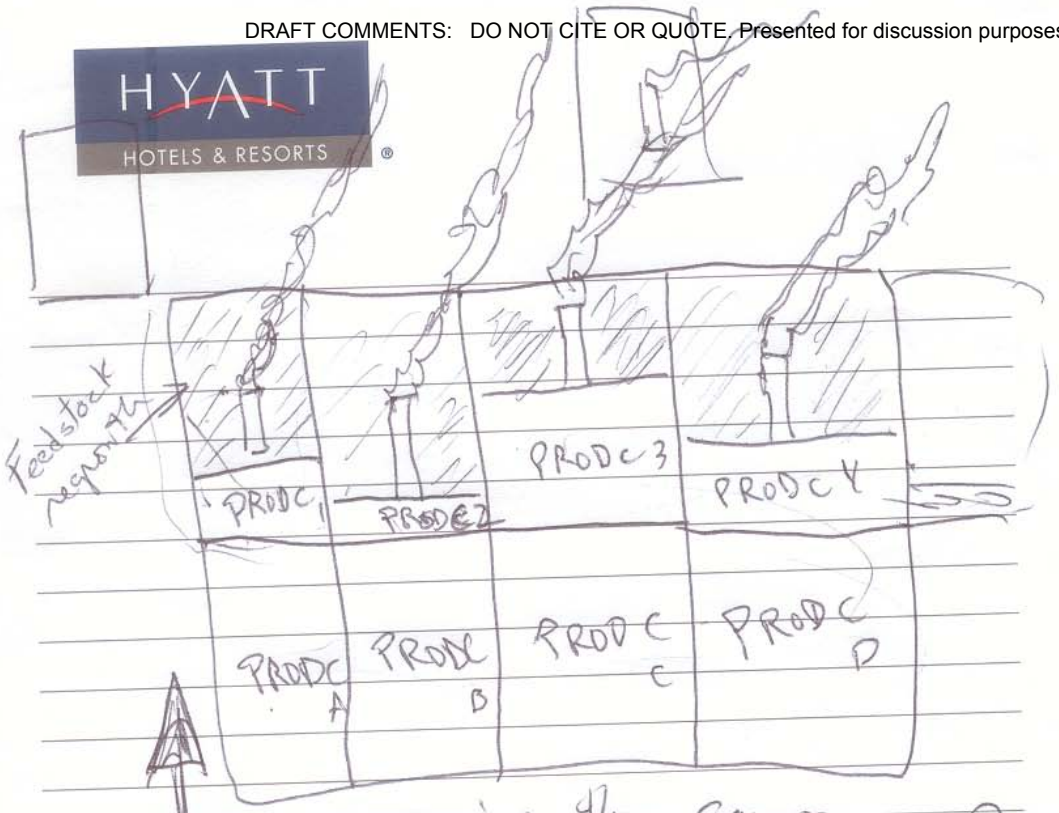
Perspective 4

NBE = [PGE x (1+L) x (1-LAR) x (1-PRODC)]
- [PGE x SEQP]
+ [SITE_TNC x (1-PRODC)]
+ [LEAK x (1 – PRODC)]

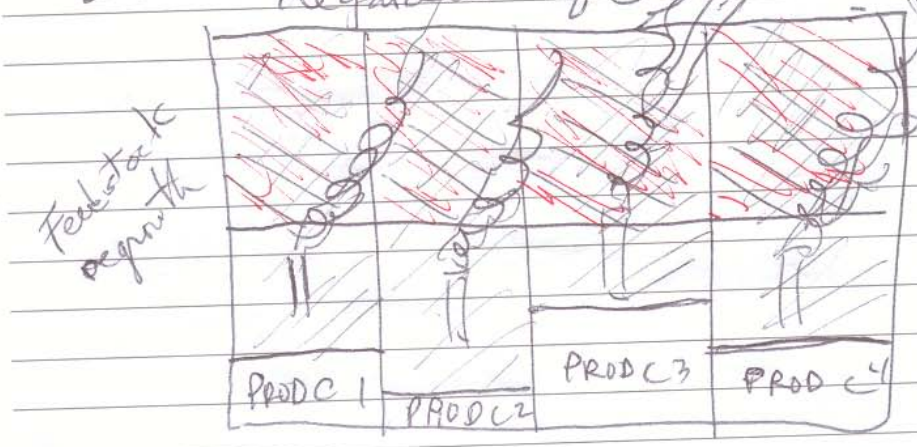
Use of equation must be scale robust.

DEBIT	CREDIT
• Emissions • Loss	• Feedstock regrowth - On existing base - On new base • Avoided emissions • Sequestration
DEBIT/CREDIT • Leakage • Non-feedstock - On existing land base - New land base	


Feedstock supply area
Non feedstock supply area
Non feed stock area
Stationary source
Stationary source



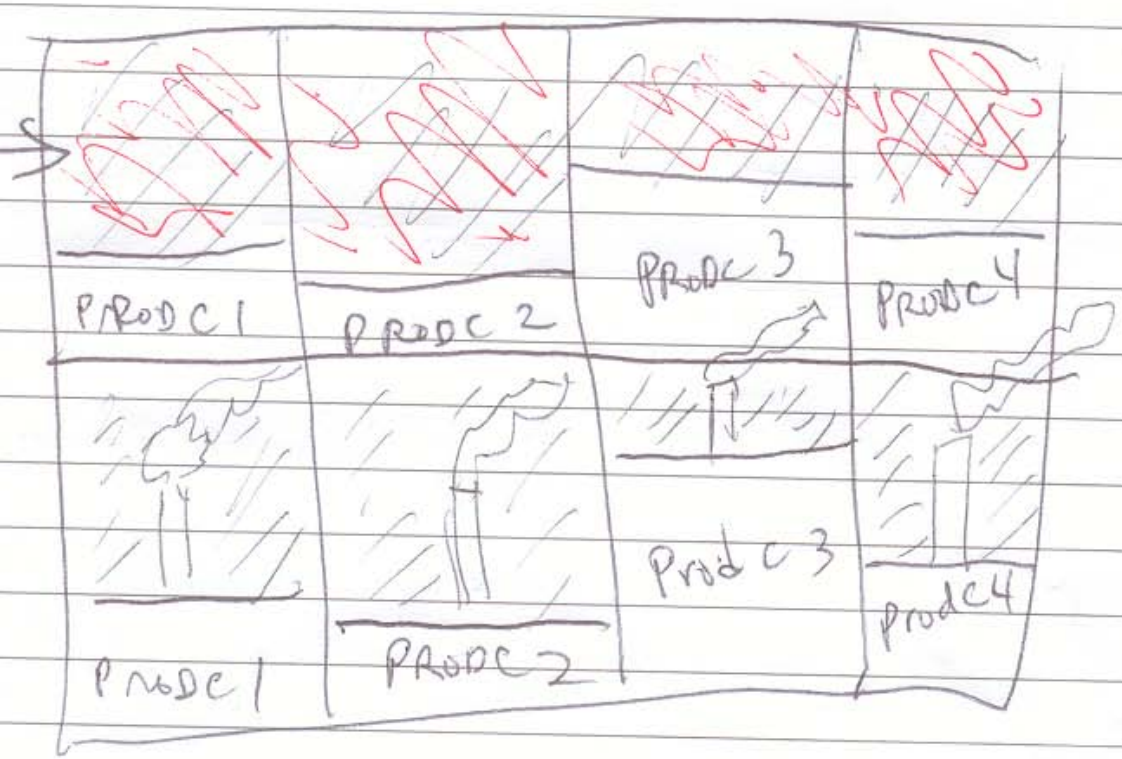
LAR remains the same regardless of landuse



LAR

HYATT
HOTELS & RESORTS ®

no plant but feedstock production added



yet another value of LAR

Perspective 4

Alter equation for more intuitive understanding.

NBE = [PGE x (1+L) x (1-LAR) x (1-PRODC)]
- [PGE x SEQP]
+ [SITE_TNC x (1-PRODC)]
+ [LEAK x (1 – PRODC)]

1. Allow LAR>1, and remove increased biomass growth from SITE_TNC so no double-counting occurs. This enables all feedstock growth to be represented in the LAR value.
2. Separate feedstock growth on (a) existing land base, and (b) new land base.
3. Include non-feedstock growth (a) existing land base, and (b) new land base.
4. Separate avoided emissions from LAR into different parameter.
5. All land, both feedstock and non-feedstock, in “region” should be included in PRODC (see following slide).
6. Leakage can be positive (anticipatory forest expansion) or negative (reduction of stock elsewhere).

Preliminary summary comments on EPA's Draft Accounting Framework for Biogenic C02 Emissions Charge #4 Questions ("Evaluation of Accounting Framework")

Marilyn Buford, Steven Rose, Ken Skog, Peter Woodbury,

- Preliminary recommendations for all charge questions under development

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Does the framework accurately represent the changes in carbon stocks that occur offsite, beyond the stationary source (i.e., the BAF)?

First, we assume that the "carbon outcome" to be estimated as a result of stationary biogenic emissions is net atmospheric CO2 change over a time period such as 100 years

No

- Not properly accounting for carbon recovery in forests or "anyway" emissions, which occur of over a few to many decades
- Reference point baseline not estimating actual C gains/losses associated with biogenic emissions
- Regions by default "sourcing" and "non-sourcing" regions, but actual C changes may or may not be consistent.
- No consideration of uncertainty of whether likely to achieve our assumed goal
- …

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Does the framework accurately represent the changes in carbon stocks that occur offsite, beyond the stationary source (i.e., the BAF)?

Continued

- Landfill CH4 treated via CO2. However, the change of form should not be ignored in avoided emissions due to the different GWP.
- Inconsistencies need to be resolved – (1) relative to stationary fossil fuel emissions accounting, (2) land management and GHG flux accounting, (3) baseline use, (4) treating all forests as a C debt and ag as C credit

- However, most of the accounting variables *for evaluating carbon fluxes directly from the feedstock source to the stationary source are appropriate*. Mistake in computing L and the non-intuitive formulation and terminology should be addressed.

Is it scientifically rigorous?

No

- Many elements not adequately discussed and scientifically supported – e.g., reference point approach, leakages, losses.
- Insufficient justification for substituting space for time – facility engages landscape (v. parcels)
- Did not consider starting point for commercial forest C accounting as regeneration
- BAF value for roundwood & logging residue unlikely to reflect "difference in CO2 concentrations" in atmosphere in 50 – 100 yrs
- Uncertainty is not acknowledged and considered

Does it utilize existing data sources?

Yes, but…

- Data source unclear for some of the information required
- Data considered are not adequate to attribute emissions to a facility
- Dubious data sufficient to support proposed framework
- Data from individual feedstock producers appears necessary – costly and burdensome

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Is it easily updated as new data become available?

Don't know

- Some pieces updatable – e.g., FIA data
- Others, not clear given that implementation is unclear
- Also, may not be meaningful to update annually for some data (e.g., soil & forest carbon)

Is it simple to implement and understand?

No

- The framework is not easy to understand and non-intuitive
- The framework appears to be difficult to implement, possibly unworkable, especially due to data and facility-by-facility requirements and calculations
- More implementation specifics are needed – e.g., frequency and timing of calculations and crediting, specific data sources and updating processes over time

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Can the SAB recommend improvements to the framework to address the issue of attribution of changes in land-based carbon stocks?

- Yes, given our assumption about goal – recommendations under development

Are there additional limitations of the accounting framework itself that should be considered?

Yes

- Many issues left open, yet actual proposals made. Ambiguity should be removed. e.g., 3 feedstock categories or more, leakage not included but it is.
- Feedstock groupings – not sure what these mean, if anything.
- Additional and more detailed case studies would be useful – landfills, switchgrass, waste, other regions
- Without specifying goals of the policy clearly, and without specifying the different policy contexts for which this accounting framework, it is challenging to evaluate the utility of the framework.
- Undesired consequences due to this kind of partial accounting – perverse incentives for investors and land-owners
- Cost-benefit analysis of the framework implications would be valuable
- Actual feedstock use will be market driven – framework doesn't appear to provide flexibility to accommodate (i.e., facilities limited to "approved" feedstock(s) and their BAF(s))

Biogenic CO_2 Emissions

Case Studies – Responses to Charge Questions

Charge Questions:

1) Does the SAB consider these case studies to be appropriate and realistic?

2) Does the EPA provide sufficient information to support how EPA has applied the accounting framework in each case?

3) Are there alternative approaches or case studies that EPA should consider to illustrate more effectively how the framework is applied to stationary sources?

Team Members

Morton Barlaz, Chuck Rice, Steven Kelley, Richard Nelson

Charge Question #1

Does the SAB consider these case studies to be appropriate and realistic?

- "Marginal at best" to "No" for case studies #1 - #4;
  - "real-world" scenarios need to be incorporated to serve as models for other situations
  - we will learn more about the utility of the framework by testing it in multiple unique case studies with "real world" data development and inclusion

- Case study #5 needs to be re-done/removed as it is unrealistic.

Charge Question #2

Does the EPA provide sufficient information to support how EPA has applied the accounting framework in each case?

- Somewhat, but many values are single numbers across a wide region (e.g., the 1.5 tons of corn stover per acre across a "region") and in some instances don't really mirror real situations.
- Document does not address uncertainties and should develop examples from real data plus possible sensitivity analyses.
- More definitive wording statements is needed.
- Need accounting for co-products.

Charge Question #3

Are there alternative approaches or case studies that EPA should consider to illustrate more effectively how the framework is applied to stationary sources?

- Land scale needs to be addressed with each feedstock. Regional is probably too big for most cases that involve a soil component.

- Perform additional case studies:
  - perennial herbaceous energy crop
  - annual energy/biomass sorghums
  - rotations with food and energy crops
  - different land and soil types
  - municipal solid waste
  - internal reuse of process materials

Recommendations

More Actual/Realistic Case Studies that:

- Mirror "reality" with examples currently in practice.
- Determine the "real" BAF across many different scenarios that mirror real agriculture/forestry situations (e.g., "slice and dice" a little more finely).

Overall Evaluation: Charge-6 Questions

- Does the report-in total-contribute usefully to advancement of understanding…?
  - Yes: It forced important questions.
- Does it provide a mechanism to adjust total on-site emissions?
  - Yes:
    - but is there sound science behind all elements?
    - Does it meet a cost benefit test, or even a test that it would be an improvement over a categorical 1.0 or 0.0?
    - More on following slide
- Does the SAB have any advice regarding potential revisions that might enhance the final document
  - Yes: Other charges provide guidance on improving the method. I take this to be elements of the presentation, background presented, style, etc. that would help readers/users of the document to understand the method and intuition behind it.
  - More on later slide.

Are all elements of the method based on sound science.

- The method offers no sound way to define a region, and how a region is defined makes a huge difference as we saw from case studies.
  - Is there a scientific foundation for defining a region?
- What justification is there for using an average regional value for land use emissions/uptake.
  - Scientifically these should reflect what happens on the land that is actually supplying biomass to the point source.
- What justification for not crediting uptake if a region is positive?
  - This appears arbitrary or based on an assessment that it is not fair that point sources get credit for this uptake—but is it "fair" to penalize a point source for land mismanagement that they did not control—fairness in eye of beholder?
- Implicitly the method assumes fossil energy related emissions and biogenic emissions from products of points sources will be controlled by other measures or are not relevant but not upstream—land use related changes in carbon.
  - What justification for this differential treatment?
  - Even if we stick to biogenic CO2, if the boundaries of the point source can be expanded upstream why not down stream—to emissions from by-products, co-products, or products? Ethanol combustion, DDGs in animal feed that will soon become CO2 (or CH4)

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Does the report demonstrate that the revised method meets a cost benefit test or even a test that applying this method will reduce atmospheric carbon compared with a categorical 0 or 1

- No evidence is presented on cost-benefit or even if there is an improvement.
- Imprecise, and irrelevant regional factors could be wrong in either direction.
- Moving to more precise and relevant measures is very costly, or would require a very burdensome sourcing of biomass for a point source and monitoring carbon stocks on these parcels indefinitely—high cost to improve fidelity—worth it?
- The potential for significant behavioral response to avoid a high BAF could seriously undermine its effectiveness—behavior to avoid high BAF is a bias in one direction and no assessment of this bias.

Key question EPA asked us to answer?

- Is this method better than a categorical 1 or 0? (or can it feasibly be or meeting some cost benefit test.)
  - Yes
  - Yes with some modifications
  - Possibly yes but many unanswered questions
  - No
- If no
  - Categorical 1 or categorical 0.

Improvements to the document.

- The document is wordy and more complex than it needs to be.
- Better statement of objective and where they are heading at the front. Useful to point out that this is in response to EPA's requirement to regulate GHG emissions under the Clean Air Act…and what that is.
- Formula not very intuitive.
- I understand attempt to keep this policy neutral but because how to account depends on the policy framework, not clear that the system can be evaluated absent an expectation about the policy environment, and a lot of those expectations of EPA are unstated reasons for decisions they have made—those should be stated explicitly
  - Can be very clear that these are not decided but that the method proposed is based on these assumptions about the more complete policy framework.
  - Then clear that the method would need to be amended if the policy framework is different or changes.

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Some General Comments

- EPA Staff have done an admirable job of tackling a very complex assignment.
- Their significant challenge is to create an accounting system that ultimately would be used in a regulatory system that is not well-defined, and is likely to be highly incomplete (covering some GHGs/sources but not all), but at this point is some implementation of the Clean Air Act.
- An important complication is that the accounting system attempts to apply responsibility to things that happen on the land, to a point source, for which the agent who owns that point source has no direct control.
- If land use emissions/uptake were controlled directly then, under some conditions, there would be no reason to include this in estimates related to point source emissions==applying zero at the point source. I.e. This problem arises because of the anticipation of incompleteness in the GHG control system.
- Estimating an individual point source's BAF based on average data in a region is highly problematic.
- In general it ought to be specific to suppliers to the point source.
- In general, the accounting system ought to be based on observable and measured changes rather than projections and these are not available from public sources at the resolution level required.
- Dynamics need to be addressed through regular update of BAF, and ongoing liability for/accounting of suppliers to the point source.