

Framework for Assessing Biogenic CO₂ Emissions from Stationary Sources

Presentation to the
Agriculture Air Quality Task Force

April 22, 2015



- Overview of the Framework process
 - Purpose
 - 2011 draft Framework
 - 2012 SAB recommendations
- Revised Framework
- 2015 SAB Panel peer review
- Questions and clarifications

What is the original purpose of this study?



- 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 to account for stationary source onsite biogenic CO₂ emissions, taking the biological cycling of carbon into consideration?
- Biogenic CO₂ emissions are defined as CO₂ emissions related to the natural carbon cycle, as well as those from the production, harvest, combustion, digestion, fermentation, decomposition, and processing of biologically-based materials

2011 Draft Framework and 2012 Peer Review



- Technical report on considerations for accounting net biogenic CO₂ associated with stationary sources; flexible to be adapted for different applications.
- Described an accounting methodology on the basis of the carbon cycle (including biogenic feedstock growth and/or emissions avoidance).
- SAB peer review: 18 expert panelists; 1 year review with public meetings; 17 member consensus, 1 separate opinion
 - *A priori* “carbon neutrality” is not supported by the science.
 - 17 found IPCC inventory approach not adequate for less than all sector coverage.
 - Preferred a specific policy application to evaluate or a larger scope of analysis.
 - Captured main factors to assess offsite carbon cycle dynamics associated biogenic feedstock use; especially for certain feedstocks (i.e. waste and short-rotation agricultural feedstocks; Reference point baseline approach is not adequate (additionality is important).
- Recommendations
 - Future anticipated baseline approach
 - Alternative fate approach (waste-derived feedstocks, decay rates for forestry/ag residues)
 - Consideration of tradeoffs between different temporal scales
 - Default factors by feedstock and region



Revised Framework



- Technical report, not specific to any policy or program: flexible to be adapted within various types of programs
- Consistent with existing stationary source regulatory programs
 - Direct emissions from stationary source as starting point
 - Fossil and biogenic fuels analyzed comparably
- Provides critical link from direct emissions to land supplying feedstocks
- Further explores the key technical elements that should be considered when assessing biogenic carbon-based emissions from stationary sources using biogenic feedstocks:
 - Baseline
 - Temporal Scale
 - Spatial Scale
 - Leakage
 - Feedstock categories



- Improved framework equation representation
- Added future anticipated baseline approach analysis
- Evaluated implications of different temporal scales
- Refined feedstock categories
 - 3 broad categories: forestry, agricultural, waste-derived
- Added alternative fate approach for waste-derived feedstocks and industrial byproducts with no current alternative markets
- Added illustrative case studies and regional biogenic assessment factors using different baseline approaches and temporal scales to demonstrate the functionality of the framework equation

Not able to address all recommendations

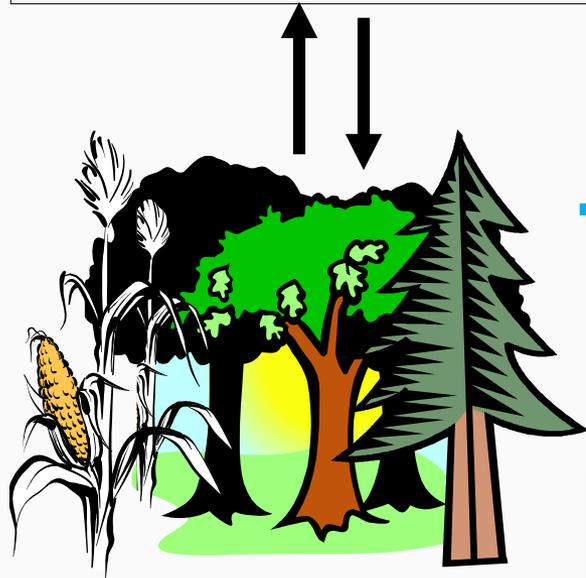
- Flexible to be adapted within various types of programs and stationary sources
- Not specific to any policy or program
- No final BAFs

Framework Scope



Biogenic Landscape Attributes

Landscape C-based fluxes from feedstock growth and/or collection, avoided emissions, land use management or land use change



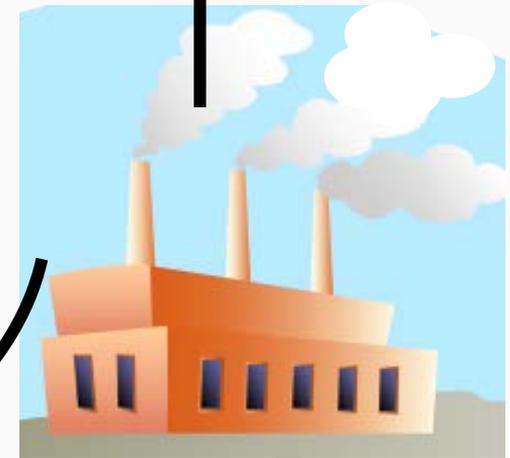
Feedstock transferred from landscape to stationary source



Biogenic Process Attributes

Carbon that leaves the supply chain as losses or products

Stationary source
Biogenic CO₂ emissions





$$BAF = \frac{NBE}{PGE}$$

$$NBE = (PGE)(GROW + AVOIDEMIT + SITETNC + LEAK)(L)(P)$$

Therefore:

$$BAF = (GROW + AVOIDEMIT + SITETNC + LEAK)(L)(P)$$

- The equations above are designed to transform a measurable or estimated quantity (carbon content of biogenic feedstock used at the point of assessment) into a quantity that cannot be directly measured (the net atmospheric biogenic CO₂ contributions associated with different stages of biogenic feedstock production, processing, and use at a stationary source).
- The Biogenic Assessment Factor (**BAF**) is a unitless factor that represents the net atmospheric biogenic CO₂ contribution associated with using a biogenic feedstock at a stationary source, taking into consideration biogenic landscape and process attributes associated with feedstock production, processing, and use at a stationary source, relative to the amount of biogenic feedstock consumed.



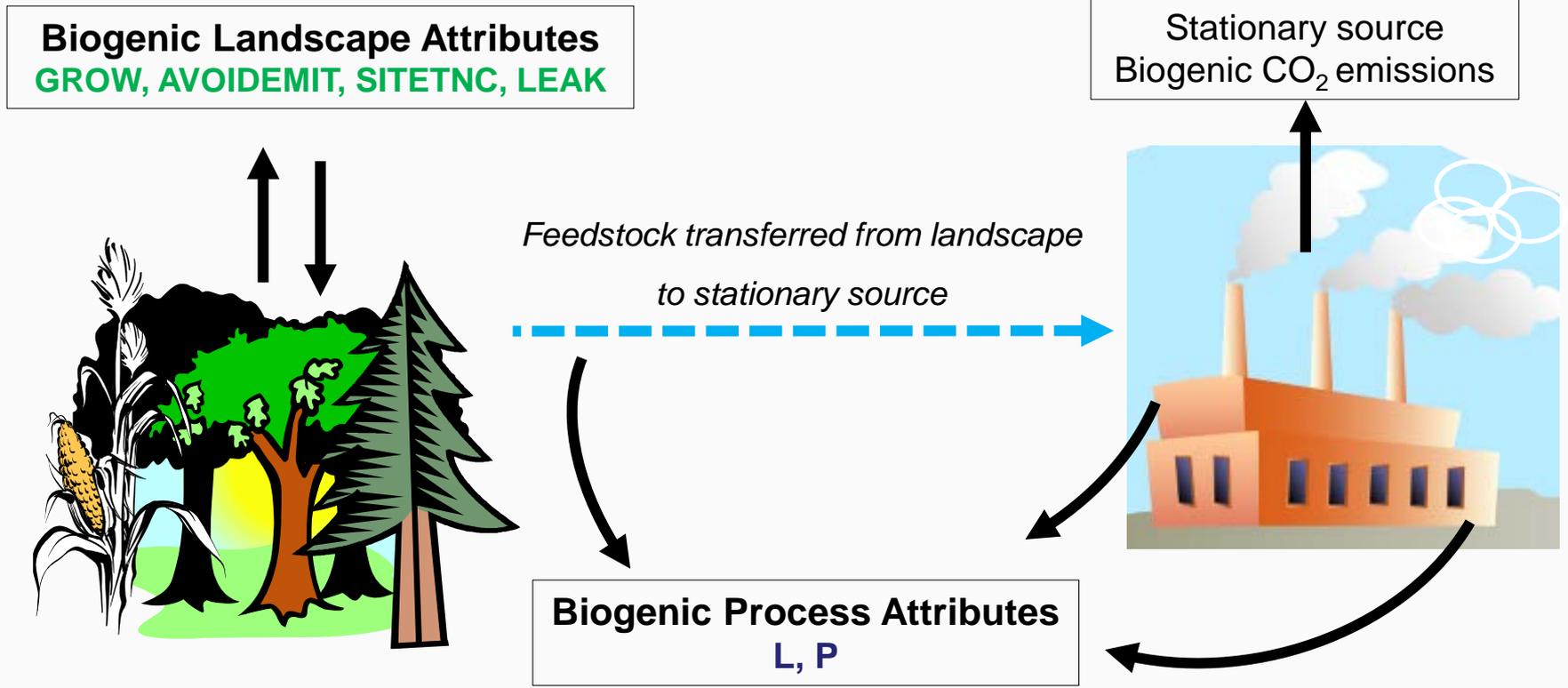
- Biogenic Landscape Attributes

- Net growth (**GROW**): net biogenic carbon sequestered or emitted through feedstock growth and removals on the feedstock production landscape
- Avoided emissions (**AVOIDEMIT**): avoided landscape emissions associated with feedstocks that would have eventually decomposed or been burned on the production site if not removed
- Total net change at production site (**SITETNC**): net biogenic carbon emissions or sequestration from non-feedstock biogenic carbon pools on the production landscape associated with land management or land use or land management change
- Leakage (**LEAK**): emissions associated with leakage, such as indirect land use change from displaced feedstock or feedstock substitute production

- Biogenic Process Attributes

- Losses (**L**): represents losses of biogenic feedstock carbon during transportation, storage, and processing (e.g., via decomposition)
- Products (**P**): represents carbon embodied in process products (e.g., lumber, ethanol, biochar, ash) that pass out of the supply chain prior to or exit the stationary source through forms other than as stack emissions

Framework Scope with Equation Terms





- EPA requested a second targeted peer review of the revised framework with the Science Advisory Board (SAB)
 - EPA incorporated many of the 2012 SAB's findings and recommendations into the revised report.
 - Thus the charge questions focus on specific areas that were not addressed and where EPA would like further guidance
- SAB reconvened the 2011 Panel (14 of 17)
- First in-person public meeting held March 25-26, 2015
 - 20+ public comments submitted
- Next meeting public teleconference May 29



1. Considerations for choosing appropriate temporal scales: e.g., differences in temporal characteristics of different feedstocks, in assessment timeframe
 - For example: Fluxes related to feedstock production may occur over many years/decades, whereas policies may cover only a few years/decades and reporting may be the current year.
2. Considerations for choosing appropriate scales of biogenic feedstock usage for analyzing future potential bioenergy production changes
 - After establishing the anticipated baseline, employ different 'shocks' or changes to one or more variables within models to simulate different market, policy or biophysical conditions
 - Allows evaluation of estimates for different potential biogenic feedstock production market and land use effects, including the biogenic carbon-based emissions profile.

Illustration: Temporal Scale

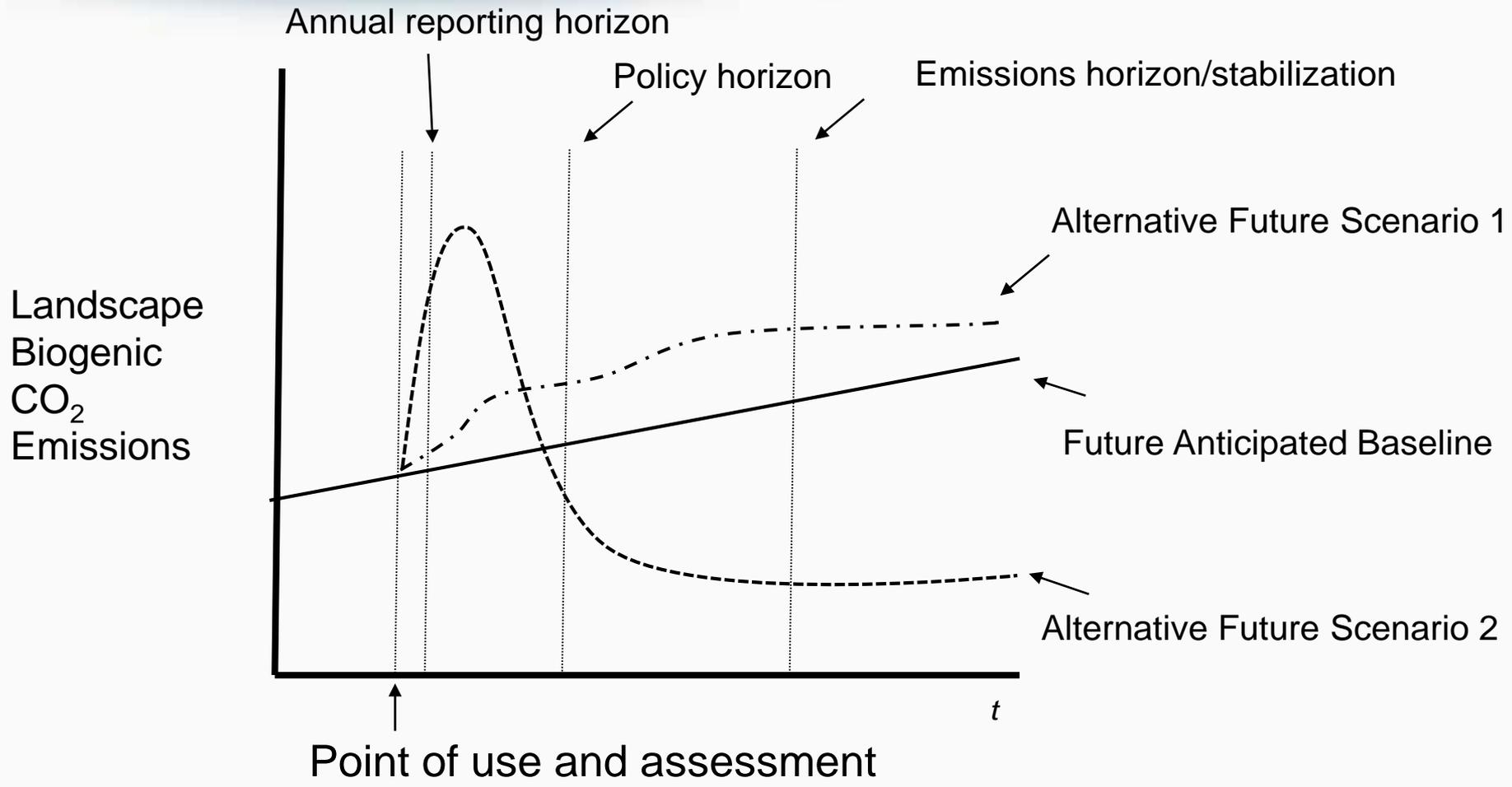
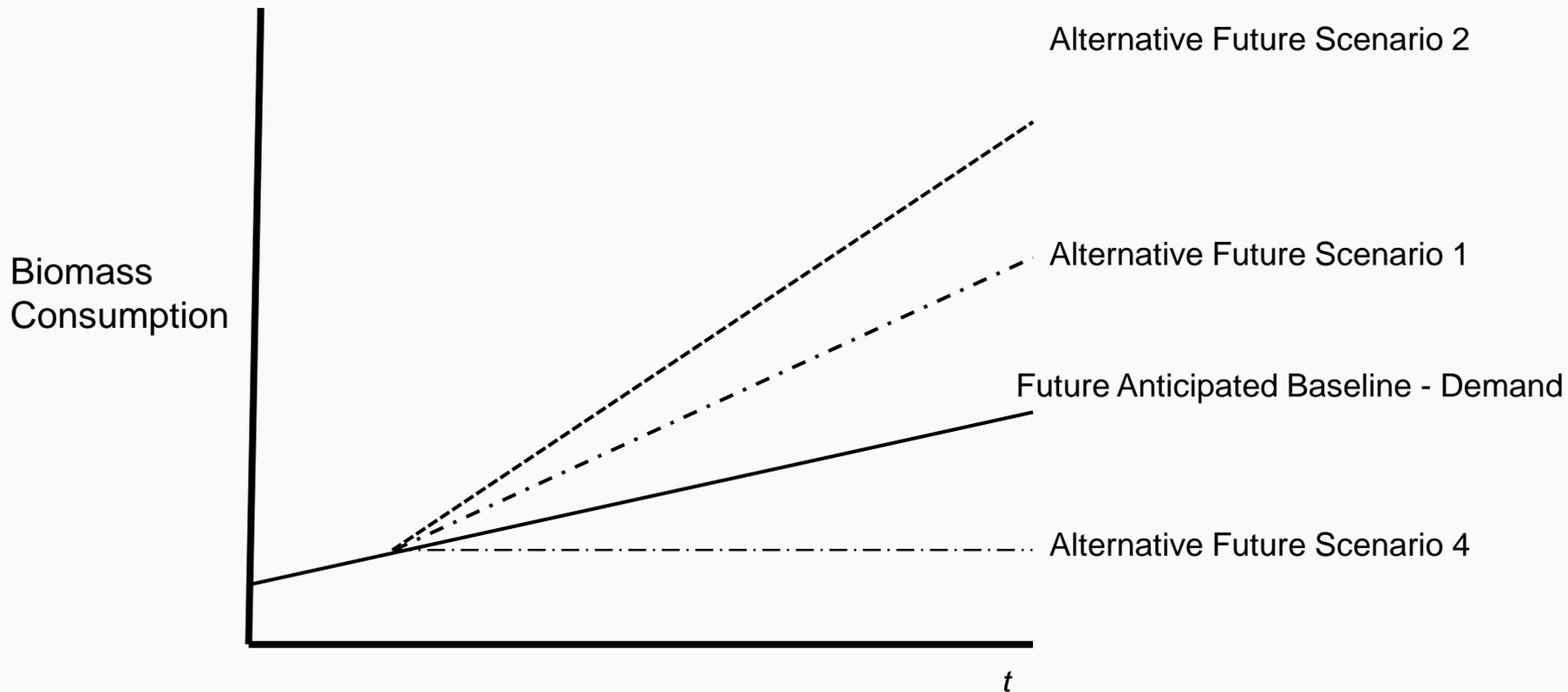


Illustration: Biomass Demand Scenarios



Biomass scenarios can vary in the quantity of future feedstock demand, the portfolio of feedstocks consumed or changes to other variables.



- SAB peer review an important part of the ongoing process to evaluate the role of biomass and its use at stationary sources.
- As part of this technical process, we will continue to assess and closely monitor overall bioenergy demand and landscape conditions for changes that might affect public health or the environment
- We encourage your engagement on this next round of SAB peer review on the revised Framework.



Thank you!

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