



NDCEE

National Defense Center for Energy and Environment

Renewable Doesn't Mean Carbon Neutral: Emerging Greenhouse Gas Inventory Challenge

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Presentation Overview

- Greenhouse Gas (GHG) Drivers
- Federal Efforts Moving Forward
- What are Biogenic Emissions?
- GHG Protocols and Biogenic Emissions
- Biogenic Emissions: Area of Concern?
- Calculation Example
- Biogenic Calculation Challenges
- Considerations and Next Steps

GHG Inventory Drivers

- Executive Order 13423
- Complements goals of Energy Policy Act 2005 (EPA Act 2005) and Energy Independence and Security Act of 2007 (EISA)
- *Massachusetts v. EPA* - U.S. Supreme Court (2007)
- EPA's GHG Advance Notice of Proposed Rulemaking (ANPR) or "GHG Rule" (2008)
- New Administration Direction
 - "State of Union" call for GHG Cap and Trade System
 - New GHG Executive Order(s)
- State and Regional GHG Mandates and Activities

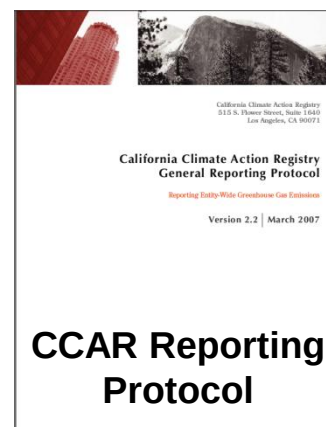
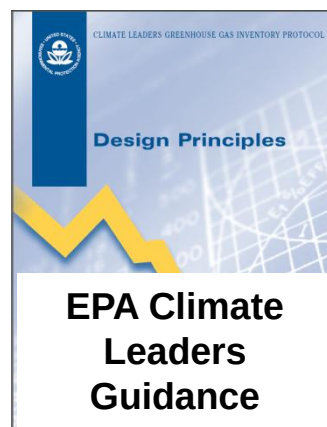
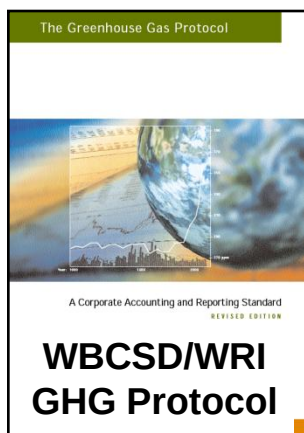
Federal Efforts Moving Forward

- These drivers are spurring DoD and civilian federal agencies to better understand:
 - GHG inventory frameworks
 - Calculation methodologies
 - Registry and regulatory programs
- Proactive federal GHG inventory efforts emerging in:
 - Deputy Assistant Secretary of the Army (ESOH) via NDCEE
 - NASA Headquarters and Goddard Space Flight Center
 - Army Environmental Command
 - U.S. Air Force
 - National Park Service
- Some efforts already looking at biological sequestration

What are Biogenic CO₂ Emissions?

- Biogenic emissions are “CO₂ emissions produced from combusting a variety of biofuels, such as biodiesel, ethanol, wood, wood waste and landfill gas” per CCAR 2008 guidance
- Biogenic CO₂ could be generated by direct combustion of renewable fuels (and materials), such as:
 - Biomass, wood, and wood waste
 - Landfill gas / biogas
 - Biofuels (B100, E100)
 - Biofuel component of mixed fuels (B20, E85)
- “Renewable” energy purchases produced via combustion of:
 - Biomass / biogas
 - Biofuels
 - Biomass portion of MSW

Most Federal Efforts Developed Using GHG Inventory Protocols/Guidance



GHG Protocol Overviews on Biogenic

- WRI/WBCSD GHG Protocol, The Greenhouse Gas Protocol
 - P.25 - Stationary emissions of biomass, not included in Scope 1 or 2
 - P.63 - Biologically sequestered carbon “reported separately from scopes”
 - P.88 - Biologically sequestered atmospheric carbon explained
- U.S. EPA Climate Leaders, Greenhouse Gas Inventory Protocol, Design Principles
 - P.15,16 - Direct emissions from combustion of biomass, not included in Scope 1 or 2 emissions
 - P.85 - Biofuels fall under “renewable energy”
- CCAR, General Reporting Protocol, Version 3 (April 2008)
 - P.41 – Lack of international consensus on biogenic emissions but distinct from anthropogenic emissions
 - P.45 - Provides specific example of calculation methodology for biodiesel mixes

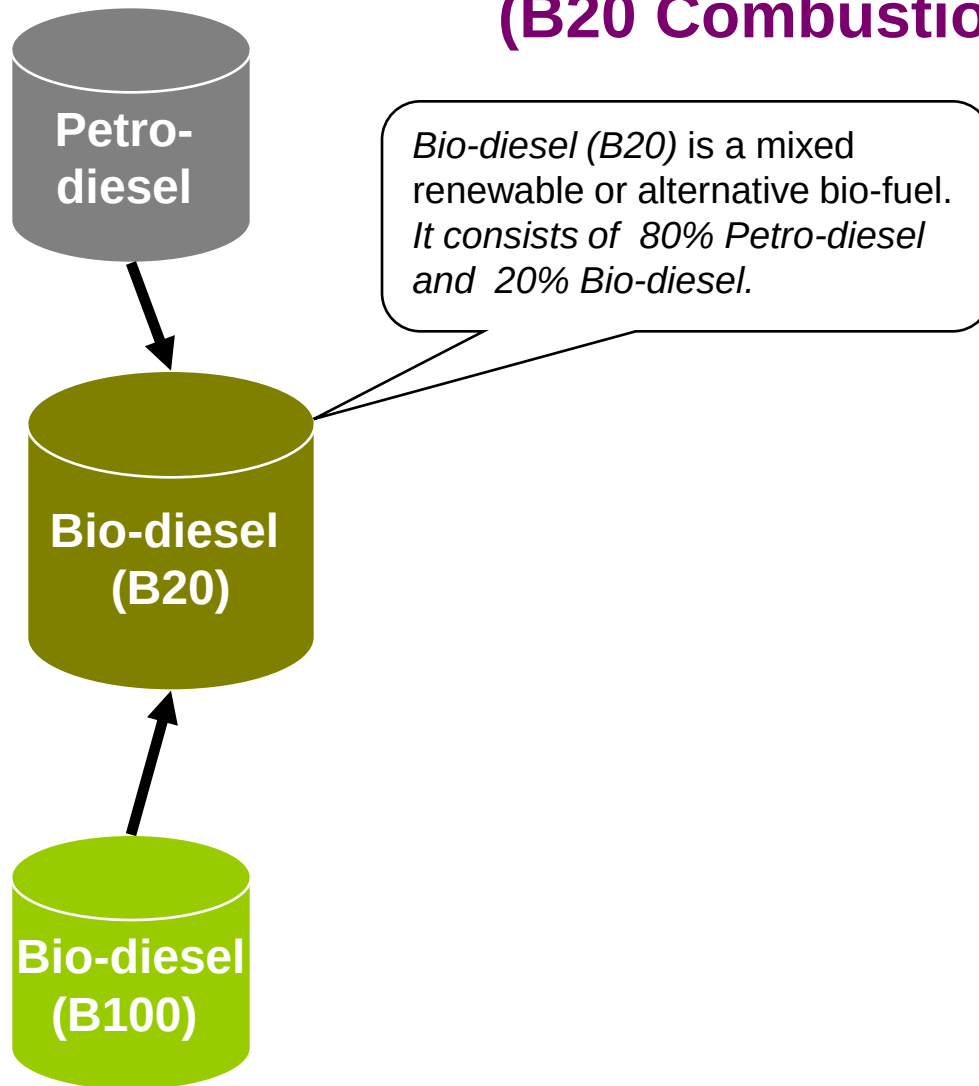
Biogenic Emissions: Area of Concern?

- Growing area of concern is calculation of biogenic CO₂ emissions from renewable sources
 - Urgency with keen interest in sequestration quantification and offset projects
- GHG Protocols exclude biogenic (or biologically sequestered) CO₂ emissions from Scope 1 & 2 inventories
- But, the N₂O or CH₄ emissions from same biomass / biofuel sources are considered anthropogenic (or human generated) and are included in Scope 1 & 2 inventories
- Biogenic CO₂ emissions to be calculated but are considered optional by most protocols and registry programs

Biogenic CO₂ – “Devil is in the Details”

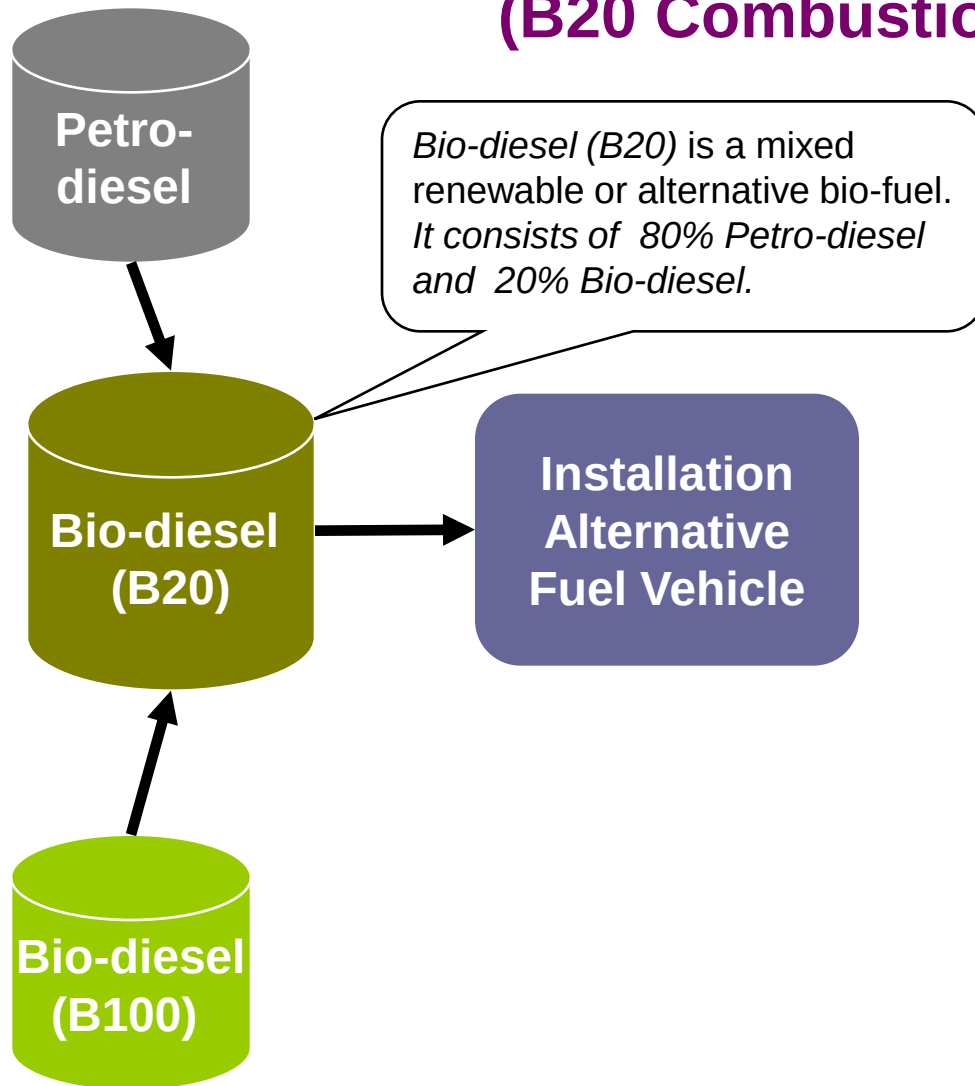
- Current federal inventory calculation approaches account for biogenic emissions in divergent ways
- Common approach is to “zero out” the biogenic CO₂
 - Pros - Easier calculation and simpler calculation paths
 - Cons - Emission factors or calculations that omit biogenic CO₂ portion
- Alternative approach to fully but separately account for biogenic emissions
 - Pros - Enables fuller accounting of GHG emissions and supports future biogenic requirements whether optional or mandatory
 - Cons - More calculation complexity and limited emission factors
- Lets work through a biogenic calculation example...

Mixed Renewable Fuel Example (B20 Combustion in Vehicle)



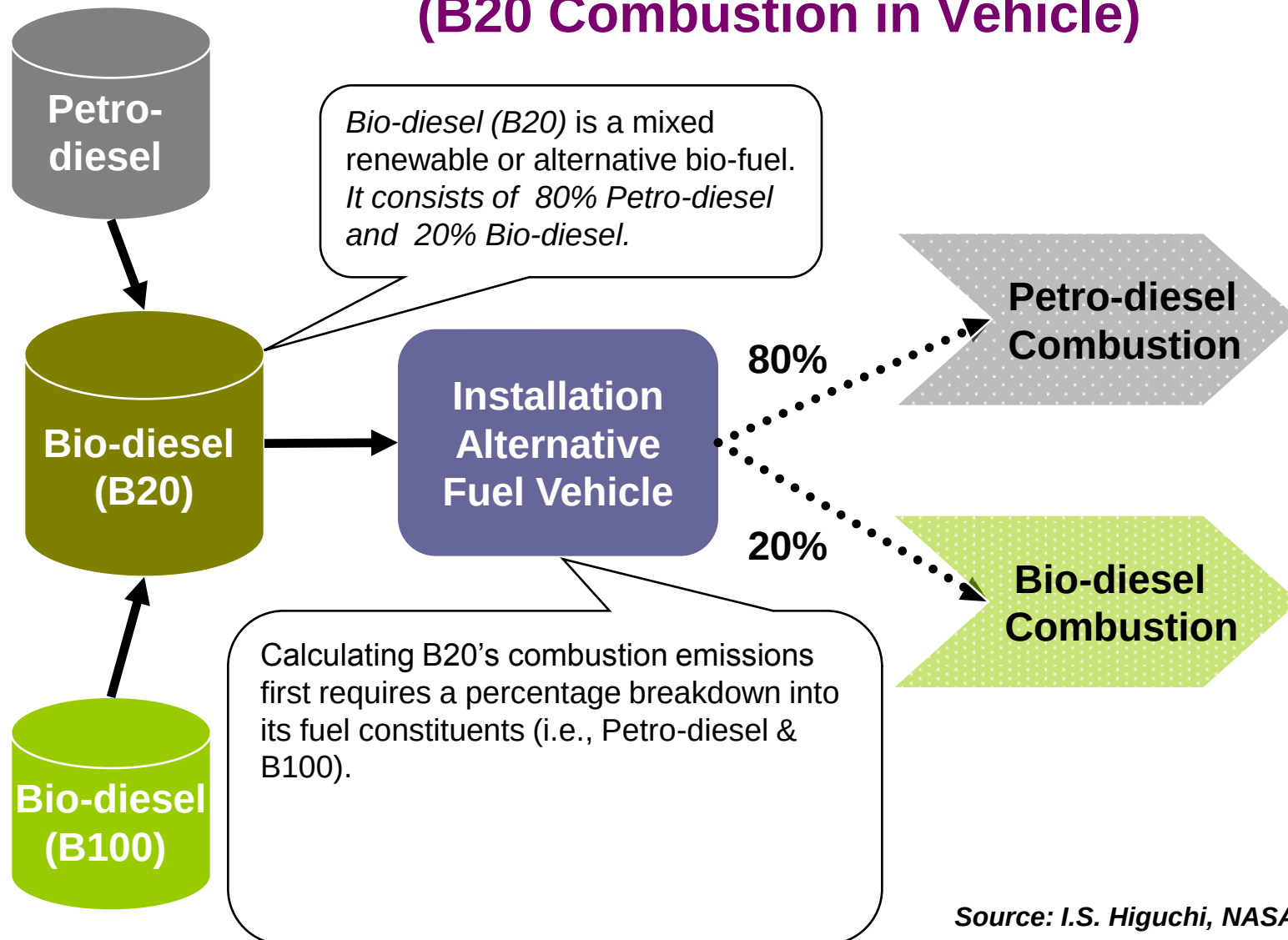
Source: I.S. Higuchi, NASA and J. Alcorn, CTC

Mixed Renewable Fuel Example (B20 Combustion in Vehicle)



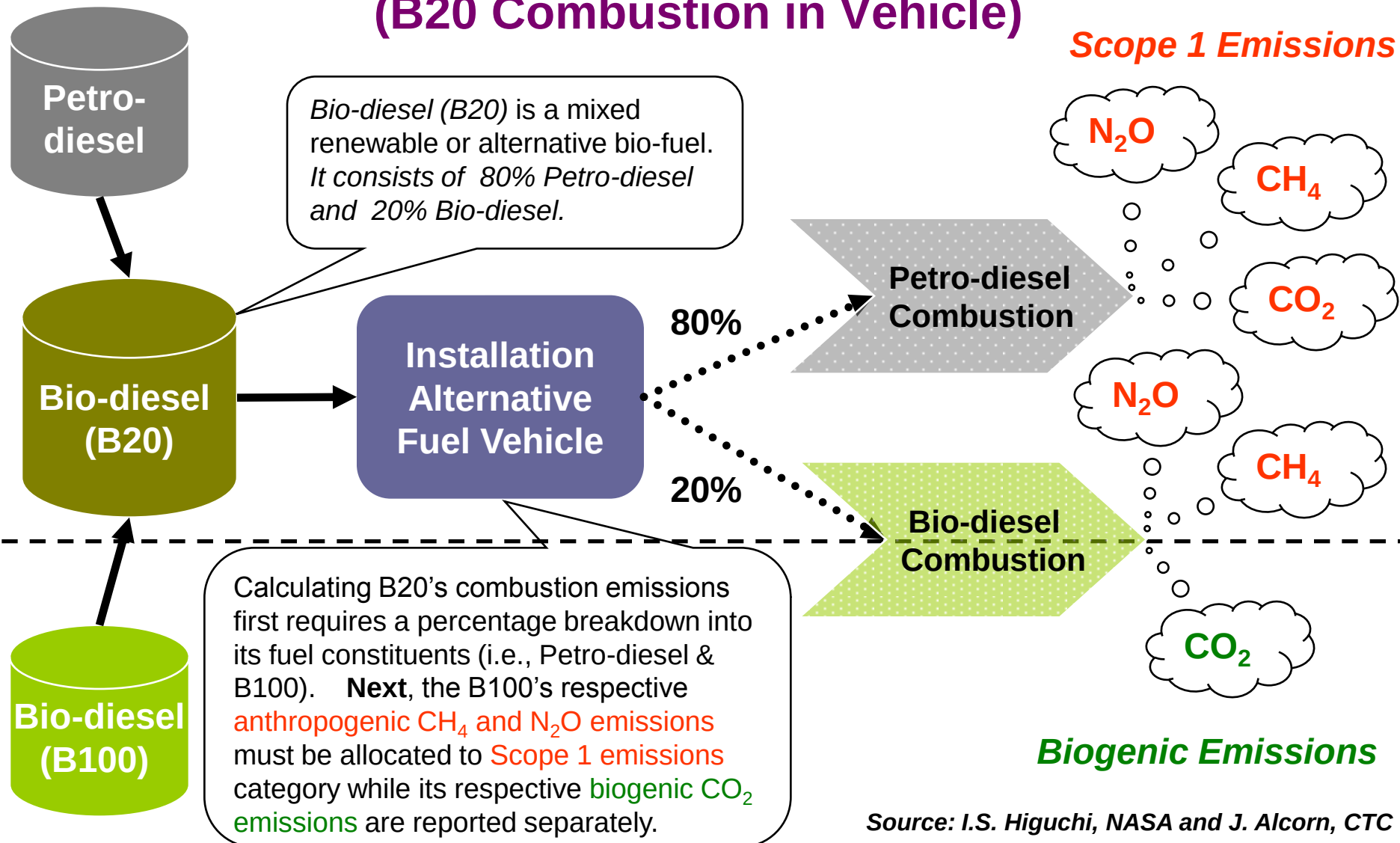
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Mixed Renewable Fuel Example (B20 Combustion in Vehicle)



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Mixed Renewable Fuel Example (B20 Combustion in Vehicle)



Biogenic Calculation Challenges

- Lack of international consensus on biogenic emissions
- Not currently a “required” element
- Emission factors often don’t differentiate between biogenic and anthropogenic or “zero out” the biogenic CO₂ portion
- Increases data calculation complexity and recordkeeping
- Many of GHG inventory efforts jump from Scope 1 & 2 to sequestration projects but ignore “optional” biogenic emissions

Considerations and Next Steps

- Despite dynamic regulations/consensus, protocols have biogenic provisions to reporting
- Prudently develop federal GHG inventory approaches with biogenic calculation provisions from the start because:
 - Requires minimal resources to do so now
 - Avoids costly rework and recalculation in the future
 - Enables fuller accounting of GHG emissions whether biogenic emissions requirements are optional or mandatory
- Build awareness of optional protocol provisions
- Makes for easier progress to sequestration/offset projects

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Key Reference Resources

- WRI/WBCSD GHG Protocol, The Greenhouse Gas Protocol , Revised Edition - <http://www.ghgprotocol.org/files/ghg-protocol-revised.pdf>
- U.S. EPA Climate Leaders, Greenhouse Gas Inventory Protocol, Design Principles - <http://www.epa.gov/stateply/documents/resources/design-principles.pdf>
- CCAR, General Reporting Protocol, Version 3 (April 2008) - http://www.climateregistry.org/resources/docs/protocols/grp/GRP_V3_April2008_FINAL.pdf