

# Clean Energy

Biofuel Production and Usage  
Energy from Biomass Combustion  
Anaerobic Digesters

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Keith Driver and Kirsten Hogan ~ Baseline Emissions Management Inc.

# Presentation Format

- Review for Each Protocol
  - Seed materials
  - Protocol scope
    - Project condition
    - Baseline condition
  - Functional equivalence
  - Emission reduction mechanisms
  - Applicability criteria
  - Flexibility mechanisms
  - Overview of quantification approach
- Gaps in Protocols for Grouping

# Biofuel Production and Usage

- Seed Materials
  - *Greenhouse Gas Protocol: Biofuels in Transportation Projects (Apr, 2006)*
    - Prepared for NRCan  
[Technology Early Action Measures (TEAM)]
    - Prepared by The Delphi Group and GHGm.com
  - Other Good Practice Guidance
    - CDM protocols
    - Project evaluations
- Technical Review
  - TEAM process
  - Alberta process with gov't and industry stakeholders

# Biofuel Production and Usage

- Project Condition
  - Implementation of Biofuel Production Facility
    - Range of processes  
(Pyrolysis, gasification, fermentation, distillation, etc.)
    - Range of fuel outputs  
(Biodiesel, ethanol, charcoal, syngas, etc.)
    - Thermal and electricity energy
    - Landfill diversion
- Baseline Condition
  - Fossil fuel production, processing and usage
    - Fuel Usage
    - Thermal energy
    - Electricity production
  - Landfill of similar amount of material

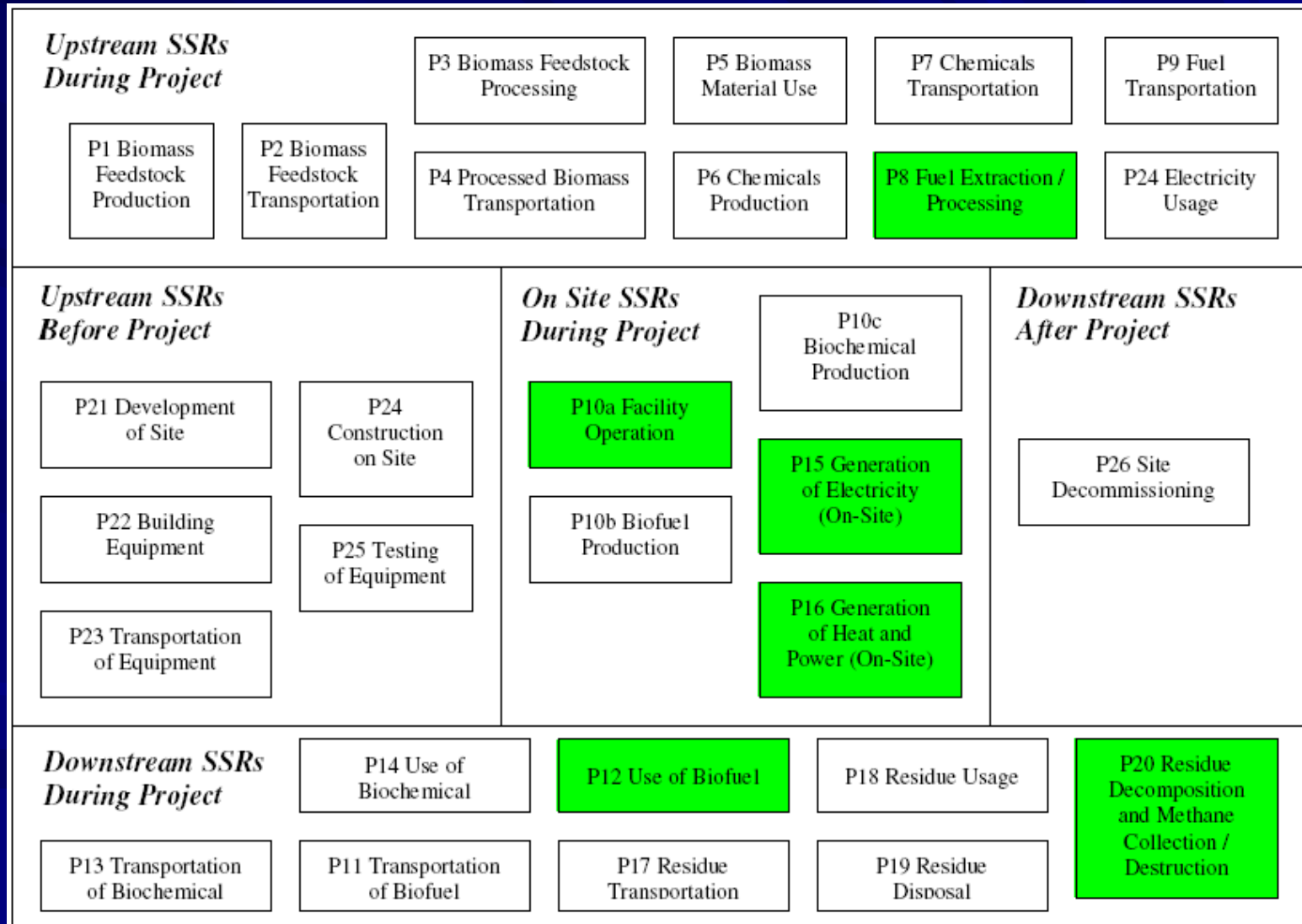
# Biofuel Production and Usage

- Functional Equivalence
  - Energy potential of outputs
  - Electricity generation
  - Landfill of equivalent material
- Emission Reduction Mechanisms
  - Offset fossil fuel production, processing and usage
    - Biogenic nature of biofuels
    - Thermal energy production
  - Offset non-renewable electricity production
  - Diversion of organic materials from landfill
    - Avoid methane production
- Biogenic CO<sub>2</sub> emissions

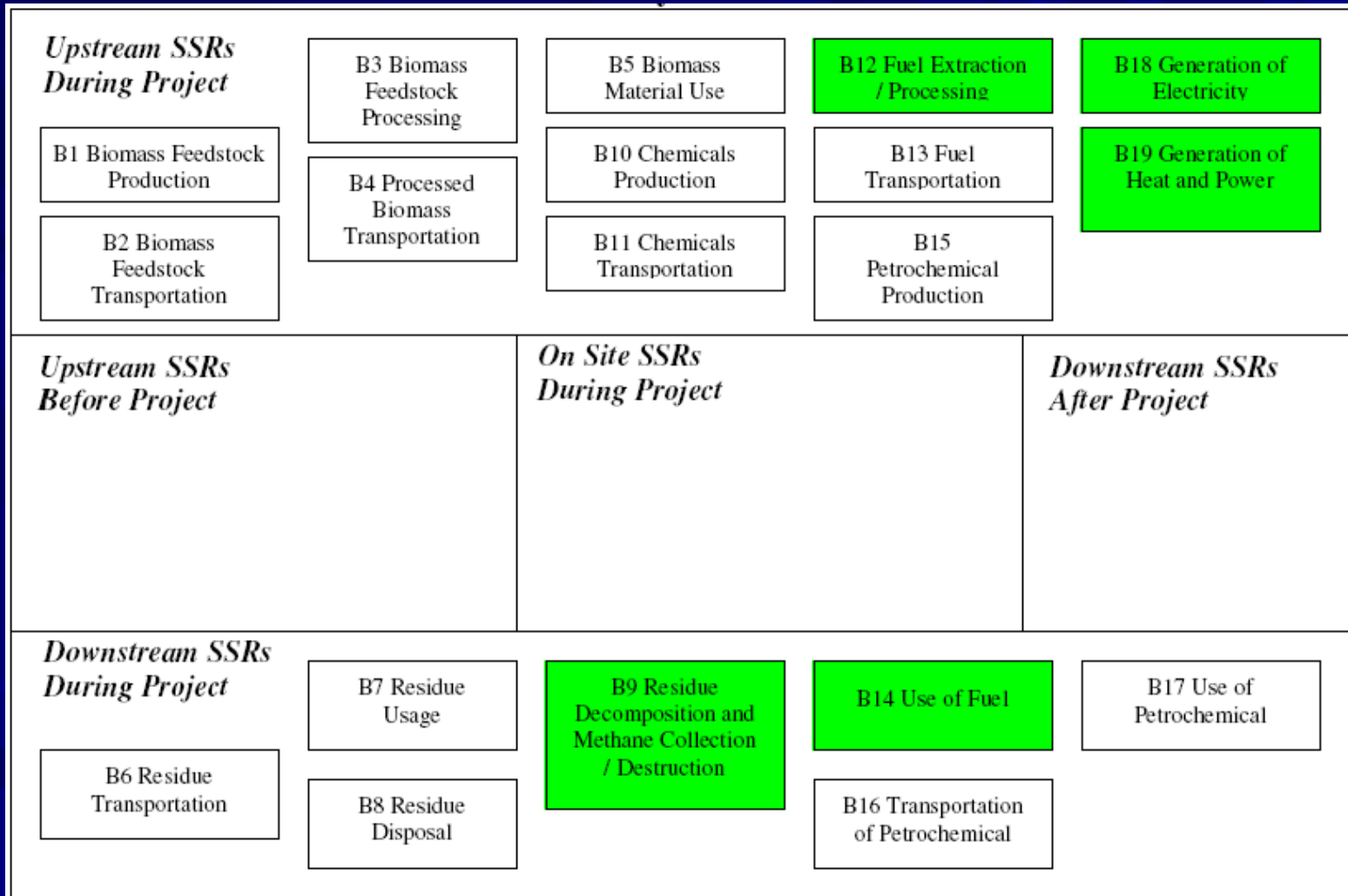
# Biofuel Production and Usage

- **Applicability criteria**
  - Fit with project and baseline descriptors
  - Exclusion of petrochemical production
  - Process emissions are not material
- **Flexibility mechanisms**
  - WHR protocol may be applied in conjunction
  - Include supplementary heat production
  - Transportation emissions may be included
  - Site specific emission factor usage
  - Accounting for diversion of waste from landfill

# Biofuel Production and Usage



# Biofuel Production and Usage



# Biofuel Production and Usage

$$\text{Emission Reduction} = \text{Emissions}_{\text{Baseline}} - \text{Emissions}_{\text{Project}}$$

$$\begin{aligned} \text{Emissions}_{\text{Baseline}} = & \text{Emissions}_{\text{Fuel Extraction / Processing}} + \text{Emissions}_{\text{Use of Fuel}} \\ & + \text{Emissions}_{\text{Electricity Generation}} + \text{Emissions}_{\text{Gen Heat and Power}} \\ & + \text{Emissions}_{\text{Decomposition, Collection and Destruction}} \end{aligned}$$

$$\begin{aligned} \text{Emissions}_{\text{Project}} = & \text{Emissions}_{\text{Fuel Extraction / Processing}} + \text{Emissions}_{\text{Facility Operation}} \\ & + \text{Emissions}_{\text{Use of Biofuel}} \\ & + \text{Emissions}_{\text{Distribute Heat and Power}} + \text{Emissions}_{\text{Gen Heat and Power}} \\ & + \text{Emissions}_{\text{Transfer / Conversion}} \end{aligned}$$

- **Data Capture**

- Volume of biofuels produced / consumed
- Volume of fossil fuels consumed / offset
- Thermal and electrical energy produced
- Landfilling characteristics

# Biofuel Production and Usage

- Questions and Comments
  - Technical issues?
  - Policy concerns?
  - Customization questions?
  - Linkage issues?

# Energy from Biomass Combustion

- Seed Materials
  - Private sector protocol
    - Multi-stakeholder (Industry, project proponents)
  - Other Good Practice Guidance
    - CDM protocols
    - Project evaluations
- Technical Review
  - Multi-stakeholder review
  - Preliminary review by Environment Canada
  - Alberta process with gov't and industry stakeholders

# Energy from Biomass Combustion

- Project Condition
  - Implementation of an aerobic biomass combustion facility
    - Thermal energy and electricity
    - Diversion of wood waste from landfill
- Baseline Condition
  - Equivalent energy production
    - Thermal energy
    - Electricity production
  - Disposal of material in landfill

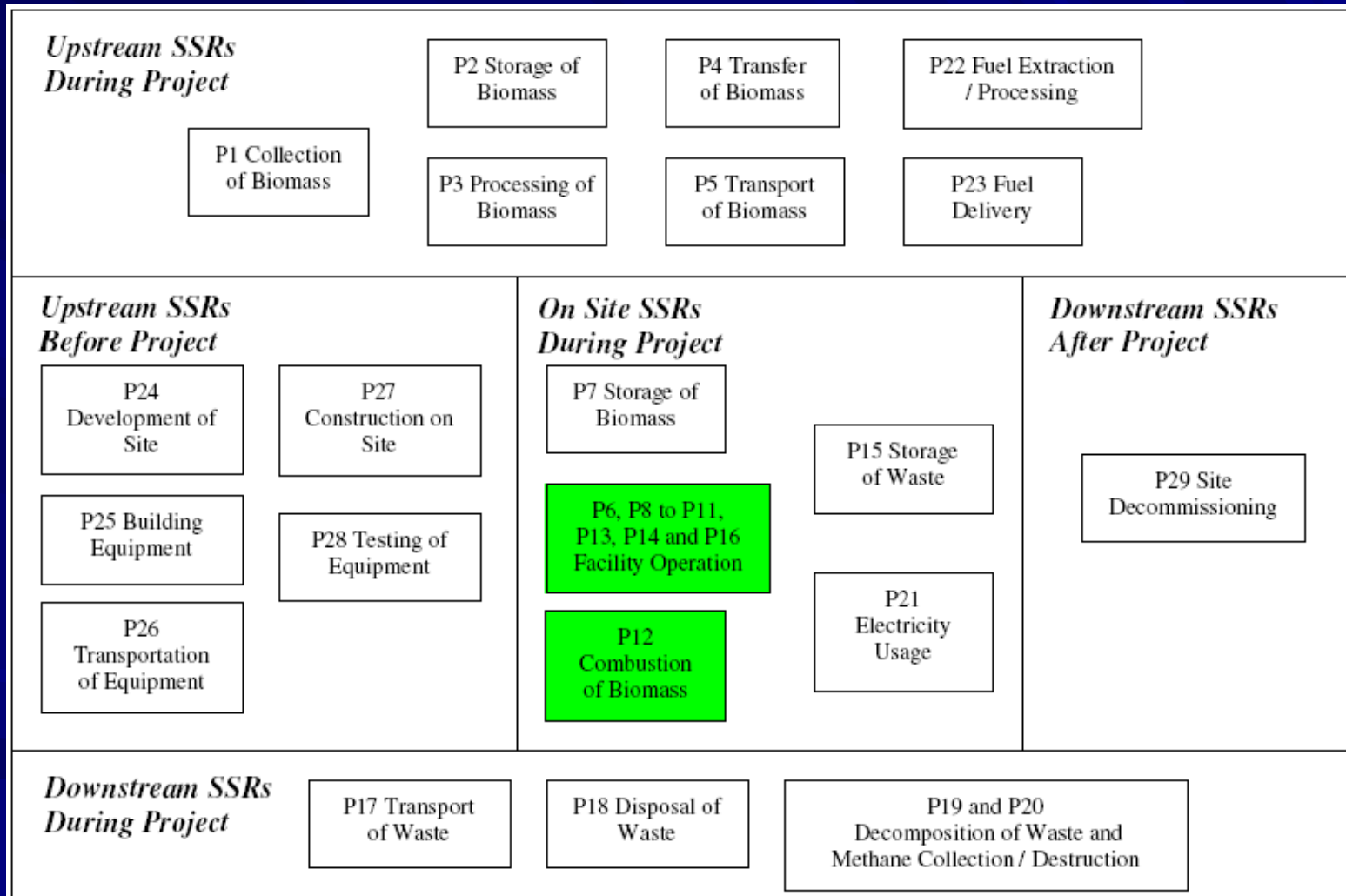
# Energy from Biomass Combustion

- Functional Equivalence
  - Electricity generation
  - Thermal energy output
  - Landfill of equivalent material
- Emission Reduction Mechanisms
  - Offset fossil fuel production, processing and usage
    - Thermal energy production
  - Offset non-renewable electricity production
  - Diversion of organic materials from landfill
    - Avoid methane production
- Biogenic CO<sub>2</sub> emissions

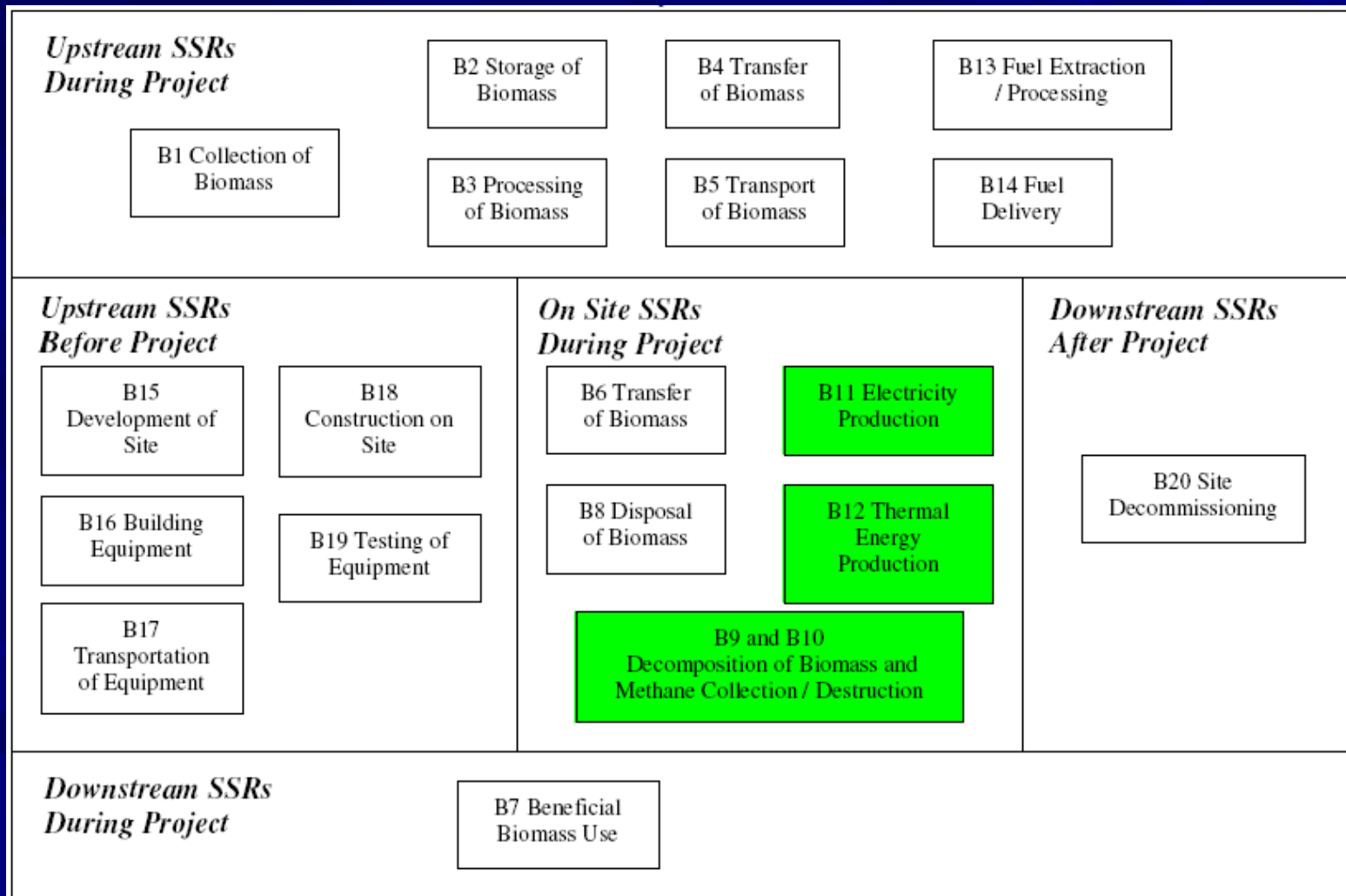
# Energy from Biomass Combustion

- Applicability criteria
  - Fit with project and baseline descriptors
  - Biomass claimed as diverted biomass
    - Would have undergone anaerobic decomposition
  - Based on actual measurement of inputs and outputs
- Flexibility mechanisms
  - Functional equivalence of transportation not assured
  - Grouping sources and sinks to match data management
  - Site specific emission factor usage
  - Modification of measurement and data management

# Energy from Biomass Combustion



# Energy from Biomass Combustion



# Energy from Biomass Combustion

$$\text{Emission Reduction} = \text{Emissions}_{\text{Baseline}} - \text{Emissions}_{\text{Project}}$$

$$\text{Emissions}_{\text{Baseline}} = \text{Emissions}_{\text{Decomp Biomass}} + \text{Emissions}_{\text{Electricity}} + \text{Emissions}_{\text{Thermal Heat}}$$

$$\text{Emissions}_{\text{Project}} = \text{Emissions}_{\text{Facility Operation}} + \text{Emissions}_{\text{Combustion of Biomass}}$$

- Data Capture

- Mass of biomass diverted / combusted
- Volume of fossil fuels consumed
- Thermal and electrical energy produced
- Landfill characteristics

# Energy from Biomass Combustion

- Questions and Comments
  - Technical issues?
  - Policy concerns?
  - Customization questions?
  - Linkage issues?

# Anaerobic Digesters

- Seed Materials
  - NOQT anaerobic digester protocol
    - Multi-stakeholder (gov't, industry, project proponents)
  - Other Good Practice Guidance
    - CDM protocols
    - Project evaluations
- Technical Review
  - Multi-stakeholder review
  - Input in review from Environment Canada
  - Alberta process with gov't and industry stakeholders

# Anaerobic Digesters

- Project Condition
  - Implementation of an anaerobic digester with methane capture and destruction
    - Thermal energy and electricity
    - Diversion of materials from landfill, avoidance of incineration
- Baseline Condition
  - Equivalent energy production
    - Thermal energy
    - Electricity production
  - Disposal of material in landfill, land-spread or incineration

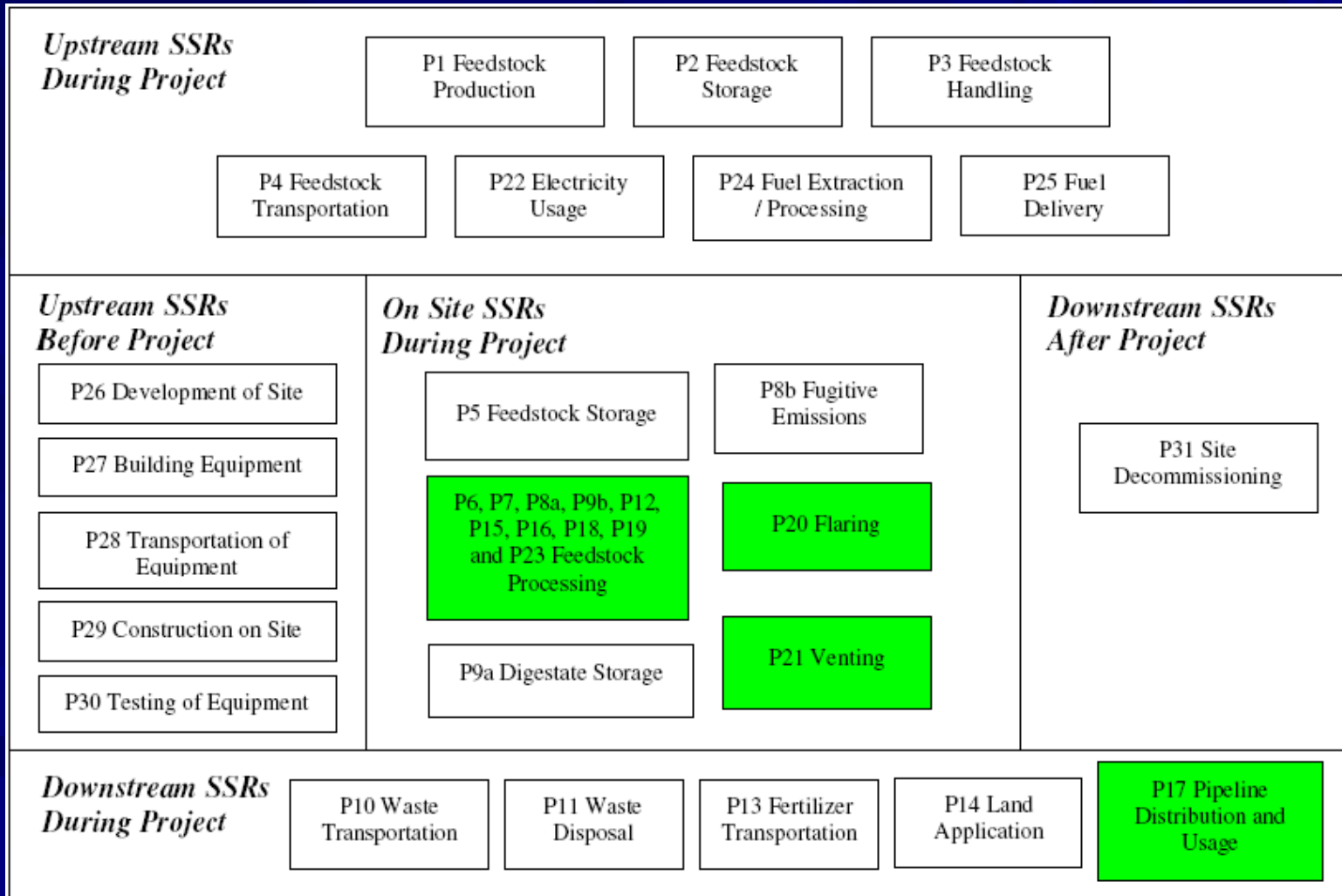
# Anaerobic Digesters

- Functional Equivalence
  - Electricity generation
  - Thermal energy output
  - Treatment of equivalent material
- Emission Reduction Mechanisms
  - Offset fossil fuel production, processing and usage
    - Thermal energy production
    - Incineration
  - Offset non-renewable electricity production
  - Diversion of organic materials from landfill
    - Avoid methane production
- Biogenic CO<sub>2</sub> emissions

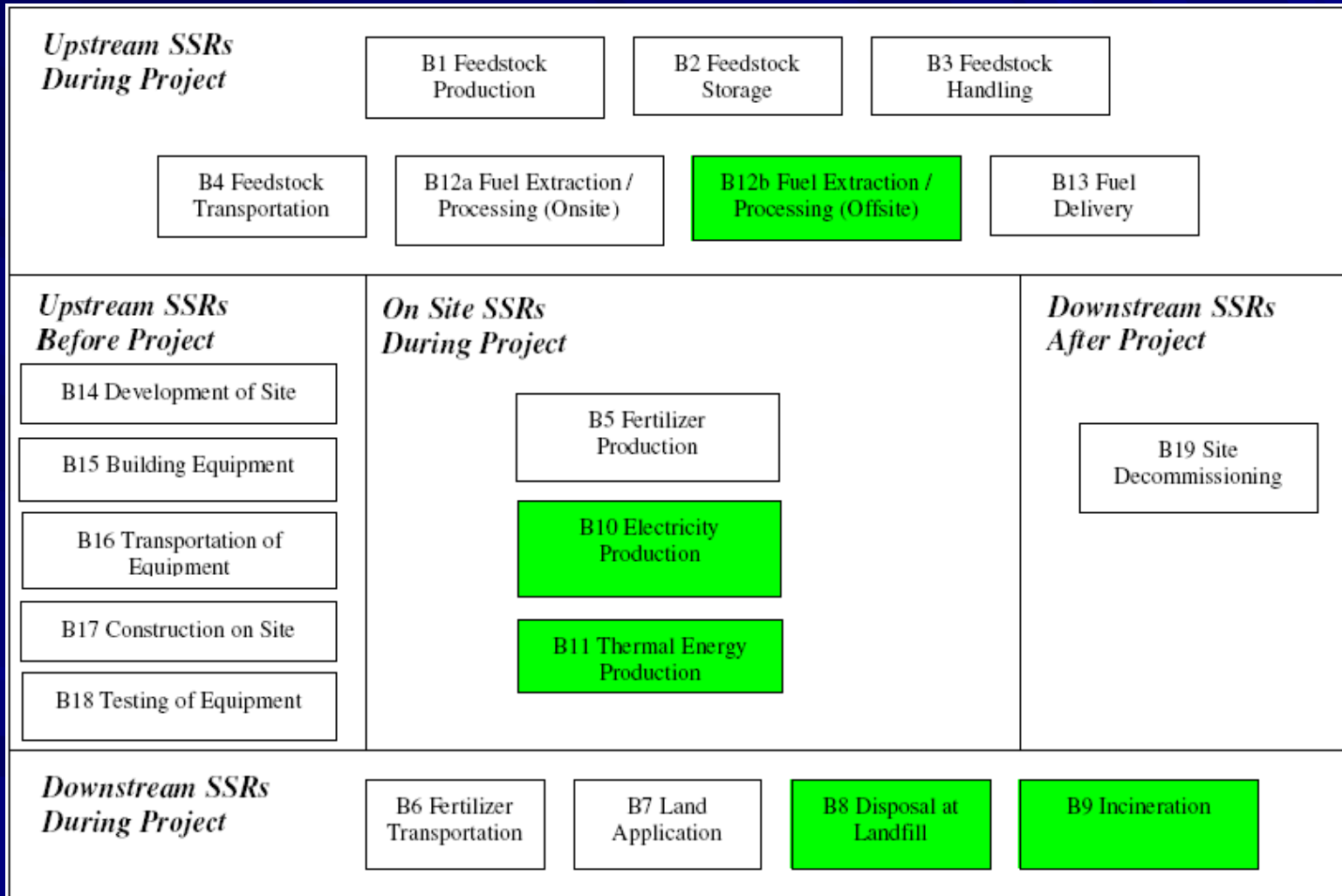
# Anaerobic Digesters

- **Applicability criteria**
  - Fit with project and baseline descriptors
  - Material disposal by one of three mechanisms
    - Landfill diversion
    - Land-spread
    - Incineration
  - Risk of fugitive emissions properly managed
  - No active windrow composting
  - Based on actual measurement of inputs and outputs
- **Flexibility mechanisms**
  - Functional equivalence issues
  - Grouping sources and sinks to match data management
  - Site specific emission factor usage
  - Modification of measurement and data management

# Anaerobic Digesters



# Anaerobic Digesters



# Anaerobic Digesters

$$\text{Emission Reduction} = \text{Emissions}_{\text{Baseline}} - \text{Emissions}_{\text{Project}}$$

$$\begin{aligned} \text{Emissions}_{\text{Baseline}} = & \text{Emissions}_{\text{Feedstock Disposal}} + \text{Emissions}_{\text{Incineration}} + \\ & \text{Emissions}_{\text{Electricity}} + \text{Emissions}_{\text{Thermal Heat}} + \\ & \text{Emissions}_{\text{Fuel Extraction / Processing}} \end{aligned}$$

$$\begin{aligned} \text{Emissions}_{\text{Project}} = & \text{Emissions}_{\text{Multiple Sources}} + \text{Emissions}_{\text{Pipeline Distribution and Usage}} + \\ & \text{Emissions}_{\text{Flaring}} + \text{Emissions}_{\text{Venting}} \end{aligned}$$

- **Data Capture**

- Volume of biogas combusted
- Volume of fossil fuels consumed
- Flaring and venting characteristics
- Thermal and electrical energy produced
- Landfill / incineration characteristics

# Anaerobic Digesters

- Questions and Comments
  - Technical issues?
  - Policy concerns?
  - Customization questions?
  - Linkage issues?