Energy Efficiency

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Waste Heat Recovery

Alberta Protocol Stakeholder Consultations ~ May 17 -18, 2007
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Energy Efficiency

- ## Seed Materials
  - Climate Change Central and Alberta Agriculture's On-Farm Project
    - Energy audits
  - Other Good Practice Guidance
    - CDM protocols
    - Project evaluations

- ## Technical Review
  - Alberta process with gov't and industry stakeholders

Energy Efficiency

- Project Condition
  - Increased energy efficiency due to:
    - Range of processes
      (mechanical, biological, chemical)
    - Facility retrofits
  - Impact on heat, electrical and power requirements

- Baseline Condition
  - Process configuration prior to the process changes or facility retrofits
  - Functional equivalence based on energy per unit of production

Energy Efficiency

- Functional Equivalence
  - Inputs and Outputs
  - Equivalent unit of production

- Emission Reduction Mechanisms
  - Offset fossil fuel consumption
  - Offset non-renewable electricity production
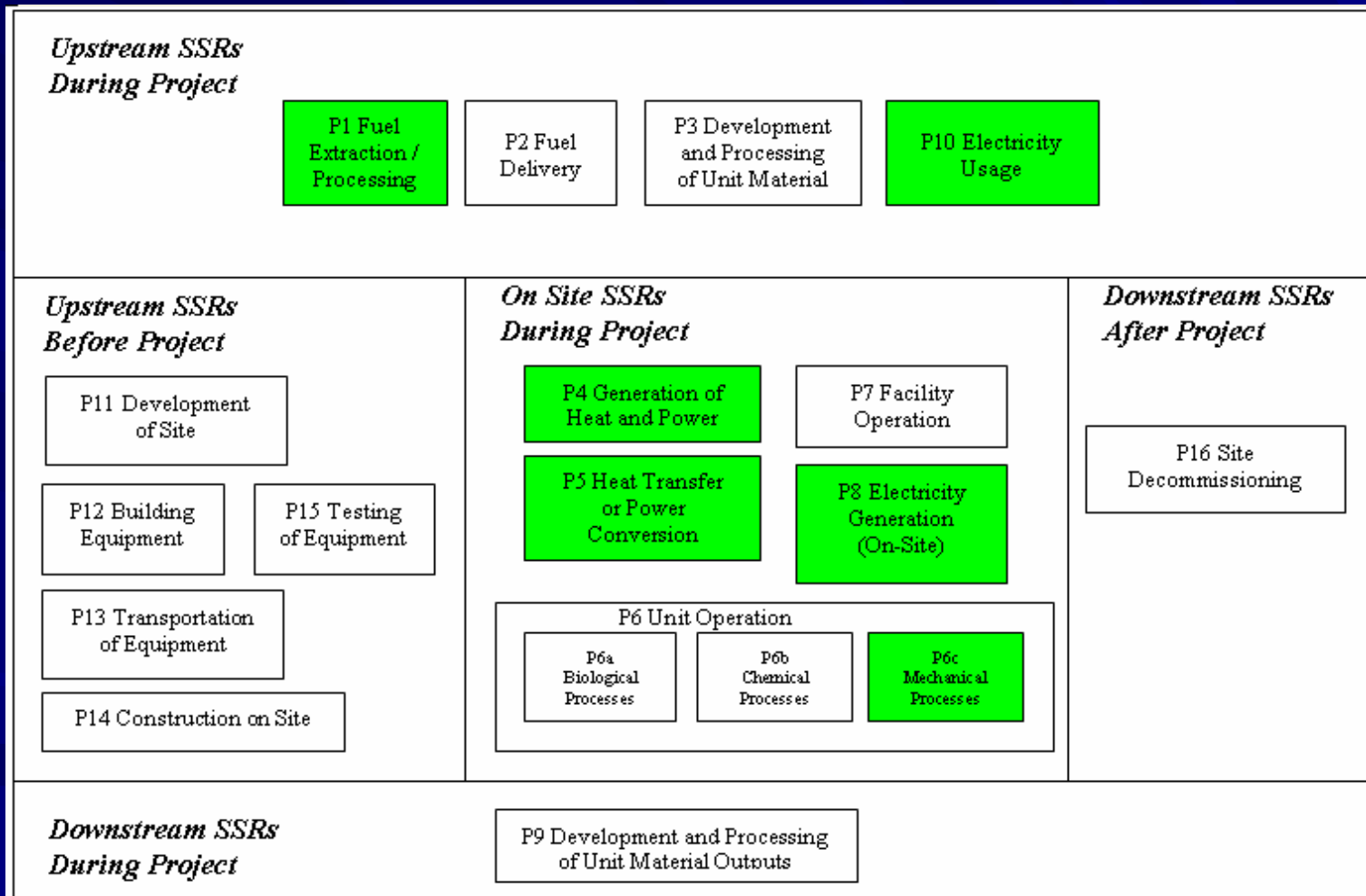
Energy Efficiency

- Applicability criteria
    - Functionally equivalent inputs and outputs
    - A suitable unit of production can be defined
    - Biological or chemical components of the process do not result in increased non-biogenic emissions
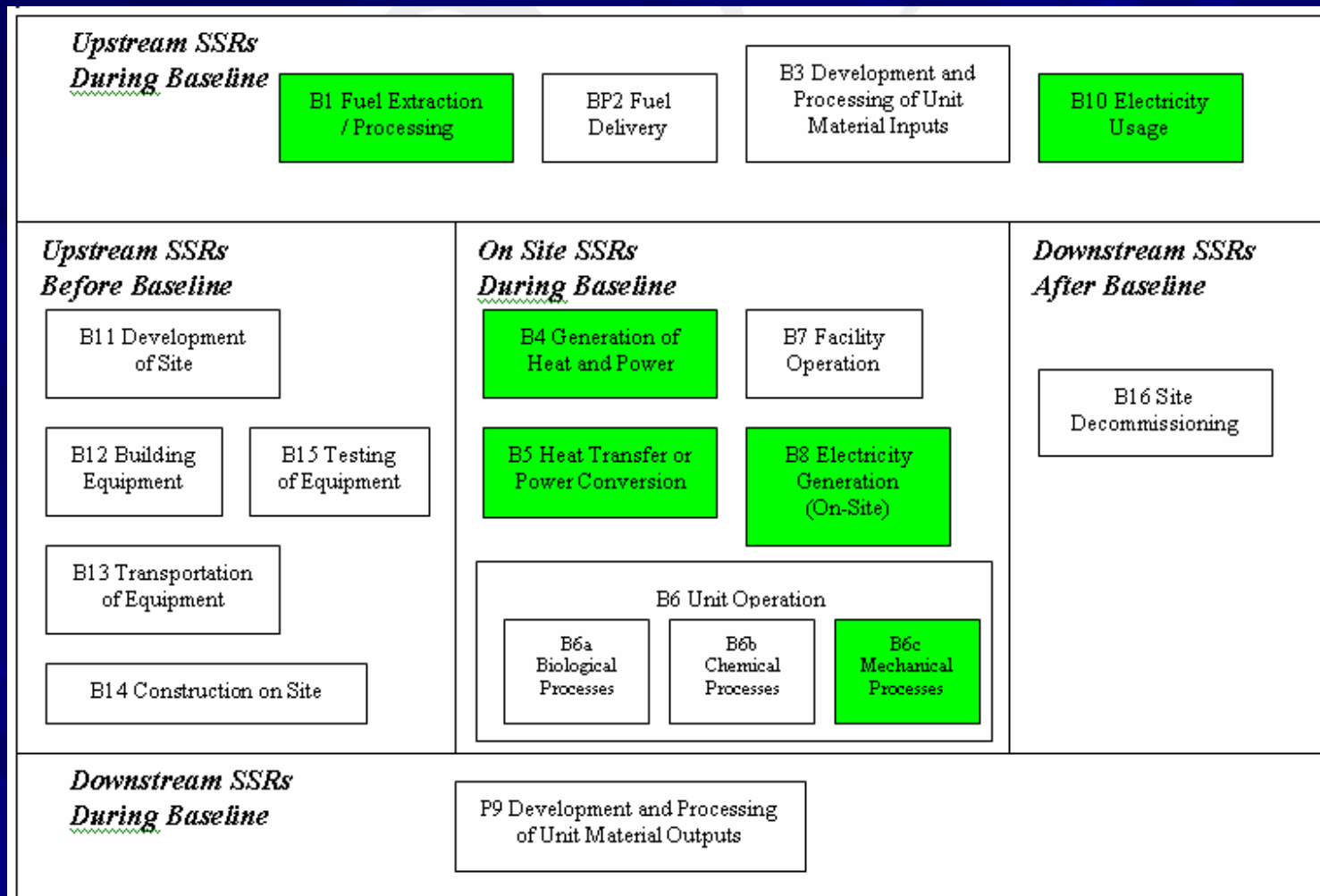
Energy Efficiency

- Flexibility mechanisms
  - Sources and sinks for biological/chemical processes must b modeled appropriately
    - may be excluded if not relevant
  - Requirement for an energy project assessment may be waived
  - New processes/facilities may be included
  - Functionally equivalent sources and sinks may be excluded
  - Link to external ambient temperature data allowed
  - Process units impacted may be defined by the project developer
    - single or multiple processes on single or multiple sites
  - Site specific emission factor usage
  - Changes may impact production efficiency and gross production

Energy Efficiency

Energy Efficiency

Energy Efficiency

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

$$\text{Emissions}_{\text{Baseline}} = \text{Emissions}_{\text{Fuel Extraction / Processing}} + \text{Emissions}_{\text{Gen Heat and Power}}$$
$$+ \text{Emissions}_{\text{Transfer / Conversion}} + \text{Emissions}_{\text{Unit Operation}}$$
$$+ \text{Emissions}_{\text{Electricity Generation}} + \text{Emissions}_{\text{Electricity Usage}}$$

$$\text{Emissions}_{\text{Project}} = \text{Emissions}_{\text{Fuel Extraction / Processing}} + \text{Emissions}_{\text{Gen Heat and Power}}$$
$$+ \text{Emissions}_{\text{Transfer / Conversion}} + \text{Emissions}_{\text{Unit Operation}}$$
$$+ \text{Emissions}_{\text{Electricity Generation}} + \text{Emissions}_{\text{Electricity Usage}}$$

- Data Capture
  - Volume of fossil fuel consumed
  - Electricity usage

Energy Efficiency

- Questions and Comments

  - Technical issues?

  - Policy concerns?

  - Customization questions?

  - Linkage issues?

Waste Heat Recovery

- Seed Materials
  - Good Practice Guidance
    - CDM protocols
    - Project evaluations
- Technical Review
  - Alberta process with gov't and industry stakeholders
- Two streams of protocols
  - Generic
  - Streamlined

Waste Heat Recovery

- Project Condition
  - Capture and usage of heat currently being wasted
    - Production of electricity
    - Supplementary heat production off-site

- Baseline Condition
  - Provision of equivalent heat load without waste heat recovery
 - Energy balance for the generating, distribution and utilization systems

Waste Heat Recovery

- Functional Equivalence
  - Equivalent energy production
  - No change to the product or service

- Emission Reduction Mechanisms
  - Offset fossil fuel consumption for heat generation

- Applicability criteria
  - Heat collected was not being used in either a passive or active manner prior to the project
  - Streamlined
    - No supplementary power production
   - No material impact to energy requirements of unit production

Waste Heat Recovery

- Flexibility mechanisms
  - Waste heat recovery can be supplemented by other sources
    - Meet constant energy demand
  - Process units impacted may be defined by the project developer
    - single or multiple processes on single or multiple sites
  - Site specific emission factor usage
  - Waste heat may account for some or all of the heat requirement

Waste Heat Recovery
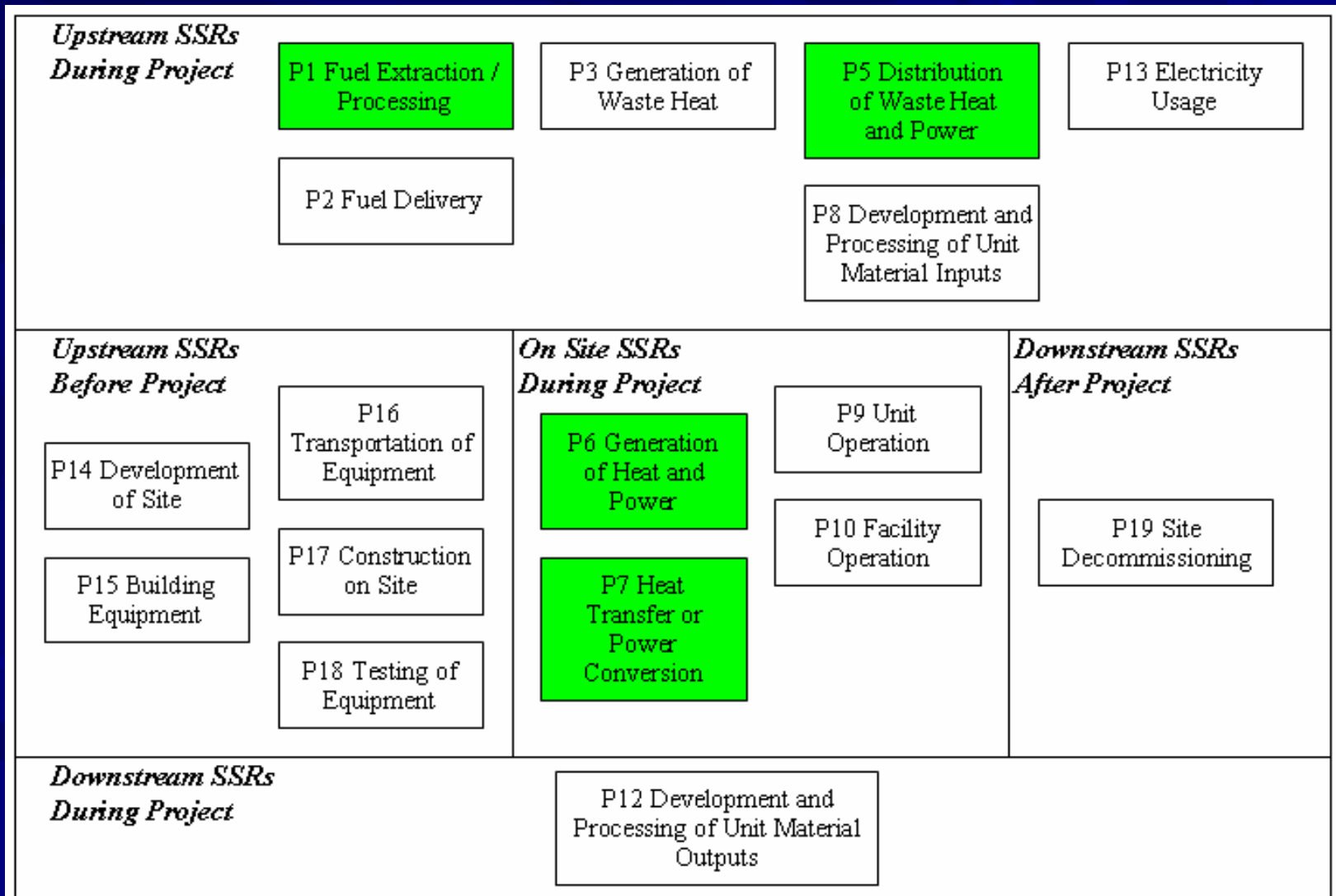
Waste Heat Recovery
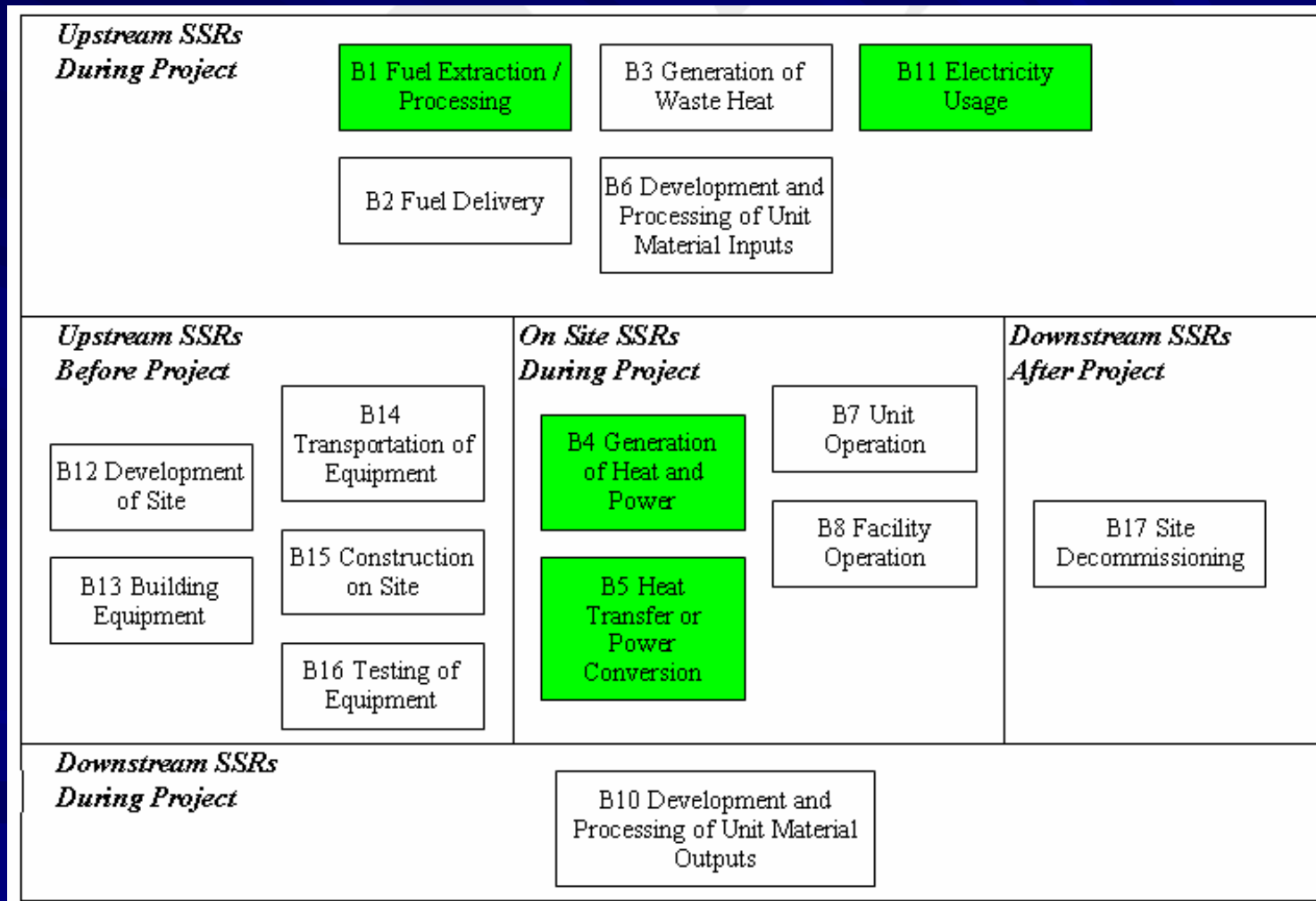
Waste Heat Recovery

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

$$\text{Emissions}_{\text{Baseline}} = \text{Emissions}_{\text{Fuel Extraction / Processing}} + \text{Emissions}_{\text{Gen Heat and Power}}$$
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$$\text{Emissions}_{\text{Project}} = \text{Emissions}_{\text{Fuel Extraction / Processing}} + \text{Emissions}_{\text{Gen Sup Heat and Power}}$$
$$+ \text{Emissions}_{\text{Distribute Heat and Power}} + \text{Emissions}_{\text{Gen Heat and Power}}$$
$$+ \text{Emissions}_{\text{Transfer / Conversion}} + \text{Emissions}_{\text{Unit Operation}}$$
$$+ \text{Emissions}_{\text{Electricity Generation}}$$

- Data Capture
  - Volume of fossil fuel consumed

Waste Heat Recovery

- Questions and Comments

  - Technical issues?

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