Industrial Decarbonization in Washington

BIL Industry Funding Workshop

Ruby Moore-Bloom | August 17, 2022
CETI Industrial Emissions Analysis

- [Link](https://www.cleanenergytransition.org/projects/washington-state-industrial-emissions-analysis)

**Washington State Industrial Emissions Analysis Documents:**

- Final Report
- Cement Case Study
- Characterization Tables
Clean Materials Manufacturing

- https://www.cleanenergytransition.org/cmm
Industrial Decarbonization

Three cross-cutting strategies:

- Efficiency
- Waste Heat Recovery
- Process Emissions Reductions
1. Energy Use Efficiency & Fuel Use Efficiency

80% of the energy consumed by the pulp and paper industry comes from boiler fuel.

Energy efficiency improvements to steam systems = energy savings and emissions reductions.

Black liquor gasification = creating a clean syngas from black liquor (byproduct of pulping process).

The syngas can produce electricity and process steam at higher efficiency than direct black liquor combustion.
2. Waste Heat Recovery

- 20-50% of industrial energy input is lost as waste heat
- Waste heat can be recovered and reused
- Example in glass manufacturing:
### 2. Waste Heat Recovery

#### Potential uses:
- Preheating of combustion gases, raw materials, and cullet;
- Onsite building heating/cooling;
- Electricity generation;
- Offsite heating needs through district heating system.
3. Process Emissions Reductions

- Direct process emissions = emissions that happen during the chemical production of a material

- Example = The production of cement releases CO$_2$ from the calcination of limestone used as a raw material
  - Calcination is responsible for ~two-thirds of the total direct CO$_2$ emissions from cement production
3. Process Emissions Reductions

Use of Low-Carbon Cements and Concrete

- Blend cement with **supplementary cementitious materials (SCMs)** to reduce clinker-to-cement ratio
  - Standard Portland cement = 95% clinker
  - SCMs can be byproducts of other industries
- Other innovations in cement binding materials, new concrete chemistries in development
Thank you very much
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