U.S. DEPARTMENT OF ENERGY
Office of ENERGY EFFICIENCY & RENEWABLE ENERGY
INDUSTRIAL EFFICIENCY & DECARBONIZATION OFFICE

IEDO – Energy- and Emission-Intensive Industries (EEII) subprogram Overview

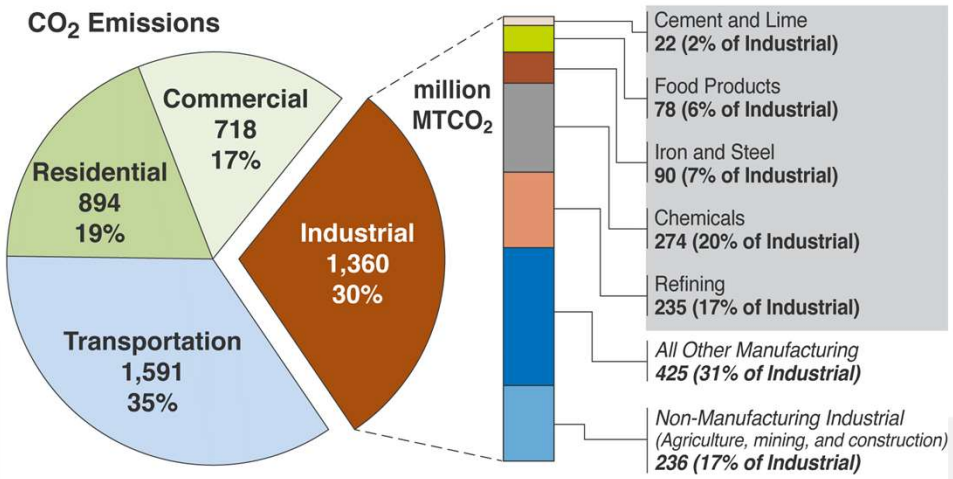
Paul Majsztrik, PhD- Program Manager
Felicia Lucci, PhD- Technology Manager
Industrial Efficiency and Decarbonization Office

U.S. Department of Energy Reactive Carbon Capture Project Review Meeting |Golden, Colorado
January 17- 18th 2024

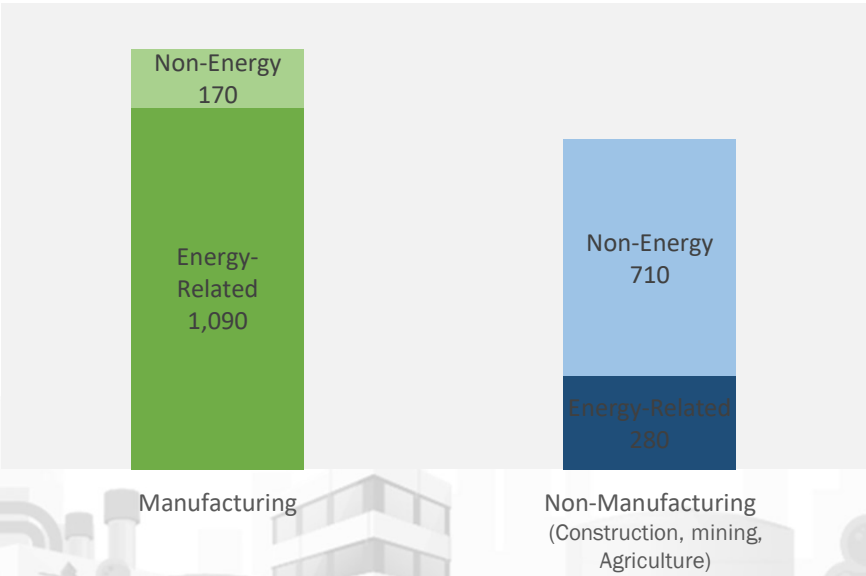
Industrial Efficiency and Decarbonization

Mission: Accelerate the innovation and adoption of cost-effective technologies to increase efficiency and reduce greenhouse gas (GHG) emissions in the U.S. industrial sector.

Energy Related CO_2 Emissions Across U.S. Industry



Total CO_2 Emissions Across U.S. Industry



Data source: Energy Information Administration (EIA) *Annual Energy Outlook 2021 with Projections to 2050* and other EIA and EPA source

IEDO R&D Strategy

Investment in both **sector-specific technology solutions** and **cross-cutting technologies** that can be applied across the industrial sector.

Energy- and Emission-Intensive Industries

- **IRON & STEEL**
- **CHEMICALS** (including production of low-carbon fuels)
- **FOOD & BEVERAGE**
- **FOREST PRODUCTS**
- **CEMENT & CONCRETE**

Cross-Sector Technologies

Thermal Processes & Systems

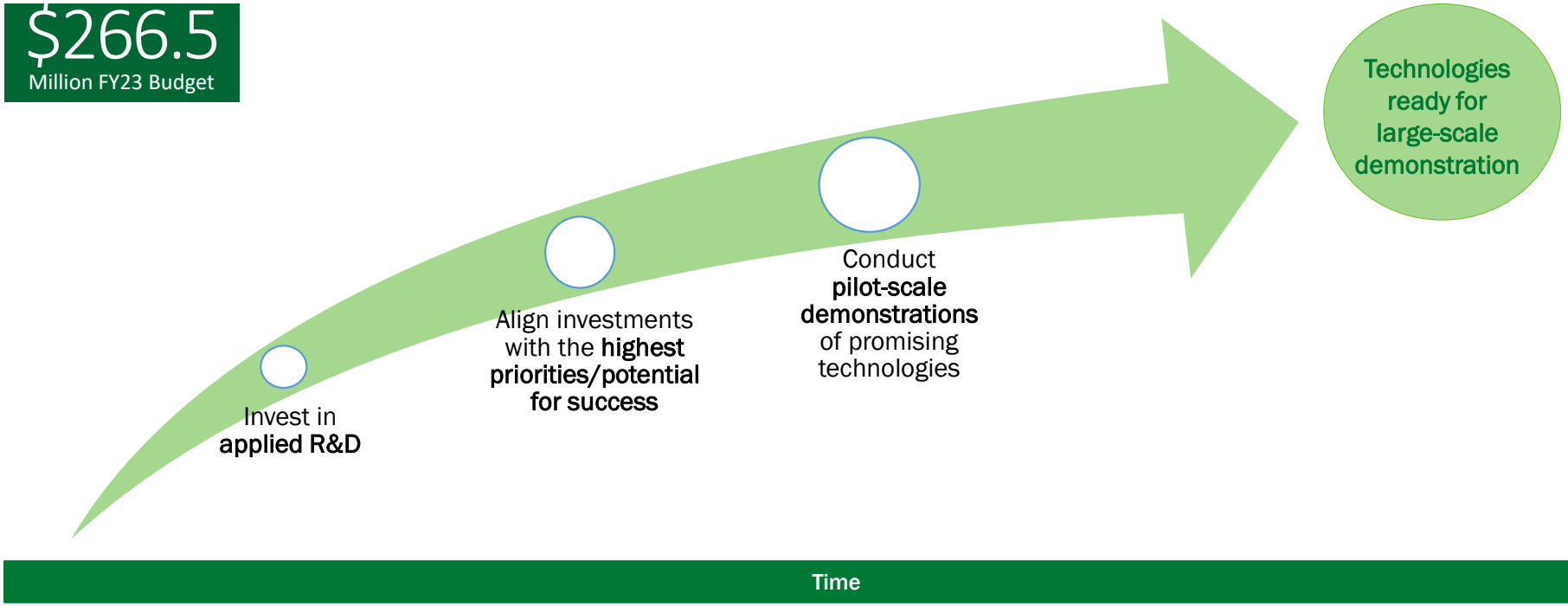
Low-Carbon Fuels, Feedstocks, & Energy Sources

Emerging Efficiency

Water & Wastewater Treatment

IEDO Investment Strategy

Investments are needed now to meet the Net Zero by 2050 goal—given the **15 to 20-year capital investment cycle typical for broad adoption** of new and emerging industrial technologies



IEDO Strategy for Carbon Capture, Utilization, and Storage

Focus of IEDO RD&D Efforts in CCUS:

- Address technical challenges in CCUS process integration
- Strong emphasis on carbon utilization
  - Accelerating emerging technologies – reactive capture
  - De-risking near term solutions – co-location and stranded CO_2

>$60M in CCUS investments

Sector specific focuses:

- Unique R&D challenges exists on a sector-by-sector basis (not all inclusive)
  - **Chemicals** – Catalysts require high purity CO_2 sources to avoid poisoning from impurities in stream
  - **Cement/concrete** – Mineralizing CO_2 sources has low conversion, limiting CO_2 uptake/sequestration
  - **Forest Products** – Integration of carbon utilization increases complexity limiting R&D efforts
- BIG emissions → BIG impact potential
- Important role → can't replace products

Cross sector focuses:

- De-risk technologies that can bisect multiple industries to accelerate adoption
- R&D strategy is open to a broad range of topics including
  - Co-benefits of industrial-scale carbon capture
  - Improving manufacturability of CC materials
  - CC for power generation <20MW

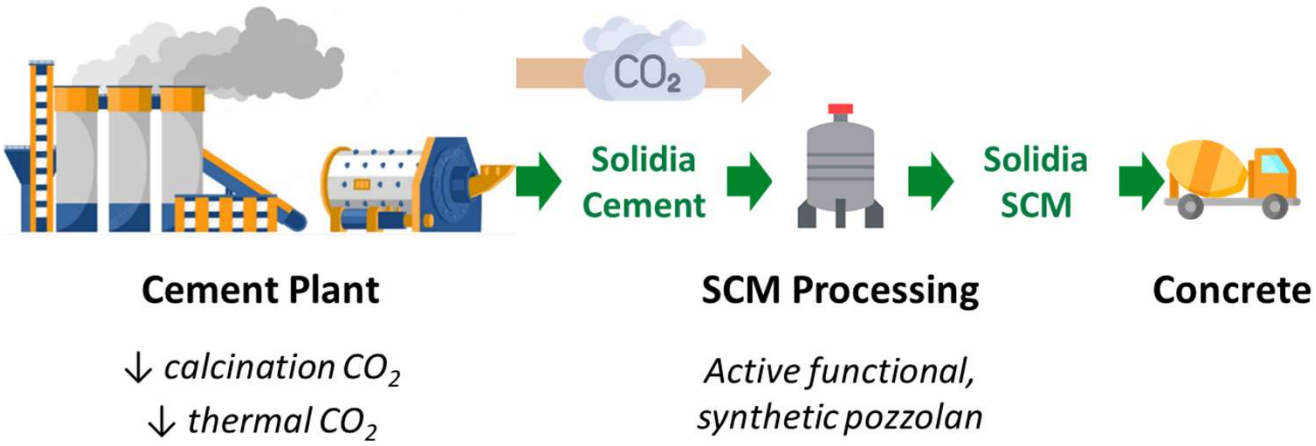
IEDO Cement and concrete Reactive Capture project (Closed)

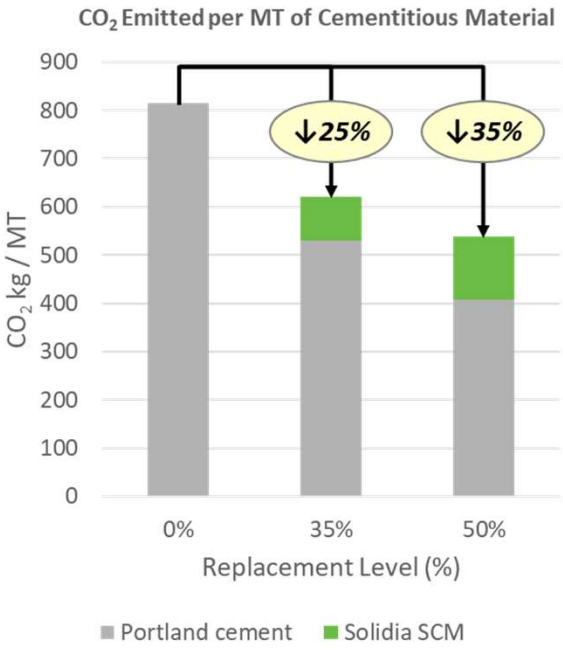
- Success story : Solidia Technologies (FY20 Award- Federal Share: $2,100,000)

REDUCE CO_2 Emissions

USE & STORE Waste CO_2

AVOID high embodied CO_2



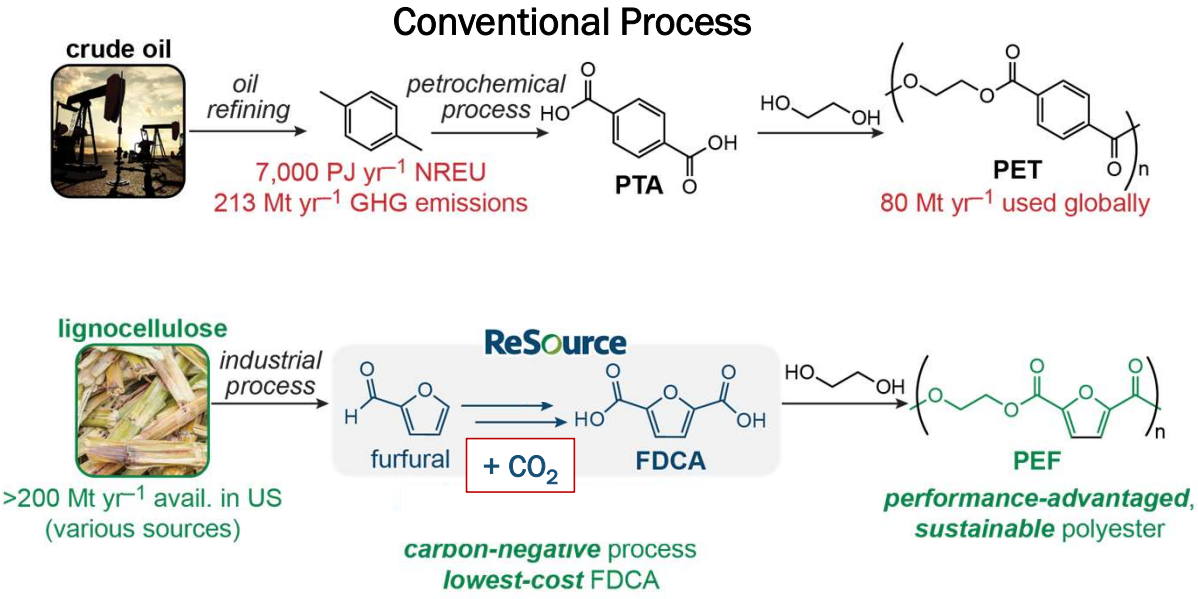


Performance-Advantaged Chemicals and Materials Made from Lignocellulose and CO2

Project Lead: ReSource Chemical Corp.
Project Partners: N/A

Innovation

- Demonstrating a continuous process to produce 2,5-furandicarboxylic acid (FDCA) from CO2 and waste inedible biomass
  - Feed CO2 can be low purity, dilute and is directly converted into chemical intermediate
- Uses only 1/3 the process steps of state-of-the-art FDCA process based on edible sugars No catalyst is needed reducing side products
- Only water is used as a solvent and salt intermediates are recycled



Impact:

- ReSources has the potential to replace fossil derived terephthalic acid, a solvent used to make polyethylene, with FDCA which produces a higher quality polymer; potentially reducing energy consumption by 96% and emissions by as much as 139% (carbon negative)

FY24 IEDO Funding Opportunities

Energy- and Emissions-Intensive Industries NOI

- $83M to focus on applied RD&D for the highest GHG-emitting industrial subsectors, specifically: chemicals and fuels; iron and steel; food and beverage; building and infrastructure materials (including cement and concrete, asphalt pavements, and glass); and forest products.

Join the Teaming List Today

Cross-Sector Technologies FOA:

- $38M to accelerate the innovative, cross-sector technologies required to decarbonize industry.
  - Electrification of Industrial Heat
  - Efficient Energy Use in Industrial Systems
    - Advanced Membrane Separations
    - Industrial Heat Exchangers
  - Decarbonizing Organic Wastewater and Wet Waste Treatment

Starting Selections Period

Thank you