2023 FECM / NETL
Carbon Management Research Project Review Meeting

Carbon Utilization & Procurement Grants Overview

U.S. DEPARTMENT OF ENERGY
Fossil Energy and Carbon Management

Carbon Management Overview: Fossil Energy and Carbon Management (FECM)

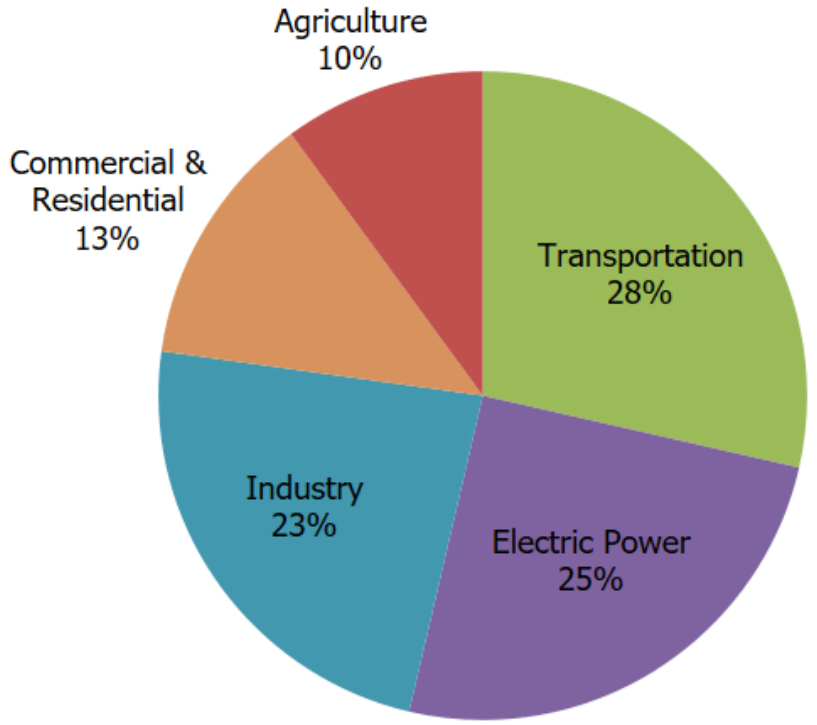
Office of Fossil Energy and Carbon Management

DOE-FECM

The name of our office reflects our **vision**

- President Biden's goals:
  - **50% emissions reduction** by 2030
  - CO_2 **emissions-free power sector** by 2035
  - **Net-zero emissions** economy by no later than 2050

Total U.S. Greenhouse Gas Emissions by Economic Sector in 2021



U.S. Environmental Protection Agency (2021). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021

Carbon Management Overview: FECM Mission- Deep Decarbonization and Environmental Justice

Minimize environmental and climate impacts of fossil fuels from extraction to use

Priority Technology Areas

1. Point source carbon capture
2. Carbon dioxide (CO_2) removal
3. **CO_2 conversion into products**
4. Reliable CO_2 storage
5. Hydrogen production

Office of Carbon Management
(FECM-20)

6. Critical mineral production from industrial and mining waste
7. Methane mitigation

Office of Resource Sustainability
(FECM-30)

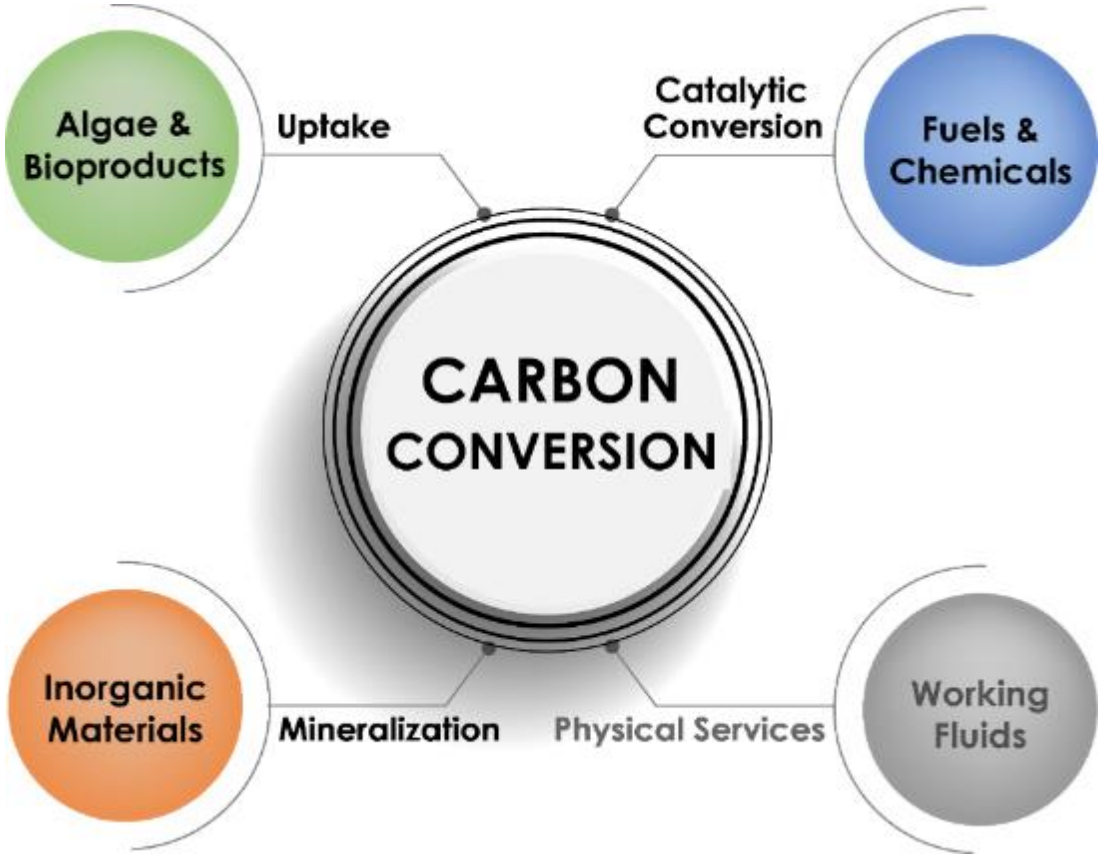
Enacting Justice and Supporting Legacy Communities

- Good-paying jobs
- Job growth acceleration
- Healthy economic transitions
- Improve community conditions

Address hardest-to-decarbonize applications in the electricity and industrial sectors

Pathways for CO_2 Conversion to Products

U.S. Department of Energy's (DOE) Carbon Conversion Program Structure

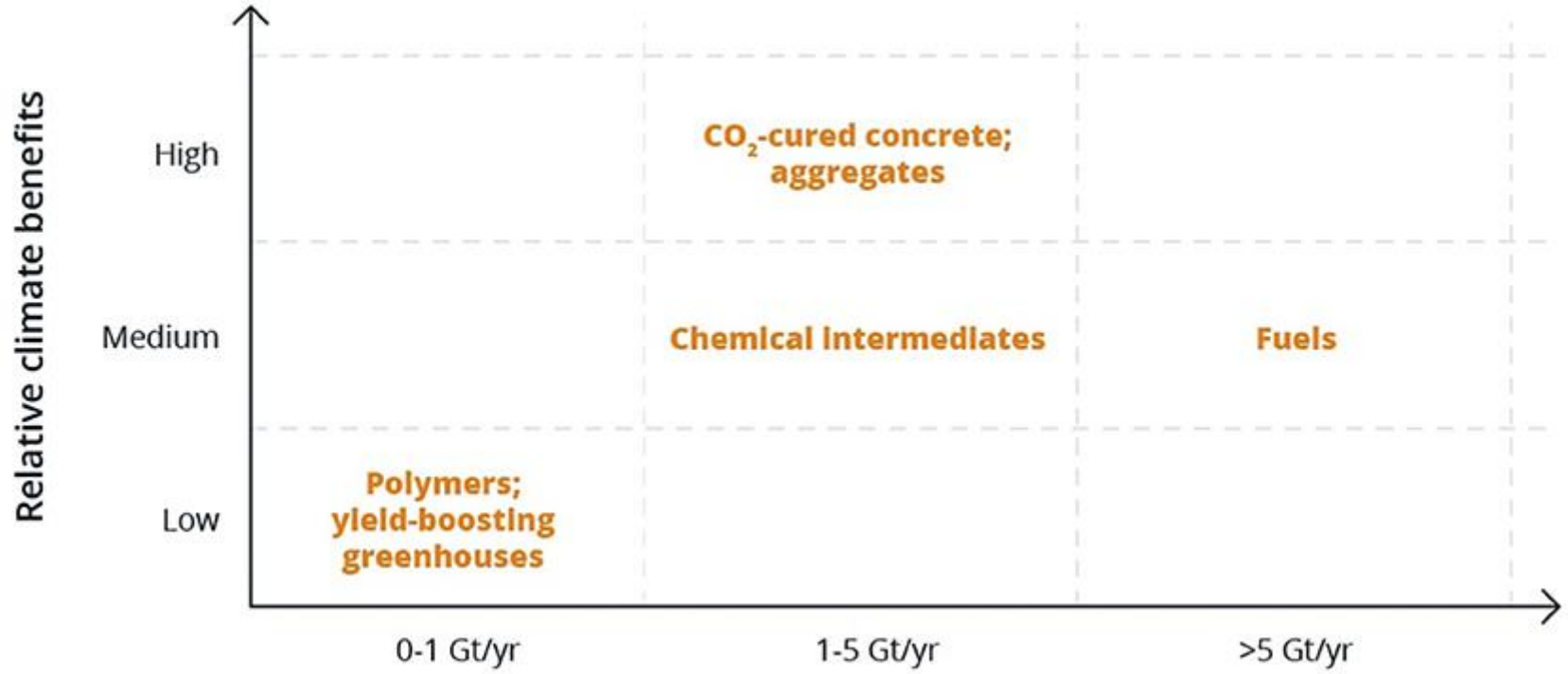


Focus of other programs

United States Department of Energy, Office of Fossil Energy and Carbon Management, "Strategic Vision: The Role of Fossil Energy and Carbon Management in Achieving Net-zero Greenhouse Gas Emissions," 2022.

Climate Benefits of CO_2-derived Products

Projected carbon removal potential *and climate benefits of CO_2-derived products and services*



CO_2 into concrete products ⟶ growth $150B - $400B by 2030

Source*: taken from – Dunford E, Niven R, and Neid C (2021) Deploying Low Carbon Public Procurement to Accelerate Carbon Removal. Front. Clim. 3:686787.* doi: 10.3389/fclim.20211.686787.

Opportunities for the Entire Value Chain: Bipartisan Infrastructure Law (BIL)

Industrial and Power Plant Carbon Capture

- CCUS Integrated Demos: $2.5 billion (OCED)
- Carbon Capture Large Pilot: $1 billion (OCED)

Direct Air Capture

- Regional Direct Air Capture Hubs: $3.5 billion
- DAC Technology Prize Competition: $115 million

Project Applications Require:

- Community and Stakeholder Engagement
- Diversity, Equity, Inclusion, and Accessibility
- Justice40 Initiative
- Quality jobs

Bipartisan Infrastructure Law Programs at Department of Energy

Carbon Transport Systems

- FEED Studies for Transport Systems: $100 million
- CIFIA – Loans and Future Growth Grants: $2.1 billion

Carbon Dioxide Utilization and Storage

- Carbon Storage Validation and Testing: $2.5 billion
- Carbon Utilization Program: $310 million

Potential of Utilization

Small relative to storage, but North America's CO_2 demand for utilization is projected to grow to ~40 million tonnes per annum (MTPA) of carbon by 2030 and ~100–250 MTPA by 2050

Emissions abatement potential further from certain high-emission or hard to decarbonize sectors supports development carbon conversion pathways.

ENERGY earthshots U.S. DEPARTMENT OF ENERGY | Clean Fuels & Products™

Aims to decarbonize the fuel and chemical industry and reduce GHG emissions at least 85% compared to fossil-based sources by 2035 and meet 2050 projected demand for:

- 100% of aviation fuel;
- 50% of maritime, rail, and off-road fuel; and
- 50% of carbon-based chemicals

by using sustainable carbon resources.

US DOE Pathways to Commercial Liftoff: Carbon Management Report 2023.

BIL SEC. 40302: Carbon Conversion Program

Directs the Secretary to establish a program for **eligible entities** *(State; a unit of local government; or a public utility or agency)* …to **procure and use commercial or industrial products** that

(i) use or are derived from *anthropogenic carbon oxides*; and

(ii) demonstrate significant net reductions in *life-cycle greenhouse gas emissions compared to incumbent technologies, processes, and products.*

BIL SEC. 40302: Critical Points

``(1) $41,000,000 for fiscal year 2022;

``(2) $65,250,000 for fiscal year 2023;

``(3) $66,562,500 for fiscal year 2024;

``(4) $67,940,625 for fiscal year 2025; and

``(5) $69,387,656 for fiscal year 2026.''.

- DOE total funding for *demonstration* of Utilization Procurement Grant program flexible
- Procurement grants eligible entities
  - State government
  - Local government
  - Public utilities or agencies
- Net reduction in life-cycle GHG emissions

Conversion Opportunities & Challenges

Building Materials

- CO_2 -cured cement
- CO_2 -based aggregates
- Clinker replacement

Plastics & Products

- CO_2 -derived polyethylene carbonates (PEC) for heat insulation foams, polyurethane plastics
- CO_2 -derived polypropylene carbonate (PPC) for polyurethane plastics

Fuels

- Electrolysis: syngas to produce synthetic fuel (e.g., diesel)
- Thermo-catalysis: liquid fuels (gasoline, diesel etc.) from CO_2 and hydrogen
- Fischer-Tropsch: syngas into liquid hydrocarbons through a catalytic chemical reaction
- CO conversion: Non-Fischer-Tropsch conversion of gases containing CO into liquid fuels and chemicals

Challenges

- Scale & rate of CO_2 emissions relative to of CO_2 conversion
- Determining economic viability and environmental impact requires significant resources - very place-based

Adapted from US DOE Pathways to Commercial Liftoff: Carbon Management Report 2023.

UPGrants Program Overview

MANUFACTURERS & VENDORS

Manufacturer submits product LCA data → NETL reviews LCA → Product LCA

Approved products will use anthropogenic CO_2 & show at least a 10% reduction in emissions

Denied

Manufacturer may work with NETL to resubmit, if applicable

Approved

Product & Manufacturer added to **Approved Vendor** List

ELIGIBLE ENTITIES

States, local governments, public agencies & utilities

Work with **Approved Vendors** to determine available products

Submit Application to Purchase & Use Approved Product

Successful Applicants receive 50% cost-share

Program and Application Timeline

Carbon Utilization (UP) Grants : Preliminary LCA Process

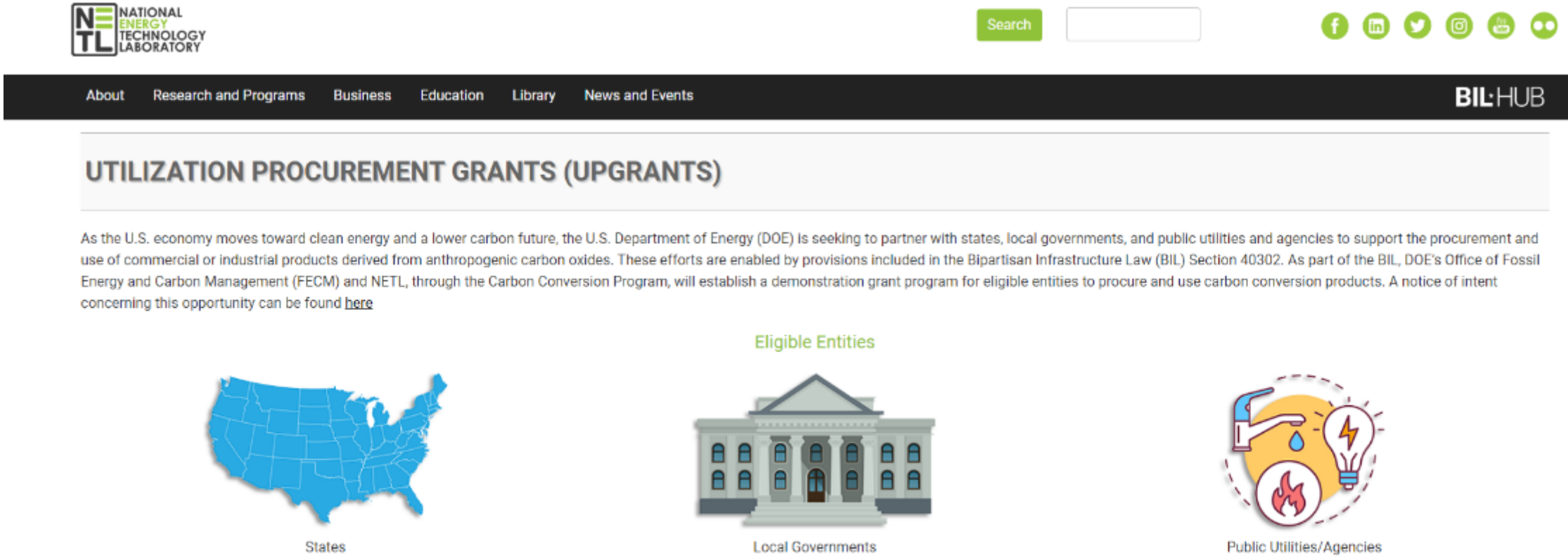
Product manufacturer completes LCA for eligible product(s) in accordance with **consistent** guidelines and submits for review

DOE reviews manufacturer LCA to confirm it meets guidelines and a **minimum of 10% emissions reduction**

Once approved, manufacturer and product are added to an approved list of vendors

Eligible entities engage approved suppliers and establish a purchase agreement

Carbon Utilization (UP) Grants Program Lifecycle Analysis Website



[Utilization Procurement Grants (UPGrants) | netl.doe.gov]

Importance of Government Procurement: Carbon Utilization/Conversion Derived Products

- Implementing **public procurement incentives** for carbon conversion products
- States, local governments, and public utilities and agencies ===== **significant procurement activities** can help **to advance** key policy objectives
- **Scope** and **scale** of **public procurement** makes it one of the most **effective mechanisms** available to **drive emissions reductions**
- **Citizens support** the concept of public agencies using their buying power to deliver environmental benefits

***Source**:* **(1)** *Karen L. Howard, Laura Holliday, Rebecca Parkhurst, Xiang Bi, Virginia Chanley, Patrick Harner, Natalie Hurd, Shelby Johnston, Timothy Kinoshita, Anika McMillon, Ben Shouse, Evonne Tang, Kristen Watts, William Bauder, Nacole King, Michael Krafve, David Marroni, Frank Rusco, and Matthew Tabbert. United States Government Accountability Office (GAO), GAO-22-105274.*
Technology Assessment, Decarbonization: Status, Challenges, and Policy Options for Carbon Capture, Utilization, and Storage. September 2022.
(2) Eric Dunford, Robert Nivern, Christoper Neidl (2021). *Deploying Low Carbon Public Procurement to Accelerate Carbon Removal*. Front. Clim. 3:686787. doi: 10.3389/fclim.20211.686787.

Demand-side Initiative: Federal Government

- **Federal Buy Clean Initiative**
  - **Meaning of Buy Clean**
    - **Procurement policy** promoting **purchasing** construction materials and **products** with **lower embodied green house (GHG)** emissions, considering life-cycle emissions associated with production
  - **Promotes use of low-carbon, made in America construction materials**
  - **Prioritizes**, first time, using American-made, **lower-carbon construction materials** in **Federal procurement and Federally-funded projects**
  - **Prioritizes purchase** of **steel**, **concrete**, **asphalt**, and **flat glass** with lower levels of embodied GHG emissions
  - **Steel**, **concrete**, **asphalt**, and **flat glass procurement** represent 98% of the Federal Government's purchased construction materials




Source: (1) Office of Clean Energy Demonstrations (OCED). Industrial Demonstrations Program Funding Opportunity Announcement Informational Webinar 2023
(2) Office of The Federal Chief Sustainability Officer, Council on Environmental Quality. Federal Buy Clean Initiative. https://www.sustainability.gov/buyclean/#faqs. [05/01/2023]

Demand-side Initiative: State Governments

- **State Governments with Buy Clean Initiatives**
  - **California** (Buy Clean California Act; AB 262)
  - **Washington** (Buy Clean and Buy Fair Washington Act; HB 1103)
  - **Oregon** (Buy Clean Oregon; HB 4139)
  - **Minnesota** (Buy Clean and Buy Fair Minnesota Act; HF 2710/SF4181)
  - **Colorado** (HB21-1303; Global Warming Potential for Public Project Materials)
  - **New York & New Jersey** (Low Embodied Carbon Concrete Leadership Act (LECCLA); New York (A2591/S542), New Jersey (A5223)

***Source(s)*: (1)** *BLUEGREEN ALLIANCE, Buy Clean in the States. https://www.bluegreenalliance.org/site/buy-clean/buy-clean-in-the-states/. [11/08/2022].* **(2) HF 2710.** *Buy Clean and Buy Fair Minnesota Act. Minnesota Legislature, Office of the Revisor of Statues. https://www.revisor.mn.gov/bills/text.php?session=ls93&number=HF2170&session_number=0&session_year=2023&version=list. [04/11/2023].* **(3)** *Dunford E, Niven R, and Neidl C (2021) Deploying Low Carbon Public Procurement to Accelerate Carbon Removal. Front. Clim. 3:686787. doi: 10.3389/fclim.2021.686787*

Demand-side Initiative: State Governments

States' Buy Clean Eligible Products

California
- Concrete reinforcing steel
- Flat glass
- Mineral wool board insulation
- Structural steel

Colorado
- Asphalt and asphalt mixtures
- Cement and concrete mixtures
- Glass
- Steel (Post-tension, reinforcing, structural)
- Wood structural elements

Washington
- Engineered wood products
- Steel (reinforcing, structural)
- Structural concrete products

Minnesota
- Asphalt paving mixtures
- Concrete
- Structural steel & carbon steel rebar

New York & New Jersey
- Concrete

Oregon
- Asphalt paving mixtures
- Concrete (ready mix, shotcrete, precast, masonry)
- DOT-designated materials
- Steel (rebar, reinforcing, structural)

***Source(s)**: **(1)** Buy Clean California Act, DGC Procurement Division, Resources, Product Category Rule. **(2)** HB21-1303; Global Warming Potential for Public Project Materials. **(3) HF 2710.** Buy Clean and Buy Fair Minnesota Act. Minnesota Legislature, Office of the Revisor of Statues. **(4)** HB 1103;* Buy Clean and Buy Fair Washington Act. ***(5)** HB 4139;* Buy Clean Oregon. ***(5)** Dunford E, Niven R, and Neidl C (2021) Deploying Low Carbon Public Procurement to Accelerate Carbon Removal. Front. Clim. 3:686787.*

Additional Resources

Utilization Procurements Grants Page

Utilization Procurement Grants (UPGrants) | netl.doe.gov

NETL LCA Toolkit
netl.doe.gov/LCA/CO2U

Virtual Carbon Management Applicant Education Workshop

https://usea.org/event/virtual-carbon-management-applicant-education-workshop

Review current funding opportunities:
https://www.energy.gov/fecm/solicitations-and-business-opportunities

Please reach out with any additional questions or to learn more

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