Scaling Up: Enabling Opportunities of Low-Carbon Concrete Policy in Pennsylvania

October 30, 2025

Overview

- About Talen Energy
- Coal Combustion Products (CCPs)
  - What They are
  - What Forms They Take
  - How They are Utilized
- Power Generation and Operations
  - Operations Overview
  - CCP Production during Electricity Generation
- CCPs and CO2 Reduction

Megan Toomey – VP of Environmental

- Former Power Plant Engineer
- Nonlinear Career Path
  - Engineer>Environmental>External Affairs>Regulatory>Energy Market Specialist>Utility Business Model Disruptor
- Lifelong Learner

About Talen

Talen Energy is a leading independent power producer and energy infrastructure company dedicated to powering the future.

We own and/or operate approximately 10.3 gigawatts of power infrastructure in the U.S. We produce and sell electricity, capacity, and ancillary services into wholesale U.S. power markets, with our generation fleet principally located in the Mid-Atlantic and Montana.

Our power generation assets utilize a variety of fuels including nuclear, natural gas, coal and oil, providing reliable, dispatchable energy to meet around-the clock requirements of commercial, industrial and residential customers.

Talen's 2,500 MW Susquehanna nuclear generation facility is one of the top-performing nuclear plants in the nation.

Talen has ~1,900 employees and approximately 40% are members of labor unions.

Powering Data Centers

We are expert first-movers in powering data centers. Talen developed a first-of-its kind co-located data center campus powered by our Susquehanna nuclear plant.

We are well-positioned to help meet the growing demand for clean, reliable power that is being driven largely by increased manufacturing, electrification and the adoption of artificial intelligence.

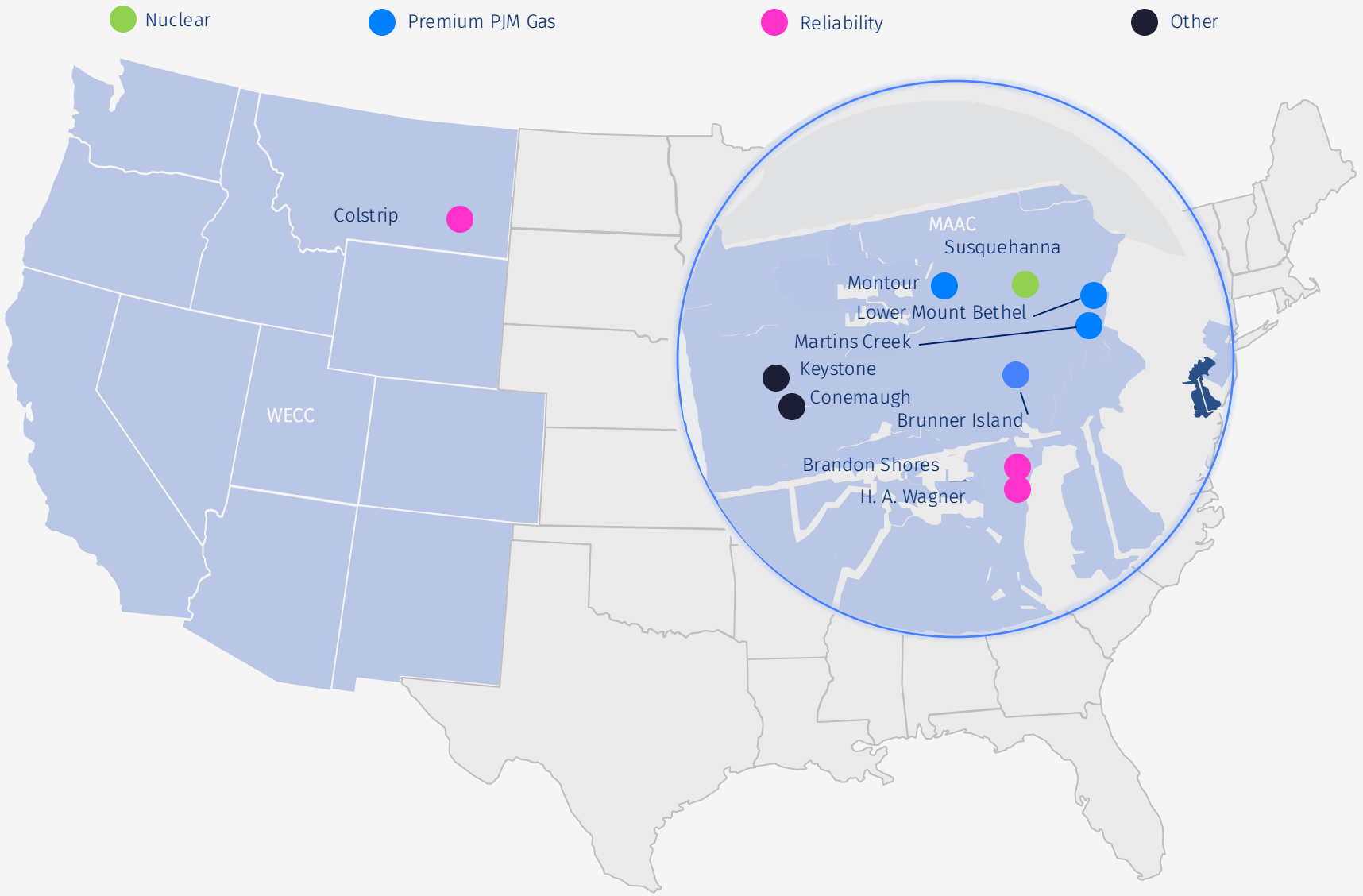
Decarbonizing Our Plants

- Converted Brunner Island* and Montour facilities from coal-fired generation to natural gas.
- Conversion, instead of closure of these facilities, allows them to continue to meet the increasing energy demand.
- Maintains support of our employees and communities.

*Brunner Island is a dual-fuel facility.

Talen Energy Power Generation

10.3 GW generation platform across diverse geographies & using multiple fuels



What are CCP's - Coal Combustion Products

Coal Combustion Products (CCPs) — sometimes called Coal Combustion Residuals (CCRs) are the materials left over after coal is burned to generate electricity in power plants.

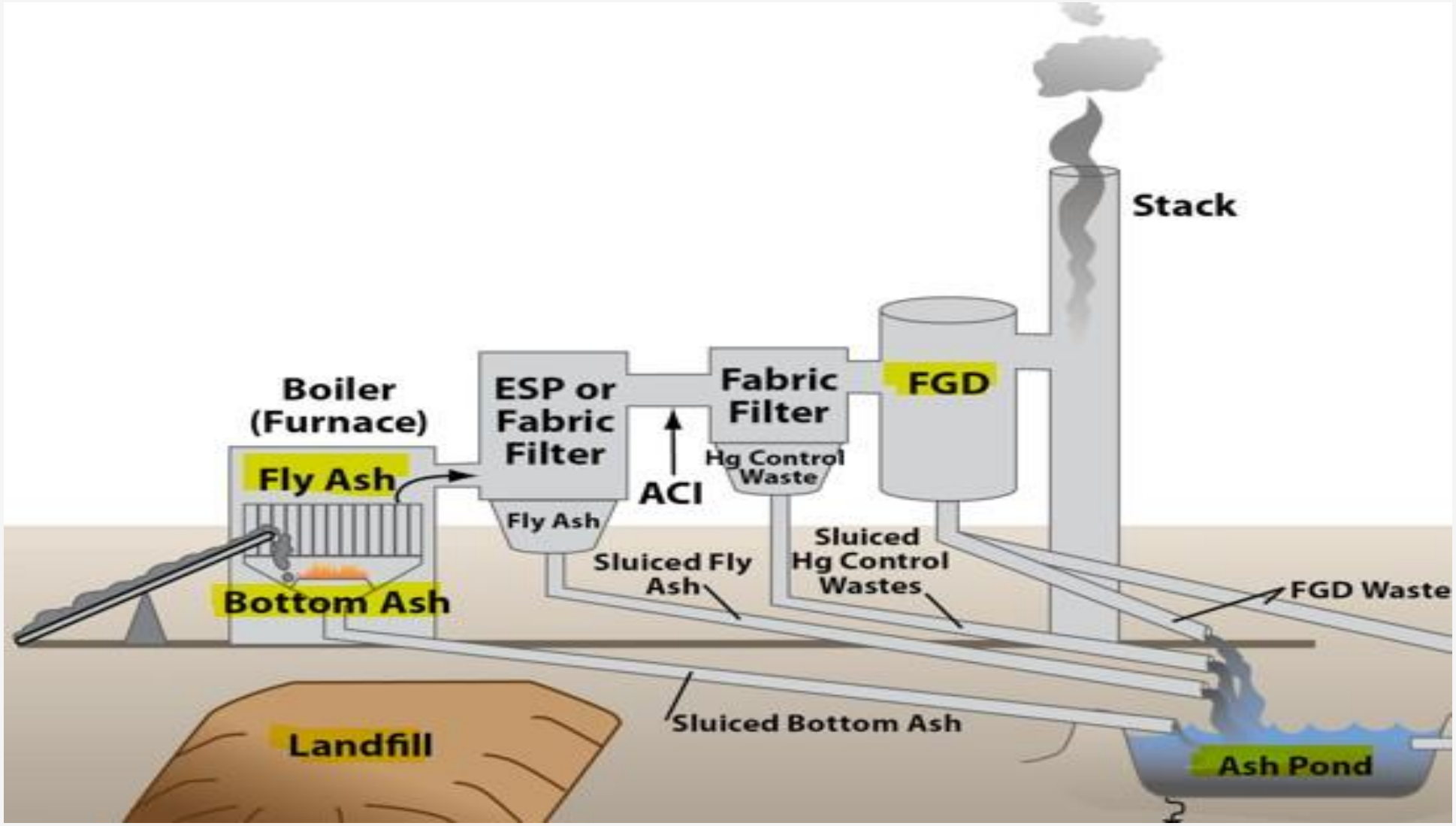
They come from the mineral matter naturally present in coal, which doesn't burn but instead melts, fuses, or vaporizes during combustion and then solidifies into various byproducts.

Valuable industrial materials when recycled properly

Main Types of Coal Combustion Products

Type	*Description*	*Typical Use*
Fly Ash	Very fine, powdery particles carried with flue gases; captured by electrostatic precipitators or baghouses.	Used in **concrete**, cement, flowable fill, and structural fill. RARE EARTH ELEMENT EXTRACTION
Bottom Ash	Coarser, heavier particles that collect at the bottom of the boiler.	Used in **road base**, **embankment fill**, and **aggregate** for asphalt and concrete, anti-skid, blasting grit, roofing granules.
Boiler Slag	Molten ash that cools into glassy pellets (from wet-bottom boilers).	Used in **abrasives**, roofing granules, and blasting grit.
Flue Gas Desulfurization (FGD) Materials	Produced when sulfur dioxide (SO_2) is removed from flue gases using limestone or lime scrubbers. The main product is **synthetic gypsum ($CaSO_4 \cdot 2H_2O$)**.	Used in **wallboard (drywall)**, **cement**, and **agriculture** as a soil amendment.

Power Generation and CCP Production



Fly Ash & CO2 Reduction

- Different types of coal when burned yield different quantities and types of ash

    - Talen - Central Appalachian Coal when burned yields > 8-12% ash / ton of coal
      Fly Ash - 80% (Class F & C types)
      Bottom Ash - 20%

- *How are ashes important for CO_2 Reduction??*

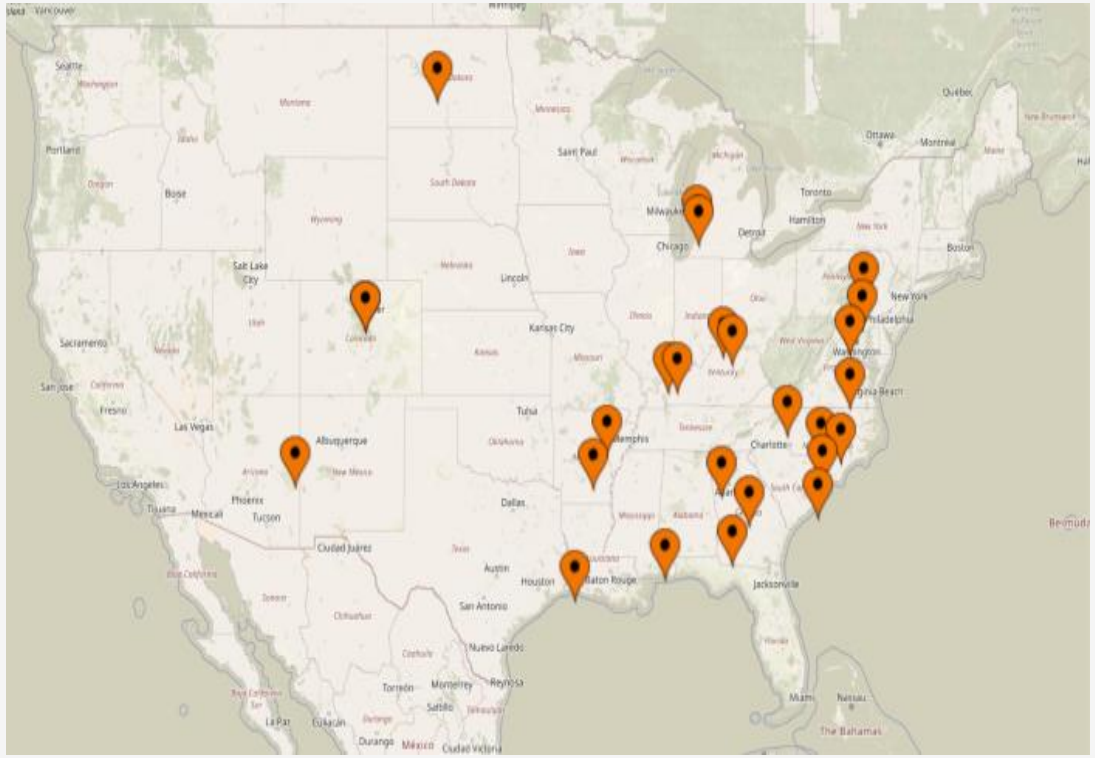
    - Mineral composition is valuable – SiO2, Al2O3, Fe2O3, CaO (LISA)
      Replace virgin mined ores & products
    - Clinker ingredient when used as cement kiln feed
      Clinker substitution when added to finished cement
      Direct replacement for cement in concrete products
      Used in construction and remediation for various purposes
      Used as a soil amendment
      Used as a road anti-skid for states and townships

CCP Recycling = CO_2 Reduction

- Coal is the fuel source for approximately 20% of electricity generation in America and produces large volumes of solid coal combustion products — primarily ash and synthetic gypsum from emissions control devices
- Use of coal fly ash in **concrete** increased from 10.9 million tons in 2022 to 11.9 million tons in 2023. Concrete producers and consumers indicated a desire to use more fly ash, but several regional markets continued to be affected by shifting supply dynamics associated with closures of coal-fueled power plants. **Fly ash improves concrete durability and significantly reduces greenhouse gas emissions associated with concrete production.**
- "Coal ash beneficial use already constitutes one of America's greatest recycling success stories. Over the past several decades, hundreds of millions of tons of coal ash have been used to construct resilient infrastructure and manufacture more sustainable building materials. In doing so, our nation has conserved natural resources, reduced energy and water consumption, and significantly reduced greenhouse gas emissions from production of the materials coal ash replaces when used in concrete". *Tom Adams, Executive Director of the ACAA*
- In a 2011 study, the American Road and Transportation Builders Association concluded that use of coal ash in concrete saves $5.2 billion per year in federally funded road and bridge construction costs, chiefly because of the increased lifespan of structures using the material. American Road and Transportation Builders Association Transportation Development Foundation, "The Economic Impacts of Prohibiting Coal Fly Ash Use in Transportation Infrastructure Construction," September 2011, https://acaa-usa.org/wp-content/uploads/2021/05/2011FlyAshStudy_lowres-FINAL.pdf
- Concrete producers and consumers indicated a desire to use more fly ash, but several regional markets continued to be affected by shifting supply dynamics associated with closures of coal-fueled power plants. Harvesting of existing stockpiles of ash have begun but need appropriate regulation reform. **Ample supply of fly ash remains in historic disposal units to continue to reduce CO2 by using fly ash as a Supplementary Cementitious Material.**

Coal Ash Harvesting of existing resources

- Harvesting Operations (active & developing)



- Harvesting operations require **significant capital investment** for material recovery, processing, and product distribution to end markets.
- Current coal ash disposal regulations requiring closure of ash facilities on **aggressive timelines which creates barriers** to some of these investments.
- A regulatory pathway encouraging “closure by removal **for** beneficial use” is a concept for consideration that would allow the United States to maximize the potential for its abundant, domestic coal ash resource while simultaneously removing large volumes of material from the disposal setting permanently.
- **Not all historic CCP disposal sites are candidates for closure by removal for beneficial use**. Product quality and location are key drivers.

Opportunities and Considerations

- CCP management, disposal and use are subject to regulations at the federal and state levels.
- Pennsylvania has a strong regulatory regime and a rich, successful history in the beneficial use of CCPs for various applications
- To promote CO2 reductions through the use of more CCPs in concrete, federal and state regulators and policymakers are encouraged to closely review existing policies and discuss reforms with stakeholders in the power generation industry and in the concrete and cement industries to identify key enhancements
- Team PA can assist in the process by developing a task force to perform the required analysis and present recommendations to policymakers

APPENDIX

Click to edit Master title style

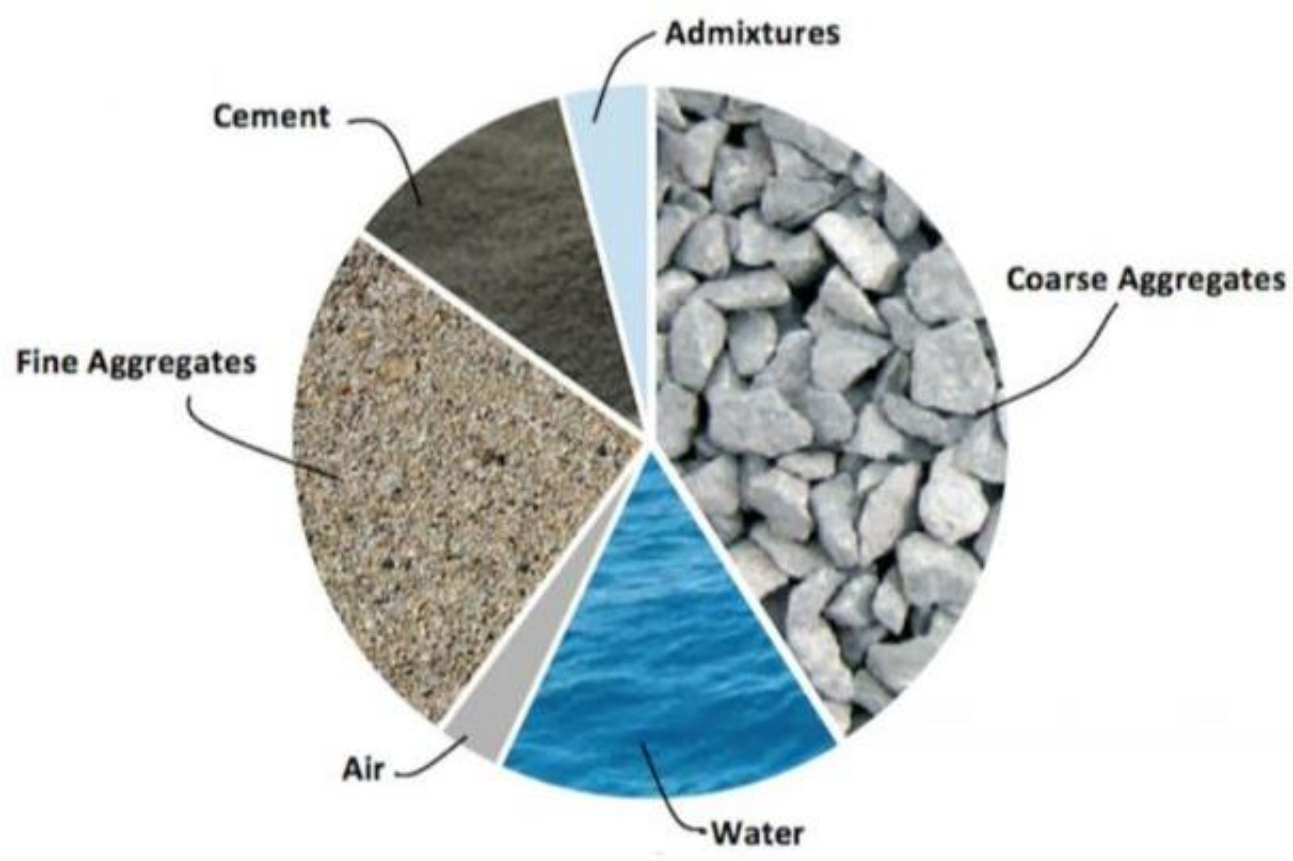
Why Cement & Concrete Matter

Concrete = most used construction material on Earth.

Cement is the key ingredient in concrete.

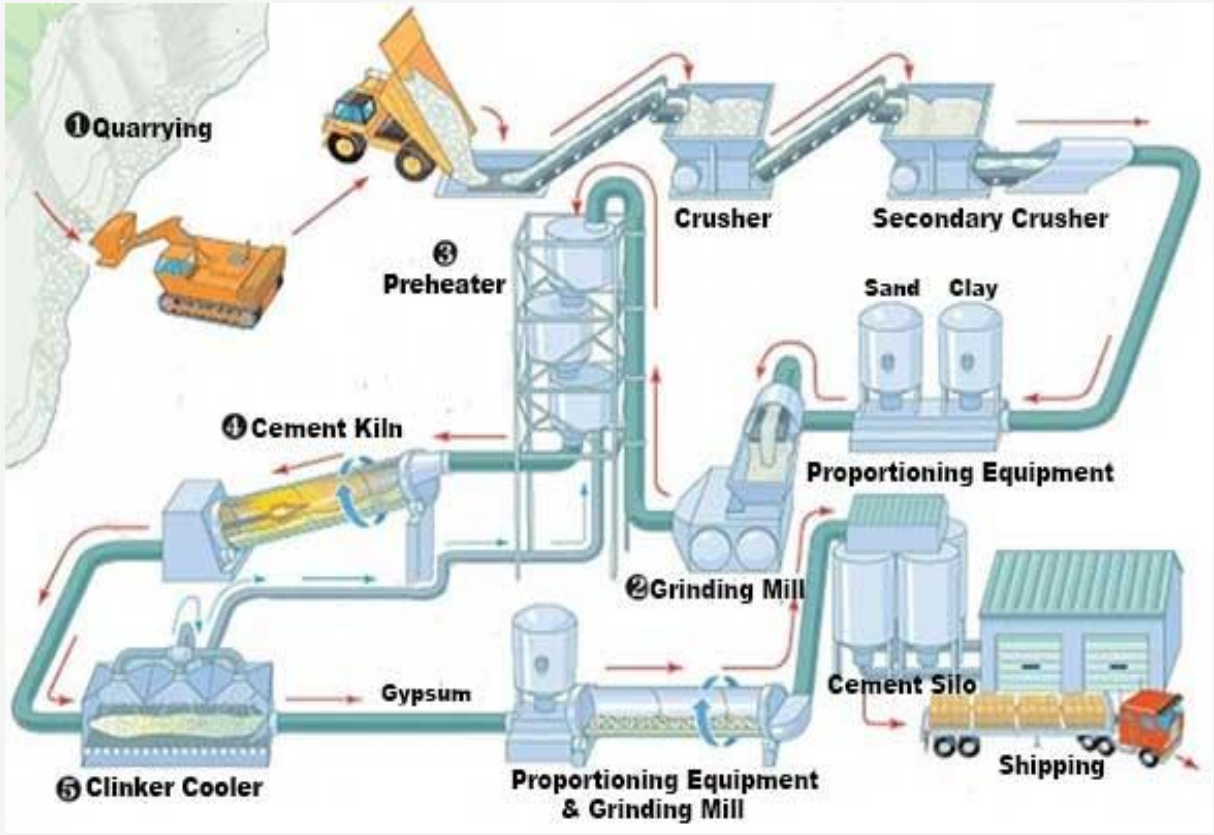
Annual global cement production ≈ 4.2 billion tons.

Construction sector = ~8% of global CO_2 emissions.

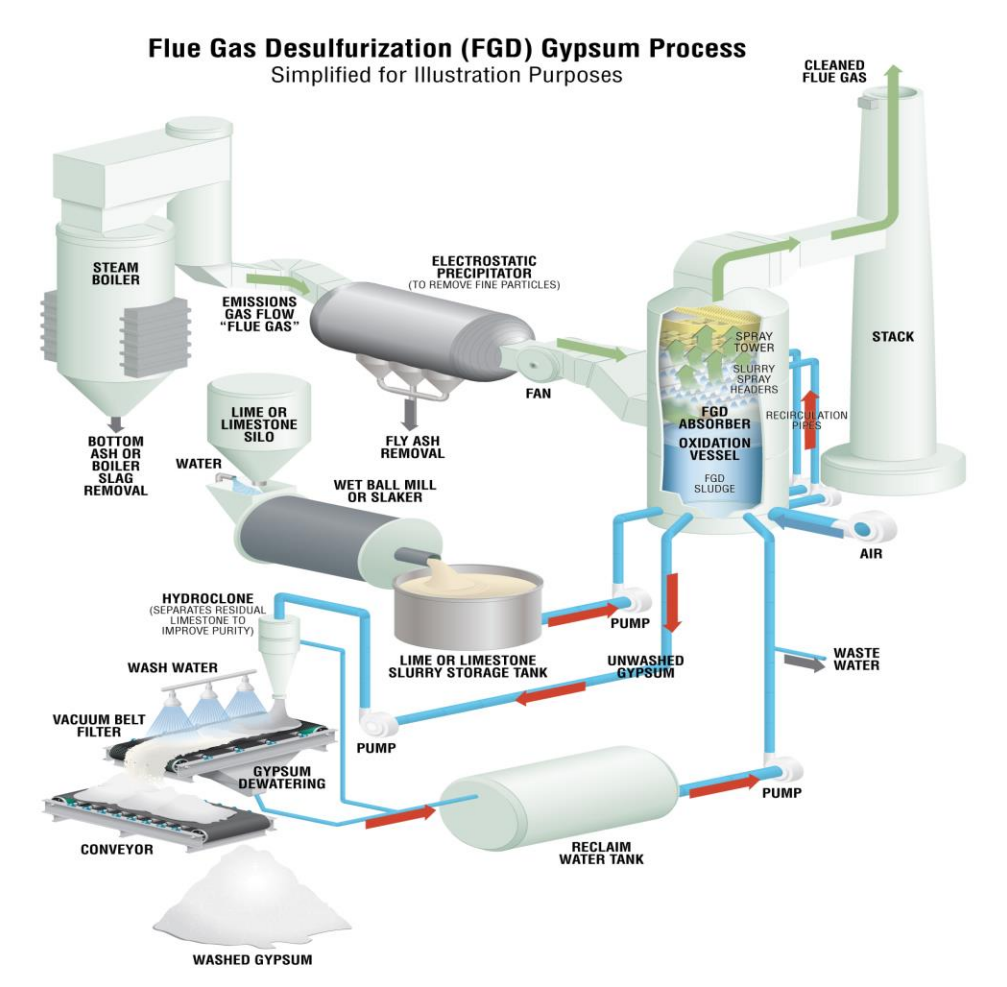


What is Cement?

Dry powder and primary ingredient in concrete – "cementitious" component
One of the most important building products in the world



FGD Gypsum Process



- Mineralogically identical to natural gypsum, FGD gypsum, or synthetic gypsum, is produced from gas captured within emission control systems at coal fired electric utilities.

- Beneficial Uses
  - Cement Manufacturing (finish process) a 1 million ton cement plant uses ~ 50K tons of gypsum
  - Gypsum Wallboard Manufacturing
  - Agricultural Soil Amendment/Fertilizer
  - 17.2 Million Tons were reported Beneficially Used in 2023 = 99.4% of FGD gyp produced

Gypsum - Flue Gas Desulfurization (FGD)

Produced when sulfur dioxide (SO_2) is removed from flue gases using limestone or lime scrubbers. The main product is **synthetic gypsum ($CaSO_4 \cdot 2H_2O$) known as FGD Gypsum.**

Used in **wallboard (drywall)**, **cement**, and **agriculture** as a soil amendment/fertilizer.

How is this important for CO_2 Reduction?

Mineral composition is valuable – C_aSO_4 *$2H_2O$ = GYPSUM
Replace virgin mined gypsum
Required to manufacture cement (1MM ton cement plant uses 50K tons of gypsum)
Clinker substitution when added to finished cement
Used as a soil amendment which replaces other products