



**GRAYMONT**

# **DOE CEMENT & LIME DECARBONIZATION WORKSHOP**

---

## **Unique Production Process Characteristics Impacting Decarbonization**

Canonsburg, PA  
July 19 – 20, 2023

# Existing Plant Retrofits – Lime Kilns

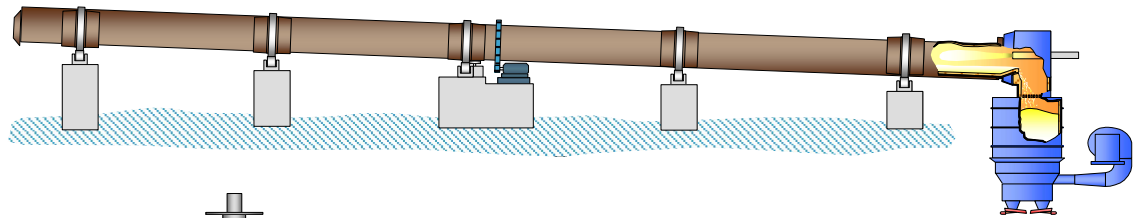
- ▶ **Common US lime kiln technologies**
- ▶ **Carbon capture challenges**



# Common US lime kiln technologies

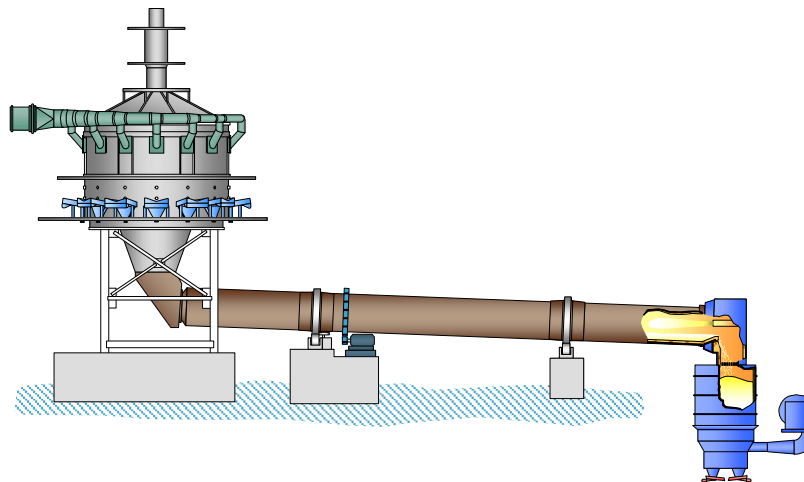
## ▶ Straight Rotary

- 7.5 to 11 GJ/kg lime



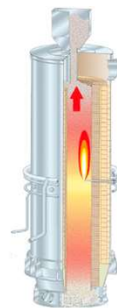
## ▶ Rotary Preheater

- 5.2 to 6.5 GJ/kg lime



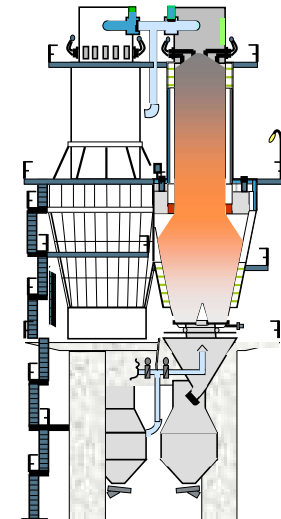
## ▶ Single Shaft Vertical

- 4.8 to 5.5 GJ/kg lime



## ▶ Parallel Flow Regenerative (PFR)

- 3.8 to 4.2 GJ/kg lime

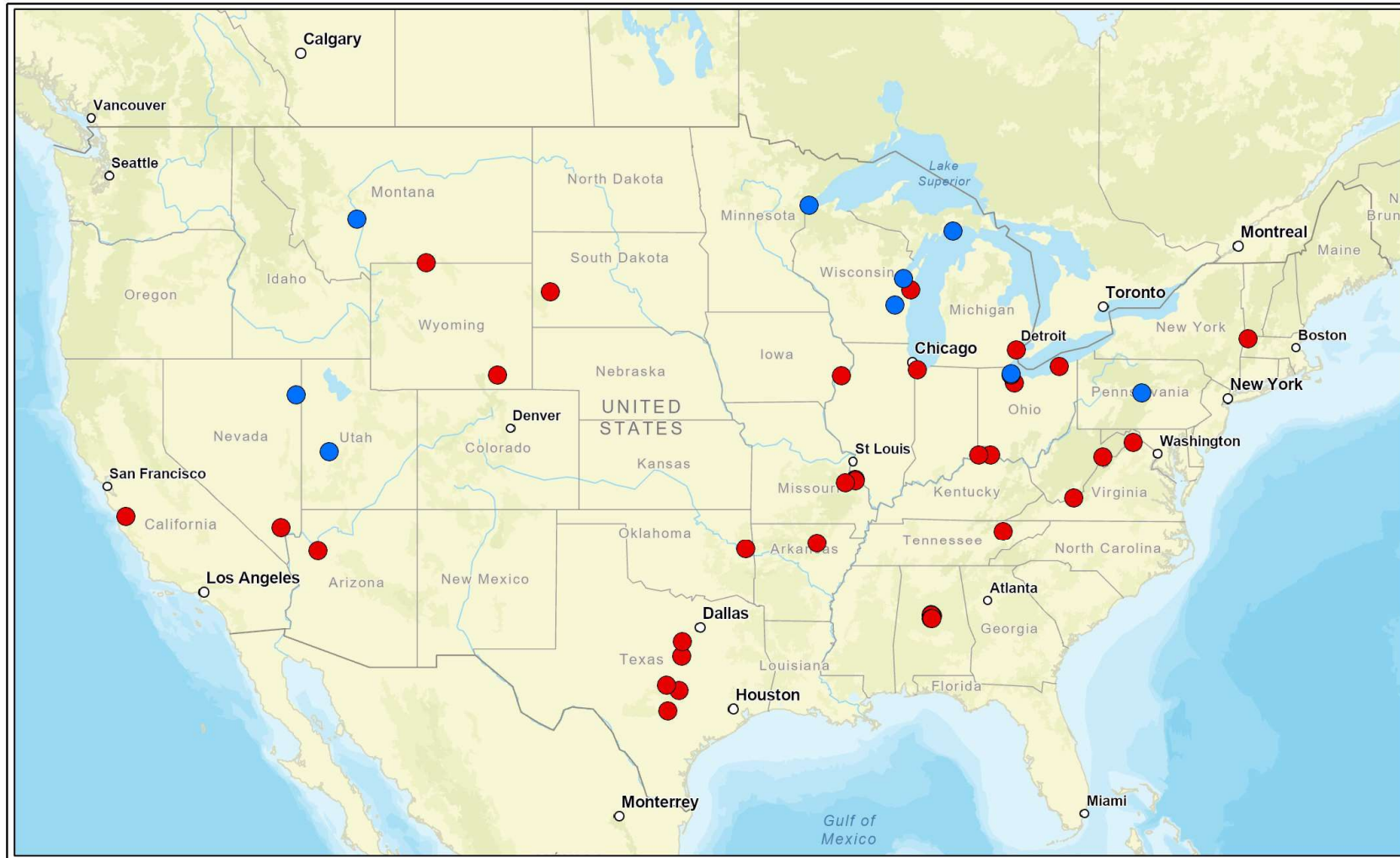


# Carbon capture challenges for lime kilns

- ▶ **We have studied the capture technologies with higher TRLs such as liquid amine that are being deployed in the power and cement industries**
  - The economy of scale does not favor typical lime kiln CO<sub>2</sub> emission rates
  - Modularization may help the economics, but the BoP CAPEX remains substantial for a lime plant where there is little waste energy, no steam, no water treatment, and no traditional heat rejection (e.g. cooling towers)
- ▶ **Lime plants are distributed and often remote**
  - CO<sub>2</sub> value chain will be plant-specific (off-taker challenges)
  - Utilities may limit the options in terms of choice of CCS technologies



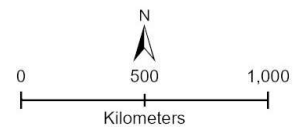
# Majority of US lime plants



## United States Lime Plants

Does not include captive plants

- Graymont Lime Plant
- Other Lime Plant



Map Name: US20200901  
Web Date: 11/13/2020

# Decarbonization pathways

- ▶ **We are looking at transformational technologies that could deploy by 2030, following DoE's roadmap for industrial decarbonization**
- ▶ **We are closely following the initiatives to develop the infrastructure of a decarbonized industry (CO2 and H2 hubs) in the US and assessing the opportunity for our plants to participate**

