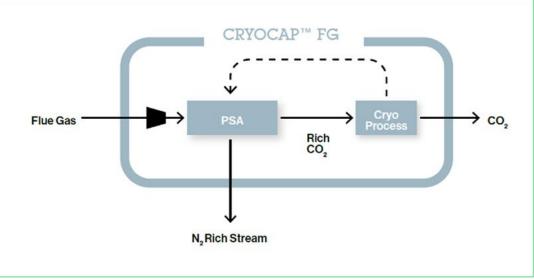
#### Industrial Carbon Capture from a Cement Facility Using the Cryocap<sup>TM</sup> FG Process (DE-FE0032136)



**I**ILLINOIS

Prairie Research Institute



Nisage Energy @Kiewit

U.S. DEPARTMENT OF

Kevin C OBrien, PhD Director, Illinois Sustainable Technology Center Director, Illinois State Water Survey Prairie Research Institute University of Illinois at Urbana-Champaign

DOE/NETL 2023 Cement and Limestone Decarbonization (August 15-19, 2022) Pittsburgh, PA.

Liauide

## **Project Overview**

- Cooperative Agreement No. DE-FE0032136
- Total Funding: \$4,999,585
  - DOE: \$3,999,585
  - Non-DOE: \$1,000,000

**HOLCIM** 

- Cost Share: 20%
- Performance Period:

April 1, 2022– September 30, 2023 18 months, 1 Budget Period

- DOE Funds Non-DOE Funds
- <u>Main objective</u>: To execute and complete a front-end engineering and design (FEED) study for a commercial-scale, carbon capture system that separates 95% of the total CO2 emissions at Holcim Ste Genevieve Cement Plant using Air Liquide's Pressure Swing Adsorption (PSA) assisted Cryocap<sup>™</sup> FG technology

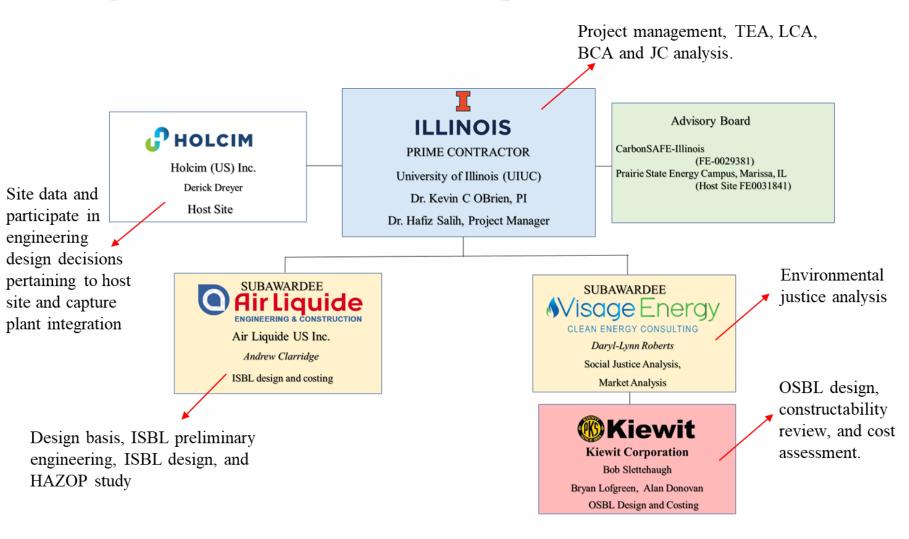
**r Liquide N**isage Energy



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### Project Tasks vs. Lead Organizations



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### **STE. GENEVIEVE CEMENT PLANT SIGNIFICANCE**

- The largest single cement kiln in the world, commissioned in 2009
- Annual cement production capacity of 4.5 million metric tons
- A 4,000-acre site containing more than 100 years of limestone supply, in addition to 2,000 acres conservation area.
- Modern, efficient & state of the art facility, with high degree of automation and utilization (on stream factor)

HOLCIM



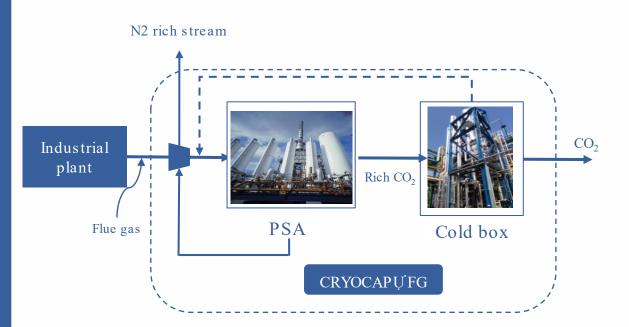
Wisage Energy **®Kiewit** 

• CO<sub>2</sub> transportation and storage partnership under development for storing CO2 close to potential geological storage locations, i.e. the Illinois Corridor, where CarbonSAFE has highlighted significant storage potential



## Cryocap<sup>TM</sup> FG: CO<sub>2</sub> Capture from Flue Gas (~15% to 40% dry mol CO<sub>2</sub>)

- Suitable for Cement, Lime, SMR (flue gas), FCC, ...
- > PSA as a preconcentration brick
- HSE friendly (no chemicals and no flammables)
- Electricity powered (no steam needed)
- Compact & Flexible footprint: Compressors, PSA and Coldbox can be located in 3 different plots
- > NO<sub>x</sub> Smart Management
- $\succ$  Gaseous or liquid CO<sub>2</sub>
- ≻ CO<sub>2</sub> capture rate: 95%+



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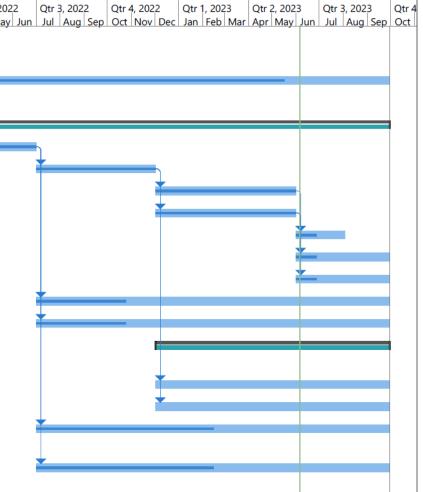
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## **Project Timeline**

ID	Task Name	Start	Qtr 1, 2022         Qtr 2, 2022         Qtr 3, 2022         Qtr 4, 2022
1			
2			
3	1.0 Overall Project Management	Fri 4/1/22	
4	1.1. Project Management Plan	Fri 4/1/22	_
5	2.0 Initial Engineering Design	Fri 4/1/22	
6	2.1 Design Basis	Fri 4/1/22	
7	2.2 Preliminary Engineering	Fri 7/1/22	<b>*</b>
8	2.3 ISBL Engineering	Fri 12/2/22	
9	2.4 OSBL Detailed Engineering	Fri 12/2/22	×
10	2.5 HAZOP Review	Thu 6/1/23	
11	2.6 Constructability Review	Thu 6/1/23	
12	2.7 Cost Assessment	Thu 6/1/23	
13	3.0 Business Case Analysis	Fri 7/1/22	*
14	4.0 Technology EH&S Risk Assessment	Fri 7/1/22	*
15	5.0 Techno-Economic Analysis (TEA) and Life Cycle Analysis (LCA)	Fri 12/2/22	
16	5.1 TEA Analysis	Fri 12/2/22	
17	5.2 LCA Analysis	Fri 12/2/22	
18	6.0 Preliminary Environmental Justice Analysis	Fri 7/1/22	*
19	7.0 Preliminary Economic Revitalization and Job Creation Outcomes Analysis	Fri 7/1/22	*



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# **Moving Forward**

- Completion of all Studies and Investigations
- Business Case Analysis
- Technology EH&S Risk Assessment
- TEA and LCA
- Preliminary Environmental Justice Analysis
- Preliminary Economic Revitalization and Job Creation Outcomes Analysis
- Coordinate with synergistic geological storage projects near the Host Site so that the capture system would be part of a full  $CO_2$  value chain system to capture, compress, transport, and store the  $CO_2$  emissions from the Host Site.

