Direct Carbon Conversion to Chemically Enhanced Supplementary Cementitious Materials for Building Construction (MACE)

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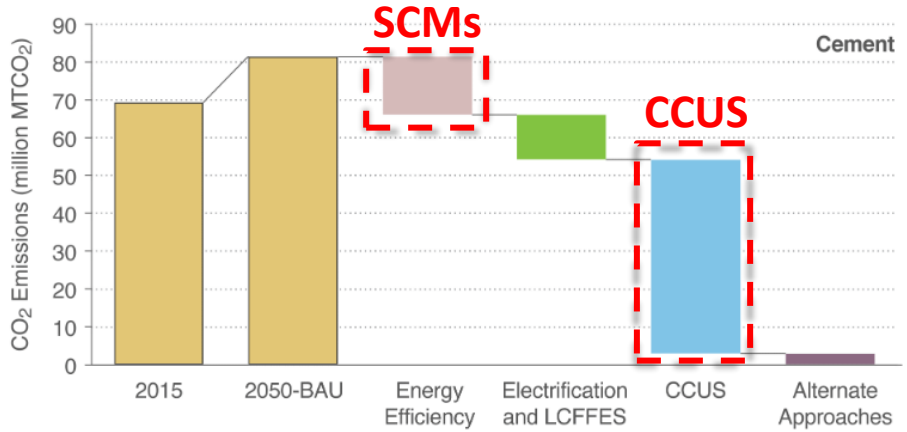
ACT Knowledge Sharing Workshop

October 4-5th, 2023

Technology Overview

- **Clinker Substitution and Carbon Capture Utilization and Storage (CCUS) are the biggest opportunities to decarbonize the cement/concrete industry.**
- **Dwindling supplies of supplementary cementitious materials (SCMs), such as fly ash and slag, drive the need for alternative SCMs.**
- **Upcycling of industrial and biomass byproducts into SCMs address the critical need to reduce CO2 emissions from construction and building materials.**

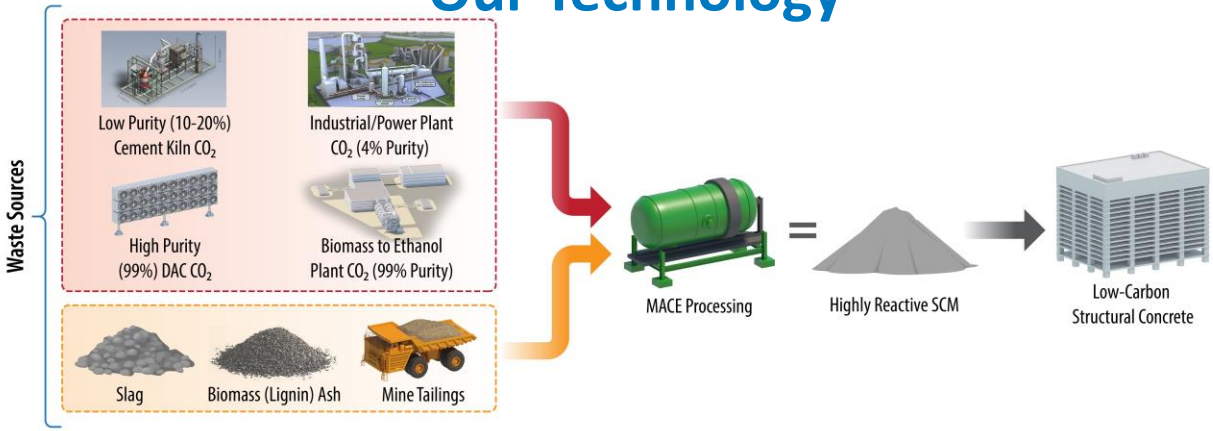
Objective: *To identify low-value waste products and mineralizable resources in North America (i.e., Canada and the U.S.) that can be unlocked for use as SCMs while aiming to determine the efficacy of CO_2 sequestration and enhanced cementitious reactivity of a range of low-grade feedstocks.*



Impact of Decarbonization Sectors on CO_2 emissions (million MT/year) for the US cement manufacturing subsector, 2015–2050

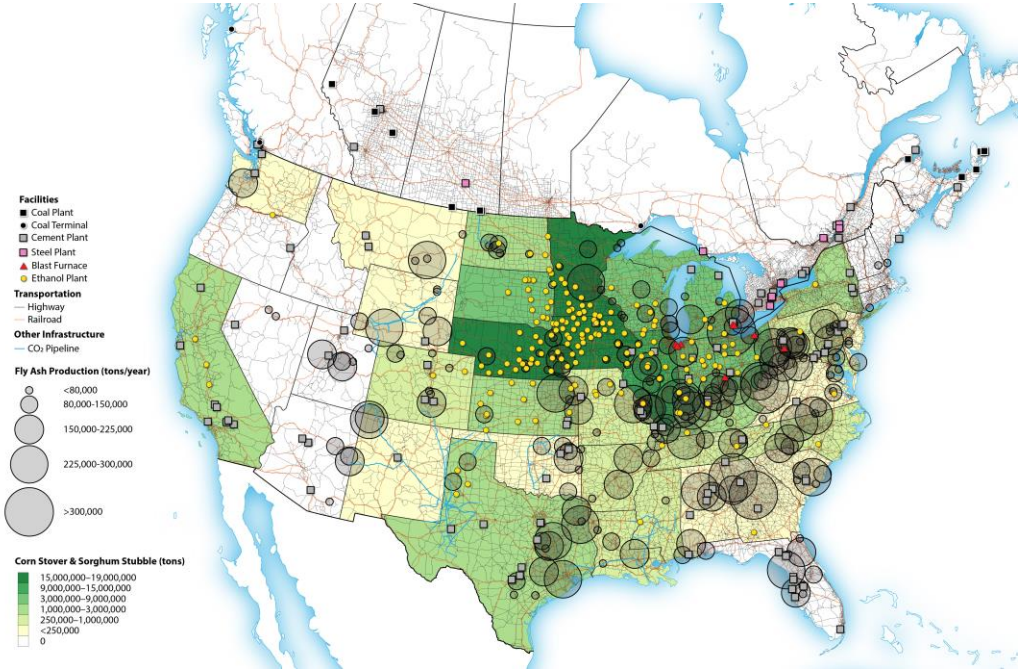
DOE Industrial Decarbonization Roadmap, 2022, DOE-EE-2625

Our Technology



Technology Impact

- This technology combines CCUS and clinker substitution into one solution.
- Can be deployed large scale with potential to replace 20-60 megatons of cement per year.
- Unlocks low-value waste products and mineralizable resources that are currently available in North America for use as SCMs.
- Enhanced SCMs comparable to the cheaper and once readily available SCMs like fly ash ($35-110/ton), slag from steel mills ($1-110/ton).



Success Metric	Commercialization target	Project Target
Demonstrate direct CO_2 conversion to enhanced SCM by weight	20%	10%
Net CO_2 reduction of concrete with enhanced SCM	>20%	20%
$/ton (feedstock)	<$100/ton	~$100/ton