Lehigh Hanson
HEIDELBERGCEMENT Group

Groundbreaking Technologies: Carbon Capture and Storage (CCS)

2021 ACI Concrete Convention

Ignacio Cariaga – Lehigh Hanson

aci VIRTUAL CONCRETE CONVENTION

Heidelberg's approach to Carbon Neutrality

CCS Technologies

Lehigh Edmonton Cement CCS

Lehigh Hanson is part of the HeidelbergCement Group
one of the worldwide market leaders in the building materials sector

World leader in the vertical integration

 # 1 worldwide in aggregates:

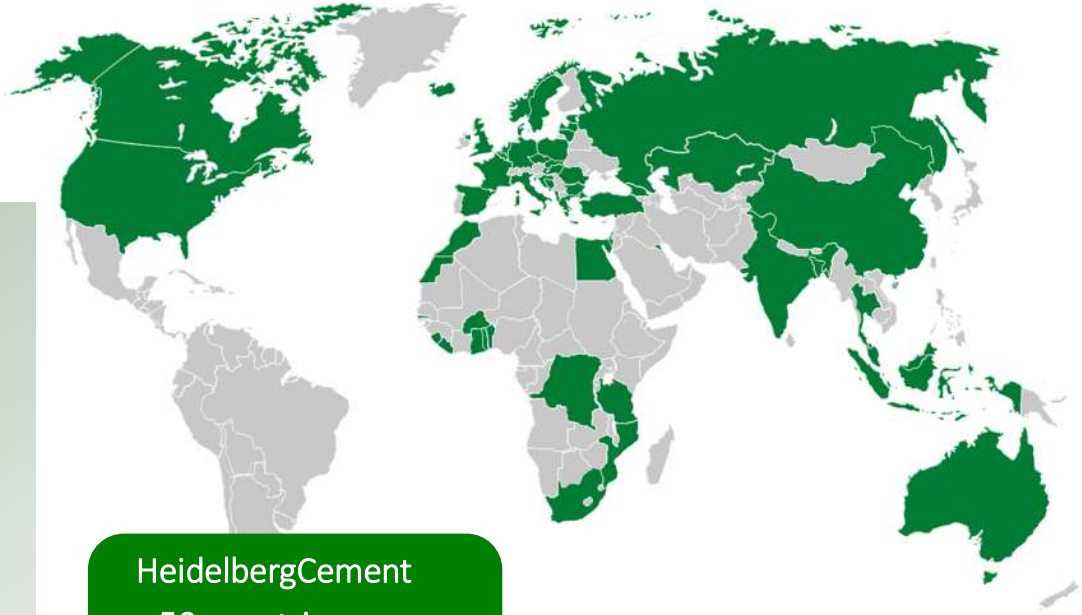
- 600 production sites for sand, gravel and crushed rock (200+ Lehigh Hanson)

 # 2 worldwide in cement

- 160 cement plants/grinding mills (20+ Lehigh Hanson)

 # 3 worldwide in ready-mixed concrete

- 1,700 ready mixed concrete plants (200 Lehigh Hanson)



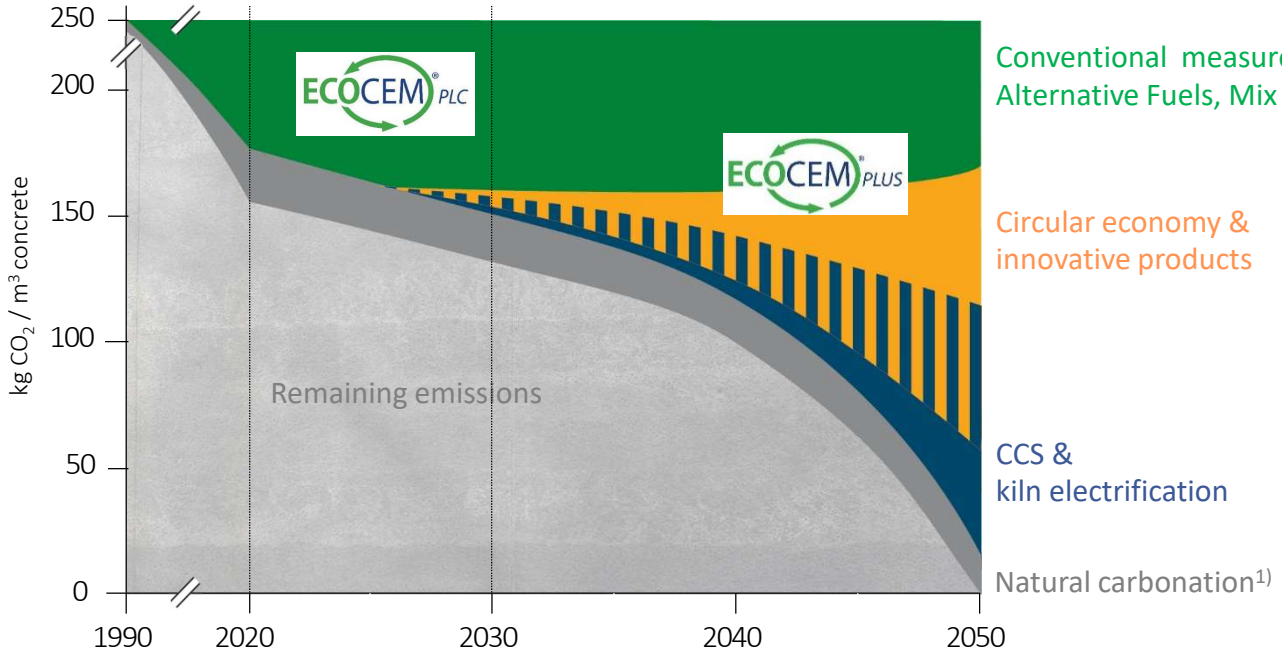
HeidelbergCement
>50 countries
>3,000 locations
>54,000 employees

HEIDELBERGCEMENT

Lehigh Hanson
HEIDELBERGCEMENT Group

Carbon neutrality by 2050 requires a variety of solutions

Our approach to carbon neutrality



1) Natural carbonation is the absorption of CO_2 from the atmosphere during the lifetime of a concrete construction

Source: ESG Heidelberg's Road to Carbon Neutrality

Heidelberg's approach to Carbon Neutrality

CCS Technologies

Lehigh Edmonton Cement CCS

CCS –projects and technologies with significant potential

TRL 8

Post combustion (Amine)

Early Stage: 4 research projects in Europe
Feasibility Study: Edmonton, Canada
Industrial/commercial scale:
Brevik, Norway

TRL 5

Oxyfuel

Early Stage: Preparatory research work done together with ECRA/UMONS
Pre-industrial: CI4C, Germany

TRL 6

Direct separation (LEILAC)

Pilot: LEILAC-1, Belgium
Pre-industrial: LEILAC-2, Germany

TRL 8

Micro-algae

Early Stage: 3 research projects executed in Sweden, Turkey & France
Pre-industrial: Safi, Morocco

TRL 7

Hydrogen

Pre-industrial: Carbon neutral H_2 based fuel, pilot at Ribblesdale, UK
Industrial/commercial scale:
H_2/O_2 HydrOxy combustion, France

TRL 3

Kiln electrification

Early Stage: Feasibility studies CEMZERO, Sweden, ELSE, Norway & LEILAC-2, Germany

TRL - Technology Readiness Level ***(scale from 1-9, 1 being very early stage and 9 being commercially available)***

Source: ESG Heidelberg's Road to Carbon Neutrality

Cement emissions & Carbon Capture Technologies 101.

VIDEO: https://www.youtube.com/watch?v=f0NgTfLIuGQ

Source: ESG Heidelberg

Each technology has pros & cons – we develop all three in parallel

	Impact	Amine	Oxyfuel	LEILAC
Readiness/ time horizon	+			
% of CO_2 captured	+++			
Purity of CO_2 captured	++			
Energy use/ costs	+++			
Retrofitability	++			

Heidelberg's approach to Carbon Neutrality

CCS Technologies

Lehigh Edmonton Cement CCS

CCS EDMONTON

Lehigh CCS Edmonton Update

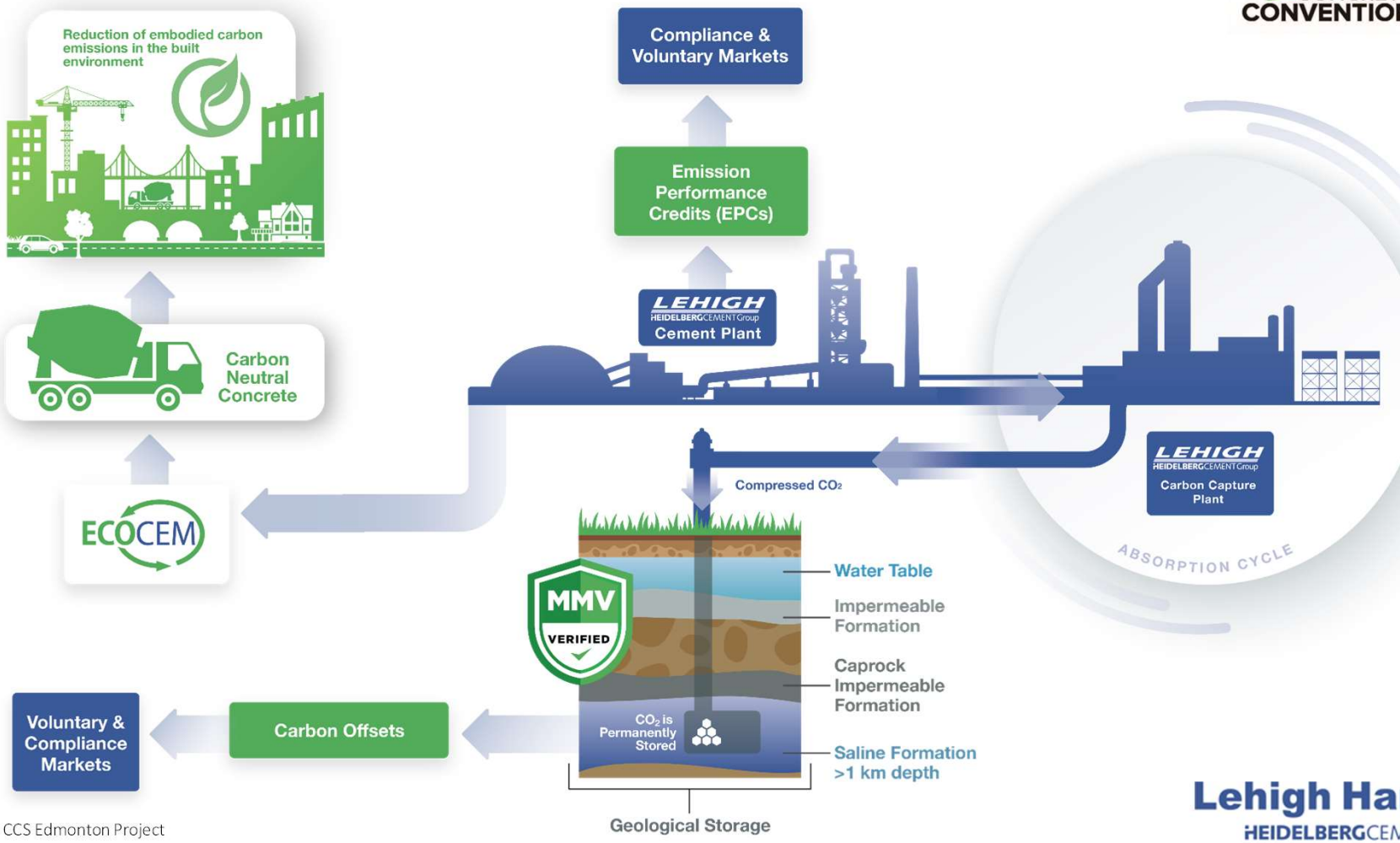
CCS EDMONTON

Lehigh CCS rendering

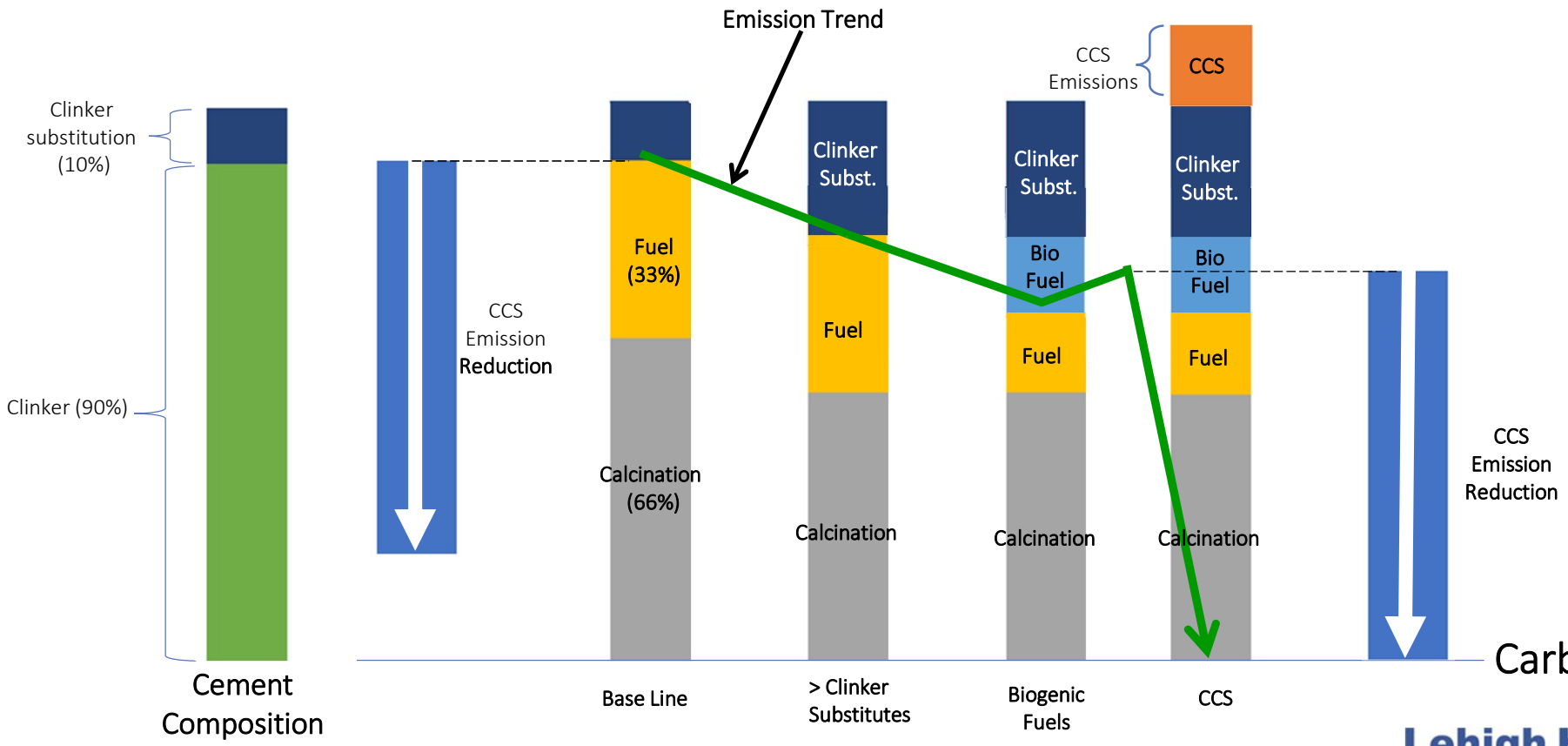
Unique CCS within Heidelberg

- Full Scale
- Safe local storage availability
- Fast Track
- Reducing scope 3 emission
- Biofuel

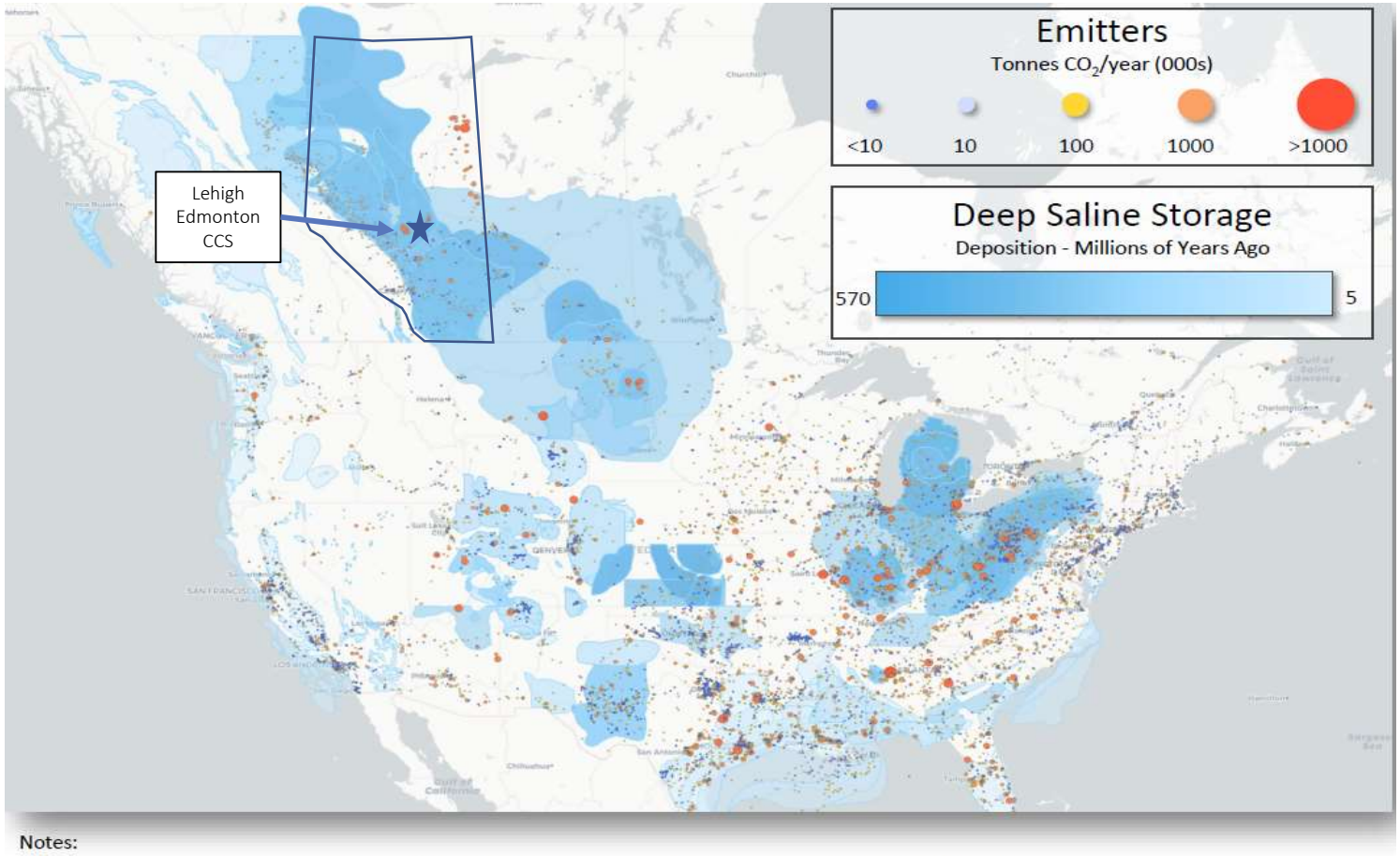
Lehigh Carbon Capture Value Chain



Lehigh Edmonton Cement Carbon Intensity Trajectory



Carbon Storage in Alberta: Proven Geological Pore Space



Notes:
(1) Emissions Data from Environment and Climate Change Canada's Greenhouse Gas Reporting Program (2019)
(2) Saline Aquifer Data from https://edx.netl.doe.gov/geocube/#natcarbviewer

Decades of historical data

- Shell Quest
- Boundary Dam
- NWR (ACTL)
- Nutrien (ACTL)

CCUS Edmonton Update

Schedule: Operational 2026

Questions