INTERNATIONAL
CCS KNOWLEDGE
CENTRE

CCS to Decarbonize Cement

UNECE 5th Workshop on Attaining Carbon Neutrality
April 14, 2021

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INTERNATIONAL CCS KNOWLEDGE CENTRE

ccsknowledge.com

At the International CCS Knowledge Centre, we take climate action seriously.

- We have a breadth of experience based on Boundary Dam 3 CCS Facility, Shand 2nd Gen CCS Feasibility Study, and ongoing work on feasibility of CCS on Cement.
- We offer guidance for planning, design, construction and operation.
- We understand real value through continuous CCS advancements on real applications.
- We actively engage with financiers, decision makers, and business case partners.

We are dedicated to advancing the understanding and use of large-scale CCS as a means of managing GHG emissions, globally.

BOUNDARY DAM

LEARNING STARTS HERE

THE WORLD'S 1ST LARGE SCALE POST-COMBUSTION CCS FACILITY

with over 4 million tonnes captured & stored since 2014

Large Scale CCS & Net Zero

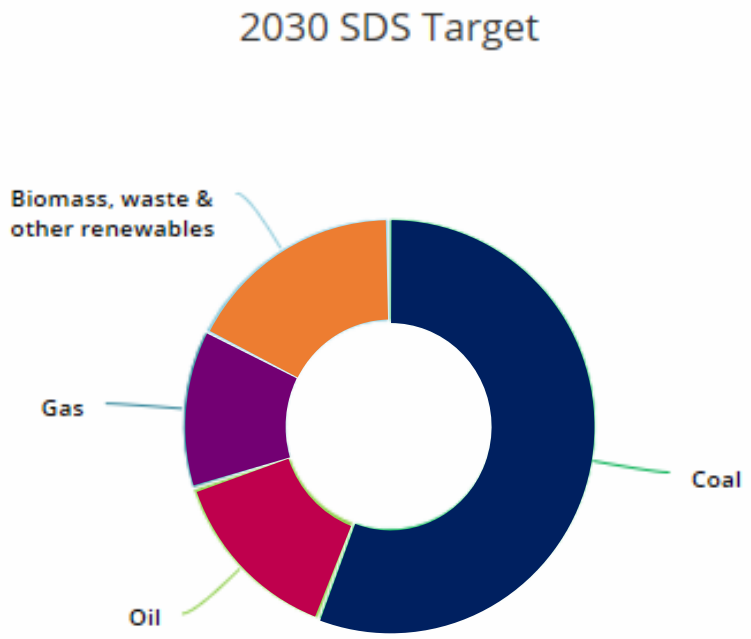
The International CCS Knowledge Centre supports the **Paris Agreement** global commitments to **Net Zero Emissions** by the second half of the century, temperature rise must be kept to well below 2 degrees Celsius above pre-industrial levels; and limiting global warming to 1.5 degrees Celsius.

- Much of the world cannot meet their emission reduction targets without large-scale CCS.
- Getting to net-zero by 2050 requires over 8Gt to be captured and storing 200 times more than current levels.
  - International Energy Agency (2020), *CCUS in Clean Energy Transitions*
- Without CCS, to get to 2°C the median increase in mitigation cost is 138%.
  - International Panel on Climate Change

Cement Industry Emissions

- Cement manufacturing represents around 7% of global emissions
- Global demand for cement is expected to increase 12-23% by 2050 (IEA)
- To produce cement two streams of emissions occur:
  - energy emissions, and
  - industrial process emissions
- Energy emissions can be reduced by efficiency.
- Industrial process emissions **must** be captured to significantly lower emissions. They represent 4% of global emissions.

The International Energy Agency advises the use of alternative fuels in cement production must more than double by 2030

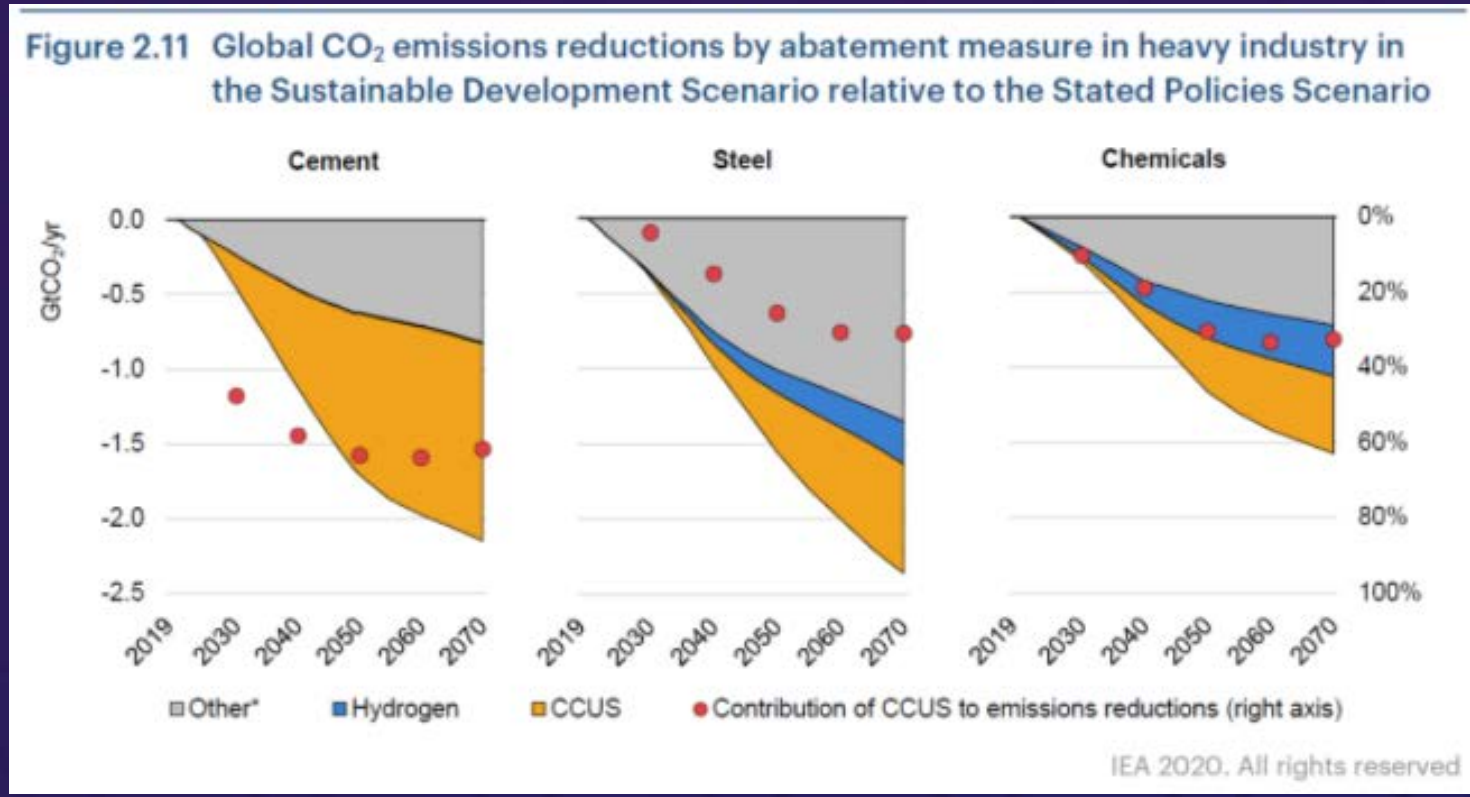


International Energy Agency, Cement (2019)
https://www.iea.org/tcep/industry/cement/

CCS on Cement in the coming decades

In its Sustainable Development Scenario (SDS), IEA requires:

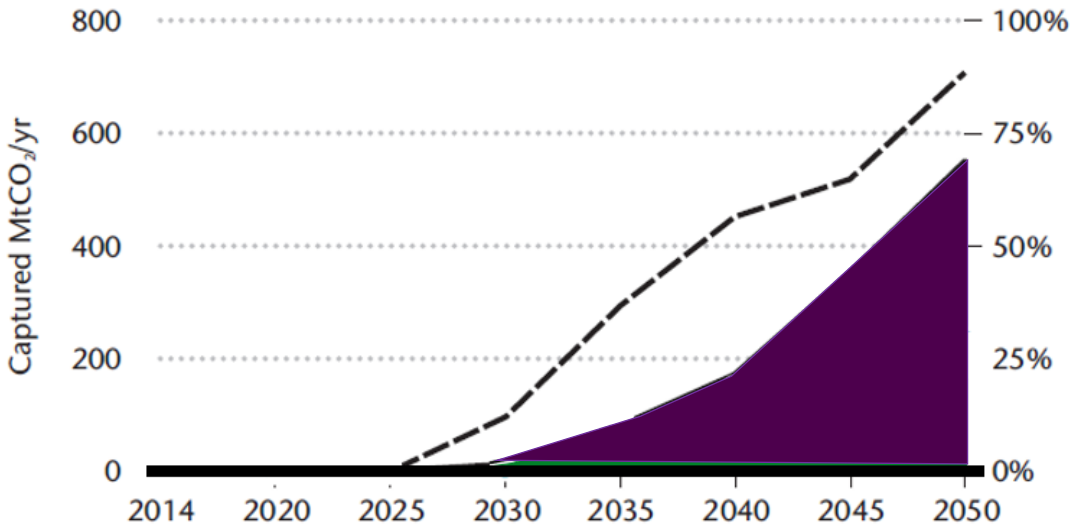
- around **450Mt CO_2 to be captured by 2030** by industry worldwide – mainly by the cement sector.
- CCUS has to deliver **60% of the cement** sector's emission reductions.



Integrating CCUS on Cement

- Post Combustion capture technologies are ideal for cement manufacturing
  - Flue gas is similar in cement to coal
- Can be applied to existing facilities
  - Occurs on emissions after being generated in the cement kiln
  - No fundamental modifications the kilns
- CCUS has been proven at large scale
- Biomass firing with CCS can result is carbon neutral cement.

Global deployment of CCS required in the cement sector for permanent storage to reach 2 degrees
(Low and high variability scenarios)



International Energy Agency, Technology Roadmap Low-Carbon Transition in the Cement Industry (2018) https://webstore.iea.org/technology-roadmap-low-carbon-transition-in-the-cement-industry

Lehigh Hanson Edmonton Post-Combustion CO_2 Capture Pre-Feasibility Study

On Nov. 28, 2019, Lehigh Cement and the Knowledge Centre announced a joint feasibility study of a commercial-scale CCS project.

- The study targets the feasibility to capture CO_2 from the flue gas of Lehigh's Edmonton, Alberta, Canada cement plant.
- Retrofitting a cement production facility with a full scale, post-combustion, amine-based CO_2 capture system.
- Feasibility study commenced in November 2019 and will be complete in the fall of 2021.
- Capture rate is estimated at over 700,000 tonnes of CO_2 annually.
- Study budget of $3.0M (CAD), Emissions Reduction Alberta invested $1.4M (CAD) in the feasibility study of CCS on an industrial cement facility.

Lehigh Hanson Edmonton Post-Combustion CO_2 Capture Pre-Feasibility Study
https://ccsknowledge.com

CCS on the Cement Horizon

Canada
- Lehigh Cement post-combustion 600,000t CO_2/a
- CO_2MENT Inventys CO_2 capture & LH CCU

Europe
Horizon 2020
- CEMCAP
- ECRA
- LEILAC
- AC² OCEM
- CLEANKER
- ANICA

India
Dalmia Tamil Nadu - 500,000t CO_2/a Post-Combustion

Norway
NORCEM Post-Combustion 400,000t CO_2/a

China
Anhui Conch Baimashaun 50,000t CO_2/a Post-Combustion

Taiwan
Taiwan Cement 450,000t CO_2/a Full Scale CaL

GCCA Global Cement and Concrete Association

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Thank You

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ccsknowledge.com

Contact us by email:

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