SCALABLE NEGATIVE EMISSIONS
DIRECT AIR CARBON CAPTURE

Schulich School of Engineering - University of Calgary
Department of Chemical Engineering
Kondwani Asefa, Whitney Ebose, Erioluwa Fagbuyi, Adhm Mostafa, Aaron Ng

PROJECT DRIVERS
- Addressing Climate Change Urgency
- Practical Carbon Reduction
- Commitment to Environmental Responsibility

THE GOAL OF CARES
Design a scalable Direct Air Capture pilot plant capable of removing a net total of 10 tons CO₂/day from the atmosphere, utilizing natural gas as its power source.

Constraints:
- The plant must be powered using natural gas.
- The plant uses a 3-Aminopolyethylamine (APEI) modified silica gel solid absorbent.
- Accomplish the net goal, factoring in both plant emissions and emissions generated from offsite electricity production.
- Scalability.

THE GOAL OF CARES

SCALABILITY
- Use of easily available and affordable supply of natural gas without intermittency issues, compared to other renewables such as solar and wind.
- Strategic location in Alberta Industrial Heartland for easy access to natural gas and simple shipping of CO₂ to ACTL.
- Capture of majority of emissions via combination of air with the exhaust stream.
- Addition of more adsorber columns to increase capture capacity.

FEASIBILITY

CONCLUSIONS
- Net Negative Emissions: 11 tons of CO₂/day captured directly from the atmosphere.
- Scalable design enables CO₂ capture to be increased as needed.
- Further reduction of OPEX and process emissions.

ACKNOWLEDGEMENTS
We would like to thank our supervisor Dr. Bryant and Wolf Carbon President Jeff Pearson for their guidance and support throughout this project.

REFERENCES
1. OurWorldInData.org
Hannah Ritchie, Pablo Rosado and Max Roser (2023). “CO₂ and Greenhouse Gas Emissions” Published online at OurWorldInData.org