Intern Work Scope

Hire Assignment

Name	School	Grad Date
Degree	**Academic Discipline**	**Other Degree/Discipline**
M.Sc. or Ph.D.	Chemical Engineering	Mechanical Engineering
Mentor / Buddy	**Supervisor**	**Work Group**
Tecle Rufael	Vincent Kwong	Process Engineering

Main Assignment *

Project Name

Technoeconomic Analysis of Anthropogenic CO2 Sources in US Midcontinent

Project Description

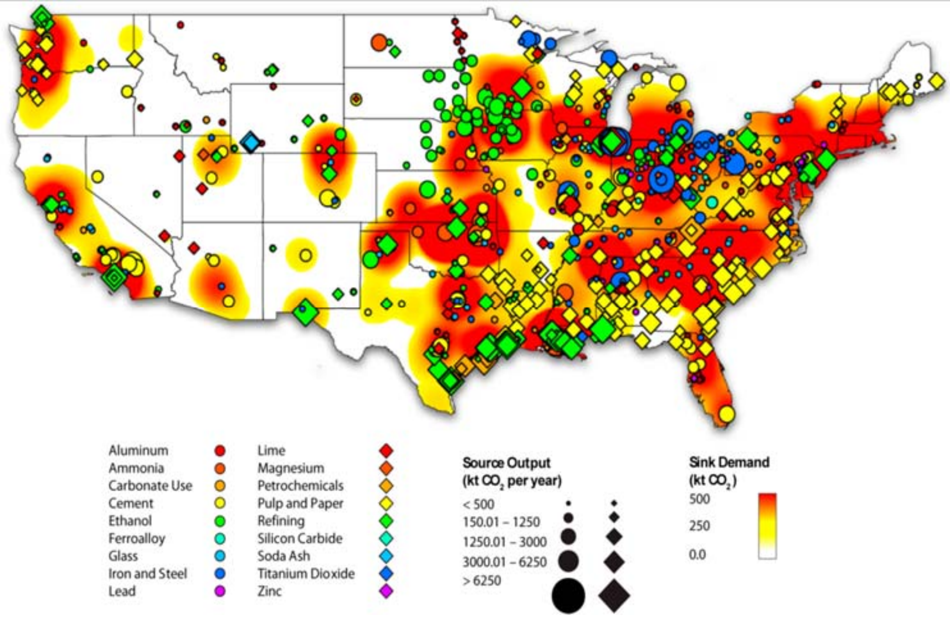
1. Introduction:

Carbon Capture, Utilization and Storage (CCUS) is widely considered to be a critical technology option for achieving deep cuts in anthropogenic greenhouse gas (GHG) emissions and in slowing down global climate change. However, progress in global CCS deployment has been slow due to several challenges, one of which is the high cost of CO_2 capture from industrial sources. The CO_2 capture cost portion makes up the bulk of the entire capture-compression-transportation-injection-storage cost chain.

Recent large-scale CCS projects are moving forward partly by making strong linkage to CO_2 use for Enhanced Oil Recovery (EOR). In addition to potential environmental benefits, likely tightening of CO_2 supply from existing geologic sources or natural gas processing plants, especially in the US Midcontinent, is the primary motivation.

According to DOE DOE/NETL 2015 Report [1], the current CO_2 pipeline system in the US consists of total length of about 4500 miles, most of it in the mid-continent region. The vast majority of the pipeline is dedicated to CO_2-EOR, with small fraction used for other industrial uses, such as the food and beverage industry. Roughly 80% or 68 million metric tons per year of CO_2 in the US pipeline network comes from natural or geologic sources. However, volumes of CO_2 from industrial sources are expected to increase in coming years. The 2018 US carbon credit tax law (IRS Section 45Q) is meant to boost CO_2 utilization and sequestration from anthropogenic sources. Currently most industrial CO_2 comes from hydrogen, urea, ethanol plants, limekilns or Kraft pulping processes.

This project aims to understand the technicoecomics of potential industrial CO_2 sources near two major pipeline networks in the US midcontinent, namely the Permian and Rocky Mountain regions.



Source: US distribution of industrial CO2 processes. [2]

Source: NETL and O&G Journal

[1] DOE/NETL Report 2015
[2] Psarras, et. al. *Environ. Sci. Technol.* 51(19) 2017

2. Objective:

This summer project aims to analyze and shed some light to the technical feasibility and economic viability of potential industrial CO_2 sources within a given distance and flow direction from two major pipeline networks in the US midcontinent, namely the Permian and Rocky Mountain regions.

3. Project Tasks:

The tasks for this project include:

1. Familiarization:
    a. Overview of CCUS as a GHG mitigation option
    b. EPA GHGRP FLIGHT database
    c. Geo-referencing or GIS analysis

2. Analyze levelized cost of CO_2 capture, compression and transportation
    a. Use Sherwood or other methods to estimate cost of CO_2 capture from selected facilities [2];

b. Generate dehydration and compression cost estimates from same facilities
c. Use GIS to map selected industrial CO_2 facilities and pipeline networks
d. Estimate cost of pipeline/truck transportation of captured CO_2 to nearest point of pipeline network

Business Value and Drivers

1. Industrial CO_2 sources could alleviate potential shortage in existing CO_2 supplies in certain regions
2. Low cost industrial CO_2 sources could play a role in emission reduction in new or existing CO_2 utilization processes.

Deliverables

A report documenting:

1. Identification of likely industrial CO_2 sources near the Permian Basin or Rocky Mountain pipeline networks.
2. Levelized cost of CO_2 capture, compression and transportation to nearest point in CO2 pipeline network.
3. Prioritize anthropogenic CO_2 opportunities based on cost, volume and emission reduction potential.

Experience and Knowledge Project Provides to Hire

1. High level understanding of broad GHG emission mitigation, especially CCUS and role of industrial CO_2 sources.
2. Understanding the various emission types in industrial facilities and corresponding CO_2 capture technology options
3. Cost estimation of CO_2 capture, compression and transportation in US mid-continent region

Additional Comments or Experience Beyond Project (Safety, OE, etc)

**** This work scope will provide valuable working experience and a great introduction to Chevron's commitment to safety and Operational Excellence. It is aligned with the Chevron Way values – HIGH PERFORMANCE, as we look for innovative and agile solutions, and PROTECT PEOPLE AND THE ENVIRONMENT as we look for safer and more efficient solutions. Your internship creates the opportunity for you to see the big picture of engineering in the oil and gas business and the other disciplines within the business and Chevron. Your project addresses a real gap in our business and can add significant value. It is important you fully engage with your team, Unit and the other interns. Deliver your workscope(s) and make your thinking visible to your leadership where you are "getting it" and where you are challenged. Build your network, learn as much as you can and have some fun.*