CAAP Quarterly Report

June 30, 2025

Project Name: **Characterize Expected CO_2 Specification Ranges for Various Product Streams**

Contract Number: **693JK32450003CAAP**

Prime University: **Energy & Environmental Research Center, affiliated with the University of North Dakota**

Primary Investigator:

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Reporting Period: 04/01/2025 – 06/30/2025

Project Activities for Reporting Period:

1) Task 1: Project management, planning, and reporting
   a) Biweekly meetings were held with project members to discuss research efforts being conducted and to summarize activities performed while providing an avenue to coordinate research efforts within project scope and timing.
   b) Biweekly meetings were held with PRCI and DNV to discuss respective projects and to provide collaboration between the Pipeline and Hazardous Materials Safety Administration's (PHMSA's) and PRCI's investigation on impurities within CO_2 streams.
   c) Monthly meetings held with PHMSA personnel and advisors.
   d) Maintained budget.

2) Task 2: Research into composition of CO_2 streams from industrial sources
   a) Updated Excel spreadsheet listing the CO_2 compositions from additional projects.
      i) Added the CO_2 specification from the National Grid project.
      ii) Added CO_2 guidelines for DNV CO2SafePipe presented at AMPP conference, April 2025.
      iii) Added composition for the Fluxy project that transports CO_2 at a pressure <500 psig (gaseous state).
   b) Reviewed max/min limits for CO_2 compositions by industry.
   c) Reviewed alternative methodology for using CO_2 from direct air capture (DAC) from concrete (Enverus Intelligence Vault, https://intelligence.enverus.com/research/153390).
3) Task 3: Integration of CO_2 stream composition
   a) Reviewed the testing and analysis plans for storage projects based on permit applications for Class VI wells per the EPA website.

b) Compared the CO_2 stream compositions by industry with consistent and expanded compounds to list the varying levels and reported compounds of the CO_2 streams.
c) Reviewed information on data associated with mercury (Hg), carbonyl sulfide (COS), and amines. Very little information is publicly available on these compounds.
d) Continued review of literature on the effects of impurities on the corrosion of pipeline steels, documenting findings from research.
e) Reviewed CO_2 streams to HUB projects with varying compositions and transportation methods.
f) Reviewed the effect of dehydration with the varying recommended levels from the identified CO_2 compositions and the respective transportation method (pipeline or ship). Determined that the data on the interaction between impurities are lacking, but the level of NOx and SOx in the system can pose issues with the formation of strong acids.
g) Reviewed the effect of impurities on the thermodynamics and kinetics of the system.
h) Continued research into odorants for CO_2 pipelines with Arkema.

4) Task 4: Prioritization of emitters
   a) Reviewed the Global CCS Institute's (GCCSI) listing of a CCS project, providing a summary of active projects and projects in construction, in advanced development, and early development; finding that most of the identified projects are incorporated with the bioenergy/ethanol, hydrogen/ammonia/fertilizer, power generation, DAC, and natural gas/LNG industries. Most projects are in or in proximity to storage areas.
   b) Simulated the CO_2 streams with AspenPlus for five near-term emitters: steel, olefin, refiner, H2/syngas, and natural gas plants.
   c) Summarized the CCS projects and estimated the percentage of plants with CCS capture projects based on EPA Flight website.
   d) Reviewed the estimated CO_2 capture volumes as submitted to EPA for Class VI permits per Enervus.
   e) Reviewed the number of CO_2 pipeline projects based on the GCCSI listing.

5) Task 5: Review of CO_2 standards and development of knowledge base
   a) Reviewed current CO_2 transport industry standards to include AMPP.
   b) Initiated a list of impurities from various projects and initiated a guideline for the level of impurities within the CO_2 streams.
   c) Lamar University, as lead, submitted abstract to AIChE conference titled "Safety and Economic Assessment of CO_2 Product Stream Impurity Levels." Abstract was accepted for the conference.
   d) Lamar University delegates attended Carbon Capture Technology Expo/Hydrogen Technology Expo North America, June 25–25, NRG Center in Houston, TX.

Project Financial Activities Incurred During the Reporting Period:

	Total Project Expenses as of 6/30/2025	
	CAAP Funds	**Nonfederal**
Personnel	$52,079	$17,608
Fringe Benefits	$21,379	$10,283
Travel		–
Equipment		–
Supplies	$99	–
Contractual	$48,045	–
Construction		–
Other	$1,107	$79
Total Direct Charges	$122,710	$27,971
Indirect Charges	$61,958	$16,782
Totals	**$184,667**	**$44,753**
In Kind		**$36,284**
Total Cost Share %	**69.5 %**	**30.5%**

* EERC payroll is 2 weeks behind, so the payroll for 6/16–6/30 will be expensed in July. Our funds do not finish posting for the month until around July 10, so the amount for June could change.

Project Activities with Cost Share Partners:

Research efforts and information sharing between project partners have been developed and are ongoing.

Project Activities with External Partners:

Discussions with project team members (Lamar University, Stress Engineering, and PRCI) are ongoing with routinely scheduled meetings. Information sharing among project partners has been ongoing.

Potential Project Risks:

None known at this time.

Future Project Work:

1) Continue research efforts on CO_2 streams from industries as information is available.
2) Submission of draft final report.

Potential Impacts on Pipeline Safety:

Carbon capture at the various industries results in CO_2 streams that contain impurities. The level and type of impurities are influenced by the feedstock and capture process utilized where the carbon capture occurs. Through this investigation, guidelines for limits of various impurities contained within CO_2 streams will be provided. With these guidelines, considerations for the design, operation, and safety of CO_2 pipelines will be enhanced.